European butterflies and moths : based upon Berge's "Schmetterlingsbuch" / based upon Berge's "Schmetterlingsbuch" by W.F. Kirby.

Contributors

Kirby, W. F. 1844-1912.

Publication/Creation

London ; New York : Cassell, 1889.

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EUROPEAN

BUTTERFLIES AND MOTHS.

With 61 Coloured Plates.

BASED UPON BERGE'S "SCHMETTERLINGSBUCH."

BY

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CASSELL & COMPANY, LIMITED:

LONDON, PARIS, NEW YORK & MELBOURNE.

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PREFACE.

THE present work is designed to provide entomologists and tourists with a comprehensive illustrated guide to the study of European *Macro-Lepidoptera*, all previous works on the subject (with the exception of a small pocket manual including the Butterflies only, and now nearly out of print) relating solely to British species. After due consideration, it was determined to base the work upon Berge's "Schmetterlingsbuch," the best and most widely-used German book of this kind, which has already gone through five editions in Germany, and has had the advantage of the successive revision of several eminent entomologists of great experience. The German work being chiefly confined to the species of Central Europe, the plan of the English edition has been extended to include descriptions of the whole of the species inhabiting Europe proper, according to the catalogue published by Staudinger and Wocke in 1871, with additions bringing the subject down to the present time. Large additions have likewise been made to every part of the work, rendering it one of the most complete which has hitherto been published, either in England or on the Continent; and a series of additional plates has been added, in order to illustrate the *Macro-Lepidoptera* more fully.

British species are marked with an asterisk.

It has not been thought advisable to give more synonymy than seemed absolutely necessary; and English names, which are now but little used, are also only inserted occasionally.

The *Micro-Lepidoptera* are unsuited to popular treatment, on account of their small size and great number. Had they been included in detail, the size of the book would have been doubled, simply by the addition of those groups of small moths in which many collectors take little or no interest. A brief account of some of the principal groups, illustrated by two plates, has, however, been given; and much general information with regard to them will also be found to be contained in the Introduction.

W. F. KIRBY.

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Anker.
Assm. (Assmann and Assmuss).

Bayle.
Bell. (Bellier de la Chavignerie).
Berce.
Bergstr. (Bergstraesser).
Bisch. (Bischoff).
Boeb. (Boeber).
Boie.
Boisd. (Boisduval).
Bon. (Bonelli).
Borkh. (Borkhausen).
Brahm.
Bruand.
Bugn. (Bugnion).
Butl. (Butler).

Chard. (Chardiny).
Chav. (Chavannes).
Christoph.
Cl. (Clerck).
Const. (Constant).
Costa.
Cram. (Cramer).
Crewe.
Curt. (Curtis).
Cyr. (Cyrilli).

Dalm. (Dalman).
Dard. (Dardoin).
De Prunn. (De Prunner).
De Vill. (De Villiers).
Dietze.
Don. (Donovan).
Donz. (Donzel).
Dorfm. (Dorfmeister).
Doubl. (Doubleday).
Drury.
Dup. (Duponchel).

Esp. (Esper).
Eversm. (Eversmann).

Fabr. (Fabricius).
Fall. (Fallou).
Feisth. (Feisthamel).
Fenn.
Fisch. (Fischer von Röslerstamm and Fischer von Waldheim).
Fonsc. (Fonscolombe).
Forst. (Forster).
Frey.
Frey. (Freyer).
Friv. (Frivaldszky).
Fuessly.

Géné.
Gerh. (Gerhard).
Germ. (Germar).
Gey. (Geyer).
Ghil. (Ghiliani).
Giorna.
Godt. (Godart).
Goeze.
Graells.
Grasl. (Graslin).
Gray.
Gregs. (Gregson).
Guén. (Guénée).
Guér. (Guérin-Méneville).

Harr. (Harris).
Hatch. (Hatchett).
Haw. (Haworth).
Heeger.
Hein. and Heinem. (Von Heinemann).
Herbst.
Hering.
Herr.-Schäff. (Herrich-Schäffer).
Heyd. (Heydenreich).
Hoch. and Hochenw. (Hochenwarth).
Hoffmannsegg.
Hübn. (Hübner).
Hufn. (Hufnagel).

Ill. (Illiger).

Kirb. (Kirby).
Klug.
Knaggs.
Knoch.
Kol. (Kolenati).
Koll. (Kollar).
Kretschm. (Kretschmar).

Lah. (De la Harpe).
Lang.
Lasp. (Laspeyres).
Latr. (Latreille).
Leach.
Led. (Lederer).
Lef. (Lefebvre).
Lep. (Lepechin).
Lew. (Lewin).
Linn. (Linné).
Luc. (Lucas).

Mab. (Mabille).
Mann.
Meig. (Meigen).
Mén. and Ménétr. (Ménétriès).
Metzn. (Metzner).
Meyer.
Mill. (Millière).
Miller.
Möschl. (Möschler).
Müll. (Müller).
Murray.

Newm. (Newman).
Nick. (Nickerl).

Oberth. (Oberthür).
Ochs. (Ochsenheimer).

Pall. (Pallas).
Palmer.
Panz. (Panzer).
Payk. (Paykull).
Petagna.
Pierr. (Pierret).
Pill. (Piller).
Poda.
Prunn. (De Prunner).

Quens. (Quensel).

Ramb. (Rambur).
Reutti.
Roem. (Roemer).
Rössl. (Rössler).
Rogenh. (Rogenhofer).
Rossi.
Rottemb. (Rottemburg).
Rott. (Rottenburg).

Say.
Schmidt.
Schneid. (Schneider).
Schranck.
Schulze.
Scop. (Scopoli).
Scriba.
Sieb. (Siebold).
Snell. (Snellen).
Sodoffsky.
Sparrm. (Sparrmann).
Spey. (Speyer).
Staint. (Stainton).
Staud. (Staudinger).
Steph. (Stephens).
Stoll.
Sulz. (Sulzer).

Tausch. (Tauscher).
Tengstr. (Tengström).
Thunb. (Thunberg).
Tr. (Treitschke).

V. Hein. (Von Heinemann).
View. (Vieweg).
Vill. (De Villers and De Villiers).
Vogel.

Waldersdorff.
Waldh. (Fischer von Waldheim).
Wallengr. (Wallengren)
Werneb. (Werneburg).
White.
W. V. or Wien. Verz. (Wiener Verzeichniss).
Wocke.

Zell. (Zeller).
Zett. (Zetterstedt).
Zinck. (Zincken Sommer).

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(The plants figured are indicated by capital letters.)

PLATE I.

DETAILS OF THE PERFECT INSECT.

(For full explanation, compare the Introduction, pages ii.—x.)

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C. Grass.
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CASSELL'S BOOK OF

EUROPEAN BUTTERFLIES AND MOTHS.

INTRODUCTION.

BUTTERFLIES and Moths belong to the order *Lepidoptera*, or Scale-winged Insects, which forms part of the Class *Insecta*, the largest and most important division of the sub-kingdom *Articulata*, or Jointed Animals. The *Articulata* have a symmetrically-formed body, consisting of a series of parts resembling each other called segments. They have no internal bony skeleton like that of vertebrate animals, but in its place an outer skin, generally like horn, but varying in hardness, to which the muscles are attached, and which is frequently called an external skeleton, because it thus supplies the place of the internal bony skeleton of the more highly organised animals. The nervous system consists of a double row of small nervous centres, or ganglia, which are connected together by two large nerve-cords running through the length of the body. Their blood is generally white, and circulates through a vessel running along the back, while the nervous system runs along the under portion of the body. They breathe by tracheæ when they live in air, and by gills when they live in water.

The Class of Insects comprises all those articulated animals in which the body is composed of three distinct parts in the perfect state, which are called head, thorax, and abdomen. Every insect has also six legs when fully developed. They breathe by tracheæ, that is, by air-tubes, which run along the sides of the body, and which branch outwards in little openings called spiracles, and inwards into the interior of the body, and more or less pervade the whole of it. Insects are generally provided with wings, and pass through several changes or metamorphoses before arriving at the perfect state.

Butterflies and Moths (*Lepidoptera*, or *Glossata*) are distinguished from other insects, in their perfect state, by the organs of the mouth being formed for sucking up their food, and by the presence of four membranous wings, covered with coloured scales on both sides. From these characters they derive their scientific appellations: *Lepidoptera*, from λεπίς, a scale, and πτερόν, a wing; and *Glossata*, from γλῶσσα, the tongue. Their metamorphoses are complete; that is, they appear in three entirely different forms after leaving the egg: first as a soft-skinned caterpillar, or larva, more or less resembling a worm in shape, with jaws fitted for biting; next as a chrysalis, or pupa, enclosed in a horny case, and without any external organs adapted for locomotion or for taking nourishment; and finally as the perfect butterfly or moth, provided with antennæ, proboscis, legs, and wings, and fitted for flight and for the reproduction of its kind. They only grow in the larval state; the pupa and the fully-developed insect never increase in size.

The beautiful forms and colours of butterflies, the intricacy of their markings, and their

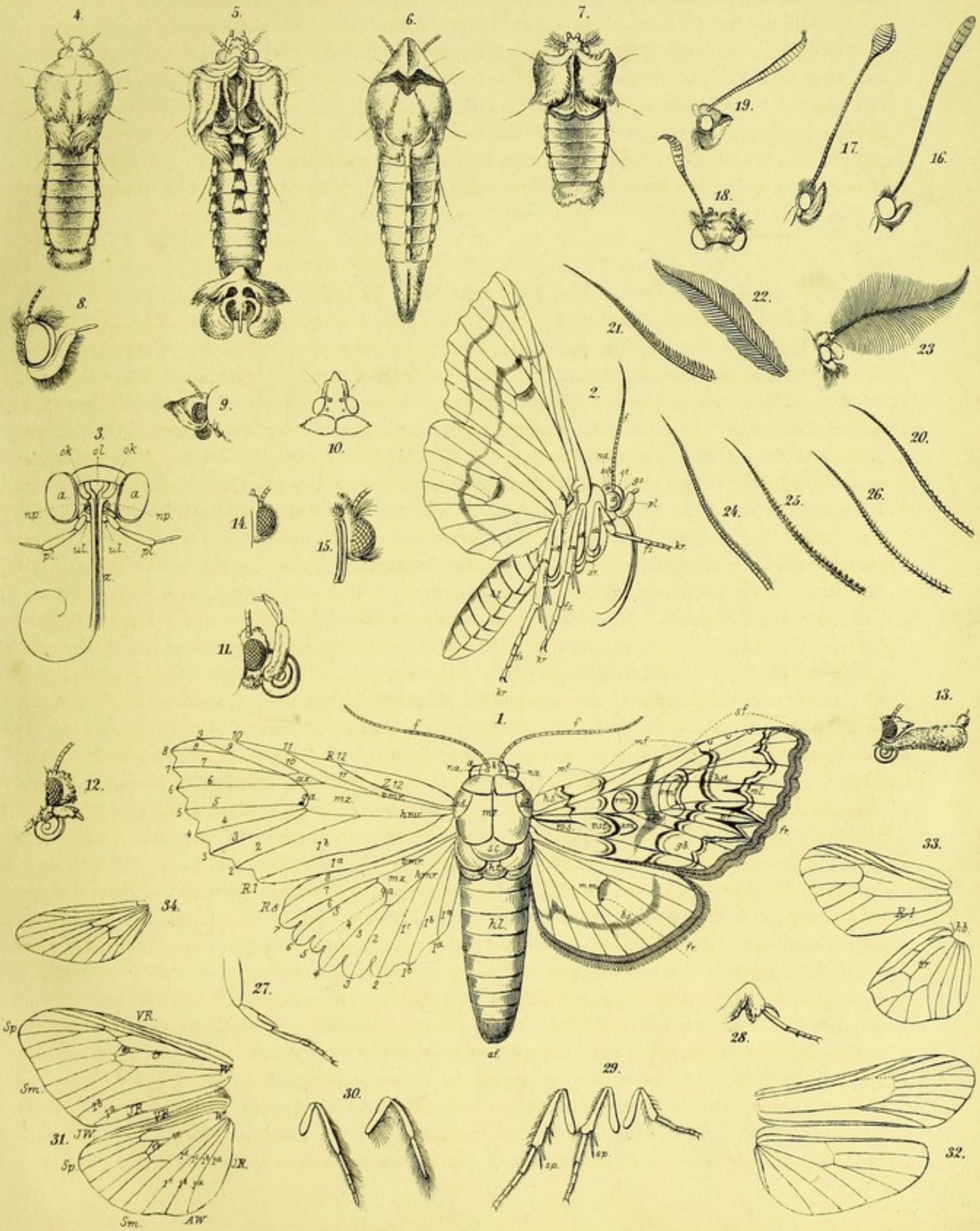
graceful evolutions in the air and around flowers, have always caused them to be much admired by lovers of the beauties of Nature. Almost every boy has hunted butterflies through the woods and fields, or has reared silkworms or other moths, and been delighted to find the newly-emerged insect in the box along with the empty pupa-case. And how often has the remembrance of these youthful pleasures led elderly men to return to them, and cheer the evening of their lives by a more scientific study of their early favourites! The beauty and the wonderful transformations of butterflies and moths have attracted attention and pleased the fancy from the most ancient times. Men have even reverently traced in them the symbol of the soul, and afterwards of immortality; for there is a beautiful analogy between the graceful winged insect emerging from the dark, motionless pupa, and the spirit leaving its mortal body and winging its flight to higher regions.

THE PERFECT INSECT, OR IMAGO.

(*Consult Plate* I.)

Structure.—The body of a butterfly or moth consists of three parts, called the head, thorax, and abdomen, which are not always sharply separated. The head (Fig. 1, *k*) is attached to the front of the thorax by a narrow membranous neck, and is perfectly movable. It is rounded, and generally rather broader than long. The upper part is called the vertex (Fig. 2, *sch*), the more or less vertical part in front the face (Fig. 2, *gs*), and the part between these two the forehead (Fig. 2, *st*). The two large eyes (Figs. 1, 2, and 3, *a*) are placed on the sides of the head. The feelers, or antennæ, are placed in two hollows, generally near the margins of the eyes, and are probably organs of smell (Figs. 1 and 2, *f*). There are often two small, round, flat elevations, called simple eyes, or ocelli (Figs. 1 and 2, *na*), behind the antennæ. The mouth is placed on the lower side of the face; its upper part consists of the scarcely distinguishable triangular upper lip, the labrum (Fig. 3, *ol*), on the sides of which the small projecting mandibles (Fig. 3, *ok*) are placed. Under these lies the tongue, which consists of a hollow tube formed of two portions placed closely together, but separable, through which the insect imbibes its food (Fig. 3, *z*). When the tongue is not in use, it is rolled up in a spiral form close to the mouth. At its base are placed two small organs called maxillary palpi (Fig. 3, *np*). The mouth is terminated beneath by the lower lip, or labium (Fig. 3, *ul*), which is generally heart-shaped, and upon which two projecting organs called labial palpi, or simply palpi (Figs. 2 and 3, *pl*), are placed. These vary in length in different species, but always consist of three joints. The palpi enclose the tongue on both sides, and, added to the scales of the face, generally cover the other parts of the mouth, so that these cannot be examined until the palpi are removed. In many genera the maxillary palpi are the only other organs which are externally visible.

The *thorax* properly forms the basis of the whole body, as the head is attached to it in front, the abdomen behind, the wings at the sides, and the legs beneath. It is more or less egg-shaped, and is often rather flattened above. Its lower side is called the *pectus*, or breast. The thorax consists of three parts, corresponding to the second, third, and fourth segments of the larva, which are called respectively the *pro-thorax*, *meso-thorax* (Fig. 1, *mr*), and *meta-thorax* (Fig. 1, *ht*), which are separated by fine sutures. The pro-thorax is visible above like a narrow border to the meso-thorax, but becomes wider on the under surface, where the first pair of legs are attached to it. The meso-thorax is very large, and divided longitudinally above. The two fore-wings are attached beneath two thin plates called *scapulæ* (Fig. 1, *sd*), one on each side; and the middle pair of legs are attached to its under surface. The meta-thorax is short, and generally consists of five small plates above. The hind-wings are attached to its sides, and


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12.
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f
f
na.
na.
mf.
mf.
R12
Z12
mx.
hmx.
1b
1a
R1
R6
mx
mx
hmx
hmx
hl.
sc.
af.
af.
fr.
fr.
13.
33.
34.
27.
28.
hb.
VR.
Sp.
Sm.
JW.
VR.
JR.
Sp.
Sm.
AW.
30.
29.
sp.
sp.
32.

the last pair of legs beneath. There is another small plate above, between the meso-thorax and the meta-thorax, which is called the *scutellum* (Fig. 1, *sc*).

The *abdomen* (Fig. 2, *hl*) is cylindrical, and consists of nine movable segments; the first pair of which, and often the last pair also, are united. The segments are arranged in such a manner that the hinder margin of every segment covers the base of the next. Each segment consists of two separate plates, joined at the sides. The last segment contains the anus and the sexual organs (Fig. 5). The male organ is enclosed by two small folds, and the oviduct in the female is sometimes produced into a conspicuous ovipositor.

The whole body is densely clothed with hair or scales, so that its structure cannot be examined until this covering is removed. There are many other peculiarities connected with this clothing which we shall notice in their place.

PECULIARITIES OF THE DIFFERENT PARTS OF THE BODY.

The *head* is large or small, and has sometimes a horn-like projection on the forehead. This is cone-shaped, or smooth and truncated, or furnished with either one or three projecting points (Fig. 10), but is generally hidden by the scales. Its covering is hairy or scaly, either raised or flattened, and is sometimes divided by one or several furrows. At other times it forms a pointed and prominent frontal crest above the palpi (Figs. 9 and 13).

The *eyes* are prominent, and are either globular (Figs. 14 and 15), or form a rather long segment of a circle (Fig. 8). They are constructed of many small facets, each of which forms a small eye by itself, and this gives the surface a reticulated appearance. The entire surface is either covered with short hairs (Fig. 14), or is naked (Fig. 11). In the latter case, the borders of the eyes are often furnished with overhanging bristly eyelashes (Fig. 15).

The *antennæ* consist of a great number of small joints articulated together. There are generally from forty to sixty, but there are sometimes less than thirty, and in other cases more than a hundred. Their length varies from one-third to three-fourths of the length of the body, but in some cases they are longer or shorter than this. For example, the antennæ are scarcely one-sixth of the length of the body in the genus *Hepialus*, while in some genera of *Tineina* the antennæ may be six times the length of the whole body. They vary much in shape, and are of great importance in classification. Those which are thread-like, and of equal thickness throughout, are called filiform (Fig. 1, *f*). Those which taper gradually at the end are called setiform (Fig. 2, *f*). In other species the antennæ are gradually thickened towards the end into a club-shape, and are then called clavate (Fig. 16); and in others, again, they thicken suddenly into a knob at the end, which is generally more or less round, and often flattened: these are called capitate antennæ (Fig. 17). Those which are thickest near the middle, and taper again towards the end like a spindle, are called fusiform (Fig. 19); and their club-shaped extremity is sometimes bent round like a hook (Fig. 18). The separate joints are either cylindrical, or round on one side and flat on the other, or with two or three angles, and the antenna consequently receives a round, half-rounded, or angulated form. The first joint is called the basal joint, and is generally (except in the butterflies and *Sphinges*) considerably longer and thicker than the succeeding joints. In some genera of *Tineina* the basal joint is expanded into a scale, which more or less covers the eye when at rest, and is called the eye-cap. The separate joints of the antennæ are longer than broad in the butterflies, the *Psychidæ*, and in many *Micro-Lepidoptera*, at least till towards the end of the antennæ. In the other groups they are broader than they are long, and often diminish in length towards the extremities. They have many additional peculiarities. They often form short angles at their ends, and widen into conspicuous projections either on one side or on both. The processes on the antennæ can be

separated and raised, or laid flat to the shaft, at the will of the insect. In some cases these processes are on the lower side of the antennæ, and are then called lamellæ. They are, however, more frequently placed on the sides, and have received different names according to their structure. Those antennæ in which the appendages are short and blunt are called dentated (Fig. 20); those in which they are longer than broad, and are pointed, are called serrated (Fig. 21); and when they are of regular thicknesses throughout like a comb, they are called pectinated (Fig. 22). The antennæ are called plumose when the thread-like appendages are very long and slender, and give them the appearance of the feather of a bird (Fig. 23). The separate joints of the antennæ have generally only one filament on each side, but we occasionally meet with two pectinations on the same joint, and sometimes even at both ends, where they unite closely with the pectination of the next joint, and form with this a single tooth, which can be separated throughout its entire length. It very frequently happens that all these appendages gradually increase in length from the base of the antennæ, and decrease again on approaching the extremity; and thus dentated antennæ may pass into serrated, and these, as well as lamellated, into pectinated, and *vice versâ*.

The antennæ have often another special covering, consisting of hair or of adherent or raised scales. When the antennæ are clothed with fine hairs they are called ciliated (Fig. 24), and when the hairs are unusually stout, bristly (Fig. 26). We sometimes meet with single hairs only, placed at the extremity of each joint of the antennæ, or we find several arranged lengthways, or in clusters (Fig. 25). These hairs are so short and fine in many cases that they cannot be detected without the aid of a strong magnifying power. The above-mentioned processes are also frequently provided with a similar covering; and those of pectinated antennæ have commonly longer or shorter hairs on both sides, which are sometimes so arranged that the ends of the hairs of each pectination touch those of the next. The sexes may often be distinguished by these appendages and their covering, for they are either present in the male only, or more fully developed in the male than in the female. The basal joint of the antennæ has often a conspicuous tuft of hair (Fig. 18), or the antenna is thick at the base, and often clothed with woolly hair, while the longer terminal half is naked. When the insect is at rest, the antennæ lie against the body, or are extended forward.

The *labial palpi* are rarely absent, but are often very small, although in some instances they are longer than the head and thorax together (Fig. 13). They are three-jointed, but the two first joints are generally so hidden by their hairy covering that they cannot be distinguished. They rise up more or less abruptly from the head (Fig. 8), and are sometimes curved upwards like a sickle (Fig. 11). Sometimes they stand out horizontally in front, and are then called porrected (Fig. 13); and are sometimes curved downwards, or hang down (Figs. 12 and 23). The two first joints are generally densely clothed with hair or scales beneath, which is often visible at one corner in front. The covering is often pressed together on the lower side into a kind of beak, and this is sometimes the case on the upper surface as well. The terminal joint is most frequently naked, though it is sometimes concealed under the hairy covering of the middle joint. It may be club-shaped, rounded, thread-like, or finely-pointed. The comparative length of the two last joints of the palpi is very variable. It has been observed that some *Lepidoptera*, such as the Skippers, sometimes lose one or both of their palpi during life. It is not unlikely that the missing organs may have been torn off in the struggles of the insect to escape from some adhesive flower; for it is known that *Sphingidæ* and *Noctuæ* often lose a portion of their long spiral tongues in this manner.

The *maxillary palpi* are wanting in all the *Macro-Lepidoptera*, or are completely concealed under the other parts of the mouth, but they are present in many *Micro-Lepidoptera*. They are generally two-jointed, and appear like short threads near or above the tongue. In a few genera of *Tineina* they consist of five or six joints, and are then very peculiar in shape; for they first rise up,

and are then bent downwards, somewhat in the manner of a clasp-knife, and are called plicate.

The *tongue* is sometimes very strongly developed, especially in the *Sphingidæ*, in which it is often as long or longer than the body when extended. In some foreign species it measures little less than a foot in length. But in most of the *Bombyces*, in many *Tineina*, and in some species of other groups, it is only slightly developed, and sometimes only consists of two short and soft threads. In other cases it is horny, and perceptibly rolled.

The *thorax* is oval or square, and is sometimes broader than it is long. It is smooth, or more or less convex, with the front angles or shoulders either rounded off (Fig. 4), obtusely angulated (Fig. 5), rectangular, or with projecting angles (Fig. 7). There is often a tuft of hair or scales on the thorax, behind the collar, especially in the *Noctuæ*, which may be either smooth, raised, or divided by a longitudinal furrow (Fig. 5). It is sometimes pointed, and in this case it is often produced into a longitudinal ridge or crest (Fig. 7). We often find a truncated or divided tuft on the plate at the end of the thorax (Fig. 5), or the back of the thorax is raised like a sort of cushion, and is consequently often contracted longitudinally.

The *abdomen* (Figs. 1 and 2, *hl*) is cylindrical or tapering (Fig. 6), arched (Fig. 5), or flattened (Figs. 4 and 7). It differs in length and thickness, and sometimes does not reach nearly so far as the hinder angle of the hind-wings, while in other cases it extends much beyond it. Like the thorax, the abdomen is frequently furnished with tufts of hair on the back, especially on the first segments. Sometimes these tufts extend to the extremity of the body (as in Fig. 5); and we occasionally find similar tufts on the sides and at the tip of the abdomen. The last is called the anal tuft.

The *legs* consist of three portions—the thigh (*femur*, Fig. 2, *sk*), the shank (*tibia*, Fig. 2, *su*), and the foot (*tarsus*, Fig. 2, *fs*). The femur is united by a small connecting ring, called the *trochanter* (Fig. 2, *sr*), to the hip-joint, or *coxa*, which is jointed to the pectus. The tibia is jointed to its extremity, and the tarsus to that again. The femur and tibia consist of a single joint each, but the tarsus has five movable joints, the first of which is much longer than the others. At the end of the last joint are the claws (Fig. 2, *kr*), of which there are nearly always two. The comparative lengths of the different parts vary, but on the front pair of legs the tibia is generally considerably shorter, and the tarsus longer than the femur; on the middle pair of legs the three parts are of equal length; and on the hind pair of legs the femur and the tarsus are of nearly equal length, and the tibia is longer. There are, however, many exceptions to these proportions, and the length of the front tibiæ in particular is very variable. The femora are often thickened towards the ends, but rarely exhibit any other peculiarity. The front tibiæ have often a narrow linear appendage, varying in length, on the inside, at or above the middle, which stands out more or less (Fig. 27). They have sometimes a claw-like appendage at the extremity also (Fig. 28) called a spine. We generally find two thorn-like appendages called spurs at the extremity of the two hinder pairs of tibiæ (Fig. 29, *sp*), and the hinder tibiæ have usually another pair of spines above them, generally just below the middle, but sometimes nearer the joint or the extremity. Their length is different, but the inner ones are always longer than the outer. Many butterflies and *Noctuæ* have one or several rows of fine parallel spines, either on all the tibiæ or on the two hinder pairs (Fig. 29). The soles of the tarsi are also frequently furnished with very short and fine bristles, and with longer ones at their extremities. The claws are either simple or finely toothed, and there are sometimes appendages of different forms between them. In other respects the tarsi are always naked, but the femora and tibiæ are often more or less densely clothed with hair. The hairy covering often forms a kind of tuft or flag on the back of the tibiæ. The front pair of legs are imperfect in many families of butterflies,

either in both sexes or in the male only. In such cases the legs are rather smaller, and the tarsi are terminated with a simple horny hook instead of the usual pair of claws; or the tarsi are either not jointed at all, or only imperfectly (Fig. 30), when they often appear to be united with the tibiæ into a densely hairy brush-like paw, or the fore-legs are reduced to very small three-jointed appendages. The hind-legs of the male are shortened in a few *Hepialidæ* and *Geometræ*.

The *wings* consist of two larger fore-wings and two smaller hind-wings, so connected together that the hinder edge of the former laps over the front edge of the latter. There are two additional lobes at the base of the hind-wings above in the males of some *Geometræ*, which makes them appear as if they had six wings, whereas the wings of the females of many moths are either absent or rudimentary. The wings are formed of a transparent or semi-transparent membrane, which is held expanded by hollow horny tubes called veins, nervures, or nervules, and are covered on both sides with coloured scales, and more rarely with hair-like scales. In some cases the wings are transparent in the centre, being only thinly clothed with scales on emerging from the pupa, which are lost almost immediately. The only European species which exhibit this phenomenon to any remarkable extent belong to the smaller *Sphingidæ* and groups allied to them. The form of the wings is usually triangular, and there are therefore three borders—the front edge, or *costa* (Fig. 31, *VR*), nearest the head of the insect; the inner margin (Fig. 31, *JR*), which is opposite to it, and is parallel to the body in the hind-wings; and the hind margin, or border (Fig. 31, *Sm*), which lies furthest from the body, and unites the costa with the inner margin. The point where the wings are attached to the body is called the base (Fig. 31, *W*); the angle formed by the costa and the hind margin is called the tip, apex, or anterior angle (Fig. 31, *Sp*); and the angle formed by the hind margin and the inner margin is called the hinder angle (Fig. 31, *JW*), or, in the hind-wings, the anal angle (Fig. 31, *AW*).

The shape of the wings depends on the comparative length of the margins. The costa is the longest margin of the fore-wings, and their breadth depends on the length of the hind and inner margins taken together. If the hind margin is short, the wing must be narrow; and the shorter and more oblique it becomes, the narrower are the fore-wings, and the more obtuse is the hinder angle. Sometimes the latter is quite straight, and in some *Tineina* especially the hind and inner margins pass into each other so gradually that they cannot be distinguished. The breadth of the hind-wings depends chiefly on the length of the inner margin, which generally extends as far as the abdomen, or beyond it in broad-winged species such as Butterflies, *Bombyces*, and many *Geometræ*. In the other groups it does not extend so far, sometimes only as far as the first segment of the abdomen, and in such cases, also, it generally passes imperceptibly into the hind margin. The triangular form of the wings is thus often converted into a long oval or lancet shape, especially in *Micro-Lepidoptera*. The fore-wings are often widened close to the base by a strong curve in the marginal nervures, or the hind margin of the hind-wings is considerably curved beyond the middle. In this case the wings assume, more or less, the shape of a long quadrangle, truncated behind. In the Plume Moths, the wings are divided into distinct feathers almost from their base. In the ordinary Plume Moths (*Pterophoridæ*), the fore-wings are divided into two feathers, and the hind-wings into three. In the Twenty-plume Moths (*Alucitidæ*), each wing is split up into six distinct feathers.

The costa and hind margin seldom exhibit anything remarkable. The former is generally somewhat curved in the fore-wings, and sometimes more strongly at the base. It is frequently flattened or curved upwards in the middle, and in a few *Tortrices*, called "Notch-Wings," it is more or less excavated. The middle of the inner margin of the fore-wings is furnished with a

projecting fold. There are several variations to be noticed in the hind margin. As regards its general shape, it is called straight on the fore-wings when it runs in a nearly straight line from the tip to the hinder angle (Fig. 31, *Sm*); arched when it is curved outwards (compare the right fore-wing in Fig. 1); or sinuated when it is curved inwards at any point (see the fore-wing in Fig. 2); angulated when its outline forms distinct angles; and indented when it has large and deep indentations. It is also called entire when it forms a simple, curved, or sinuated line (Figs. 31 and 32); undulated when it curves slightly outwards at the end of each nervure, and thus forms a sort of wavy outline (see the right fore-wing in Fig. 1); dentated when it consists of small roundish indentations, meeting in sharp angles at the ends of the nervures (compare the left fore-wing in Fig. 1); and lobed when it consists of rounded projections which meet towards the base in acute angles between the nervures (as in the left hind-wing in Fig. 1).

Neuration of the wings.—The arrangement of the nervures of the wings is very important, not only for the purposes of classification, but to enable us to point out any particular part of the wing with as much exactness as possible. The nervures either rise from the base of the wing, or from other nervures; and, in the latter case, generally in consequence of one nervure dividing into several. All nervures which do not rise from the base are called branches, or nervules. The first nervure running from the base forms the costa itself, and does not require any special name. Two nervures rise close together from the middle of the base, and diverge from each other, throwing off several branches. They are generally united at or beyond the middle of the wing by two, or, in the *Papilionidæ*, three, short transverse nervules called the disco-cellular nervules (Fig. 1, *qa*). The first of these diverging nervures is called the sub-costal nervure (Fig. 1, *vmr*), and that nearest the inner margin the median nervure (Fig. 1, *hmr*). These names apply as far as the disco-cellular nervules. Another nervure rises from the base, between the costa and the sub-costal nervure, which finally unites with the costa, and is called the costal nervure (Fig. 1, *R*12 and *R*8). In the hind-wings it often touches the sub-costal nervure near its origin, or is united with this for a short distance, or it may be absent altogether (as in Fig. 32). In many species, especially those in which the hind-wings are not folded when at rest, there are one or more nervures, which are generally short and curved, at the base of the hind-wings, close to the costa. There are also from one to three nervures running between the median nervure and the inner margin, which run from the base either to the anal angle, or the inner margin, or the hinder part of the hind margin. These are called the sub-median nervures, and there is generally only one on the fore-wings (Fig. 1, *R*1), which is often forked near the base, and more rarely near the hind margin (Fig. 33, *R*1). Sometimes there is a second between this and the median nervure (Fig. 31, 1*a* and 1*b*), which is generally conspicuous only near the hind margin, and passes into a mere seam towards the base. In the hind-wings there are generally two sub-median nervures (Fig. 1, 1*a* and 1*b*). In many genera, especially among the *Micro-Lepidoptera*, there are three (Fig. 31, 1*a*, 1*b*, and 1*c*), the second of which often forms a short fork near the base; and there is seldom only one on the hind-wings. We often find one or two more fine nervures between the sub-costal and median nervures, which run from the base to the disco-cellular nervules, and are frequently only visible at their extremities (Figs. 31, *tr*, and 33, *tr*). The different nervules branch either from the sub-costal or median nervure, or from the disco-cellular nervules. In the former case they often do not rise from the nervure itself, but from one of its branches. The sub-costal nervure of the fore-wings generally throws off six branches in this manner, and that of the hind-wings two, which run to the costa and hind margin.

These branches are called sub-costal nervules. The median nervure divides into three branches, which mostly run to the hind margin, and are called median nervules; and one branch runs from the disco-cellular nervules, which is called the discoidal nervule: it is sometimes fainter than the others, or is absent. There are two discoidal nervules on the fore-wings of the *Papilionidæ*. It happens exceptionally that one or two branches run from the disco-cellular nervules instead of from the sub-costal or median nervures, or the discoidal nervule itself rises from the median nervure. The neuration of the hind-wings is almost identical with that of the fore-wings in the *Hepialidæ* (Fig. 34, which represents a hind-wing). The ramifications of the sub-costal nervure are very various, as its branches often sub-divide or touch one another, thus forming net-like patterns. One nervule or another is sometimes wanting on the hind-wings (Fig. 32).

The separate nervules are indicated by numbers, and are always counted from above downwards, *i.e.*, in the direction from the costa towards the inner margin, and not *vice versâ*. This is the English and French notation. The German is somewhat different, and is shown in Fig. 1 (left side). According to this system, the nervures and nervules are counted in the opposite direction, or from below upwards, *i.e.*, from the inner margin towards the costa. This system is very simple. All the nervures and nervules which run to the inner margin are numbered 1*a*, 1*b*, &c.; and those which run to the hind margin are numbered 2, 3, 4, &c. These are numbered from 2 to 11 on the fore-wings, and from 2 to 7 on the hind-wings. The discoidal nervule is always numbered 5; and the sub-costal nervure is numbered 12 on the fore-wings, and (generally) 8 on the hind-wings; and they retain these numbers, even when some of the nervules are absent. I have thought it necessary to explain this notation in full, because it is continually employed by German authors; and unless it is clearly understood from the outset, those who may wish to refer to German entomological works would often find them unintelligible.

The space enclosed by the sub-costal and median nervures is called the discoidal cell (Fig. 1, *mz*), and the space between this and the hind margin is called the disc. When the disco-cellular nervules are perfectly formed, the discoidal cell is said to be closed; but when they are absent, or imperfectly formed, it is said to be open, or imperfectly closed. The intermediate spaces between the nervures and nervules are called cellules; and as there is no complete English or French classification of them, I think it well to add the German notation for these also, which is very full and satisfactory. When the discoidal cell is divided longitudinally by one or two fine nervures, the divisions are called the front, middle, and hind discoidal cell respectively. When portions of the discoidal cell are divided from it by nervules, or if two nervures run together or are united by a transverse nervule, the spaces thus enclosed are called accessory cellules. The accessory cellules are divided into intrusive cells when they lie before the disco-cellular nervules, and are bounded by these and by dividing lines which unite towards the base (Fig. 31, *ez*); and appendicular cellules when they are formed by the junction or crossing of nervules beyond the discoidal cell (Fig. 1, *az*). Each marginal cellule is indicated by the nervure or nervule which lies below it, *i.e.*, on the side of the inner margin. Thus the cellule between 1*a* and 1*b* (or the first and second sub-median nervures) would be called cell 1*a*; that between 11 and 12 (or the costal and the first sub-costal nervules) would be called cell 11, and so on. (The cellules are numbered on the left side of Fig. 1.)

When the wings are imperfectly developed, the neuration is also modified, especially by the absence of certain nervures. The neuration is also simpler in the narrow-winged *Tineina*, in which the discoidal cell is inconspicuous or disappears altogether, and only a few nervures remain, some of which are branched.

The connecting bristle.—We must now mention another structure which is connected with the

neuration. Most *Lepidoptera* which do not fold the hind-wings together when at rest have one or more short nervures at the base of the latter, between the median nervure and the costa. But in those species which fold the hind-wings, these nervures generally appear as one or more compressed elastic bristles, extending from the membrane of the wing to beyond the costa, and lie behind a border of erected hairy scales on the under side of the fore-wings near the base, so that they serve to unfold the hind-wings when the wings are extended, and to hold them connected with the fore-wings during flight. This bristle is called the *frenulum* (Fig. 2, *hb*), and is always single in the male, whereas the female possesses two or more minute and slender bristles. Sometimes the frenulum is present in the male and absent in the female, in which case the latter is unfitted for flight. This structure is only found in the Moths, with the rarest exceptions (the only exception is perhaps an Australian butterfly, allied to the *Hesperidæ*, which possesses it), so that it is considered to form one of the most weighty characters by which we separate *Lepidoptera* into the two main sections of Moths and Butterflies.

Areas of the Wings.—The wings of *Lepidoptera* may be conveniently divided into three areas, or spaces. The first, the basal area (Fig. 1, *wf*), occupies the basal third of the wing; the second, the central area, extends from this to the end of the discoidal cell (Fig. 1, *mf*); and the third, or marginal area, extends from the extremity of the discoidal cell to the hind margin (Fig. 1, *sf*). These areas are often separated by transverse lines, the position of which determines their extent; in which case the basal area generally appears to be the smallest, and the marginal area the largest. The central and marginal areas are generally broader on the costa than at the inner margin.

The Scales of the Wings.—The colour and pattern of the wings are due to the scales. In some genera, such as *Sesia*, the scales are wanting over a large portion of the wings, which are then colourless or translucent. These scales appear to the naked eye like a fine dust, and their form only becomes visible under a microscope. They are small discs, composed of two, or perhaps three, layers of exceedingly fine membrane, and are attached to the wing by a short stalk, so that they lie over each other in rows, like the slates on a roof, and cover the roots of the next row with their ends. They generally lie flat in one direction, with their ends turned towards the hind margin; but they are sometimes erect in certain parts of the wing, or opposed to each other, forming small raised patches. Their forms are very different, both according to the species and according to the particular position of the scales. They may vary, from being comparatively broad to very narrow and linear, so as to pass into the form of hairs. One particular kind of scales, called plumules, is only found in certain parts of the wings of some male butterflies (*Lycænidæ* in particular), mixed with the ordinary scales. The scales on the hind margin are often more or less deeply toothed. They are not only placed on the surface of the wing, but are also placed on one or more parts of the border, when they are called fringes, or *cilia* (Fig. 1, *fr*). In the *Micro-Lepidoptera*, the fringes are often composed of fine hairs.

The Pattern of the Wings.—The colours and patterns of *Lepidoptera* are very numerous; and it is only markings of frequent occurrence which have received special names. Among these are lines (*lineæ*), stripes (*strigæ*), bands (*vittæ*), and *fasciæ*, which are distinguished by their different breadths, the fasciæ being the broadest. When they run towards the hind margin they are called longitudinal or basal lines, &c.; when they run from the costa to the inner margin they are called transverse lines; or costal lines when they only run a short distance from the costa. When they run more or less obliquely they are called oblique lines. A curved transverse line running through the middle of the wing is called an arched line or stripe (*linea arcuata*). When a thick band is not sharply bounded it is termed suffused. Short longitudinal lines are called streaks. The lines and

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streaks are either simple, or form several curves. They are called waved, or undulating, when they form short rounded curves inwards and outwards; and dentated when they consist of small curves meeting in acute angles. They may also be straight, curved, sinuated, &c.

Among the spots, we must pay attention to the lunules, which are crescent-shaped spots. There is often one at the extremity of the discoidal cell (Fig. 1, *mm*). Round spots, enclosed by rings of different colours, are termed ocelli, eye-spots, or eyes. They have generally a pale dot in the centre, which is called the pupil; when there are two, the spot is termed a bipupilled eye; and when the pupil is absent, the eye is termed blind. The hind margin and fringes frequently have various peculiar markings. The hind margin is often marked with a single or double line, which runs parallel to all its curves; or with spots, called marginal spots, or points; or with lunules, of which there are sometimes more than one row. These are often placed on the intermediate spaces between the nervures, which are called the incisions, when the wings are scalloped. The fringes are frequently intersected by one or more dark lines running parallel to the hind margin, or are chequered with pale and dark, interrupted by light markings, or marked with lunules also. Particular attention must be paid to the special pattern of the fore-wings which is found in most *Noctuæ* (Fig. 1, right fore-wing). It consists of three pale transverse lines, generally bordered with darker, or of single or double dark stripes. The first is near the base, and runs from the costa about as far as the median nervure, and is called the half-line (*strigula*, Fig. 1, *hs*); the second and third are called the inner (Fig. 1, *vst*) and elbowed lines (Fig. 1, *hst*) respectively, and enclose between them the central area, upon which is often a less distinct broader line called the central shade (Fig. 1, *ms*). Between the elbowed line and the hind margin, and more or less parallel to the latter, is another pale line, which is either undulated or dentated, and rarely straight, called the sub-terminal line (Fig. 1, *wl*). It is sometimes so strongly indented that the ends of the teeth touch the hind margin in some places. The space between this and the elbowed line is generally pale, and is shown at Fig. 1, *gb*. Upon this we frequently find long pointed black spots behind the nervules, resting on the sub-terminal line and pointing towards the base, which are called sagittate spots (Fig. 1, *pf*). There are three spots, called stigmata, on the central area. That nearest the base stands in the discoidal cell, and is round or oval; it is called the orbicular stigma (Fig. 1, *rm*). The second is a larger kidney-shaped spot at the extremity of the discoidal cell, and is called the reniform stigma (Fig. 1, *om*). Beneath this is frequently a wedge-shaped spot called the claviform stigma (Fig. 1, *zm*). The orbicular and reniform stigmata are often connected by a dark space, or by a sharply-defined square black spot, which is sometimes continued in a point above the orbicular stigma towards the base, and is then called the pyramidal stigma. Some of these markings are often wanting, but the ordinary pattern of the *Noctuæ* is considered to be present if we find the inner, elbowed, and sub-terminal lines, and the orbicular and reniform stigmata. These stigmata, as well as the transverse lines, are often found in other families besides the *Noctuæ*, and are then known by the same names.

The hind-wings and the under surface of all the wings are often as brightly coloured as the upper side of the fore-wings, in butterflies. In many moths, the hind-wings and the under side are inconspicuously coloured, and are often nearly uniform pale grey, though their examination is sometimes an important aid to the determination of a species.

Hermaphrodites.—Fully-developed *Lepidoptera* are fitted to reproduce their species. The sexes are sometimes alike or nearly so in outward appearance, but in other cases they are more or less unlike, either on the whole, or in the structure of certain parts. The females are frequently larger than the males, and their abdomen is thicker. They are seldom so brightly coloured as the males, their colours being better adapted for concealment; and the remarkable phenomenon

known as mimicry, or protective resemblance, in which one insect resembles another with which it has no real affinity, but which enjoys some special immunity from the attacks of birds or other enemies, is always seen in the greatest perfection in the female, to which sex it is indeed often confined. The sexual differences presented by the antennæ, frenulum, and front legs, &c., have been already noticed. Specimens are occasionally met with in which the characters of the two sexes are combined in one individual. In some cases the opposite sides of the body present all the characteristics of the two sexes, the wings, legs, antennæ, &c., being male on one side, and female on the other. These are called hermaphrodites, or gynandromorphous specimens. In other cases, different parts of the insect combine the colour or structure of the sexes to a greater or less extent. Any specimen combining the characters of both sexes in any degree is a rarity which must on no account be passed over; and if, by rare chance, the captor happens to reside in the same neighbourhood as an entomologist who studies the anatomy of insects, the specimen should be submitted to his examination immediately, while still quite fresh. I may add that *perfect* hermaphrodites are confined to those animals in which the sexes are not separated; and that when the sexes are combined in an individual of a species in which they are normally separated, such individuals are always imperfect hermaphrodites, however completely the sexes may appear to be combined, and are generally incapable of fulfilling the functions of either sex.

EGGS.

The eggs of *Lepidoptera* are small bodies, covered with a hard shell, and filled with fluid, containing the germ of the larva, and the nourishment required for its preliminary development. They are very interesting objects for examination with a microscope of low power, for their shapes are very varied, and are often remarkable. Some are globular, others egg-shaped, bowl-shaped, cylindrical, barrel-shaped, cheese-shaped, turban-shaped, &c.; and they are often truncated or hollowed at the ends. Their surface is either flat, or covered with impressed or raised points, and there are often furrows or deeper stripes running along the sides from the middle of the upper end, like the meridian lines on a globe; the intermediate spaces between these stripes are generally rounded, and raised, with fine transverse stripes, and the intermediate spaces between these are often again still more finely ribbed. The colours of the eggs are also very various: they may be brown, blue, green, red, or yellow, but are most frequently greenish or greenish-white, and are often spotted, striped, or marked with net-like or other patterns. The eggs of nearly-allied species have generally a particular definite shape, especially in sharply-characterised groups.

The eggs are laid by the female insects in places where the future larvæ can easily find their food, and most frequently on the plant on which they are to feed. They are either laid singly or in numbers, and sometimes the whole mass is laid at once. They sometimes form an irregular heap, often covered with hair or wool taken from the body of the mother, and are sometimes arranged in several rings, set close together, around a twig, or are attached to a flat surface, generally that of a leaf. After a few days, fertilised eggs generally become slightly depressed and change colour, and unfertile eggs shrivel up. Unfertilised eggs produce no larvæ, except among some genera of small moths, and, in very rare cases, among large moths. Among silk-worms, for instance, the development of unfertilised eggs has frequently been observed. This phenomenon is called Parthenogenesis, from *παρθένος*, a virgin, and *γένεσις*, birth.

The period required for the formation of the germ in the egg previous to its hatching varies according to the time when the egg is laid, and the season when the larva will find food. In summer the development is more rapid, and in autumn and winter it takes place more slowly.

The higher or lower temperature of the season is also not without some influence. In those species whose larvæ will find nourishment during the same year, the period of development is generally from eight days to four weeks; but in those species which lay their eggs so late in the season that the food-plant of the larvæ would have died down or shed its leaves by the time that they were hatched, if their development was as rapid as in the other case, the eggs do not hatch until the following spring, at the time when the food-plant is also unfolding itself.

When the period for hatching has arrived, the young larva bores through the shell, in which it has previously lain coiled up, and enlarges the opening by gnawing it away till it can creep out, when it often completes its task by devouring the empty egg-shell before tasting any other food.

LARVÆ.

Size and External Structure.—The body of the larva resembles a long cylinder, flattened off on the under surface. It is, on the whole, of equal thickness throughout, but frequently becomes rather thinner at each extremity. A few larvæ are egg-shaped or woodlouse shaped (Pl. 14, Fig. 2, *a*); and those of the small moths, which mine in the substance of leaves, are generally quite flat. A larva consists of thirteen joints, one behind another, separated by more or less perceptible divisions, and sometimes by deep incisions. The joints are called segments, and the first forms the head. Continental entomologists reckon twelve segments only, counting the head separately, probably because the head of insects, although apparently forming but one segment, is considered to consist morphologically of several.

The head (*caput*) is always conspicuous, and is formed of a horny substance, but differs very much in size and shape. It is seldom small and contracted, but is generally distinctly separated from the next segment. Its shape is generally roundish, but is sometimes flattened, truncated, or triangular. In the larvæ of *Geometræ* it is often produced into two angles at the sides; and in the genus *Apatura* it is provided with two triangular horns (Pl. 11, Fig. 2, *a*). It consists of two lobes, generally hemispherical in shape, which are separated above by a longitudinal division, and divide in front near the mouth, where they enclose the basal portion of the head, or *clypeus*. These lobes have frequently been called "eyes," but cannot be regarded in this light. The true eyes (*ocelli*) are merely small, shining, roundish elevations on each lobe, six of which are arranged in a semi-circle on each side of the mouth; and they can only be distinctly seen with a magnifying-glass. The clypeus is bounded beneath by the upper lip (*labrum*), under which the horny jaws (*mandibles*) are placed on each side, which serve for biting. At the base of the latter are placed the feelers (*antennæ*), two small, pointed, movable projections, generally four-jointed; and beneath the mandibles the membranous lower lip (*labium*) is united above with the lower jaws (*maxillæ*) and with two small four-jointed organs called "maxillary palpi," and underneath on the inside with the two-jointed "labial palpi." At the extremity of the lower lip is a horny, perforated projection called the spinneret, from which issue the silken threads which form the cocoon.

The rest of the body of the larva is covered with a soft and often wrinkled skin, and is capable of being moved in any direction. The three segments after the head correspond to the thorax of the fully-developed insect; the first corresponds to the pro-thorax; the second to the meso-thorax; and the third to the meta-thorax. These are called thoracic segments, and the remainder, abdominal segments; the last is called the terminal segment. The segment behind the head is often covered with a horny plate, the scutellum; but the remaining segments only exhibit a similar structure in a few genera. The last segment has a triangular or crescent-shaped flap above the anus, called the abdominal fold, which is also horny in many species. Besides this,

each segment, except the first, third, fourth, and last, is provided with a small opening on each side, above the feet, which is surrounded with a horny margin, and through which the larva breathes. These air-holes are the spiracles, already mentioned, and are often placed on round coloured spots called stigmata. The spiracles placed on the second and twelfth segments are generally larger than the others. The larvæ of the typical *Papilionidæ* have a fleshy retractile fork on the second segment.

Every Lepidopterous larva has a pair of legs (*pedes*) on each of the three thoracic segments. These consist of three cylindrical joints, covered by a more or less horny skin, and are terminated by a claw. They are thickest at the base, and taper towards the extremities. These are the true legs, which correspond to those of the perfect insect;* and in the larva of the Lobster Moth (*Stauropus Fagi*, Pl. 30, Fig. 8, *a*) they are of extraordinary length. In addition to these, most larvæ are furnished with four pairs of false legs, or "prolegs," on the seventh to the tenth segments; and another pair called "claspers," which terminate the last segment. These prolegs consist of two fleshy joints, and their extremities are either rough, very movable, and adapted for climbing, and furnished on the outer side with hooks directed inwards (*pedes semi-coronati*); or else they are smooth, shaped like a bolster, and not adapted for grasping any object, but furnished with a continuous or nearly continuous circle of small hooks, directed outwards (*pedes coronati*). Legs constructed for climbing are only met with among the larvæ of *Macro-Lepidoptera;* but some of these have legs of the other description. This is especially the case with those which feed in the interior of plants, or in cases. None of the larvæ of *Micro-Lepidoptera* have climbing legs. Several larvæ belonging to the families *Notodontidæ* and *Drepanulidæ* have no claspers, because the terminal segment ends, in the former, in two long slender processes (as in the larva of the Puss Moth, Pl. 30, Fig. 4, *a*); and in the latter, it terminates in a point.

The larvæ of the *Geometræ* have generally only one pair of prolegs on the tenth segment (Looper Caterpillars, like that of *Ennomos Alniaria*, Pl. 43, Fig. 2, *a*), but in some genera we find a pair on the ninth segment also (as in the larva of the Light Emerald Moth, Pl. 43, Fig. 1, *a*); while in the larvæ of several genera of *Noctuæ*, the prolegs are wanting, or rudimentary on the seventh, and sometimes also on the eighth segment, as may be seen in the larva of *Agrophila Sulphuralis* (Pl. 42, Fig. 3, *a*). The larvæ of these aberrant *Noctuæ* are called "half-loopers." In other larvæ the front prolegs are smaller and less fully developed than the hind ones. The larvæ of the *Psychidæ*, which live in cases, and the tortoise-shaped larvæ of the *Cochliopodidæ*, are indeed furnished with prolegs, but these are all very short. Those larvæ which are provided with the full number of legs crawl along. Those of the *Macro-Lepidoptera* creep slowly, but the movements of the larvæ of the *Micro-Lepidoptera* are generally very rapid; and the latter can run backwards as well as forwards.

Looper larvæ have a very peculiar mode of walking; they fix themselves firmly by their true legs, and then draw the prolegs and claspers up to them by strongly arching their body. They then attach themselves by their prolegs and claspers, stretch out their body, and fix themselves as before with their true legs. The motion of the half-loopers is more crawling, but they likewise arch their bodies in the middle, more or less, when walking.

Many larvæ exhibit other structural peculiarities. These consist chiefly of fleshy excrescences or appendages, which may occur on the middle line of the back, or in pairs, or in a regular series;

* The thoracic legs are absent in the larvæ of the genus *Nepticula* (which contains the smallest of all known moths), which are furnished instead with nine pairs of undeveloped prolegs, without claws, on segments 3 to 11; as well as in the entirely footless larva of *Gelechia Inopella*, which lives in the seeds of the common Flea-bane (*Inula dysenterica*); and also in the footless larvæ of the genus *Parasia*, which live in the heads of different composite plants.

or some of the limbs may be much thicker than usual, &c. These excrescences often form regular humps on the back, as in the hump-backed larva of *Notodonta Ziczac* (Pl. 31, Fig. 9, *a*); or fleshy peg-like processes, as in the larva of the Common Dagger Moth (Pl. 32, Fig. 7, *a*); or a pyramidal elevation on one of the last segments, as in that of the Kentish Glory (Pl. 27, Fig. 1, *a*). Other larvæ have short fleshy spines on the back, arranged in pairs, like that of *Lophopteryx Camelina* (Pl. 31, Fig. 3, *a*); or two horizontal projections behind the terminal segment, as in that of *Hipparchia Circe* (Pl. 12, Fig. 1, *a*), and in most of those of the *Satyridæ*. Other larvæ are furnished with longitudinal rows of hard branching spines on the back and sides, like that of the Camberwell Beauty (Pl. 6, Fig. 2, *a*); or with rows of thorn-like, cylindrical, fleshy spines, covered with short hair, like that of the Glanville Fritillary (Pl. 8, Fig. 5, *a*); or are covered with bud-like prominences, like that of *Saturnia Pyri* (Pl. 27, Fig. 2, *a*). The larvæ of the *Sphingidæ* have a fleshy horn on the last segment but one (see Pl. 16, &c.), which is generally curved backwards, and has sometimes a small horny plate behind it. The sides of many larvæ are studded beneath with a row of short fleshy filaments, as in that of the Clifden Nonpareil (Pl. 41, Fig. 3, *a*).

The skin of larvæ is either naked or hairy. In the former case it may either be smooth (as in *Panolis Piniperda*, Pl. 33, Fig. 8, *a*) or rough (as in the Eyed Hawk Moth, Pl. 19, Fig. 4, *a*), or furnished with small, separate, and regularly-arranged warty processes, covered with a very fine and scarcely visible down (as in *Gortyna Flavago*, Pl. 34, Fig. 5, *a*). We class these among the naked larvæ on account of the fineness of the down. In hairy larvæ the body is either thinly covered with soft hairs (as in *Eriogaster Lanestris*, Pl. 29, Fig. 4, *a*), or with short hair placed close together (as in the Oak Eggar, Pl. 29, Fig. 1, *a*) or in tufts; or the hairs stand on large warts, and are arranged either like stars or rays (as in the Jersey Tiger, Pl. 23, Fig. 2, *a*); or else they are stiff and long, so that the star-like arrangement is no longer perceptible, at least on the back (as in the Tiger Moth, Pl. 23, Fig. 6, *a*). Other larvæ are provided, in addition to the ordinary covering of hair, with truncated tufts of hair on the back (as in *Dasychira Fascelina*, Pl. 24, Fig. 4, *a*), or with long pencils of hair on the back or sides (as in the Vapourer Moth, Pl. 24, Fig. 2, *a*). The hairs themselves are either bristly or thread-like, and more rarely lanceolate. In the Processionary larvæ they are covered with exceedingly fine recurved hooks, and with small openings, which discharge a fine dust, which causes an inflammatory irritation on the human skin.

Colour and Pattern of Larvæ.—The colours and patterns of both the naked and hairy larvæ are very various. The markings consist of longitudinal lines, or bands of variable breadth; oblique lines and stripes, which generally converge towards the back; transverse bands; large or small spots, &c. There is often a longitudinal line, frequently bordered with darker, running along the middle of the back (the dorsal line or streak); and sometimes another line lower down on each side (the sub-dorsal line); or one lower still, near the spiracles; or else a broader pale streak (the lateral line or streak). The oblique streaks generally run forwards from the back, and more rarely run backwards along the sides. The dorsal line is sometimes double, or divided by a narrow line throughout its length. The various forms of the lateral streak may be compared in the larvæ of *Hipparchia Janira* (Pl. 13, Fig. 4, *a*), *Mamestra Pisi* (Pl. 37, Fig. 10, *a*), and *Panolis Piniperda* (Pl. 33, Fig. 8, *a*). In that of the Poplar Hawk Moth (Pl. 19, Fig. 3, *a*) it is combined with oblique streaks on the sides. Other larvæ have an angular pattern on the back, sometimes forming open or closed squares, like that of *Mamestra Albimacula* (Pl. 37, Fig. 5, *a*). Others have two parallel stripes on the back of the hinder segments, which often unite behind, forming a mark resembling a horse-shoe, as in the larvæ of some of the Yellow Underwings (Pl. 35, Figs. 3, *a*, and 5, *a*). The larva of the Cinnabar Moth (Pl. 22, Fig. 13, *a*) has transverse bands

on the segments; other larvæ have rows of transverse spots between the first segments, or are covered with large or small spots, varying in number, and often arranged in rows or in transverse bands (compare the larvæ figured on Pl. 39).

Moulting.—As the outer skin of the larva does not expand with its growth, it is cast off when it becomes too narrow. This phenomenon is called moulting. It takes place at more or less regular intervals, usually after from six days to a fortnight, but sometimes at much longer intervals, especially in cases when hybernation intervenes. Some larvæ moult twice only, others seven times, but the greater number four or five times. During the time of moulting the larva appears to be ill. It ceases to eat, and fixes itself firmly with the prolegs and claspers. The old skin becomes dry and shrivelled; a new and larger head appears behind the old head; and at last the old skin splits down the back behind the head, and the larva, clothed in a new skin, extricates itself gradually from the old one. The empty shell of the old head generally remains sticking to the mouth of the new head for a little while, till it is rubbed off. In hairy and spiny larvæ the hairs and spines are thrown off with the old skin, under which the new hairs and spines lie close to the body in a limp condition, and stiffen and become dry after the old skin is thrown off. All the other parts slip out of the old skin, in which they are enclosed. Even the lining of the intestines and breathing tubes is thrown off with the old skin, according to some writers. The colour and pattern of the larva, and in some cases even its shape, are liable to considerable alteration after moulting. Thus the larvæ of *Aglia Tau* lose the small spines which they possess on first quitting the egg; and the larvæ of many *Noctuæ*, which have the first pair of prolegs imperfect in their earlier stages, and consequently walk somewhat like loopers, acquire perfectly developed prolegs after the two first moults.

Habits.—The food of larvæ consists almost exclusively of vegetable substances, though the larvæ of some *Micro-Lepidoptera* form an exception, as they live upon animal substances, such as hair, feathers, wool, &c., or on animal products, such as grease, the wax in the nests of bees and humble-bees, &c. The larvæ of some *Noctuæ* and *Geometræ*, for instance, those of the genus *Cosmia*, and of *Scopelosoma Satellitia* and *Crocallis Elinguaria*, will devour other larvæ which may happen to be in their company. It is even doubtful whether the larva of *Senta Maritima* does not feed exclusively on other insects. Most of the larvæ which feed on plants live on the softer portions, such as the leaves and flowers; but there are many which feed on other parts: some on the buds, fruits, or seeds, and others live in the interior of the stem, or in the bark, wood, and roots, often burrowing in the solid wood. Thus the larvæ of the *Sesiidæ* live and feed in or under the bark and in the wood of trees, or in the roots of herbaceous plants; the larvæ of the genera *Cossus* and *Zeuzera* also live in the trunks of trees; those of *Phragmatœcia*, *Hydrœcia*, *Gortyna*, *Helotropha*, *Nonagria*, and *Calamia* feed in the stems of plants, and sometimes creep down into the roots, while those of the genus *Dianthœcia* live in the seed-capsules of plants allied to the pink. The larvæ of the genus *Agrotis*, &c., live on or just beneath the surface of the ground, and frequently do great injury by eating through the roots of cultivated plants—a habit which has led to their being called "cut-worms" in America. Several other larvæ besides those which we have mentioned above feed in the interior of plants. These chiefly belong to the *Micro-Lepidoptera;* and a great number of them burrow in the leaves of plants, and are called mining larvæ. These live between the upper and under cuticle of leaves, and feed upon the green substance called chlorophyl, thus forming colourless spots or galleries in the leaf. Such mines are formed by most larvæ belonging to the families *Elachistidæ*, *Lithocolletidæ*, *Lyonetidæ*, *Nepticulidæ*, and *Coleophoridæ*. The last have the additional peculiarity of living in cases, from which they stretch out their heads to eat into the leaf, while the hinder part of their body remains in the case, and thus they hold

themselves firm. But we must not conclude that every mine is the work of one of these larvæ, for the larvæ of some flies and beetles mine in leaves in a similar manner. There are only a few mining larvæ known among the *Macro-Lepidoptera*. We may mention those of the genus *Ino*, and that of *Cidaria Incultaria*. The latter mines in the leaves of *Primula Auricula*. Most of the larvæ of *Macro-Lepidoptera* which do not feed in the interior of plants live exposed, but others live in webs, or between leaves which they have spun together. Others live in sack-like cases, covered externally with portions of the food-plant, which they carry about with them. Most of the larvæ of *Micro-Lepidoptera* which are not miners also live in webs, or in leaves spun together, turned over, or rolled up; or in silken tubes; or else in cases. Many of the larvæ of *Macro-Lepidoptera* which live exposed, especially among the *Noctuæ*, hide themselves during the day on or in the earth, under plants, in dry leaves or moss, or in the crevices of bark, &c., and only come out to feed at night. Many larvæ live in company, either exposed or in a common web. They generally separate while feeding, and assemble together again to rest, or when about to undergo their moults. The larvæ of the genus *Cnethocampa* are particularly deserving of notice. They always keep together in great numbers, and march forward to eat in a regular procession, either in a long train, one behind the other, or else one goes first and others follow; and thus the train becomes gradually broader, remains for a time of equal breadth, and towards the hinder end again becomes narrow. After they have finished eating, they return in similar order. They have acquired the name of Processionary Caterpillars from these regularly-arranged trains.

The duration of the larva state is very variable. It generally lasts two or three months, and only extends to ten months when the larva passes the winter in that state. In several genera of *Tineina* the larvæ require only a few days before they assume the pupa state; and the growth of the larvæ of some *Macro-Lepidoptera* is also very rapid. Larvæ of *Cucullia Chamomillæ*, bred from the eggs, have been known to reach their full growth in fourteen days. On the other hand, the larvæ of the genus *Cossus*, many *Sesiidæ*, and generally those also of *Pleretes Matronula*, require two or three years to reach their full growth. The growth of larvæ is accelerated by warmth, and retarded by cold. Many larvæ hybernate: some when they are very young, and even previous to the first moult; and it is remarkable that in this case many, like those of the *Zygænæ*, leave off eating long before they commence their actual winter sleep, and remain without food for months before winter. Others hybernate when they are full grown, and some of these live far into the summer without taking food; but this has only been observed in the case of *Micro-Lepidoptera*. But the greater number hybernate when half grown, and feed till late in the autumn. The larvæ of many *Noctuæ* perhaps feed even in winter during mild weather, and as soon as their food-plant grows up in spring they at once begin to feed upon it again. Many of these moult before they re-commence feeding, and others very soon afterwards. Many species, such as those of the genus *Melitæa*, live in company till winter, pass the winter in a common web, but disperse in spring, and lead a solitary life afterwards.

Metamorphosis.—When the larva has reached its full size, the last moult, called "pupation," takes place. This change also is attended with very various circumstances. The larvæ of many butterflies, as well as those of the Plume Moths and of some other *Micro-Lepidoptera*, attach themselves by the tail to a twig or some other object, and undergo their transformations suspended freely in the air. The larvæ of many other butterflies, as well as those of the genus *Elachista*, are fastened with a fine thread, which they draw round the body or over the mouth. Other larvæ prepare themselves a more or less hidden or protected place of safety called a cocoon. This is composed of threads, in which hairy caterpillars generally weave their hairs, as well as fragments of leaves, moss, or wood-shavings. These cocoons are of different consistencies: sometimes quite

loose, something like a firm felty substance; others are very hard and firm, especially if shavings have been used in their construction; and sometimes they are quite smooth and parchment-like. The cocoons are generally placed in hidden or protected situations, some in corners, in crevices of trees, in the ground, or under moss, and the outside is often difficult to distinguish from surrounding substances. Cocoons attached to the trunks of trees are often very skilfully constructed, and covered with pieces of bark and lichen so as perfectly to resemble a natural excrescence of the bark. The form of the cocoon is generally egg-shaped, but some are spindle-shaped, pear-shaped, or boat-shaped. Others resemble a bottle with a short neck, and have a valve-like partition at the base inside, and others are closed by a kind of lid. The larvæ which feed in the interior of the hard portions of plants prepare a path by which the moth can escape, before they assume the pupa state. This generally consists of a tube or passage from the place where the pupa rests, to the outer wall, where it is closed by the outermost skin of the plant. Case-bearing larvæ do not prepare a special cocoon, but fasten the upper end of the case to some object, and then turn round inside before assuming the pupa state. The moth afterwards emerges from the hinder end. Larvæ which live between leaves which they have spun together generally make no regular cocoon, but change to pupæ between the leaves where they have lived, or else go into the ground for the purpose. Most of the naked larvæ of *Macro-Lepidoptera*, except those of the butterflies, undergo their transformation in or on the surface of the ground, sometimes without any preparation. Some of those which change on the surface of the ground do so between two leaves, which they draw together around them; and others which change beneath the surface construct a sort of cocoon of agglutinated grains of earth, which may be either loose or firm, and is generally lined with silk. The transformation to a pupa is effected by the swelling of the front segments till the skin of the larva splits at the back of the neck, and is shuffled off behind by continuous movements of the pupa. When the pupa first appears it is often soft and pale, but soon acquires its proper colour and consistency. The larger and more complicated cocoons frequently require a day or more for their completion.

PUPÆ.

Form and Colour.—The shape of the pupa is generally cylindrical, becoming narrower behind, either gradually or suddenly. It is surrounded with a horny skin varying in hardness, and is divided into the thorax, corresponding to the thoracic segments of the larva; and the abdomen, which consists of nine movable rings jointed together. The separate parts of the future butterfly may be plainly noticed on the outside of the thorax of the pupa, in the seams by which the covering is divided. The head is indicated by a slight swelling in front. It is pressed downwards, and the eyes are visible on each side. Behind and above this is a narrow segment, the pro-thorax; then the large and broad meso-thorax, and behind this the short meta-thorax. The lower joints of the two first pairs of legs are placed on the under side in front, on the side of the head, while their thighs and the last pair of legs are concealed, except that the extremities of the latter are visible behind the other legs. The antennæ pass round the eyes, and run backwards outside the middle pair of legs, which they thus enclose. The cases of the fore-wings rise on the sides of the meso-thorax, and run backwards and beneath, bordering the antennæ, and meet towards the ends, or are separated by the legs, antennæ, and tongue, according to the length of these organs. The hind-wings are attached to the meta-thorax, but there is only a small part of their base visible, because they are hidden under the fore-wings. The wing-cases usually extend at least as far as the middle of the pupa, and are always conspicuous beyond the meta-thorax. They sometimes reach as far as the end

of the pupa. The cases of the legs, antennæ, and tongue are also longer or shorter, and that of the tongue often forms a knob-like projection at the end, or a separate tube, close to the breast or separated from it, and sometimes convoluted. The abdomen becomes gradually or suddenly narrow towards the end, and its segments represent the nine last segments, or the abdomen of the butterfly. The four first are generally hidden by the wing-cases on the under surface, and the others entirely enclose the body. The last segment has a short, longitudinal impression beneath, and there are two small hooks, separated by an indentation, on the last segment but one in the male sex. The last segment is either rounded or terminated by an obtuse angle, or by a process which has often two or more points, called the "cremaster." There are spiracles, or breathing-holes between the pro-thorax and the meso-thorax, and on all the segments of the abdomen, except the first and last. There are many variations in the form and covering of pupæ. Many butterflies have two sharp projections in front on the head, or a hatchet-shaped or nose-like projection on the middle of the back, and short spines on the upper surface of the abdomen; while the pupæ of other groups exhibit no such peculiarities, except that the head is prolonged into a point in some few genera. In the case of species which live in the interior of plants in their larva state, and assume the pupa state there, the abdominal segments have transverse series of short spines or hooks on the upper side, by means of which they push themselves forward when the moth is ready to emerge. The last segment of the abdomen and the cremaster are also generally covered with spines or hooks, or with a varying number of bristles. The pupa is very seldom covered with soft hair or with fine dust.

Most pupæ are dark-coloured, and without any markings. They are seldom pale-coloured; but the pupæ of some butterflies exhibit spots which have often a metallic lustre.

Duration of the Pupa State.—This is variable. Pupæ from which the insect emerges in the same year during which the pupa has been formed usually require from two to six weeks. In warm weather, butterflies frequently emerge from the pupæ in ten days; but many *Lepidoptera* require a longer time than six weeks before the perfect insect is matured. Hybernating pupæ require from six to nine months, and it occasionally happens that some pupæ, chiefly those of *Sphingidæ*, do not develop the moth for two or three years. The most remarkable instance of long life in the pupa state is, however, afforded by the Small Eggar (*Eriogaster Lanestris*), one of the *Lasiocampidæ*. If a brood of this insect be reared, some of the moths will emerge from the cocoons every year for eight or ten years, if a large number of cocoons be kept in the first place, and if they be retained so long.

Development of the Perfect Insect.—A few days before the appearance of the butterfly or moth, the pupa generally becomes less lively, and loses its colour so much that the colour and pattern of the enclosed insect are often visible through the wing-cases. At last the pupa-skin splits down the back, and the insect squeezes the fore part of its body out. At the same time it gradually draws its antennæ, legs, and wings out of their cases, and lastly the abdomen, with the help of its legs, and clings to the pupa-case or some other object in such a position as to let the wings hang down from the back. These are very small, and like wet flaps at first, but they expand so fast that they may almost be seen to grow; and after they have acquired their full size, they soon become stiff and firm. In pupæ which are enclosed in a cocoon, or lie underground, the moth has to break through the former, or to work its way out of the ground. Those pupæ which are found in the interior of plants, such as those of the *Sesiidæ*, *Cossidæ*, and larvæ which live in reeds, &c., push themselves along through the gallery which they have previously prepared, by means of the fringe of hooks on the segments, and push the fore part of the pupa through the outer opening.

HABITS AND FUNCTIONS OF *LEPIDOPTERA*.

Flight.—The character of the flight of *Lepidoptera* depends upon the strength and structure of the wings. In the larger butterflies it is generally sailing, but in the smaller butterflies, as well as in the *Geometræ*, and in many *Bombyces* and *Micro-Lepidoptera*, it is more fluttering. In the *Sphinges* and *Noctuæ* it is rushing. In some species it is direct, and sometimes dancing, jerking, or hovering. The flight may be quick or slow, and is sometimes long sustained. Several of the larger *Sphinges* are only occasional visitors in Central Europe, to which they extend their flight in warm seasons from the shores of the Mediterranean. Among these may be mentioned *Chærocampa Nerii* and *Celerio*, and *Deilephila Livornica*, which can scarcely be regarded as indigenous insects with us, although they are met with both as larvæ and as perfect insects. *Acherontia Atropos* and other insects not unfrequently fly on board vessels sailing at a distance of hundreds of miles from land. On the other hand, the females of many *Bombyces* and *Geometræ*, even those which have fully-developed wings, fly with difficulty or not at all, although the males of the same species are more active.

The *position of the wings at rest* is very various. Most butterflies and many *Geometræ* hold their wings erect and almost touching each other. Among the other *Lepidoptera*, some of the *Bombyces* and *Geometræ* spread their wings out flat, so that the hind-wings are but little covered by the fore-wings. In the great majority of the moths the fore-wings lie close to the body and cover the hind-wings completely, or so far that only the costa of the hind-wings projects beyond them. The hind-wings are then generally folded together, but the fore-wings either slope, roof-like, on both sides, more or less steeply; or they lie together almost in the same plane; or they are pressed together flat, with the inner margins lapped over each other; or they are folded round the body to some extent. The body generally rests flat on the surface when the insect sits, but the thorax or abdomen is sometimes raised. The antennæ are often laid backwards against the body under the wings, and are seldom extended, except in butterflies.

The *food* of *Lepidoptera* consists of the honey of flowers, or the moisture exuding from trees and plants, or fruits, or, in some rare cases, from putrid or excrementitious substances. They also frequently imbibe moisture from damp ground. They feed solely on liquid substances, which they suck up through their spiral tongue. Most species feed at rest, but the *Sphinges* and many *Noctuæ* hover over flowers without alighting. They are sometimes captured by adhesive or by insect-feeding plants; or leave a portion of their tongue fixed in a flower in their struggles to escape, as already mentioned. Many moths, especially *Bombyces* and *Tineina*, require no nourishment at all, when the tongue is either absent or very slightly developed; and these only live a few hours. But even tongueless *Lepidoptera* will occasionally visit sugared trees, &c., and probably derive either nourishment or pleasure from the surrounding odour.

Reproduction.—Butterflies generally pair while flying in the sunshine, but moths pair while at rest; and united couples are frequently met with. The males seek out the females; and as many of the latter are incapable of flight, or fly but little, the males have a peculiar power, not yet perfectly understood, of discovering virgin females at a great distance. The readiest way of obtaining the males of many *Bombyces* is to carry an unfertilised female in your pocket to the place where the insect occurs, when the males will often swarm round you, and sometimes even endeavour to creep into your pocket. But the moment a meeting is permitted the attraction ceases, and the males disappear at once. This method of collecting is called "assembling," and succeeds admirably with such species as the Oak Eggar, Kentish Glory, &c.

The union of the sexes varies in duration, according to the species. Sometimes it lasts several seconds, and sometimes several hours. The female generally begins to lay her eggs soon after pairing; but some *Noctuæ*, and, probably, also some butterflies and *Sphingidæ*, which appear in autumn, do not begin to lay till after hybernation. In many species the male dies soon after pairing, and the female soon after she has laid her eggs. Eggs laid by unfertilised females are generally sterile; we have already noticed the exceptions to this rule (p. xi.), but may here add that in *Solenobia*, a genus of *Tineina*, the wingless females of which live in cases, the unfertilised eggs produce larvæ which produce only females, and the males only appear as the result of fertilised eggs, and are frequently of very rare occurrence, whereas the unfertilised females are abundant. This phase of Parthenogenesis is found occasionally among other insects, and is best known among the Aphides, or Plant-lice.

Habits.—Many *Lepidoptera* fly by day as long as the sun continues high. They do not appear much before the dew is dried off the grass, and generally go to rest at or before sunset. Among these are all the butterflies, *Sesiidæ*, *Zygænidæ*, and *Psychidæ*, many *Bombyces*, a few *Sphinges* and *Noctuæ*, and many *Micro-Lepidoptera*. They fly about in the sunshine with more or less activity, visiting flowers, or fulfilling the various functions of their lives; but in dull and rainy weather they fly very little, hiding themselves in sheltered situations. The *Micro-Lepidoptera* are most active towards evening, extending their gambols into the twilight. Many *Sphinges* and *Noctuæ* appear at twilight, buzzing round flowers, but disappear again when it begins to grow darker. The greater part of the *Bombyces*, *Noctuæ*, and *Geometræ* do not appear till twilight has given place to darkness. They fly till morning twilight, when they seek their hiding-places, and the twilight-loving species re-appear for a short time. Many nocturnal species may be seen in the daytime, when disturbed from their resting-places, but they only fly hastily and irregularly, and look for a fresh hiding-place as soon as they can. This is especially the case with *Geometræ*, which are more easily disturbed by day than most other moths, as they do not seek such retired hiding-places and are more easily alarmed; but the sleep of many *Bombyces* and *Noctuæ* is so profound that they may often be transfixed with a pin without being roused.

The *duration of life* of *Lepidoptera* varies. We have already said that many species die immediately after pairing or laying. Many males, as, for instance, among the *Psychidæ*, only live a few hours, even when they have had no opportunity of pairing. Most species live a few days or a few weeks; and, in general, the longer they live, the longer is pairing deferred; and they seldom live very long afterwards. Other species, among which are many small and delicate insects, live a long time, emerging from the pupa in summer or autumn, and awakening to new life in the spring, after having lived through the winter. This is the case with many species of *Vanessa* among the butterflies, which often retire to their winter quarters quite early in autumn, as well as with the genera *Orthosia*, *Xylina*, *Calocampa*, &c., among the *Noctuæ*, and also many *Tineina*, especially those of the genus *Depressaria*, which generally appear in July and August, and live till April or May. Most of these hybernating *Lepidoptera* do not lay their eggs till spring, and perhaps do not pair till then.

Broods.—Most *Lepidoptera* appear only once a year. Those that have passed the winter in the pupa state generally appear from March to May; those that have hybernated as larvæ, from June to August; and those which only quitted the egg in spring, in autumn. Many species, however, complete the whole cycle of their lives twice in the year, or are double-brooded. For instance, the pupa hybernates, the perfect insect appears in May, the larva in June, the perfect insect again in August, and the larva again in September and October; those

of the second brood passing the winter in the pupa state. It often happens that these two broods are so dissimilar that no one would imagine them to belong to the same species, unless they had been bred. Among the most striking instances are the broods of *Vanessa Levana* among the butterflies, and those of the genus *Selenia* among the *Geometræ*. Many species which are usually single-brooded may develop a second brood in an unusually fine season, or a double-brooded species may produce a third generation; but, on the other hand, when the season is unfavourable, a species which is usually double-brooded may appear only once. But notwithstanding this, it always happens that the perfect insect and the larva appear at the usual time. Many species are double-brooded in the south, or in the plains, which are single-brooded further north, or in the mountains.

Distribution.—Lepidoptera are distributed over the whole surface of the globe, but not in equal numbers. They are dependent upon vegetation, and are most numerous where the vegetation is most luxuriant or most varied. In Europe the latter is the case; and the countries lying around the great central mountain ranges possess by far the richest Lepidopterous fauna. On their southern slopes we find most of the species belonging to the Mediterranean fauna; on their northern slopes most of the species of Central Europe; and on their summits many of the species which occur in the extreme north of Europe, just as we find many northern plants on the Alps, mingled with others peculiar to themselves. North and south of the Alps the number of species rapidly diminishes, till it reaches its minimum on the shores of the Arctic Ocean in one direction, and on the outskirts of the Sahara on the other. Even beautiful and fertile Andalusia scarcely produces more butterflies than Sweden; for the Alpine species of Central Europe have nearly all disappeared in the former country, and many of our most familiar insects are exclusively confined to the mountains, so far to the south.

As regards the vertical distribution of *Lepidoptera*, five regions have been defined by the Messrs. Speyer, in their work on the Geographical Distribution of German and Swiss *Lepidoptera*. The first is the lower region, and is bounded by the limit above which the walnut-tree ceases to grow. In Central Germany this is about 450 metres above the sea; in the northern lime-stone Alps, about 750 metres; and in the Southern Alps, about 900 metres. Next to this is the hill region, to the limit of the beech-tree, which reaches a height of 900 metres in Central Germany, and 1,200 in the Alps. Next to this is the lower Alpine region, to the limit of the pine-tree, *Pinus Picea*, from 900 to 1,350 metres in Germany, and from 1,200 to 1,800 metres in the Alps. Above this is the upper Alpine region, extending above the region of the forests to a height of from 2,100 to 2,250 metres; and, finally, the snow region, from this to the snow line, and beyond. We give here a table, showing the comparative number of Central European species of various families found in each of these regions respectively:—

Regions.	Papilionidæ.	Sphingidæ.	Sesiidæ.	Zygænidæ.	Arctiidæ and Lithosiidæ.	Liparidæ.	Lasiocampidæ.	Saturnidæ.	Drepanulidæ.	Psychidæ.	Notodontidæ.	Noctuidæ.
I.	165	21	32	24	42	17	21	6	7	19	36	520
II.	122	13	13	15	28	10	10	3	3	12	17	281
III.	85	2	1?	5	12	1	4	1?	—	5	—	96
IV.	54	—	—	4	8	—	2	—	—	2	—	27
V.	20	—	—	3	5	—	—	—	—	—	—	8

The character of the soil also determines that of the *Lepidoptera* of a locality as well as that of the plants. Moist and dry districts, and sandy or limestone soils, each have species of *Lepidoptera* peculiar to them. Many species are only found inland, while others are peculiar to the sea-coast. But many causes combine to render a species rare or common, apart from outward conditions, even where its food-plant is abundant, and the locality apparently favourable. While many species are abundant almost everywhere, others are confined to particular localities, frequently without our being able to discover any reason for this difference.

The number of individuals of different species is also various. While many species are common in the localities which they frequent, others are scarcer, or are only to be met with more commonly in years which are peculiarly favourable to their development. Many species which are common in the larva state are considered great rarities as perfect insects. A species which has formerly been common often disappears from a locality almost entirely, and re-appears, perhaps, years afterwards, at first singly, and then more abundantly, till it becomes as common as before. This is, no doubt, due to the influence of unusual seasons. The disappearance of many of the English fen insects is believed to be due as much to the larvæ or pupæ having been destroyed by unusually high floods as to the actual drainage of the fens, both causes having combined for their extermination at about the same time. As we advance towards the high north, or to the summits of the highest mountains, we find the number of individuals greatly diminished, as well as that of species.

The fewest species are to be met with in flat cultivated districts. Many *Lepidoptera* are found only in woods, generally in flowery places, or flying round bushes. Others frequent road-sides, others meadows, some prefer barren hill-sides, and often settle on the bare rocks, while others select low flowery places.

Uses of Lepidoptera.—The *Lepidoptera* which are most directly useful to man are the Silkworms. These are the larvæ of various moths belonging to the families *Bombycidæ* and *Saturnidiæ*, which spin a thick cocoon, from which we obtain the valuable material called silk. The best known and most useful species is the Mulberry Silkworm (*Bombyx Mori*, Linn.), a native of China. Its eggs were brought to Constantinople during the reign of Justinian (A.D. 550) by two missionaries, who concealed them in hollow canes. Since that time the insect has been reared throughout Southern Europe for the sake of its silk, but is only reared as a curiosity in the north.

Attempts have lately been made to introduce other silkworms into Europe. The best known is the Ailanthus Silkworm (*Attacus Cynthia*, Drury), common throughout the East Indies, which feeds on the *Ailanthus Glandulosa*, a tree which is often grown for shade and ornament. It is hardy and easily reared, and has become naturalised in several parts of England and France, as well as in the United States and Australia; but it yields a small cocoon of doubtful quality, which is very difficult to unwind. The Japanese and North Chinese Oak-feeding Silkworms (*Antheræa Yama-mai* and *Pernyi*, Guèr.) yield large cocoons of excellent quality, which are easily unwound; but they are only reared with great difficulty and uncertainty, and rapidly degenerate in Europe; so that *Bombyx Mori* is still the only silkworm of any economic value which is reared on this Continent. Larvæ, pupæ, and even moths, form an important article of food among those savages who live partly on insects, especially in Australia.

Like other insects which frequent flowers, *Lepidoptera* probably contribute largely to the fertilisation of the latter by conveying the pollen from one flower to another.

Injurious Lepidoptera.—As the larvæ of most *Lepidoptera* feed on plants, many of them cause great damage to our fields, gardens, and forests. They are generally injurious only when in great numbers, though, in the case of larvæ which attack the roots and stems, a very few may

suffice to kill a plant. Our forests suffer little from the attacks of insects compared with those of the Continent, where it sometimes happens that large tracts of forest are completely destroyed. One reason of our immunity is that extensive pine forests like those of the Continent are rarely met with in England, and that this tree is subject to the attacks of the larvæ of many moths which are either very rare or wholly unknown amongst us. When there is an extraordinary appearance of destructive larvæ, their ravages sometimes continue for one season only, but more frequently for several seasons, during which their numbers continue to increase; but after a few years, they frequently disappear almost suddenly, in consequence either of disease, or from the abundance of their parasites; for, as each infected larva usually furnishes food for many ichneumon larvæ, the latter naturally tend to increase at a much greater ratio than those of their prey. It thus frequently happens that after any particular larva has been unusually abundant during one year, it may be difficult to find one which is not ichneumoned during the following season. Among the larvæ which thus increase to a devastating extent at intervals on the Continent, we may mention those of *Lasiocampa Pini* and *Psilura Monacha*. The former is a doubtful British species, and the latter is by no means a generally abundant insect with us. During the years 1863 to 1865, the larvæ of a *Tortrix* (*Grapholitha Pinicolana*) increased to such an extent that all the larch forests in the Upper Engadine were stripped of their leaves in July, 1865, and it seemed as if their very existence would be endangered if the larvæ continued their ravages for another year. But, numerous as the larvæ were, they nearly all sickened, perhaps on account of their food failing them, and either died without becoming pupæ, or died in the pupa state, so that very few moths arrived at maturity. Next year there were very few larvæ to be seen. For several years previous to 1875, one of the small Ermine Moths (*Hyponomeuta Malinella*) had been very destructive to the fruit-trees in various parts of France, but in 1875 the larvæ of *Clisiocampa Neustria* and *Liparis Dispar*, which appear earlier in the year, were beforehand with it, and stripped the trees of their leaves by the time the *Hyponomeuta* larvæ appeared. The latter consequently found no food, and were actually starved out by other larvæ, larger and as voracious as themselves. The nature of the injury caused to plants by the larvæ of *Lepidoptera* depends on the habits of the latter. Some, which feed inside the trunks and roots of trees, impede their growth, and may perhaps cause their death. Among these may be mentioned the larvæ of *Cossus Ligniperda* and *Zeuzera Æsculi*, which are met with in trees of various kinds, and those of *Trochilium Apiformis*, and *Sesia Myopiformis*, and *Tipuliformis*, which attack the poplar, apple, and currant respectively. Those which feed on the leaves of trees likewise impede their growth, and often destroy them by continued attacks. Among these we may mention the larvæ of the Brown and Gold-tail Moths, the Lackey Moth, the Small Ermine Moths; and on the Continent, those of the Black-veined White Butterfly, as particularly destructive to fruit-trees. Other larvæ may be mentioned as only occasionally destructive, such as the White Satin Moth to willows; *Dasychira Pudibunda* to beech; the Processionary Caterpillars (on the Continent) to oak and fir; *Fidonia Piniaria* to pine; the green *Tortrix* to oaks, &c. Much havoc is wrought in our gardens almost every year by the larvæ of the White Cabbage Butterflies and of the Cabbage Moths. Many *Tortrices* live in and destroy the young shoots of trees, while others live in various fruits and seeds. The larvæ of the winter moths, of *Eupithecia Rectangulata* and *Laverna Atra*, destroy the buds of fruit-trees. The roots of grass and corn are destroyed by many insects, among which are the larvæ of the Ghost Moth and of *Charæas Graminis*. Much mischief is often caused to the Continental vineyards by the larva of *Conchylis Roserana*, which is double-brooded, and destroys the buds in spring, and the half-ripe grapes in autumn.

Nor do all Lepidopterous larvæ content themselves with fresh vegetable food. Many of the smaller *Lepidoptera* live in our outhouses and storehouses, and their larvæ feed on dried products.

Thus, those of the genus *Ephestia* live on dried fruits, and those of *Pyralis Farinalis*, *Tinea Granella*, *Gelechia Cerealella*, and several others on corn, &c. The Clothes Moths, which chiefly belong to the genus *Tinea*, infest our dwellings, and destroy textures of all kinds, both animal and vegetable, but chiefly the former, such as cloth, horsehair, feathers, &c. There is one small family of moths, the *Galleridæ*, whose larvæ feed on wax, and often commit great ravages in bee-hives by devouring the combs.

A few larvæ are directly injurious to man. We have no European species which are furnished with a regular stinging apparatus; but the hairs of many larvæ belonging to the *Bombyces*, such as those of *Lasiocampa Rubi*, and the Brown and Gold-tail Moths, are capable of giving rise to painful itching and irritation on the human skin. But this is not to be compared with that caused by the hairs of the Processionary larvæ, which are very loosely attached and studded with exceedingly fine and recurved hooks, and cause violent inflammation on the skin of men and animals, partly by thus adhering to it, and partly in consequence of a fine dust with which they are covered. On this account the neighbourhood of the nests of these larvæ, which are intermingled with these hairs, is dangerous, for the surrounding air is filled with loose hairs and dust, which are liable to be inhaled, and to give rise to internal inflammation and swellings, which have sometimes caused death. The inflammation caused by the hairs of larvæ may be relieved or averted by rubbing the skin with oil. The larvæ of the Tabby Moth (*Aglossa Pinguinalis*) have occasionally been swallowed, and have proved a highly injurious casual parasite.

The *enemies* of *Lepidoptera* and their larvæ are very numerous, and they are exposed to many dangers. Insectivorous birds destroy immense numbers; and one reason why our crops suffer much less than those of the Continent from the attacks of insects is due to small birds being more numerous with us than in countries where they are destroyed wholesale for food, as is the case in Italy, for example. The mischief caused by birds to the farmer and gardener is insignificant compared with the service which they render him in this manner. But *Lepidoptera* have many enemies even among other insects. Spiders and dragon-flies prey upon them in the perfect state, and the large carnivorous beetles devour their larvæ. But there are many ichneumon flies and two-winged flies which are still more destructive to them. These either lay their eggs in the larvæ of *Lepidoptera* by means of an ovipositor, or attach them to their skin. Some even lay their eggs in those of butterflies or moths. When the parasitical larvæ emerge from their eggs they pierce the skin of their prey, if not already safely lodged beneath it, and begin to feed upon the fatty portions, out of which the perfect insect is to be developed, avoiding the vital portions of the larva, which either lives till it is about to assume the pupa state, and then dies, or dies as a pupa. The parasites either change to pupæ within the empty skin, or emerge from it and spin their own small cocoons round it. Some of these parasites deposit but one egg in a larva, while others lay a considerable number; and it sometimes happens that when a larva only nourishes one or two of those of an ichneumon, which usually infests it in numbers, it may nevertheless arrive at maturity, though more or less crippled. Thus, a case is on record where a specimen of *Pieris Brassicæ* was bred, with two of the small cocoons of an ichneumon fly rolled up in its wings. Ichneumons are, however, not the only *Hymenoptera* which destroy the larvæ of butterflies and moths. Various species of sand wasps provision their nests with them, first crippling them in such a manner with their sting as to render them unable to move, while they continue to live in this torpid state till the eggs which have been deposited with them hatch, and they are devoured by the larvæ of the wasps. The countercheck of such enemies is usually sufficient to keep the ravages of Lepidopterous larvæ within bounds, and to set a limit to their further increase whenever they become inordinately numerous.

Diseases.—Larvæ are subject to many diseases, among which is diarrhœa, which destroys great numbers. They are also subject to a kind of low fever, and to the attacks of fungi and other low vegetable parasites. Sick larvæ are generally sluggish, flabby, and sometimes discoloured with spots or blotches. Many are also destroyed by vicissitudes of the seasons, especially when moulting, which is always a critical period. A continuance of cold wet weather in spring is peculiarly fatal to them; on the other hand, larvæ and pupæ bear the cold of winter very well. During Ross's second Arctic Expedition several larvæ were collected, which revived at once when brought into the cabin, though previously frozen so stiff that some of them had been snapped like glass.

SYSTEMATIC REMARKS.

Species, Variety, Aberration.—A species is an assemblage of individuals, consisting of two sexes, male and female, which pair, and produce offspring similar to themselves. But the individuals of the same species vary within certain limits, independently of the ordinary sexual differences, in size, colour, markings, and outline, without ceasing to be recognised as belonging to it. All these differences, when unimportant, are classed under the idea of the typical form of the species. But we meet with other variations which are more unlike the usual form, and are often quite dissimilar. When these appear occasionally in single individuals among those of the typical form, they are called aberrations; but when they are of frequent occurrence, they are called varieties. These are often confined to special localities, as when we find a dark form of a species on mountains or in a more northerly locality, while those found on the plains or further south are brighter coloured. Such forms are called local varieties; and when they are both peculiarly well marked, and also isolated, as is the case with many insects which are peculiar to Corsica and Sardinia, they may justly be termed sub-species. Lastly, when two different forms of the same insect appear at different times of the year, the phenomenon is called seasonal dimorphism, and the varieties are called broods.

Hybrids.—It sometimes happens that nearly allied, though truly distinct species pair, and produce offspring which resemble neither of their parents, but combine the characters of both species in varying proportions. It is more than doubtful whether these varieties can perpetuate themselves; and, in many cases, the resulting insects are hermaphrodites, in which the sexes are mixed as well as the species. Many broods of hybrids die in the larva state, and most of those known were bred in confinement. A true hybrid is very rarely produced in a state of nature.

Classification.—An assemblage of species which agree in certain peculiarities which are exclusively confined to them in the same combination, forms a genus. The name of a species is composed of the name of the species combined with that of the genus. Allied genera are classed in families, and families are again combined in groups.

The characters of the genera and families are chiefly taken from the antennæ, palpi, legs, and wings, and the arrangement of the nervures of the wings is also of considerable importance.

Linnæus divided the *Lepidoptera* into three genera only: *Papilio*, *Sphinx*, and *Phalæna*, or Butterflies, Hawk Moths, and Moths. He sub-divided *Phalæna* into *Attacus*, *Bombyx*, *Noctua*, *Geometra*, *Pyralis*, *Tortrix*, *Tinea*, and *Alucita*. These sections were again sub-divided by later authors, and various modifications proposed; but the classification of the *Lepidoptera* is an exceedingly difficult study, and we have none which can be considered quite satisfactory at present. It would be out of place to enter into the various systems of classification in detail in an elementary work like this; and the classification which we have adopted is based upon the system of Herrich-Schäffer, with some modifications by Lederer, Speyer, and others. The

groups of Linnæus are still retained, with the exception of *Attacus*, for the names of the main groups. In the system of Guénée, which is much used in England, the *Sphinges* are united with the *Bombyces*, under the name of *Nocturni;* the *Geometræ* are placed after this group, followed by the *Drepanulidæ* and *Notodontidæ;* and the *Geometræ* and *Tortrices* are divided into a number of small families. The *Psychidæ* are transferred to the *Tineæ;* and there are several other differences of minor importance.

The Butterflies are frequently called *Rhopalocera*, from their club-shaped antennæ; and the Moths are called *Heterocera*. The Butterflies, Hawk Moths, and Moths used to be called Diurnal, Crepuscular, and Nocturnal *Lepidoptera* respectively, in allusion to their times of flight; but as large numbers of the two latter groups fly by day, these terms are now abandoned as too loose to be retained at all. The groups from the Butterflies to the *Geometræ* inclusive are frequently termed *Macro-Lepidoptera*, because most of the species which they include are of large or moderate size; and the remaining groups are called *Micro-Lepidoptera*, because most of the species belonging to them are of small size. Although this distinction is not absolutely correct (for many of the *Micro-Lepidoptera* are larger than many of the *Macro-Lepidoptera*), it is sufficiently so to form a rough division. Many writers divide the *Pyrales* into two groups, *Pyrales* and *Crambi*, the second division including all but the two first families. In this case the *Pyrales* are generally included with the *Macro-Lepidoptera*, and the *Crambi* with the *Micro-Lepidoptera*.

We give below, for convenience of reference, a list of the groups and families of the European *Lepidoptera*, arranged on the system which we shall employ in the present work:—

TABLE OF THE GROUPS AND FAMILIES OF EUROPEAN *LEPIDOPTERA*.

(*Those which include no British species are marked with an asterisk.*)

MACRO-LEPIDOPTERA.

A.—RHOPALOCERA.

1. Papilionidæ.
2. Pieridæ.
3. Nymphalidæ.
*4. Danaidæ.
5. Satyridæ.
*6. Libytheidæ.
7. Erycinidæ.
8. Lycænidæ.
9. Hesperiidæ.

B.—SPHINGES.

1. Sphingidæ.
*2. Thyrididæ.
3. Sesiidæ.
4. Zygænidæ.
5. Syntomidæ.

C.—BOMBYCES.

1. Lithosiidæ.
2. Arctiidæ.
3. Liparidæ.
4. Cossidæ.
5. Cochliopodidæ.
6. Hepialidæ.
*7. Heterogynidæ.
8. Psychidæ.
9. Drepanulidæ.
10. Saturniidæ.
11. Lasiocampidæ.
*12. Bombycidæ.
13. Notodontidæ.
14. Cymatophoridæ.

D.—NOCTUÆ.

1. Noctuidæ.
   a. Bombycoidæ.
   b. Acronyctidæ.
   c. Orthosiidæ.
   d. Agrotidæ.
   e. Hadenidæ.
   f. Xylinidæ.
   g. Cleophanidæ.
   h. Cuculliidæ.
   **i.* Eurhipiidæ.
   j. Heliothidæ.
   k. Anartidæ.
   l. Plusiidæ.
   **m.* Calpidæ.
   n. Acontiidæ.
   o. Ophiusidæ.
   p. Toxocampidæ.
   q. Noctuophalænidæ.
   r. Deltoididæ.
2. Nycteolidæ.
3. Chloephoridæ.
4. Brephidæ.

E.—GEOMETRÆ.

1. Dendrometridæ.
2. Phytometridæ.

MICRO-LEPIDOPTERA.

F.—PYRALES.

1. Pyralidæ.
2. Botididæ.
3. Chilonidæ.
4. Crambidæ.
5. Phycidæ.
6. Galleriidæ.

G.—TORTRICES.

H.—TINEÆ.

1. Choreutidæ.
*2. Atychiidæ.
3. Tineidæ.
   a. Talæporidæ.
   b. Lypusidæ.
   c. Tineidæ.
   d. Adelidæ.
   e. Ochsenheimeriidæ.
   f. Teichobiidæ.
   g. Acrolepiidæ.
   h. Hyponomeutidæ.
   i. Plutellidæ.
   j. Orthotæliidæ.
   k. Chimabacchidæ.
   l. Gelechiidæ.
   m. Glyphipterygidæ.
   n. Chauliodidæ.
   o. Lavernidæ.
   p. Butalidæ.
   q. Elachistidæ.
   r. Douglasiidæ.
   s. Heliozelidæ.
   t. Heliodinidæ.
   u. Cosmopterygidæ.
   v. Batrachedridæ.
   w. Augasmidæ.
   x. Coleophoridæ.
   y. Gracilariidæ.
   z. Argyresthiidæ.
   aa. Lithocolletidæ.
   bb. Lyonetiidæ.
   cc. Phyllocnistidæ.
   dd. Nepticulidæ.
4. Micropterygidæ.

I.—PTEROPHORI.

J.—ALUCITÆ.

The main groups are frequently called *Sphingina*, *Bombycina*, *Noctuina*, *Geometrina*, *Pyralidina*, *Tortricina*, *Tineina*, *Pterophorina*, and *Alucitina*.

Number of Species.—It is almost impossible to give an exact estimate of the number of species of *Lepidoptera* existing in the world: 100,000 has been suggested, and may ultimately prove to be below rather than above the mark; but at present there are probably about 40,000 species of *Lepidoptera* described in various works from different parts of the world. The following table gives the number of species known to inhabit Europe, Great Britain, and Germany and Switzerland respectively, according to the catalogues of Staudinger and Wocke (1871), Stainton (1859), and Herrich-Schäffer (1862). To make these lists quite accurate, the additional species since discovered should be added; but the numbers given are sufficiently close for the present purpose:—

Groups.	Europe.	Britain.	Germany and Switzerland.
Rhopalocera	289	66	203
Sphingina	132	36	82
Bombycina	295	101	196
Noctuina	883	294	546
Geometrina	683	274	418
Pyralidina	542	157	260
Tortricina	635	301	424
Tineina	1,728	645	1,050
Pterophorina	88	29	55
Alucitina	9	1	
	5,284	1,904	3,234

ON COLLECTING BUTTERFLIES AND MOTHS IN THE PERFECT STATE.

Nets are indispensable for capturing insects on the wing. There are several different kinds, but those most commonly used in England are the ring-net and the umbrella-net. The former consists of a light iron ring, jointed so that it can be folded up and put into the pocket. It may be constructed to screw on the top of a common walking-stick, to which a cap is fitted, which can be screwed on in its place whenever the net is not mounted, to keep out the dirt. The ring itself should be nearly a foot in diameter, and may, of course, be fitted to a stick of any length as well as to a walking-stick; but a very long stick is both inconvenient and unwieldy, and is rarely required, for there are not very many species which habitually fly at a great distance from the ground. The net should be made of green gauze, and should not be attached to the ring, but sewn on to a strip of some stronger material less liable to tear, which should be sewn loosely round the ring, so that it can be slipped off and on. The gauze itself is liable to wear out too soon if sewn upon the ring. The net should be made gradually tapering, but the end must be rounded, so that there are no corners into which the insect can creep and damage its wings. It should be about three times as long as the breadth of the ring; or, more definitely, it must be long enough to lap round the ring or stick when an insect is captured, so as to enclose it till the collector can take the net in his hand, and yet not long enough to be inconvenient in use.

The umbrella-net is similar to the ring-net, but is much larger—generally about two feet in diameter. The framework is made of whalebone, or of some equally flexible material, and the stick runs through the centre, upon which the rim is constructed to slide up and down, exactly on the principle of an umbrella. When the net is not in use, it is rolled round the closed frame and slipped into an ordinary umbrella-case. This is an exceedingly portable form of net, but it is considerably more expensive than the other. Besides, it is much shorter, and will often be

found inconvenient on this account. Another disadvantage is, that in striking at a flying insect we run the risk of hitting it with the stick, which, it will be remembered, passes through the middle of the net; in which case we are very liable either to spoil or to lose our prize. On the whole, the ring-net is perhaps to be preferred. Before speaking of the practical use of the net, it will be better to consider the necessary adjuncts of boxes and pins.

Pins.—The pins used for butterflies and moths must be proportioned to the size of the insects for which they are intended. A large insect on a slender pin is very inconvenient, and a small insect may be utterly destroyed by using too large a pin. Ordinary pins are too short and thick for convenient use, and long slender pins, which may be purchased from the dealers in objects of natural history under the name of "entomological pins," are employed for the purpose. They are often gilt, to diminish their liability to corrosion; and, being long and slender, they are sometimes liable to bend, and require care in their use. Many entomologists use a curved pair of entomological pliers (which must be ridged in such a direction as to grasp the pin firmly, without slipping) to remove pinned insects from one box to another. This instrument will be found very useful at home (after you have learned to handle it), but is not much needed for field work. The Continental and American entomologists generally use very long pins, and set the insects high up, whereas most English entomologists set them rather low down on the pin, as we shall explain when we come to speak of setting. Some collectors carry a pincushion fastened to their button-hole or hung round their neck with a string, and others simply stick pins in their collecting-boxes.

Collecting-boxes, &c.—Many moths and small butterflies will sit quiet till you get home, if enclosed in a pill-box, and can then be killed and set at leisure. For this purpose we must carry a supply of well-fitting chip or pasteboard boxes, sufficiently strong to avoid breakage, and of different sizes. Dr. Knaggs recommends that the chip boxes should be carefully covered at the ends with a small piece of calico attached with shoemaker's paste, and drawn down all round below the lid, so as to prevent the lid coming out. Others brush round the inside edges with liquid glue for the same purpose. These boxes may either be carried in two large outside pockets, or in a satchel of any convenient construction, divided into at least two compartments; for when a box is filled it must be at once transferred to another compartment. The full and empty boxes must on no account be mixed together, and only one insect must be put into each box. But many insects must be killed when caught, such as all the largest species, including Butterflies, *Sphingidæ*, and all *Bombyces*, except *Lithosidiæ*, and any other very active insects, which do not sit still in a box, but are liable to knock themselves about in it and spoil their plumage. These require to be killed and pinned on the spot. In the case of slender-bodied insects, a practised hand can kill them with a sharp nip under the wings, or, in the case of small insects, a touch with a finger-nail; but, unless done carefully, this rough mode is liable to damage them, and it will not answer at all for thick-bodied insects. To kill these, some use chloroform, and others a bottle prepared with cyanide of potassium; while others, again, employ a solution of oxalic acid or oil of tobacco, and prick the insect with a pin dipped in the liquid. Tobacco-smoke, ammonia, and sulphur matches are also used by some entomologists; but ammonia and sulphur are liable to discolour many insects, especially green ones, and cyanide of potassium and oxalic acid are both deadly poisons, and even chloroform should be used with caution. Another objection to chloroform is that, although it will soon stupefy an insect, it is liable soon to recover from the fumes; while if it receives an over-dose it may become too stiff to be set afterwards. But supposing the insect killed, we choose a pin proportioned to its size; and, if it is an insect of sufficient size, we take it between the finger and thumb of the left hand, and insert the pin as straight as possible through the middle of the thorax. Small

insects are more conveniently pinned lying flat on the hand, or when resting between two fingers of the open hand. When pinned, the specimen should be transferred to the collecting-box, which should be of a convenient size for the pocket, and must be lined at the top and bottom with cork. It should be deep enough to avoid the risk of the insects pinned on opposite sides coming in contact when the box is shut, and it should never be closed without the collector making sure that there is no such danger. Collecting-boxes may be made of wood or zinc. The latter will keep the insects fresher and in better condition for setting, especially if the cork be damped occasionally. Collectors in foreign countries generally employ "papers" instead of boxes. These are prepared of square pieces of paper, which are folded diagonally and doubled over at the side, leaving a sort of triangular envelope open at one end. When an insect is caught and killed, the wings are closed over the back, and it is dropped into one of these, and the end is doubled over. Insects in papers will keep very well packed in a tin box, with a little cotton-wool laid over to prevent their shaking about. Of course, the box should contain a little camphor, to keep away mites. The specimens can then be relaxed and set at leisure. The greater number of exotic insects sent home by collectors abroad are packed in this manner, as a great many can be packed in a very small compass, and there is no danger of a heavy insect getting loose and smashing everything else, as often happens when insects are sent home pinned in boxes. But this method, though very convenient when proper apparatus cannot be obtained or carried, is not to be recommended when other means can be adopted, for it is always better to set an insect when fresh than to relax it afterwards; and insects which are left long unset become dry and brittle, and are apt to lose their legs and antennæ with the slightest touch or pressure. As in the case of boxes, the papers used should be proportioned to the size of the insects, and only one specimen should be put into each paper.

On the Use of the Net.—Many small butterflies and moths fly gently near the ground, and may be caught without the slightest difficulty. In the case of strongly-flying insects, some may be run down, but with many this is almost impossible. An insect resting on a flower or on a twig may be struck at sideways, but it is generally better to approach the net as close to the insect as possible without alarming it, and then to strike suddenly. Even the Humming-bird Hawk Moth may easily be captured in this manner. As soon as the stroke is delivered, the net must be thrown round the stick with a twist of the wrist, and the collector should then seize it with his left hand, above the point where the insect is fluttering, when he can proceed either to transfer it alive to a pill-box, or to kill and pin it on the spot. If it is a species which is not required, or in too bad condition for the cabinet, the net should be inverted, and the insect shaken out. It is a great pity to destroy any more specimens than you require for yourself or your friends. Among the most difficult insects to deal with are perhaps those which are in the habit of settling on the flowers of the bramble (the Silver-washed Fritillary, for instance), as the net is very likely to be entangled and probably torn by the thorns. But it is still more difficult to catch those insects which are in the habit of flying low and settling on the bare ground, or those which settle on the bole of a tree. In some cases we can lay the ring over them and hold up the net, when they will fly into it; but it more frequently happens that they take fright and fly away before we can do this, and escape in the opposite direction. When an insect is flying low, or settled on the ground, the best chance is a side stroke of the net, held as near the ground as possible without actually touching it; and if the insect is seated on the bole of a tree, we must make a sweep at it as it flies up. In neither case is a direct stroke to be recommended, as it would probably break either the ring or the stick, without securing the insect.

Localities.—Different species of butterflies and moths are found in different localities. Generally speaking, any particular insect is likely to be met with in the neighbourhood of the food-plant of the larva. Butterflies and day-flying moths frequent heaths, meadows, gardens, and especially open places in woods. Many settle on walls, and are more easily captured than those which settle on the trunks of trees. But many moths may be found asleep on the trunks of trees, walls, palings, &c., in the daytime, especially in the morning, and may easily be swept off into the net, or enclosed in a pill-box, or even transfixed with a pin as they sit. Our remarks above as to the difficulty of catching insects resting on tree-trunks apply to strongly-flying insects which choose them as a temporary resting-place, and not to those which sleep in such situations. Many butterflies when disturbed will return to the resting-place from which they have been driven, so that it does not always follow that we have lost an insect because it has escaped us once. This habit is most noticeable in the *Nymphalidæ*. Many insects, chiefly *Geometræ* and small species, may be disturbed in the daytime by beating a hedge, taking care to keep to the windward. Some use a stick in one hand and the net in the other; but it answers just as well to use a ring-net attached to a longer and stronger pole than usual, which may be held in the middle, and used to beat the hedge with the butt end, while it may be at once turned to capture anything which may fly out.

Mothing.—Many moths may be taken at twilight hovering over flowers; and this mode of collecting is termed "mothing." The large *Sphinges* frequent honeysuckle, petunia, &c.; and among the most attractive flowers to *Noctuæ*, &c., may be mentioned valerian, heliotrope, clover, and in general any strongly-scented flowers. The blossoms of the lime, the sallow, and the ivy are also peculiarly attractive. *Bombyces* either fly by day, or later in the evening than the *Sphinges*. They are rarely met with at flowers, but fly in search of the females at the edges of woods, or on heaths or meadows. The *Geometræ* fly in the evening or at night, among weeds and bushes, but often come to flowers. Many species may be disturbed by beating, or found at rest in the daytime. Day-flying *Noctuæ* are generally found on heaths, meadows, or clover-fields; but many nocturnal species of *Agrotis*, &c., may be found clinging to the flowers of thistles and similar plants in the daytime, especially in the mountains. But most of the *Noctuæ* fly at dusk or at night. Many rare species of *Dianthœcia*, &c., may be collected at the flowers of the white campions (*Silene inflata* and *maritima*), which are common on many parts of the sea-coast, and are most attractive in June. In August the flowers of the rag-weed attract many species of *Agrotis*, &c. Many moths may also be attracted by a light placed at an open window, especially if the latter overlooks a garden or a meadow.

Sugaring.—Many years ago the Brothers Doubleday discovered that the empty sugar-hogsheads thrown out into their yard at Epping were visited by moths at night, for the sake of the sugar still adhering to the inside. This hint was soon improved upon; and the trunks of the trees along Mr. Doubleday's field are (or were lately) entirely blackened in many places with the sweet mixture daubed over them night after night for years. Sugar-hogsheads having soon been abandoned, a sweet mixture brushed over the trunks of trees was used instead, and this mode of collecting is called "sugaring," and is found particularly efficacious for attracting *Noctuæ*. The compound generally used in England is a mixture of coarse brown sugar and beer, boiled down thick enough to adhere to the trees, but not so thick as to be inconvenient in use. It must be applied to the trunks of trees with a common paint-brush. Tins are sold for this purpose with a brush fixed in the lid; but any one can use what apparatus suits him best. When it gets dusk the sugared trees must be examined with a lantern as carefully as possible, to avoid disturbing the moths. If they take fright, they fly away or fall down; and it is usual to add a few drops of rum to the sugar, which stupefies them, and renders them more sluggish.

Some also flavour the compound with various essential oils, to render it more attractive. In many cases moths may be boxed directly off the sugar; but before turning on the lantern, we must hold the net underneath, to endeavour to catch any which may fall down; and we should also be on the look-out to net any which fly away. When there are no trees near, we can sugar walls, fences, &c., and many collectors even sugar flowers. As a last resource, rags soaked in the sugar, and stuck on the ends of sticks, will answer very well.

Some entomologists use putrid soap-suds or paste to attract *Noctuæ;* and others recommend sliced apples. To prepare these, choose apples with a strong odour, peel, core, and cut them into slices, according to the size. String them on a thread, taking care that they do not touch one another (as otherwise they are very likely to decay), and hang them in a sunny place where there is a thorough draught. It will take from three to five days, according to the heat and dryness of the air, before the apples are ready for use, which we can tell by their strong smell. They must not be allowed to dry too much, but must be tied in strings of eight or ten, and preserved in a close vessel. These strings must be hung up on the collecting-ground in any convenient spot, which may be marked, if necessary, with a piece of white paper. They must not be placed too near together; and when it is dark they must be examined with a lantern, the net being held under as before, to catch any moths which may fall down. The moths generally sit quiet till boxed, or drop into the net; but when there are a great number together, they become more restless and are more difficult to secure. These modes of collecting succeed best on dark nights, and on clear nights shaded spots should be selected for sugaring, or hanging up dried apples. Moths fly all through the night, from evening to morning twilight, but some appear later than others, and we should therefore return to our sugar at intervals, as late or as early as we like to continue to collect. When trees are frequently sugared they become more attractive, so that it is well, when we have an opportunity, to sugar the same trees constantly. The apples may be most conveniently carried in a botanical collecting-box. If by exposure to damp air they have lost their attractive power, they should be hung up for a day to dry again. Freshly-prepared apples can be used for two or three weeks, after which time they gradually lose their smell and cease to be attractive. If we wish to keep them good longer, they require more careful preparation. We must first take care that they do not become too dry, and that they do not get mouldy. This object may be attained by sprinkling the apples with sugar before drying them, which will help to preserve them, and will also increase the attractive powers of inferior apples. When the apples are dry, they must be kept tied tightly up in a linen bag, and hung in a dry room or in a garret. When they are to be used, they must be again sprinkled with sugar, or rubbed over with some sweet preparation, and sprinkled with some apple-flavouring, to renew the odour which they have lost. We have been particular in describing this mode of collecting with apples, because it is but little known or practised in this country.

The best evenings for attracting moths with sweets are calm, warm, cloudy evenings, especially when a thunderstorm is threatening. Moonlight and dewy evenings are generally unfavourable, although there are exceptions. Sometimes we find few or no *Noctuæ* when the weather appears most favourable; and on other evenings, when the moon is bright and the dew is heavy, the baits are covered with them. These exceptions are doubtless due to atmospheric influences which escape our observation. A cool wind and light rain is not unfavourable, only then the *Noctuæ* fly more under the shelter of the trees. The most favourable seasons for sugaring are March and April, when the hybernated and early spring *Noctuæ* may be attracted; and again from August to the end of October. Collectors often sugar all the year round; but there is almost nothing abroad in the depth of winter; and our artificial attractions are naturally less

appreciated by the moths in the height of summer, when so many flowers are in bloom, than at other times of the year when there are fewer. Some genera of *Noctuæ*, especially those which fly by day or at early twilight, are seldom or never attracted by sugar; among these we may mention *Nonagria*, *Cucullia*, *Plusia*, &c. Most of the moths which are attracted by sugar are *Noctuæ;* but it is also visited by many *Geometræ* and *Micro-Lepidoptera*, and occasionally even by a stray *Bombyx*. Nor do *Lepidoptera* alone visit the sugared trees; for ants, earwigs, beetles, &c., may frequently be seen enjoying the sweets intended for moths.

On Searching for Lepidoptera at Rest.—Many moths may be found at rest on walls, fences, tree-trunks, and stones and rocks, especially in dark corners. They may also be found between boards or behind window-shutters, especially when these are seldom opened. We have already spoken of beating bushes, but moths may often be beaten or shaken from overhanging trees, thatch, &c. The hybernating butterflies may often be found in outhouses, faggot-stacks, &c., in winter; and in dull weather small butterflies may often be found at rest, sitting on the tops of long grass or rushes. *Noctuæ* and *Tineæ* which are hidden among tufts of grass and weeds may be induced to creep out or fly up by gently shaking the tuft from below with a stick, and repeating the shake as often as necessary. The moths are disturbed and creep up to the ends of the grass, and are then easily captured. They may also be driven out by tobacco-smoke blown into the grass or bushes where they are hidden. If the material of our net be sufficiently strong, we may sweep the grass and bushes for small moths, as coleopterists do for beetles.

ON BREEDING *LEPIDOPTERA*.

By breeding *Lepidoptera* we obtain perfectly fresh and unblemished specimens, in better condition than any caught specimens which can be found. Besides, we may often obtain many species in abundance by breeding which can only be found casually and sparingly in any other way. Many species, especially among the *Micro-Lepidoptera*, have never yet been met with at large in their perfect state, and therefore cannot be procured at all except in this manner. There is another great advantage in rearing *Lepidoptera*, as it makes us acquainted with their appearance and habits in all stages. In many of the more obscure genera, too, a knowledge of the transformations is almost indispensable to their identification, for caught specimens cannot always be determined, partly because they are not always in sufficiently good condition, and partly because allied species are sometimes so similar in their perfect state that they can only be separated by a knowledge of their previous individual transformations. These remarks will apply to such genera as *Eupithecia* and *Nepticula*, for instance. Although the rearing of *Lepidoptera* is much more troublesome, and not so attractive, perhaps, as the pursuit of the perfect insects, it must on no account be neglected, and will ultimately be found worth all the care and attention that the collector can bestow upon it. As he pursues this part of the study, he will not only find it becoming more and more attractive and profitable as he proceeds, but he may perhaps be able to make important additions to our scientific knowledge.

Lepidoptera may be reared from the egg, or from the partly-grown larvæ or pupæ which we may meet with.

On Breeding from the Egg.—The eggs of *Lepidoptera* are deposited in various situations: sometimes in a ring around a twig, sometimes in a cluster, or singly on a plane surface, and frequently on or under the surface of a leaf. Some species lay their eggs in flowers or in the chinks of bark. Those eggs which are laid in clusters are frequently covered with down; and apterous females often lay their eggs in or upon their old cocoon. When we discover eggs, we

should secure them without disturbance, by cutting away the twig or leaf to which they are attached. We can sometimes discover the eggs of butterflies by watching the females laying; and the larvæ of several species, the transformations of which were previously unknown, have been discovered in this manner. The females of butterflies generally lay their eggs on warm sunny days, generally between 10 a.m. and 3 p.m. They generally flit from one plant to another, staying a little while at each, without settling on the flowers themselves. We must carefully note the plants, and examine them after the butterfly has flown away, when we shall probably discover the eggs after a sufficiently thorough search. Many *Bombyces*, *Noctuæ*, and *Geometræ* will lay their eggs in confinement, and, in many instances, even when they are pinned or set. But to ensure this, it is better to bring home the fertilised female (which we may know by her thicker abdomen) and put her in a good-sized box covered over with gauze, and containing a glass of strongly-scented flowers, among which we should put some of the food-plant, if it can be obtained. The box should then be set in the open air, or at an open window, in the twilight, when moths begin to fly; and after a day or two we may very likely find the eggs, either on the plants, or on the gauze, or on the sides of the box. When the moth does not lay immediately, it is necessary to feed her, especially if she is a *Noctua*, for which purpose a sponge moistened with honey and water should be given to her to sip from. By this means we shall generally obtain our end. When the young larvæ appear, we must transfer them carefully to the breeding-cage with the end of a feather, but they must be sharply looked after, for fear some of them may have hidden themselves. It is better to line the box with paper, and to tie finely-perforated tissue-paper over the top, in place of a lid, after which we can cut out any portions upon which eggs may have been laid, and transfer them to tightly-fitting pasteboard boxes, from which the larvæ cannot escape; but the eggs must be carefully watched, especially when they show signs of hatching, or the larvæ may be starved for want of food. In the interim they should be gently sprinkled with rain-water now and then, and those of butterflies must be sometimes placed in the sun. One advantage of breeding insects from the egg is that they are not likely to be infested with parasites, as many of the larvæ which we meet with in a state of nature are. By rearing large numbers of a species, too, we are sure to rear on some occasions very curious and interesting varieties; but it must be added that bred specimens are not unfrequently dwarfed or crippled, probably from some error in management. It will require time and experience for a novice to rear large broods successfully, and it would perhaps be better for him to confine himself to rearing such half-grown larvæ as he may happen to meet with at first, till he has learned how to manage them successfully, before he attempts to rear specimens from the egg.

Larva-boxes.—Larvæ may be found either by searching for them, or by beating, shaking, or sweeping them from the plants on which they feed. They may either be brought home in pill-boxes, like those used to put the perfect insects in, or in small tin boxes, freely perforated at top and bottom to allow of a free current of air. In wooden or pasteboard boxes the food dries very rapidly, on which account most collectors prefer tin ones. The boxes must fit very closely, and may have a lid which screws on. We can either use a number of small boxes, and keep each larva, or at least each species, separate, or can use several larger ones, putting together all those species which feed on the same plant. In the latter case the tins should have a narrow neck, so that we can put a new-comer in without risk of our former captures taking the opportunity to creep out. The beginner must also learn as soon as possible to recognise the cannibal larvæ, which will destroy their companions, and always keep these by themselves. The worst larvæ of all in this respect are those of *Cosmia Trapezina*, *Scopelosoma Satellitia*, and *Crocallis Elinguaria*. The latter is figured at Pl. 49, Fig. 3, *a*. The larvæ of the Lobster Moth (Pl. 30, Fig. 8, *a*) will also

sometimes bite each other's long legs off. In securing larvæ it is advisable to avoid touching them; it is better to cut off the leaf or the twig on which they are resting, and to transfer it bodily to the box. Very small larvæ should not be mixed with the larger ones, but must be put in small boxes separately. This is especially necessary with those of *Micro-Lepidoptera*, such as the *Tineæ*. Any rare or unknown larvæ should also be kept separate; and naked larvæ with unusually large jaws should be looked upon with suspicion, lest they may prove to possess cannibal tendencies, and they should not be mixed with others without due precautions.

Searching for Larvæ.—In looking for larvæ, we must begin by searching for indications of their presence, such as partly-eaten leaves. Those which are eaten at the sides have generally been fed upon by a Lepidopterous larva; but many young larvæ, as well as those of *Micro-Lepidoptera*, eat holes in the middle, or devour the epidermis on one side only. We must not overlook discoloured spots on the leaves, as the mines or blotches often contain the mining larvæ of small *Tineæ;* or the cases of *Coleophoræ* may be attached to the leaves, which contain larvæ which mine in the leaves from their cases. If we notice that a leaf appears to have been recently attacked by larvæ of any kind, we must carefully examine the adjoining leaves and twigs, as well as the plants near, from all sides, when we shall probably discover the larva. Nocturnal feeders often conceal themselves at or near the roots of the plants on which they feed during the day—a point which must not be overlooked.

When two or more leaves are spun together, they often contain larvæ; so do leaves which have been folded over or rolled up, and undeveloped shoots. This may be ascertained by opening them a little, or, when only two leaves are spun together, by holding them up to the light. Such larvæ are to be put into the box along with the leaves which they inhabit; but as the larvæ are often very active, the net should be held underneath when the leaves are gathered, to catch the larva if it attempts to escape.

Any flowers or buds which have an unusual appearance, or are drawn together or distorted in any way, should be carefully examined, as well as the catkins of sallows, willows, and alders, the heads of thistles and other *Compositæ*, the flowers of umbelliferous plants, &c. Such plants often contain larvæ without any external traces of their presence being visible. Apples, plums, acorns, beech-nuts, &c., which fall off before they are ripe often contain *Tortrix* larvæ, but must be examined as soon as possible after they have fallen, as the larvæ soon creep out, in order to spin their cocoons. Other *Tortrix* larvæ live in the fruit of the wild rose, where their presence may be known by a black spot beneath the flower; and others in peas, vetches, *Dipsacus sylvestris*, &c. The larvæ of the genus *Dianthœcia* live in the seed-capsules of plants allied to the carnation, and betray their presence by their ejected dung.

The presence of larvæ in the stem or roots of a plant may be recognised by its withered or dried-up appearance, especially in the upper leaves, and by swellings or excrescences on the stem. We generally find an opening in the stem, too, through which the dung is ejected. The plants which most require such examination are reed-like plants, especially *Typha*, in which the larvæ of *Nonagria* and several other allied genera of *Noctuæ* live, and the pithy stalks of burdock, thistle, cow-parsnip (in which the larva of *Dasypolia Templi* feeds), *Petasites*, &c. When we find a larva in a stem, the stem should be cut off at some distance above and below the opening; and roots containing larvæ should be pulled up.

The presence of larvæ in the branches of shrubs is often indicated by swellings on them, or by the unnatural appearance of the bark, or by openings through which the larva in the interior discharges its excrement. Such branches should be cut off, the bark peeled, and the piece of wood containing the larva cut out, if possible, without disturbing the larva itself. Among such larvæ we

must mention the *Sesiæ*, which live in the bark of trees, and especially in stumps which have been left in the ground after a tree has been felled. They also live in the stems or roots of herbaceous plants. The larvæ of the *Cossidæ* live when young under the bark and afterwards in the trunks of trees, and may be detected by their unpleasant smell. If we notice webs of different sizes on trees, bushes, or herbs, they should be examined, as they often contain larvæ, or even colonies of larvæ. When these are worth rearing, the whole web is to be taken away with the larvæ. Larvæ often drop down from the trees on which they are feeding, by a single thread, by which they remain suspended.

We can often discover the presence of larvæ from noticing their cast-off skins or heaps of excrement, especially when the latter is lying, freshly fallen, under the plant on which the larva is feeding. *Sphinx* larvæ, which feed on low plants, are particularly liable to betray themselves in this manner. We can often trace a larva in its wanderings from one plant to another from the tracks it has left behind it, when the soil is loose and sandy, and by following up this clue we can discover the place where the larva is hidden, which is frequently under the surface of the ground, or at the root of a plant.

Many larvæ resemble portions of their food-plant, and are thus liable to be overlooked. Some resemble leaves, or leaf-stalks, or small dry twigs, like many *Geometræ*, and others resemble the bark, such as several species of *Gastropacha* and *Catocala*, which are still more likely to escape notice, because this resemblance is increased by their habit of clinging closely to the trunks and branches of trees. The larvæ which feed exposed on flowers are often coloured like flowers, as is the case with most larvæ of *Cucullia*. While many larvæ feed and rest on plants openly, others hide themselves when not feeding, either in the crevices of the bark of a tree, or under the leaves at the root of broad-leaved plants, in or under dry leaves, in the hollow stems of dried plants, especially reeds, under stones, in the grass, under the ground, or elsewhere, and must be looked for in their hiding-places. In order to discover the larvæ among fallen leaves, we must take a strong umbrella turned upside down, or a sweeping net, and after filling it with leaves, shake them vigorously about, and take them out carefully, when we shall find the larvæ lying underneath. This mode of collecting is particularly productive when the dry leaves are lying among freshly-budding plants at the edges of woods, especially when they face the south, under hedges, or in similar situations. The hybernating larvæ will thus be met with at the beginning of spring, and even in winter when there is no snow on the ground. Larvæ also like to hide themselves under haycocks and shocks of corn; and as they are often carried away with them, and fall out when the waggons are unloaded, they may generally be met with in great numbers when such an opportunity presents itself.

As a great number of larvæ, especially those belonging to the family *Noctuidæ*, only feed at night, and hide themselves by day, they must be sought for on their food-plants at night with the aid of a lantern. They generally drop down at once as soon as the light falls on them, so that, if possible, a net should be held under the plant we are examining to receive them. In early spring, when several rainy days have been followed by warm nights, and the air is full of moisture, the hybernated larvæ leave their winter quarters at twilight and creep up the dry stems of trees and plants, or creep about on the surface of fallen leaves, or anywhere where they may enjoy the soft air. A rich harvest may be reaped, with the aid of a lantern, on such nights, especially in open places in woods where plants abound, on hedges and palings, thatched roofs, &c. Many larvæ hybernate in the hollow stems of plants, and may be found there in early spring.

The larvæ which feed by day may be searched for on their food-plants at any time. The hairy larvæ of the *Bombyces* prefer the morning, but those of most *Noctuæ* appear after sunset, and again in early morning, when the leaves and grass are covered with dew.

Beating for Larvæ.—The larvæ which feed on trees, shrubs, and tall plants may be obtained by beating either with a thick stick or with a mallet. The latter should be of a size which can be conveniently held in the hand, but with a rather long handle, and must either be made of heavy wood, or loaded with lead, and the striking part should be covered with leather or gutta-percha, to avoid damaging the trees. The whole mallet might be covered with gutta-percha, but it is then very liable to split. This instrument is used to strike the stems of young trees, or such branches of taller ones as may grow within reach, while an inverted umbrella, a sheet, or a large sweeping-net is spread below to catch any larvæ which may be dislodged. At the same time, we must be on the look-out for any larvæ which have let themselves down by a thread upon being disturbed. The higher branches should be jerked suddenly and violently with a hooked pole. Bushes and slender branches and plants may be beaten over an umbrella with a common stick. A sheet is more inconvenient than an umbrella, but is more productive, and is particularly useful when hedges or large trees are beaten, or when trees are shaken with the hooked pole. The best time to beat for larvæ is at twilight, for the larvæ of many *Noctuæ* do not leave their hiding-places to feed till then. For instance, the larvæ of the genus *Valeria* can only be obtained by beating after dark, and those of *Catocala* can then be most easily procured.

Sweeping for Larvæ.—Larvæ which feed on grass and herbs are to be obtained most readily and in most abundance by means of a sweeping-net similar to that used by coleopterists when collecting beetles. This is a ring-net with a stronger ring, the edge of which is sharp instead of rounded, and the net is composed of stout linen instead of green gauze. As the collector walks slowly forwards he brushes the grass and bushes sharply in opposite directions alternately, and now and then examines the contents, and transfers the larvæ which may have been captured to his boxes. Larvæ may also be swept off any trees which are sufficiently low for the net to reach. The most productive time for sweeping for *Noctua* larvæ is after sunset, and the best localities are openings in woods, level heaths, grassy slopes, meadows, and moors, and, in general, anywhere where the vegetation is thick or varied. In sweeping after dark, the collector must either use a lantern, to enable him to sort his captures on the spot, or else turn the whole contents of the sweeping-net into a well-secured bag, to be examined on reaching home, which can best be done by turning a small portion at a time into a white dish, and sorting it over. Sweeping for larvæ may be pursued at any time of year when vegetation is sufficiently advanced, but it is most productive in May and June, and again in autumn.

Food-plants.—There is no difficulty about the food of larvæ which we discover feeding or beat from any particular plant, but there may be some uncertainty about those which we discover in their hiding-places or sweep up. Fortunately, most *Noctua* larvæ which are obtained in this manner are not particular about their food, but will eat grass, primrose, lettuce, chickweed, plantain, heath, bilberry, or any other low plants. But it is true that many are confined to a particular food-plant, and will die if they cannot obtain it. We must therefore note carefully what plants grow on the spot where we have found any particular larva, and offer it these, if it will not eat the food we have given it in the first instance. We should always take a supply of food home with us for the larvæ we capture, which can be most conveniently carried in a botanist's vasculum, which will keep it fresh. An entomologist who wishes to do any good with breeding insects should possess some knowledge of botany, or should at any rate be able to recognise our common plants at sight.

Searching for Pupæ.—The pupæ of *Lepidoptera* are found in the places where the larvæ have undergone their transformations. Those of the butterflies are generally fixed to branches, the trunks of trees, or walls; those of the *Zygænidæ*, most *Bombyces*, many *Geometræ*, and many *Micro-Lepidoptera* are formed in cocoons, or between leaves which they have spun together; and those of

most *Sphingidæ*, *Noctuæ*, and *Geometræ* are formed on or under the ground, frequently under their food-plant; under stones; among moss; or at the roots of trees. On entomological excursions the search for pupæ should not be neglected. Many suspended pupæ, and some of those in cocoons, may be found with ease, while others require a careful and laborious search. This is especially the case with cocoons like those of *Cerura*, &c., which are attached to the trunks of trees, and so carefully covered with fragments of bark and lichen that they look deceptively like a small excrescence on the trunk, and can only be recognised by a very practised eye. Many pupæ may be found in the crevices of the bark of trees; under loose bark; or among the moss on the trunks and roots of trees, or on rocks. Others may be found in the stems of their food-plants, like the pupæ of the *Nonagriæ*, which may be found in the stems of the reeds and the reed-mace, where they may be detected by the withering of the plant, and by the holes made by the larva which inhabits it. Pupæ are also to be looked for in spring in the dry stems of last year's plants. These are chiefly those of *Tortrices*, and their presence cannot be detected by any external sign; but if we split the stem down, we may conclude that it contains a pupa, if it contains the excrement of larvæ. The pupæ which are formed on the surface of the ground must be looked for under moss and stones, among the turf. In order to obtain the pupæ which are constructed underground, we must turn up the ground in likely localities with a flat trowel, which is preferable to a rounded one. The most productive spots are round the trunks of trees standing by themselves, or in rows. When we have turned up a trowelful of earth, we must carefully search through it for any pupæ which it may contain; and if we have uncovered any roots, they should be carefully examined, for pupæ are often attached to or placed in the forks formed by the roots of trees. Pupa-digging may be practised throughout the year, but is generally carried on from autumn to spring, when there is less work on hand for the lepidopterist than at other times. In consequence, however, of the numerous accidents to which pupæ are exposed, the best authorities consider autumn or early winter to be the most productive season for this mode of collecting.

The pupæ must be carried home in a box loosely filled with cotton-wool or moss, and must be shaken as little as possible. When we find a suspended pupa, we should cut away the leaf or twig to which it is attached without injuring the threads by which it is fixed, and place it in the breeding-cage in the position in which we found it, or we shall obtain nothing but a crippled specimen.

Dress and Outfit of the Collector.—It will be seen from the foregoing remarks that the apparatus which a fully-equipped collector would require is too multifarious and cumbrous to be conveniently carried about everywhere. It is therefore better not to attempt too much, but to set before us some definite purpose upon each excursion. We may collect perfect insects at one time, beat for larvæ at another, sweep for them, or hunt for them among dry leaves at other times, &c. But we may meet with larvæ unexpectedly while collecting perfect insects, or *vice versâ*, and it is always advisable to carry a net, box and pins, &c., when looking for larvæ, and to carry a few larva-boxes in our pockets when collecting perfect insects. By this means we shall be enabled to secure anything of special value without inconveniently encumbering ourselves with apparatus, although we may be more specially looking for insects in another stage.

When collecting, a small satchel or knapsack will be necessary to hold our boxes, &c., or we should provide ourselves with a shooting-jacket containing a sufficient number of pockets. As the pursuits of the entomologist frequently lead him into thorny brakes and marshy places, good strong substantial clothing and a good pair of boots are to be recommended. In searching for larvæ in wet places, a piece of waterproof stuff should be carried, on which the collector can kneel when he wishes to examine the ground closely. In some places, and especially when we wish to examine water-plants, a pair of wading-boots will be found very useful.

ON REARING LARVÆ AND PUPÆ.

General Remarks.—The first point to be observed in rearing larvæ is to keep them as far as possible in the same condition as if they were at liberty. As this is very different with different species, our treatment of larvæ must vary accordingly. In general we may depend on the following rule: we must take note of the conditions under which we have found a larva, and endeavour to imitate them. It must be provided with fresh air, light, sunshine or shadow, as well as hiding-places, and must be kept damp or dry according to the nature of the locality; but above all things it must be supplied with plenty of fresh food. The food may be kept fresh in a small narrow-necked glass, filled with water, the mouth of which must be stopped up with cotton, or some other substance, to prevent the larvæ creeping into the water. The food will thus keep fresh for four or five days, but should then be renewed, and the water should also be changed at the same time. But there are many larvæ which cannot be fed on food kept fresh in this manner. They will eat and grow, but afterwards become weak and sickly, and die. This is particularly liable to happen with larvæ which feed on plants which are not very juicy, or on those which grow in a poor and dry soil. These larvæ must either be reared on growing plants, or be supplied with fresh food every day. It will help to retard the withering of a plant a little if we cover the stalk with wax when we have cut it off. We must never offer larvæ wet food.

All the larvæ which live in the ground, or hide themselves there during the day, require both earth and moisture. As many other larvæ which feed exposed on plants form their pupæ on or in the ground, it is advisable to cover the bottom of all larva-cages with dry sifted earth, mixed with sand. The soil must be moistened with rain-water from time to time, especially in dry weather, which is best done by sprinkling it with a brush which has been dipped in water. The larvæ which live in the ground should often be sprinkled in the same way, and the others only occasionally, to replace the rain and dew to which they are exposed in the open air. When larvæ are reared in a damp place, such as a cellar, it is unnecessary to sprinkle them.

Breeding-cages.—A great variety of different contrivances for rearing larvæ are in use, of which we shall only mention a few of the simplest and most convenient. Among these is a large box, a foot and a half long, a foot broad, and two feet high, in which to place larvæ which we know already, and which do not require separate breeding-cages. The box must be well made and nailed together, so that it will not come to pieces from damp. It must be made in two parts, which are fitted together at two-thirds of their height, so that the upper part can be lifted off. A considerable portion of the lid should be cut away, and the opening closed with wire gauze or perforated zinc. Six inches above the bottom of the cage is a shelf with openings, in which the glasses containing the food may be placed. The space between this board and the side is to be filled on one side with earth, as already mentioned, which should first be baked, to destroy any creatures which might be injurious to the larvæ. This is to be covered with moss at the sides, and some flat stones should also be laid upon it. On the other side, instead of earth, moss, dry leaves, and soft wood, turf or cork should be laid. The glasses with the food should be laid obliquely in the openings, so that some of the leaves hang down to the board, enabling any larvæ which may fall down to creep up again. If we have no larvæ in the cage except such as feed on grass, we may cover the bottom of the cage with earth, and lay a sod of turf upon it, which will then only require to be kept fresh. The larvæ may be left in this cage till they are full-grown and have become pupæ. It is convenient to rear those larvæ which feed on trees and shrubs, and those which feed on low plants, in different cages.

Such cages provide the larvæ with all that they require in the way of air, hiding-places, and

materials for forming their cocoons, &c. The necessary moisture is to be supplied by sprinkling with a brush dipped in rain-water, which can best be done early in the morning, to replace the falling dew. The earth must be kept tolerably damp, especially in dry weather.

Unknown larvæ, or those which, like cannibals, must be reared separately, may be reared in small cages of the same construction, but only six inches long and broad, and eight inches deep. We cannot put a perforated shelf into these, but the glass containing the food must be put in a corner, and propped up with a piece of stick. Instead of small cages, many collectors use a jam-pot, covered with earth at the bottom, and with gauze tied over the top. This is sometimes replaced by a cover of tin or ground glass.

A simpler apparatus than we have described may be constructed of a large wooden box, partly filled with earth, the lid of which is formed of wire gauze. But if we use a box which opens and shuts with a hinge, instead of being made to lift off, we shall run the risk of crushing some of the larvæ when it is opened or shut. In all cases we must see that our larva-cages close so tightly that it is impossible for the larvæ to creep out and escape.

Flower-pots may be conveniently used for rearing larvæ, and one advantage is that the larvæ can thus be reared on living plants. The pot should be half filled with earth, and the food-plant should be planted in it. If it is a low plant, which will not reach above the top of the flower-pot, the latter may be closed by tying a piece of strong muslin or gauze over it. But it is always better, especially when the plant overtops the pot, to place over it a raised cover of wire gauze, which will leave the plant room to grow, and which must be tightened round the edge of the pot, or otherwise firmly secured. The same end may be reached by sticking two bent twigs, crossing each other, into the pot, and tying a covering of gauze over them; but in this case the larvæ are very likely to hide in the folds of the gauze, and escape when it is untied. Of course the enclosed plant must be supplied with sufficient moisture to keep it fresh, either by sprinkling the earth, or by setting the flower-pot in a saucer full of water. The amount of moisture required by the plant will also be found suitable to the larvæ which feed on it. The hole at the bottom of the flower-pot must be stopped up sufficiently to prevent any larva which may burrow in the ground to form its cocoon escaping through it.

Bell-glasses may also be used, set over a deep round dish or pan filled with earth, and offer great facilities for observing the enclosed larvæ.

Wood-feeding larvæ, like those of the Goat Moth, and those which prepare their cocoons with fragments of wood, like the *Notodontidæ*, &c., cannot be kept in wooden cages, but must be reared in stone jars or jam-pots covered with wire gauze. The larvæ of many *Noctuæ*, &c., will gnaw holes in gauze or muslin, so that wire gauze is much to be preferred as a covering for larva-cages under all circumstances.

Breeding-cages for the Larvæ of Micro-Lepidoptera.—The different larva-cages which we have been describing are too large for most Micro-Lepidopterous larvæ, which would be lost in them. We must therefore provide them with smaller dwellings, and tumblers or jam-pots partly filled with earth and sand, and covered with a lid of ground glass, may be recommended. The food cannot be placed in water in such small receptacles, and must be kept as fresh as possible by other means. The glass cover will retard its drying, by keeping out the external air; and if the cage is set in a cool shady place, the exclusion of the air and the dampness of the ground will prevent the food from drying up for several days. But mildew is very likely to appear in closed glasses of this kind, if they are not well looked after. One advantage in rearing the larvæ of *Micro-Lepidoptera* is that many of them feed up very rapidly, especially in the summer.

If the breeding-cages are kept in a cellar, the food can be kept eatable for a longer time, and there is less liability to mould, but in this case the cages must not be covered with glass; and as many of the smaller larvæ will gnaw holes in gauze or muslin, and thus escape, fine and flexible wire gauze will be found preferable to either for a covering.

Another kind of cage for the larvæ of *Micro-Lepidoptera*, in which likewise the food may be kept fresh by excluding the external air, may be formed of a flower-pot with a glass inverted into it, of such a size as to fit the inside exactly. The bottom of the pot must be covered with earth, but not high enough to reach so far up the sides as to where the glass rests, or else there is danger that the larvæ might spin up on the ground where it touches the glass, and be destroyed when the glass is lifted off. But if we attempt to rear very small larvæ in such a contrivance, and fear that they might escape between the glass and the flower-pot, we must press the former down into the ground, and heap the earth up a little round the edges. Instead of the glasses, we may cover the flower-pots with very fine wire gauze, and put them in a cellar.

The glasses with covers are more suitable for larvæ which form their pupæ on or in the ground, and the flower-pots for those which spin up above ground. The latter like to make their cocoons on the edge of the cage, and the inverted glass is a safer place for them than the cover of glass or wire gauze.

Most larvæ of *Micro-Lepidoptera*, and especially those which do not feed exposed on plants, do very well in these closed glasses, especially in a cellar. Others, such as the case-bearing *Coleophoræ*, cannot be reared in this manner. They require as much fresh air as possible, and glass covers cannot be used, and must be replaced with fine wire gauze when flower-pots are used. As the food-plant cannot well be kept in water, the bottom of the flower-pot should be covered with damp sand, and it should be stuck into this to keep it fresh. In the case of mining larvæ, which mostly grow to their full size in the same leaf, which must therefore be kept fresh till they are full-grown, it is always best to keep the cages in the cellar; and if the stalk of the leaf or of the plant on which the larva is feeding is stuck in damp earth, it will keep fresh longer.

There are some larvæ which cannot be prevented from escaping by any of these contrivances, as they can squeeze themselves through the smallest crevice, especially before spinning up. Among these are several *Tortrix* larvæ which inhabit fruits, such as *Grapholitha Roseticolana* in hips, *G. Pallifrontana* in the pods of *Lotus corniculatus*, as well as some mining larvæ, such as those of the genus *Cosmopteryx*, *Gelechia Subdecurtella*, &c. These can only be reared in wide-mouthed glass bottles with tightly-fitting glass stoppers or corks, which must nevertheless be opened daily in order to give them fresh air.

Necessary Precautions.—It is advisable in all cases to avoid putting too many larvæ into one cage, and the cages must be kept as clean as possible, and the excrements of the larvæ carefully removed. If there are too many larvæ in one cage, they disturb each other, which is particularly injurious when they are moulting, and is frequently the cause of epidemics, which destroy many larvæ. Accumulations of the excrements of larvæ are injurious from their smell, and more especially because they often give rise to mould. It can most easily be removed by means of a small metal shovel. But when doing this, or when removing old food, or putting in fresh, it is necessary to avoid disturbing the larvæ, especially when they are moulting or changing. In giving them fresh food, they are not to be taken from the old, but the fresh is to be laid near them till they creep upon it themselves. When we find leaves spun together, or cocoons among the old food, they must be left undisturbed in the cage until the larva which is hidden among them is likely to have completed its change; or if this is inconvenient, the plant and the cocoon must be removed, without opening the latter, to another cage. It often happens that larvæ about to change

to pupæ, or preparing to hybernate, fasten some leaves of the food-plant to the roof or walls, or they spin their cocoons on the surface of the ground under the food-plant, and attach it to some leaves of the latter. In such cases the leaves which are attached to the cocoon should be carefully separated with a pair of scissors, and left where they are, when the rest of the stale food is removed.

Special rules must be observed in rearing larvæ when there is anything unusual in their habits. Fruits and seeds which contain larvæ only require to be laid on the ground, which should be occasionally damped. In the case of larvæ which feed in the stems of plants, the stalk should be stuck into damp sand after it has been cut off, and when the stalk appears to be eaten out or withered, a fresh stalk must be stuck close to it into which the larva can eat its way. If it neglects to do this, a hole should be bored in the upper part of a fresh stalk, and the larva should be allowed to creep in, when it will soon make itself at home there. It is more difficult to rear larvæ which live in the branches of trees and shrubs, especially when they are still small, as the branches will seldom remain fresh in water or in damp sand till the larvæ are ready to assume the pupa state. It is therefore advisable to defer bringing home such larvæ till they are nearly full-fed. Otherwise nothing more can be done than to cut a branch or sapling from a living tree of the same kind, to bore a hole from above into the stump, and to allow the larva to creep in, after it has been carefully removed from its old dwelling. The hole must then be stopped with a wooden plug, and not touched until the larva is likely to have become a pupa, when the portion of the stump which contains it must be cut off, and brought in-doors. This is the best way of rearing those *Sesiæ* which live in the slender branches of trees. Those which live in the bark or the trunks of trees must be treated in a similar manner. A hole must be bored for these in a piece of fresh bark, into which they must be plugged as already directed, and the bark must then be laid on damp sand. It is still better if the piece of bark containing the larva can be removed without disturbing the latter. Larvæ which feed in the substance of the wood itself should be cut out with the piece of wood containing them, and laid on damp sand in the same way. In the case of the larvæ of *Cossus*, it is sufficient to provide them with a quantity of rotten wood, in which they can make their home comfortably. Larvæ which feed in the roots of plants must be transplanted with the roots and surrounding earth. Other larvæ which feed on roots should also be moved into flower-pots containing their food-plant, or the roots or tubers on which they feed (such as potatoes or turnips) should be placed on or in loose earth. In the case of lichen-feeders, it is best to put a piece of stone or bark with the food growing on it into the breeding-cage, and to renew it from time to time. Besides, such lichens require to be frequently damped.

Management of Larvæ on emerging from the Egg.—These larvæ are generally so small that many of them would be lost, even in cages intended for the larvæ of *Micro-Lepidoptera*. They must first be reared in small glasses or pasteboard boxes without earth, and kept in the cellar till they have at least passed through their first moult. The food requires renewing frequently. Most larvæ which feed on low plants can be fed at first on young lettuces, and the tenderest leaves must always be selected for very young larvæ. The young larvæ of *Noctuæ* which have hybernated, or which emerge from the egg in early spring, often appear before the trees on which they feed have come into leaf. In such cases we must supply them with the buds, into which they will immediately eat, or with willow catkins. After the first moult we can remove the young larvæ to the ordinary breeding-cages.

Situation of the Breeding-cages.—In general, the breeding-cages with the larvæ should be kept in places where there is plenty of fresh air; and if they are kept in a room, the window

should be frequently opened. The morning or evening sun is good for larvæ, or at least not injurious, but they should not be exposed to the hot rays of the sun by day. Heavy rain is also injurious to them, for although they generally like a certain amount of moisture, the damp which heavy rain leaves behind in the breeding-cages renders the atmosphere too moist, and also spoils the food. When breeding-cages are kept out of doors, the best situation is the north-east or north-west side of a building, or they may be placed in an outhouse. Small cages for the larvæ of *Micro-Lepidoptera* may be kept without hesitation in a room, or in a cellar.

Hybernation of Larvæ.—Larvæ which pass the winter in the larva state require special management. Although there are many which hybernate well enough under favourable circumstances, yet there are others which are so difficult to bring through it, that we may consider ourselves fortunate if we can succeed in keeping only a few alive out of a large number. Larvæ hybernate best, as a rule, when they are about half-grown; hybernation is more precarious when they are either quite young or nearly full-grown. In general, larvæ will hybernate best under conditions as nearly as possible resembling those to which they are exposed in a natural condition; but it cannot always be said that more larvæ die in captivity than in the open air during hybernation, for there is no doubt that unfavourable weather in winter, or, more especially, long-continued cold and rainy weather in spring, destroys great numbers of larvæ; and the larvæ in our breeding-cages are at least protected from such vicissitudes of the season.

The larvæ of *Macro-Lepidoptera* which have already passed through several moults in the autumn may be put in boxes about eighteen inches long, ten or twelve inches broad, and ten inches deep. These must be well made, and nailed together outside; the lid must be provided with a large opening covered with wire gauze, and it is advisable to have a similar network on the upper part of one of the sides also. The bottom should be covered, two inches deep, with very fine earth mixed with sand, on the surface of which should be laid flat stones and pieces of bark, which should all be covered with an inch or two of moss, pressed down rather tightly, on the top of which dry leaves should be laid. The larvæ should be moved into these cages about the end of October, and a few leaves of their food-plant should be put with them at first, in case they still require food. If possible, the cages should be set on the ground in the open air, but in a sheltered situation, where they are not immediately exposed to rain and snow. They should then be covered loosely with dry leaves or straw, over which a board should be laid crosswise to prevent the covering being blown away. If there is no place protected by a projecting roof, it is easy to nail two boards together in a sloping position, and put them over the larva-cages for a roof. If the winter is severe, with much frost and snow, it is a good plan to cover the breeding-cages entirely with snow; but needful precautions must be taken to prevent too much water leaking into them in case of a thaw, and, if necessary, to remove the snow in time. When the weather is only moderately cold, the snow covering is not only unnecessary, but rather injurious. When the winter is past, nothing more remains to be done for the larvæ but to take care that the moss in the cages does not become dry during a continuance of fine mild weather, and to sprinkle it with water if necessary. The larvæ can generally be kept healthy in this manner till the end of January, or when there is a long frost till a thaw sets in; but then comes the time when they generally begin to get sickly, probably from too much moisture and too close an atmosphere. The boxes and their contents should then be moved into a room without a fire, without disturbing them in any other way, but they must then be kept sufficiently moist by frequent sprinkling. When the food-plant grows up, it must be put into the cages, and afterwards, when the larvæ have fairly left their winter quarters, they must be moved into the ordinary breeding-cages; but we must not forget to look for any

that may be hidden among the dead leaves or moss. When they have been moved, it is well to sprinkle them freely with rain-water once or twice, which seems to be useful in helping them to recover themselves after their long winter's fast. Many larvæ do not eat fresh food immediately after hybernation, but withered leaves of the year before, which should therefore always be put with them. With this exception, most larvæ which have hybernated will eat sorrel, dead-nettle, plantain, chickweed, grass, &c.

Larvæ may also be kept through the winter in flower-pots in which their food-plant is growing. The earth must be covered with moss and dry leaves, and the pot must be covered with muslin or gauze. Larvæ which feed on grass may be put into boxes or pots in which a sod of turf has been planted.

Larvæ which are already full-grown in autumn may be left undisturbed in the breeding-cages, for many of them will spin up in the course of the autumn.

Larvæ which are still very small, as well as all larvæ of *Micro-Lepidoptera*, should be kept through the winter in glasses covered with muslin or wire gauze, or in jam-pots, in which earth and sand, as well as moss and a few dead leaves, must be placed. If the larvæ have already spun themselves up in autumn for hybernation at the sides of the breeding-cage, or between the leaves of the food-plant, or, like many species of the genus *Conchylis*, spun themselves up in the stalks, they must be left there till they come out of their own accord in spring. Many of these larvæ will become pupæ in such webs. During the winter they must be exposed to the cold in a room without a fire, and must be moderately sprinkled with water from time to time, except during frosty weather.

Rearing Larvæ in the Open Air.—The foregoing instructions chiefly apply to rearing larvæ within doors; but if the collector possesses a garden or greenhouse, he may find it more convenient and less troublesome to rear the larvæ of *Macro-Lepidoptera* on the growing plant. The food-plant must be transplanted into the garden, if it does not grow there already, and placed in a sheltered situation, not too much exposed to wind and rain. In the case of larvæ which feed on trees or shrubs, a sheltered bough full of leaf should be chosen, to which the larvæ must be transferred, and then a large muslin bag must be slipped over the whole, and tied tightly below the larvæ. When the leaves within the bag are all devoured, the bag and the larvæ must either be transferred to another branch, or else the bag must be untied and fresh twigs slipped into it. The latter plan is better when the larvæ are clinging to the branches, as it will disturb them less; but when they are clinging to the bag, or to stalks of leaves with which they can readily be removed, the former is preferable. The dirt should be carefully shaken out of the bag every time it is untied. In the case of larvæ which feed on low plants, the food-plant may be covered with a sieve, which can easily be constructed deep enough for the purpose; the sieve should be pressed tightly down, and the sides should be heaped up a little with earth to prevent the larvæ escaping. When these larvæ or those on the trees are nearly ready to change, they should be transferred to an ordinary breeding-cage. This mode of rearing is best adapted for large broods of larvæ belonging to large and common species: for even with the precautions we have mentioned, larvæ reared in the open air are exposed to various dangers, from which those under our immediate supervision are more exempt; and rare larvæ, or those of which we have only a few specimens, should never be exposed to any unnecessary risk.

Management of Pupæ.—All suspended pupæ must be suffered to remain in the same position as that in which they have attached themselves, as they generally produce crippled specimens if their position is altered. Pupæ in cocoons may be left as they are, and those among moss or between leaves may be carefully lifted out and cut away from any redundant substances

which may be casually attached to them, but without interfering with any part of the cocoon. They may then be removed to another box, and will require no further attention. Pupæ which are constructed underground should also be removed, but, if possible, without breaking the cell in which they are generally enclosed. Many larvæ of *Noctuæ* remain unchanged in these cells for a long time, some throughout the whole winter, and others from May to August ; and special care is necessary not to take them out of the ground too soon. All pupæ which are constructed on or under ground require particular attention, and especially a certain amount of moisture. It is often difficult to regulate this exactly ; if the pupæ are kept too dry they generally dry up, and if they are kept too damp they are liable to rot. The bottom of the pupa-cage should be strewn several inches deep with earth or sand, covered with a layer of moss, on which the pupæ and cocoons should be laid. These should be again loosely covered with moss, and the ground must be moistened with rain-water occasionally by means of a funnel, and the covering of moss should be sprinkled at the same time. Or the pupæ may be laid on a layer of blotting-paper, and covered over with another layer consisting of four or five thicknesses, and the topmost sheet should be occasionally dipped in water, which will soak down to the lower ones and keep the pupæ sufficiently damp. Or the pupa-cage may be so arranged that we can put a flat plate into it containing a little water, and stretch some loose stuff over to lay the pupæ on, when the vapour of the water will save the necessity of damping the pupæ themselves. When the weather is dry the pupæ will generally require to be kept damper, and when the weather is damp they will not need much attention.

Hybernating pupæ should be placed in an unheated room, at least at first, where they will be exposed to the cold, for the hardest frost will not hurt them, and it appears as if they require a certain amount of cold for their development. As long as it freezes they ought not to be damped. If we wish to "force" the pupæ, or to make the perfect insects appear sooner, we must wait till they have been fully exposed to the frost for a day or two, and then bring them into a warm room, setting them at first in the coolest place, and afterwards nearer the fire. When pupæ are being forced in a warm room, frequent damping with tepid water is necessary. Forcing is strongly recommended by Dr. Knaggs in the case of insects which appear to be originally natives of warm climates, and which are not thoroughly acclimatised in our own, as is the case with many of the rarer *Sphingidæ*.

There should be a free current of air through the pupa-cage to prevent mould. Two opposite sides should have large openings in them covered with muslin, or the greater part of the lid should be open and covered with muslin, as well as the roof and inside walls, so that when the insects appear they may be able to climb up it, and suspend themselves in the position most suitable for their proper development.

The pupæ of *Micro-Lepidoptera* can be kept best in the breeding-cages, and allowed to develop themselves there. Frequent damping with water is necessary for these also, especially when they are kept in warm rooms. Dr. Knaggs, in his handbook on the practical rearing and collecting of *Lepidoptera*, decidedly condemns damping, except in the case of forcing pupæ. But much will, no doubt, depend on climate and situation, which vary considerably even within the limits of the British Islands ; and whereas damping may be absolutely necessary in some cases in a dry locality or during dry weather, it may be positively injurious when these conditions are reversed. But the young collector will learn more from his own experience—if possible guided, in the first instance, by the practical instruction of a friend already versed in these matters—than from any amount of written directions.

JOURNALS AND NOTE-BOOKS.

We have already said that rearing *Lepidoptera* is important as a means by which we may obtain an insight into their life-history and habits. But for this purpose it is necessary to be quite sure which insect is the perfect state of each larva, as well as to record our observations on the larva and its habits in writing. For this purpose a journal must be kept, in which everything of importance should be noted at the time, especially the change in the larva at each moult, and any circumstances which will make our observations reliable, and prevent our falling into mistakes and confusing one larva with another. The following hints may be useful.

Each larva or pupa cage may be designated by a certain number, and all larvæ with the natural history of which we are not fully acquainted, or from which we do not know what insect will result, should be kept separate. The pupæ obtained from such larvæ should also be kept separate, if possible; and if not, they should be put into a particular part of the pupa-cage and marked with a separate number.

Then we must note in the journal the number of the breeding-cage in which the larva, and subsequently the pupa, is placed, as well as the number of the pupa, the day, the locality, and the plant where the larva was found, the dates when it moulted and when it became a pupa, as well as the date of the appearance of the perfect insect. Besides this, a precise description must be made of all unknown larvæ, and of all those which do not exactly agree with a description or figure before us. Larvæ which alter their appearance after moulting must be carefully described in each stage. If the collector can draw, a careful drawing of the larva would also be very desirable. When we think we recognise a larva from a figure or description, this may also be referred to in the journal. When the perfect insect appears, its name should be added to the description of the larva.

The diary can be best kept in a quarto manuscript book, ruled with columns for the number and name of the larva and pupa, descriptions and citations, locality, food-plant, moultings, dates of the larva becoming a pupa and of the appearance of the perfect insect, and remarks. It will, however, save much space to have a separate book for detailed descriptions, and keep the first for dates and short memoranda, as aforesaid. All larvæ which the collector has not already bred should be entered in this journal, but he need not enter those with which he is already fully acquainted, except when they do not agree with his former observations respecting food-plant, times of appearance, &c.

It is very desirable that the journal should also contain observations on the state of the weather, especially the temperature, the forwardness or backwardness of the season, &c. All these conditions influence the times of appearance of larvæ and perfect insects, and the different observations will in time be useful to form a table, according to which the appearance of certain insects can be definitely expected at a certain time every year, according to the weather. Nothing has yet been done to compare the times of appearance of the same species in different parts of Europe, which often differ very much. Such entries, however, could be more conveniently entered in an ordinary diary than in the journal of which we have been speaking. The nature of the season, whether forward or otherwise, and the progress of vegetation on which insect life depends, may be indicated by noting the date at which common and well-known plants are observed in blossom, such as the wood-anemone, the starwort, the gooseberry, the lilac, the apple, the blackthorn, the hawthorn, the sallows, the heaths, &c. The average temperature, as well as the highest and lowest on each day, the number of sunny and rainy days, and the direction of the wind, should also be noticed.

The journals should be provided with indexes, so that their contents can easily be referred to, and should contain notices of insects seen or caught, with localities, the time and place where pupæ were met with, and the date of the appearance of the perfect insect. Every specimen in the collection, or at least any of any rarity, should bear a number corresponding to one in a ledger, showing where, when, and how it was obtained. Generally speaking, all species captured on the same excursion, or at least all found under the same circumstances or derived from the same source, may bear the same number.

ON PREPARING *LEPIDOPTERA* FOR THE CABINET.

Any perfect insects which we bring home alive, or those which are bred from the pupa, should be killed and pinned as soon as possible, unless we wish to breed from them. It is generally better to box all bred specimens before attempting to kill them. We have already spoken of the various modes of killing *Lepidoptera*. It is necessary to be very careful to pin all specimens exactly through the middle of the thorax, and some collectors use a lens when pinning *Micro-Lepidoptera*, for if they happen not to be pinned quite straight, we shall find it very difficult, and often impossible, to set them afterwards. Insects of large or moderate size may be pinned in the hand, as already directed, but very small ones can be better pinned if laid on white blotting-paper. When chloroform, sulphuric ether, ammonia, or any other strong volatile substance has been dropped into a pill-box, it is always necessary afterwards to leave the box open till the smell has entirely evaporated before using it for any other purpose. When the sun is bright and hot, the readiest way of killing an insect is to put it in a box without a lid, and press the box against the glass of a window on which the sun is shining, when the insect will speedily die.

Pinning, &c.—In removing insects, great care is necessary in drawing the pin from the cork, especially when it is tightly fixed or very slender. It must then be drawn up with a slow, steady motion, and quite straight, so as not to jerk when finally drawn from the surface. A sudden jerk, caused either by the pliers slipping, or the elastic pin springing when drawn from its place, is often enough to shake a delicate specimen to pieces. All the insects in the collection should be set at a uniform height and in a uniform manner. English collectors usually set their insects with the wings somewhat sloping, and rather low down on the pin, so as almost to rest on the paper of the cabinet, which, however, the specimens should never be allowed to touch. The mode generally practised on the Continent and in America is to use very long pins, and set the insects, with the wings expanded flat, a good half inch or more from the surface of the drawer. This method has many advantages; but perhaps the chief disadvantage is that long pins require much deeper drawers and boxes than are commonly used in England. Some collectors pin their *Micro-Lepidoptera* to one end of a narrow strip of cork or pith, through the other end of which a pin is run to fix it in the drawer. The end of the pin should be touched with gum to fasten it in the pith. The advantage of this plan is that it allows the specimens to be moved without either difficulty or danger, to which the smaller *Micros*, which must necessarily be pinned with the finest pins which can possibly be obtained, would otherwise be exposed whenever it was necessary to touch them. We have already spoken of the necessity of all the specimens being set alike; and this is necessary, not only because the symmetry of a collection is destroyed, even if the specimens are well set, if they are set at different heights on the pin, or if the wings of some are more expanded than those of others, but because it is difficult to compare specimens satisfactorily when the setting is not uniform. *Lepidoptera* require to be set, or to have their wings expanded to

the best effect for display, on frames called setting-boards or saddles, which we shall presently proceed to describe; but if this operation is not performed immediately after death, we shall find that the insect cannot be set, in consequence of its fluids having dried up, which renders it stiff and brittle. Specimens in this condition require to be relaxed before they can be set.

Relaxing.—This may be effected in various ways, but insects which are undergoing this process must be examined every day, and set as soon as they are sufficiently soft for the wings to be fully opened out without more pressure than would be required to open the wings of a recently dead specimen. If left longer they are liable to become mouldy or rotten. For relaxing insects, some collectors use a wide-mouthed glass-stoppered bottle half filled with chopped laurel-leaves (which may also be used for killing insects), lined with cork on the upper part, on which the insects are pinned; but it is simpler to relax them with water. For this purpose a piece of cork, with the insects stuck upon it, may be floated in a basin of water, over which a cloth is tied to prevent the vapour from escaping. Another convenient method is to use a tin box, partly filled with damp sand or sawdust, on which some clean white blotting-paper is laid, and to place the insects on this. The box should then be put on the chimney-piece, and left there till the specimens are sufficiently relaxed. The water should not be allowed to touch the insects, or it will be liable to injure their colours; and white, blue, green, or metallic colours are more liable to suffer in this way than any others. Some collectors touch large insects with alcohol to facilitate their relaxing, applying it to the under side of the thorax, and the roots of the wings beneath. If an insect requires re-pinning, it can sometimes (if large) be slipped off the old pin without difficulty; but if it is too tightly fixed upon it, it must be put into the relaxing box for a short time. The thorax may be damped with a camel's-hair brush dipped in diluted alcohol till the pin is sufficiently loosened; but it is perhaps better to relax the insect altogether, and, if necessary, to re-set it. If it is loose on the new pin, a slight touch of gum on the lower side, just where the pin is inserted, will be sufficient to fix it.

Setting-boards are made of long strips of deal, varying in width, according to the size of the insects which are intended to be expanded on them. There must always be a groove in the middle, lined at the bottom with cork, to receive the body of the insect; and the sides are frequently also constructed of cork, which is absolutely necessary when the specimens are to be set with braces. English setting-boards are generally made with sloping sides, so as to give the insect a rounded appearance when set. The sides are frequently covered with unsized paper; and some collectors rule them across with transverse lines, to assist the eye in getting the wings exactly even on both sides. They may be of any convenient length, say about a foot, and are often made to slide into a frame called a setting-house, which has a handle at the top to allow of its being carried about, a door fitted with a sheet of perforated zinc to admit the air, and a drawer at the bottom divided into several compartments for pins and braces. This is sometimes combined with a store-box, or is constructed to serve at once as a setting-house and a receptacle for the various articles required for the outfit of the collector. A number of setting-boards will be required, varying in width from half an inch to six inches. This will be amply sufficient for even the largest European species, for neither the Death's Head nor the Great Peacock Moth exceed six inches in expanse at the utmost; but collectors who receive unset specimens from abroad will occasionally require setting-boards of larger size, even up to a foot in breadth. Flat setting-boards may easily be made by cutting a groove of any required depth down the middle of a piece of wood, and gluing a strip of cork along the bottom of the groove; and the smallest moths cannot well be set on

ordinary setting-boards. It is better to set these on a very smooth sheet of cork (elder pith is often used on the Continent instead), in which very small grooves have been scored to receive the bodies.

Setting is usually effected on sloping boards by means of braces, which may be constructed either of cardboard or paper. In the former case the cardboard must be cut into long, narrow, pointed strips, through the thick end of which a pin is driven. Then, having selected a board proportioned to the size of the subject, we pin the insect exactly in the middle of the groove, keeping its body quite straight, and bringing its wings into such a position that when expanded they will rest upon the cork sides of the setting-board. The wings are then to be brought into such a position on each side that a straight line drawn from tip to tip would pass just in front of the head of the specimen, and the card braces are then to be pinned down over the wings with sufficient firmness to keep them in their places, but not so tightly as to damage them. The wings may be drawn into their places with a very fine needle pressed against the costa; but great care must be taken not to pierce or tear the wing. It often happens that several braces on each side are required to keep the wings in position, though it can sometimes be managed with one long one only. The position of the hind-wings must not be neglected, and they should be placed as nearly as possible in a natural position, with the inner margin of the fore-wings lapping over the costa of the hind-wings. This rule will not apply, however, to *Micro-Lepidoptera* with very narrow hind-wings, which sometimes stand off at an angle from the fore-wings, and should be set in that position. Stiff paper braces may be used for setting small and delicate insects, for which cardboard would be too coarse; and in the case of large insects, strips of paper pinned down at both ends will be found nearly as convenient and efficacious as cardboard braces. Some collectors set their insects by twisting thread over the wings, round and round the ends of the setting-boards; but this method requires much practice to manage it successfully, and is more likely to damage the specimens in unskilful hands than the ordinary method. When flat setting-boards are used, braces and threads may be dispensed with, and the wings may be kept in position by the weight of bits of thin glass laid over them. The width of the setting-board must in all cases exceed that of the expanded wings of the insects set upon it; but there is no harm in setting a small insect on a large board, especially if the body is large in proportion to the wings. Whenever possible, each insect should be set on a board the groove of which is proportioned to the size of its body, for no insect can be properly set unless the groove is large enough to receive its whole body easily; and, on the other hand, it is very awkward to set a slender-bodied insect on a setting-board the groove of which is much too wide for it. If the antennæ or abdomen be not in a symmetrical position when the insect is set, a couple of slender pins must be crossed over each to secure them. The insects must be left on the setting-boards till they are thoroughly dry and the wings are firmly fixed in their position. For greater security, some collectors touch the roots of the wings beneath with liquid glue when they remove them from the setting-boards. If any signs of mites, *Psocidæ*, or other parasites show themselves on the boards, which will sometimes happen, the boards must be washed over with some preparation to destroy the intruders. To diminish the risk of their presence, it is necessary to keep the boards scrupulously clean, and not to allow any broken fragments of legs, &c., to remain upon them, and, above all, not to allow a forgotten or worthless specimen to remain on the boards after the others have been removed. The setting-house must be kept in a dry place where it will be safe from the visits of mice, cockroaches, or ants, and where it will not be exposed to dust. When the house is infested with ants, the setting-house should either be suspended by a cord, or put on a stand of some kind, the legs of which are placed in cups of water.

On Denuding the Wings of Lepidoptera.—It is often necessary to remove the scales from the wings of *Lepidoptera* in order to study the arrangement of the nervures. There is no difficulty about this in the case of the larger and more strongly-built species. The scales can be easily removed, even without detaching the wings from the body, by means of a soft and blunt camel's-hair brush, and specimens may be thus obtained which show the complete scaling of the wings on one side, and on the other the naked membranes. It is more difficult to denude the wings of small and delicate species, which is effected in the following manner:—The wing is carefully removed at the base, and placed between two thin plates of glass, such as those used for microscopic slides, which are then gently rubbed together: this will be sufficient to remove some of the scales. Then breathe upon one of the plates, lay the wing on the place, breathe on the other plate, lay it over the wing, and rub the plates together as before. Continue this process until the wing is nearly clean, wiping the scales now and then from the glass on which the wing is not resting, and then transferring the wing to this while the lower glass is rubbed. If there still remain scales on the wing which cannot be removed in this manner, breathe again on one of the glasses, press the wing firmly down upon it with a dry, clean glass, and rub the scales off with a fine, soft brush; then breathe on the other glass, press it down till the wing adheres to it, and then clean the other side with the brush in the same manner. When the membrane is perfectly clean, lift it up with a moistened brush and gum it upon another glass plate, over which another plate is to be fastened by gumming the edges, in order to preserve the specimen. The other pair of wings, with the scales attached, as well as the antennæ, palpi, legs, and other portions of the insect, may also be placed between the glasses, in order that all important parts of the insect may be examined with a microscope or lens. It is absolutely necessary that the name of the insect should be attached to all such preparations the moment they are completed, unless the undenuded wings accompany them.

Attempts have also been made to obtain impressions of the wings of *Lepidoptera* by pressing them down upon gummed paper, when the membrane of the wing can be removed, leaving the scales attached to the paper. The body can then be painted in between. But these latter preparations serve no purpose which cannot be better answered either by real specimens, or by carefully-executed drawings or good engravings; whereas the denuded wings and microscopic preparations mentioned in the last paragraph have a real scientific value, and should not be neglected by any entomologist who possesses a microscope; for though he will probably not be inclined to sacrifice rare specimens for anatomical or microscopic purposes, he will easily procure a sufficient number of common or broken insects to employ him for a very long time, if he has any taste for such researches.

ON THE ARRANGEMENT AND MANAGEMENT OF A COLLECTION.

Store-boxes are made of various sizes, but should be constructed of light wood, and lined with cork at the top and bottom. They are used for carrying specimens from place to place when we wish to compare a number with a collection at a distance, or to bring home a larger supply from a long excursion than the setting-house or collecting-boxes will hold. They are also used for sending duplicates to our correspondents, when the specimens must be pinned in very tightly, and cross-pins put over the bodies of all heavy-bodied moths. The box or boxes must then be packed in an outer case, with hay, tow, shavings, or other soft packing material all round, to prevent their being jarred, or allowed to touch the outer case at any point; and the lid of the case had better be screwed down than nailed down. In sending insects abroad, it is better to pack them in single

boxes which are not corked at the top, but have a piece of strong glass let into the lid to allow the customs officers to examine the contents without opening the boxes, over the edges of which a strip of paper or calico should be pasted to keep out dust. When insects are sent away in single boxes, they should be marked "This side up."

Store-boxes are also used for keeping surplus specimens, which may be useful to give away or to exchange. A small muslin bag filled with camphor should always be pinned in one corner. Boxes that are corked top and bottom must always be deep enough to prevent the insects which they contain coming into collision. Practically, however, there is seldom any risk of this with insects set low down on the pin in the English fashion. Some collectors use store-boxes instead of a cabinet for keeping their collections. In this case the boxes are generally made of better construction, and are covered with green cloth, and frequently lettered on the back to resemble books. They are also sometimes fitted with movable glass lids, like cabinet drawers, and can be ranged upright on shelves, like books. Some collectors use small single boxes, labelled and piled upon one another, instead of book-boxes; but this arrangement is not convenient for the larger *Lepidoptera*. It may, however, be used for the *Micro-Lepidoptera*. Insects must never on any account be kept in uncovered glass cases, as they soon fade when exposed to light, especially to the direct rays of the sun.

Cabinets may be made to contain any number of drawers, which may be arranged in one, two, or three tiers. They are usually constructed to contain from twenty to fifty drawers, in a double tier. They must on no account be made of cedar or any other resinous wood. The drawers should be about eighteen inches square, and made of thoroughly seasoned wood. They are lined at the bottom with sound cork, and are fitted with glass lids to keep out the dust. A partition of thin wood runs along either the front of the drawers, the two sides, or all round. This is perforated here and there with holes about the size of a shilling. Perhaps the commonest arrangement is to have a partition along each side, with two openings opposite each other in each partition. The bottom of the drawer and the inside of the partitions are covered with white unsized paper, and holes are pricked through the paper covering the openings in the partitions, to allow the vapour of camphor, with which the camphor cells should be freely supplied, to escape into the drawers. Another arrangement, sometimes used on the Continent, is to use drawers constructed with glass bottoms as well as glass tops, upon which the insects are fixed by pinning them on thin strips of cork, which may either be gummed in their places, or made to fit into grooves in the frame. The advantages of this plan are that the collection is less liable to the attacks of mites, and that the whole drawer may be turned upside down, to show the under sides of the insects. But the last purpose may be better served by having a sufficient series of specimens to show under sides as well. Although it is tolerably easy to arrange a cabinet to accommodate a limited Fauna, such as that of the British Islands, which only contain about 2,000 species of *Lepidoptera*, many of which are very small, yet, if we extend our collection to European or foreign species, it will be impossible to calculate beforehand what space will be required for each group, and the cabinet or cabinets will then require re-arranging from time to time. *It is therefore indispensably necessary that every drawer, not only in the same cabinet, but in every cabinet belonging to the same collector, should be interchangeable;* and the larger the collection, the more important this becomes. If the old cabinet gets too full, and a new one is procured, it will probably be found that in a cabinet of, say, twenty drawers, fifteen will require no alteration whatever, while the remaining five can well be spread out into fifteen or twenty. If the drawers are made interchangeable, new drawers can easily be intercalated to any extent wherever they are required, and the end drawers transferred to a new cabinet; but if they are only made to fit in the

same places, almost every insect in the old cabinet will require to be shifted, perhaps two or three times, and re-arrangement will become a work involving a vast amount of absolutely useless labour, and considerable risk to the specimens; for specimens cannot be constantly shifted, even with the greatest care, without a certain amount of deterioration, and the risk of an occasional accident. No cabinet-maker ought to be trusted to make a cabinet who will not undertake to make the drawers interchangeable.

When examining insects contained in large and heavy cabinet drawers, it is sometimes convenient to place the drawer on a pad, sufficiently large to keep it steady, but which allows of the drawer being turned, as on a pivot, in any required direction.

On the Position of the Cabinet.—Cabinets should be kept in a dry room where there is a fire burning in damp or cold weather, and should not be placed against an outside wall, but either against a partition wall, or back to back. If it should be necessary to place a cabinet against an outside wall, it should not be pushed close up to it, but there should be a space left between to prevent the immediate contact of the cabinet with any damp from the wall. The cabinet should also be constructed either with short legs or a small stand, to avoid direct contact with the floor, and to allow of a free current of air beneath it, as well as at the back. When the cabinet has been standing in an unheated room, and the drawers are brought into a warm room, they must be allowed to stand for a considerable time till they are warmed through; for if they are opened without this precaution, the enclosed specimens will be very liable to contract damp.

On Arranging and Labelling a Collection.—In order to study our collection properly, it is necessary to have a sufficiently large number of each species to exhibit it in all its forms. In species where the sexes and under sides vary, we should place in our cabinets at least four specimens —that is, a male and female exhibiting the upper surface of the wings, and another pair set to display the under surface. In cases where the sexes differ little, and where the under sides are not remarkable, one or two specimens may serve to represent the species. Each specimen should be ticketed with a small piece of paper attached to its pin beneath, bearing a number corresponding with our journal, which will give us its complete history. Or the date, locality, &c., may be written on a piece of paper and pinned under the insect in the same way; but it is difficult to write so much on a label without its being often too large to be concealed by the specimen, and the collection would then look untidy. And if the paper has to be folded, it will be much more troublesome to examine than if we have merely to turn up the insect and glance at it. Continental entomologists often write the names of their insects on small oblong pieces of card, which are pinned through a long strip projecting from the middle; but this plan is only applicable to insects set in the Continental fashion, nor does it look so tidy as the method we are about to describe.

Specimens should be arranged in parallel columns, one beneath another, commencing with the left-hand top corner of the first drawer in the cabinet. They must also be arranged and labelled in systematic order, according to some book or catalogue. The names of the families and genera are placed at the top of each, and the name of each species is placed beneath it. When a genus fills more than one drawer, and part of it has to be arranged in a second, its name should be repeated at the beginning of the second drawer. The names may either be written, or cut from a printed list, and may either be fixed in their places with a touch of gum or paste, or by pins; in the latter case, many entomologists use pin-points. There are several lists of British *Lepidoptera* arranged for this purpose by Doubleday, Stainton, and others; for European *Lepidoptera*, a small edition of Staudinger and Wocke's catalogue may be used; or for European butterflies only, Kirby's "Synonymic List." As we have said, the specimens must be arranged in parallel lines, and

for this purpose each drawer must be spaced out for the insects it is intended to contain, either by ruled lines or by black paper or thread. First of all, measure with a pair of compasses the different widths which will be required for the insects, which must in all cases go well within the lines, and having carefully noted the exact points for the dividing lines at the top, turn the drawer upside down, and measure off the other end of the lines at the bottom so as exactly to correspond with those at the top. After this, you may rule lines with a pen or pencil between each of the opposite points; but the disadvantage of this is that if the drawer requires re-arranging, it will also require re-papering, as the lines cannot easily be obliterated so as to look well. This may be avoided by using narrow strips of black paper cut to fit the drawer, and secured by pin-points; or by threading, which is perhaps the most convenient and neatest plan of all. To thread a drawer, you have only to stick a short strong pin, sloping a little towards the wood, at the end of each of the lines which you have already marked with the compasses. Then tie a piece of black thread round the pin at the left-hand top corner, bring it down to the bottom of the drawer, and pass it round the two pins nearest to the left-hand bottom corner of the drawer; bring the thread up to the top again, pass it round the second and third pins at the top; bring it down again, and pass it round the third and fourth pins at the bottom; carry it up again to the top, and so on, till you arrive at the last pin, round which you fasten off the thread. The smaller *Micro-Lepidoptera* are generally arranged in double instead of single rows. The specimens must be pinned exactly in the middle between these lines, placing the males first and the females after. If possible, a sufficiently long series of each species must be placed in the cabinet to show the limits of its variation. Locality labels may also be pinned under or on one side of the specimens, if the collector wishes to show the locality of each specimen without the necessity of referring to a journal. Although no one who values his collection from a scientific point of view would reject a bad specimen of a species when he has not a good one, yet the beauty of a collection depends so much upon the perfection of the specimens which it contains that no opportunity should be lost of replacing broken, faded, or worn specimens with better.

Preservation of the Collection.—If the directions previously given about the situation of the cabinet, &c., have been followed, the collection will not be much exposed to be injured by light, dust, mould, or damp; or even from the larger parasites which destroy collections, such as the larvæ of some small beetles and moths. But the most tightly-fitting drawers are no security against the two worst of the enemies against which we have to contend—mites and grease. The most usual preservative from the former is camphor, and it is so far effectual that it will prevent any clean specimens from being attacked by mites; but if, by any mischance, they should be introduced into the drawers with specimens from the setting-boards, or in any other way, it will not be sufficient to destroy them. Some wash the inside of the drawer before using it with pure carbolic acid diluted with water. Essential oil of cajeput or benzole, dropped on a piece of cotton-wool, and put into an infected drawer, will prove useful, but are liable to grease the drawers; and both camphor and benzole are accused of attracting grease to the specimens themselves. Dusty specimens may be carefully cleaned with a soft camel's-hair brush; for the older the specimens, the less likely are the scales to be rubbed off, whereas in fresh specimens the least touch is often sufficient to remove them. Mouldy specimens may be cleaned with a brush dipped in sulphuric ether; and if the application of the fluid does not entirely remove it, the brush must also be employed, taking great care not to injure the fringes.

Grease is peculiarly liable to attack moths which have lived in the larva state in the stems or trunks of plants or trees—that is to say, all those known as internal feeders. It generally begins by exuding from the abdomen of a specimen, and gradually spreads all over it, soaking into and

discolouring even the paper and cork below the insect. If the collector possesses sufficient dexterity, all such moths may be stuffed while fresh, by removing the contents of the abdomen and filling it with cotton-wool. But this is a difficult operation, and almost impracticable with small insects. If this is not done, and any signs of grease show themselves, the greasy specimen must be attended to at once; for the longer the grease is neglected, the more it will spread, and the more difficult will be its removal. If the specimen be small, the greasy portions may be thoroughly soaked with benzole or rectified spirits of turpentine by means of a camel's-hair brush, or may even be sunk in the liquid for several days, and then thickly covered with French chalk or powdered magnesia till they are thoroughly dry, when the powder can easily be blown away or carefully dusted off. If the insect be large, and the abdomen only be attacked, the abdomen should be carefully broken off, and put into a mixture of five parts of highly rectified alcohol and one part of sulphuric ether. It must then be boiled in the fluid on a water-bath. It might be done in a test-tube over a flame, but this is too dangerous a plan to be recommended, on account of the highly inflammable and explosive nature of the chemicals employed. The abdomen must then be allowed to dry, covered as before with the white powder, and when thoroughly dry must be put into clean sulphuric ether for a short time, to remove the last traces of grease. Both liquids can be used several times, as directed, before they are rendered unfit for further use. If several bodies are operated on at the same time, it is necessary to attach a number to each, to avoid any mistake in replacing them.

When verdigris appears on the pins, it may be removed, with care, by the point of a penknife. If the pin becomes otherwise corroded, or breaks, it is better to re-pin the specimen. Some collectors, especially on the Continent, pour liquid mercury into their drawers to destroy mites; but besides other inconveniences, and the inapplicability of this method to collections set on low pins, the mercury is very liable to corrode the pins themselves.

When antennæ, wings, abdomens, &c., are broken off, they may be replaced with gum, which should be thick enough to retain the broken part in its place at once. The wing or abdomen must, if necessary, be supported in its place till it is fixed by means of a prop of cardboard, fixed on a pin, and placed at the necessary height. Some collectors re-set a broken specimen, and attach the loose member to it while the whole insect is supported on the setting-board.

ON PREPARING SPECIMENS OF EGGS, LARVÆ, AND PUPÆ.

To preserve the eggs of *Lepidoptera*, they should first be killed, by exposing them to heat or by placing them in spirits, and should then be gummed on bits of cardboard stuck on pins. If the eggs are arranged in a particular manner, such as those of the Lackey Moth, which are placed in a ring round a twig, they must be kept in their natural position, and the twig or other object to which they are attached must be preserved. It is more difficult to preserve larvæ in such a manner that they shall retain their shape and colour. The simplest though, nevertheless, very defective method is as follows:—The larva must be killed by immersion in spirits of wine, and a small vertical opening must then be made with a fine, sharply-pointed pair of scissors at the anus. The larva must then be laid between two layers of several thicknesses of soft blotting-paper, and the soft contents of the body must then be carefully squeezed from the head of the larva to the tail, and out through the opening that has already been made for the purpose. After the skin is completely emptied, the tube of a small blow-pipe must be inserted in the opening, and the skin tied tightly round it with a thread. The skin must then be gradually inflated by means of the blow-pipe till it has re-assumed the shape of the larva. It must then be dried as quickly as possible before a fire or over a spirit-lamp, continuing to keep it inflated by blowing through the blow-pipe till it is dry. Then the larva must be untied from the blow-pipe, and the

prolegs gummed to a twig or to a card. A hollow grass stem may be substituted for the blow-pipe, and when the larva is dry the stalk may be cut off short near the point of insertion, and a pin stuck through the end to fix it in the cabinet. The inflation must be performed with great care, and the heat applied must not be too great. While some recommend that the larva should be dried as rapidly as possible, others consider it indispensable to dry it as slowly as possible. The skin must not be inflated too rapidly or violently, lest it should be unduly distended, or even burst during the operation. One disadvantage of this method is that the larva loses more or less of its colour during the process. Other means have, therefore, been attempted in order to preserve the colours better. After the larva-skin has been emptied, as previously directed, it may be filled with fine sand or sawdust through a small funnel inserted in the opening through which the contents have been removed, till the skin has resumed the shape of the living larva. The stuffing must be well dried; and if sawdust be used, it should be previously tinted with a colouring matter corresponding to the ground colour of the living larva; and after the stuffed skin has been brought to the required condition, it should be dried slowly at a moderately warm temperature, and then attached to some suitable object.

When larvæ differ at different moults, a series of specimens should be prepared, showing them in all their stages.

Pupæ should be killed by immersion in spirit, and should then be dried in a strong heat, when they may either be pinned or gummed on a piece of card. In preserving suspended pupæ, they should, if possible, be allowed to remain attached to a portion of the object to which they were found fixed, and the same with cocoons attached to twigs, &c.

Eggs, larvæ, pupæ, and the cocoons belonging to them, may be kept in separate boxes or drawers, with the names attached. It is, however, a very pleasing and practical method to exhibit all the stages of the species at once, by grouping together the egg, the various stages of the larva, the pupa, and the cocoon, and the moth or butterfly which emerges from it, as well as specimens of any ichneumons or other parasites by which the species is liable to be attacked. The early stages may be attached to an artificial representation of the plant upon which the insect feeds, or else a carefully coloured drawing should be placed with it.

ON EXCHANGING AND FORWARDING *LEPIDOPTERA*.

If we confine our collection to the specimens we are able to procure ourselves, it will be limited to the species found in our own immediate neighbourhood, or to those which we may obtain casually while travelling; but we shall find it necessary to add to our specimens by purchase or exchange, if we wish to bring together anything like a tolerably complete collection. It is, of course, unnecessary to buy any specimens which we are likely to have an opportunity of procuring for ourselves, or which we can easily procure by exchange, unless we happen to want them for some special purpose at a time when we have no immediate opportunity of procuring them otherwise. In exchanging insects, always make it an absolute rule never to send away any but absolutely perfect specimens; and require the same from your correspondents. The only departure from this rule that should be admitted is in the case of positively rare species, and it is then necessary that both correspondents should perfectly understand each other about the condition of the specimens beforehand. Most collectors have an opportunity of procuring numerous specimens of some local species for which those living in other places will be glad to exchange the species of their own neighbourhood. Before exchanging, it is always better to exchange lists of duplicates and desiderata first, and then arrange as fair an exchange as possible by letter. The young collector

should beware, on the one hand, of driving too hard a bargain, and of carrying on exchange in too mercenary a spirit; and on the other, of distributing species wholesale for little or no return, and perhaps occasionally allowing himself to be imposed upon. But the medium will be learned by experience; and in the meantime let every one resolve to deal fairly and honourably towards all his correspondents to the best of his power, and he will not ultimately find himself a loser by it.

In purchasing insects, buy only perfect specimens, unless it is a species you require very much, and which you may never have an opportunity of procuring again. But these cases are very rare exceptions. And if you confine your collection to British insects, do not pay high prices for professedly British specimens of rarities. Most of the rarest British species are abundant on the Continent, and may be had for a mere trifle; and the few varieties which are really peculiar to Britain are (with the exception of the extinct or nearly extinct fen insects, such as *Lycæna Dispar* and *Agrotis Subrosea*, for instance) tolerably common where they are to be met with. In buying insects, it is much better to see the specimens yourself; and, in general, it is better never to undertake a commission to buy insects for another, nor to commission any one else to buy for you, as the result is usually unsatisfactory to both parties.

We have already given directions for packing up insects to be sent away (see p. xlix.), and will therefore only add a few additional remarks here. If they are on long pins, it is well to cover the whole bottom of the box with cotton-wool; but when they are pinned low, as English-set insects generally are, this cannot be done. When only a few specimens require to be sent, they may be sent by post, packed in small boxes, sold by the dealers in entomological apparatus as postal boxes, and made specially strong for the purpose. These should be tightly wrapped up in several thicknesses of cotton-wool or tow, and either enclosed in an outer covering of thick paper, and then tied round firmly with string, or enclosed in a network of string so carefully that it cannot possibly slip off. The address and stamps must on no account be placed on the box itself, but on an ordinary parchment luggage-label, which must be carefully tied on the box, so that the post-marks may all be attached to the label; and thus any risk of accidental injury to the box in the process of stamping at the post-office may be avoided.

ON THE SCIENTIFIC IMPORTANCE OF THE STUDY OF *LEPIDOPTERA*.

Before Linnæus succeeded in establishing a definite system of nomenclature for natural objects, it was almost impossible for the study of natural history to be pursued to advantage; and hence it is not surprising that naturalists were formerly looked upon as triflers, or worse. Indeed, such was the contempt with which the pursuit of entomology was regarded, that about two hundred years ago an action-at-law was taken to set aside the will of Lady Glanville on the ground of insanity; and the chief, if not the only, evidence relied on by the plaintiffs was her fondness for collecting insects.

But Time brings about strange reverses; and the Glanville Fritillary,* named after this lady, has carried down her name to our own times, and will probably perpetuate her memory for many succeeding generations.

At present the study of butterflies, so far from being despised, is regarded by many of our leading naturalists as of great importance in helping to elucidate many of the problems of modern science. The variation of the same species in different localities, or on account of change of food; the extraordinary resemblance of whole groups to others, to which they have no

* *Melitæa Cinxia* (vide p. 15).

real affinity, but which possess some special means of protection, in the advantage of which the imitating species are supposed to share; and the distribution of the various families and genera over the earth, are all questions which, though only beginning to be investigated, already throw great light on the laws by which a constant equilibrium is maintained among the various competing forms of life on the earth, while it likewise serves to illustrate, to some extent, its past history.

Unfortunately, fossil butterflies are very rare, and their affinities are frequently doubtful; but they serve to confirm the results arrived at by the study of other groups, the remains of which are better known, as to the affinity of the early European Fauna and Flora with the present productions of tropical countries.

This deficiency in fossil remains is compensated for, to a certain extent, by the study of the distribution of existing species. It is now believed that the north of the Old World was the spot where most of the principal forms of animal and vegetable life originated, and that those which were not exterminated at the time of the Glacial Epoch were driven southwards. Some of these returned to their old localities slowly after the retreat of the cold, while others, finding their return prevented by insurmountable barriers, or by permanent changes of climate, only survive at the present day in tropical countries, to which they were formerly strangers. Many Arctic plants and insects are found at the summits of the Alps, and other high mountain ranges; and it is thought that they retreated up the mountains and towards the poles at the end of the Glacial Period, and became isolated in these localities.

The colours of larvæ are also very interesting. Bright-coloured and conspicuous larvæ are rarely attacked by birds, and frequently feed on poisonous plants, and are therefore, doubtless, themselves unwholesome; but all larvæ which are specially protected by their brown or green colour, or by their resemblance to twigs, are greedily eaten by birds. Similar observations may be made by almost any one; and there are, no doubt, innumerable other interesting and important discoveries to be made relative to *Lepidoptera*, which are at present wholly unsuspected, but which may serve to throw a clearer light on many of the perplexing scientific problems which we desire to unravel.

EUROPEAN BUTTERFLIES AND MOTHS.

THE *Rhopalocera*, or Butterflies, are divided into several families, differing considerably in appearance, but may always be easily distinguished from the Moths by many important characters. Their wings are broad, and are nearly always brightly coloured on both sides, and the under surface is frequently of a very different pattern to the upper, especially on the hind-wings. When in repose they hold the wings erect, or else opened to the fullest extent, sometimes fanning them up and down. It is only in some of the *Hesperidæ*, or Skippers, the family which comes nearest to the Moths, that we find the fore-wings covering a small portion of the hind-wings when at rest; and the hind-wings of butterflies are never folded like a fan, as is the case with many moths. The body is nearly always small in comparison with the wings, and is thicker in proportion in the Skippers than in any other family. The position which these insects assume when at rest has clearly a reference to the comparative thickness of their bodies; for the *Geometræ*, or Looper Moths, in which the body is not larger in proportion than in the butterflies, often sit with their wings erected when at rest like the latter. The antennæ, or feelers, are generally more than half as long as the fore-wings, and are always more or less thickened or knobbed, and sometimes slightly hooked at the tip. In moths, the antennæ are of various shapes; but even the transparent winged Hawk Moths, and the Barnet Moths (Pls. 20 and 21), which most resemble butterflies in this respect, have such differently shaped antennæ that this character would be alone amply sufficient to prevent their being mistaken for them. There is no European moth which has antennæ sufficiently resembling those of a butterfly to allow of its being mistaken for one.

All European butterflies fly by day only, and seldom make their appearance in the morning till the sun has dried the dew off the grass. They never fly in the rain, and very little when the sun is obscured. In hot countries, on the contrary, many species, especially of dark colours, fly chiefly at dusk.

The larvæ, or caterpillars, of butterflies have sixteen legs; the first six are horny, and correspond to those of the perfect insect, and the others are fleshy, and are called "pro-legs." The caterpillars are cylindrical, spindle-shaped, or short and thick like a woodlouse, and are sometimes smooth, and sometimes covered with fine short hair, or else with spines, or fleshy warts covered with hair. They generally live on plants, often in company, without any covering; but some species live between leaves, which they spin together. The pupæ, or chrysalides, are suspended by the tail, and are often fastened by a girth round the body as well. They are more rarely enclosed in a loose web, or formed on or under the ground.

FAMILY I.—PAPILIONIDÆ.

To this family belong the great *Ornithoptera*, or Bird-winged Butterflies, of the East Indies, some of which measure nearly a foot across the expanded wings, and are the largest of all butterflies, surpassing even the great Blue and Owl-eyed Butterflies of South America (*Morpho*

and *Caligo*). It also includes the greater part of the Swallow-tailed Butterflies, which are so numerous and so handsome in all tropical countries. In cold countries we only find a few species of this family, but they are, nevertheless, among the largest and finest of our indigenous butterflies. All our European *Papilionidæ* are white or yellow, with black markings and red or blue spots; but every shade of colouring may be found among exotic species. The larvæ have a fleshy fork behind the head, which they thrust out when alarmed. The butterflies are generally found in open places, fly low, and settle frequently on flowers or in damp places, and are therefore not difficult to capture, although capable of a high and rapid flight.

GENUS I.—PAPILIO (LINN.).

Large and strong butterflies, with broad, triangular fore-wings and dentated hind-wings; a long tail before the anal angle. The colour is yellow, with black spots and stripes, and a large eye-like spot at the anal angle of the hind-wings. The larvæ are naked, with a small round head, and there are two or three broods in the year. The pupæ are angular, with two projecting points in front, and are attached to plants by the tail, and a thread round the body.

1. *P. Podalirius* (Linn.), (*Scarce Swallow-tail*).—Wings pale yellow, with black transverse bands, the intermediate ones on the fore-wings shorter; hind-wings with a black border marked with several blue crescents. They have also a long tail, and the eye-spot is orange in front, and black, dusted with blue, behind. Expands from $2\frac{3}{4}$ to $3\frac{1}{2}$ inches. It is met with in open places near woods, especially in hilly districts, in May and July, and is common in Southern and Central Europe, North Africa, and Western Asia as far as Persia and the Altai. It appears to have formerly inhabited England, but is now extinct. It varies in size, intensity of colour, and the length of the tails; the variety *Feisthamelii* (Dup.) is much whiter; and the variety *Zanclæus* (Zell.) has a white abdomen in the male. Both these occur in South Europe; the variety *Virgatus* (Butl.), from Damascus, is smaller than the type, and the tails are very long in proportion. The larva is thick, shaped somewhat like a woodlouse, and contracted behind. It is green, with yellow lines on the back and sides, and with yellow transverse lines spotted with red. It turns yellow when about to change into a pupa. It lives on almond, sloe, plum, apple, pear, and oak from June to August, and may be obtained by shaking sloe-bushes over an inverted umbrella. Figured in all stages at Pl. 2, Fig. 1, *a—d*.

2. *P. Alexanor* (Esp.).—Wings yellow above, with black transverse stripes, of which the second and third on the fore-wings are short, and the fourth is dusted with yellow. The sub-marginal band of the hind-wings is dusted with blue, and dentated externally. The eye-spot is yellowish-red, bordered in front with black, dusted with blue. Expands from $2\frac{1}{2}$ to 3 inches. It is found in May, June, and July, in the Alpine meadows of Southern Europe, but is not very common, although its range extends from the Pyrenees to Persia. The larva is green, with black stripes, and rows of black and yellow spots on the sides. It feeds on different species of Alpine umbelliferous plants in July. The butterfly is figured at Pl. 2, Fig. 2.

*3. *P. Machaon* (Linn.), (*Swallow-tail*).—Wings sulphur-yellow, fore-wings black at the base, and with black veins. They have also black spots on the costa, and a broad black sub-marginal band dusted with yellow. The hind-wings are broadly black, dusted with blue, before the hind margin, and the eye-spot is red, bordered in front with black and blue. All the wings with yellow lunules before the hind margins. Expands from 3 to 4 inches. It is found throughout

* British species are throughout this work distinguished by an asterisk.

the summer in Europe, North Africa, Asia as far south as the Himalayas, and Western North America. A closely-allied species (*P. Hospiton*, Géné), which is smaller and darker, with a shorter tail, and scarcely any eye-spot on the hind-wings, is found in Corsica and Sardinia. Its larva feeds on *Ferula Communis*. In England *P. Machaon* is almost confined to the fens of the south-eastern counties; but on the Continent it is common in meadows, clover-fields, open places in woods, gardens, &c. The larva is cylindrical, green, with transverse black stripes on the sides, spotted with orange. It lives on many umbelliferous plants throughout the summer, and is often found in gardens, feeding on the common carrot. It will also eat pimpernel. Figured in all stages at Pl. 2, Fig. 3, *a—d*.

GENUS II.—THAIS (FABR.).

Middle-sized butterflies, with very short antennæ; the wings are yellow, with black markings and red spots. Fore-wings rounded at the tips, hind-wings dentated. Larvæ with several rows of fleshy tubercles, with stiff bristles at the extremity. They feed on species of *Aristolochia*, and the pupæ are attached by the tail, and a thread round the body. The few known species are confined to the countries bordering on the Mediterranean and Black Seas.

1. *T. Hypermnestra* (Scop.), (*Polyxena*, W. V.).—Wings above pale yellow, fore-wings with black spots and veins, and a rather broad black band towards the hind margin, followed by a much waved yellow line, edged by a black one. The intermediate spaces on the extreme edge yellow. Hind-wings dentated, the sub-marginal yellow line less deeply indented, and followed by a row of blue and then of red spots. Expands from 2 to 2½ inches. Common in Europe, south of the Alps, from February to May, according to the season. "It is of very short duration, and very sluggish, frequenting marshy grounds, where it flies lazily from flower to flower, settling with expanded wings" (Rev. D. C. Timins). The larva varies from yellowish to grey, with rusty brown warts, red at the ends, and is to be met with in summer. The butterfly is figured at Pl. 2, Fig. 4.

2. *T. Rumina* (Linn.).—Varies from pale yellow (*Medesicaste*, Ill., South France) to ochre yellow (*Rumina*, L., Spain and North Africa), veined and spotted with black. Fore-wings with black borders, spotted in the middle and on the outer edge with yellow. They have also five red spots, and a transparent spot near the tip. Hind-wings dentated, with a dentated sub-marginal black line, within which is a row of red spots, and another red spot near the base. In the variety *Honnoratii* (Boisd.), occasionally found at Digne, the red spots are so much extended as to cover a great part of the wings. Expands from 1½ to 2½ inches. Found in April and May. It is a more active insect than the last, and "frequents localities where the beautiful rose-coloured *Cistus* grows. . . . *Medesicaste* seldom flies after two or three P.M., while *Cassandra* [*Hypermnestra*, var.] is partial to the afternoon sunshine, and may be seen on the wing till four P.M., or even later" (Timins). Mr. G. F. Mathew found *Rumina* common on the Rock of Gibraltar, at the end of February. All the varieties, except *Honnoratii*, appear to be common where they are met with. The larva is greyish or reddish, with six rows of short reddish spines. It is found in March and April. The butterfly is figured at Pl. 2, Fig. 5.

3. *T. Cerisyi* (Godt.).—Yellowish-white, with short black streaks on the costa, and black spots near the margins of all the wings, followed on the hind-wings by an inner row of red ones. Hind-wings irregularly dentated, forming one or more short tails. Found in January, February, and May, in Turkey in Europe and Asia Minor. Larva blackish-grey, with yellow stripes on the back and sides, and a short red spine on each segment. Found in August.

GENUS III.—DORITIS (FABR.).

May be distinguished from the following genus, to which it is closely allied, by the shorter palpi, the curved club of the antennæ, and the absence of a horny pouch in the female. The only species, *D. Apollinus* (Herbst.), measures about 2 or 2½ inches across the fore-wings, which are semi-transparent, and whitish, dusted with dark grey; there are two large black spots on the costa. Hind-wings rounded, yellowish, with a marginal row of black eye-spots with blue centres, and an inner row of red lunules. The larva is black, spotted with red, and lives on *Aristolochia* in April. The butterfly, which is figured at Pl. 2, Fig. 6, is found in the mountains of Asia Minor, and in some of the Greek Islands, in February and March.

GENUS IV.—PARNASSIUS (LATR.).

Large white or yellow butterflies, with rounded wings, semi-transparent at the edges, nearly always with at least two black spots on the costa of the fore-wings, and two round red spots on the hind-wings. The palpi are hairy, and longer than in *Doritis;* the antennæ are short, with a straight club; the body is stout and hairy, and the abdomen of the female is furnished with a singular horny pouch. The larvæ are covered with fine down, and are all very much alike, being black, with red, orange, or yellow spots, and the pupæ are enclosed in a slight cocoon. They feed on different species of Saxifrage. There are nearly thirty species known, inhabiting the mountains of Europe, except the north-west; Asia, to the Himalayas and Japan; and Western North America, from Alaska to California; but many species are very rare in collections.

1. *P. Apollo* (Linn.).—White, fore-wings with several large black spots, one of which is placed near the inner margin. Hind-wings with two large red eye-spots, white in the centre and enclosed in black rings; under-side with several more red spots; antennæ whitish. Expands from 2 to 4 inches. The largest specimens come from Siberia. Common in the mountains of Europe and Northern Asia. It has been reputed British, but is believed not to occur in Britain, nor in the adjacent portion of North-Western Europe, the nearest known locality being Scandinavia, in one direction, and the mountains of the lower Moselle in another. It is found all over Spain; but no insects belonging to the mountain fauna of Europe are met with in the mountains of North Africa. Attempts to introduce it in localities where it is not indigenous have hitherto failed, though the food-plant (*Sedum telephium*) was plentiful. It is found in June, July, and August, and its flight is low and somewhat heavy. At a short distance it much resembles the Black-veined White Butterfly on the wing. The larva is found in May and June. The insect is figured in all stages at Pl. 3, Fig. 1, *a—d.*

2. *P. Phœbus* (Fabr.), (*Delius*, Esp.).—Very like the last, but smaller, measuring from 2¼ to 2½ inches across. The black spots of the fore-wings are smaller, and one or more are often marked with red; that on the inner margin is frequently absent in the male. The antennæ are ringed with black and white. Found in the Alps at a much greater elevation than *Apollo* in July. It is also found throughout Northern Asia; and some of the Himalayan and Californian *Parnassii* have been considered varieties of this insect. In Europe it is a much scarcer and more local insect than *Apollo*, and the larva, which may also be found in July, appears to be almost amphibious, frequenting very wet places; and the pupa must be liable to long-continued immersion in water. The butterfly is figured at Pl. 3, Fig. 2. *P. Nordmanni* (Ménétr.), found in the Caucasus, differs from this in having only two black spots on the fore-wings above, and no red spots at the base of the hind-wings beneath.

3.



A. B.

3. *P. Mnemosyne* (Linn.).—Wings white, fore-wings dusky at the tips, and with two black spots near the costa, but no red spots. Expands from 2 to 2½ inches. It is found in Scandinavia, Eastern and Central Europe, and in Asia Minor, chiefly in the mountains. It is an extremely local insect in the Alps, though common where it occurs, in a few damp Alpine valleys. It has been reputed British, but on no reliable authority. The butterfly is found in June and July, and the larva, which feeds on *Corydalis Halleri*, and conceals itself during the daytime, may be looked for in April and May. Figured in all stages at Pl. 3, Fig. 3, *a—c*.

FAMILY II.—PIERIDÆ.

This family differs essentially from the last in the inner margin of the hind-wings not being concave. It contains a number of middle-sized white or yellow butterflies, generally with black borders, and the wings are never dentated, though with angular projections in one genus. The larvæ are slender, thinly covered with fine hairs, and have no protrusile fork on the neck. The pupæ are all attached by the tail, and by a thread round the body. The butterflies frequent gardens, fields, and open places in or near woods. Among the foreign species the prevailing colours are also white and yellow, though some are beautifully marked on the under surface of the wings. With few exceptions, they do not greatly surpass our native species in size.

GENUS I.—LEUCOPHASIA (STEPH.).

White, delicately formed butterflies, with no spot in the centre of the fore-wings; abdomen very slender, reaching beyond the hind-wings. Pupa with a projection in front, giving it a boat-shaped appearance. The few species of this genus are found in Europe and Northern Asia.

* 1. *L. Sinapis* (Linn.), (*Wood White*).—Wings white, fore-wings (except in variety *Erysimi*, Borkh.) with a rounded ash-coloured spot at the tip. Expands about 1½ inches. It is found from May to August in shady woods, and its flight is very weak. Abundant in most parts of Europe, and in Northern and Western Asia. It is very local in England, Ireland, Holland, and the Lower Rhine district generally; and in many localities extremely rare. The larva is green, with yellow stripes on the sides; it lives in June and September on vetch and trefoil. Figured in all stages at Pl. 4, Fig. 1, *a—c*. (*L. Duponcheli*, Staud., from South France, has a triangular spot at the tip of the fore-wings, generally extending to the inner margin, and the base of the wings yellowish.)

GENUS II.—EUCHLOE (HÜBN.).

Fore-wings rounded at the tip, which is generally marked with an orange blotch in the male; hind-wings green beneath, chequered with white or yellow, or with silvery-white streaks or spots. Antennæ slender and rather short; abdomen slender. The larvæ feed on many cruciferous plants. Pupa boat-shaped. This genus is found throughout Europe, Asia, North Africa, and Western North America. "Orange Tips," belonging to other genera, are numerous in Africa and in the East Indies; some of those from the East Indies, belonging to the genus *Hebomoia* (Hübn.), are the largest of all the *Pieridæ*, measuring 5 or 6 inches across the wings.

1. *E. Belemia* (Esp.).—White, fore-wings with a large black spot in the middle of the costa; the tip greenish-black with white spots. Under side of hind-wings and tip of fore-wings green, with silvery or (in variety *Glauce*, Hübn.) with white streaks. Expands about 1½ inches. Found in meadows in South Spain and North Africa, from December to May. Larva yellow, with rose-red streaks on the back and sides.

2. *Ausonia* (Hübn.), (*Simplonia*, Freyer).—Upper side as in the last species; under side of hind-wings green, mixed with yellow in variety *Esperi* (Kirb.), *Ausonia* (Ochs.), and spotted with white, or in variety *Crameri* (Butl.), *Belia* (Cram.), with silvery white. A double-brooded insect, found from March to June in South Europe, North Africa, and Asia Minor. The typical form is found in the Alps and Altai in June and July; the others are broods of the same species, which are found on level ground, as far north as Paris. They vary from $1\frac{1}{4}$ to $1\frac{3}{4}$ inches in expanse, the spring brood, *Crameri*, being the smallest. The larva resembles that of *Belemia*, but the streaks are blue. It passes one winter, and sometimes two, in the pupa state.

3. *E. Tagis* (Hübn.).—Smaller than the last, measuring from 1 inch to $1\frac{1}{4}$ inches across, but greatly resembling variety *Crameri*. The under side of the hind-wings is more greyish-green, sometimes slightly washed with yellow, and the spots are white, rarely silvery, and never yellowish, nor are the nervures yellowish. Found from February to May in South France, Spain, Corsica, and South Russia. The larva, which feeds on *Iberis pinnata* in June, is green, with a white stripe on each side, and a bright red one above it.

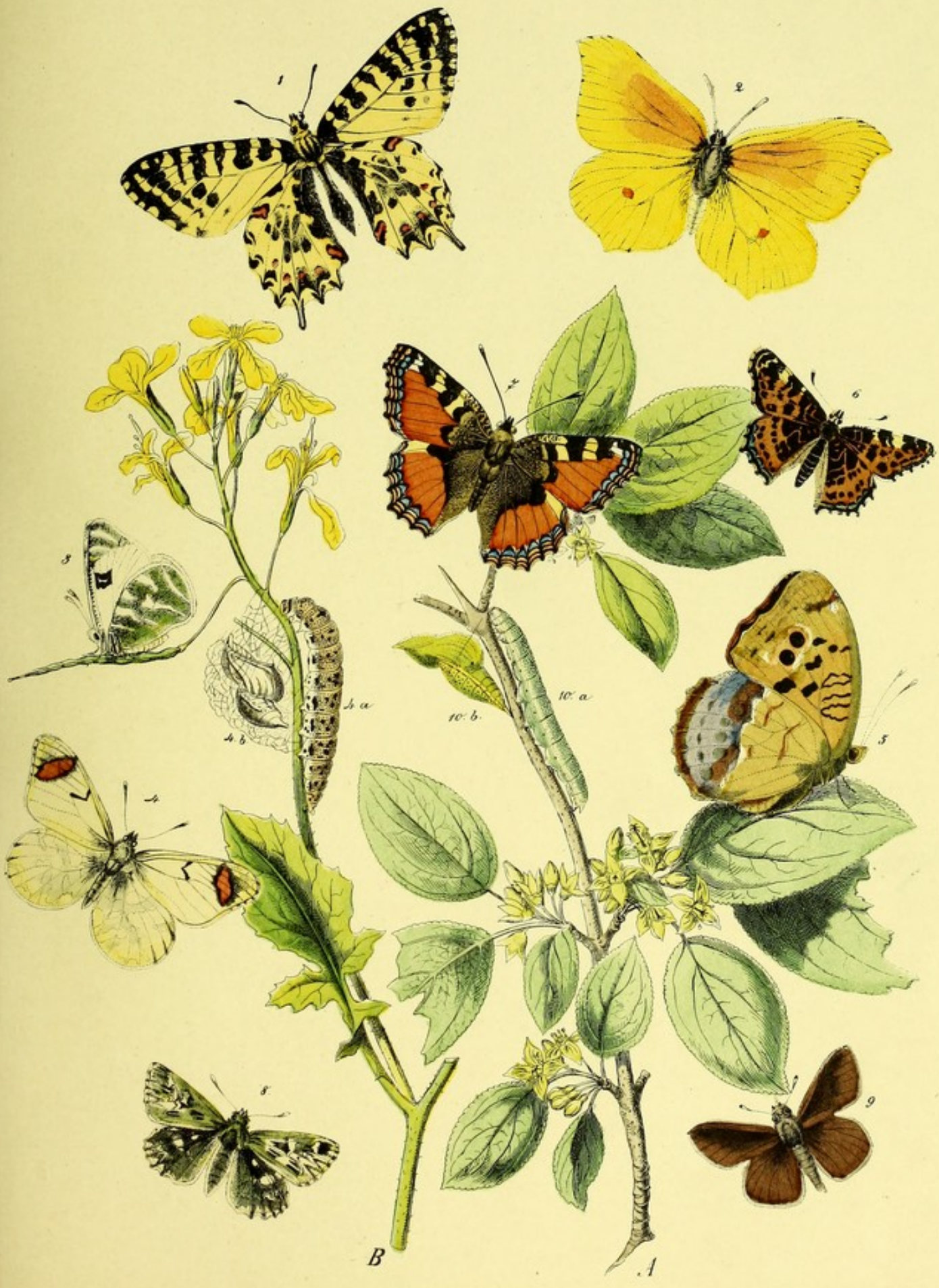
* 4. *E. Cardamines* (Linn.), (*Orange Tip*).—White, fore-wings with the tip blackish, and a black spot at the end of the cell, the intermediate space bright orange in the male. Hind-wings and tip of fore-wings chequered with green and white beneath. Expands from $1\frac{1}{2}$ to 2 inches. The female is much scarcer and varies more in size than the male. Common throughout Europe and Western Asia from April to June. The larva is green, with a white stripe on each side; it feeds on various cruciferous plants, including the common garden rocket. The butterfly often sits with its wings raised, on the flowers of umbelliferous plants, to which the colouring of the under side perfectly corresponds. The sexes are figured at Pl. 4, Fig. 7, *a*, *b*.

5. *E. Turritis* (Ochs.), from Italy, has generally been considered a variety of this; but Mr. J. Watson, who has given so much attention to the scales of butterflies, informs me that it has a different plumule. It is smaller, with the black spot of the male on the edge of the orange portion of the fore-wing, instead of distinctly within it.

6. *E. Gruneri* (Herr. Schäff.) differs from *Cardamines* in its smaller size, measuring less than $1\frac{1}{2}$ inches across the wings. The white ground-colour is often tinged with yellow, and the inside of the orange spot of the male is bordered by a short dusky line, sometimes broken into two spots. The under side of the hind-wings is green, with yellowish markings and distinct white spots. Inhabits Greece and Turkey. (*E. Pyrothoe*, Eversm., found in South Russia in April, is about the same size, but may be distinguished from any other white *Euchloe* with an orange tip by the hind-wings, which are green beneath, with large white oblong spots. It is very scarce in collections.)

7. *E. Eupheno* (Esp.) resembles *Cardamines* above, but the male is sulphur-yellow, and the orange spot is bordered within by a black line. The female is white, with a large discoidal spot, and the tip brownish-yellow. Under side of hind-wings yellow, with three distinct green streaks, which are all connected. Expands about $1\frac{1}{2}$ inches. Found in April and May in South France, Spain, and Italy, where it is common in waste places. A smaller but closely-allied species (*E. Belia*, Linn.), with narrower streaks on the under side of the hind-wings, inhabits Algeria and Morocco. The larva of *E. Eupheno* is yellow, with a white stripe on each side, bordered above with blue, and separated from a yellow streak below it by a row of black dots. It feeds on *Biscutella didyma* in July. The male butterfly is figured on Pl. 4, Fig. 8.

8. *E. Damone* (Feisth.), which inhabits Turkey and Greece in March and April, is yellow in the male, with an orange spot, and white in the female; but may be distinguished from any other species by the under side of the hind-wings, which is mottled irregularly with green and yellow.


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A

GENUS III.—ZEGRIS (RAMB.).

Antennæ very short, abdomen rather short and stout, thorax stout, very hairy; pupæ with a short, obtuse spike in front, and a sort of arched tail behind. The only species is *Z. Eupheme* (Esp.), which is white, with a large black lunule at the end of the cell of the fore-wings, which are green or grey at the tip, and marked with an oblong orange streak, bordered with black on the inside. The hind-wings are yellow beneath, with greenish streaks, and several white spots. Expands from 1½ to 1¾ inches. It is common in meadows from April to June in Spain, South Russia, and Asia Minor, but is always scarce in collections. Specimens from these different localities vary a little, but are probably not distinct, though they have received different names. The larva is yellow, with a white stripe and three rows of white spots on each side. It feeds on *Sinapis incana.*

GENUS IV.—PIERIS (SCHRANK).

This genus contains the White Cabbage Butterflies, three species of which are abundant everywhere. The antennæ are rather long and slender, with a distinct knob at the end, and the wings are white, with black tips and spots. The pupæ are not pointed.

* 1. *P. Daplidice* (Linn.), (*Bath White*).—Wings white above, with a large black spot in the middle of the costa of the fore-wings, which are more or less bordered with blackish markings, enclosing distinct white spots. The markings of the under side show slightly through on the hind-wings, which have blackish marks near the edges in the female. The hind-wings are green beneath, with two rows of broad white spots beyond the middle and on the margin. It is found in spring and autumn, the butterflies of the autumn brood being the largest and commonest. Expands from 1½ to 2 inches. It is common in most parts of South and Central Europe, North Africa, and Western Asia, but is a great rarity in the south of England. In Germany I have usually taken it in stubble fields in autumn, and its flight is low and heavy. The larva, which is greyish-green, with yellow stripes on the back and sides, lives on cabbage, weld, &c., in June and September. The butterfly is figured at Pl. 4, Fig. 6. (*P. Chloridice*, Hübn., a scarce insect found in various parts of Russia and Turkey, resembles this, but the dark markings on the hind margin are much less extensive in both sexes, and there is much more white on the hind-wings beneath.)

2. *P. Callidice* (Esp.).—White, the hind margins more or less bordered with black, and a black spot at the end of the discoidal cell of the fore-wings. Hind-wings green beneath, with whitish spots shaped like arrow-heads. Size of *Daplidice.* Found in July and August on high mountains, up to the snow-line along all the central ranges from the Pyrenees to the Himalaya. Larva deep greyish-blue, with white stripes. Feeds on Alpine *Cruciferæ* in August and September.

3. *P. Krueperi* (Staud.).—White, fore-wings with some black spots on the hind margin, a black spot on the costa near the tip, and a second below it, at about half the breadth of the wing. Hind-wings with a black spot on the costa. Under side of fore-wings white, yellowish at the tip, with only the two spots marked: the first is greenish, and the second black, larger than above. Under side of hind-wings dull green, with the outer third of the wing and a very large blotch near the costa paler. Expands 2 inches. It inhabits the mountains of Greece and Asia Minor. It is not a variety of the Indian *P. Canidia* (Sparrm.), as some writers have supposed.

* 4. *P. Napi* (Linn.), (*Green-veined White*).—White, fore-wings with the tip dusky, and with one black spot in the male, and two, and a black dash on the inner margin, in the female. Hind-wings with a spot on the costa above; beneath yellowish, with very broad greenish veins. Expands from 1½ to 2 inches. Common from April to August throughout Europe and Northern

and Western Asia, in fields and open woods. In the Arctic regions and the Alps, a brownish variety of the female (*Bryoniæ*, Hübn.) is met with. Some writers consider that this butterfly is a survivor of the Glacial epoch, and that *Bryoniæ* represents the form of the species which was then in existence. The larva is dull green, paler on the sides. It lives on rape, &c., in June and September. The under surface of the butterfly is shown on Pl. 4, Fig. 5.

* 5. *P. Rapæ* (Linn.), (*Small Cabbage White*).—Fore-wings white, with a small brownish spot at the tip, the male with or without a black spot in the middle, and the female with two, and a dash on the inner margin. Hind-wings, above with a black spot on the costa, beneath yellowish. Expands from 1½ to 2½ inches. It is found throughout the year in gardens in Europe, North Africa, and Northern and Western Asia. Its reported occurrence in West Africa requires confirmation. The larva is dull green, with a yellow stripe on the back, and yellow dots on the sides. It lives on cabbages, &c., in June and September, eating into the heart of the cabbage. This insect has lately been introduced into North America, and is spreading rapidly throughout the United States and Canada. It has already become a very destructive insect; but what is more remarkable is, that a yellow variety, scarcely known in Europe, has appeared in America, and it will be very interesting to see if it will become the normal American form of the species. Small varieties of *P. Rapæ*, called *Mannii* (Meyer) and *Ergane* (Geyer), are found in South-Eastern Europe; the latter has only one black spot in the female, and the under side of the hind-wings is paler yellow than in *P. Rapæ*, the female butterfly of which is figured, with the larva, at Pl. 4, Fig. 4, *a*, *b*.

* 6. *P. Brassicæ* (Linn.), (*Large Cabbage White*).—White, fore-wings with the tip black, the colour extending along more than half the hind margin; the male with a black spot on the costa of the hind-wings, and the female with two on the fore-wings, and a black dash on the inner margin. Hind-wings and tips of fore-wings yellowish beneath, dusted with black. Closely resembles *P. Rapæ*, but considerably larger, generally measuring about 2½ inches across, and with the dark mark at the tip of the fore-wings much larger and darker. Abounds in fields and gardens in Europe, Northern and Western Asia as far as the Himalayas, and North Africa, but does not occur in the extreme north of Europe or Asia. In the Canary Islands it is replaced by a form with very large black spots (*P. Cheiranthi*, Hübn.), and the intermediate variety found in Madeira is said to be identical with the North Indian variety *Nepalensis* (Gray). This is extremely interesting, because another butterfly, *Pyrameis Indica* (Herbst.), is found only in the East Indies and the Canaries, but in no intermediate locality. There are several broods of this butterfly throughout the year; at Gibraltar it appears as early as February. The larva is bluish-green, with yellow streaks, and lives on cabbages in June and September. The pupa is common on walls and palings, and is often surrounded by the little yellow cocoons of an ichneumon fly, which lays its eggs in the body of the larva, which hatch into grubs that feed upon it, and eventually destroy its life. The male butterfly and the larva are represented on Pl. 4, Fig. 3, *a*, *b*.

GENUS V.—APORIA (HÜBN.).

Antennæ longer and thicker than in *Pieris*, with the club more gradually formed; veins of the wings very strongly marked. Pupa not pointed.

* 1. *A. Crataegi* (Linn.), (*Black-veined White*).—Wings white, semi-transparent in the female, with black nervures. Expands from 2½ to 2¾ inches. Abundant in most parts of Europe and Western Asia, but somewhat uncertain in appearance. Pallas saw them in such numbers in Siberia as to look like snow-flakes. It is a very local insect in the south of England and


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Wales, and is not known to occur in Scotland, though not unlikely to be found in the south-east of Ireland. It flies in fields and gardens from May to July; there is but a single brood in the year, which lasts a very short time, the flight being generally quite over within a month after the appearance of the first specimens. The larva is ashy grey, the back black, with two reddish-yellow stripes. It lives from autumn to May on hawthorn, sloe, and various fruit-trees, and is often very destructive to orchards on the Continent, in seasons when it happens to be abundant. The insect is figured in all stages at Pl. 4, Fig. 2, *a*—*c*.

GENUS VI.—COLIAS (FABR.).

Middle-sized yellow butterflies, with rounded wings, the black borders of which are often veined or spotted with yellow. Fore-wings with a black spot in the middle on both sides, hind-wings beneath with a whitish central spot surrounded with darker, which has often a small dark spot close by it, forming together a figure of 8. Antennæ with a gradually thickened club. The larvæ feed on clover and other leguminous plants, and the pupæ have a prominent ridge on the back.

1. *C. Palæno* (Linn.).—Wings sulphur-yellow in the male, and greenish-white in the female, with a broad unspotted black border; the fringes rose-colour. Under side greenish, dusted with black on the hind-wings, which have a small white spot in the middle, surrounded with brown. Expands from 1½ to 1¾ inches. This species, as well as the closely-allied North American *C. Philodice* (Godt.), have been erroneously reputed British. *C. Palæno* is found on moors and mountains in Northern and Central Europe, and Siberia, but is very local, and appears to be absent from South Europe, and the British Islands, and the adjacent parts of the Continent. Its reputed occurrence in Greenland, Iceland, North America, and the Neilgherries requires confirmation, as other species may have been mistaken for it. The northern varieties of *Palæno* are paler, with a narrower border, and like most Polar *Colias*, of a darker green beneath. The butterfly is found in June and July; and the larva, which is green, with yellow stripes and black dots, feeds on *Vaccinium uliginosum* in Germany, in May, and on *Coronilla* in Sweden, in August and September. Male figured Pl. 5, Fig. 1. (*C. Nastes*, Boisd., variety *Werdandi*, Zett., is smaller than this, with a narrower and paler black border, composed of confluent spots, which sometimes does not extend beyond the middle of the hind-wings. It is found in Lapland.)

2. *C. Phicomone* (Esp.).—Wings greenish-yellow above in the male, and greenish-white in the female, with the nervures dusted with blackish, and an ill-defined blackish border, spotted with yellow. Fore-wings with a black spot in the middle, and hind-wings with a yellow one. Hind-wings beneath with a whitish spot in the middle, which is broadly surrounded with rose-colour, and is sometimes double. The fringes of all the wings are rose-colour. Expands from 1½ to 2 inches. Common in the Pyrenees, Alps, and Carpathians in July and August, at an elevation of 3,000 feet and upwards. The larva is dark green, with a white stripe on the sides, spotted with yellow beneath. It lives on vetches in May and June. The butterfly is figured at Pl. 5, Fig. 2.

* 3. *C. Hyale* (Linn.), (*Pale Clouded Yellow*).—Wings sulphur-yellow in the male, and greenish-white in the female, with a blackish-brown border spotted with pale yellow, which does not extend fully to the hinder angle of the fore-wings, and is much narrower on the hind-wings. A black spot in the middle of the fore-wings, and a yellow spot on the hind-wings, the latter replaced beneath by a double silvery spot, surrounded by two brown lines. Expands from 1½ to 2 inches. This butterfly used to be a great rarity in the south-eastern counties of England, but like *C. Edusa* it is now extending its range all over the British Isles, along with the increasing cultivation of

the various kinds of clover on which the larva feeds. It is double-brooded, but is commonest in Central Europe in autumn, though in the south it may be found throughout the year, and has been noticed in Malta as early as March. It is one of the most widely distributed of all butterflies, inhabiting the whole of Central and Southern Europe and Asia, as far as Japan and the Himalayas, and South as well as North Africa. It is generally one of the very commonest autumn butterflies in fields and meadows on the Continent, and its flight is much less rapid than that of *Edusa*. The larva, which is green, with yellow longitudinal stripes, may be found in June and July. It is figured, with the butterfly, at Pl. 5, Fig. 3, *a*, *b*. (*C. Erate*, Esp., found in South Russia and India, is yellow, with a broad black border to all the wings, which is spotted with yellow in the female.)

4. *C. Chrysotheme* (Esp.).—Wings yellow above, suffused with orange, with a blackish-brown border, veined with yellow in the male, and spotted with pale yellow in the female. Hind-wings with a reddish-yellow central spot, represented beneath by a double silvery-white spot, surrounded by two brown lines. Extremely local in Austria in July and August. It also inhabits some parts of Western Asia. The *C. Chrysotheme* and *Myrmidone* of British authors are only varieties of *C. Edusa*.

* 5. *C. Edusa* (Fabr.), (*Clouded Yellow*).—Uniform bright orange, with a broad black border, veined with yellow in the male, and spotted with pale yellow in the female. Hind-wings with a reddish-yellow central spot, represented below by a double silvery-white one, surrounded by two brown lines. *C. Helice* (Hübn.) is a white form of the female, a variation which is liable to occur in the females of most of the orange species of *Colias*. Expands from $1\frac{3}{4}$ to $2\frac{1}{2}$ inches. Its range is co-extensive with that of *C. Hyale*, except that it is replaced in South Africa by the closely-allied *C. Electra* (Linn.). It may be found throughout the year on the Continent, even as early as February at Malta, but is rarely seen in England before August. It is a much commoner insect than *C. Hyale* in the British Islands, though rarer on the Continent, and is also somewhat irregular in appearance. It was particularly abundant in Britain in 1877, but by no means so elsewhere. The larva is dark green, with a white stripe spotted with yellow on the sides. It is found in June and July on several leguminous plants. The butterfly is found in clover-fields, and its flight, though low, is more rapid than that of almost any other butterfly, so that it is no easy matter to capture it except when resting on a flower. Both sexes are represented, with the larva and pupa, at Pl. 5, Fig. 4, *a*—*d*. (*C. Hecla*, Lef., found in Iceland (?), Lapland, and Greenland, as far north as the Polar expeditions have penetrated, resembles this, but is smaller and duller in colouring, with a long and narrow black spot, instead of a round one, on the fore-wings, and with the hind-wings very dark green beneath. *C. Aurorina*, Herr.-Schäff., var. *Heldreichi*, Staud., found in the mountains of Greece, is another species closely allied to *C. Edusa*, but much larger. The male is magnificently shot with purple.)

6. *C. Myrmidone* (Esp.).—Closely resembles *C. Edusa*, but the black border is rather narrower, rarely with orange veins in the male, and the ground colour of the wings above is deep reddish-orange, often suffused with purple. Expands from $1\frac{1}{2}$ to $1\frac{3}{4}$ inches. Ranges from Eastern Germany to the Altai and Himalayas. It is found in meadows in summer and autumn. The larva is green, with a dark-green streak on the back, and light-green streaks on the sides. It is found in March, April, and October, on *Cytisus biflorus*.

GENUS VII.—GONEPTERYX (LEACH).

Wings with no black border, but each with a short broad projection. Antennæ short and thick, body very hairy. The common Brimstone Butterfly (**G. Rhamni*, Linn.) is one of the most


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A. B. C.

conspicuous of our native insects, and as it hybernates and re-appears very early in the spring, it may be found nearly all the year round, and is nearly always in fine condition. Expands from 1¼ to 1½ inches; the male is sulphur-yellow, and the female whitish-yellow, and there is a small orange spot in the middle of each wing. The butterfly abounds in and near woods in most parts of Europe, Asia, and North Africa; but though common in the south of England, it is unknown in Scotland, and the only certain locality in Ireland is Killarney, though it is also said to have been taken occasionally in Wicklow. The larva is dull green, paler on the sides, with a dull white stripe on each side. It feeds on buckthorn from May to July. The male butterfly is represented at Pl. 4, Fig. 9, and the larva and pupa at Pl. 51, Figs. 10*a*, *b*.

G. Cleopatra (Linn.), found on the shores of the Mediterranean, has the wings rather less angulated, and the fore-wings of the male are orange, except on the margins. *G. Cleobule* (Hübn.), found in the Canaries, has the whole of the fore-wings orange. Some writers consider *G. Cleopatra* to be a variety of *G. Rhamni*, but Rambur states that they present anatomical differences. The butterfly is figured at Pl. 51, Fig. 2.

FAMILY III.—NYMPHALIDÆ.

Middle-sized or large butterflies, generally brightly coloured. The fore-legs of the male are quite rudimentary, consisting of a roughly-haired paw of apparently only two joints; in the female the separate portions are present, but small. The larvæ are spiny, or have fleshy warts covered with hair, or horns on the head. The pupæ are suspended by the tail.

GENUS I.—VANESSA (FABR.).

Brightly-coloured butterflies, with broad, dentated wings, nearly always with angular projections. Larvæ warty, with long, branching spines; the second segment without spines. Some species have spines on the head also. Some are gregarious, and others solitary, sometimes living between leaves which they have spun together. The pupæ have a double point on the head, and a nose-shaped projection on the back. They are generally metallic-spotted. The butterflies are found in gardens, fields, and woods, and are very fond of sucking the honey from thistles and other tall flowers. They may also be observed at fruit, or sucking the sap oozing from the trunks of trees. Most of the species are very common; and as they are generally double-brooded, and the second brood passes the winter in the perfect state, re-appearing on the first fine days of early spring, they may be found almost throughout the year. There is no month during which *V. Urticæ*, for instance, may not be occasionally observed on the wing in the south of England.

* 1. *V. Atalanta* (Linn.), (*Red Admiral*).—Velvety black, with an orange-red band across the fore-wings and bordering the hind-wings; in the latter it contains a row of black dots, and a larger blue spot at the anal angle. The tip of the fore-wings is spotted with white, and is bordered on the outside by a bluish line; the fringes of all the wings are also spotted with white. Expands from 2 to 3 inches. Common in gardens throughout Europe, North Africa, and Western Asia. Larva pale yellow, brown, or black, with a dark-grey head, a yellow stripe on the sides, and yellow spines. Lives on nettles, between leaves which it has spun together, in May and June. It is single-brooded, and the butterfly is rarely seen till summer and autumn in Northern Europe. It is figured on Pl. 6, Fig. 1. (*V. Indica*, Herbst., which has a broader, paler, and indented orange stripe on the fore-wings, is found in the East Indies and the Canaries, and has lately been introduced into Spain and Portugal.)

* 2. *V. Antiopa* (Linn.), (*Camberwell Beauty*).—Chocolate-brown, with a broad white or yellow border, and two spots of the same colour on the costa of the fore-wings. Within the border is a row of blue spots. Under side black, with white borders. Expands from 2½ to 3½ inches. Common during most of the year in the greater part of Europe, North Africa, Northern and Western Asia, and North America; the last-named specimens are larger and darker than European. It is absent from the steppes of South Russia, and is very scarce and uncertain in appearance in Britain, and in some of the adjacent parts of Europe. The yellow variety prevails on the Continent, but is scarcely ever found in Britain. The larva is black, with black spines and large rust-coloured spots on the back. The legs are of the same colour. It lives gregariously on birch and willow from June to August. Figured in all stages, Pl. 6, Fig. 2, *a—c*.

* 3. *V. Io* (Linn.), (*Peacock Butterfly*).—Dark red, with brown borders. Fore-wings with two black blotches on the costa, separated by a small yellow spot. Outside these markings and the border the wing is varied with yellow, black, blue, red and white; below these markings are two white spots. Hind-wings with a very large black spot in a buff ring at the front angle, marked with several blue spots. A large black crescent-shaped spot on the front edge of the wing, just within the buff ring. Common throughout the year in Central and Southern Europe, and Western and Northern Asia as far as Japan. In Northern Europe (including Scotland) it is rare; and it is said to be absent from Andalusia and Sicily. Expands from 2 to 3 inches. The larva is black, dotted with white, and lives gregariously on nettle from June to August. The insect is represented in all stages on Pl. 6, Fig. 3, *a—c*.

* 4. *V. Urticæ* (Linn.), (*Small Tortoiseshell*).—Reddish-orange, hind margin black, spotted with blue on all the wings. Three large black spots divided by yellow ones, and with a smaller white spot beyond the outermost, on the costa of the fore-wings. Another large black spot near their inner margin, and two smaller ones near the middle of the wing. Hind-wings broadly black at the base. Expands from 1½ to 2¼ inches. (*V. Ichnusa*, Bon., from Corsica and Sardinia, wants the small black spots on the fore-wings. *V. Caschmirensis*, Koll., from North India, is larger and darker.) *V. Urticæ* is common throughout Europe and Western Asia in gardens and weedy places. The larva, which lives gregariously on nettles in June and July, is striped with blackish and dull brownish-yellow. *V. Urticæ* is figured at Pl. 6, Fig. 4, and *V. Levana* at Pl. 51, Fig. 7.

5. *V. Xanthomelas* (Esp.).—Very like *V. Polychloros*, but redder, the wings shorter and more dentated; the first black spot on the costa is divided into two round spots, and there is a whiter spot outside the last; the legs, too, are pale yellow, whereas they are brownish in *Polychloros*. Expands from 2 to 2½ inches. A local insect in Eastern Europe, generally found near rivers, as the larva, which is bluish-black, dotted with white, with whitish stripes on the back and sides, and black spines, lives gregariously from May to July on smooth-leaved willows. The butterfly may be found from July to September, and is figured at Pl. 7, Fig. 1.

* 6. *V. Polychloros* (Linn.), (*Large Tortoiseshell*).—Deep fulvous, the hind margins rather broadly black, spotted with blue on the hind-wings only. Fore-wings with three black blotches on the costa, separated by pale yellow spots; three black spots in the centre of each wing, and a fourth near the hinder angle. Hind-wings with a large black blotch in the centre of the costa, bounded exteriorly by a pale yellow blotch. Expands from 1¾ to 2¾ inches. Common during most of the year in Southern and Central Europe, including the south of England, and in Northern and Western Asia. The larva is greyish-brown, with dull, rusty-yellow stripes on the back and sides, and rusty-yellow spines. It feeds gregariously on elms and cherry-trees from May to August, and is sometimes sufficiently abundant to be considered an injurious insect on the Continent. The butterfly is represented at Pl. 6, Fig. 5.



A. B.

7. *V. V-album* (W. V.).—Markings similar to those of *Polychloros*, but the ground colour deeper, and no blue lunules on the borders of the wings. The tip of the fore-wings is black, with a large white triangular spot on the inside. A large white blotch on the costa of the hind-wings, and a row of yellowish spots within their black hind margin. On the under side they are marked with a small white spot in the middle. Expands from 2 to 2½ inches. Very local in Eastern Germany and Russia in September. The larva is brown, with ochre-yellow stripes on the back and sides, and yellow spines tipped with black on the head and body. It lives gregariously on aspen in July and August.

* 8. *V. C-album* (Linn.), (*Comma*).—Deep fulvous, with dark-brown spots and borders, the latter marked with yellow lunules. Wings beneath brown, more or less varied with greenish, yellowish, and whitish; hind-wings with a white mark like a C in the middle. All the wings are very strongly dentated, and the longest projection is on the middle of the border of the hind-wings. The inner margin of the fore-wings is concave. Expands from 1½ to 2¼ inches. Common during most of the summer in Europe, and in Northern and Western Asia, along hedges and the borders of woods. It is a local insect in England and Wales. Many species closely allied to this are found in North America. The larva is brown and spiny, and the back is reddish, yellow in front, and white behind. There are two short spines on the head. It is a solitary feeder, and lives in June and July on elm, hop, gooseberry, currant, &c. The insect is represented in all stages at Pl. 7, Fig. 2, *a—d.*

9. *V. Egea* (Cram.), *Triangulum* (Fabr.).—Very similar to the last species, but paler, and with smaller dark spots. The wings are less strongly dentated, and the inner margin of the fore-wings is only slightly concave. The under side of the hind-wings is varied with yellow and violet-grey, and has a small white mark in the middle shaped like an acute angle. Expands from 1½ to 2 inches. Frequents gardens and sunny walls in Europe, south of the Alps; it is also found in Asia Minor and Persia. It appears in April, May, June, and September. The larva is pale blue, with black and yellow transverse stripes on the second segment. The other segments have strong spines. It lives on *Parietaria officinalis.*

* 10. *V. Cardui* (Linn.), (*Painted Lady*).—Brick-red, with black spots. Fore-wings with the tip and hind margin broadly black, the tip spotted with white. Under side of hind-wings yellowish-grey, marbled with different colours; a large whitish triangular spot in the centre. A bluish line on the border hardly divided into spots, within which are four black eye-spots in pale rings. Hind margin of fore-wings slightly excavated; that of hind-wings rounded and dentated. Expands from 2 to 2¾ inches. Common throughout the summer over nearly the whole world, except South America. Frequents waste and weedy places; I have often met with it on the tops of hills, in company with *V. Atalanta.* Larva dark grey, with yellow stripes on the back and sides, and with yellow spots; the spines yellow or grey. It lives singly on nettles, thistles, &c., the leaves of which it spins together, and may be found, like the perfect insect, throughout the summer. Figured in all stages on Pl. 7, Fig. 3, *a—d.* (*V. Ionia*, Eversm., placed here in my "Manual of European Butterflies," is omitted, as it is not a European species, but confined to Asia Minor. *V. Virginiensis*, Drury, is sometimes included among the British butterflies under the name of *V. Huntera*, Fabr., or the Scarce Painted Lady. It is very like *V. Cardui*, but the black markings are less extensive, and the under side of the hind-wings is reticulated with brown and white, and there are two large eye-spots near the hind margin. It is a common insect in North America, and as it has become naturalised in the Azores and Madeira, and has several times been taken in England, it is not unlikely to become ultimately established in the latter country. The larva feeds on *Gnaphalium obtusifolium.*)

11. *V. Levana* (Linn.).—The smallest species of the genus, expanding under 1½ inches. The hind margins of the fore-wings have two slight projections, and the hind-wings have a projection in the middle, making the outer margin nearly rectangular. The first brood, found in April and May, is fulvous with black spots; there are three white spots near the tip of the fore-wings, and rows of black spots across all the wings. Under side brownish-red, mixed with violet and pale yellow, with pale yellow veins and transverse lines. The second brood (*V. Prorsa*, Linn.), found in July and August, is black, with a red marginal line, and a white transverse band, interrupted on the fore-wings. The under side is similar to *V. Levana*, but redder, and the yellow markings are replaced by white. Intermediate varieties (*V. Porima*, Ochs.) are also occasionally met with. It has been erroneously reputed British, and is local in damp woods throughout Southern and Central Europe, and Northern and Western Asia. Larva black, sometimes striped with brown, with black or brown spines, and with spines on the head. Lives gregariously on nettles in June and September. *V. Prorsa* is figured, with its larva, at Pl. 7, Fig. 4, *a*, *b*.

GENUS II.—MELITÆA (FABR.).

These butterflies are rather below the middle size, and their wings may be described either as fulvous above, with rows of black spots, or blackish, with rows of fulvous spots; beneath, the fore-wings are paler, with fewer dark markings, and the hind-wings are brown or red, with three pale bands edged with black; of which those at the base and on the border are often broken into spots. The larvæ are thickly covered with spiny tubercles, and live in autumn under a common web. After hybernation they disperse, and may be found under dry leaves. The pupæ are thick, and obtuse in front. The butterflies are found in summer in flowery places and meadows near woods. They are generally called "Fritillaries" in England, and differ from the "Fritillaries" of the following genus by the absence of silvery markings on the under surface of the wings. This genus is found throughout Europe, North Africa, the greater part of Asia, and the west of North America. In other parts of North and South America it is represented by the allied genus *Phyciodes*. The species allied to *M. Athalia* form the most difficult group of this genus, and are not yet perfectly understood.

1. *M. Maturna* (Linn.).—Dark brown, with rows of reddish spots, with whitish ones between them. Hind-wings beneath orange, with four spots near the base and another outside them, a central band divided by a black line, and a row of small crescents before the border, all pale yellow; no black spots between the border and the central band. Expands from 1½ to 1¾ inches. Erroneously reputed British. It is found throughout Central Europe and Asia, from Paris to the Altai, but is always very local. It is found in May and June in open glades and flowery slopes in the neighbourhood of woods. Larva black, with black spines and rows of yellow spots, the uppermost divided by a black line. Lives on young ash-trees, snowball-tree, sallow, plantain, and scabious in May. The butterfly is figured at Pl. 8, Fig. 1.

2. *M. Cynthia* (W. V.).—Wings of the male black, spotted and banded with white; a row of red spots near the border of the hind-wings, and one or two red spots on the fore-wings. Female brownish-yellow, with black transverse stripes; under side of hind-wings as in *Maturna*, but much duller, and there is a row of black dots before the marginal lunules. Expands about 1½ inches. Common in Alpine meadows in July and August, generally above the tree limit. The larva is black, with yellow rings, and a row of yellow streaks on the sides; spines black. It feeds on plantain and violet in June. The male butterfly is represented at Pl. 8, Fig. 2. (*M. Iduna*,


3d
4b
2d
2b
3c
2c
3a
1
4a
2a
3b
A
B
B

Dalm., found in Lapland, differs from the male of *Cynthia* in having more and paler spots on the wings, arranged in rows, and no white spots at the base of the fore-wings above.)

* 3. *M. Aurinia* (Rott.), (*Greasy Fritillary*).—Fulvous, tesselated with black, and spotted with pale yellow. The outer fulvous band of the hind-wings contains a row of black dots. Hind-wings beneath pale brick-red, rather shining, with spots at the base, as in *Maturna*, a central band, edged on both sides with a black line, and marginal spots all pale yellow; before the last is a row of black spots in pale rings. Expands from 1½ to 1¾ inches. It is local in Britain, frequenting marshy meadows from May to August. It is common in most parts of the Continent, North Africa, and Northern and Western Asia. The local varieties of several species of *Melitæa* are very numerous; among those of *M. Aurinia* we may notice the Alpine form, *M. Merope* (De Prunn.), which is smaller, paler above, and dusted with blackish; and the South European varieties, *M. Provincialis* (Dup.), larger and more suffused; and *M. Desfontainii* (Godt.), which is dark reddish-brown. The larva of *M. Aurinia* is black, with rows of white dots; spines yellowish, black at the tips; head black; legs reddish-brown. Feeds on scabious, plantain, speedwell, foxglove, &c., in April, May, July, and September. Figured in all stages at Pl. 8, Fig. 3, *a—d*. (*M. Bætica*, Ramb., from Andalusia, resembles *M. Aurinia*, var. *Desfontainii*, but the outer yellow band of the under side of the fore-wings is edged with black dashes.)

4. *M. Didyma* (Esp.).—Reddish fulvous, with marginal and central rows of black spots, and others more scattered. Hind-wings beneath sulphur-yellow, with large black spots, and two reddish-yellow bands. Expands from 1¼ to 1¾ inches. Very variable; locally abundant in Central and Southern Europe, North Africa, and Western and Central Asia. A specimen was recently taken in Scotland. Frequents open places near woods, especially on a dry soil. I have found it on the high flowery slopes overhanging the Rhine, above the vineyards. It flies from June to August, and thus later in the summer than most of the smaller Fritillaries. Larva bluish, dotted with white, with black transverse bands, and a yellowish line on each side. Back and sides whitish-yellow; head and spines brownish-yellow. Lives on plantain, &c., from April to June. The butterfly is represented at Pl. 8, Fig. 4.

5. *M. Trivia* (W. V.).—Very similar to *M. Didyma*, but generally rather smaller, and duller in colour; the black spots before the margin are more distinctly crescent-shaped, and are connected with each other as well as with the margin, thus enclosing marginal fulvous lunules. The bands on the under side of the hind-wings are of a paler reddish-yellow, and the black spots on their edges run more together. Found from June to August in Eastern Europe and Northern and Western Asia. Larva ashy-grey, with bluish spots, a blackish stripe on the back, pale yellow spines, white at the tips, head reddish-brown, and legs whitish. Feeds on different species of mullein in June.

* 6. *M. Cinxia* (Linn.), (*Glanville Fritillary*).—Wings fulvous, with several rows of black lines, the last row of fulvous spots but one dotted with black on the hind-wings. Hind-wings beneath straw-colour, with two rust-coloured bands edged with black, and with black spots in the outer band and before the margin. Expands from 1½ to 2 inches. Common in meadows in May and June throughout the greater part of Europe, and Western and Northern Asia. It is an extremely local insect in England, and is met with most commonly on waste ground near the coast, in the Isle of Wight. Larva black, dotted with white, the head and feet reddish, and the spines short and black. Feeds on plantain, speedwell, &c., in April, May, August, and September. Figured in all stages at Pl. 8, Fig. 5, *a—d*. (*M. Arduinna*, Esp., found in South-Eastern Europe, resembles *M. Cinxia*, but there are several yellow bands on the under side of the hind-wings, much broader than in *Cinxia*, which always enclose black dots.)

7. *M. Phœbe* (Knoch.).—Wings above fulvous, more broadly reticulated with black than in *M. Cinxia*, the under side of the hind-wings greenish-white, with reddish bands bordered with black, behind which are sharply-defined black crescents and rust-coloured spots. There are also narrow and less deeply indented black crescents on the border. The variety *Ætherie* (Hübn.) is more uniform in colour, and less reticulated. Expands from 1½ to 1¾ inches. It is found from May to August in Central and Southern Europe, North Africa, and Northern and Western Asia, but is a local insect. The larva is blackish-grey, dotted with white, and with the sides whitish. There are three blackish lines on the back, and the spines are reddish-yellow; those on the sides are whitish. It feeds on *Centaurea jacea* from May to September.

8. *M. Dictynna* (Esp.).—Wings blackish-brown, with rows of fulvous spots, but smaller and fewer than in any other species, especially on the hind-wings, which are cinnamon-brown beneath, with the spots at the base, the middle band (which is divided into spots by dark lines) and the crescent-shaped spots on the hind margin straw-colour; a row of black dots is placed before the double row of pale marginal crescents. Expands from 1¼ to 1½ inches. Common in June and July in meadows in many parts of Central and Southern Europe and Western Asia, though somewhat local. Larva dark grey, dotted with pale blue; a black line on the back. Spines short, rust-coloured, or sulphur-yellow. Head black, marked with blue. Feeds on speedwell in May and June. The butterfly is figured at Pl. 8, Fig. 6.

*9. *M. Athalia* (Esp.), (*Pearl-bordered Likeness Fritillary*).—Blackish-brown, with rows of fulvous spots; under side of the hind-wings yellowish-brown, with the spots at the base, the broad central band (which is divided by a black line), and a row of crescents before the border, as well as the space behind, pale yellow; before the crescents are black arches filled with brownish-red. The palpi are pale yellow, and only occasionally reddish at the tips. Expands from 1¼ to 1½ inches. It is perhaps the commonest species of the genus, frequenting heaths and meadows throughout Europe and Northern and Western Asia from May to August. It is a very local insect in the south of England and Ireland, but is abundant wherever it occurs. Larva black, dotted with white, with pale brown spines. Feeds on plantain, &c., in May and September. The insect is figured in all stages at Pl. 8, Fig. 7, *a—c*.

10. *M. Britomartis* (Assm.).—Resembles *Athalia*, but the ground colour of the under side of the hind-wings is darker rust-brown, and the central band is darker yellow before the dividing line than behind. The essential distinctions are that the border is brownish-yellow as far as the spots, and considerably darker than these, and that the spots at the base and those in the band opposite are shining whitish. Palpi as in *Athalia*. Expands from 1¼ to 1½ inches. Found in May and June from Eastern Germany to the Altai, but is either very local, or has been overlooked from its resemblance to *Athalia*. Larva pearly white, with rusty-yellow spots, and white spines; head black. Feeds on toadflax, speedwell, &c., in May.

11. *M. Aurelia* (Nick).—Also very similar to *M. Athalia*, but generally smaller, with the under side of the hind-wings more brownish, and the inside of the central band rather darker than the outside. Most easily recognised by the palpi, which are reddish-yellow on the outer side, and pale yellow at the base only. Found in Eastern Germany in August. Larva black, dotted with white, with small pale yellow spots on the sides, and black spines with whitish hairs. Feeds on *Melampyrum* in June.

12. *M. Parthenie* (Borkh.).—Smaller than *M. Athalia*, the upper side is not so black, and therefore appears fulvous, with narrow blackish-brown transverse lines. The third row of fulvous spots from the border is much broader than in *Athalia*, especially towards the front edge of the hind-wings; and the separate spots between the nervures are at least twice as long as


4.
5d.
5c.
6.
3d.
2.
5a.
5b
7a.
3b.
3c.
7c.
3a.
7b.
8a.
8b.
1.
A.
B
C
D.

broad; under side of the hind-wings and the palpi as in *Athalia*. Expands rather less than 1½ inches. The Alpine variety, *Varia* (Bisch.), is smaller. The upper side of the male most resembles *Parthenie*, and that of the female *Athalia*, and is dusted with black, especially on the hind-wings. On the under side of the hind-wings, the spots at the base, and the middle band behind the dividing line are white. Local in Central and Southern Europe, and found in meadows from May to August. The larva is black, with very small white dots, some fine white hairs, and a series of indistinct yellow blotches on the sides. It feeds on plantain. (*M. Deione*, Gey., a scarce species found in the south of France and Spain, closely resembles *M. Parthenie* above, but the black lines are more numerous and distinct, and it is more fulvous at the base of all the wings. On the under side of the hind-wings it is more like *M. Athalia*, but paler, and the reddish bands are narrower. The larva feeds on *Linaria*.)

13. *M. Asteria* (Freyer).—The smallest species of the genus, not measuring more than an inch across the wings. Upper side as in *M. Athalia*, but much dusted with blackish; the rows of spots in the female are very pale. The best distinction is that the pale marginal spots on the under side of the hind-wings stand upon the hind margin itself, without being separated from it by any black line, as is the case in the other species. A scarce and local insect, inhabiting the high Alps of Eastern Switzerland and Austria in July and August.

GENUS III.—ARGYNNIS (FABR.).

Large or middle-sized butterflies, upper side fulvous with the following black markings: some transverse stripes in the discoidal cell, a curved row of connected and generally more angular spots on the middle, beyond which is a row of rounder spots, and another series of spots on the border, often hatchet-shaped. Fore-wings beneath rather paler and with duller markings than above; hind-wings beneath with some pale yellow spots at the base, and a broad band of the same colour before the middle; behind this is generally a paler transverse stripe, or else a series of larger and paler spots; then follow a series of black dots, or small spots with pale centres, and a series of pale lunules on the margin. The pale spots are generally more or less silvery, and are replaced in some of the larger species by silvery streaks. The larvæ are cylindrical, and are furnished with six rows of hairy spines; they generally pass the winter as larvæ, and do not assume the pupa state till May. Most of them feed on violets, especially the dog-violet and the wild pansy. They may be found in spring on their food-plants, or under fallen leaves. The pupæ are angular, with a hollow on the back. The butterflies frequent meadows, heaths, and open woods, and are fond of settling on flowers. The smaller species are double-brooded, and fly in spring and autumn; the larger ones are single-brooded, and appear in summer; the latter have a very strong flight. As the upper side is very similar in most species, we have given a general description above, and shall therefore in most cases confine ourselves to noticing the differences of the under surface of the hind-wings. The genus *Argynnis* is found throughout Europe, Asia, North Africa, and North America; perhaps the finest species is *A. Childreni* (Gray), from the Himalayas, in which the whole surface of the under side is covered with a network of broad silver stripes. Several of the smaller species are circumpolar, and have been found as far north as our explorers have yet penetrated.

1. *A. Aphirape* (Hübn.).—Fulvous, reticulated with black; a row of spots near the marginal lunules on all the wings. Hind-wings beneath reddish-yellow, varied with straw-colour on the

outer half; the middle band, a row of spots in black rings, and a series of triangular marginal spots, straw-colour or whitish, with a faint silvery lustre in the female. The northern variety, *A. Ossianus* (Herbst.), is smaller, darker above, and with white or silvery spots below. *A. Aphirape* expands about 1½ inches, and is found in marshy meadows about the end of June in Central Europe and Western Asia, but is always very local. *A. Ossianus* is found in Northern Europe and Asia. The larva of *Aphirape* is silvery grey, with paler lines on the back, a white streak on the sides, and short whitish spines. It feeds on *Polygonum bistorta* and marsh violet. The butterfly is figured at Pl. 8, Fig. 8, *a*, *b*.

* 2. *A. Selene* (W. V.), (*Small Pearl-bordered Fritillary*).—Under side of hind-wings rust-colour, varied with straw-colour beyond the middle. There is a row of silvery and straw-coloured spots at the base; one in the centre of the wings, beyond this a narrower one, of which only the ends are distinct, and outside this a marginal row of triangular silvery spots. Between this and the incomplete band is a row of small black spots, and there is a larger one, edged with yellow, between the large silver spot in the middle of the broad central band and the base. Expands from 1½ to 1¾ inches. It is common in open woods in spring and autumn throughout Europe, except in the extreme south, and is also found in Northern and Western Asia. The Lapland variety, *Hela* (Staud.), is smaller and darker above. The larva is black, with a whitish stripe on the back divided with black, and short pale brown spines. There are also two slender black spines on the head, which are not branching. It lives on dog-violet in June and September.

3. *A. Selenis* (Eversm.).—Very similar to *A. Selene*, but the darker portions of the under side of the hind-wings are light red instead of rust-colour. There are four rows of silvery spots across the wings, the two inner rows mixed with straw-coloured spots. The black spot near the base is also surrounded with silvery. The under side of the fore-wings has also a marginal row of silvery spots, not seen in any allied species. Expands from 1¼ to 1½ inches. Inhabits the south of Russia and Siberia.

* 4. *A. Euphrosyne* (Linn.), (*Pearl-bordered Fritillary*).—Also very like *Selene*, but the darker portion of the under side of the hind-wings is brick-red, and the only silvery spots except the marginal ones are one large one in the middle of the central band and one or two smaller ones at the base; the black spot between these is also bordered with silver. The Lapland variety, *A. Fingal* (Herbst.), has darker spots on the upper surface than the type, which are often united to form bands. In size, habits, times of appearance, and distribution in Europe and Asia, it agrees almost entirely with *Selene;* but, except that it occurs in mountainous countries at a greater elevation than the latter, is perhaps the scarcer insect of the two. The larva is black, with a bluish-white stripe on the sides, and short black or yellow spines. It lives on violets in April, June, and September.

5. *A. Dia* (Linn.), (*Weaver's Fritillary*).—Also resembles *Selene*, but the darker portion of the under side of the hind-wings is purplish, and the interrupted spots are replaced by a violet streak; there are two basal rows of silvery and yellow spots, as in *Selene*, and the next row is still more rudimentary; and the middle spot of the row of black spots, as well as that nearer the base, has a silvery centre. The black spots of the upper side of the wings are also larger than in the allied species, although *Dia* is generally smaller, rarely measuring as much as 1½ inches in expanse. It is common in woods in spring and autumn throughout Central and Southern Europe and Western Asia, and has also been captured several times in the south of England, though not yet regularly placed on our lists as a British species. Larva dark grey, with a whitish streak on the back divided with black, near which are black spots; a double

rust-coloured line on the sides; and yellow spines, whitish at the tips. Found from April to September on violets. The butterfly is figured at Pl. 9, Fig. 1.

6. *A. Amathusia* (Esp.).—The under side of the hind-wings is similar to *A. Dia*, but most of the silvery spots are replaced with yellow, and there is no yellow spot in a black ring towards the base. The marginal line is double, and the marginal spots are shaped like large black arrow-heads, filled with silvery spots behind. The pale central band is composed of whitish spots, dusted with brown, and irregularly dentated; the next band is replaced by a violet streak, with a faint silvery lustre; and the outer round spots are dark brown. Expands from $1\frac{1}{4}$ to $1\frac{3}{4}$ inches. Found throughout the Alpine ranges, at a moderate elevation, in June and July; also in the plains throughout Russia, and the adjacent parts of Eastern Europe. Larva blackish, with darker stripes on the back and sides, and yellow spines, longest on the second segment. Lives in May on *Polygonum bistorta.* The butterfly is figured at Pl. 9, Fig. 2.

(*A. Chariclea*, Schneid., from Lapland, Greenland, and Labrador, resembles *A. Amathusia*, but the dull yellow of the central band and marginal spots is replaced with silvery white. *A. Polaris*, Boisd., another Polar species, has the under side of the hind-wings ferruginous brown, with white spots and transverse fasciæ, and marginal lunules in the form of a T. There is a milk-white spot towards the base. *A. Freya*, Thunb., is a commoner and more widely-distributed circumpolar species, which differs from *Polaris* by the dull reddish-brown colour of the under side of the hind-wings. The spot near the base is white, with a black pupil; and the marginal and central rows of spots are whitish. These three species are always brought from Greenland by our Polar expeditions; and as they also occur in Lapland and Labrador, are probably to be found in Iceland. Some of them have indeed been recorded from that country; but although about six species of butterflies in all are said by various writers to have been collected there, naturalists who have recently visited Iceland have met with various moths, but have seen no butterflies; and it is beginning to be seriously doubted whether any species of butterfly is really indigenous to the island.)

7. *A. Thore* (Hübn.).—Inner margin of the fore-wings and the basal half of the hind-wings blackish above; hind-wings beneath brownish-yellow, with the yellow spots at the base very small; the central band is also pale yellow, and does not extend quite across the wing; the next is represented by an ill-defined violet-grey line, and the small and inconspicuous marginal spots are of the same colour. The round spots are brown, with obscure pale centres. It expands about $1\frac{1}{2}$ inches, and is a local and somewhat scarce insect found in Alpine meadows in Switzerland, &c., from May to July. The paler variety, *Borealis* (Staud.), inhabits Scandinavia and Northern Asia. (Another circumpolar *Argynnis*, *A. Frigga*, Thunb., is very similar to this, but has yellowish or silvery spots at the base of the hind-wings beneath, and a band of yellow or silvery spots across the middle. There are no traces of an outer pale band, though there is a row of brown spots with whitish centres beyond the central band.)

8. *A. Pales* (Linn.).—Hind-wings beneath pale yellow, varied with rust-colour, and often with greenish. Some spots at the base, and in the middle band, silvery, the marginal spots and the intermediate interrupted stripe also silvery. There are two forms of this insect, which used to be considered distinct species. The true *Pales* is paler above, with finer black markings; the hind-wings are somewhat angulated, and are more varied with rusty yellow. There is a female variety of this, *A. Isis* (Hübn.), in which the upper side is dusted with blackish, and the under side of the hind-wings is dusted with greenish. In the second form, *Arsilache* (Schneid.), the upper side is brighter coloured, with broader black markings, which often run together. The border of the hind-wings is rounded, and the under side is conspicuously mixed with rust-red. The northern variety,

Lapponica (Staud.), is intermediate between these. Expands from 1¼ to 1½ inches. This butterfly inhabits damp mountain meadows and moors. *Pales* is confined in Southern Europe to the Alpine ranges; but is also found in the plains of the north of Europe and Asia. *Arsilache* is found at a lower elevation, and is local in Germany, Switzerland, Northern Europe, and Northern and Western Asia. The butterfly appears in July and August; and the larva, which is brownish-grey, with a sulphur-coloured streak on the back intersected with a fine line, and has black warts and short flesh-coloured spines, feeds on *Viola montana* in early summer.

9. *A. Hecate* (W. V.).—Hind-wings beneath brownish-yellow, with pale yellow basal and central bands; no marginal lunules, and the intermediate band obscured, but with two rows of black spots on a pale ground before the hind margin. Expands 1½ inches. It is found in June and July in Southern and South-Eastern Europe and Western Asia, frequenting meadows in hilly districts.

10. *A. Daphne* (W. V.).—Hind-wings beneath greenish-yellow, varied with violet-red towards the margins. There is no silver, but the middle band is followed by a row of dusky spots with pale centres, between which and the hind margin is another row of obscure dusky marks. The upper side has separate square black marginal spots, placed obliquely on the nervures. Expands from 1½ to 2 inches. Another somewhat scarce and local insect, found in June and July in Southern and Eastern Europe and Western Asia. The larva, which feeds on violets and raspberries in May, is blackish-brown, with dark yellow spines, and yellow stripes on the back and sides, that on the back divided by a dusky line.

11. *A. Ino* (Rottemb.).—Closely allied to *A. Daphne*, but smaller (expands 1¼ to 1¾ inches); the hind-wings beneath are dusted with brown towards the margins, and are only faintly clouded with violet; the middle band is bordered with brown. The dark marginal spots on the upper side are connected with each other and with the border. Common in many parts of Europe and Northern and Western Asia in damp meadows in June and July. Absent from the north-west and the extreme south of Europe. The larva is whitish-yellow or yellowish-brown; the back brown, with a double pale yellow line. A brown stripe, bordered with yellow beneath, on the sides; spines yellowish. Feeds on *Sanguisorba officinalis*, *Spiræa ulmaria*, and *Urtica urens* in May.

12. *A. Niobe* (Linn.).—Hind-wings beneath pale yellow, dusted with greenish and rust-red, with large pale yellow (var. *Eris*, Meig.) or silvery spots at the base, two rows of similar spots across the middle, and another marginal row. Outside the third row is a series of small rust-coloured spots with silvery centres. On the upper side of the fore-wings the nervures are not thickened in the male, and the female has whitish spots before the tip. Expands from 1¾ to 2 inches. This has long been a reputed British species, and has lately been said, on good authority, to have been taken not uncommonly in Kent; but there is a difference of opinion among those entomologists who have examined the specimens as to whether they may not belong to the next species. It is common in woods in June and July throughout the greater part of Europe and Western Asia. The larva is brown, with a white stripe on the back, bordered with blackish, next to which is a row of triangular white spots; spines reddish-white. Feeds on violets in May.

* 13. *A. Adippe* (Linn.), (*High Brown Fritillary*).—Very like *A. Niobe*, but the wings are brighter coloured above, and two of the nervures of the fore-wings are thickened before the middle in the male; the female has no pale spots at the tip. The hind-wings are yellowish beneath, and are not dusted with rust-colour, or (except in some varieties, such as *Chlorodippe*, Herr. Schäff.) with greenish. The spots are silvery in the type; in the variety *Cleodoxa* (Ochs.)


4 d.
5
6 a.
2.
4 c.
1.
4 a.
6 d.
6 c
4 b
6 b
A.

they are pale greenish-yellow, and almost lost in the ground colour, the centres of the small round spots only being silvery. Expands from $1\frac{3}{4}$ to $2\frac{1}{4}$ inches. Common in most parts of Europe (including England) and Western Asia in July, though it is a rarer and less generally-distributed insect on the Continent than *A. Niobe*. It frequents woods and heaths, especially in hilly districts. Larva dark grey, with interrupted whitish lines on the back, under which are blackish transverse stripes. Spines rusty brown. Feeds on violet and wild pansy from May to July. The butterfly is figured at Pl. 9, Fig. 3.

* 14. *A. Aglaia* (Linn.), (*Dark Green Fritillary*).—Hind-wings beneath green, mixed with pale yellow towards the hind margins, with silvery spots at the base, two rows across the middle of the wing, and another marginal row of silvery spots. There are no reddish spots with silvery centres, as in the last two species ; and the silvery spots on the under side of the fore-wings in the female are smaller and more numerous than in *A. Adippe*. In the male, especially of the latter species, they are frequently almost absent. Expands from $2\frac{1}{4}$ to $2\frac{1}{2}$ inches. It is the commonest of the large Fritillaries throughout Europe (including the British Isles) and Northern and Western Asia, frequenting meadows and heaths in July and August. Some of the Californian species of *Argynnis* are very closely allied to this, and may perhaps prove identical with it when the variations of *A. Aglaia* have been traced round throughout Northern Asia. The larva is yellow, with a double white line on the back, and red spots on the sides ; the spines are black. It lives on dog-violet in May and June. The insect is figured in all stages on Pl. 9, Fig. 4, *a—d*.

(*A. Elisa*, Godt., which occurs in the mountains of Corsica and Sardinia, is allied to this, but has fewer and smaller black spots above, and smaller and more numerous silvery spots below. *A. Alexandra*, Ménétr., from the Caucasus, is another allied species, but the marginal spots of the under side of the hind-wings are green, and not silvery. These species are both rather smaller than *A. Aglaia*. Two American species, *A. Cybele*, Fabr., and *A. Aphrodite*, Fabr., have been introduced into some works as having been taken in England. The former is much larger than *A. Aglaia*, and the latter about the same size. *A. Cybele* is darker above and paler below than *A. Aphrodite*. The under side of the hind-wings of *Aphrodite* is dull reddish, where that of *Aglaia* is green ; the silvery spots are similar, and the marginal row is edged within with pale yellow.)

* 15. *A. Lathonia* (Linn.), (*Queen of Spain Fritillary*).—Hind-wings beneath brownish-yellow, with very large oval silvery spots, between which are some small ones. Within the marginal spots is a row of seven small brown spots with silvery centres. There are also several silvery spots at the tip of the fore-wings beneath. Expands from $1\frac{3}{4}$ to a little over 2 inches. Found throughout Europe, Northern and Western Asia to the Himalayas (the Indian variety has been named *A. Issæa*, Gray, but hardly differs from the European), and North Africa. It frequents lanes and roads in woods, and its flight resembles that of *Hipparchia Megæra*, but is more rapid. It sometimes settles on the pathway, and has also been seen in clover fields. It is found in early summer, and again in autumn. It is very rare in the south of England, and has once been taken at Killarney. The larva lives on heartsease, &c., in April and July ; it is blackish-grey, with a whitish stripe on the back, and brownish-yellow lines on the sides. The spines are short and brick-red. The butterfly is figured at Pl. 9, Fig. 5. (*A. Eugenia*, Eversm., should not be included among European butterflies ; it is a Siberian species.)

* 16. *A. Paphia* (Linn), (*Silver-washed Fritillary*).—Hind-wings beneath green, with a silvery streak across the middle, and two shorter ones running from the costa nearer the base ; the hind margin is also bordered with silvery. The male is brighter coloured than the female, and has four nervures of the fore-wings rather broadly black in the middle. There is a variety of the female, *Valesina* (Esp.), which is greenish-brown above, with some pale spots towards the costa

of the fore-wings. Expands from 2½ to 3 inches. Common in July and August throughout Europe and Western Asia, frequenting open places in and near woods, where it settles on the bramble, and other flowers which grow at a moderate elevation. The insect appears to be scarce in Scotland, and the dark variety *Valesina* is not common in Northern Europe. In Corsica and Western Asia we find another variety, *Anargyra* (Staud.), in which the silvery markings of the under side are absent. Larva blackish-brown, with a broad, pale yellow streak on the back, divided and bordered with dusky; spines very long, especially those on the second segment. It feeds on dog-violet and wild raspberry in May and June. The typical female and the transformations are figured at Pl. 9, Fig. 6, *a—d.*

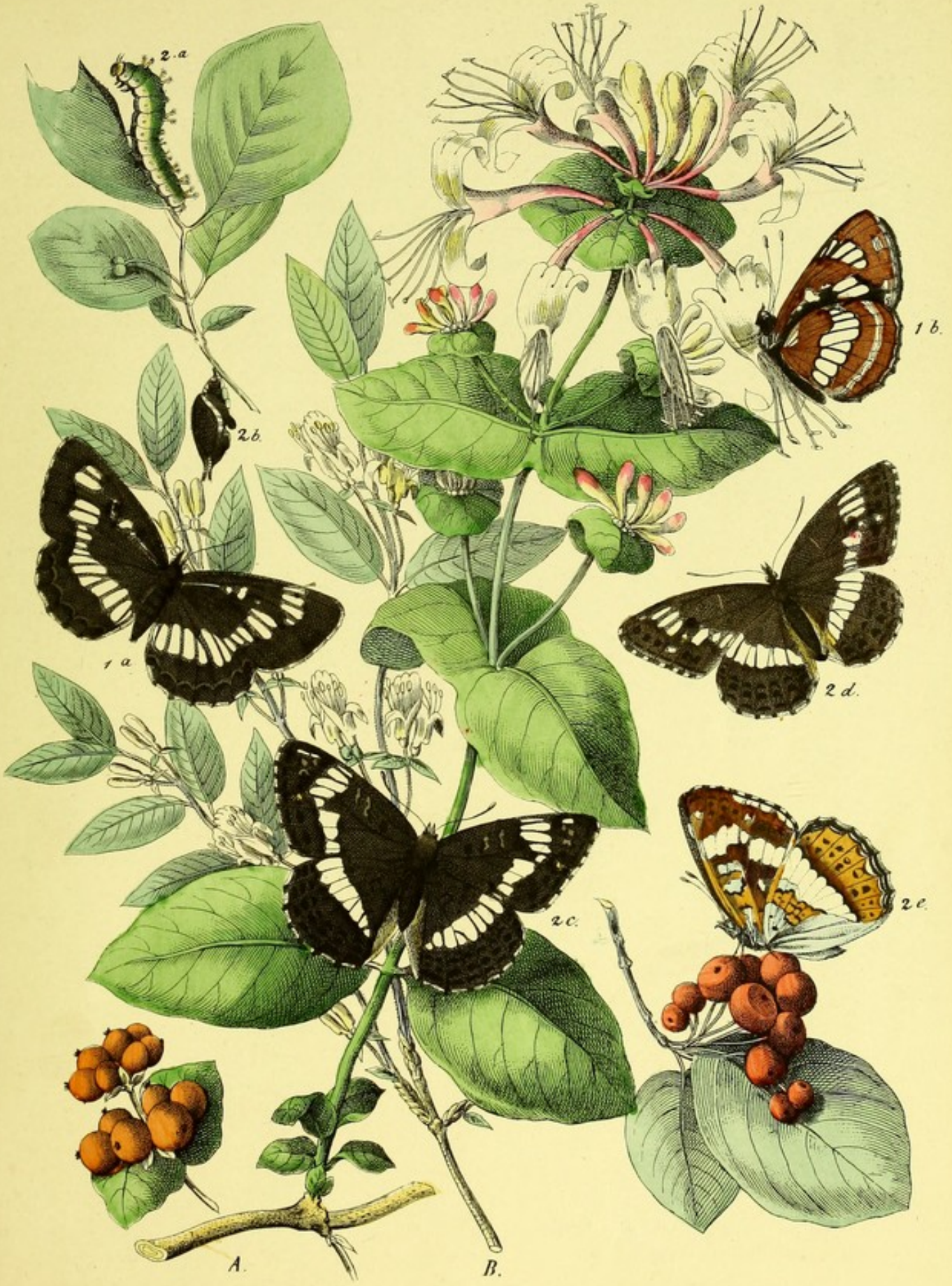
17. *A. Maia* (Cram.).—Hind-wings beneath green, with a marginal silvery streak (sometimes scarcely visible), and two others across the centre. This species is greener fulvous above than *A. Paphia*, var. *Valesina*, which it otherwise much resembles, and two of the nervures of the fore-wings are thickened in the male. The under side of the fore-wings is rose-colour, instead of fulvous, with the costa, tip, and hind margin broadly yellowish-green. Expands from 2¼ to 3 inches. Inhabits Europe, south of the Alps, and the shores of the Mediterranean and Black Seas. It frequents bushy places in June and July. The larva is purplish-brown, with black transverse marks on the back; it feeds on heartsease.

18. *A. Laodice* (Pall.).—Hind-wings beneath yellowish towards the base, with two short irregular reddish lines, the outer portion varied with greenish and pale iridescent pink; on this are two rows of obscure greenish spots. The two portions of the wing are divided by a silvery line, broken into irregular spots. Two of the nervures of the fore-wings are thickened on the upper side in the male. The under side has a general resemblance to that of *A. Daphne;* but the latter is a smaller insect, and has no silvery line. Expands from 2 to 2½ inches. It inhabits glades in woods in June and July, and is found in Eastern Europe and Northern and Western Asia. The most westerly localities are East Prussia and Livonia. The butterfly is figured at Pl. 51, Fig. 5.

GENUS IV.—NEPTIS (FABR.).

This genus, and the following, contain middle-sized or large butterflies. The few European species are all of dark colours, and have a white band across all the wings, broken into detached spots on the fore-wings and divided by the nervures on the hind-wings. The under side is tawny or yellowish, mixed with black, with the white markings of the upper side. The margins of the wings are slightly dentated. The larvæ are cylindrical, with excrescences or branching spines on the back. They hybernate when young, and reach their full growth in May. The butterflies appear in woods in June and July, and sometimes settle in damp places and on ordure. *Neptis* may be distinguished from *Limenitis* by its rather long fore-wings, with a short rounded border. The discoidal cell is open behind, and there is a white streak running from the base. The larvæ have hump-like excrescences. The species are all very similar, and are either black with white markings, or tawny with black markings. They are very numerous in the East Indies, and a few inhabit other portions of the Old World.

1. *N. Aceris* (Lep.).—Black, fore-wings with a white basal streak interrupted behind, an interrupted row of large white spots, and a marginal row of small ones. Hind-wings with two white bands, the outer one narrower. Expands from 1½ to 2 inches. Found throughout Asia and South-Eastern Europe, as far west as Salzburg, but is local and generally scarce in Europe. It is said to frequent woody slopes and shady river banks. The larva is dark green on the sides, and white and greyish-green on the back. There are two spiny excrescences on each of the 3rd,


2.a
2.b
1.b
1.a
2.d
2.c
2.e
A.
B.

4th, and 11th segments. There are two broods: one in the spring, after hybernation, and another in July. It feeds on *Orobus vernus*. The butterfly appears in June and August.

2. *N. Lucilla* (W. V.).—Size and colour of *Aceris*, but the basal streak is narrow, and broken into spots. The white central bands are broader, and the small marginal spots of the fore-wings, and the narrow outer band of the hind-wings, are entirely absent on the upper side. Found in Eastern and South-Eastern Europe and Western Asia in June and July. The extremities of its western range are Bohemia on the north and Piedmont on the south. It is not considered a very common insect. Larva reddish-brown, with two thick peg-like processes on each of the 3rd, 4th, 6th, and 12th segments. Lives in May on *Spiræa salicifolia*. The butterfly is figured at Pl. 10, Fig. 1, *a*, *b*.

GENUS V.—LIMENITIS (FABR.).

This genus differs from *Neptis* chiefly in the fore-wings. The hind margin is broad, long, and curved, and the discoidal cell is closed. There is no white stripe from the base. The larvæ have branching spines, or fleshy humps covered with spines. Many handsome species of *Limenitis* are found in the East Indies and North America, but the genus scarcely appears to reach either of the southern Continents.

* 1. *L. Sibylla* (Linn.), (*White Admiral*).—Blackish-brown, with an interrupted row of white spots on the fore-wings, and a white band on the hind-wings. Under side varied with tawny, with two rows of black spots before the hind margin. Inner margin of the hind-wings bluish. Expands from 1¼ to 2¼ inches. It is found in most parts of Central Europe, including the south of England, in June and July, but is somewhat local. Its elegant sailing flight through the forest glades has long been celebrated. It frequents bushy places in or on the edges of woods, and is generally found in the neighbourhood of water. The larva is green, with a white streak on each side, and two rows of rust-coloured spines on the back. The head is red, with two white stripes. It lives in May on honeysuckle in shady places, and prefers those plants which creep on the ground. The butterfly is figured in all stages at Pl. 10, Fig. 2, *a*—*e*.

2. *L. Camilla* (W. V.).—Size and pattern of *L. Sibylla*, but bluish-black, with a row of pale blue dots round all the wings. The fore-wings have a conspicuous white spot in the middle, which is scarcely marked on the upper side in *Sibylla*. The under side is varied with brown and reddish, instead of tawny, and there is only one row of black spots before the hind margin. Common in many parts of Southern and Central Europe and Western Asia, but does not appear to extend much further north than the fifty-first parallel of latitude. It is nevertheless somewhat local and scarcer than *Sibylla*, and appears rather later in the summer (July and August), frequenting more open places, such as hedges and bushes in the neighbourhood of woods, especially in hilly districts. It has been erroneously reputed British, owing to the names of this and the former species having been confused by many of the older writers. The larva is very similar to that of *Sibylla*, and likewise feeds on honeysuckle in April, May, and July. It is green, with the belly and legs red. The head is also red, finely spotted with white, instead of striped. The tubercles are large and green, with the tips red.

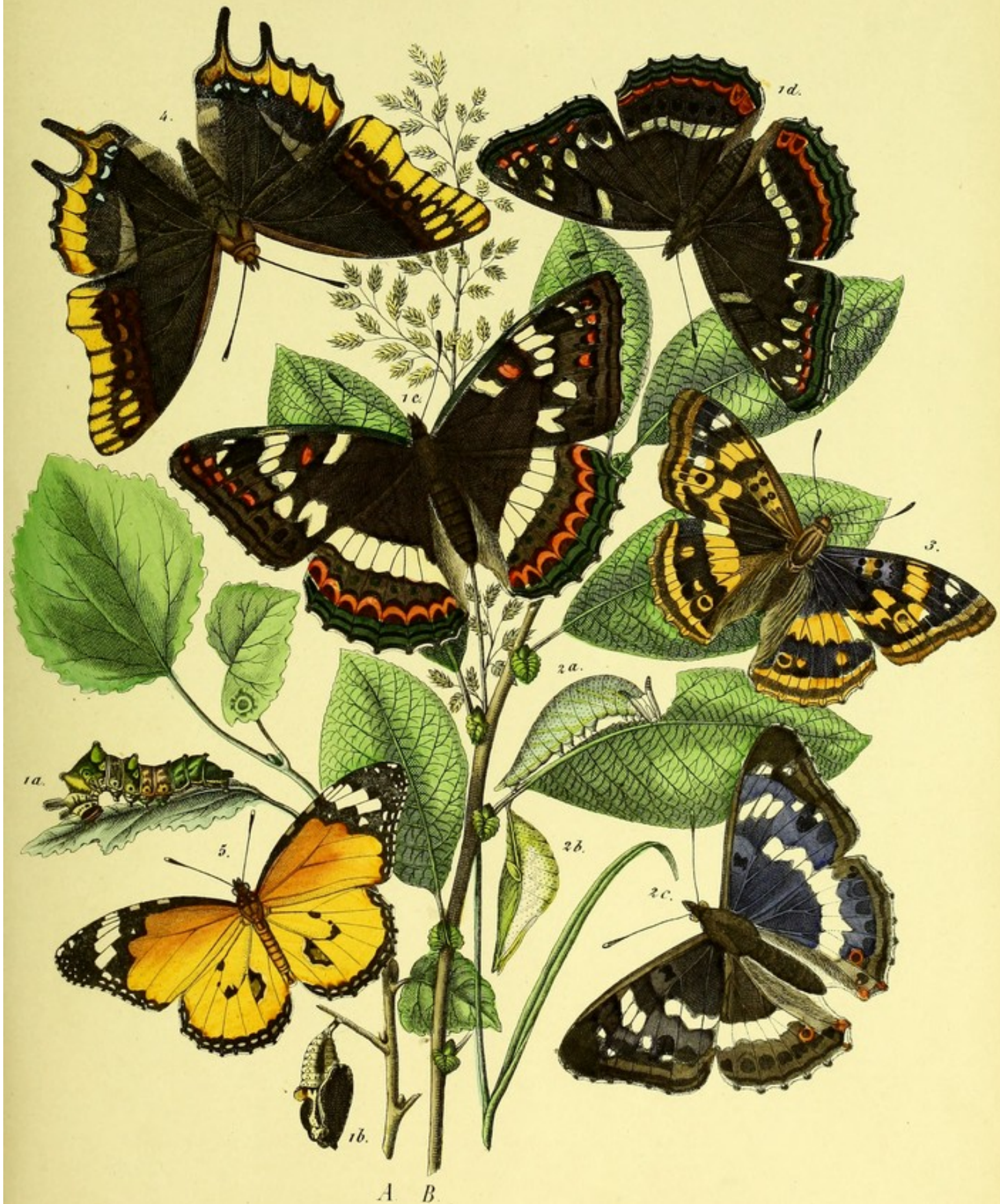
3. *L. Populi* (Linn.), (*Poplar Butterfly*).—Dark brown, fore-wings with white spots, and hind-wings with a white band. Hind-wings with a marginal row of red lunules, of which traces may also be seen on the upper part of the border of the fore-wings. In the male the white markings are generally dusted with brown; and in the variety *Tremulæ* (Esp.), the white band is absent above. Wings beneath tawny, the pale markings greenish, especially

on the hind-wings. Expands from 2½ to 3 inches. Erroneously reputed British, but generally distributed in Central and Northern Europe, except the north-west; it is also said to occur in the Altai. It is common in some seasons and in some localities, but is generally rather scarce. It is found in woods in June, where it settles on wet paths, &c., in the morning, before ten o'clock, and again in the evening, to suck up the moisture. It also settles on the dung of animals, and may be attracted by strongly-smelling cheese. In the middle of the day the butterfly flies round the tops of the trees, and settles on high branches, like *Apatura Iris*. The female is rarer than the male, because she descends less frequently from the tops of the trees. Larva green, darker and paler mixed, with two rows of short fleshy humps covered with hair. Those on the second segment are large and club-shaped. It feeds on white poplar and aspen in May. The young larvæ pass the winter between dry rolled-up leaves of the food-plant, and are easily to be found in this situation in winter or early spring. The transformations are figured on Pl. 11, Fig. 1, *a—d*.

GENUS VI.—APATURA (FABR.).

Large butterflies, of a blackish-brown colour above, shot with purple or violet in the males. The fore-wings have large white or yellow spots, and the hind-wings a band of the same colour beyond the middle; and the border of the former is slightly concave. There is a large eye-spot near the hinder angle of the fore-wings, and a small one in a similar position on the hind-wings, at least on the under surface. The larva is stout, and attenuated behind, with a forked tail, and two large triangular horns on the head. It hybernates when small, and is full grown in May. The pupa has also two projections from the head. The butterflies are found in woods in June and July, and resemble *Limenitis Populi* in their habits. The genus *Apatura*, though not very numerous in species, has representatives in all parts of the world except Africa and Australia; but, as is usually the case when the same genera have an extensive range, the tropical species of *Apatura* rarely surpass our own in either size or beauty, and are often much inferior to them in both respects.

* 1. *A. Iris* (Linn.), (*Purple Emperor*).—Blackish-brown above, shot with rich purple in the male. Fore-wings spotted with white, hind-wings with a white band, nearly straight inside and with a short projection on the middle outside. There is a black eye-spot in an orange ring, with a very small white dot in the centre, near the hinder angle of the hind-wings. Under side varied with different shades of grey, brown, black, and tawny, the white markings as above. A black eye-spot with a large blue pupil in a tawny ring near the hinder angle of each wing; that on the fore-wings is very large, and two of the white spots are placed upon the outer curve of the tawny ring; the eye on the hind-wings is small, and the outer ring is not marked with white. In the variety *Iole* (W. V.) the white markings of the upper side are obsolete. Expands from 2 to 3¼ inches. Appears to be confined to Central Europe (including the south-eastern counties of England, as far north as the Humber), and in many localities common, but difficult to capture, as it frequents the tops of the loftiest forest-trees. It sometimes descends to the ground in wet places, to imbibe the moisture; and a German entomologist has lately recorded that, when collecting in Russia on a very hot day, when he was covered with perspiration, numbers of *A. Iris* flew round him, and settled on his clothes. It is also attracted by dung and carrion. The latter substance is generally employed by English collectors as a bait, with great success. The variety *Iole* is always rare, and occurs only singly. The male *Iris* is much more frequently seen and taken than the female, which is more retired in her habits. The larva is green, shagreened with


4.
1d.
1c.
3.
2a.
1a.
5.
2b.
2c.
1b.
A
B

whitish; it has a yellow lateral stripe in front, and yellow oblique stripes in the middle; the horns are bluish in front. It lives on poplar, aspen, and sallow, in May and June; and, contrary to the habits of the perfect insect, it prefers low stunted bushes, where it may be found resting on the upper side of the leaves. The transformations are figured at Pl. 11, Fig. 2, *a*—*c*.

2. *A. Ilia* (W. V.).—Closely resembles *A. Iris*, but the black eye-spot near the hinder angle of the fore-wings is always placed in an orange-tawny ring on the upper side, and the white band on the hind-wings is considerably excavated on the inner side, and wants the projecting tooth on the outside. It is a variable insect, and the white markings are replaced by ochre-yellow in the variety *Clytie* (W. V.). The under side is brownish-grey, and the pale band on the hind-wings beneath is not nearly so conspicuous as in *A. Iris*. Expands from 1¾ to 2½ inches. It is much more widely distributed than *A. Iris*, being found over the greater part of Europe, from Finland to Italy, and throughout Western and Northern Asia to Japan. It appears, however, to be absent from Spain, Scandinavia, and the greater part of North-Western Europe. Larva very like that of *A. Iris*, but the horns are bordered with blackish in front, and the yellow streaks are bordered with reddish. It lives on aspen and other species of poplar and sallow in May and June. The variety *Clytie* is figured at Pl. 11, Fig. 3.

GENUS VII.—CHARAXES (OCHS.).

Large and robust butterflies, with the border of the fore-wings deeply excavated, and the hind-wings dentated, with two rather long tails. Larva with a forked tail, and with four horns on the head. This fine genus is found in Africa and India, but the single European species belongs to one of the African groups. It is common round the Mediterranean, including South France, wherever the strawberry-tree (*Arbutus unedo*) grows wild. The larva feeds on this tree, and as the Arbutus is common in the south of Ireland, and the butterfly is one of those southern forms which occur much further north in France than in the other parts of Europe, where the mountain ranges form an insurmountable barrier to their northward extension, some have suggested the possibility of its being found in Ireland. Although it is not unlikely that the insect might thrive if once introduced, I cannot conceive it possible that so large and conspicuous a butterfly could have escaped the notice of the many botanists and entomologists who have visited the districts where it ought to be found, if it were really an inhabitant of that country.

1. *C. Jasius* (Linn.).—Dark brown, bordered with deep orange, shading off into straw-colour at the anal angle of the hind-wings. A second row of orange spots on the fore-wings, and four small bluish-spots just within the border on the hinder half of the hind-wings. Under side red, with a broad white stripe across both wings, within which are a number of irregular black spots bordered with buff, most of which are oval. Outside the white band, on the fore-wings, are two orange bands, divided into spots by the nervures. Between these is a row of black spots on a buff ground. On the hind-wings the white band is bordered outside by a row of large red spots, outside which is a row of small bluish spots on a buff ground, and edged outside with black. The marginal orange band as on the fore-wings, but paler. The fringes and the tails are edged, with black on the hind-wings both above and below; on the fore-wings the black edging is scarcely visible. Expands from 2½ to over 3 inches. It is common where it occurs, at the end of May, and again in August and September, the first brood being the most numerous. It has a sailing flight, and is fond of settling on rotten fruit. Mr. W. F. De V. Kane has kindly supplied the following notes on its habits at Hyères, from information furnished by a local collector:—It appears in that neighbourhood about the end of June, and continues on the wing till about the

middle of August. Its flight is very powerful and rapid, turning about like a swallow to avoid the net or any obstacle. It is very shy, and almost impossible to approach when settled. It generally rests high on the trees, and delights in the hottest localities, avoiding the shade of deep woods. It is most common on dry hills and in the dry beds of torrents, up and down which it careers without stopping to rest; and in such localities it may be captured on the wing. Like other *Nymphalidæ*, it has a great preference for the same spot or twig, and you may find it day after day, when at rest, on its favourite twig or branch. The larva is green, with a yellow stripe on the sides and two green ocellated spots with blue pupils on the 7th and 9th segments. Horns yellowish, tipped with reddish. It may be found throughout the spring and summer. The butterfly is figured at Pl. 11, Fig. 4.

FAMILY IV.—DANAIDÆ.

Rather large butterflies, chiefly inhabiting the warmer regions of the earth. The front pair of legs are rudimentary in both sexes; the club of the antennæ is gradually formed; and the inner margin of the hind-wings is not grooved. The larva is tolerably stout, smooth, and cylindrical, and is furnished with one or more pairs of long, slender, fleshy filaments. The pupa is suspended by the tail. These butterflies are distasteful to birds, and their tissues are exceedingly tough and elastic, in consequence of which they are not only abundant wherever they occur, but are frequently "mimicked," as it is called, by butterflies or moths which are destitute of a similar protection. This is especially the case with *Danaus Chrysippus*, the markings of which are closely copied by those of five or six African or Indian butterflies belonging to different groups. In most cases it is the female only which resembles *D. Chrysippus*, while the male is utterly different. The larvæ of the only species which we need notice feed on shrubs of the genus *Asclepias*.

GENUS I.—DANAUS (LINN.).

Large butterflies, with the wings slightly dentated and moderately long and broad. The costa of the fore-wings is arched, and the hind margin is slightly curved. The hind-wings are rounded, and rather shorter than the fore-wings. They are generally of pale colours (often fulvous), with black borders, which are often spotted with white. The genus *Danaus* is found on all the Continents, but is absent from the greater part of Europe and Northern and Central Asia, except Japan, where the Indian Fauna curves round to the north, east of the central ranges, just as the South European Fauna curves round into France, west of the Alps, at the other extremity of the great continent of Asia-Europe.

1. *D. Chrysippus* (Linn.).—Pale reddish or tawny, with the tip of the fore-wings broadly black, crossed by a band of large white spots. The borders of the wings are also edged with black and dotted with white, and there are four black spots about the middle of the hind-wings. The nervures of the hind-wings are narrowly bordered with white beneath. The variety *Alcippus* (Cram.) has white hind-wings, bordered with orange within the black borders; and *D. Dorippus* (Klug) wants the black and white markings at the tip of the fore-wings. Expands from $2\frac{1}{2}$ to $3\frac{1}{2}$ inches. *D. Chrysippus* occurs throughout Africa, Western Asia, the East Indies, and Greece. It was formerly taken in Italy, but was probably introduced, and has not succeeded in establishing itself. *D. Alcippus* is common in Africa and Western Asia; and *D. Dorippus* in North Africa and Western Asia; but I have never seen Indian specimens

of either, although I believe that *D. Alcippus* has been taken in Europe. The larva, which feeds on *Asclepias fruticosa*, is pale violet, with black and yellow transverse stripes. The 3rd, 6th, and 12th segments are furnished with a pair of black elastic filaments on the back. They are crimson at their base, and the front pair is the longest. The butterfly is figured at Pl. 11, Fig. 5. (*D. Erippus*, Cram., var. *Archippus*, Fabr., measures 4 inches or more across. The tip of the fore wings is less broadly black, and is irregularly spotted with fulvous, or white in the typical *Erippus*, instead of being crossed by a white band. The colour is deeper fulvous than in *D. Chrysippus*, and the veins of the wings are more or less broadly black, both above and beneath. *D. Erippus* is South American, and the variety *Archippus* is one of the commonest butterflies in North America. We notice it here, because it has not only spread over almost all the Pacific Islands, from the Sandwich Islands to Java, within the last few years, but no less than three specimens were taken in England in 1877, and one or two in France, so that it is quite possible that it may ultimately become naturalised in Europe, if the larva is capable of feeding on any indigenous plant. The larva is whitish, transversely fasciated with black and yellow, and has two pairs of blackish fleshy processes, situated on the 3rd and 12th segments, of which the first are the longest. It feeds on American species of *Asclepias*.)

FAMILY V.—SATYRIDÆ.

Large or small butterflies, generally black, brown, or tawny, and occasionally white. They have nearly always black eye-spots with white pupils before the hind margins, which are often placed on a pale band, or upon pale spots. The wings are rounded, and the hind margins are either entire or scalloped. The palpi are short, and bristly beneath; and the front pair of legs are very small and rudimentary. The larvæ are clothed with fine, short hair; the tail ends in a small fork, and the head is round. They live chiefly on grasses. The pupæ are thick and truncated, and are either suspended by the tail, or are formed on, or in, the ground.

GENUS I.—HIPPARCHIA (FABR.).

Middle-sized or large butterflies, with broad wings. The upper side is brown or black, and there is generally a white or yellow band near the hind margin. There is a moderately large eye near the tip of the fore-wings, and frequently a second towards the hinder angle, often with two white dots between them; and a very small eye towards the anal angle of the hind-wings. The hind-wings are dentated, and are marbled beneath with pale and dark. The antennæ are gradually thickened, or terminate in a distinct club. The larvæ are thick in the middle, and tapering at both ends, with pale and dark longitudinal streaks. They hybernate, and live till June in a very retired manner. The pupæ are formed in a hollow on the surface of the ground, or under stones. The butterflies are found more in Central and Southern Europe than in the north. They appear in July and August, and generally settle on the ground, or on the trunks of trees.

1. *H. Circe* (Fabr.).—Dark brown, with a broad white band near the margins, which is broken into spots on the fore-wings. A round black spot, with a small white pupil on the under side, stands on the extremity of the band near the tip of the fore-wings, and there is sometimes a smaller one on the third white spot below the first. On the under side the band is more continuous, being only interrupted beneath the eye. There are two white spots near the costa of the fore-wings, and another on the costa of the hind-wings (which are dusted with grey), and a

curved white streak runs from the latter to the median nervure. The fringes are also spotted with white. Expands from 2¼ to 3 inches. Common in Southern Europe and Western Asia, frequenting bare hill-sides. It is also found in many localities in Eastern France and Southern Germany, but it there becomes very local. The larva is brown, with two white lines on the back and a stripe on the sides, which is whitish above and yellowish below. It feeds on grass in May, and hides itself under stones and leaves in the daytime. The transformations are figured at Pl. 12, Fig. 1, *a—c.*

2. *H. Hermione* (Linn.).—Brown, with a continuous dull white band near the hind margins, on which is placed a black eye with a white pupil towards the tip of the fore-wings, and a smaller one (not ocellated, nor always visible below) nearer the hinder angle. There is also a small eye near the anal angle of the hind-wings. The ground colour is reddish-brown in the female, and the band on the fore-wings is clouded with this colour, instead of with dusky. On the under side the band is pale yellow on the fore-wings, and white on the hind-wings; on the latter it is suffused, and not sharply bounded on the outside. Expands from 2¼ to over 2½ inches. Its range is similar to that of *H. Circe*, but, though local, it is much commoner and more widely distributed in Central Europe. It flies in open places in woods, and likes to settle on the trunks of trees, with which the colouring of its under surface assimilates very well. The larva is reddish-grey, with a double brown streak on the back, and a broad streak of ashy-grey, bordered with a black and white line, on each side. The male butterfly is figured at Pl. 12, Fig. 2.

3. *H. Alcyone* (W. V.).—Smaller than *Hermione* (expands from 2 to 2¼ inches), generally with two eyes on the fore wings (more rarely one near the tip only), and with none at the anal angle of the hind-wings above. The pale band is narrower and darker above; and that of the hind-wings is white, scarcely dusted with brown, and well defined. The dark basal portion of the wing projects into it, almost in a right angle, about the middle, but forms no other prominent projections. Common in Southern and many parts of Central Europe, but absent in the north-west. In the north it frequents sandy pine-forests; but in the south it prefers the sunny slopes of hills. The larva feeds on *Holcus lanestris*, &c.

4. *H. Briseis* (Linn.).—Brown, the costa yellowish. Fore-wings with a row of rather long white spots near the hind margin, marked with two more or less distinct black eye-spots. Hind-wings with a rather broad whitish band across the centre. Under side of fore-wings whitish, with the margins brown, and one or two black spots on the costa within the eye. Hind-wings dark brown at the base, and paler on the borders; a yellowish-grey band between, the middle of which sends off a projection towards the base. The under side of the female is much paler, and the markings of the hind-wings are very ill-defined. In the female variety, *Pirata* (Hübn.), the pale markings of the upper side are dull yellow; the under side of the fore-wings has a tawny band towards the hind margin, bordered on both sides with grey, deepening into dark brown towards the inner margin; base pale yellow, intersected by a black lunule. Hind-wings light brown, varied with grey, nearly as in the typical female. Expands from 1¾ to 2½ inches. Common in many parts of Central and Southern Europe and Western Asia in dry grassy places, especially on a limestone soil. Absent in Northern and North-Western Europe, though a specimen was once bred in England from a larva which had probably been accidentally introduced. The variety *Pirata* is confined to Southern Europe. The larva is yellowish-grey, with dark lines on the back, and a pale grey streak on the sides. The butterfly is figured at Pl. 12, Fig. 3. (*H. Prieuri*, Pierr., which some writers consider another variety of *Briseis*, is found in North Africa and Spain. It has a more broken white band on the fore-wings, and that on the hind-wings is smaller and angular.)

5. *H. Persephone* (Hübn.), *Anthe* (Ochs.).—Brown, fore-wings with two large eye-spots scarcely ocellated, placed on a broad whitish band, which entirely surrounds the second eye. There is no white spot above the eye nearest the tip, but the spot within it is produced to the costa. Hind-wings with a white suffused band, angulated in the female, and with a black spot in a yellow ring near the anal angle beneath. There is a variety of this species also with the pale markings tinged with ochre-yellow. Expands 2½ inches. The under side of the hind-wings is brown, varied with grey. Frequents the mountainous regions of South Russia and Western Asia, and is not very common in collections. (*H. Autonoe*, Esp., from the steppes of Russia, is generally smaller than this, and has a duller coloured band, which is much narrower, especially on the hind-wings, where it is scarcely more than a broad angulated line. The pupils of the eyes of the fore-wings are distinctly marked, and there is often a third eye at the anal angle of the hind-wings, which are varied with white lines beneath.)

* 6. *H. Semele* (Linn.), (*Grayling*).—Brown, fore-wings with two well-marked eyes, placed on a tawny band. Hind-wings with a darker sub-marginal band, and an eye at the anal angle. In the male, which is considerably smaller than the female, the pale markings of the fore-wings are much obscured, and there is an oblique dark patch in the middle of each fore-wing. Under side of fore-wings tawny, the base darker in the female; hind margin brown. Hind-wings beneath brown, mottled with grey, the basal portion darker in the male, and bordered by a distinct irregular white band, suffused on the outside. Varies somewhat according to locality; the variety *Aristæus* (Bon.), from Corsica and Sardinia, has the pale markings more suffused, and the variety *Mersina* (Staud.), from Asia Minor, has the hind-wings beneath unicolorous grey. Madeiran specimens before me are much darker than European, though the only Algerian specimen I possess is paler. The commonest and most widely-distributed species of the genus. It is found throughout Europe and Western Asia on dry heaths and hill-sides, and is fond of settling on stones and tree-trunks, where the colouring of the under surface secures it from observation. It is considered a local insect in Britain; but this is most likely only because the country is so highly cultivated. Expands from 1¾ to 2¾ inches. Larva brownish, with a darker line on the back, and two grey lines on each side, of which the uppermost is the palest.

7. *H. Pelopea* (Klug.), var. *Græca* (Staud.), is brown, with a red sub-marginal band in the male, and a white one in the female, containing two black eyes on the fore-wings, with white spots between them, at least on the under side; there are also one or two white spots at the anal angle of the hind-wings. Under side brown, much mixed with whitish. Expands about 2 inches. Found in the mountains of Greece, where it represents in Europe the variable *H. Pelopea* of Western Asia.

8. *H. Telephassa* (Hübn.), var. *Amalthea* (Friv.).—Brown, with a large black basal streak on the fore-wings of the male. A broad sub-marginal white band, edged with yellow, on both wings, containing two eyes on the fore-wings, and an anal eye on the hind-wings. (In some females the white band is much obscured on the hind-wings, and edged with smoky brown instead of yellow.) Expands about 2 inches. Common in the mountains of Greece and Southern Turkey. (In the typical *Telephassa* from Syria, which is larger, the bands are fulvous in both sexes; in the variety *Anthelea*, Hübn., from Asia Minor, the band is white in the male, and fulvous in the female. Neither of these forms is found in Europe.)

9. *H. Hippolyte* (Esp.).—Light brown, with a continuous yellow band near the hind margin, containing two black eyes with very small white pupils on the fore-wings; and there is also a small eye at the anal angle of the hind-wings. Hind-wings grey, with the veins whiter, and some obscure white transverse lines. Expands nearly 2 inches. It inhabits the mountains of

Andalusia and South Russia. (*H. Beroe*, Freyer, found in Turkey and Greece, is pale brown, with a very obscure band, two eyes on the fore-wings, indistinctly pupilled, and a small anal eye on the hind-wings, which are varied beneath with grey, and marked with a narrow transverse white band, although they are not white along the nervures. It expands about 2 inches.)

10. *H. Neomiris* (Godt.), *Iolaus* (Bon.).—Dark brown, with an eye at the tip of the fore-wings, and another at the anal angle of the hind-wings. There is a broad, bright fulvous band on the hind-wings, and on the hinder half of the fore-wings, which is not divided by the nervures, except slightly on the fore-wings above, and is broader and redder on the under side of the fore-wings. The hind-wings are dark brown beneath, with a very distinct whitish transverse band. Expands $1\frac{3}{4}$ inches. This species is confined to the mountains of Corsica and Sardinia.

11. *H. Arethusa* (W. V.).—Brown, with an eye, blind above, at the tip of the fore-wings, and a very small one at the anal angle of the hind-wings. A broad, tawny, sub-marginal band on all the wings, though frequently less distinct on the hind-wings. It is divided into spots by the nervures, and surrounds the eyes more or less completely. Under side of fore-wings fulvous, with brown borders; hind-wings beneath brown, with a narrow, curved, transverse grey band across the centre. Expands from $1\frac{1}{2}$ to 2 inches. Common in South Europe, but also found in many parts of France and South-Western Germany. It frequents rocky places in woods, and often settles upon stones.

12. *H. Statilinus* (Hübn.).—Dark brown, the fringes spotted with dirty white; two black eyes with two white dots between them on the fore-wings, and one eye on the hind-wings. Eyes of the fore-wings surrounded with yellow rings on the under side, where a black line bordered outside with whitish runs within them. Hind-wings beneath varied with violet-grey; a crooked black line across the centre, bordered outside by a suffused pale band. Expands from $1\frac{1}{2}$ to 2 inches. Common in many parts of Southern and Central Europe, frequenting sandy places near fir woods in the plains, and rocky places in the mountains. (The South European variety, *Allionia*, Fabr., is larger and rather darker. *H. Fatua*, Freyer, from Greece, which is probably another variety, has a dark line near the hind margin of all the wings above, and the hind-wings are more uniformly coloured, and darker beneath.)

13. *H. Fidia* (Linn.).—Very similar to the last, but the white spots on the fore-wings are larger, and the fringes are pure white, spotted with brown on the fore-wings. Under side of hind-wings pale grey, varied with brown towards the hind margins, and within the black angulated line which crosses the centre. A short black line runs from the costa near the base. Expands from $1\frac{3}{4}$ to 2 inches. Common in South Europe. The larva is yellow, with black stripes on the back and sides.

14. *H. Dryas* (Scop.), *Phædra* (Linn.).—Dark brown, with two black eyes on the fore-wings with large blue pupils, and surrounded with yellow rings, which are most distinct on the under side. Expands from $1\frac{3}{4}$ to $3\frac{1}{2}$ inches. Common in many parts of Southern and Central Europe (except the north-west), and throughout Asia to Japan. It is a local insect, and is generally found on damp moors and heaths, although it also occurs in dry, hilly districts. Larva yellowish-grey, with several dark longitudinal lines. It feeds on *Avena elatior*.

15. *H. Actæa* (Fabr.).—A very variable species. The male much resembles *H. Dryas*, but the eyes are smaller, and there are two white spots between them. The second eye on the fore-wings is sometimes absent in the male. The female is yellowish-brown, sometimes with a dull tawny, sub-marginal band; and the eyes are surrounded with yellow rings above. There are generally two or three small eyes at the anal angle of the hind-wings beneath, and the

fore-wings are fulvous beneath in the female. *H. Cordula* (Fabr.), *Podarce* (Ochs.), *Pæas* and *Bryce* (Hübn.), and *Virbius* (Herr-Schäff.), are varieties of this species, which is common in Southern Europe and Western Asia, including the southern slopes of the Alps, where it frequents dry, rocky places. It expands from 1¾ to 2½ inches. The male of *H. Cordula* is figured at Pl. 12, Fig. 4.

GENUS II.—ŒNEIS (HÜBN.), CHIONOBAS (BOISD.).

Middle-sized butterflies, with the nervures of the fore-wings very little dilated at the base. The ground colour is brown, tinged with tawny, with a tawny sub-marginal band containing a variable number of eyes. The hind-wings are rounded and almost entire; they are sprinkled with white and brown beneath, and the nervures are often whitish. The antennæ are very short, and the club is gradually formed. With the exception of *Œ. Tarpeia*, which inhabits the steppes of South Russia, this genus is circumpolar, or occurs only at a great elevation in the Alps, Himalayas, Mount Washington, and California, the Californian species being the largest of the genus. The perfect insects may all be looked for in June and July. The only known larva is that of *Œ. Semidea* (Say), which feeds on lichens near the summit of Mount Washington in North America. We enumerate below only those species which are indubitably European; several others, formerly said to have been taken in Lapland, are now asserted to be only found in Labrador.

1. *Œ. Jutta* (Hübn.).—Brown, male with a broad black oblique streak on the fore-wings. A sub-marginal tawny band, divided into spots by the nervures, generally containing three blind eyes on the fore-wings, and one or two near the anal angle of the hind-wings. The band is frequently so narrow and so much divided, especially on the fore-wings, that it might often be called a series of spots. Under side of hind-wings brown, varied with grey, an angulated darker band across the middle, which is scarcely visible in the female. A circumpolar insect, frequenting peat marshes in the extreme north of Europe, Asia, and America, in company with *Erebia Embla*. It expands nearly 2 inches.

2. *Œ. Aello* (Hübn.).—Brown, slightly dusted with tawny, a pale tawny marginal band, suffused on the inner side, containing from two to four black spots on the fore-wings, which are sometimes ocellated, and an anal eye, and sometimes a second spot on the hind-wings, which are marked beneath with very distinct white nervures. Expands from 1½ to 2 inches. Found at a great elevation in the Alps, frequenting rocky places and meadows. Not very common, and, some say, only to be found in alternate years. The butterfly is figured at Pl. 52, Fig. 2.

3. *Œ. Tarpeia* (Pall.).—Tawny, with about four sub-marginal black spots on each wing. Expands from 1½ to 1¾ inches. Inhabits the steppes of Southern Russia and Siberia.

4. *Œ. Norna* (Thunb.).—Brown, tinged with tawny. Marginal band fulvous, with two eyes on the fore-wings, and one on the hind-wings. The eyes of the fore-wings are sometimes blind, and are sometimes absent, or only one is present. It may be distinguished from *Œ. Jutta*, with which it agrees in having a darker band across the hind-wings beneath, by the suffused sub-marginal band, which is reddish rather than yellowish, and is not divided into spots on the hind-wings. It expands from 1½ to 1¾ inches, and inhabits Lapland and Siberia.

5. *Œ. Bore* (Schneid.).—Fore-wings pale greyish tawny, sometimes with a row of black dots near the hind margin. Hind-wings brown, tinged with tawny, sometimes with a sub-marginal tawny band. Under side of hind-wings greyish-brown, with some obscure whitish lines (banded with pale lines in var. *Taygete*, Hübn.). Expands from 1½ to 1¾ inches. Circumpolar; in Europe it occurs in Lapland.

GENUS III.—EREBIA (DALM.).

Small or middle-sized butterflies, nearly always of a dark brown colour, with a sub-marginal rust-coloured band, marked with eyes. The band on the fore-wings is broadest, and generally contains one or two eyes near the tip, and another lower down. On the hind-wings the band is narrower, and often broken into spots; and the eyes are smaller. The under side is paler; but the basal half of the hind-wings is often dark. The hind-wings are generally entire in the smaller species, and slightly dentated in the larger. The palpi are covered with long bristly hairs, and the antennæ are slender, with a rather long club. None of the nervures of the fore-wings are much dilated at the base, except the sub-costal nervure. The larvæ are narrow behind, with very fine scattered hairs. They conceal themselves closely, and very few are known. The pupæ are formed on the surface of the ground. The butterflies are found almost exclusively in mountainous regions, except in the extreme north. Even the few species which descend to the plains in Central Europe appear to be confined to hilly districts. They inhabit the mountains of Europe, Asia, and North America; but very few species extend to the extreme south of Europe, and none are recorded from the mountains of North Africa, though, strange to say, the genus re-appears in those of South Africa. They have a black appearance on the wing, so that they can be easily recognised when flying.

1. *E. Medusa* (W. V.).—Wings on both sides dark brown, with black eyes pupilled with white placed on rust-coloured spots, and of equal size both below and above. The number of eyes varies; there are generally from two to six on the fore-wings, of which the two nearest the tip are the largest. In the East European variety, *Psodea* (Hübn.), the spots are larger and more numerous; the northern variety, *Polaris* (Staud.), is smaller and darker, with the band not so well marked beneath. Common in Central and Eastern Europe, and Northern and Western Asia. It occurs in Lapland and Finland, but is absent from other parts of Northern and North-Western Europe. It is found in open places and meadows near woods in May and June; south of the Alps it occurs exclusively in the mountains. The larva is pale green, with darker longitudinal lines bordered with white. It feeds on *Panicum sanguinale* in autumn and spring. The butterfly and larva are figured at Pl. 12, Fig. 5, *a*, *b*.

2. *E. Œme* (Esp.).—Blackish-brown, with black eyes pupilled with white placed on round rust-coloured spots. Under side of the hind-wings paler, with the eyes larger than above. The fore-wings have only two small eyes near the tip in the type; but the Austrian variety, *Spodia* (Staud.), has from three to five eyes, which are larger, and are placed on large red contiguous spots. Expands from $1\frac{1}{4}$ to $1\frac{1}{2}$ inches. Widely distributed throughout the Alpine ranges, but local, and frequenting luxuriant meadows and damp places in June and July at a considerable elevation. It prefers a limestone soil.

3. *E. Ceto* (Hübn.).—Dark brown above; both sides with long narrow rust-coloured spots, generally divided by the nervures, containing small black eyes with white pupils. In the variety *Phorcys* (Freyer), there are white spots with brown eyes on the under side of the hind-wings. Expands about $1\frac{1}{2}$ inches. It is found in July in grassy places in the Southern Alps.

4. *E. Pyrrha* (W. V.).—Dark brown above; both sides with a series of rust-coloured spots, which are rather long on the fore-wings. The spots on the under side of the hind-wings are yellow, and there are often others at the base. The middle spot extends further towards the hind margin than above, and the eyes are blind or absent. Extends about $1\frac{1}{4}$ inches. Common, and widely distributed in the Alps in July and August.

5. *E. Melampus* (Fuessly).—Dark brown, rather paler beneath, with a rust-coloured band,

which is mostly divided into spots, at least on the hind-wings, and is marked with black dots. The hind margin of the hind-wings is perfectly rounded. (In the variety *Eriphyle*, Freyer, the middle red spot on the under side of the hind-wings is placed further towards the base than the others.) Expands from 1¼ to 1½ inches. One of the commonest species in the Alps, Pyrenees, &c., in July, frequenting grassy places from a moderate elevation upwards. *Eriphyle* is more local, and is only found at a considerable height.

* 6. *E. Epiphron* (Knoch.), (*Mountain Ringlet*).—Dark brown on both sides, fore-wings with a rust-coloured band or row of spots, and hind-wings with round rust-coloured spots, on which blind or ocellated eyes are placed. The hind margin of the hind-wings projects into a very slight angle in the middle. The variety *Cassiope* (Fabr.) has black dots instead of eyes. Expands from 1¼ to 1½ inches. Inhabits many of the mountain ranges of Central Europe, including some of those of Scotland, the north of Ireland, and the English lake district; but from other ranges, such as the Riesengebirge, Black Forest, and Jura, it is entirely absent. It is met with in June and July in swampy places at a considerable height, varying with the locality, and the particular variety of the species. The larva is green, with darker green lines, and a white stripe on the sides. It feeds on *Poa annua* and *Festuca ovina*. The butterfly is figured at Pl. 12, Fig. 6.

7. *E. Arete* (Fabr.).—Wings blackish-brown above, with a rust-coloured band, which is divided into spots on the hind-wings. The hind-wings have a row of white spots before the hind margin on the under side, and sometimes also above. Their hind margin is dark reddish-brown beneath in the male, and they are wholly greenish-grey in the female. Expands 1¼ inches. After this local insect had been described, eighty years elapsed before its re-discovery in the mountains of Carinthia.

8. *E. Pharte* (Esp.).—Wings above dark brown, with a rust-coloured band divided into round spots on the hind-wings, without black dots. Under side of the male dark brown; and of the female dark brown, dusted with greyish-yellow. Expands from 1¼ to 1½ inches. Widely distributed in the Alps, occurring in grassy meadows in July and August at a great elevation.

9. *E. Muestra* (Esp.).—Wings above dark brown, with a reddish or rust-coloured band, sometimes containing two black dots, or small eyes, towards the tip of the fore-wings. Fore-wings beneath reddish or rust-colour, with dark borders; hind-wings beneath uniform dark brown in the male. In the female they are pale brown, dusted with whitish, and with a pale grey band. Expands about 1¼ inches. A local insect, but found throughout the Alpine ranges, on slopes above the highest meadows, in July. It appears to be commonest in the French Alps, but is said to be difficult to capture.

10. *E. Alecto* (Hübn.).—A very variable species, black or blackish-brown above, sometimes without any markings, or with a faint rust-coloured band; occasionally with two small eyes, generally blind, near the tip of the fore-wings. Fore-wings beneath unicolorous dark brown; or with a rust-coloured band; or brownish-red with a dark border. Hind-wings beneath dark brown, and without markings in the male; in the female they are dusted with grey, and have generally a paler sub-marginal band. Expands about 1½ inches. Widely distributed in the Alps from June to August, but nowhere common, and only found in rocky places above the tree-limit.

11. *E. Scipio* (Hübn.).—Wings brown, fore-wings with a rust-coloured band divided by the nervures, and marked with two confluent black eyes pupilled with white near the tip. There are often one or two smaller ones separated from these, especially in the female. The band is narrower and more divided into spots on the hind-wings, with or without two or three eyes. Under side of the fore-wings reddish, with the margins brown, and the eyes as above; under side of the hind-wings uniform brownish-black in the male, with or without eyes. In the female it is uniform ashy-grey,

sometimes with some black spots without pupils. Found only in the mountains of the south of France (Basses-Alpes) in July.

12. *E. Epistygne* (Hübn.).—Fore-wings brown, with the discoidal cell more or less filled with yellowish; marginal band yellowish, with five or six eyes ocellated above and below, the three nearest the tip contiguous. Hind-wings with the band fulvous, and marked with five or six small eyes. Under side of fore-wings with the band redder; hind-wings beneath brown, mixed with whitish, with the eyes very small and scarcely visible. Expands about 1½ inches. Found in March and July in the mountains of the south of France (Departments of Var and Basses-Alpes).

13. *E. Afer* (Esp.).—Brown, tip of fore-wings paler, a marginal row of black eyes with blue or white pupils placed in yellowish or fulvous rings. There are about six on each wing. The eye nearest the tip is very small, and next to this are two contiguous eyes much nearer the base than any of the others. Under side of fore-wings with the eyes as above; hind-wings beneath with broad whitish veins. Expands about 1½ inches. It is found in South Russia, and perhaps also in Dalmatia, in June and July. (The Siberian *E. Parmenio*, Boeb., which has been said to occur in Styria, has also white veins on the under side of the hind-wings beneath; but it is a very large brown species, with a large black eye bipupilled with white and enclosed in a yellowish ring near the tip of the fore-wings, beneath which, and on the hind-wings, are several smaller eyes with single pupils.)

14. *E. Manto* (W. V.).—Wings above blackish-brown, the fore-wings with a rust-coloured band containing from two to five black dots, and the hind-wings with or without black dots placed in red rings. Under side of fore-wings reddish-brown, with violet-grey margins; hind-wings beneath marbled with violet-grey, with two dark zigzag lines. Expands from 1¼ to 1¾ inches. One of the most widely-distributed species. It is common throughout the Alpine ranges above the tree-limit from June to August, and is also common all over Scandinavia and in the Altai. It has never been reputed British, but is not unlikely to inhabit some of the mountain districts in the north of Scotland. (*E. Ocnus*, Eversm., is perhaps a Siberian variety without black spots above.)

15. *E. Tyndarus* (Esp.).—Wings above dark brown, with a green lustre; fore-wings with a short rust-coloured band, consisting of rather long spots, with two black eyes near the tip, generally pupilled with white, and sometimes contiguous; hind-wings with or without three or four eyes surrounded with fulvous. Under side of fore-wings brownish-red, with the tip violet-grey; hind-wings suffused violet-grey, with some zigzag dark lines. It varies considerably; the variety *Cœcodromus* (Guén.) has no eyes, and the variety *Dromus* (Herr. Schäff.) has very large ones. Expands about 1¼ inches. It is one of the commonest butterflies throughout the Alpine ranges in June and July, and likewise occurs on all the mountains of South Europe and Western Asia.

16. *E. Gorge* (Esp.).—Dark brown, with a rust-coloured band containing two small eyes near the tip of the fore-wings, and sometimes three on the hind-wings. Under side of fore-wings dark brown, marbled at the tips in the male, or reddish, with brown borders, in the female; hind-wings beneath marbled with dark brown and whitish, with a dark line, strongly and regularly dentated. The hind-wings of this species are rather long. The variety *Erynis* (Esp.) has no eyes; the variety *Triopes* (Spey.) has a third eye on the fore-wings, and the variety *Gorgone* (Boisd.), found in the Pyrenees, is a little larger, often with more eyes than *Gorge*; the male is unicolorous beneath, and the female has the nervures whitish. Expands about 1¼ inches. Widely distributed in the Alps and Pyrenees in July and August, frequenting rocky places not much below the snow-line. It is somewhat local, and partly owing to this, and partly to the elevation at which it flies, it is not considered one of the commonest species, although sometimes met with abundantly.


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17. *E. Goante* (Esp.).—Very like *Gorge*, but larger. Expands about 1½ inches. The band is brighter coloured and better defined, and the eyes are larger and pupilled below. The hind-wings are not so much produced, but regularly rounded, and are darker on the basal half, which forms irregularly rounded projections behind. Widely distributed throughout the Alpine ranges in July, though somewhat local. It flies at a considerable elevation, and is more frequent towards the south side of the ranges.

18. *E. Pronoë* (Esp.).—Dark brown, with a rust-coloured band containing eyes. The fore-wings are reddish-brown beneath; hind-wings beneath with a paler band, which is sharply bounded towards the base. The hind-wings and tips of fore-wings are dusted with violet-grey beneath; the former have a paler band towards the hind margin. The variety *Pitho* (Hübn.) is darker, with the red band more or less obliterated. Expands from 1½ to 1¾ inches. One of the commonest species throughout the Alpine ranges in July and August, where it frequents the meadows of the forest region. The male is much more abundant than the female. It also extends to the mountains of Asia Minor and the Caucasus.

19. *E. Neoridas* (Boisd.).—Brown, with a fulvous marginal band containing at least three eyes on each wing. The two nearest the tip of the fore-wings are the largest, and are often confluent. The hind-wings are somewhat oval, and are brown beneath, varied with darker, and paler towards the margins, but without eyes. It expands nearly 1½ inches. Common in August at a moderate elevation in some parts of South France and Spain.

* 20. *E. Æthiops* (Esp.), *Medea* (Hübn.), *Blandina* (Fabr.), (*Scotch Argus*).—Upper side nearly as in *Neoridas*, but the band is of a darker red, more rust-colour, and the hind-wings are more rounded, and slightly dentated. The bands are sharply defined on both sides of the fore-wings, but are rather paler below. Hind-wings of the male brown beneath, with a band near the hind margin dusted with whitish, and containing white dots; in the female they have a greenish tinge, and are banded with greenish-yellow. Expands from 1¼ to 1¾ inches. Inhabits the greater part of Central and Southern Europe, and Northern and Western Asia, but is wanting in the north-western plains of Europe, and in Silesia. It is common in many places in Scotland and the north of England, frequenting open places in woods from July to September. The larva is pale green, with a dark green or brownish stripe on the back, and two white stripes bordered with darker on each side. Lives on different species of *Poa* in October, May, and June. The butterfly is figured at Pl. 12, Fig. 7.

21. *E. Nerine* (Freyer).—Wings above dark brown, with a rust-coloured band containing eyes, the two nearest to the tip of the fore-wings placed obliquely. Under side of fore-wings reddish-brown; paler towards the hind margins. Hind-wings beneath dark brown, faintly dusted with whitish, with a slightly paler band in the male; greenish-grey, with a pale yellow band in the female. In the variety *Reichlini* (Herr. Schäff.), the eyes are smaller; the fore-wings are darker beneath, and the band on the under side of the hind-wings is less dentated towards the base. Expands nearly 2 inches. A very local species, found only in the forest region of the South-Eastern Alps in July.

22. *E. Stygne* (Ochs.).—Upper side nearly as in *E. Nerine;* fore-wings beneath dark brown, as far as the sharply defined rust-coloured band. Hind-wings beneath almost uniform blackish in the male, and brownish-yellow, with an indistinct paler band, in the female. Expands from 1¼ to 1½ inches. Common in the Alps, and in all the mountains of South-Western Europe at a moderate elevation, in June and July.

23. *E. Evias* (Godt.).—Dark brown, with a rust-coloured band enclosing eyes, three of which, near the tip of the fore-wings, are placed in a straight line. Under side of the fore-wings dark

brown, within the band; hind-wings beneath brown, dusted with whitish, and with a paler band near the hind margin, enclosing small eyes. Expands from 1½ to 1¾ inches. Found in July in rocky places covered with weeds in the Southern Alps, and the mountains of South France and Spain. It is considered one of the rarer species.

24. *E. Melas* (Herbst.).—Male very variable, ground colour dark brown or blackish, often with a bluish shade, and generally with at least three eyes on all the wings. The two nearest the tip are confluent, and are sometimes united into one bipupilled eye. Fore-wings beneath sometimes with traces of a fulvous band. Under side of hind-wings unicolorous brownish-black, sometimes with an inconspicuous paler band towards the hind margin, enclosing eyes. The female is paler, with about four eyes on all the wings, which are placed on a rust-coloured band, visible on both sides of the fore-wings. Hind-wings beneath ashy-grey, with blackish wavy lines, and blackish atoms. A broad paler dentated band, on which eyes are placed, before the hind margin. Expands about 1½ inches. Found in the mountains of South-Eastern Europe, Spain, and the Pyrenees, in June and July.

25. *E. Ligea* (Linn.), (*Arran Brown*).—Dark brown, with rust-coloured bands containing eyes or spots on all the wings; the fringes spotted with white. Under side of fore-wings with the band well defined (at least in the males) and paler; hind-wings dentated, under side brown, with a broad pale band near the hind margin, which is strongly indented on the basal side, and spotted with white; towards the hind margin it encloses eyes surrounded with yellow rings. Expands about 1¾ inches. The variety *Euryale* (Esp.) is smaller (expands only 1½ inches), and the band on the hind-wings beneath is more yellowish. We find only faint traces of it in variety *Adyte* (Hübn.); and in the variety *Philomela* (Hübn.), the whole under side is dusted with whitish. One of the commonest species at a moderate elevation in the mountainous or hilly parts of almost all Europe and Northern Asia. It is a species very likely to be found in Scotland, and was said, some years ago, to have been taken in the Isle of Arran. The perfect insect is found in June and July; and the larva, which is pale yellowish-green, with a broad stripe on the back, bordered with paler, and has whitish lines on the sides, feeds on grass in spring and autumn. The under side of the butterfly is figured at Pl. 12, Fig. 8.

26. *E. Embla* (Thunb.).—Dark brown, fore-wings with a large bipupilled eye near the tip, and smaller ones beneath it with single pupils. Hind-wings with a variable number of small eyes. All the eyes enclosed in fulvous rings. Wings beneath dark brown; fore-wings marked as above; hind-wings generally with a white spot on the costa, and another near the middle of the wing, and two black dots towards the anal angle. Expands from 1¾ to 2 inches. Found in marshes from June to August throughout the extreme north of Europe and Asia.

27. *E. Disa* (Thunb.).—Very like *E. Embla*, but the eyes are generally blind. Hind-wings unspotted above; on the under side they are ashy-grey, with a broad dentated brown band in the middle. It is found in Lapland in July.

GENUS IV.—MELANARGIA (MEIG).

Middle-sized butterflies, with the wings rounded and slightly scalloped. The ground colour is white, more or less marbled with black; the under side of the hind-wings is duller, with a row of about six eyes with bluish pupils, interrupted between the second and third, and sometimes slightly visible above. The two eyes nearest the anal angle are generally small and contiguous, and there are also one or two eyes at the tip of the fore-wings beneath. The antennæ are long, with a slender and gradually formed club, and the front pair of legs are unusually small. The larvæ

are stout and spindle-shaped, with a round head, and are thinly covered with fine hair. They hybernate young, and live concealed in spring. They feed on grass, and conceal themselves during the day. The pupæ are placed on the surface of the ground. There are not many species of this genus known, but it appears to be met with throughout Central and Southern Europe, North Africa, and part of Central and Western Asia. The majority of the species are found on the shores of the Mediterranean, and only one is met with north of the Alps.

* 1. *M. Galathea* (Linn.), (*Marbled White*).—Creamy white, marbled with black; base black; hind margins blackish, and spotted with white lunules on all the wings. A large square spot in the middle of the costa of the fore-wings. Under side of fore-wings with one eye at the tip; hind-wings beneath white in the male, and yellowish in the female. There is a marginal row of six black eyes, and a greyish band across the centre, always interrupted in the middle. Expands from 1¾ to 2¼ inches. A very variable insect; specimens have occurred almost perfectly white, and others almost black; the latter are most common in Southern Europe. The paler varieties have been called *Leucomelas* (Esp.), which has the hind-wings unicolorous cream-colour beneath, and *Galene* (Ochs.); the dark forms, which are more constant, are *Procida* (Herbst) and *Turcica* (Boisd.). *M. Galathea* is one of the most abundant insects in Central and Southern Europe; in England it is common where it occurs, but very local. It frequents meadows and open places in woods from June to August. The larva is yellowish-green, with red lines on the back and sides, and may be found in April and May. The butterfly is figured at Pl. 12, Fig. 9.

2. *M. Lachesis* (Hübn.).—White, with black borders spotted with white. A large irregular black spot, deeply excavated on both sides, at the end of the cell of the fore-wings. There is a more or less distinct square black spot on the inner margin at the base, but the costal half of the base is white. The under side is similar to that of *M. Galathea*, and two or three of the eyes are visible on the upper side of the hind-wings. Expands about 2¼ inches. It is found in South-Western Europe in May and June. The larva is flesh-colour, with pale carmine lines.

3. *M. Larissa* (Hübn.) resembles the last two species; base of all the wings dusky. The discoidal markings on the fore-wings are composed of two square black spots, forming a sort of right angle. Under side of hind-wings with an uninterrupted central row of white spots edged on both sides with black, and six eyes, with violet pupils, and enclosed in distinct black rings. Expands from 1½ to 2 inches. It inhabits South-Eastern Europe and Western Asia in June.

4. *M. Iapygia* (Cyr.).—White, with black spots and nervures; an indented black line enclosing white spots on the hind margins. Eyes of the hind-wings visible above; they are yellow below, and pupilled with blue. The base of the wings is often dusky above, without being very distinctly black. Expands from 2 to 2¼ inches. It inhabits the shores of the Mediterranean and Black Seas in June and July. The larva is pubescent; its colour is citron-yellow, with a slight greenish tint, and a brighter line on the back, and yellowish ones on the sides.

5. *M. Syllius* (Herbst), *Psyche* (Hübn.).—White, an irregular black fascia spotted with white at the end of the cell of the fore-wings; all the hind margins black, spotted with white, especially at the tip of the fore-wings, where there is a double row of spots. There are one or two eyes at the tip of the fore-wings, visible on both sides; and five on the hind-wings beneath, some of which are also visible above. The eyes are reddish, with blue pupils, and are enclosed in yellowish rings. The nervures of the hind-wings, and those at the tip of the fore-wings, are broadly reddish beneath. In this and all the following species the hind-wings are edged with a double black line, instead of a single one. Expands from 2 to 2¼ inches. Common in the south of Europe in June and July. It flies rapidly, and is not easy to catch, except in the morning. It frequents bare hill-sides and waste places. The larva is yellowish flesh-colour, with a light brown line on the back, bordered

with whitish on both sides; and a yellow sub-dorsal line, bordered with dark green. A common variety is green, with a dark line on the back. It feeds on *Brachypodium piniatum* in spring.

6. *M. Pherusa* (Boisd.) resembles *M. Syllius*, but the black spot at the end of the discoidal cell is round, enclosing a white spot, and from its extremity runs a black streak as far as the second nervure below. Nearer the base a short black streak runs across the cell. The base of all the wings is dusky above, and there are two eyes on each side at the tip of the fore-wings. The nervures of the hind-wings are narrowly edged with pale reddish-brown beneath. Expands about 2 inches. It is found in Sicily in June. The larva is yellowish-white, with darker lines on the back, and feeds on *Spiretum* in March.

7. *M. Arge* (Sulz.).—White, marbled with black towards the hind margins; fore-wings with two eyes, and hind-wings with five, which are reddish beneath. Expands 2 inches. It is found in Calabria in June. (*M. Thetis*, Hübn., found in Spain from April to June, is similar to this, but much darker above, especially on the margins, where the eyes of the upper side are almost lost in the dark border.)

GENUS V.—SATYRUS (LATR.).

Middle-sized butterflies, with hairy eyes. The antennæ are straight, with a distinct club, except in the last species, in which they are gradually thickened. The middle pair of tibiæ are scarcely longer than half the length of the tarsi, and the hind-wings are more or less denticulated. The larvæ are spindle-shaped, with a small round head. They are green, and covered with thin short hair, and may be obtained by sweeping. The pupæ are suspended, except, perhaps, that of *Ægeria*. The butterflies are brown, varied with tawny, and have always an eye at the tip of the fore-wings, and a sub-marginal row of eyes on both surfaces of the hind-wings.

1. *S. Roxelana* (Cram.).—Brown, fore-wings with a large fulvous blotch in the centre, and the apical eye blind; hind-wings with from three to five marginal eyes in yellowish rings. On the under side the apical eye on the fore-wings is ocellated, and there is a row of five large eyes and two or three small ones on the hind-wings. Expands from 2 to 2¼ inches. Figured at Pl. 52, Fig. 1.

2. *S. Clymene* (Esp.) is smaller; the eyes are blind above, and the under side of the hind-wings has a continuous row of seven small black dots in fulvous rings. Both this species and *S. Roxelana* are found only in South-Eastern Europe in June and July. The larva of *Clymene* is green, with indistinct lines, and a large round head, surmounted by two points.

3. *S. Mæra* (Linn.).—Wings brown in the male, with a fulvous marginal band, divided into spots by the nervures on the fore-wings, at the tip of which is a large black eye, containing one or two white pupils, and a small eye near it. Hind-wings with two or three eyes. The female has the fore-wings fulvous, with brown transverse streaks. Under side of hind-wings grey, with a marginal row of six black eyes with white pupils, enclosed by several black and yellow rings; the eye at the anal angle is double, and very small. In the variety *Adrasta* (Hübn.) the marginal fulvous band is more distinct than in the typical *Mæra*. Expands about 1¾ inches. Widely distributed in Europe, except the north-west, in spring and autumn, being double-brooded. It is chiefly met with in hilly districts, and is fond of settling on rocks. Larva pale green, with a dark line on the back, and pale lines on the sides. It feeds on grass in July, and again from September to May. The butterfly is figured at Pl. 13, Fig. 1.

4. *S. Hiera* (Hübn.).—Smaller and darker than *S. Mæra;* the eye at the tip of the fore-wings is smaller, with a single pupil, and there is a distinct black transverse line on the dark portion of the hind-wings, between the base and the eyes. Under side of hind-wings dark grey, with the eyes rather small and indistinct. Expands about 1½ inches. It is found at a moderate elevation


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in the Alps, and other mountains of Southern Europe and Western Asia, from May to August; and also in Scandinavia. The larva is undescribed, but is believed to feed on *Poa pratensis.*

* 5. *S. Megæra* (Linn.), (*Wall Brown*).—Tawny, with transverse brown lines; the male with a broad oblique stripe on the fore-wings. The eye at the tip of the fore-wings has only one pupil, and there is another very small eye near it; the under side is yellowish-grey. Otherwise similar to *Mæra.* The females are difficult to define by description, when the eye of *Mæra* is not bipupilled; but the ground colour of *Megæra* is paler, and the tawny markings of the hind-wings are more extensive. The variety *Lyssa* (Boisd.), from South-Eastern Europe, has grey hind-wings beneath; and the variety *Tigelius* (Bon.), from Corsica and Sardinia, is smaller and darker fulvous than the typical *Megæra.* Expands from 1¾ to 2 inches. Abundant in all parts of Europe and Western Asia throughout the fine season; it appears as early as February in the extreme south of Europe. It flies along road-sides, frequently settling on the road, or on flowers growing by the wayside; and very frequently on sunny walls, whence its popular name. The larva is green, with pale stripes, and may, like the butterfly, be found throughout the year. The transformations are figured at Pl. 13, Fig. 2, *a—c.*

* 6. *S. Ægeria* (Linn.), (*Speckled Wood*, or *Wood Argus*).—Brown, spotted with tawny or (var. *Egerides*, Staud.) with pale yellow. Fore-wings with an eye near the tip, and hind-wings with three marginal eyes. Hind-wings beneath purplish-grey, the eyes reduced to white dots surrounded with brown. Expands from 1¾ to 2 inches. Abundant in shady woods, during all the fine season, throughout the greater part of Europe, North Africa, and Western Asia. The form *Ægeria* is found only in the South, and *Egerides* only in Northern and Central Europe. The larva is green, with white stripes, and is found throughout the year. The form *Egerides* is figured at Pl. 12, Fig. 10.

7. *S. Achine* (Scop.), *Dejanira* (Linn.).—Pale brown, with a marginal row of large black eyes in yellow rings on all the wings, ocellated only on the under side, which is paler, with a white sub-marginal band, on which the eyes are placed. Expands from 1¾ to 2 inches. Found in shady woods in June in Northern and Central Europe and Asia; but is generally a scarce and local insect, and is absent from a great portion of North-Western Europe. The larva is dull green, with a darker line on the back, and white lines on the sides; the forked tail is also white. Feeds on *Lolium perenne* in April. The butterfly and larva are figured at Pl. 52, Fig. 3, *a, b.*

GENUS VI.—EPINEPHILE (HÜBN.).

Middle-sized butterflies, the fore-wings with an eye near the tip, and generally fulvous beneath; the male with a broad black streak on the fore-wings above (except in *Hyperanthus*), which is either oblique or transverse. Hind-wings slightly dentated. The antennæ gradually clubbed, and the middle pair of tibiæ nearly as long as the tarsi. The butterflies are found in meadows, at the edges of woods, &c., from June to August. The larvæ are spindle-shaped, and covered with fine hair; they hybernate, and may be obtained by sweeping in spring. The pupæ are suspended, except that of *Hyperanthus*, which is placed on the surface of the ground.

* 1. *E. Hyperanthus* (Linn.), (*Ringlet*).—Dark brown, paler beneath; fringes grey. A variable number of eyes on the wings, ringed with yellow beneath, and slightly also on the upper side in the female. It is a variable insect, and in the variety *Arete* (Müll.) the eyes of the under side are represented only by their white pupils. I have a specimen, taken in Germany, in which the outer half of the fore-wings and the edges of the hind-wings are grey instead of brown; and a similar variety of *E. Janira*, in which some portions of the margins on the right side only are grey. Expands from 1½ to 1¾ inches. Abundant in woods throughout the greater part of Europe and

Northern and Western Asia. Larva grey, with a blackish line on the back, and pale lines on the sides. The butterfly is figured at Pl. 13, Fig. 3.

2. *E. Lycaon* (Rott.).—Brown; male with an eye at the tip of the fore-wings, which are tawny in the female, except at the edges, and have two eyes on the outer portion, within which is a brown line. Hind-wings beneath brown, with no traces of eyes. Common in many parts of Southern and Eastern Europe, though entirely absent in the north-west; also met with throughout Northern and Western Asia. It frequents sandy openings in woods, and the slopes of limestone hills. Expands about 1½ inches. Larva green, with two fine white lines on the back, and a yellow streak on the sides, bordered above with reddish. The female and the larva are figured at Pl. 52, Fig. 6, *a*, *b*. (*E. Narica*, Hübn., from the Kirghis Steppes, has fulvous fore-wings, with one eye in the male and two in the female, and the under side of the hind-wings is varied with white.)

* 3. *E. Janira* (Linn.), (*Meadow Brown*).—Brown; fore-wings with the centre, or at least a sub-marginal band, fulvous in the female. An eye at the tip in both sexes, sometimes bipupilled in the female. Hind-wings beneath greyish-brown, with a paler band towards the hind margins, which is marked with two black dots in the male. The South European variety, *Hispulla* (Esp.), is larger, and much more suffused with fulvous on both the fore and hind wings. It expands from 1½ to 2 inches. Abundant everywhere in grassy places throughout Europe, North Africa, and Western Asia. The larva is yellowish-green, with a darker line on the back, and a yellowish-white stripe on the sides. The female and the larva are figured at Pl. 13, Fig. 4, *a*, *b*. (The Algerian *E. Janiroides*, Herr. Schäff., which is said to occur also in Spain, has a row of small brown dots in yellow rings on the hind-wings beneath; in the Corsican *E. Nurag*, Ghil., the male is brown, with a fulvous blotch on each wing, and the apical eye surrounded with fulvous; and the female is fulvous. The under side of the hind-wings is uniformly brown, without paler markings or black dots.)

* 4. *E. Tithonus* (Linn.), (*Large Heath*).—Centre of the wings fulvous; the margins of the fore-wings and the margins and basal portion of the hind-wings brown. Fore-wings with a bipupilled eye at the tip, and, in the male, a large brown blotch running from their inner margin nearly across the fulvous part. Under side of hind-wings light brown, with several white dots surrounded with brown, and an irregular buff or yellowish band towards the hind margin. Expands about 1½ inches. The little group to which this and the two following species belong is principally located in South-Western Europe. This species is the commonest and most widely distributed over Europe and Western Asia, but is absent from Scandinavia, as well as the greater part of Eastern Europe. It is common in bushy places wherever it occurs. The larva is green or brownish, with a dark reddish line on the back, two white lines beneath it, and a yellow stripe on the sides. The male butterfly is figured at Plate 13, Fig. 5.

5. *E. Ida* (Esp.).—Very similar to the last, but the average size is rather smaller, and the black blotch on the fore-wings of the male is smaller, more square, and better defined. The under side of the hind-wings is pale grey, without eyes, but with a whitish central band bifurcated towards the costa. The larva is whitish-grey, with a black line on the back, and whitish lines on the sides. It inhabits the shores of the Mediterranean, and is found as far north as the southern slopes of the Tyrolese and Austrian Alps.

6. *E. Pasiphaë* (Esp.).—Brown; fore-wings with the centre fulvous in the female, and with a fulvous marginal band in the male; a black bipupilled eye near the tip. Hind-wings with a marginal fulvous band, containing three or four black eyes. Under side of hind-wings brown, with a central yellowish-white streak, and five marginal eyes. Expands from 1¼ to 1¾ inches. It inhabits South-Western Europe and Algeria, frequenting stony places covered with bushes. The larva is rather short; clay-colour, with many fine reddish-brown lines, and a broader dark brown line on the back.

GENUS VII.—CŒNONYMPHA (HÜBN.).

Small brown or tawny butterflies, with rounded wings, and a row of eyes on the hind-wings beneath. All the three nervures of the fore-wings are dilated at the base, and the antennæ are slender, with a long and fusiform club. The middle pair of tibiæ are as long as the tarsi. The larvæ are slender, with fine hair. They are green, with a small head, and generally hybernate. The pupæ are suspended, and the butterflies, some of which are double-brooded, are found in meadows and at the edges of woods.

1. *C. Œdipus* (Fabr.).—Dark brown above, sometimes shot with purple. Under side olive-brown; the hind-wings with a marginal row of black eyes, with white pupils in pale yellow rings, and bordered outside with a broad lead-coloured line. There are occasionally eyes on the upper side, and on the under side of the fore-wings. Expands from 1¼ to 1½ inches. Found in May and June in marshy meadows, but is very local along a narrow strip of country running from the south of France along the Alps and Altai to Pekin and the Amoor. The larva is green, with a darker stripe on the back, and a yellowish-white streak on the sides. It lives on *Iris pseudacorus* from July to September. The butterfly is figured at Pl. 52, Fig. 5.

2. *C. Hero* (Linn.).—Dull brown, olive-brown beneath, with a lead-coloured marginal line on all the wings. Hind-wings beneath with a row of large black eyes with white pupils, in rust-coloured rings, bordered within by a somewhat irregular white stripe. The upper side, and the under side of the fore-wings, are also occasionally marked with eyes. Expands a little over 1 inch. Common in many parts of Central Europe in open woods in May and June, but absent from many districts. It has been reputed British, but no doubt erroneously. Figured at Pl. 52, Fig. 7.

3. *C. Iphis* (W. V.).—Brown, tinged with tawny; female tawny; hind-wings darker, with an orange line at the anal angle, and often with a row of eyes within it. Under side of fore-wings tawny, with a small eye at the tip; hind-wings with a row of small black eyes, pupilled with white and ringed with pale yellow. There is a narrow lead-coloured line on the hind margin, edged internally with an orange spot, and an irregular and interrupted whitish band nearer the middle of the wing. Expands from 1 to 1¼ inches. Found in open woods in Eastern and Southern Europe and Western Asia in June and July. It is absent from Scandinavia and North-Western Europe. Larva green, with a dark line on the back, and a narrow white line on the sides. Head dark green; stigmata and anal fork reddish. Feeds on grass in April and May. The butterfly is figured at Pl. 13, Fig. 6.

4. *C. Arcania* (Linn.).—Fore-wings reddish-tawny, with a broad dark brown border; hind-wings dark brown, sometimes with a few marginal eyes. Under side of fore-wings with a smal eye at the tip; hind-wings beneath pale brown, within which is a black eye on the costa with a white pupil, and surrounded with a yellow ring. Hind margin reddish, intersected by a broad lead-coloured line, and there are three or four small eyes within it, placed on a broad whitish or yellowish band. Expands from 1 to 1¼ inches. Common in open woods, in June and July, in most parts of Europe and Western Asia; it has been erroneously reputed British. Larva green, with a dark green line on the back, and yellow lines on the sides. Mouth reddish, and the anal fork reddish at the ends. Lives on grass in May. The transformations are figured at Pl. 13, Fig. 7, *a—c*.

5. *C. Philea* (Hübn.), *Satyrion* (Esp.), resembles *C. Iphis* above, but the under side of the hind-wings is olive-green, with a distinct central white band, always continuous, of equal width throughout, on which the eyes are placed. There is also a red marginal band, intersected by a thick lead-coloured line. Expands a little over 1 inch. It is found in damp meadows in July,

in the Alps and in the mountains of South France, and is now believed to be an Alpine variety of *C. Arcania.*

6. *C. Leander* (Esp.).—Male brown, fore-wings suffused with tawny; an orange band at the anal angle of the hind-wings. Female with tawny fore-wings, brown hind margins, and sometimes with one or two marginal eyes; hind-wings with a paler band than in the male, four black dots, and sometimes a black line. Under side of fore-wings yellow, with an eye at the tip. Hind-wings beneath greenish-yellow, hind margin dusky. A marginal orange band, with six eyes. All the wings with a narrow sub-marginal lead-coloured line. Expands from 1 to 1¼ inches. It inhabits South-Eastern Europe in June.

7. *C. Dorus* (Esp.).—Fore-wings brown in the male and fulvous in the female; hind-wings brown, with the centre and a marginal line fulvous. A black eye at tip of fore-wings, and a curved row across the hind-wings. These are surrounded by fulvous rings, and are generally blind above; the eye of the fore-wings stands on a pale marginal band, sharply bordered on both sides, and shading into the ground colour towards the inner margin. Under side of hind-wings very similar to that of *C. Arcania*, but with a much narrower pale band across the centre. Expands from 1 to 1¼ inches. Inhabits South France, Spain, and Italy in July.

8. *C. Corinna* (Hübn.).—Reddish fulvous; hind margins brown. Fore-wings with a black eye on both sides. A silvery sub-marginal line on all the wings beneath; hind-wings beneath dull fulvous, tinged with green at the base; a narrow irregular central white band, with a large eye on the costa within it, and three or four smaller ones on the outside. Double-brooded, frequenting dry places in June and August in Corsica, Sardinia, Sicily, and probably Italy. The larva is green, with greenish and yellowish lines. It feeds on grass in spring and autumn.

9. *C. Amaryllis* (Cram.).—Tawny; fore-wings with indistinct traces of marginal eyes. Under side of fore-wings tawny; hind-wings greenish. All the wings with grey hind margins, bordered within with traces of a silvery line, within which is a row of black eyes with large silvery pupils and yellow rings; on the hind-wings there are traces of an outer reddish ring, and within the eyes are one or two pale spots. Expands from 1 to 1½ inches. Inhabits Eastern Russia and Siberia in June and July.

10. *C. Thyrsis* (Freyer).—Fulvous, with the margins brown, a fulvous streak at the anal angle of the hind-wings. A black eye at the tip of the fore-wings, and three on the outer part of the fulvous portion of the hind-wings, ocellated only below. Under side of fore-wings with a black line within the eye, and a pale fulvous one on the brown hind margin. Hind-wings yellowish-grey, with a central pale yellowish band, and traces of several eyes besides the three principal ones. The marginal line is stone-coloured and indented. Expands 1¼ inches. Common in May in the island of Crete.

* 11. *C. Pamphilus* (Linn.), (*Small Heath*).—Tawny, a black dot at the tip of the fore-wings, represented below by a black eye in a buff ring. Hind-wings beneath greenish-grey, paler towards the margins, and an irregular and interrupted white band across the middle. There are occasional faint traces of marginal eyes, especially in the large South European variety *Lyllus* (Esp.). Expands from 1 to 1½ inches. Abundant everywhere throughout Europe, North Africa, and Northern and Western Asia, during all the fine season. The larva is green, with two white stripes on the back, and a yellowish stripe on the sides. It feeds on grass, and there is a succession of broods throughout the year. The butterfly is figured at Pl. 13, Fig. 8.

* 12. *C. Typhon* (Rott.), *Davus* (Fabr.), (*Marsh Ringlet*).—Very variable; ochre-yellow or brownish-yellow, sometimes with black eyes on the hind margins in yellow rings, and ocellated only below; sometimes with no eyes above, and mere traces of them below. Fore-wings beneath


3.
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9
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4b
2c
7a
7b
7c
2b
4a
2a
A
B
C
D

with a pale line within the eyes; hind-wings brown, tinged with green at the base, with an interrupted white band, broken into spots, within the eyes. Expands from 1¼ to 1½ inches. Common, though somewhat local, on moors and mosses in Northern and Central Europe, including Ireland, Scotland, and the north of England. It has also been met with in North Wales, Lincolnshire, Norfolk, and it is said in Ashdown Forest, in Sussex. It is found in July; and the larva, which feeds on cotton grass near the roots in May, is green, with white longitudinal lines; and the pupa, which is suspended by the tail, is also green.

GENUS VIII.—TRIPHYSA (ZELL).

Wings entire; the three principal nervures of the fore-wings much dilated at the base in the male, but only the two first in the female. Club of the antennæ round and flat. The only European species, *T. Phryne* (Pall.), is found in South Russia and Siberia, and there are one or two other species in Northern Asia, among which is *T. Sunbecca* (Eversm.). *T. Phryne* expands from 1 to 1¼ inches; the male is brown, with whitish hind margins, and the female is dirty white. The under side of all the wings is brown, with the nervures and a marginal line on all the wings white, and a marginal row of black eyes with white pupils. It is found in meadows in May and June. The sexes are figured at Pl. 52, Figs. 4, *a*, *b*.

FAMILY VI.—LIBYTHEIDÆ.

Fore-wings broadly truncated at the tip, with a prominent angle below it; hind-wings strongly dentated; the discoidal cell open. The antennæ are moderately long, and gradually thickened to the extremity; the palpi are very long, and contiguous throughout their whole length, forming a kind of beak, nearly as in the *Crambidæ*. The front legs are rudimentary in the male, and perfect in the female. The larvæ are cylindrical, with a few fine hairs and a smooth rounded head. The pupa is suspended by the tail. This family is now generally treated as a section of either the *Nymphalidæ* or the *Erycinidæ*. It contains but one genus, *Libythea* (Fabr.), which is represented in most parts of the world by a very few species, closely resembling the European *L. Celtis* (Esp.), which is brown, with a fulvous basal streak on the fore-wings, beyond which, and on the hind-wings, are several large fulvous blotches. Near the tip are one or two white spots. Expands about 1¾ inches. It is found in Europe, south of the Alps, and in Western Asia, in March, June, and July, wherever its food-plant, *Celtis Australis*, grows wild. The larva is green, with black dots, and with whitish stripes on the back and sides. It is found in April, May, and July. The butterfly is figured at Pl. 13, Fig. 9.

FAMILY VII.—ERYCINIDÆ.

The palpi generally very small, the antennæ long, and the hind-wings slightly grooved. The front legs are rudimentary in the male, and perfect in the female. The pupa is attached by the tail and a girth round the body. The larvæ resemble those of the *Lycænidæ*, of which some entomologists regard the *Erycinidæ* as a section. There must now be nearly a thousand species of *Erycinidæ* described, but, except a few found in the East Indies and North America, they are exclusively confined to tropical America. The single European species is likewise the only species of its genus, and has much resemblance to a small *Melitæa*.

GENUS NEMEOBIUS (STEPH.).

Head small, eyes hairy, antennæ slender, with an abrupt and compressed club. Fore-wings short and triangular, the costa and hind margin nearly straight, hind-wings rounded and dentated. The only species, **N. Lucina* (Linn.), expands from 1 to 1¼ inches; it is brown, with three rows of dull orange spots on the fore-wings, and two on the hind-wings, the outer rows enclosing black dots. Under side reddish-brown, with black marginal dots, and two rows of whitish spots on the hind-wings. It is common in woods in many parts of Southern and Western Europe (including the south of England) in May, June, and August. The larva is pale olive-brown, with a darker stripe on the back, dotted with blackish, and a paler line on the sides. It lives on primroses and sorrel from June to September. The butterfly is figured at Pl. 13, Fig. 10.

FAMILY VIII.—LYCÆNIDÆ.

This family comprises most of our smaller butterflies, except the Skippers. They are blue, copper-red, or brown, often with a short tail; and the under side is generally marked either with black eyes enclosed in pale rings, or with pale transverse lines. The antennæ have a rather long club; the palpi are hairy, with the last joint naked; and the front legs of the male are rather smaller than those of the female, and the last joint of the tarsi terminates in a simple hook. There are ten or eleven nervules on the fore-wings, and the disco-cellular nervules are perpendicular, with the fifth nervule rising between them. The larvæ are wood-louse shaped, and clothed with fine short hair; the head is small and retractile. The pupa is attached as in the *Erycinidæ*. This family is well represented in all parts of the world, especially in the northern hemisphere and in South America, but the number of distinctly-defined genera is small; and while some are inclined to sub-divide them, others would prefer still further to reduce the number of genera, by placing the Blues and Coppers, and perhaps even the Hair-Streaks, in the same genus.

GENUS I.—POLYOMMATUS (LATR.).

The antennæ are slender, with the club abrupt and elongated; the palpi are rather long, and the eyes are sometimes hairy and sometimes naked. The upper side is more or less blue in the male, seldom brown; but the female is generally brown, though often dusted with blue. There are nearly always eyes towards the base of the hind-wings beneath, and often on the fore-wings also. In the latter case there is never more than one in the discoidal cell, and an eye-like spot or streak at its extremity; and the hind-wings have often a black transverse streak at the end of the cell, surrounded with white, and there are often one or two rows of eye-like spots near the hind margin, sometimes with reddish spots between. Some species have pale transverse lines on the under side instead of eyes; and these, and one or two others, have short and slender tails on the hind-wings. These streaked species are sometimes placed in another genus, under the name of *Lampides* (Hübn.). The fore-wings have eleven nervules, the seventh and eighth nervule rising from a common stem, and the sixth nervule separate. The larvæ are short and arched, and generally live on the flowers and seeds of leguminous plants. Some hide themselves during the day, and most of them hybernate, and may be obtained in spring or summer either by sweeping or by searching for them on their food-plants. The butterflies frequent open flowery places, especially on a chalk or limestone soil. A few species are Alpine or Polar, and the genus is

tolerably well represented in all parts of the world, though there are fewer species in Africa and South America than elsewhere. The only butterfly yet described from the Galapagos Islands, which are remarkable for the poverty of their fauna and flora, though lying directly under the equator, is a species of this genus (*P. Parrhasioides*, Wallengr.). Although our species are small insects, few of the tropical species surpass them in size and beauty, and many are small and insignificant in comparison; and the largest known species (*P. Pryeri*, Murray), which is found in Japan, does not expand more than 2 inches, and is therefore not much larger than the European *P. Iolas* (Ochs.), which it resembles on the upper side.

1. *P. Arcas* (Rott.).—Wings dark brown above, dusted with dark blue towards the base in the male, which has a row of indistinct elongated spots running across the middle of the wings above. Under side uniform brown, with a row of small eyes, waved on the fore-wings and strongly arched on the hind-wings, but with no other spots or markings, except the narrow discoidal lunules. Expands about 1¼ inches. Frequents marshy meadows in Central Europe, but is absent from the north-west; it is also found in the Altai. It flies in July and August, but is not generally very common. The young larva lives in the pods of *Sanguisorba officinalis* in August and September.

* 2. *P. Arion* (Linn.), (*Large Blue*).—Blue, with black hind margins, fore-wings with a black lunule in the discoidal cell, and a row of oval black spots beyond it; under side ashy grey, with a much waved row of eyes across all the wings, and two marginal rows of spots. There are also discoidal lunules on all the wings, and one small spot nearer the base on the fore-wings, and several on the hind-wings, which latter are dusted with pale blue at the base. Expands from 1¼ to 1½ inches. Common on heaths and meadows in a great part of Europe and Western Asia from May to July. It is a very local insect in England, being restricted to a few localities in Northamptonshire, Devonshire, &c. The larva feeds exposed on the blossoms of the wild thyme.

3. *P. Euphemus* (Hübn.).—Very close to *Arion*, but with a row of black spots on the upper side of the hind-wings in the female. Under side with no basal eye on the fore-wings, and only two on the hind-wings. The central row of eyes is less curved, and the base of the hind-wings is less blue. Expands about 1¼ inches. It is common, but local, in various parts of Central Europe in July, frequenting damp meadows. The butterfly is figured at Pl. 14, Fig. 1.

4. *P. Alcon* (Fabr.).—Male purplish-blue, unspotted; female brown, dusted with blue at the base. Under side similar to *Euphemus*, but browner, and the middle row of spots is much curved. Expands about 1¼ inches. Found on moors and meadows, near woods, in June and July in many parts of Central and Southern Europe, and in the Altai, but is seldom common, and appears to be almost absent from North-Eastern Germany. It has been erroneously reputed British.

5. *P. Iolas* (Ochs.).—Male purplish-blue, with a narrow brown border, and the costa of the hind-wings brown; in the female the hind margin of the fore-wings and the costa of the hind-wings are very broadly brown. The under side is silvery grey, with discoidal lunules, and a row of eyes which are not much curved on the hind-wings, and are nearly straight, and parallel to the hind margin on the fore-wings. There are two basal eyes on the hind-wings (which are dusted with blue at the base), but none on the fore-wings. There is a row of marginal spots on all the wings beneath, which are very indistinct, except towards the anal angle of the hind-wings. Expands from 1¼ to 1½ inches. Inhabits Europe south of the Alps, but is a rather scarce insect. It appears in June and July. The larva is greenish-brown, with a black line on the back, and a broad pale band on the sides. It lives in the pods of *Colutea arborescens*. This insect attains a larger size than any other European species of the genus.

6. *P. Melanops* (Boisd.).—Male purplish-blue, with a narrow black border; female brown, with the base blue. Under side grey, green at the base, with discoidal lunules, and one or two basal

eyes on the hind-wings; none on the fore-wings. The central row of black eyes on the fore-wings is much larger and more distinct than that on the hind-wings. Expands about 1 inch. Inhabits South France, Spain, and Algeria in April and May. Larva bluish-grey, sometimes apple-green, with glaucous green longitudinal lines. Lives on *Dorycnium* at the end of May and in June.

7. *P. Cyllarus* (Hübn.).—Male sky-blue; female brown, blue at base. Under side as in *Melanops*, but the hind-wings are powdered with brilliant coppery green from the base to beyond the discoidal lunule, which is lost in it. Common in flowery slopes and glades on the edges of woods from May to August, in the greater part of Europe and Northern Asia. In the north-eastern plains of Germany it is very local, and it is wholly absent from the north-western plain of Europe (including England). The larva is yellowish-green, with a reddish line on the back, dark green oblique stripes, and a black head. Feeds on various *Papilionaceæ* in June and July. The butterfly and larva are figured at Pl. 14, Fig. 2, *a*, *b*, and the very characteristic under-surface of the former at Pl. 52, Fig. 10. (*P. Cœlestina*, Eversm., from the south of France and Russia, differs from *Cyllarus* in the size of the central row of eyes on the fore and hind wings beneath.)

*8. *P. Semiargus* (Rott.), *P. Acis* (Fabr.), (*Mazarine Blue*).—Male dark purplish-blue, with a moderately large black border; female uniform brown. Under side dull ash-colour, green at the base, the central row of eyes of uniform size on the fore and hind wings, and with discoidal lunules. Fore-wings with basal eyes. There are several varieties found in South-Eastern Europe and Asia Minor with red marginal spots on the under side. Expands from 1 to 1¼ inches. Common in meadows throughout Europe and Northern and Western Asia. A local insect in England, where it has lately been so rare that it seems to be becoming extinct. It is found from May to August. The larva is covered with fine yellowish-green hair, with darker stripes on the back and sides. The head, feet, and stigmata are dark brown. It lives on *Anthyllis vulneraria* in August and September.

9. *P. Sebrus* (Boisd.).—Male violet-blue, with a narrow black border; female dark brown, dusted with violet-blue at the base. Fringes very white. Under side grey, more or less bluish at the base, and with discoidal lunules; the central row of eyes rather small, and of uniform size. Fore-wings with the eyes nearly straight, and near the hind margin, but with no basal eyes. Hind-wings with two basal eyes; the eyes of the hind-wings in an irregular series, twice interrupted, and commencing with a single detached eye on the costa. Expands about 1 inch. It inhabits dry places in mountainous districts in Europe, south of the Alps, and in Western Asia from May to July.

* 10. *P. Minima* (Fuessly), *Alsus* (W. V.), (*Bedford Blue*).—Brown, faintly dusted with silvery blue in the male. Under side similar to *Sebrus*, but less tinged with blue at the base. The eyes are much larger, and the central row of the hind-wings commences with two spots on the costa. Expands a little under 1 inch. Common throughout Europe and Northern and Western Asia from May to August. Chiefly confined to chalk and limestone districts in Britain. Larva dirty green, with a reddish stripe bordered with yellow on back, and similar oblique streaks and a yellowish line on sides. Lives in June and August on *Coronilla varia*, *Astragalus cicer*, and *Melilotus*. The butterfly—the smallest British species—is figured at Pl. 14, Fig. 3.

* 11. *P. Argiolus* (Linn.), (*Azure Blue*).—Blue; female with the hind margin of the fore-wings and the costa of the hind-wings broadly black, and with a black discoidal spot on the fore-wings, and black marginal dots on the hind-wings. Under side pale blue, with a central row of black spots scarcely ocellated, and with black marginal spots which are indistinct except towards the anal angle of the hind-wings. Discoidal lunules very slender; no basal spots on the fore-wings. Expands from 1 to 1¼ inches. It is common, but seldom very abundant, in open woods

throughout Europe, Northern and Western Asia, and North Africa; and very closely allied species are found in the Himalayas and North America. It is double-brooded, occurring from April to August, and thus appears earlier in the year than any of our other Blues. The larva is dull dark satiny green, with a dark green line on the back, and a black head. It feeds on the flowers of holly, buckthorn and ivy in early summer, and again in autumn. The upper and under sides of the butterfly are figured at Pl. 14, Fig. 4, *a*, *b*.

12. *P. Donzelii* (Boisd.).—Brown, basal half of all the wings pale blue in the male. Under side similar to that of *P. Damon*, but the eyes of the fore-wings beneath are not much larger than those of the hind-wings, and the white longitudinal streak on the under side of the hind-wings (which often have marginal orange spots, as well as indistinct marginal dark spots) is shorter, broader behind, and less distinct than in *P. Damon*. Expands from 1 to 1¼ inches. It is found in the high mountains of South France, the Southern Alps, and the Altai in June and July, but is met with in the plains in some parts of Russia and Sweden.

13. *P. Damon* (W. V.).—Male pale blue, with rather broad brown hind margins; female brown, sometimes bluish at the base; fringes white. Under side greyish or reddish brown, with a row of eyes which are much larger on the fore-wings than on the hind-wings. Fore-wings with no basal eyes; hind-wings with a broad white longitudinal streak running from the base almost to the hind margin. In the variety *Damone* (Eversm.), from the Ural, the male is blue, with a narrow black border, and the basal streak on the hind-wings beneath is narrower and whiter. Expands from 1 to 1½ inches. Common from June to August in many parts of South Europe and Western Asia, though somewhat local. It frequents sunny slopes, especially on a limestone soil, in fields of *Onobrychis sativa*, on which the larva, which is yellowish-green, with a dark green stripe on back, and a paler stripe, bordered with white, on sides, may be found in May and June. The butterfly is figured at Pl. 14, Fig. 5, and the under-surface at Pl. 52, Fig. 11.

14. *P. Admetus* (Esp.).—Dark brown, with brownish fringes, hind-wings often with traces of marginal orange spots in the female. Under side pale grey; fore-wings with a black discoidal lunule surrounded with white, but without basal spots; hind-wings with two basal spots. There is a central row of eyes on all the wings, and a double row of brown ante-marginal lunules, which are slightly tinged with orange in the female. Inhabits South-Eastern Europe, Western Asia, and perhaps South France, in June. The variety *Ripartii* (Freyer) is more widely distributed, occurring also in the Southern Alps in June and July. It may be distinguished from *Admetus* by its smaller size, and by possessing a white basal streak on the under side of the hind-wings. Expands from 1 to 1½ inches.

15. *P. Dolus* (Hübn.).—Male very pale blue, almost white, base greenish-blue, centre of the wings light brown, veins brown, hind margins darker. Female dark brown, faintly bluish-green at the base, with a large black discoidal spot on the fore-wings. Under side yellowish-grey, with the usual row of eyes, and one on the costa of the hind-wings near the base. The female has a faint basal streak (more distinct in the Turkish variety *Menalcas*, Freyer, the male of which is less brown). *P. Dolus* is not uncommon in South France and Piedmont from June to August. The larva, which feeds on *Onobrychis sativa* in May, is green, with slightly oblique yellowish dorsal streaks, separated by more conspicuous green lines, violet at the sides, and bounded by a yellowish line. This is probably only another variety of *P. Admetus*, as is also doubtless the Syrian *Hopfferi* (Herr. Schäff.), which appears to be intermediate between *Admetus* and *Menalcas*.

16. *P. Daphnis* (W. V.).—Wings dentated, slightly in the male, but with two strong projections before the anal angle of the hind-wings in the female. Male blue, female duller, with black nervures, a black discoidal spot surrounded with whitish, and broad blackish borders with a

marginal row of orange spots, often partly surrounded with white, on the hind-wings. Under side pale grey, with the usual row of eyes, and indistinct marginal orange spots; one basal eye in the cell of the fore-wings. In the variety *Steeveni* (Treitschke), from South-Eastern Europe, the male has a distinct black border, and the female is brown. Very local, and seldom common in Southern and Eastern Europe and Western Asia, frequenting sunny, flowery places in June and July. It expands about 1¼ inches.

17. *P. Dorylas* (W. V.).—Male bright blue, with a narrow black border; female brown, with a small discoidal spot on the fore-wings, and traces of a marginal row of orange spots on the hind-wings. Fringes white, unspotted. Under side reddish-grey, with a row of eyes, which are largest on the fore-wings. Fore-wings with no basal eyes, but with marginal orange spots edged inside with black ones; hind-wings with a white heart-shaped spot in the middle. Opposite to this is a faint white streak, intersecting the hind margin. The marginal orange spots on the hind-wings are edged outside with black ones. Expands from 1 to 1¼ inches. It is found from May to August in many parts of Europe, but is local and not very common, frequenting grassy woods and hills, especially on a limestone soil. It is almost absent from the plains of Northern Germany, and although it has long been reputed to occur in the south of England, its occurrence in Britain has not yet been fully confirmed. The larva is dark green, with a darker line on the back, and a yellow streak on the sides; between these runs a row of yellow streaks: head black. It lives on the flowers of *Melilotus officinalis* in spring and autumn, being double-brooded.

* 18. *P. Corydon* (Poda), (*Chalk-hill Blue*).—Male pale blue, with rather broad black hind margins; female brown. Fringes white, distinctly spotted with black. Under side of fore-wings whitish in the male, and brownish-grey in the female, with basal eyes; hind-wings beneath brown, with a whitish heart-shaped discoidal spot, and a white dash before the red marginal spots. All the wings with a row of eyes, but the three first basal eyes on the hind-wings do not form with the others a regular curve round the discoidal spot. Common in Southern and Central Europe on chalk and limestone from May to August. It generally appears about the end of July in its localities in the south of England. Expands from 1¼ to 1½ inches. Larva green, with yellow lines on the back and sides. It lives on *Coronilla varia*, &c., in May and June. The male and the larva and pupa are figured at Pl. 14, Fig. 6, *a—c*.

* 19. *P. Bellargus* (Rott.), *Adonis* (Hübn.), (*Clifden Blue*).—Male sky-blue; female brown, but with fewer marginal orange spots than *P. Corydon*. It is dusted with blue towards the base, and is wholly blue in var. *Ceronus* (Esp.). The fringes are white, spotted with black. Under side as in *P. Corydon*, but darker in the male, and the basal eyes of the fore-wings are occasionally wanting. The three first basal eyes of the hind-wings are arranged so as to form nearly a circle round the discoidal spot with those of the central row. Expands from 1¼ to 1½ inches. It is double-brooded, appearing both in spring and autumn, and is very common in many parts of Europe, North Africa, and Western Asia, especially on chalk or limestone. In North-Eastern and North-Western Europe it is much more local than in the south. The larva is green or pale brown, with a darker line on the back, and a yellow line on the sides. Between these is a row of triangular reddish-yellow spots; head blackish-brown. It lives on *Trifolium*, *Genista*, *Lotus*, *Hippocrepis*, &c., in May and June, and again in autumn. The male butterfly is figured at Pl. 14, Fig. 7.

* 20. *P. Icarus* (Rott.), *Alexis* (W. V.), (*Common Blue*).—Male lilac-blue, narrowly edged with black; fringes white, unspotted. The female varies from blue to brown, and has a marginal row of red spots. Under side with marginal red spots, bordered with black ones, and a central row of eyes. Fore-wings brownish-grey, with two basal spots, except in var. *Icarinus* (Scriba). Hind-wings yellowish-brown, with basal spots; and a white dash in the centre of the hind margin. Base

bluish on fore-wings, and greenish on hind-wings. Expands from two-thirds of an inch to an inch and a half. Both the perfect insect and the larva are abundant everywhere during all the fine season throughout Europe, Northern and Western Asia, as far as the Himalayas, and North Africa. The larva is green, with a dark line bordered with paler, dull white transverse streaks, and a yellow stripe on the sides; head black. It feeds on grass, clover, &c.

21. *P. Eros* (Ochs.).—Very similar to *Icarus*, but the male is shining pale blue, with broader black borders, and the female brown; fringes unspotted. Under side paler, fore-wings with basal eyes, hind-wings with smaller and duller-coloured marginal spots. The fore-wings, too, are more pointed, and the fringes longer. The variety *Eroides* (Friv.) is larger, the male darker blue above, and the under side purer grey, with larger eyes. Expands from 1 to 1¼ inches. Local and not very common on Alpine meadows and slopes in the Pyrenees, Alps, Altai, and the mountains of Western Asia from June to August. It is said to occur on the plains of the middle and lower Volga. The variety *Eroides* is met with more to the north-east; in South Russia, East Prussia, &c.

22. *P. Anteros* (Freyer).—Male pale whitish-blue, with a moderately broad brown border; fore-wings with a black discoidal spot, and hind-wings with traces of black dots surrounded with orange. Female brown, with a marginal row of large orange spots enclosing black dots on the hind-wings. Under side brownish, with a marginal row of orange spots. The row of eyes on the fore-wings is rather large, and there is one small basal spot within the discoidal spot. Hind-wings with two rows of spots much mixed with white, and a spot at the base. Expands from two-thirds of an inch to an inch. Inhabits South-Eastern Europe and Asia Minor from May to July.

23. *P. Escheri* (Hübn.), *Agestor* (Godt.).—Very close to *Icarus*, but generally larger (from 1 to 1¼ inches). The male is a little darker, with silvery white nervures, and the black border is a little broader, and more sharply defined. The female is brown, with marginal orange spots, which fade away gradually towards the tips of the fore-wings. Under side brighter-coloured, with larger eyes, but with no basal eyes on the fore-wings, and the row of eyes before the hind margin is less curved. Found in the Southern Alps, and other mountains of South Europe, from May to July.

24. *P. Amandus* (Schneid.), *Icarius* (Esp.).—Wings above purplish-blue in the male, fore-wings with a broad suffused black border, and hind-wings with a narrower one; fringes white, unspotted. Female like that of *Icarus* above. Under side with the central row of eyes nearly uniform in size (in the female, those of the fore-wings are the largest); fore-wings with no basal eyes, hind-wings with a long and narrow black discoidal spot surrounded with white, and with orange marginal spots. There is no white blotch in the middle, but sometimes a white longitudinal streak running from the marginal orange spots to the discoidal spot. Expands from 1 to 1¼ inches. Local in Eastern and Southern Europe and Northern Asia from June to August. It frequents hilly districts, and is confined to the mountains in South-Western Europe; it is unknown in the north-west.

25. *P. Chiron* (Rott.), *Eumedon* (Esp.).—Brown, with a black discoidal spot on the fore-wings, and a marginal row of orange spots on the hind-wings in the female; fringes white, unspotted. Under side brownish-grey, with the central row of eyes larger on the fore-wings than on the hind-wings, and with marginal orange spots. No basal spots on the fore-wings; the discoidal spot of the hind-wings surrounded with white, and with a broad white streak running from it to the eyes. Expands from 1 to 1¼ inches. It is found from June to August in damp meadows, and its range is similar to that of the last species, except that it occurs in Western Asia also. In the Alps and the south of Europe it appears to be exclusively a mountain insect.

26. *P. Idas* (Ramb.).—Brown; fore-wings with a black discoidal lunule sometimes marked

with white; hind-wings with from two to four marginal black dots marked with orange. Under side with reddish-brown eyes, hind margins whitish-yellow, with yellowish fulvous lunules; fore-wings with the marginal spot nearest to the anal angle white, and the other marginal spots often wanting; hind-wings with a large white triangular discoidal spot. The eyes of the central row are rather irregular; the first two eyes of the fore-wings and the second on the hind-wings are widely separated from the others. It inhabits the mountains of Andalusia in June.

* 27. *P. Astrarche* (Bergstr.), *Medon* (Esp.), *Agestis* (Hübn.), (*Brown Argus*).—Brown, with a marginal row of very distinct orange spots, except in variety *Allous* (Hübn.), on all the wings, both above and below, resting on black dots on the hind-wings. Under side with rather large eyes, fore-wings with no basal spots, hind-wings with the first two spots of the middle band placed close together and widely separated from the next; a white blotch in the middle, within the red spots, to which runs a narrow white line from the second of the three basal eyes. In the variety called the Scotch Argus (*Artaxerxes*, Fabr.) the discoidal spot on the fore-wings above is white instead of black, and the eyes of the under side are almost entirely filled up with white. This is connected with the ordinary *Astrarche* by the intermediate variety called the Durham Argus (*Salmacis*, Steph.), found in the north of England. Expands rather under 1¼ inches. It is found throughout Europe, North Africa, and Northern and Western Asia to the Himalayas, from May to August, frequenting dry, sunny places, especially on chalk or limestone. In the Alps it is found nearly to the tree-limit. *Allous* is the second brood in the south of Europe; and *Artaxerxes* is exclusively confined to Scotland. The larva of the last form is pale bluish-green, with a dark green line on the back, and a pinkish one on each side; the head is glossy black. It lives on *Helianthemum vulgare* in May. *P. Astrarche* is figured at Pl. 14, Fig. 9.

28. *P. Orbitulus* (De Prunn.).—Wings above dark brown, with a black discoidal lunule, and dusted with pale bluish-grey, especially towards the base, in the male; fringes white, unspotted. Under side pale grey in the male, and brownish in the female; fore-wings with a double basal eye, and the usual row of eyes; hind-wings with a white heart-shaped discoidal spot; hind margins broadly whitish, with some blackish dots and markings in the male, and some orange spots towards the anal angle; the central row of eyes represented only by two contiguous spots resembling a white figure of 8 filled up with black, in the middle of the costa. Expands rather under 1 inch. Locally abundant in the Alps, Pyrenees, and the mountains of Asia Minor in June and July, especially on a limestone soil. The variety *Aquilo* (Boisd.), which is smaller and bluer, is probably circumpolar.

29. *P. Pheretes* (Hübn.).—Male blue, with a narrow black border; female brown, fringes white, unspotted. Under side greenish-grey; fore-wings with the usual row of eyes, but with no basal eye; hind-wings with two oblique rows of large round white spots. Expands about 1 inch. Locally abundant in June and July at a great elevation in the French and Swiss Alps. It also occurs in the mountains of Scandinavia and Siberia. The under-surface is figured at Pl. 52, Fig. 9.

30. *P. Psylorita* (Freyer).—Pale brown, with a marginal row of orange-yellow spots. Under side white or silvery grey, all the usual rows of eyes reduced to simple dots, and very indistinct; marginal band pale yellow, frequently almost obliterated. Expands nearly 1 inch. It occurs on Mount Ida in June, nearly at the snow-line.

31. *P. Rhymnus* (Eversm.).—Brown, base dusted with greenish-purple. Under side dark brown, with a slight greenish tinge, and speckled all over with white spots. Expands three-quarters of an inch. It is found on mountains in South Russia and the Altai in May and June.

32. *P. Lysimon* (Hübn.).—Brown, male blue at the base; fringes brown. Under side pale grey, with discoidal lunules and basal eyes, a double row of black marginal spots, and an

angulated central row of black dots. There is an eye on the costa of the fore-wings above the discoidal lunule. Expands two-thirds of an inch. It is found in meadows in the south of France, Spain, the greater part of Africa, Western Asia, and the East Indies in July.

33. *P. Panope* (Eversm.).—Brown, blue in the centre and towards the base in the male, fringes spotted with black and white. Under side greyish-brown, with black discoidal lunules, outside which is a curved row of black eyes, and a double row of submarginal black dots; hind-wings with three or four basal eyes. All the eyes, except the marginal dots, are rather large, and surrounded with white. Expands about 1 inch. It inhabits the marshy steppes of the Lower Ural, and is one of the rarest of the Russian species.

34. *P. Hylas* (W. V.).—Male blue, with black dots towards the anal angle of the hind-wings; female brown, blue at the base, and with a marginal row of bluish-white lunules, partly enclosing the black spots of the hind-wings. Fringes spotted with black and white; fore-wings with a large discoidal lunule. Under side bluish-grey, with the usual central row of eyes; fore-wings with a second smaller eye in the cell within the discoidal lunule, and a marginal row of small black spots; the eyes of the fore-wings are much larger than those on the hind-wings. Hind-wings with a double marginal row of small black spots, between which is a row of orange spots. Widely distributed on the shores of the Mediterranean, and in France, South Germany, and Northern Asia. It is double-brooded, and is found in dry, sunny places from May to August. The larva feeds on different species of thyme.

35. *P. Orion* (Pall.), *Battus* (Hübn.).—Brown, purplish-blue at the base; fore-wings with a black discoidal lunule, and a row of violet-blue lunules towards the hind margin; hind-wings with a marginal row of large black spots in violet-blue rings. Fringes very distinctly spotted with black and white. Under side whitish, with large black spots instead of eyes; fore-wings with basal spots and a discoidal lunule, beyond which are two rows of large and almost confluent spots, and a third row of smaller separated spots nearer the hind margin; hind-wings with a discoidal spot, and four basal spots; outside these is an orange band, edged within with black lunules, on each side of which is a row of large round black spots. Expands about 1 inch. It is common, though local, in many parts of Southern and Central Europe (except the north-west) and Southern and Western Asia from May to July, generally frequenting rocky places. The larva is sea-green, with a black head, and a dark violet line on the back. It feeds on *Sedum telephium* in July and August. The under-surface of the butterfly is figured at Pl. 52, Fig. 8.

36. *P. Bavius* (Eversm.).—Male purplish-blue, with a rather broad black border, and three or four black eyes in orange rings at the anal angle of the hind-wings. Female dark brown, slightly orange at the base, with a marginal row of orange spots on the hind-wings. The fringes are spotted with black and white. Under side of the fore-wings with the spots much larger than on the hind-wings. There is a double row of eyes, the innermost much curved, and two spots in the discoidal cell, that nearest the base double. Hind-wings beneath with a marginal row of orange spots, edged outside with black spots and inside with black lunules, within which the central row of eyes curves round the discoidal lunule; and there are also four basal spots. It expands about 1¼ inches, and is found in South Russia and Western Asia.

37. *P. Pylaon* (Waldh.).—Male purplish-blue, with a very narrow black border, and white fringes; the hind-wings with some black dots occasionally marked with orange near the anal angle, and slight traces of an inner whitish line within the black border. Female brown, with marginal orange spots, which diminish as they recede from the hinder angles of all the wings; and nearly always with bluish-white streaks or spots before the marginal line. Under side silvery grey, with a submarginal row of orange spots on all the wings, edged on both sides with black ones. The

discoidal lunules are large and black; fore-wings with no basal eyes, but with a curved row of six basal spots, of which the fifth is placed nearer the base, and the sixth in a line with the others, but very small. Hind-wings with the central row consisting of eight rather large spots, the sixth placed nearer the base than the others, and three basal spots within the discoidal lunule. The outer black spots on the under side of the hind-wings are rarely dusted with green scales. Expands about 1 inch. Inhabits the steppes of South Russia in May. (*P. Cyane*, Eversm., which Staudinger considers a variety of this, is larger, and the female has marginal white spots, and is blue at the base. It is also a South Russian species.)

38. *P. Zephyrus* (Friv.).—Very similar to *Pylaon*, which may be only a variety, but is rather larger. Male purplish-blue in the type, and greenish-blue in variety *Hesperica* (Ramb.). Female brown. Anal angle of hind-wings with about three black dots, marked with orange in the female, but rarely with whitish or bluish. Spots of the under side rather smaller than in *Pylaon*, and those nearest the hind margin of the hind-wings generally very slightly marked with green scales. Found from May to July in Turkey, Greece, and Asia Minor; *Hesperica* occurs in Andalusia.

39. *P. Optilete* (Knoch).—Male dark purple, with a narrow black border; female brown, purplish at the base, hind-wings with an orange spot at the anal angle. Under side grey, fore-wings with no basal eyes; the central row of eyes near the hind margin. All the wings with a double row of marginal black spots; the outermost spots towards the anal angle of the hind-wings are dusted with brilliant blue, and marked with one or two orange spots. Expands about 1 inch. Common in Northern, Eastern, and Alpine Europe, but absent from the north-west. It occurs on peat bogs in June and July, but is a mountain insect in the Alps. The variety *Cyparissus* (Hübn.) which is found in Lapland, is smaller, with the under side paler. Larva pale green, with short reddish hairs, and a white stripe on the sides bordered with white; head blackish-brown. It feeds on *Vaccinium oxycoccus* from autumn to May.

* 40. *P. Ægon* (W. V.), (*Silver-studded Blue*).—Male blue, with a brown border; female brown, with the base blue, and marginal red spots on the hind-wings. Under side bluish-grey in the male, or brown, with the base bluish, in the female. A marginal row of large orange spots, and three rows of black eyes, the outermost dusted with metallic blue on the hind-wings. The front pair of tibiæ have a short spine at the ends. Expands about 1 inch. Common in most parts of Europe and Asia Minor from May to August, on heaths, meadows, &c. Larva slender, green or brown, with a reddish-brown line on the back, bordered with lighter, and a white streak on the sides; head black. It feeds on clover, vetch, &c., in May and June.

41. *P. Argus* (Linn.).—Very like *Ægon*, but generally a little larger, with the black border narrower in the male; female bluer, and with less distinct orange spots. Under side generally less blue at the base and with smaller spots; but both species are variable, and the only certain distinction between them is the want of spines at the end of the front tibiæ in *Argus*. Its range is similar to that of *Ægon*, but it is scarcer and more local, especially in North-Western Europe, and it is not found in Britain. It frequents similar localities in June and July. The larva is green, with a dark stripe on the back bordered with paler, a reddish-brown streak and white oblique stripes on the sides, and a blackish head. It feeds on broom, clover, &c., in May and June. The butterfly is figured at Pl. 14, Fig. 10.

42. *P. Trochilus* (Freyer).—Brown; hind-wings with two or three black spots, partially surrounded with orange, near the anal angle. Under side pale grey, with the usual row of eyes; fore-wings with no basal spot; hind-wings with three or four black marginal eyes towards the anal angle, surrounded with orange, and brilliantly dusted with gold outside. There are several white lines on the outside of all the wings. Inhabits Turkey and Asia Minor in July and

August; it is also found in South Africa. This is the smallest butterfly known to occur in Europe, not expanding much more than half an inch.

43. *P. Fischeri* (Eversm.).—Brown, with white fringes. Fore-wings with a black discoidal spot; hind-wings very slightly dentated, and often with one or two black dots near the anal angle. Under side greyish, with a double row of black marginal spots. Hind-wings with a row of orange spots between these, and the outermost black spots dusted with metallic green. The central row of spots is rather large; fore-wings with no basal spots. Expands about three-quarters of an inch. It inhabits the steppes of Russia in July.

44. *P. Argiades* (Pall.), *Tiresias* (Rott.).—Male lilac-blue; female brown, with two orange spots at the anal angle of the hind-wings, which have a short slender tail. Under side bluish-white, with small eyes; fore-wings with no basal eyes; hind-wings with orange marginal spots, bordered with black, before the anal angle. The spring brood, *Polysperchon* (Ochs.), is much smaller than the summer brood, and the variety *Coretas* (Ochs.) has no orange spots. Expands from three-quarters of an inch to an inch. Common in Southern and Central Europe (except Spain and Britain) and a great part of Asia. It frequents open flowery places in woods and mountain meadows from May to August. The larva is pale green, with a dark stripe on the back, and dull, dark wavy lines below, as well as with brown and whitish spots. It feeds on *Lotus*, *Trifolium*, &c., in June, and again from August to April. The butterfly is figured at Pl. 14, Fig. 11.

45. *P. Balcanica* (Freyer).—Male pale violet-blue, with several black spots on the fore-wings. Female brown, with indistinct greyish and whitish markings. Hind-wings with a short tail. Under side white, with very numerous black lines and spots; hind-wings with a marginal row of metallic green spots. Inhabits Turkey and Asia Minor in July and August.

46. *P. Telicanus* (Lang).—Male violet-blue, with small black spots at the anal angle of the hind-wings; female brown, blue at the base, with some faint black markings outside the blue portion of the wings. Hind-wings with a long slender tail. Under side brownish-grey, covered with waved whitish transverse lines; hind-wings with two black dots dusted with silver, and enclosed in orange rings, at the anal angle. It inhabits the shores of the Mediterranean throughout the fine season, and is met with occasionally in Germany in July and August, and, like *P. Trochilus*, is also found in South Africa. Expands about 1 inch. The larva is purplish-red, with a dark line on the back and brownish oblique streaks. It lives on the flowers of *Lythrum salicaria* in August and September.

47. *P. Bæticus* (Linn.).—Male violet-blue, with two large black spots at the anal angle of the hind-wings; female brown, blue only at the base of the fore-wings and at the inner margin of the hind-wings. Under side pale brown, with numerous nearly straight white streaks, which are shorter on the basal part of the fore-wings, not extending beyond the discoidal cell; hind-wings with a much broader submarginal white band than in *Telicanus*, outside of which are two large black spots at the anal angle, edged below with metallic green, and broadly surrounded with orange. Expands about 1¼ inches. It is met with in June and July, and its range is even more extensive than that of *Telicanus*, as it is found everywhere in Europe south of the Alps, and all over Africa, Western Asia, and the East Indies. On the other hand, it is scarcely ever found north of the Alps, except in France, though it occasionally extends its range as far as the Channel Islands, and has even been met with once or twice on the south coast of England. Larva green or dark reddish-brown, with a dark line on the back. There are also a pale line and pale oblique streaks on the sides. It lives in the pods of peas, of *Colutea arborescens*, and other leguminous plants, in June and July. The butterfly is figured at Pl. 52, Fig. 12.

GENUS II.—LYCÆNA (FABR.).

Upper side in the males brilliant orange or coppery red, often shot with purple, or brown; the females vary from copper-colour to dark brown, with a copper band on the hind margins bordered with black spots. The females (and in some cases the males) are usually marked with black spots on the fore-wings, and sometimes on the hind-wings also, corresponding in situation to the eyes of the under side. The under side of the fore-wings is coppery, and that of the hind-wings is generally brownish-ashy, with black eyes placed in white rings. There are three eyes, placed in a straight line between the base and the extremity of the discoidal cell; beyond this is a row of eyes, which are often arranged in pairs, and a single or double row of marginal spots. Hind-wings with eyes at the base and two or three in the middle, beyond which is a row of eyes and a double row of marginal black spots, between which is a coppery band. Fringes white at the extremity, and unspotted. The hind-wings are slightly dentated, and are sometimes furnished with a short tail. The eyes are naked, and the palpi are rather long; the antennæ are long, and terminated by an abrupt fusiform club. The neuration of the wings is the same as that of *Polyommatus*. The larvæ are elongated, and are covered with short, fine, reddish hair. They feed on various low plants, especially dock and sorrel (*Rumex*), and conceal themselves during the day; and many of the species form their pupæ on the surface of the ground. The species of this genus are generally called "Coppers" by collectors, on account of their brilliant colour. There are several allied genera found in different parts of the world, but the genus *Lycæna* is the most brilliant of all the group; and the European species are fully equal to any others, though the genus is well represented, without being very numerous in species, in most parts of the world.

1. *L. Helle* (W. V.).—Fore-wings coppery, with black spots; hind-wings black, with a coppery submarginal band. The upper side is shot with blue in the male, and the spots are partly bordered with blue in the female. Under side of the fore-wings coppery, with an additional basal eye above the inner margin; hind-wings beneath brownish. Expands 1 inch or under. Widely distributed in Northern and Central Europe (absent in the north-west), and in Western and Northern Asia. It is found from May to August in swampy meadows; in the more southern parts of its range it is a mountain insect, but though often abundant it is very local. The larva is green, yellowish above, with a dark green line on the back and a pale stripe on the sides; head reddish-yellow. It feeds on sorrel and *Polygonum bistorta* from June to September.

2. *L. Dorilis* (Hufn.), *Circe* (W. V.).—Male dark brown, spotted with black, and with a marginal row of black spots bordered within by connected orange lunules; female with the fore-wings copper, and the hind-wings dark brown, both spotted with black. Hind-wings with a submarginal copper band, bordered outside with black spots. Under side greenish-yellow (fore-wings coppery in the female) spotted with black, and with a pale orange marginal band (except in the variety *Subalpina*, Spey.). The hind-wings are emarginate before the anal angle. Common throughout the fine season in Central and Southern Europe (except Britain and the extreme south of Europe), and in Western Asia and the Altai; frequenting meadows, especially at the edges of woods. The larva is uniform pale green, dotted with white, and covered with pale red, or brownish-yellow bristles. It feeds on *Rumex acetosa*, and there is a succession of broods throughout the year. (*L. Hypoxanthe*, Kirb., is probably not distinct from this.)

3. *L. Thersamon* (Esp.).—Male coppery, with a slight bluish lustre, and spotted with black; the female more distinctly spotted, and with the hind-wings brown above, with a marginal copper band. Under side of fore-wings yellowish-copper, with the eyes arranged in pairs, and a double row of black spots before the hind margin; hind-wings beneath slate-colour, with a marginal


4b
9.
4a
13a
12.
5.
1.
11.
13b
7.
8d
3
8c
10.
8a
6a
2a
2b
6c
B
6b
A
8b
C

copper band. Expands from 1 to 1¼ inches. Found in South-Eastern Europe, Italy, and Western and Central Asia from May to July, but not very common. The summer brood has short tails in Syria. The larva feeds on *Spartium scoparium.*

4. *L. Alciphron* (Rott.).—Wings above spotted with black; male copper, strongly suffused with blue; female dark brown, with a marginal copper band, which is often bordered with blue in front. Under side of the fore-wings pale copper, with the principal row of eyes arranged in pairs, and generally with only one row of black marginal spots; hind-wings ashy-grey, with a marginal copper band. The variety *Gordius* (Sulz.) is coppery in both sexes; the male strongly tinged with blue at the base, and the black spots are much larger and more conspicuous. Expands from 1¼ to 1½ inches. Found in damp meadows in Eastern and Southern Europe, and in Western Asia, in June and July; the variety *Gordius* is met with only south of the Alps. The larva is dull green, with brown lines on the back and sides; head brown. Feeds on sorrel from April to June.

*5. *L. Hippothoe* (Linn.), *Eurydice* (Rott.), *Chryseis* (Ochs.), (*Purple-edged Copper*).—Male bright copper-red, with a black spot at the end of the discoidal cell of the fore-wings; the margins rather broadly brown, and suffused with purple. The female is dark brown, tinged with copper on the fore-wings, and spotted with black; hind-wings with a copper band, spotted outside with black. Under side of fore-wings coppery, with ashy-grey margins, and with an irregular row of eyes, not arranged in pairs, and a single row of marginal spots; hind-wings ashy-grey, with a marginal copper band. The Alpine variety *Eurybia* (Ochs.) is smaller, the male paler, and with the margins scarcely tinged with purple; the female is almost uniform brown, very faintly suffused with copper, and the under side is uniform brownish-grey, the fore-wings slightly tinged with copper in the female. Expands from 1 to 1¼ inches. Common throughout a great part of Europe and Western Asia from June to August, though somewhat local, frequenting damp meadows near woods and in the mountains. It appears to have formerly inhabited the south of England, but is probably now extinct. Epping Forest, and Ashdown Forest in Sussex, are mentioned as its localities. The former is very doubtful; and the latter, though said to have produced many rarities in former times, has been little visited lately by entomologists. I have also seen a pair in the collection of the late Mr. T. Marshall, of Leicester, who told me that he picked them out of a quantity of *L. Dispar* received from Cambridgeshire at a time when the latter insect was selling for threepence a specimen; and I therefore see no reason to doubt the British origin of the specimens of *Hippothoe* also. The larva is green, with whitish incisions, and a brown head. There is a dark line on the back and two white lines on the sides. The male butterfly is figured at Pl. 14, Fig. 12.

*6. *L. Dispar* (Haw.), (*Large Copper*).—Male brilliant copper, with rather narrow black borders, and two spots in the discoidal cell of the fore-wings; female with the fore-wings copper, with three discoidal spots, and an outer row of large black spots; hind-wings dark brown, with black spots, and a submarginal copper band. Under side of fore-wings copper; hind-wings, except the marginal copper band and the hind margin of the fore-wings, bluish-grey. The variety *Rutilus* (Werneb.), *Hippothoe* (Hübn.), (*Dark Under-winged Copper*), is smaller and duller-coloured, with much smaller spots, and only two discoidal spots in the female and one in the male, and the under side is ashy-grey rather than bluish. Expands from 1¾ to 2 inches. *L. Dispar* was formerly abundant in the fens of the south-eastern counties of England, but has not been seen alive since about 1848, and is believed to have become quite extinct in consequence of the draining of the fens. The variety *Rutilus*, which has been reputed British on insufficient authority, is a very local insect in Central Europe. In Eastern Europe and Northern and Western Asia it appears to be commoner. It is found in damp meadows from June to August. I have an indistinct recollection of having heard or read, many years ago, that the true *Dispar* was found in Nubia; but I have never since been

able to discover the authority for the statement, and merely mention it here for what it is worth. Scarcely anything of any value has yet been published on the *Lepidoptera* of Egypt, which are likely to be very interesting, though not numerous. The larva of *L. Dispar* is somewhat hairy, bright green, with innumerable white dots, and feeds upon the great water-dock. That of *Rutilus* is dark green, with a pale stripe on the sides, and a brown head. It feeds on *Polygonum* and sorrel in June. The sexes of *L. Rutilus* are figured at Pl. 14, Figs. 13, *a*, *b*.

*7. *L. Virgaureæ* (Linn.), (*Scarce Copper*).—Male brilliant copper-red, unspotted, with a rather narrow black border. Female dull copper, with black spots. Under side of fore-wings copper, with the central row of eyes arranged in pairs; hind-wings greenish-grey, spots small, and partly bordered outside with white spots. In the southern variety, *Miegii* (Vogel) the male has black spots above, and the female is paler; in the variety *Zermattensis* (Fallou) the female is darker, and the white spots are slightly visible above. Widely distributed in Europe and Western Asia, frequenting dry, flowery glades and slopes from May to August. It is a scarce insect in the north-west of Europe, and is said to have formerly inhabited the fens of Cambridgeshire and Huntingdonshire, and to frequent the flowers of the golden rod in August. It has been excluded from our British lists, but there seems little reason to doubt that it really inhabits this country, although almost extinct. A specimen, however, was lately taken at Cromer. Ths larva is dark green, with yellowish lines on the back and sides, and a black head. It lives on golden rod, sorrel, &c., in June and September. Both sexes of the butterfly, and the larva, are figured at Pl. 15, Fig. 1, *a*—*c*.

8. *L. Ottomanus* (Lef.).—Brilliant copper-red, with brown hind margins; fore-wings with three black spots in the discoidal cell, and an outer row of black spots, all small and indistinct; hind-wings unspotted. Under side of fore-wings pale copper-yellow, with the markings more distinct, and an outer row of marginal black spots. Hind-wings greenish or yellowish grey; hind margin brown, with a row of orange spots edged inside with black ones, and many small black eyes nearer the base. Expands a little over 1 inch. It inhabits Turkey, Greece, and Asia Minor in March and June.

9. *L. Thetis* (Klug).—Brilliant copper-red; the tips of the fore-wings narrowly black; hind margins narrowly black, and marked with triangular black spots. Hind-wings emarginate at the anal angle, near which are two detached black dots. Under side ashy; fore-wings tinged with copper, with three discoidal spots, and two rows of spots nearer the hind margin. Hind-wings ashy-grey, with a marginal copper band, edged on each side with indistinct black dots. Nearer the base are two rows of grey eyes in black rings, six in the first row and three in the second. Expands about 1¼ inches. It inhabits the mountains of Greece and Asia Minor.

*10. *L. Phlæas* (Linn.), (*Common Copper*).—Fore-wings bright copper-red, with broad black hind margins, and large square black spots, two in the discoidal cell, a third on the under side, and an irregular outer row. Hind-wings black, with a marginal copper band. Under side of fore-wings paler copper, the margins grey, edged within with a row of black spots towards the hinder angle, and the others ocellated; hind-wings grey, with small black dots, and traces of a marginal copper band. The southern variety *Eleus* (Fabr.) has short tails, and is darker above. Accidental varieties have also been met with in which either the black or the copper of the wings was replaced with milk-white. Expands from 1 to 1¼ inches. There is a succession of broods of this butterfly throughout the fine season of the year. It abounds almost everywhere in dry, sunny, flowery places, and is found throughout Europe, North Africa, Northern and Western Asia to the Himalayas, and even over the greater part of North America. The larva is green, with red lines on the back and sides, and may be found on sorrel throughout the year. The butterfly and larva are figured at Pl. 15, Fig. 2, *a*, *b*.

GENUS III.—THESTOR (HÜBN.).

Brown butterflies, more or less marked with orange or reddish, but rarely with the brilliant coppery lustre of *Lycæna*. The club of the antennæ is distinct and rather thick; the eyes are hairy, the palpi short, and the hind-wings are rounded, not emarginate before the anal angle, and without a tail. The few known species inhabit the shores of the Mediterranean and Black Seas.

1. *T. Ballus* (Hübn.).—Male brown; fore-wings with the spots of the under side showing through, and hind-wings with traces of a marginal orange band at the anal angle. Female with the fore-wings orange, the costa and hind margin broadly brown. Hind-wings brown, the outer half with a very broad orange band. Fore-wings beneath brown, tinged with copper, with two rows of large black eyes in the discoidal cell, and two curving transverse rows nearer the hind margin. Hind-wings beneath green, the hind margins broadly brown. Expands about 1 inch. Common in South France, Spain, Morocco, and Algeria in February and March. The larva is yellowish-white, with a row of reddish spots on the back, which are bordered with brownish-red and bisected by a blue line; there are also violet-red oblique streaks, and a longitudinal line on the sides. The head is brown, and the first two or three segments are washed with whitish. It feeds on *Lotus hispidus* in May. The butterfly is figured at Pl. 52, Fig. 14.

2. *T. Nogellii* (Herr. Schäff.).—Dark brown, tinged with copper; fore-wings of the male with a large orange blotch in the centre; there is also a short orange band at the anal angle of the hind-wings. The under side of the hind-wings is slaty-grey, with the base greenish, and two rows of square orange spots, edged on both sides with black ones. Nearer the base are four similar spots, forming an imperfect third band. Expands from 1 to 1¼ inches. Inhabits Turkey in Europe and Asia.

3. *T. Callimachus* (Eversm.).—Fore-wings red, with the costa and hind margin brown; hind-wings brown, with a large oval orange blotch on the hind margin towards the anal angle. Under side of the fore-wings red; the costa greyish-white, with large connected spots; there is also a large pure white spot in the centre of the costa, with a black lunule on each side. Hind-wings beneath grey, varied with brown towards the margins and between the three double rows of small black dots. Expands nearly 1 inch. It inhabits South Russia and Western Asia in May.

GENUS IV.—LÆOSOPIS (RAMB.).

The only species of this genus, *L. Roboris* (Esp.), resembles *Zephyrus Quercus* in appearance, but the eyes are naked, the hind-wings are not scalloped at the anal angle, and are destitute of a tail. The male has purplish fore-wings, with the tip and hind margin broadly, and the costa narrowly, brown; the hind-wings are brown, with the base purple, and some purple marginal spots. The female is brown; the fore-wings have three purplish-blue streaks at the base, of which the middle one is the shortest; the hind-wings are brown, with six purplish-blue marginal spots. The under side is grey, with a marginal row of orange spots, edged internally with a row of white ones, and externally by a silvery-blue line, most conspicuous on the hind-wings. Between the white and orange spots is a row of black dots. Expands about 1¼ inches. It is found in woods in Spain, South France, and at Botzen, in the Tyrol, in May and June, and is particularly fond of privet blossom. The larva is dull brown, with a black streak on the back, bordered with obscure yellowish markings. It feeds on the oak. The butterfly is figured at Pl. 52, Fig. 13.

GENUS V.—ZEPHYRUS (DALM.).

The species of this genus are not very numerous, and are confined to Europe, Asia, and California. They agree with the true *Theclæ* in their generally hairy eyes, the short tail towards the anal angle of the hind-wings, and the pale lines of the under surface, which has given rise to their English name of "Hair-Streaks." The larvæ of both genera have an arched back, and are smoother and narrower behind. The *Zephyri* differ from *Thecla* in their rather thick antennæ, with a very gradually-formed club; and more especially in the neuration of the fore-wings, which have eleven nervures, the subcostal nervure emitting two branches before the extremity of the discoidal cell, and a third beyond, which is bifurcated. The European species of *Zephyrus* are rather larger than those of *Thecla*.

*1. *Z. Betulæ* (Linn.), (*Brown Hair-Streak*).—Male dark brown; fore-wings with a black discoidal spot, having a pale mark on the outside; hind-wings with the tail and anal angle orange; fringes white. Female similar, with a broad transverse orange band upon the fore-wings. Under side dull orange, with a deeper-coloured marginal line; fore-wings with one, and hind-wings with two, distinct white lines, edged on one side with blackish, and a black streak edged with white at the end of the cell of the fore-wings. Expands from $1\frac{1}{4}$ to $1\frac{3}{4}$ inches. It is found flying along hedges and about bushes from July to September, and is common throughout the greater part of Central Europe and Northern Asia. It is a local rather than a rare insect in the south of England and Ireland. The larva is green, with yellow longitudinal lines and oblique streaks on the back and sides; the head is brown. It feeds on birch, sloe, plum, &c. Both surfaces of the female butterfly are figured at Pl. 15, Fig. 5, *a*, *b*.

*2. *Z. Quercus* (Linn.), (*Purple Hair-Streak*).—The male is purplish-blue, with black hind margins, and the female is brown, with a rich purple blotch on the fore-wings, reaching half across the wing in front and nearly to the hinder angle behind. The under side is silvery-grey, with a white line towards the hind margin, and with indistinct white marginal lunules. There are also some orange markings, adjoining or enclosing black spots, towards the hinder angles of all the wings. The Hungarian variety *Bellus* (Gerh.) has one or more orange spots on the upper side of the fore-wings. Expands from $1\frac{1}{4}$ to $1\frac{1}{2}$ inches. Common throughout Europe, except the extreme north and south; it also occurs in Asia Minor. It is found in oak-woods from June to August, but is not very difficult to capture, as it generally flies round bushes and low trees within reach of the net. The larva is reddish-grey, with triangular yellowish spots on the back, and a yellowish stripe on the sides; the head is brown. It feeds on oak, and occasionally on sallow in May and June. The female butterfly is figured at Pl. 15, Fig. 6.

GENUS VI.—THECLA (FABR.).

The species of *Thecla* are rather smaller than those of *Zephyrus*, and the wings are brown above and generally marked with a very distinct white line beneath; the hind-wings are nearly always tailed. The club of the antennæ is more suddenly formed than in *Zephyrus*, and the fore-wings have only ten nervures, the subcostal nervure emitting three unforked branches before the extremity of the discoidal cell, and none afterwards. This genus is exceedingly extensive, between 500 and 600 species being described as belonging to it; but there can be no doubt that it requires subdivision. The vast majority of the species are South American, and most of the North American species resemble the European. The genus is not represented in Africa, except on the Mediterranean coast. The true type of *Thecla* is the European *T. Spini*.

* 1. *T. Rubi* (Linn.), (*Green Hair-Streak*).—This, the smallest of the European species, is rather unlike any of the others. It has no tail, and is uniform brown above and uniform green below, with a row of white dots on the under side of the hind-wings. It expands from 1 to 1¼ inches. It is abundant throughout Europe, North Africa, and Northern and Western Asia as far as Persia, occurring in open places in woods in April and May, flying about and settling upon bushes. There is a closely-allied butterfly in California (*T. Dumetorum*, Boisd.) which is perhaps only a variety of this. The larva is green, with a yellow line on the back, bordered with darker, and followed by a row of pale triangular spots, and a yellow line on the sides. It lives on bramble, broom, &c., in July and August. The under side of the butterfly is figured at Pl. 15, Fig. 3.

* 2. *T. Pruni* (Linn.), (*Black Hair-Streak*).—Dark brown; the hind-wings, and sometimes the fore-wings also, with a marginal orange band towards the anal angle. Hind-wings with a short tail, as in all the following species. Under side with an interrupted bluish-white line, and the marginal orange band bordered inside with a row of round black spots, edged with bluish-white. The hind margin of the hind-wings is also edged with a bluish-white line, and there are two or three additional black spots at the anal angle, outside the band. Expands from 1 to 1¼ inches. It is found throughout the greater part of Central Europe in June, flying about bushes, but is somewhat local, and not a very abundant insect; it is also met with in the Altai. In the south of England it is one of the most local of all our species, though generally abundant where it occurs. The larva is green, with a whitish line on the back, and whitish oblique lines; the head is yellow. It lives on sloe, oak, &c., in May. The transformations are figured at Pl. 15, Fig. 4, *a—c*.

3. *T. Ilicis* (Esp.), (*Evergreen-oak Hair-Streak*).—Dark brown; female with a large dull orange transverse blotch on the fore-wings before the hind margins; the anal angle of the hind-wings marked with a small orange spot in both sexes. Under side not much paler, with the transverse white line broken into irregular spots, of which the last but one on the hind-wings forms an acute angle. Hind-wings with a row of marginal orange spots, bordered within with black triangular spots or crescents, scarcely marked with white; the fringes black, edged within with a white line. In the variety *Æsculi* (Hübn.) the white line is wanting or inconspicuous on the fore-wings. Expands about 1¼ inches. Common throughout Central and Southern Europe, North Africa, and Western Asia, but erroneously reputed British. It is found in woods from May to July. The variety *Æsculi* seems to be commonest in the south. The larva is pale green, with a row of yellow spots on the back, and a yellow line and row of transverse streaks on the sides. It lives on oak and evergreen-oak in May.

4. *T. Acaciæ* (Fabr.).—Very like *Ilicis*, but with no orange blotch on the fore-wings in the female; anal angle of the hind-wings with from two to four small orange spots. Under side paler, greyish-brown; the white line of the fore-wings is only visible in the female, and that of the hind-wings is more regular than in *Ilicis;* the last spot but one forms no angle. The red spots are crescent-shaped, and the largest, nearest the anal angle, is bordered with a black lunule dusted with blue, which fills up the hollow as far as the white marginal line. The next spot is marked with a black dot outside. The tail is deep black in the female. Expands about 1 inch. It inhabits the south of France and Germany, South-Eastern Europe, and Western Asia, but appears to be a local, and often a scarce, insect. It generally frequents hilly districts from May to July; and the larva feeds on sloe in May.

* 5. *T. W-album* (Knoch), (*White Letter Hair-Streak*).—Brown; fore-wings of the male with a patch of grey scales in the middle; hind-wings with an orange spot at the anal angle. Under side with the white line nearly continuous, and forming a very distinct white W near the anal

angle of the hind-wings. Hind-wings with a marginal orange band, edged inside with an indented black line, within which is a whitish one. Hind margins intersected with a white line, between which and the orange band are several large black spots towards the anal angle. Expands from 1 to 1½ inches. Inhabits a great part of Europe (including England) and Northern and Western Asia; but seems to be everywhere confined to very restricted localities, and to be of somewhat uncertain appearance. It is found in woods, or flying about elms, sometimes at a great height, in June and July. The larva is green, with two rows of whitish humps on the back. The belly is paler, spotted with dark red, and the head is yellowish-brown. It feeds on elm in May.

6. *T. Spini* (W. V.).—Brown, generally with orange spots towards the anal angle of the hind-wings; tail tipped with white, and the hind margin between this and the anal angle intersected with a short white line. Under side grey; the white line very distinct, and not much broken; hind-wings with a large blue spot at the anal angle, above which is a marginal row of orange spots, edged within with black ones slightly marked with white. Hind margin intersected with a narrow white line. The orange spots on each side of the blue spot have a black spot on each side, and the one which stands between it and the anal angle is much marked with white also. Expands from 1 to 1¼ inches. It inhabits Southern and Central Europe, except the north-west (its reputed occurrence in England being doubtless an error), and Northern and Western Asia. It prefers warm sunny slopes covered with bushes, especially on a limestone formation; but is not generally common, though widely distributed. It flies from June to August. The larva is green, with three yellowish lines on the back, and a whitish line and transverse streaks on the sides; the head is black. It lives on hawthorn and blackthorn in May and June.

FAMILY IX.—HESPERIIDÆ.

These are small and generally rather thick-bodied butterflies, with short wings. The fore-wings are triangular, and the hind-wings are rounded, and rarely dentated. They are either dark-coloured, with pale spots and markings, or tawny. The head is broad and hairy, the eyes are semi-circular and naked, and the palpi are covered with bristly hairs. The antennæ are short, with a rather long club, which is frequently hooked at the tip; they are placed widely apart on each side of the broad head, and have a tuft of hair at the base. The legs are perfect in both sexes, and the hind tibiæ have four spurs, or, more rarely, spurs at the end only. The fore-wings have twelve diverging nervures; nervule 5 of the hind-wings, and the disco-cellular nervule, are very slightly developed; and the discoidal cell is quite straight behind. The larvæ are tapering at both ends, and are short, covered with fine thin hair, and have a round head. They generally live between leaves loosely spun together, and undergo their transformations in the same situation in a slight cocoon.

These butterflies are generally called Skippers, from their short jerking flight. They are fairly represented in most parts of the world, but the great majority of both genera and species are South American. There is no direct affinity between this and any of the other families of butterflies; and they appear to be more closely allied to some groups of Australian and American moths than to any other insects. If, therefore, the distinction generally made between butterflies and moths is worth retaining, it might, perhaps, be better to consider them rather as the first family of moths than as the last family of butterflies, which Duncan and some other writers have actually proposed.


3
6
4c
4a
4b
5a
2b
2a
5b
13
14
12
11
8.
9.
10
1c
1b
7b
1a
7a
A
B
C
D

GENUS I.—SPILOTHYRUS (DUP.).

The club of the antennæ is thick and straight; the hind tibiæ are not furnished with a tuft of hair; the fore-wings have transparent spots, and the hind-wings are dentated. The fringes are spotted with pale and dark. The butterflies frequent weedy slopes, and are double-brooded, appearing in spring and autumn.

1. *S. Alceæ* (Esp.), *Malvarum* (Hoffmannsegg).—Wings reddish-grey, with blackish bands; fore-wings with small transparent dots in the middle, before the tips, and in cells 2 and 3; hind-wings with pale spots beneath, but with no conspicuously paler spot in the middle above. Expands from 1 to 1¼ inches. Common throughout Southern and Central Europe (except the north-west), North Africa, and Northern and Western Asia. The larva is reddish-grey, spotted with yellow on the 2nd segment, with a dark line on the back and a pale stripe on the sides. Lives in June and autumn in the folded leaves of different species of mallow, and the autumn brood hybernates. The butterfly and larva are figured at Pl. 15, Fig. 7, *a*, *b*.

2. *S. Altheæ* (Hübn.).—Very like *Alceæ*, but slightly larger on an average. The upper side shades into green or violet-grey, the transparent spots in cells 2 and 3 of the fore-wings are larger and crescent-shaped, and there is a white spot in the middle of the hind-wings, which are rather more distinctly spotted than in *Alceæ*. The fore-wings of the male have a stiff tuft of flock-like hair on the under side at the base. It is met with in Southern Europe and Western Asia, as well as in the southern half of France and Germany. The Spanish variety *Marrubii* (Ramb.) is smaller than the type, and yellowish-grey, and the larva is reddish or yellowish grey, with brownish stripes on the back and sides. It feeds on *Marrubium hispanicum* in spring and autumn.

3. *S. Lavateræ* (Esp.).—Wings above pale greyish-green, with dark bands, the transparent spots of the fore-wings larger than in the other species, and those in cells 2 and 3 nearly square; hind-wings with a whitish spot at the base, and two rows of whitish spots beyond the middle. The under side of all the wings is uniform pale grey. Expands about 1¼ inches. Its range is similar to that of *Altheæ;* but it is a very local insect, and does not appear to be very common anywhere. The larva is bluish-grey, with a blackish line on the back, two blackish stripes on each side, and two pale yellow ones beneath them. It feeds on *Stachys recta* in spring. The butterfly is figured at Pl. 51, Fig. 8.

GENUS II.—HESPERIA (FABR.).

The club of the antennæ is thick and straight; the hind tibiæ are furnished with a tuft of hairs, except in the last three species, and there are no transparent spots on the fore-wings, nor are the hind-wings dentated. The wings are dark brown above, with white spots, which are generally angular, and the fringes are spotted. The fore-wings have a transverse spot in the middle, and a row of spots beyond, which is generally strongly curved and set backwards below the costa, so that the spots which stand close to the costa are placed much nearer to the base than that which follows; and the hind-wings have a more or less distinct central band, and a row of spots before the hind margin, which are sometimes very indistinct, or absent. The under side is paler, and the hind-wings are greenish-grey or brownish, with a white central band and row of spots, as well as spots at the base. The species are either very variable, or else there are many closely-allied ones. This has not yet been satisfactorily ascertained, and we shall here omit several forms described by no one but Rambur, and most of which are probably mere varieties of other species. Rambur, and subsequently some American entomologists, have attempted to employ the structure of the abdominal appendages as a character to separate the species of *Hesperiidæ;* but though this is

found a very important aid to the study of the Caddis Flies, which are closely allied to *Lepidoptera*, it appears to be unreliable in the case of the latter Order.

1. *H. Proto* (Esp.).—Greenish-brown; fore-wings with an interrupted central row of dull white spots; hind-wings with a distinct central band of pale spots, and one basal spot; there are also faint traces of a marginal row of pale markings on all the wings. Under side of all the wings brownish-yellow, with two yellowish bands, and a row of marginal lunules; inner margin yellow. Expands about 1 inch. Inhabits South Europe, North Africa, and Western Asia in June and July. The larva, which feeds on *Phlomis lychnitis* in May, is yellowish-grey, with a red line on the back, and two red spots on the head.

2. *H. Tessellum* (Hübn.).—Resembles *Proto* above, but the row of marginal white dots is as distinct as the central row. Fore-wings with a large black spot in the discoidal cell, edged within with a nearly square white one, and outside by a white lunule. Under side of fore-wings chequered with dark green and white; hind-wings beneath yellowish-green, with a band of greenish-white spots across the centre, and white marginal and basal spots. Expands 1¼ inches. It inhabits South-Eastern Europe, Siberia, and Western Asia in May and August. (*H. Cribrellum*, Eversm., found in South Russia and Siberia in May, is rather smaller, with the green of the under side of the fore-wings shading into blackish; the hind-wings are of a yellower green beneath, and the pale spots are pure white. *H. Cynaræ*, Ramb., from South Russia and Western and Northern Asia, may be distinguished from the foregoing species by the under side of the hind-wings, which is white, with two very broad reddish-brown bands slightly tinged with greenish, which do not extend to the inner margin.)

3. *H. Sidæ* (Esp.).—Fore-wings brown, with a square white spot in the discoidal cell, edged with black on both sides, and the outermost black spot edged again with whitish. The central row of spots is continued along the costa of the fore-wings towards the base, as far as the large white discoidal spot. The marginal spots are most distinct on the hind-wings, and the central band on the fore-wings; and there is also a white spot towards the base on the inner margin of the fore-wings, opposite to another on the costa of the hind-wings. Under side of hind-wings white, with two orange bands, and an orange spot on the costa nearer the base, all edged with black lines. There is also a distinct black line on all the wings before the fringes. Expands about 1¼ inches. It inhabits South Europe and Northern and Western Asia in June, but is not a common species.

4. *H. Carthami* (Hübn.).—The upper side is very similar to *Sidæ;* the under surface more resembles that of the following species, but *Carthami* differs as follows:—The hind margins of all the wings are distinctly bordered with whitish before the fringes, and between this and the central row of spots are placed whitish longitudinal streaks on a dark ground on the fore-wings, and dark spots towards the anal angle of the hind-wings; and the fringes are distinctly spotted with black and white to their base, and are pure white towards the anal angle of the hind-wings. Expands nearly 1¼ inches. Common over a great part of Southern and Central Europe, except the north-west, frequenting dry, sunny, open places and hill-sides from May to August.

5. *H. Andromedæ* (Wallengr.).—Very similar to *Cacaliæ*, with which it agrees also in the outline of the hind-wings and in the shape of the large white spot beyond the discoidal cell of the under side of the hind-wings, but differs from it in the much larger and better-defined spots of the upper side, the much brighter colour of the under side, and especially in the fringes, which are distinctly chequered with black and white as far as the base, without any indication of an intersecting line. Expands from 1 to 1¼ inches. It is found in the mountains of Scandinavia and the South-Eastern Alps in June and July. (*H. Conyzæ*, Guén., found in mountain meadows in Savoy, resembles *Carthami* above, and *Centaureæ* below, but is no larger than *Malvæ*.)

6. *H. Cacaliæ* (Ramb.).—Larger than *Alveus;* the spots of the upper side are smaller, more like dots, and more scattered; the hind-wings are of a unicolorous dark colour, regularly rounded, and not produced at the anal angle. The under side is more unicolorous than in *Alveus*, and is brownish-grey; the spots of the hind-wings are duller and not sharply bordered; the central band is interrupted in cells 2 and 3, and the large spot beyond and above the discoidal cell is placed nearer the base. The fringes are obscured at their base, and are intersected by a dull line. Inhabits the Alps and Pyrenees in July and August.

7. *H. Alveus* (Hübn.).—The white spots of the upper side are variable in size and distinctness, and are generally indistinct on the hind-wings, the anal angle of which is distinctly produced. The under side of the fore-wings is brownish-grey, the hind margin only slightly and inconspicuously lighter; hind-wings beneath greenish-grey, with the spot of the central band beyond the discoidal cell truncated on the basal side; the fringes are obscured at their base, and intersected by a dull line. Expands about 1 inch. In the variety *Fritillum* (Hübn.) the under side of the hind-wings is rusty-yellow, with white nervures; and in the varieties *Serratulæ* (Ramb.) and *Cæcus* (Freyer) the spots of the upper side are small, and the spots of the central band on the under side of the hind-wings are punctiform in cells 2 and 3. The upper side of *Cæcus* is scaled with yellow, and the fringes are also yellowish. This species (or some of its numerous varieties) appears to occur in all parts of Europe, except the north-west, as well as in Northern and Western Asia and in North Africa, from May to August, frequenting glades in woods and sunny slopes. It is commoner in the mountains than in the plains. The larva feeds on *Polygala Chamæbuxus*. The butterfly is figured at Pl. 15, Fig. 8.

8. *H. Centaureæ* (Wallengr.).—Brown, with the base darker; fore-wings with two cream-coloured discoidal spots, a much angulated row of cream-coloured spots of moderate size, and a single spot on the inner margin; hind-wings with two indistinct rows of pale spots. Under side pale grey, the white markings more or less conspicuous and suffused. Expands nearly 1 inch. Inhabits Scandinavia and Labrador in June and July.

*9. *H. Malvæ* (Linn.), *Alveolus* (Hübn.), (*Grizzled Skipper*).—Brown, the spots of the upper side sharply defined, and of about equal size on all the wings, except the central band of the hind-wings, which is generally indicated on the costa only, though sometimes complete; under side of the fore-wings blackish-grey, with white longitudinal streaks on the hind margin; hind-wings beneath dark olive-green or cinnamon-brown, with brownish-yellow nervures. In the variety *Taras* (Bergstr.) the white spots of the fore-wings run together into a broad white band. Expands about 1 inch. Common throughout the fine season in all parts of Europe, except Ireland, and in Northern and Western Asia, in the glades of woods, heaths, hill-sides, &c. The larva is brownish-yellow, with brownish-red streaks, bordered with yellow, on the back and sides. It feeds on wild raspberry and strawberry in June and autumn. The butterfly is figured at Pl. 15, Fig. 9.

10. *H. Phlomidis* (Herr.-Schäff.).—Fore-wings dull brownish-grey, with the usual three white spots on the costa, followed by two or three small spots and two discoidal spots, below which are two or three larger ones; hind-wings darker, with a central white band, a white discoidal spot, and an ill-defined marginal line. All the wings with a row of small marginal spots. Under side of fore-wings blackish, with the spots of the upper side; hind-wings beneath yellowish-green, with the basal spot and two transverse bands white and well defined. Expands about 1 inch. It is found in Turkey and Asia Minor in June and July.

11. *H. Sao* (Hübn.).—Black; fore wings with a row of small whitish dots before the hind margin on both sides; the other spots are small on the upper side, but sharply defined, and the

central row is often interrupted. The central band on the upper side of the hind-wings is absent above, but is represented by from one to three small spots in the middle. The under side of the hind-wings is cinnamon-brown, with paler nervures and pearly-white spots. The first spot of the central row is very large, the others are small, and that beyond the discoidal cell is angular. The variety *Eucrate* (Ochs.), from South Europe, is smaller and paler beneath; and the variety *Therapne* (Ramb.), from Corsica and Sardinia, is smaller, with darker spots. Expands nearly 1 inch. Common in Southern and Central Europe, except the north-west, but local, frequenting sunny, weedy slopes, especially on a limestone soil, from May to July.

12. *H. Orbifer* (Hübn.).—Very like *Sao* above, but the hind-wings are olive-green beneath, and rarely brownish, with the spots of the central band rounded and more of equal size. Expands about 1 inch. It inhabits South Europe and Northern and Western Asia in May and June.

GENUS III.—NISONIADES (HÜBN.).

The antennæ are short, but longer and more slender than in *Hesperia*, and the club is slender and curved, but not hooked. The hind tibiæ have no tuft of hair; the wings are not chequered, and the fringes are unicolorous.

*1. *N. Tages* (Linn.), (*Dingy Skipper*).—Dull brown, with marginal rows of small pale dots. Two obscure greyish bands on the fore-wings, and one on the hind-wings. The under side is paler, with a row of indistinct spots. Expands from 1 to 1¼ inches. Common throughout Europe, except the extreme north, during all the fine season, in dry, sunny places, especially along roads in woods, and on the borders of woods. It also occurs in Northern and Western Asia. The larva is pale green, with yellow lines on the back and sides. It feeds on *Eryngium campestris* and *Lotus corniculatus* in June and autumn.

2. *N. Marloyi* (Boisd.).—Unicolorous dark brown; fore-wings with two rather narrow transverse blackish bands above, and one or two white dots on the costa near the tip, visible both above and below. It inhabits South-Eastern Europe and Western Asia in July.

GENUS IV.—CYCLOPIDES (HÜBN.).

The antennæ are not hooked at the tip, and the body is rather slender. The sexes are similar in colour, and the males have no oblique patch of scales on the fore-wings, which are long and pointed; the hind-wings are short, and not emarginate. This genus, though not numerous in species, has representatives in most parts of the world.

1. *C. Morpheus* (Pall.), *Steropes* (W. V.), *Speculum* (Rott.).—Wings dark olive-brown above, with one or two large yellowish or whitish spots near the tip of the fore-wings; hind-wings yellow beneath, with large round white spots in black rings, one near the base and the others arranged in two rows outside it. Expands nearly 1½ inches. Common in Central Europe (except the north-west) in June and July, but local. It also occurs in Western and Northern Asia. In the north it inhabits marshy meadows, and in the south hill-sides. The larva is dirty white, with a darker line on the back and white lines on the sides; head brown. It feeds on grass in May and June. The butterfly is figured at Pl. 15, Fig. 10.

*2. *C. Palæmon* (Pall.), *Paniscus* (Fabr.), (*Chequered Skipper*).—Wings above blackish-brown, with angular tawny spots on the fore-wings, and round ones on the hind-wings. The hind-wings are yellowish beneath, with paler yellow spots, not distinctly bordered with black, but arranged nearly as in *Morpheus*. It expands a little more than 1 inch, and is common over a great part of Europe and Northern and Western Asia in May and June. In the north-west of Europe, including

England, it is a very local insect, and is met with in grassy openings in woods. The larva, which hybernates, and lives on grass in spring, is blackish-grey, with a broad yellow stripe on the sides. The butterfly is figured at Pl. 15, Fig. 11.

3. *C. Silvius* (Knoch). — Fore-wings yellowish tawny, with a row of small black spots before the hind margin, and with four spots nearer the base, which are small in the male, and large and nearly contiguous in the female. Hind-wings suffused with tawny, with a basal spot, and two outer rows of nearly contiguous tawny spots. The spots on the under side are yellower than in *Palæmon*, of which *Silvius* was formerly considered a variety. The two species are of the same size, and appear at the same time. *Silvius* is a local insect in North Germany and Scandinavia, frequenting open places in damp woods, but is commoner in Eastern Europe and Northern and Western Asia generally. The larva is dirty bone-colour, with reddish lines on the back and sides, and a brownish-yellow head. It feeds on grass.

GENUS V.—PAMPHILA (FABR.).

The head and thorax are broad, and the abdomen is as long as the hind-wings, which are slightly sinuated at the anal angle. The males have generally an oblique velvety patch of scales on the disc of the fore-wings. In the first three species the club of the antennæ is pointed and hooked at the tip, and in the others it is obtusely rounded. The species of the first section are very numerous, and form one of the most typical groups of the *Hesperiidæ;* those of the second belong to the genus *Thymelicus* (Hübn.). The larvæ are narrowed behind the head, and the abdominal fold extends beyond the claspers. They live on grass, and hybernate; and the butterflies frequent grassy places and openings in woods in summer.

1. *P. Nostrodamus* (Fabr.).—Dark brown, base smoky black; inner margin of the hind-wings paler than the ground colour, and a few white dots on the fore-wings in the female. Under side pale brown, with some obscure white spots towards the tip of the fore-wings, and, in the female, at the hind margin of the hind-wings also. Expands a little over 1 inch. It inhabits South Europe, North Africa, and Western Asia in August, and is found in dry places. Figured at Pl. 51, Fig. 9. (*P. Ætna*, Boisd., formerly supposed to be found in Sicily, is a North American species.)

* 2. *P. Comma* (Linn.), (*Pearl Skipper*).—Male fulvous, with dark brown borders, and a large black oblique streak in the middle of the fore-wings enclosing a narrow silvery line. The female is brown, marked with fulvous towards the base, and spotted with paler towards the hind margins. The under side of the hind-wings and the tips of the fore-wings are green, marked with square white spots. Expands about 1¼ inches. Found throughout Europe and Northern and Western Asia in July and August, on heaths, downs, &c. It is a very local insect in the south of England, where it occurs on the chalk. The larva is blackish-grey, varied with rust-colour, with a double black line on the sides. It lives on *Coronilla varia* and other papilionaceous plants in early summer. The male butterfly is figured at Pl. 15, Fig. 12.

* 3. *P. Sylvanus* (Esp.), (*Large Skipper*).—Very like *P. Comma* in size and markings; but the oblique black streak of the male is not marked with silver, and the fulvous markings are richer and more uniformly coloured, and not paler toward the margins. The under side of the hind-wings is greenish-yellow, with indistinct pale spots not differing much from the ground colour. It is an abundant insect, and its range is nearly coextensive with that of *Comma*, though it is not found in the extreme north of Europe. On the other hand, it is generally distributed in Britain. It is double-brooded, occurring in spring and autumn, and is most abundant at the edges of woods. The larva, which is dirty green, with a dark line on the back and a yellow stripe on the sides, lives on grass in May. The male butterfly is figured at Pl. 15, Fig. 13.

*4. *P. Actæon* (Esp.), (*Lulworth Skipper*).—Brown, tinged with tawny; male with a slender and rather curved oblique black streak on the fore-wings. A curved row of paler tawny spots running from the costa beyond the discoidal cell of the fore-wings in both sexes. Under side of hind-wings dull greenish-grey, yellowish towards the inner margin. Expands about 1 inch. It is a very local species, though abundant where it occurs; and is found in Central and Southern Europe, North Africa, and Asia Minor from June to August, frequenting sunny, weedy places, especially on a limestone soil. In Britain it is exclusively confined, so far as is known, to one or two very restricted localities on the south-west coast, chiefly in Dorsetshire. The larva is pale green, with a darker line on the back, edged with a yellowish line on each side, and divided by a pale central line; there are also two yellow lines on the sides. It feeds on *Calamagrostis epigejos* in June.

*5. *P. Thaumas* (Hufn.), *Linea* (W. V.), (*Small Skipper*).—Uniform fulvous or tawny, with brown borders; the male with a slender and rather curved oblique stripe on the fore-wings. Hind-wings beneath unicolorous greenish-ash, except the inner margin, which is fulvous. The tip of the antennæ is yellow beneath to the extremity, and blackish above. Expands from 1 to 1¼ inches. Common throughout Europe, North Africa, and Western Asia, from June to September, in meadows and glades in woods. The larva, which is pale green, with two white lines on the back and a yellow line on the sides, lives on grass in spring. The butterfly is figured at Pl. 15, Fig. 14.

6. *P. Lineola* (Ochs.).—Resembles *Thaumas* in size and colour, but the club of the antennæ is yellow, with a black tip, and the hind-wings are unicolorous beneath, instead of the inner margin being fulvous. The black streak on the fore-wings of the male above is shorter and quite straight, and is sometimes wanting. The range of this species is more extensive than that of *Thaumas*, as it is found throughout Northern Asia as well as Europe and the Mediterranean district; but it is absent in Britain. It occurs in meadows, &c., in July and August; and we have generally found it commonest along paths by the side of corn-fields. The larva is yellowish-green, with four yellowish lines on the back and a yellow line on the sides. It lives on grass in spring.

SPHINGES.

Five very distinct families are included under this name, and as they have but few characters in common, we shall discuss them separately.

FAMILY I.—SPHINGIDÆ.

This family includes the true Hawk-moths, which are large or middle-sized insects, with large thick bodies and strong wings. The fore-wings are long, with a long oblique hind margin, and the hind-wings are slighter, much shorter, and narrow, and when extended do not reach beyond the middle of the abdomen. The antennæ are short, and each joint is furnished with an oblique row of short bristles beneath in the male. The palpi, which are placed close to the antennæ, are short and densely scaled. The tongue is generally strong, spiral, and very long; and rarely short and soft. The front tibiæ are furnished with a leaf-like process, and the hind tibiæ have generally two pairs of spurs. The fore-wings have eleven or twelve nervures, and have only one submedian nervure, which is not angulated towards the base; nervules 7 and 8 rise from one stalk. The hind-wings are generally furnished with a frenulum, two submedian nervures, and seven other nervures; the costal and subcostal nervures are connected near the base by a short transverse nervule. The under side is duller coloured and with duller markings. The larvæ are cylindrical, naked, generally finely granulated, and with a horn or small elevation on the 12th segment. The moths have a powerful rushing flight, and hover over flowers, sucking the honey on the wing. Most of them fly at twilight and at night, and are widely distributed, nearly all those which occur north of the Alps ranging over the greater part of Europe, at least as casual visitors.

GENUS I.—ACHERONTIA (HÜBN.).

Body very thick, head and eyes large, antennæ short and thick, terminating in a slender bristle; thorax with pale markings on the back, resembling a skull; abdomen thick and cylindrical; and the hind margins of the wings not dentated. When the insect is at rest, the wings lie sloping close to the body, and the hind-wings are folded. The larva has a flat egg-shaped head, and a strongly granulated horn, bent into an S-shape. It forms its pupa in a cell underground. The moths have the power of uttering a kind of squeak, something like that of a mouse—a peculiarity only recorded of one other species of the family not belonging to this genus. There has been much discussion about the origin of this sound, which some think is produced by the friction of the short strong proboscis when rolled up, because it ceases immediately if this is unrolled and stretched out with a pin. The European species is found over the whole of Europe, Africa, and Western Asia, but is represented in Eastern Asia by other closely-allied species. The genus does not appear to occur in America. *A. Atropos* is, however, generally rather scarce in Europe, or is only common in favourable years. It flies late at night, and does not suck the honey of flowers, but the exuding sap of trees. It is fond of honey, and sometimes enters beehives; and it is also attracted by light. Few insects have a more powerful and sustained flight than this, which is often met with at sea, many miles from the nearest land. **A. Atropos*, Linn. (*the Death's-head Hawk-moth*), has dark brown fore-wings, varied with black zigzag lines, and with irregular whitish and rusty brown markings; in the middle is a round whitish dot. The hind-wings are yellow, with two black bands towards the hind margins. The head and thorax are black, marked

with a pale yellow skull; the abdomen is orange, with the incisions black, and a broad bluish-black longitudinal stripe on the back. The antennæ are black, tipped with white. It expands 4 or 5 inches, and is the largest Lepidopterous insect found in Britain, or, except *Saturnia Pyri*, in Europe. It occurs from August to October, and hybernated specimens, or specimens from hybernated pupæ, are sometimes found in June. The larva is yellow or greenish, and those which feed on buckthorn are blackish. It has broad transverse stripes from the 5th to the 12th segments, which meet in an angle on the back, and are blue on the back and blackish on the sides. One variety is dark brown, and yellow above on the 3rd and 4th segments, with two waved black lines on the back. It lives in summer and autumn on potatoes, thorn-apple, jasmine, buckthorn, tea-tree, &c. It has been suggested that the green larvæ are designed to simulate green stalks, and the brown ones withered stalks. It is not a sufficiently abundant insect to do any real damage, but the larva has not unfrequently been mistaken for the dreaded Colorado Beetle, to which it has much less resemblance than a dog to a mouse. Hybernating pupæ must be kept in a warm room from the beginning, and kept moderately damp. The transformations are figured at Pl. 16, Fig. 1, *a—c*.

GENUS II.—SPHINX (LINN.).

Antennæ longer and more slender than in *Acherontia*, terminating in a slender bristle. Body slenderer than in *Acherontia* and cylindrical, wings entire, fore-wings long and pointed, with the hind margin slightly convex. The tongue is very long, sometimes longer than the body, and is enclosed in a separate sheath in the pupa. The upper surface of the abdomen has pale and dark bands on the sides. The wings are less sloped than in *Acherontia* when at rest, and the hind-wings are less folded. The larvæ are provided with a strong smooth horn, which is only slightly curved, and are marked with longitudinal or transverse streaks. They construct their pupæ underground. The male moths of *S. Ligustri* and *Convolvuli* emit a musky odour when alive.

* 1. *S. Pinastri* (Linn.), (*Pine Hawk-moth*).—Fore-wings ashy-grey, with two rather indistinct reddish-brown bands running from the costa, and sharply angulated about the middle; the innermost turning inwards to the base, and the outermost running to the inner margin. Between these are two or three short longitudinal black dashes, and another at the tip. Hind-wings dark grey, lighter at the base; abdomen banded with black and greyish-white. Expands rather under 3 inches. Common throughout the greater part of Europe, except the extreme south, but is at all times a great rarity in Britain. It is most frequently observed at honeysuckle flowers in the evening, or resting on the trunks of poplars and other trees in the daytime. The moth appears from May to July. The larva is green, with white longitudinal lines, and an irregular reddish-brown stripe on the back. It feeds on pine and fir, especially on *Pinus sylvestris*, in August and September. The tongue-sheath is attached to the pupa. The moth and larva are figured at Pl. 17, Fig. 1, *a*, *b*.

* 2. *S. Convolvuli* (Linn.), (*Convolvulus Hawk-moth*).—Fore-wings dark grey, varied with paler and darker, and with two narrow black streaks in the middle and another at the tip. Hind-wings pale grey, with four black bands; the two middle ones close together and scarcely separated. Abdomen banded with black and flesh-colour; the latter colour edged in front with whitish. Expands about 4 or 5 inches. Common throughout the Old World, except the north, in August and September; and occasionally, from hybernated pupæ, in May and June. In Central Europe it is only found abundantly in favourable years, and is most frequently captured in gardens, hovering over flowers at dusk. The larva is yellowish-brown or green,


1b
3a
B
1a
A
3c
2b
C
2a
3b

with oblique ochre-yellow stripes, edged above with dark brown. It lives on the small bindweed, the wild balsam, &c., in summer, and hides itself on or in the ground during the day. The pupa is furnished with a long projecting convoluted sheath for the proboscis, which is longer in this insect than in any other European species. The moth and larva are figured at Pl. 17, Fig. 2, *a*, *b*.

* 3. *S. Ligustri* (Linn.), (*Privet Hawk-moth*).—Fore-wings brown, broadly paler towards the costa and hind margin, and with several short black longitudinal streaks in the middle. Hind-wings pale pink, with three black transverse bands; abdomen banded with black and rosy. Expands from 3½ to 4½ inches. Common in most parts of Europe, except the extreme north, and in North Africa and Northern and Western Asia, from May to July. It is most frequently observed in the larva state, and is therefore generally obtained by breeding from the larva, which is green, with oblique white streaks on the sides beyond the 4th segment, which are edged with lilac above. Its attitude in repose has been thought to resemble that of the Egyptian Sphinx, and hence this name was first applied to the larva, then to the moth, and subsequently to the whole group of which it forms the type. It feeds on privet, lilac, ash, holly, &c., in autumn. The tongue-sheath is attached to the pupa. This species is represented in all stages at Pl. 17, Fig. 3, *a*—*c*.

GENUS III.—DEILEPHILA (OCHS.).

Antennæ rather short, terminating in a bristle; wings entire; tongue much shorter than in *Sphinx;* abdomen thick, and diminishing rather suddenly to a point. The larvæ are cylindrical, with the first segments not retractile, and with pale spots on the sides. The pupæ of this and the following genus have no separate case for the proboscis. They are generally constructed on the surface of the ground, between leaves loosely spun together, and the perfect insects sometimes do not emerge till after they have passed two or even three winters in the pupa state. They are not easily reared unless the pupæ are forced. The genus *Deilephila* is found in all parts of the world, but the species are not very numerous, and the greatest variety is perhaps to be met with in Southern Europe.

1. *D. Vespertilio* (Esp.).—Fore-wings unicolorous slaty-grey, with an indistinct darker line running from the inner margin towards the tip; hind-wings flesh-colour, black at the base, and with a marginal black band, very narrowly bordered outside with flesh-colour. Abdomen with black and white spots on the sides of the first segments. Expands from 2 to 2½ inches. Inhabits the southern slopes of the Alps and the shores of the Mediterranean in September; and sometimes emerges from hybernated pupæ in May and June. The larva is brownish-grey, or ashy-grey, with reddish or whitish square spots on both sides of the back. It feeds on different species of *Epilobium* from June to September.

2. *D. Hippophaes* (Esp.).—Fore-wings pale grey, shading into dark olive-green on the costa; hind margin dark olive-green from the tip to the middle of the inner margin; hind-wings rose-colour, with the base black, and a black band before the hind margin. The thorax has a white streak on each side, and the first segments of the abdomen are spotted with black and white on the sides; the hinder segments have no white margin. Expands from 2 to 2¼ inches. Confined to Europe south of the Alps, to the warm southern valleys of which its range extends. It is found at the same seasons as *D. Vespertilio*, with which it is said occasionally to form hybrids. The larva is either silvery-grey, with an interrupted black stripe on the back, and black transverse streaks spotted with red and yellow, or is green, with a whitish streak on the sides, and two oblique yellowish stripes on the back, beyond the 4th segment. It lives in autumn on the sea-buckthorn;

but beyond the mere fact of the food-plant being found in England, we can find no reason to consider this insect as a probable British species, as some authors have suggested.

3. *D. Zygophylli* (Ochs.).—Fore-wings yellowish-green, with a narrow yellowish-white band running from the base of the inner margin to the tip, emitting one or two short branches towards the costa; hind margin yellowish. Hind-wings crimson, with the base and a narrow marginal line black. Expands 2½ inches. A scarce insect, confined to South-Eastern Russia. The larva feeds on *Zygophyllum Fabago.*

*4. *D. Euphorbiæ* (Linn.).—Fore-wings grey, suffused with rosy, with a large olive-green spot at the base, and another about the middle of the costa, generally followed by a smaller one. A broad olive-green band rises from the outer half of the inner margin, and tapers obliquely to the tip. Hind-wings red, with the base and a moderately broad stripe towards the hind margin black; the hind margin itself is flesh-colour. Under side red, with a black spot in the middle of the fore-wings. Body olive-green; the thorax with a white line on each side; the abdomen spotted with black and white on the first segments, and the hinder ones bordered with white; antennæ white. Expands about 2½ inches. Common in June and July in most parts of Central and Southern Europe and in Asia Minor. It is a very rare insect in England, and is only found on some portions of the southern and eastern coasts. The larva is black, dotted with yellow, with a red stripe on the back, a red stripe spotted with yellow on the sides, and an intermediate row of yellow spots. It feeds on spurge (*Euphorbia Paralias* and *Cyparissias*) from July to September, and is very conspicuous, feeding quite exposed on plants growing near the sea-shore, or at the edges of fields and paths. The larva is seldom attacked by birds, to some at least of which it appears to be poisonous. The moth and its larva are figured at Pl. 18, Fig. 1, *a*, *b*.

5. *D. Nicæa* (De Prunn.).—Very similar to *Euphorbiæ*, but much larger. Expands from 3¼ to 3¾ inches. Fore-wings grey, rarely suffused with rosy; base white, next to which is a dark green band slightly bordered with white. Near the centre of the costa is a large dark green spot, and nearer the tip are one or two other costal markings; near the hinder angle is a large dark green band, which narrows suddenly, and branches off at almost a right angle to the tip. Hind-wings black, with a central flesh-coloured band, having a white spot at the anal angle; hind margin broadly pale flesh-colour. Under side tinged with olive, and but slightly with rosy. It is met with in South France and Piedmont in June and September, but is not a very common species. The larva is pale rose-colour, with two contiguous eyes on the back of each of the last ten segments; the rings are black, and the pupils orange. There is also a lateral row of orange spots, bordered by two black ones. The head is rosy grey, the legs and horn black. It lives solitarily on various species of *Euphorbia*, especially *E. esula*, from July to September.

*6. *D. Galii* (Rottemb.), (*Madder Hawk-moth*).—Dark olive-green, the hind margin not much paler. A rather narrow whitish stripe runs from the inner margin near the base to the tip. It is irregular on the costal side, and throws off one or two short branches. Hind-wings as in *D. Euphorbiæ*, but the red band is paler and much varied with whitish, and the outer margin is narrowly whitish, intersected by the black nervures. The under side is grey, with the principal markings of the upper side indicated; and the antennæ are dusky, tipped with white. The body nearly as in *D. Euphorbiæ*, with which this species agrees in size. It is common in a great part of Europe and in Western and Northern Asia, but is a rarity in England, though the commonest of our three British species. It is generally obtained by rearing from the larva, which may be found at various parts of the south coast. The larva is green, with a yellow stripe on the back, and large round yellow spots on the sides surrounded with black. It feeds on bed-straw, willow-herb, and fuchsia from July to September, and may be looked for especially on plants growing on coast


2b
3a
1b
4
2a
3a
1a
A
B
3b
C

sand-hills, in gardens, and in clearings in woods. The moth and larva are figured at Pl. 18, Fig. 2, *a*, *b*.

7. *D. Dahlii* (Geyer).—Much resembles *Galii*, but the pale band of the fore-wings is whitish-grey, and suffused internally; the pale hind margin is much better defined, and the green space between them is generally slightly veined with whitish. The hind-wings are black, with a central flesh-coloured band, a narrow marginal one, and a white spot towards the anal angle. Fringes of all the wings white. Expands from 2½ to 2¾ inches. It is found in June and September in Corsica and Sardinia. The larva is slaty-grey, dotted with white, with alternate red and yellow stripes on the back, and a yellow streak on the sides. There are two large white spots and three smaller ones, all surrounded with black, on the side of each segment. The horn, legs, and spiracles are red. It feeds on *Euphorbia*.

* 8. *D. Livornica* (Esp.).—Fore-wings olive-brown, with white veins. The hind margin is ashy, and a yellowish streak runs from near the base of the inner margin to the tip. Hind-wings rose-colour, with the base black, and a rather broad black band very near the hind margin; fringes whitish. There is a white stripe on each side of the thorax, and two others in the middle. The abdomen has a row of white dots in the middle, and the front segments are spotted with black and white on the sides. Expands from 3 to 3½ inches. This species is found in August and September, and sometimes emerges from hybernated pupæ in May. It is very widely distributed, occurring throughout Southern and Central Europe, including England and Ireland, as well as throughout Africa, and over the whole of the southern half of Asia. Indian specimens are generally smaller than European. In North America it is represented by the closely-allied *D. Lineata* (Fabr.), which is distinguished by having two additional pale lines on the thorax. *D. Livornica* is rare everywhere in Central Europe, and appears rather to be a regular visitor during warm seasons than a permanent resident north of the Alps. It is generally captured in gardens in the evening, in company with the much more abundant *Sphinx Convolvuli*. The larva has a rosy streak on the back and a yellow one on the sides, with an intermediate row of black and rosy spots. It lives on a great variety of plants, among which we may mention sorrel, toadflax, bed-straw, fuchsia, and vine, and may be looked for in June and July.

GENUS IV.—CHŒROCAMPA (DUP.).

The perfect insect resembles *Deilephila*, but the fore-wings are rather narrower and more pointed, owing to the costa being more strongly arched, and the hind margin generally a little concave. The abdomen is longer and more tapering. The larvæ are generally green or brown, with the front segments tapering and retractile, and eye-like spots on the sides of the 4th, 5th, or 6th segments. The peculiar structure of the larvæ has led to their being thought to resemble an elephant's trunk or a hog's snout, whence the moths derive their name of Elephant Hawk-moths, or *Chærocampa*, from χοῖρος, a hog, and καμπή, a bending. This genus, which may be divided into several sections, is very widely distributed, and has representatives in all parts of the world.

* 1. *C. Celerio* (Linn.), (*Sharp-winged Hawk-moth*).—Fore-wings olive-brown, with short black and silvery longitudinal lines, and a shining silvery wavy streak, divided by two fine brownish lines, running from the base of the inner margin to the tip, below which are whitish longitudinal lines running along the hind margin. A little below the middle of the costa is a black spot in a pale ring. The hind-wings are rose-colour, with the hind margins and a central streak broadly black. The intermediate rosy band is also divided by black veins. Expands about 3 inches. It is found in May and June, and again in autumn, and its distribution is similar to that of *Deilephila*

Livornica. The larva is green or brown, with black eyes on the 5th and 6th segments, with white pupils nearly in the middle, and enclosed in slender yellow rings. The horn is slender, and long and straight. It lives in August and September on vine; and when the perfect insect does not appear the same autumn, the pupa seldom survives the winter in Central Europe. The moth is figured at Pl. 16, Fig. 2. (*C. Osiris*, Dalm., an African species, which occasionally visits Spain, is a little larger than *C. Celerio*, the markings of the fore-wings are less silvery, and there is a continuous line parallel to the costa running from the middle of the base to the tip, where it joins the usual oblique stripe. On the hind-wings there is a longitudinal black streak near the end of the innermost black stripe. There is a double pink band on the back of the abdomen, and two interrupted black bands on the sides of the first segments.)

2. *C. Alecto* (Linn.).—Fore-wings brown, with several black transverse lines, the most distinct running from the middle of the inner margin to the tip. There is a distinct black dot in the middle of the wing. Hind-wings red, blackish at the base and along the hind margin; a pale pinkish-white blotch at the anal angle. The head and body are greenish-brown, with a broad white stripe along each side of the head and thorax, and a black spot on each side at the base of the abdomen. Expands from $2\frac{3}{4}$ to $3\frac{1}{4}$ inches. A common East Indian species, the range of which extends to South-Eastern Europe. The moth is found in May. The larva is purplish-brown, dotted with white, and with a broad flesh-coloured streak on the sides, upon which is a row of seven white rings, bordered below with black, and enclosing large spots, black above and flesh-coloured below. It feeds on vine. (*C. Boisduvalii*, Bugnion, has brown fore-wings, with a green band near the costa running from the base to the tip, where it nearly touches a narrow green streak running from the hind margin to the inner margin; hind-wings black, with an oval white spot slightly tinged with pink at the anal angle. This species, which has been confounded with *C. Alecto* under the name of *C. Cretica*, Boisd., is said to occur in Turkey and Greece. Many closely-allied species occur in the East Indies, and *C. Boisduvalii* may possibly be identical with one of these.)

* 3. *C. Elpenor* (Linn.), (*Elephant Hawk-moth*).—Fore-wings olive-green, with the costa, hind margin, and two oblique bands rosy; hind-wings rosy, with the base black; body olive-green, with rosy stripes, the abdomen with a black spot on each side at the base. Expands about $2\frac{1}{2}$ inches. Common in Europe and Northern and Western Asia in May and June; in Japan it is replaced by a closely-allied species (*C. Lewisii*, Butl.), the larva of which is entirely different. The larva is green or brown, finely streaked with darker; a pale streak on the sides of the front segments, and round black eye-spots on segments 4 to 6, the last two of which enclose a brown lunule bordered with white. The horn is short, broad, and curved. It feeds on willow-herb, bed-straw, fuchsia, and vine from July to September. Figured in all stages at Pl. 16, Fig. 3, *a*—*c*.

* 4. *C. Porcellus* (Linn.), (*Small Elephant Hawk-moth*).—Fore-wings yellowish, with rosy spots on the costa, and the hind margin broadly rosy. Hind-wings black on the costa, and rosy on the hind margin, with a broad yellowish streak in the middle. Body rosy. Expands about 2 inches. Common in the greater part of Europe and in Northern and Western Asia in May and June, frequenting flowers in gardens, hedges, &c., in the evening. The larva is very similar to that of *Elpenor*, but has no horn. It feeds on bed-straw in July and August. The moth and larva are figured at Pl. 16, Fig. 4, *a*, *b*.

* 5. *C. Nerii* (Linn.), (*Oleander Hawk-moth*).—Fore-wings beautiful grass-green, varied with dark green, whitish, pink, and violet stripes and spots; hind-wings violet-grey, with wavy whitish transverse lines; abdomen with a white band on the 1st segment. Expands from 4 to $4\frac{1}{2}$ inches. Common throughout Africa and Southern Asia and Europe; a casual visitor north of the Alps in June, July, and October, and always a great rarity in Central Europe, though occasionally met


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with in the south of England. The larva is green, and more rarely ochre-yellow, with a white stripe on the sides of all the segments beyond the 4th; the front segments are yellow, with a large black eye with two large blue pupils on the sides of the 4th segment. The horn is short and depressed. It lives gregariously from July to September on oleander, preferring the flowers, and has also been found on periwinkle. The transformations are figured at Pl. 18, Fig. 3, *a—c.*

GENUS V.—SMERINTHUS (LATR.).

Head and eyes small, the antennæ of nearly uniform thickness, and not terminating in a bristle; wings comparatively broad and more or less dentated. The species differ considerably in structure, each representing a distinct group of the genus. The hind tibiæ of *Tiliæ* have four spurs, and those of the other species have only two. *Tiliæ* has a strong frenulum, the males of *Quercus* and *Ocellatus* a slight one, and the females of the last two and both sexes of *Populi* have none. The position of the wings at rest is the same as in the last two genera, but the moths fly later in the evening. The larvæ are granulated, with a strong anal horn. They are green, with a pointed head, and with red or white oblique stripes on the sides. They feed in August and September, change to pupæ in the ground, and the perfect insects appear from May to July. As the proboscis is very short in this genus (and actually wanting in *Quercus*), the pupæ are not furnished with a separate sheath for it.

* 1. *S. Tiliæ* (Linn.), (*Lime Hawk-moth*).—Fore-wings with the hind margin irregularly dentated, ground colour whitish-grey, lilac-grey, or brick-red; hind margin pale green, with a whitish blotch near the tip; a dark green band across the centre, generally formed of two irregularly-shaped spots; hind-wings yellowish or reddish, with a dark band beyond the middle. Expands from 2½ to 3 inches. Common in Europe, except the north and the extreme south, and in Siberia. The larva is green, with oblique stripes on all the segments beyond the 4th, which are reddish above and yellow beneath. It has a granulated plate beneath the horn, which is generally red. It feeds on lime. The transformations are figured at Pl. 19, Fig. 1, *a—c.*

2. *S. Quercus* (W. V.).—Fore-wings with the hind margin irregularly dentated, pale ochre-yellow, with several darker transverse lines; the hind margin, the outside of the third line, and the inside of the second suffused with brown towards the costa. Hind-wings fawn-colour, with a large white blotch towards the anal angle. Two small reddish-brown spots near the hinder angle of all the wings. Expands from 3½ to 3¾ inches. A scarce species in South Europe and Asia Minor. The larva, which feeds on young oaks, is very similar to that of *S. Populi*, but the oblique stripes are alternately broad and narrow; the horn is pale blue, and the head is bordered with orange-yellow. The moth is figured at Pl. 19, Fig. 2.

* 3. *S. Populi* (Linn.), (*Poplar Hawk-moth*).—Wings regularly dentated, brownish, purplish, or yellowish-grey; fore-wings with a short white mark at the end of the cell, and with several irregular dark transverse lines. The middle area of the fore-wings and the hind margin of all the wings are more or less clouded with darker. Hind-wings with a large reddish blotch at the base, and with one or two dark lines beyond it. Expands from 2½ to 3¼ inches. When the insect is at rest, the front portion of the hind-wings stands considerably out beyond the costa of the fore-wings. This insect is one of the commonest species of the family throughout Europe, except the extreme north and south, and Northern and Western Asia. The larva is very like that of *S. Ocellatus*, but is more slender in front and of a more yellowish-green, often with brownish-red spots on the sides; the horn is green, and is shorter and straighter. It feeds on various trees, especially poplars and willows. The moth and larva are figured at Pl. 19, Fig. 3, *a, b.*

(*S. Tremulæ*, Fisch., a very rare species, confined to Central and Northern Russia, much resembles this, but is greener, less striped, and with no red basal blotch on the hind-wings. The larva is green, striped with pale blue, and feeds on aspen.)

*4. *S. Ocellatus* (Linn.), (*Eyed Hawk-moth*).—Fore-wings with the hind margin waved; brown, clouded with darker in the centre and on the hind margins, with two transverse dark lines, within the outermost of which is a dark spot. Hind-wings rose-colour, with a large round black spot near the anal angle, enclosing a blue ring. Expands from 2½ to 3½ inches. Common throughout Europe and Northern Asia. Hybrids of this and the preceding species have been obtained in captivity. Larva bluish-green, with a white longitudinal streak on the first segments, behind which are broad white oblique streaks, and sometimes reddish-brown spots on the sides; horn blue. It feeds on willow, apple, &c. The moth and larva are figured at Pl. 19, Fig. 4, *a*, *b*.

GENUS VI.—PTEROGON (BOISD.).

This and the following genera are sometimes classed as a separate family, distinguished by their smaller size, shorter wings, and tufted abdomen, but are more frequently treated merely as a section of the true *Sphingidæ*. *Pterogon* has the body thickly covered with woolly hair, the abdomen with tufts of hair on the sides and at the extremity, the wings thickly covered with scales, and the hind margins dentated. The moths fly at twilight, and appear in May and June.

1. *P. Proserpina* (Pall.), *Œnotheræ* (W. V.).—Fore-wings green, with a darker transverse band across the centre, dusted externally with whitish. The hind margins are also darker. Hind-wings orange, with a broad blackish border. Antennæ black, with a white hook at the tip. Expands from 1¼ to 1½ inches. Common in South Europe; in the southern half of Central Europe it is scarce and local. Larva dark green or brownish-grey, with dark streaks and lines, and a waved black macular line on the sides, under which it is yellowish; the horn is replaced by a brownish-yellow anal spot, with a black centre. The young larva is pale green, with no anal spot, and resembles the larva of a butterfly. It feeds on different species of *Epilobium* in July and August, and hides itself under stones in the daytime. The moth is figured at Pl. 18, Fig. 4. (*P. Gorgoniades*, Hübn., found in South Russia, has grey fore-wings, varied with brown, and brownish hind-wings, with several obscure greyish lines. It is a scarce insect in collections, and expands only 1 inch. The larva is dull dark red, with brilliant white longitudinal lines, and an anal horn. It feeds on *Galium*.)

GENUS VII.—MACROGLOSSA (OCHS.).

Small species; the body covered with flattened scales, the abdomen with a tuft of hair at the sides and tip; the wings not dentated, and densely clothed with scales. The species fly by day as well as at twilight with great rapidity, sucking the honey from flowers on the wing. *M. Stellatarum* has the habit of flying along walls and banks of earth, perhaps for the sake of concealment; and is sometimes attracted by artificial or painted flowers. When at rest, the species of this and the following genus hold their wings sloping. The larvæ are granulated, with a round head and an anal horn; they change to pupæ between loosely-folded leaves, and the pupæ have no separate sheath for the proboscis.

* 1. *M. Stellatarum* (Linn.), (*Humming-Bird Hawk-moth*).—Fore-wings dark brown, with two black transverse lines. There is a black spot near the costa between the lines, and another towards the tip. Hind-wings tawny, with the base and hind margin brown. Abdomen spotted with black and white on the sides. Expands about 2 inches. Common throughout the greater


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1c.
4a.
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1b.
B.

part of Europe, North Africa, and Northern and Western Asia to the Himalayas, flying over flowers in gardens, &c., during all the fine season. The larva is green or reddish-brown, with a white longitudinal stripe, and a yellowish stripe under the spiracles. It lives on bed-straw in June, and again in autumn. The transformations are figured at Pl. 20, Fig. 1, *a—c.*

2. *M. Croatica* (Esp.).—Fore-wings green, the hind margins broadly reddish-brown; hind-wings red. Body olive-green; abdomen with a broad reddish belt, behind which it is yellow; anal tuft blackish. Expands nearly 1¼ inches. It is common in South-Eastern Europe and Asia Minor in June and August. The larva is bright green, speckled with white. There are two darker lines on the back and a pale yellow streak on the sides; the stigmata are red, bordered with pale yellow; and the legs and horn are orange. It feeds on scabious in July. The moth is figured at Pl. 20, Fig. 2.

GENUS VIII.—HEMARIS (DALM.).

Characters of *Macroglossa*, but the entire discs of the wings are covered with very loose scales on first emerging from the pupa, which are lost almost immediately, when the wings appear transparent, except at the margins. The body is covered with loose downy scales, giving the insects the appearance of humble-bees, which they also somewhat resemble in colour. They are found in May and June, hovering over flowers in open places in woods, and fly only in the daytime. Their flight is much less rapid than that of *Macroglossa Stellatarum.*

* 1. *H. Bombyliformis* (Ochs.), (*Broad-bordered Bee Hawk-moth*).—Wings nearly transparent; the hind margins broadly and the costa of the fore-wings narrowly bordered with reddish-brown; the discoidal cell of the fore-wings divided by a nervure, and with an oval dark spot at the extremity. The body is yellowish-olive, and there is a broad reddish-brown belt on the abdomen. Expands about 1¾ inches. Common throughout Europe, except the extreme north and south, and in Northern and Western Asia. It is particularly fond of the flowers of the elder and the meadow sage. The larva is pale green, with two yellow lines on the back, and a curved horn. It feeds on honeysuckle in July and August. The transformations are figured at Pl. 20, Fig. 3, *a—c.*

* 2. *H. Fuciformis* (Linn.), (*Narrow-bordered Bee Hawk-moth*).—Very like the last species, but a little smaller, with narrower brownish-black borders, the base greenish, the discoidal cell of the fore-wings not divided by a nervure, and with no spot at the extremity. The body is darker, and the abdomen has a black belt. It is found in open places at the blossoms of wild sage, &c.; and is as widely distributed as the last species. The larva is bluish-green, with two white lines, and the horn nearly straight. It lives on scabious in July and August. The moth is figured at Pl. 20, Fig. 4.

FAMILY II.—THYRIDIDÆ.

Small moths with stout bodies; the wings short and triangular, with transparent spots; the hind margins waved. Eyes naked; antennæ simple, very slightly thickened in the middle, and with a thickened basal joint. Palpi short, with the last joint pointed; proboscis strong; front tibiæ with a leaf-like appendage; hind tibiæ with four spurs. All the nervures separated; the fore-wings with twelve nervures, nervule 1 angulated towards the base. Larvæ with sixteen legs, thick, with warty processes and scattered hairs on the back. They live in leaves rolled into a funnel-shape, and change to pupæ in a slight cocoon. The moths fly over flowers in the daytime, and are very active. When at rest, they hold the fore-wings half erected. The few species known are

either European, North Asiatic, or North American. There being only one European genus, it is unnecessary to characterise it.

GENUS THYRIS (ILL.).

1. *T. Fenestrella* (Scop.).—Wings dark brown, with many small, transverse, golden-yellow spots; fore-wings with two white transparent spots beyond the middle, and hind-wings with a transparent band before the middle; abdomen with narrow white bands above and broad ones below. Expands a little over half an inch. It is found throughout Southern Europe and Northern and Western Asia; it is local in the southern half of Central Europe, frequenting sunny slopes where the clematis grows. The moth appears in June and July. The larva is brown, with darker warts; the head, a plate on the back of the neck, and the anal fold are dark shining brown. It feeds on *Clematis vitalba* in July and August. The moth is figured at Pl. 20, Fig. 5. (*T. Diaphana*, Staud., which occurs in Sicily, is rather larger, the head, thorax, and fringes are golden-yellow, and the ground colour of the wings is more strongly varied with yellow; the fore-wings have only one small transparent spot, and the hind-wings a transparent stripe, divided into two spots by one of the nervures. The abdomen is marked with three yellow belts.)

FAMILY III.—SESIIDÆ.

Rather small moths, resembling different species of *Hymenoptera* in appearance. The fore-wings are generally, and the hind-wings are always, more or less transparent. The abdomen is very long, extending far beyond the hind-wings, and is generally adorned with red, white, or yellow belts. It is composed of seven segments in the male, and six in the female. The fore-wings are very long and rounded at the extremities, and are furnished with eleven or twelve nervures. The submedian nervure runs close to the inner margin, or is absent; the hind-wings are triangular, with two or three submedian nervures. The eyes are large and naked; the antennæ spindle-shaped, terminating in a slender tuft of hairs in the males, and are rarely pectinated. Palpi stout, porrected, with the terminal joint naked; legs strong; the front tibiæ short, with a leaf-like appendage; hind tibiæ with four spurs. Many of the moths fly very rapidly in the sunshine, and may be captured resting on flowers, especially those of flowering bushes, or may be found in the morning freshly emerged, and resting on the stems of their food-plants. The larvæ are naked, only covered with fine scattered hairs, and are yellowish-white, with the head and a plate on the back of the neck horny and generally dark-coloured, and with sixteen legs, the ten hinder ones coronated. They live in the trunks, branches, and roots of trees, shrubs, or herbs, and after passing one or two winters in the larva state, change to pupæ in spring in the interior of the food-plant, in a cocoon mixed with fragments of wood. The pupæ are slender, and the abdominal segments are provided with rows of small spines, by which they are able to work themselves along; and the moths appear in summer. This family is represented all over the world, but the species are very liable to be overlooked; and partly from this cause, and partly from the difficulty of rearing them, many species are seldom met with. The larvæ are very similar, and we shall generally confine ourselves to noticing their food-plants. Mr. Butler has lately proposed to remove this family to the *Micro-Lepidoptera*, placing it between the *Pyrales* and the *Gelechiidæ*.

GENUS I.—TROCHILIUM (SCOP.).

These moths resemble hornets; the fore-wings are quite transparent, the twelve nervures and the costa only being thickly scaled. The antennæ are short and thick, with short lamellæ or


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C
1b

pectinations in the males. The hind tibiæ are thickly covered with dense hair, and the abdomen is thick, with a short tuft at the extremity in the males only. The larvæ live two years, and the moths appear in June and July.

* 1. *T. Apiformis* (Linn.), (*Hornet Clearwing*).—Dark brown; the head, palpi, two spots in front of the thorax and the base of the two first segments of the abdomen and the three last yellow; wings transparent; the nervures and the costa of the fore-wings rust-colour; hind margins darker. In the variety *Sireciformis* (Esp.) the last segments are brown. Expands about 1½ inches. Common throughout the greater part of Europe and Northern and Western Asia, resting on the trunks of poplars near the roots in the daytime. The larva is whitish-yellow, with a darker line on the back, and a blackish head. It lives in the roots and in the lower part of the trunks of poplars. The moth is figured at Pl. 20, Fig. 6.

* 2. *T. Crabroniformis* (Lew.), *Bembeciformis* (Hübn.).—More slender than the last species; the thorax unicolorous dark brown, with a yellow collar; the streak at the end of the discoidal cell of the fore-wings much narrower. The larva lives in the stems of the sallow. A very scarce and local insect in Central Europe, though not uncommon in England. The moth is figured at Pl. 20, Fig. 7.

3. *T. Melanocephala* (Dalm.).—Body bluish-black, collar and sides of the thorax bordered with yellow, abdomen with narrow yellow rings; wings transparent, fore-wings rust-colour on the costa, and dusted with dark grey; antennæ of the male pectinated. Expands about 1¼ inches. A very scarce and local species, confined to Sweden and some parts of North-Eastern Germany. The larva is to be found in the trunk and branches of the aspen.

GENUS II.—SCIAPTERON (STAUD.).

Characters of *Sesia*, but the antennæ of the male are furnished with long, slender lamellæ, like the teeth of a comb, and the whole surface of the fore-wings is opaque and densely scaled, only showing faint traces of transparency towards the base.

* 1. *S. Tabaniformis* (Rott.), *Asiliformis* (W. V.).—Body bluish-black, abdomen in the male with four and in the female with three yellow rings. Besides these there is a narrow ring behind the head, a spot on the front of the thorax, and a dot at the base of the fore-wings yellow; the eye-caps are silvery-white in front. The fore-wings are brown, slightly transparent towards the base, and the hind-wings are transparent, with brown borders. The perfect insect appears in June and July, and the larva may be found in the branches and roots of the black poplar and aspen in April. The southern variety *Rhingiæformis* (Hübn.) has the antennæ and fore-wings dusted with ochre-yellow, the segments of the abdomen are all belted with yellow, and the front of the eye-caps is also yellow. The larva lives on sallow. Expands from 1¼ to 1½ inches. Appears to be distributed very generally throughout Europe (*Rhingiæformis* in South Europe and Western Asia), but is common in some localities and very rare in others. Although formerly taken in the neighbourhood of London, it has lately become exceedingly rare, if not actually extinct, in England.

GENUS III.—SESIA (FABR.).

Body slender; the abdomen with red, white, or yellow belts, and tufted at the extremity in both sexes. Fore-wings with twelve nervures, with the margins densely scaled, and a densely-scaled transverse band beyond the middle, so that there are three transparent spaces—one in the discoidal cell, one above the inner margin, and a round spot divided by the dark nervures between

the transverse band and the hind margin. The two latter transparent areas are often more or less obliterated with darker. This genus may be divided into two sections.

A. *The transparent space on the inner margin of the fore-wings extends at least as far as the dark band, and is perfectly transparent. The larvæ live in the trunks and branches of trees and shrubs.*

* 1. *S. Scoliæformis* (Borkh.).—Body, as well as the costa, the broad heart-shaped band, and the hind margin of the fore-wings, bluish-black; the sides of the shoulders and the 2nd and 4th segments of the abdomen narrowly bordered with yellow; the 4th segment whitish-yellow beneath; anal tuft orange, with a black triangle above in the male; the last half of the antennæ is whitish in the female. Expands from 1 to 1¼ inches. A scarce and local insect, found throughout Europe (the south excepted) in July. In Britain it has occurred near Llangollen, in North Wales, and traces of the larva are believed to have been noticed at Killarney. The larva lives for two years in old birch-trees, between the trunk and the bark.

* 2. *S. Spheciformis* (W. V.).—The body and anal tuft, as well as the costa, the band, which is of uniform breadth, and the hind margin of the fore-wings, bluish-black; the shoulders, and the 2nd segment of the abdomen above and the 4th below, narrowly bordered with pale yellow; antennæ broadly whitish at the tip. Expands about 1 inch. Widely distributed throughout Europe and Northern Asia in May and June, but nowhere common, and in many places, as in England, a great rarity. The larva lives for two years in the stems of the alder.

3. *S. Mesiæformis* (Herr.-Schäff.).—Body and anal tuft, as well as the costa, band, and hind margins of the fore-wings, and a stripe on the disc of the hind-wings, black; the shoulders edged with yellow, and the abdomen with two yellow belts; legs yellow, with the femora and the extremities of the tibiæ black; the antennæ with the apical half yellow in the male, and with a white fascia in the female. It occurs at Sarepta.

* 4. *S. Andrenæformis* (Lasp.).—Body, costa, the uniformly broad band and hind margin of the fore-wings, bluish-black; the 2nd and 4th segments of the abdomen bordered above with pale yellow; the 4th, and sometimes also the 3rd and 5th, pure white below; the anal tuft varied with yellow. Expands rather under 1 inch. A very scarce species, though widely distributed, occurring in England, Austria, South Russia, and perhaps in Spain.

5. *S. Cephiformis* (Ochs.).—Very close to *Tipuliformis*, but the hind margin of the fore-wings is unicolorous bluish-black, and not dusted with yellow, and the anal tuft is yellow at the extremity in the male, and almost entirely so in the female. Expands rather less than 1 inch. A scarce insect in Germany and South-Eastern Europe in June; it has been found as far westward as Alsace. The larva lives in the trunks of *Pinus Abies*, and in excrescences on the twigs of the juniper.

* 6. *S. Tipuliformis* (Clerck.), (*Currant Clearwing*).—Body, anal tuft, costa, and uniformly broad band of the fore-wings bluish-black; the hind margin golden-yellow between the nervures; the abdomen with four narrow pale yellow belts in the male, and three in the female. Expands rather less than 1 inch. Common throughout Europe and Western Asia in May and June. The larva lives for one season only solitarily in the shoots of the red and black currant, where it feeds on the pith in winter and early spring. This insect has lately been introduced into both North America and New Zealand with currant-bushes. The moth and larva are figured at Pl. 20, Fig. 8, *a*, *b*.

7. *S. Conopiformis* (Esp.).—Very like *Tipuliformis*, but rather larger; there is a double yellow spot at the back of the thorax, the outer transparent space is rather broader and nearer to the hind margin, and the marginal band is yellowish-red between the nervures. Expands about

1 inch. Common in some localities in Central Europe, but not British. The moth appears from June to August, and may be found resting on the dead branches of oaks. The larva feeds in the bark of this tree. The moth is figured at Pl. 20, Fig. 9.

*8. *S. Asiliformis* (Rottemb.), *Cynipiformis* (Esp.).—Body bluish-black, with a pale yellow double spot at the back of the thorax, and three or four yellow belts on the abdomen; anal tuft black, slightly varied with yellow in the male, and almost entirely yellow in the female; the narrow crescent-shaped band of the fore-wings saffron-yellow, the costa and hind margin often dusted with reddish-yellow. (The variety *Melliniformis*, Lasp., is smaller, with the yellow spot on the thorax scarcely marked.) Expands from three-quarters of an inch to an inch. Widely distributed throughout Central and Southern Europe and Western Asia in June and July, without being generally very abundant. The larva lives for two years in or under the bark of oaks, in old shoots or diseased excrescences of the tree, and forms its cocoon either in the bark, or under lichens or moss. The moth is figured at Pl. 20, Fig. 10.

*9. *S. Myopæformis* (Borkh.).—Body, anal tuft, costa, band, and hind margin of the fore-wings bluish-black; sides of the breast orange; the 4th segment of the abdomen with a broad red belt on the upper side in the male, and both above and below in the female. In the male the palpi are white beneath, segments 4 to 6 of the abdomen are white on the under side, and the anal tuft is whitish-yellow in the middle beneath. Expands about three-quarters of an inch. Widely distributed throughout Central and Southern Europe from May to July. The larva lives for two years under the bark of apple and pear trees, forming long galleries in the soft wood of the tree, especially near decaying portions, where branches have been lopped off or the bark has become partially detached. It forms its cocoon in a cavity in the bark. *S. Typhiæformis* (Borkh.) is probably a variety in which the red of the upper side and the white of the under side is limited to the borders of the segments. It occurs in South Europe. The variety *Græca* (Staud.) has two red rings on the abdomen. (*S. Cruentata*, Mann, from Sicily, may be another variety; the abdomen has blood-red scales, which do not form distinct bands, but cover nearly the whole sides of the 2nd and 3rd segments, but scarcely cover the hinder margins above, and are very little marked on segments 4 to 6; the white on the under side of the abdomen is likewise absent.)

* 10. *S. Culiciformis* (Linn.).—Very like the female of *Myopæformis*, but larger. The palpi are orange beneath, and the entire 4th segment of the abdomen is yellowish-red in both sexes, and sometimes segments 5 and 6 on the under side; the hind margin of the fore-wings is dusted with orange in front. A white-belted variety occurs in the proportion of about one specimen in twenty-five. Another variety, *Thynniformis* (Lasp.), has a yellow collar, and all the segments of the abdomen bordered with yellow. Expands about 1 inch. Widely distributed and often common throughout Europe and Northern and Western Asia in May and June. The larva lives for one season in the trunks and branches of the birch, forming a long passage in the wood of the tree. It is occasionally found in the alder, and, according to some writers, in fruit-trees also. The moth may be found among flowers, or flying round and settling upon tree-stumps. It is figured at Pl. 20, Fig. 11. (*S. Polaris*, Staud., from Lapland, may be distinguished from this by the absence of any coloured belt on the abdomen, and by the apical transparent spot, which is long and narrow.)

11. *S. Stomoxyformis* (Hübn.).—Body, palpi, and anal tuft blackish-green; the 4th segment of the abdomen red above, and this and the two following segments reddish-yellow beneath; the breast without the orange spots of *Culiciformis*; and the costa, band, and hind margin of the fore-wings more blackish-blue. Expands a little more than 1 inch. It occurs in Southern and Eastern Europe and Western Asia, but is not a very common species. Figured at Pl. 20, Fig. 12.

*12. *S. Formicæformis* (Esp.).—Body bluish-black; the under side of the palpi, the entire 4th segment of the abdomen, and sometimes the under side of the 5th and 6th segments red; the broad hind margin of the fore-wings is also red. Expands about 1 inch. Widely distributed throughout Southern and Central Europe from June to August, but local, and rarely common. The larva lives for one or two winters in the trunks and roots of willows, living first in the tender parts, and then in the wood and the recent shoots of the roots. The moth is figured at Pl. 20, Fig. 13.

B. *The transparent space on the inner margin of the fore-wings does not extend so far as the transverse band, and is generally more or less densely scaled, especially in the female, sometimes so much so that the transparency entirely disappears. The larvæ live in the roots of low plants. The moths may be captured among their food-plants by sweeping.*

*13. *S. Ichneumoniformis* (Fabr.).—Body black; the segments of the abdomen uniformly bordered with golden-yellow; the antennæ suffused with rust-colour beneath and broadly yellowish before the tips in the female; costa of the fore-wings dark brown; inner margin and hind margin tinged with saffron-yellow; a saffron-yellow spot behind the band. *S. Megillæformis* (Hübn.) is perhaps an aberration, in which only segments 2, 4, and 6 are bordered with yellow. Expands about three-quarters of an inch. Widely distributed in Europe, North Africa, and in Northern and Western Asia. It is found in flowery places in woods in July and August, but is not very common. The larva lives in the roots of *Ononis sativa*.

14. *S. Uroceriformis* (Tr.).—Resembles the last species; but the 2nd, 4th, and 6th segments of the abdomen are broadly, and the others very narrowly, bordered with pale lemon-yellow; the yellow portions of the fore-wings are paler, and golden-yellow rather than saffron-yellow; and the transparent space on the inner margin is smaller, and entirely covered with yellow scales in the female. Expands about 1 inch. Inhabits Southern Europe in June, but is not common. (*S. Hymenopteriformis*, Bell., from Sicily, resembles this, but the fore-wings are much darker—brownish fulvous, with two transparent spaces, in the male, and dark brown, only rather lighter in the discoidal cell, in the female. The abdomen in the male is reddish-brown, with white bands on the 2nd, 4th, and 5th segments, and the anal tuft is blackish, white beneath and at the sides. In the female the abdomen is shining black, belted with white, and with the anal tuft bluish-black.)

15. *S. Himmighoffeni* (Staud.).—Antennæ, thorax, and the opaque portion of the fore-wings bluish-black; the transparent portion of the latter tinged with yellow. Head and legs yellow; thorax with three yellow stripes; abdomen yellow, black at the base, and with six narrow black stripes arranged in pairs, the two middle ones widest apart, and the two last at the root of the anal tuft, which is black, with the centre yellow. Expands three-quarters of an inch. It is found flying over flowers near Barcelona in May.

16. *S. Masariformis* (Ochs.).—Body bluish-black; thorax with two yellow longitudinal stripes; abdomen dusted with yellow; segments 2, 4, and 6 with broad bright yellow belts; anal tuft bright yellow, not much varied with black; the base of the palpi and the front coxæ white; the margins and bands of the fore-wings black, the latter finely veined with pale yellow; the nervures in the outer transparent area, and the intermediate cells before the hind margin, pale yellow. The transverse nervule of the hind-wings attenuated behind. Expands rather under 1¼ inches. This species varies considerably in the colour and breadth of the bands, the rings of the under surface, and the anal tuft; and the next species is still more variable. Found throughout Southern Europe, as far north as Austro-Hungary, and in Western Asia.

17. *S. Annellata* (Zell.).—Bluish-black; segments 2, 4, and 6 of the abdomen (and also

segment 7 in the male) bordered with yellow above; on the under surface segment 2 is quite white, and segment 4, at least, is bordered with yellow. Wings suffused with yellow externally; front coxæ white or yellow; the broad band and the margins of the fore-wings blackish-brown, the latter dusted with pale yellow; the disco-cellular nervule of the hind-wings is thick, uniformly broad, and scaled with blackish. Expands nearly three-quarters of an inch. It inhabits South-Eastern Europe, as far as Bavaria, and Asia Minor.

18. *S. Empiformis* (Esp.).—Bluish-black; thorax with three yellow longitudinal stripes, the eye-caps dark in front, the antennæ suffused with yellow at the sides, the abdomen more or less dusted with yellow, and segments 2, 4, and 6 (as well as 7 in the male) bordered with whitish above; front coxæ pale yellow; the middle band of the fore-wings black; and the hind margin blackish in front, and golden-yellow behind between the nervures; hind-wings with the disco-cellular nervule broadly black as far as nervule 5, and finely scaled with yellow beyond; the space between the inner margin and nervule 1*b* forms a long square. Expands nearly three-quarters of an inch. Common throughout Eastern and Central Europe (except England) and Western Asia from June to August. The larva lives for two winters in the roots of the cypress spurge, entering them through broken stalks. The moth is figured at Pl. 20, Fig. 14.

19. *S. Astatiformis* (Herr.-Schäff.).—Very like *Empiformis;* the male brownish-black, and the female bluish-black; the middle line on the thorax is wanting in both, and the eye-caps are yellow in front. In the female the abdomen is not dusted with yellow, and the black anal tuft is only slightly varied with yellow. The front coxæ are whitish, and the hind margin of the fore-wings is pale yellow; the disco-cellular nervule of the hind-wings is densely scaled to beyond nervule 5, and the space between their inner margin and nervure 1*b* forms a shallow segment of a circle. Expands rather under three-quarters of an inch. Inhabits South-Eastern Europe and the Altai in June and July. The larva lives in the roots of spurge. (*S. Monspeliensis*, Staud., is probably a variety of this. It is darker; and the hind-legs, which are unicolorous in *Astatiformis*, are ringed with black. It expands about three-quarters of an inch, and is found in South France and Spain in May, flying over the flowers of *Euphorbia*, on the roots of which its larva is supposed to feed.)

20. *S. Triannuliformis* (Freyer).—Resembles *Empiformis*, but the antennæ are not suffused with yellowish, the front of the eye-caps and the front coxæ are white, and the abdomen has a row of small yellow spots on the back, but is otherwise not dusted with yellow. There are distinct white borders to segments 2, 4, and 6, which widen into large triangular spots on the sides in the female; the anal tuft is but little varied with yellow. Hind-wings as in *S. Astatiformis*, but the segment of a circle on the inner margin is wider and more strongly rounded. A little smaller than *Astatiformis*. It inhabits Eastern Europe; and the larva lives for one year in the roots of *Rumex acetosella*.

21. *S. Doleriformis* (Herr.-Schäff.).—Brownish-black; the hind margin of the fore-wings with dull yellow stripes; and dull yellow spots on the hinder segments of the abdomen in the male, which are nearly obsolete in the female. Segments 4 and 6 in the male, and segment 2 in the female, are bordered behind with white. Anal tuft with two dull yellow stripes. This species may easily be distinguished from its allies by the densely hairy hind tibiæ. Expands rather under 1 inch. Inhabits Turkey and Greece.

22. *S. Umbrifera* (Staud.).—Smoky brown; hind margin of the fore-wings with dull yellow stripes; fore-wings beneath and spots on the back of the abdomen dull yellow; hind-wings transparent, with the hind margin and the transverse stripe in the middle broadly brown; segment 4 of the abdomen belted with white behind. Expands about 1 inch. It appears to be not uncommon at Corfu.

23. *S. Stelidiformis* (Freyer).—Blackish-brown; thorax with three longitudinal yellowish stripes; hind margin of the fore-wings streaked with yellowish; the 4th segment of the abdomen bordered behind with a white belt, which covers the segment almost completely in the middle and at the sides. It varies considerably in colour, as well as in size, expanding from three-quarters to one and a quarter inches. Common in Southern and Eastern Europe.

24. *S. Ramburii* (Staud.).—Brownish-black; the outside of the antennæ scaled with ochre-yellow, hind margins of the fore-wings with obscure yellowish stripes; abdomen, with segments 2, 4, and 6 in the female (as well as 4 in the male), belted with white. It is nearly allied to *S. Doleriformis*, but is more slender, and the forehead, coxæ, and abdomen are darker, although the general colouring of this species is whiter. Expands about 1 inch. It is found in Andalusia in June.

25. *S. Lanipes* (Led.).—Allied to *Doleriformis*, but whiter, and with the tibiæ still more densely tufted. The body and fore-wings are dull blackish-brown, and appear to be covered with fine whitish atoms. Segments 2, 4, and 6 of the abdomen are bordered with white behind, and the remaining segments have only obscure narrow yellowish-brown hind borders. The anal tuft is blackish-brown above, and white below and at the sides. Expands nearly 1 inch. It inhabits the mountains of Bulgaria.

26. *S. Agdistiformis* (Staud.).—Brownish-grey; the wings not hyaline; fore-wings with whitish stripes towards the tip, and whitish spots in the middle; hind-wings whitish, with the broad hind margins and the nervures smoky; abdomen unicolorous and very slender; anal tuft whitish beneath and at the sides. Expands 1 inch. It is found at Sarepta.

27. *S. Bibioniformis* (Esp.).—Much resembles the following species, but the antennæ are suffused with yellowish on the outside, and the disco-cellular nervule of the hind-wings is uniformly thick, and almost equally broadly scaled. The palpi and front coxæ are pure white, and the abdomen has generally a series of small whitish spots in addition to the yellow scaling. The anal tuft is mixed with white, and the three longitudinal stripes of the thorax are yellowish-white. On the under side the white coloration is predominant. Expands three-quarters of an inch. It inhabits South-Eastern Europe and Western Asia.

28. * *S. Muscæformis* (View.), *Philanthiformis* (Lasp.).—Brownish-black; the thorax with three yellow longitudinal stripes, the front of the eye-caps and segments 2, 4, and 6 of the abdomen white, the palpi and coxæ white or yellowish, and the abdomen above dusted with yellow, often so as to form a series of small spots; anal tuft varied with yellow. The band and margins of the fore-wings are dark brown, the latter dusted with yellow; the disco-cellular nervule of the hind-wings is broadly scaled with blackish above, and is narrow behind. The antennæ are not suffused with yellowish, but are whitish before the tips in the female. Expands three-quarters of an inch. Appears to be widely distributed in Central Europe in June and July. It is a very local insect on the coast of England, where the larva lives for one season in the upper part of the roots of the sea-thrift. It has been found at Torquay and in the Isle of Man. (*S. Leucomelæna*, Zell., is of a smaller average size, and has the palpi and front coxæ beneath, and only segments 4 and 6 of the abdomen, bordered behind with snow-white; the transparent space at the tip of the fore-wings is nearly always composed of five cells. It occurs in Turkey. *S. Corsica*, Staud., is another form closely allied to this, which is distinguished by the very small transparent spaces of the fore-wings, the outermost composed of three cells only. It is found in Corsica, and is of the size of *Leucomelæna*. Both these forms are perhaps only southern varieties of *Muscæformis*.)

29. *S. Affinis* (Staud.).—Very like *Muscæformis*, but the middle yellow line on the thorax is

wanting, and the edge of the 2nd segment of the abdomen and the antennæ are unicolorous bluish-black in both sexes. The margins of the fore-wings and the band are very broad, the latter at least as broad as it is long; the hind margin only slightly suffused with yellowish-white. The transparent spaces are small, and the outermost is roundish. Expands nearly three-quarters of an inch. It is found in Europe, south of the Alps, in May, flying over *Helianthemum vulgare.*

30. *S. Ærifrons* (Zell.).—Brownish-black; the forehead bronzy; the outer transparent space on the fore-wings composed of three cells only; palpi and front coxæ white beneath; segments 4 and 6 of the abdomen bordered with white behind; thorax with two broad yellow stripes. Expands about three-quarters of an inch. It is not uncommon in Southern Europe, and, according to Berce, is found flying over flowering *Rumex* in the south of France; but as his description is not sufficiently precise, and his figure differs from Staudinger's description in having three yellow stripes on the thorax, and in other less important particulars, it is somewhat uncertain whether the insect Berce describes as *Ærifrons* is really that species.

31. *S. Leucopsiformis* (Esp.).—Brownish-black; the thorax with three pale ochre-yellow longitudinal stripes, abdomen above with one similar stripe and with white interrupted stripes on the sides and belly, and segments 2 and 4 narrowly bordered with white; eye-caps dark; antennæ slightly tinged with rusty-yellow. The transparent spaces of the fore-wings are very small, the outermost consisting of three cells only; hind margins with two yellowish streaks. Expands about three-quarters of an inch. A very local species, only found near Berlin and in Hungary in August and September. The larva lives for one season in the roots of the spurge.

32. *S. Alysoniformis* (Herr.-Schäff.).—Violet-black; thorax with three longitudinal stripes, and segments 2, 4, and 6 of the abdomen bordered with yellow behind, both above and below; no longitudinal transparent space on the fore-wings, and the other spaces very small and often partly covered with yellow scales. Expands a little over half an inch. It inhabits Bulgaria and Asia Minor.

33. *S. Osmiæformis* (Herr.-Schäff.).—Rather stout and compressed; cinnamon-brown, with a yellow dot at the base of the fore-wings. The band very broad, and the outer transparent space contracted at the sides. Hinder edge of the 4th segment of the abdomen with a whitish belt, which is a little widened in the middle and on the sides; abdominal tuft yellowish-brown, with some paler hairs. Expands three-quarters of an inch. Inhabits Sicily and Calabria in May and June.

34. *S. Anthraciformis* (Ramb.).—Uniform bluish-black, without belts; the outer transparent area of the fore-wings composed of three cells. Expands about three-quarters of an inch. A Corsican insect, and one of the rarest of the genus.

35. *S. Doryliformis* (Ochs.).—Greenish-black, wings brownish, the outer area of the fore-wings contracted, and segments 2, 4, and 6 of the abdomen very narrowly bordered with white behind. In the male the back of the head, two lines on the thorax, and the hind tibiæ are yellow. The anal tuft is yellow in the middle and at the sides, and the abdomen is spotted with yellow. In the female the back of the head, two lines on the thorax, the belts on segments 4 and 6 of the abdomen, and more or less of the abdominal tuft are red. Expands about three-quarters of an inch. It is found in South Europe and North Africa.

* 36. *S. Chrysidiformis* (Esp.).—Body greenish-black; the face, and the edges of the 4th and 6th segments of the abdomen, white; fore-wings broadly orange-red along the inner margin and before the hind margin; the transparent spaces small, the outermost almost filled up with orange-red; hind tibiæ reddish-yellow. Expands rather less than 1 inch. It inhabits Southern and Western Europe (including England, where it is a rarity) from May to July. The larva is said to live in the roots of *Artemisia campestris, Elychrysum,* and *Rumex crispus;* and the moth frequents

the flowers of the sorrel and of umbelliferous plants. The variety *Chalcocnemis* (Staud.), from Spain and South France, has the face dark bronze-colour, and the wings scaled with brownish. Only the spurs of the hind tibiæ are yellowish, and only the 4th segment of the abdomen is bordered with white. The variety *Minianiformis* (Freyer), from Turkey, has yellowish longitudinal lines on the thorax; and the hinder edge of the thorax, and segments 2, 4, and 6 of the abdomen (and in the male, segment 7 also), are belted with yellow. (*S. Oryssiformis*, Herr.-Schäff., from Sicily, is probably a variety either of *Chrysidiformis* or *Doleriformis;* it is black, with the front and sides of the thorax and the hinder half of the abdomen red; the legs are yellow, with black femora; the wings are bordered with brown, and the fore-wings are red, with a transparent band, crossed by the black central stripe.)

37. *S. Chalcidiformis* (Hübn.).—Very like *Chrysidiformis*, but the face is dark, the abdomen is not belted with white, and the anal tuft is orange-red in the middle. The hind tibiæ are blackish-blue at the base and at the ends. Expands about three-quarters of an inch. It is found in South Europe, as far north as French Switzerland, and in Western Asia. In the variety *Schmidtii* (Led.), from Dalmatia and Sicily, the 4th segment of the abdomen is narrowly bordered with white behind.

38. *S. Fœniformis* (Herr.-Schäff.).—Black or bronzed; fore-wings (except along the costa), segments 4 to 6 of the abdomen, and the hinder portion of the anal tuft, red or orange. Segment 4 has a complete reddish belt, bordered behind with white. Expands about 1 inch. A rare and little known Sicilian species.

GENUS IV.—BEMBECIA (HÜBN.).

Antennæ of the male pectinated. Eyes and palpi small; anal tuft truncated; fore-wings very narrow, with ten nervures, and with very small transparent spaces. The moths fly by night, and fold their wings close together when at rest. The larva lives for one season only. The only species is *B. Hylæiformis* (Lasp.), which is bluish-black; abdomen with broad yellow belts; fore-wings brown, with narrow transparent spaces in the discoidal cell and along the inner margin; the apical transparent spot is small, consisting of only three cells. Expands a little more than 1 inch. It is widely distributed in Central Europe (England and Holland excepted) from June to August. The larva lives solitarily in the roots and the lower parts of the stem of the raspberry. It may be found by gently breaking off the old stems just above the root, when both the stem and the root must be examined, as it may be concealed in either. The moth is figured at Pl. 20, Fig. 15.

GENUS V.—PARANTHRENE (HÜBN.).

Antennæ scarcely thickened, and tapering to a point; palpi very long and hairy; fore-wings opaque and very narrow; legs very hairy.

1. *P. Tineiformis* (Esp.).—Brown; fore-wings and abdomen more or less varied with luteous; hind-wings transparent, with the hind margins brown. The hind tibiæ are yellowish on the inside and in the middle. In the variety *Brosiformis* (Herr.-Schäff.) the two first segments of the abdomen are white in the female, and the first is bordered in front with white in the male. Expands nearly three-quarters of an inch. It is found throughout Southern Europe in June and July; the variety *Brosiformis* is commoner from South-Eastern Europe and Asia Minor.

2. *P. Myrmosæformis* (Herr.-Schäff.).—Bronzy black; fore-wings reddish-brown; hind tibiæ luteous, with the extremities bluish-black. Expands nearly 1 inch. Inhabits Turkey, Greece, and Asia Minor in May and June. The variety *Cingulata* (Staud.), from Greece, has yellow belts on the abdomen.

FAMILY IV.—ZYGÆNIDÆ.

Rather small moths, with thick bodies and long fore-wings; the latter are rounded behind, and are either unicolorous green or blackish, or very dark blue or green, spotted or striped with red, yellow, or white; the hind-wings form a rather long triangle, rounded at the apex, and are either of the colour of the fore-wings, or grey, or red, with black hind margins; the abdomen extends beyond the anal angle. The antennæ are generally thickened suddenly before the tip, and are rarely pointed. The eyes are naked, and the palpi are short and pointed. The fore-wings have two internal nervures, the first of which is angulated towards the base, and eleven other nervures. The hind-wings have eight nervures, and the costal and subcostal nervures either unite or are connected by a small oblique nervule. The legs are short, with flattened scales, and the front tibiæ are provided with a leaf-like appendage. The moths fly heavily by day, and hold their wings sloping when at rest. They are found during the summer months in open glades, in meadows, or on flowery slopes near the sea or a river, and settle on the heads of composite flowers, such as thistles, scabious, &c. Many species are found only on a limestone soil; and they are all very local and gregarious, swarming in one spot, while in another close by, and apparently quite as attractive, scarcely a specimen is to be found. They are generally abundant wherever they occur; and it is no uncommon thing to see half a dozen on the same flower-head, along with various other insects. The larvæ have sixteen legs, and are thick and short, shaped like a woodlouse, and covered with fine satiny hair. They have a very small head and small legs, and hybernate when young. In spring they undergo their transformations in a thick parchment-like cocoon, of a shining white or yellow colour.

GENUS I.—AGLAOPE (LATR.).

Antennæ of the male with two rows of pectinations; the hind tibiæ have spurs at the end only. The larva is covered with small warts, which are clothed with bristly hairs, and the cocoon is egg-shaped. The only species, *A. Infausta* (Linn.), is black, with a red collar, the wings thinly scaled, and the hind-wings broadly blood-red at the base and along the inner margin. Expands 1 inch. Inhabits France, Italy, and Spain, but does not extend to Britain; and is confined in Germany to a few localities in Rhenish Bavaria, Nassau, and the adjacent parts of Rhenish Prussia. It is found in July. The larva is violet; the upper part brown, with a yellow stripe on the back divided with darker, and a whitish stripe on the sides. It may be found in May, feeding on sloe, &c., and is very injurious to fruit-trees in some parts of France. The moth is figured at Pl. 21, Fig. 1.

GENUS II.—INO (LEACH).

Wings unspotted; fore-wings green, blue, or brown; the hind-wings grey or blackish; antennæ of the male with two rows of pectinations, which are thickened at the ends and placed obliquely forwards; hind tibiæ with spurs at the end only. The larva as in *Aglaope;* the cocoon rather long. The genus may be divided into two sections, according to the shape of the antennæ.

A. *The shaft of the antennæ pointed towards the tip.*

1. *I. Ampelophaga* (Bayle).—Fore-wings umber-brown and narrow; hind-wings blackish, very short, not more than two-thirds of the length of the fore-wings; body covered with shining bluish-green scales; antennæ very long, with long pectinations in the male and short ones in

the female. Expands about 1 inch. It is found in Italy and the south-east of Europe and in Asia Minor in June and August. The larva is ashy-grey with blackish warts, and is yellowish-white beneath. It lives on vine in June and July, and is often very destructive in vineyards.

2. *I. Pruni* (W. V.).—Dark blackish-grey; the thorax and fore-wings thinly scaled with blue or greenish; the hind-wings three-quarters of the length of the fore-wings. The antennæ are shorter than in the last species, with short pectinations in the male, and are serrated in the female. Expands rather less than 1 inch. Common in most parts of Europe, except Britain and the south-east, and in Northern Asia, from June to August. The larva is blackish-grey, with an orange streak on the back, enclosing a black cross on each segment. It feeds on heath in the north and on sloe in the south, and is much commoner than the perfect insect. It may be obtained by beating sloe-bushes into an umbrella in May.

3. *I. Chloros* (Hübn.).—This species and *I. Tenuicornis* (Zell.) may be distinguished from any of the following by their narrow fore-wings, which are of nearly uniform breadth; the antennæ of the male in *Chloros* are long and thickly pectinated, and the length of the pectinations is rather suddenly reduced towards the extremity. Those of the female are slightly pectinated for two-thirds of their length only. The fore-wings are unicolorous yellowish-green (or bronzy-brown in the variety *Sepium*, Boisd.), except at the base, which, as well as the thorax, is of a beautiful shining blue. Expands rather less than 1 inch. It appears to be confined to South-Eastern Europe.

4. *I. Tenuicornis* (Zell.) is a little larger than *Chloros*, and the fore-wings and thorax are of a more or less greenish-blue. The antennæ of the male are thickly and densely pectinated, and end in an obtuse point; they are much thicker than in *Globulariæ* and its allies. Those of the female, which are only very slightly serrated towards the extremity, are also thicker and less pointed than in the following species. It is confined to South-Eastern Europe and Asia Minor.

* 5. *I. Globulariæ* (Hübn.), (*Scarce Green Forester*).—In this and the remaining species with pointed antennæ, the fore-wings widen outwards considerably from the base. The pectinations of the antennæ are more slender, and diminish in length gradually, so that the antennæ appear more pointed than those of the previous group. The thorax and fore-wings of *Globulariæ* are shining green or blue. The fore-wings are broad and thinly scaled, and are rounded at the tips; the hind-wings are grey, and are long and broad behind and very obtusely rounded at the tip. In the female, which is always smaller than the male, the wings are often very short. The pectinations of the antennæ of the male are not very long, and lie close together; towards the ends they become very gradually shorter. In the female the antennæ are very slightly serrated for about two-thirds of their length. The variety (?) *Notata* (Zell.) is more shining, often with a golden lustre; and the shaft of the antennæ is more slender, with shorter pectinations, which are often placed quite close together. Expands from three-quarters to one and a quarter inches. This species appears to be found throughout Central Europe and Western Asia; *Notata* is confined to South Europe, and perhaps France. *Globulariæ* is an extremely local insect in the south of England, but it occurs abundantly in a few localities on the chalk, in company with *Geryon*. The larva is green, with reddish warts, and two zigzag straw-coloured lines on the back. It mines in the leaves of *Centaurea Scabiosa* when young, and may be found feeding exposed in May and June. The moth and larva are figured at Pl. 21, Fig. 2, *a*, *b*.

6. *I. Cognata* (Ramb.).—Fore-wings much less shining than in *Globulariæ* or *Notata*, with a dull golden lustre. Only the thorax and a very small part of the base of the fore-wings are brilliant green, and the hind-wings are darker than in *Globulariæ*. The pectinations of the

antennæ of the male are nearly twice as long as in *Notata*, and not placed so closely together; the antennæ of the female are strongly serrated for their entire length. Expands 1¼ inches. It is found in Andalusia in June and July. The variety *Subsolana* (Staud.), from South-Eastern Europe, is dark greenish-blue, with no traces of golden-yellow. (*I. Budensis*, Speyer, from Hungary, Sarepta, and Armenia, has very short antennæ; those of the male formed nearly as in *Cognata*, and those of the female scarcely serrated at all.)

B. *The antennæ thickened into a club at the extremity; the pectinations on those of the male become shorter towards the club, and there cease.*

*7. *I. Statices* (Linn.), (*Green Forester*).—Fore-wings broad and triangular, rather thickly scaled, and shining green; hind-wings grey; body shining green, and abdomen sometimes golden-red; antennæ short, only extending as far as the middle of the costa of the fore-wings; the pectinations very oblique on the antennæ of the male, and close together. The female is much smaller than the male. The bluish variety *Mannii* (Led.) is found in South Europe, and the var. *Crassicornis* (Staud.), with thicker body and much thicker antennæ, is found in Greece. Expands from 1 to 1¼ inches. The commonest species of the genus, occurring in meadows and flowery glades throughout Europe from June to August. It is local in Britain, but is found in many localities in England and Ireland, and at Oban in Scotland. The larva is ashy-grey, with a row of triangular black spots on the back and a reddish stripe on the sides, bordered above with white. It feeds on sorrel, mining in both sides of the leaf when young; when nearly full-grown, it may be found hidden under the leaves in May and June. The moth is figured at Pl. 21, Fig. 3.

8. *I. Heydenreichii* (Led.).—Larger than *Statices*, the wings still more densely scaled; the fore-wings rather narrower, shining bluish-green; the hind-wings blackish. Head and thorax fine blue, abdomen dark green; the antennæ long, reaching as far as two-thirds of the length of the costa. Expands about 1¼ inches. It inhabits South-Eastern Europe, and is perhaps not sufficiently distinct from *Statices*.

*9. *I. Geryon* (Hübn.).—Very like *Statices*, but smaller (expands rather less than 1 inch), and the two sexes are of equal size. The fore-wings are narrower and of more equal breadth, and are thickly scaled. They are green, more or less golden, but never blue. The hind-wings are blacker, being more opaque. The antennæ are shorter and thicker. This species has been overlooked, but appears to be widely distributed in Central and Western Europe in June and July. It frequents the short grass of dry hill-sides and similar localities; and the larva, which feeds on *Helianthemum vulgare*, is a miner when young.

10. *I. Chrysocephala* (Nick.).—Also very like *Statices*, but the pectinations of the antennæ of the male are less oblique and are separated. Both sexes are of the size of *Geryon*. The head is golden-red, and the fore-wings are very thinly scaled, and duller coloured than in the allied species. This insect is found in the high Alps in July, and may be an Alpine variety of either *Statices* or *Geryon*.

GENUS III.—ZYGÆNA (FABR.).

Body and fore-wings blackish-blue or green, with bright red, white, or, more rarely, yellow spots, arranged in pairs as follows:—Two spots at the base, the first (spot 1) close to the costa, and the second (spot 2) just below it; one spot before the middle below the costa (spot 3); one below and rather behind it, nearly in the middle of the wing, but nearer to the inner margin (spot 4); one spot below the costa, placed at three-quarters of the length of the wing upon the disco-cellular nervule (spot 5); and often another before the middle of the hind margin

(spot 6). Spots 2 and 4, and spots 3 and 5, often coalesce into two longitudinal streaks, the last of which is axe-shaped when spot 6 is united with it; or the spots which stand in pairs may coalesce; or all the spots may be united, and leave only a few traces of the dark ground colour visible. Occasionally the spots are bordered with white, black, or yellow. The hind-wings are generally red, bordered with black, and are seldom of the colour of the fore-wings. The abdomen has sometimes a broad red or yellow ring beyond the middle. The antennæ are not pectinated, but thickened considerably towards the extremity, which is sometimes pointed and sometimes obtuse. The hind tibiæ are sometimes entirely without spurs, and have sometimes only one spur at the end, but they have often two spurs at the end, and either one or two in the middle. The species are very variable, and are occasionally liable to have the red markings replaced with yellow. They are most numerous in the countries bordering on the Mediterranean and Black Seas, but are also found throughout Europe and Asia, as far south as the Himalayas, and in South Africa. One species has been recorded from America, but probably in error. The larvæ are rather long, and live till May or June on low plants, especially *Leguminosæ*, and may be looked for on their food-plants, or captured by sweeping. The cocoons are boat-shaped, and may often be found attached to a blade of grass. As the moths all appear between June and August, we need not specify their times of appearance separately.

1. *Z. Erythrus* (Hübn.).—Fore-wings dark blue or green, with three elongated red streaks, and the inner margin also red; the hinder streak is scarcely axe-shaped. The hind-wings are red, bordered with black; and the collar and shoulders are yellowish. One of the largest species of the genus, expanding about 1½ inches. It appears to be confined to Italy and South France, and some of the varieties of the next species closely resemble it. The larva is greenish-yellow above and lemon-yellow beneath; it feeds on *Thymus Serpyllum*.

*2. *Z. Minos* (W. V.).—Fore-wings dark bluish or greenish-grey, with three elongated red streaks, the hinder one distinctly axe-shaped and rather pointed behind. The spots are distinctly separated, and the inner margin is not red in the type. Hind-wings red, the fringes narrowly black. The antennæ terminate in an obtuse club. In the variety *Pluto* (Ochs.) the hind spot is not axe-shaped, but rounded; the variety *Polygalæ* (Esp.) has confluent spots, and the Italian var. *Rubicunda* (Hübn.) has entirely red fore-wings, with only the costa narrowly blue. The var. *Nubigena* (Led.) has the body more hairy, and the wings slightly transparent. Expands about 1¼ inches. The larva is bluish-white or pale yellow, with two rows of large black spots on the back. It feeds on clover, trefoil, pimpernel, &c. The true *Minos* is found throughout the greater part of Europe, including the west of Ireland, and Northern and Western Asia. The varieties are found chiefly in the south of Europe. The variety *Nubigena* is common in the high Alps and on the west coast of Ireland; it has also been met with on the west coast of Scotland. This variety is the ordinary *Minos* of British collectors, the type being much less common with us; its reputed occurrence on the east coast of Scotland was an error. The true *Minos* and its larva are figured at Pl. 21, Fig. 4, *a*, *b*.

3. *Z. Brizæ* (Esp.) resembles *Minos*, but the hinder spot is rounded, as in *Minos*, var. *Pluto*, instead of being axe-shaped, and the hind margins of the hind-wings are rather broadly suffused with blackish. Expands about 1 inch. It inhabits Eastern and South-Eastern Europe and Western Asia.

4. *Z. Scabiosæ* (Esp.).—Fore-wings thinly scaled; blackish-blue, with three crimson longitudinal streaks, of which the hindermost is narrow and widens into a round spot at the end, before which it is contracted, but rarely interrupted. Hind-wings crimson, with the hind margin narrowly blackish. The club of the antennæ is long and slender, and pointed at the extremity. Expands

about 1¼ inches. Local in woods in the greater part of Europe, except the north-west, and in Northern and Western Asia. In the south it appears to be confined to the mountains. The larva is golden-yellow, with whitish hairs, and three rows of black spots on the back, and a black head. It feeds on clover, but attaches its cocoon to tree-trunks; and if the cocoons are removed, the surrounding bark must be taken with them, or the moths will not be successfully reared. The moth is figured at Pl. 21, Fig. 5.

5. *Z. Romeo* (Dup.).—Fore-wings black and densely scaled, with a broad longitudinal streak beyond the middle, which is thickened into a club behind; a shorter one on the costa, a small spot between both, and a larger round spot on the disco-cellular nervule. These markings, as well as the hind-wings, which have a broad blackish border, are dark carmine-red. The club of the antennæ is long. Expands from 1 to 1¼ inches. It seems to be common in Spain and throughout the Italian peninsula, from the Southern Alps to Sicily, but, strange to say, it does not appear in the French lists.

6. *Z. Sarpedon* (Hübn.).—Wings bluish or greenish, almost transparent, with two red spots running from the base, of which the lower one is three times as long as the upper, and is often interrupted; and a round spot near the tip. There is often a fourth small spot at the bifurcation of the principal nervure. The hind-wings are more or less suffused with red at the base, and there is a red belt on the upper side of the abdomen near the tip. It expands 1 inch or under. The variety *Balearica* (Boisd.) is still paler, with larger spots, and the base of the inner margin is red. This species inhabits South France, Piedmont, and Spain, and the larva feeds on *Eryngium campestre.* (*Z. Contaminei*, Boisd., much resembles this, but is less transparent, and the red belt is almost or entirely absent. It expands 1¼ inches, and is found in the Pyrenees and in Spain. Its larva feeds on the same plant as that of *Sarpedon*, from which *Contaminei* is perhaps not truly distinct.)

7. *Z. Punctum* (Ochs.).—Wings thinly scaled, blackish-grey, with carmine-red stripes, and spots arranged as in *Romeo*, which are generally suffused, and the spots are sometimes united by a narrow streak. The hind-wings are carmine, with the hind margin narrowly blackish; the thorax has pale grey hairs, and the club of the antennæ is thick and obtuse. Expands about 1 inch. It inhabits the south of Europe, except Spain, and Western Asia.

8. *Z. Achilleæ* (Esp.).—Fore-wings blackish-blue or greenish-grey, with five large carmine-red spots, the last of which is kidney-shaped and very large, being composed of spots 5 and 6 united; the hind-wings are carmine-red, with a very narrow black border; the club of the antennæ is short and obtuse, and the abdomen is sometimes marked with an indistinct red belt. Expands from 1 to 1¼ inches. It is common in many parts of Southern and Central Europe, except Spain and the north-west, and in Northern and Western Asia, occurring in dry places, especially on a limestone soil. The larva is greenish-yellow, with a pale line on the back, and two small black dots at the front and back of each segment; head black. It feeds on *Astragalus glycyphyllos* and *Coronilla varia.* The moth is figured at Pl. 21, Fig. 6.

9. *Z. Cynaræ* (Esp.).—Fore-wings thinly scaled, and blackish-blue or green, with brownish fringes, and five separated carmine-red spots; hind-wings carmine-red, with the tips blackish. The abdomen is marked with a broad red belt, and the club of the antennæ is long and thick and rather obtuse. It expands nearly 1¼ inches, and inhabits South-Eastern Europe and Western Asia. (*Z. Anthyllidis*, Boisd., is a scarce species found in the high Pyrenees, with six large red spots more or less bordered with yellow, and a red belt on the upper side of the abdomen only. Expands 1¼ inches.)

* 10. *Z. Exulans* (Hoch.).—Fore-wings thinly scaled, of a greenish or bluish-grey, with five

crimson spots; hind-wings rounded behind, crimson-red, with a rather narrow blackish border; the abdomen densely hairy, and the collar and legs pale whitish-yellow. The Lapland variety *Vanadis* (Dalm.), which occurs on the plains in Lapland, is still more thinly scaled, and not varied with white; and the var. *Subochracea* (White), from the mountains near Braemar, is intermediate between this and the type, which occurs above the tree-limit in the Alps and Pyrenees. Expands rather over 1 inch. The larva is black, with the incisions yellowish, and a row of oval yellow spots on each side; the head is blackish-green. It feeds on *Azalea procumbens*.

11. *Z. Corsica* (Boisd.), from the mountains of Corsica and Sardinia, is one of the smallest species, only expanding three-quarters of an inch. The fore-wings are blue and slightly transparent, and have five separate red spots above, which are suffused on the under side; the hind-wings are red, with a narrow dark border; and the antennæ are thick and obtuse.

* 12. *Z. Loniceræ* (Esp.).—Fore-wings long and thickly scaled, of a shining blackish-blue or green, with five crimson spots, distinctly separated both above and below; hind-wings crimson, with a rather narrow blackish-blue border; antennæ unusually long, with a long club, which is very gradually thickened, and pointed at the extremity. Expands nearly 1½ inches. It is generally distributed, though somewhat local, throughout Europe and Northern and Western Asia. The larva of the male is yellowish, with a row of long square black spots on the back and sides, and a black head; that of the female is pale coppery-green, with white stripes on the back and sides, and black dots on the upper part of the sides. It feeds on clover, &c. The transformations are figured at Pl. 21, Fig. 7, *a—c*.

* 13. *Z. Trifolii* (Esp.) may be distinguished from *Z. Loniceræ* by the shorter and thicker antennæ, which have a very thick and less pointed club. The spots are larger, and nearly always more or less confluent, and the border of the hind-wings is broader. Expands about 1¼ inches. Widely distributed throughout Europe, North Africa, and Western Asia. It is a rather local insect in Britain. The larva is pale yellow, with four rows of black dots and a black head. It lives on clover, &c. The moth is figured at Pl. 21, Fig. 8. It is a very variable species.

* 14. *Z. Meliloti* (Esp.).—Also very like *Loniceræ*, but smaller, the antennæ and their clubs shorter and more slender, fore-wings with the tip rounder and less densely scaled; spot 3 is small and rather long; spot 4 is large and triangular, and there is sometimes a sixth spot also. In the variety *Stentzii* (Freyer) the abdomen has a dull red belt. The larva is pale green, with whitish lines on the back and sides, and a row of black spots between them, placed in front of each segment; head black. Expands a little more than 1 inch. It is found in woods throughout the greater part of Southern and Central Europe, and in Northern and Western Asia. It has long been reputed British, but it is only lately that its British origin has become established by its capture in some plenty in the New Forest, as well as by its having been bred from larvæ which agree with the description given above. This species seems either to be very local, or to have been overlooked in both France and England. The moth is figured at Pl. 21, Fig. 9. (*Z. Charon*, Hübn., from the Southern Alps, is very similar to this, but the ground colour is more intense, and there are six cinnabar spots, the fifth and sixth generally connected; and the abdomen is belted with red.)

15. *Z. Stæchadis* (Borkh.).—Wings blackish-blue or green; fore-wings generally with five spots, the outer ones small and separated; sometimes there is a sixth spot, and sometimes there are only four, one of the outer ones being absent. The hind-wings are crimson at the base, always with a very broad border; and the crimson part is sometimes very small, and divided into two portions. Expands nearly 1¼ inches. It inhabits South Europe and Armenia, and a variety with yellow spots (*Boisduvalii*, Costa) is occasionally met with. The larva is rather long

and cylindrical ; greenish-yellow, with longitudinal rows of square black spots, and round ones below them, on each side. It feeds on *Dorycnium.*

16. *Z. Angelicæ* (Ochs.).—Fore-wings densely scaled, of a dark greenish-blue, with five, and more rarely six, carmine-red spots, which are united on the under side by a longitudinal streak dusted with red ; the two spots in the middle are very oblique, separate, round, and of equal size ; the hind-wings are dark carmine-red, with a broad blackish border, and the club of the antennæ is long and pointed. Expands a little over 1¼ inches. It inhabits Eastern and Southern Europe, except Spain. The larva, which feeds on *Trifolium montanum*, is yellow, with two rows of black spots on the back.

17. *Z. Transalpina* (Esp.) is perhaps only a variety of the last, but has always six red spots, which are narrowly bordered with black, and the colour of the spots and hind-wings is of a purer carmine-red. It inhabits the Southern Alps.

18. *Z. Hippocrepidis* (Hübn.) is also very like the two last species, but the spots of the fore-wings are not surrounded with black ; the hind-wings have a narrow black border, and the red is of a bright cinnabar colour, with which the whole of the under side of the fore-wings is suffused as far as the dark borders. Expands about 1¼ inches. The larva has a blackish line on the back, and a yellow line on the sides, with triangular black spots between. It feeds on *Astragalus glycyphyllos.* This species is common in many parts of Central Europe, and has been reputed British, probably in error. It frequents dry, sunny localities.

* 19. *Z. Filipendulæ* (Linn.), (*Six-spot Burnet*).—Fore-wings rather thickly scaled, blackish-blue or green, with six crimson spots, the two middle ones placed close together and a little obliquely ; on the under side the fore-wings are very slightly suffused with pale reddish-yellow ; hind-wings crimson, with a narrow black border ; the club of the antennæ long and thick. In the aberration *Chrysanthemi* (Borkh.), the crimson markings are replaced by coffee-brown ; and in another aberration, which seems not to be very rare near Cambridge, they are replaced by rich yellow. The Alpine variety *Manuii* is more thinly scaled, and all the colours are duller ; and in the variety *Cytisi* (Hübn.), and in the Greek variety *Ramburii* (Led.), the six spots run together into three large ones ; and in the latter the spots are more of an orange-red. Expands from 1 to 1½ inches. This species is one of the commonest of the genus, and abounds throughout Europe (except South Spain and the Polar regions) and Western Asia, though not so common in some localities as *Trifolii.* It frequents meadows, flowery slopes, &c. The larva is golden-yellow, with two rows of black spots on the back, and a row of smaller ones on each side. It lives on clover and other low plants, and is figured, with the moth, at Pl. 21, Fig. 10, *a*, *b*.

20. *Z. Ochsenheimeri* (Zell.), *Transalpina* (Ochs.).—Fore-wings bluer than in *Filipendulæ ;* spot 6 divided by a black nervure, and the yellowish suffusion of the under surface fainter or absent. The hind margin of the hind-wings is more or less strongly blackish-blue, and is distinctly concave. Expands 1¾ inches. It is probably a large variety of *Filipendulæ*, and occurs in the Southern Alps.

21. *Z. Ephialtes* (Linn.).—Fore-wings blackish-blue, with five or six spots ; the abdomen with a broad belt ; the club of the antennæ slender and pointed, with the tip narrowly whitish. This species presents so many constant named variations in colour and markings that it will be necessary to describe them separately. In *Coronillæ* (W. V.) the fore-wings have six white spots, of which the two at the base are dusted with ochre-yellow. The hind-wings are black, with a round white spot towards the tip, and the abdomen is belted with yellow. It is figured at Pl. 21, Fig. 11, *a*. The true *Ephialtes* (Fig. 11, *b*) differs from this by having the basal spots of the fore-wings and the belt of the abdomen red instead of yellow. In *Peucedani,* Esp. (Fig. 11, *c*), the six

spots of the fore-wings and the belt of the abdomen are carmine-red, and the hind-wings are of the same colour, with a broad black border; and *Æsacus* (W. V.) differs from *Peucedani* in having all the red markings replaced with yellow. *Trigonellæ* (Esp.), *Falcatæ* (Hübn.), and *Athamanthæ* (Esp.) only differ from *Coronillæ*, *Ephialtes*, and *Peucedani* respectively in the absence of the sixth spot. Expands 1½ inches, or under. It is common in many localities in Central and Southern Europe, except the north-west and south-west; and in Northern and Western Asia. *Peucedani* has been reputed British, probably in error. The larva is yellow or greenish, with a dark line on the back, on each side of which is a row of black spots; and two other rows of rather longer black spots on each side. It lives on clover, *Coronilla varia*, *Medicago falcata*, &c. (*Z. Dorycnii*, Ochs., is probably another variety from the Ural and Asia Minor, which differs from *Peucedani* in its shorter and more rounded wings, its antennæ, which are bluish-black to the extremity, and in the red belt of the abdomen, which is only visible on the upper side.)

22. *Z. Lavandulæ* (Esp.).—Shining greenish or purplish-blue, with five red spots slightly bordered with black on the fore-wings, and one or two red spots on the hind-wings, the base of which is also frequently red; collar white. Expands nearly 1¼ inches. Common in South France and Spain. The larva feeds on *Lavandula* and *Dorycnium*.

23. *Z. Rhadamanthus* (Esp.).—Fore-wings greyish-blue, with six red spots distinctly bordered with black, except the sixth and the inside of the basal ones. Hind-wings red, with a narrow dark blue border. Expands about 1¼ inches. It inhabits South France and Spain, and the larva feeds on *Dorycnium suffruticosum*. In the variety *Cingulata* (Led.) the abdomen has a red belt, and in the variety *Kiesenwetteri* (Herr.-Schäff.) the fore-wings are bluer, and the hind-wings are only red at the base. (*Z. Oxytropis*, Boisd., is an Italian species, expanding only 1 inch; the third spot is smaller than the fourth, and the fifth and sixth are connected, and bordered, like the others, with black; the hind-wings are more rounded and with a rather broader border than in *Rhadamanthus*.)

24. *Z. Carniolica* (Scop.), *Onobrychis* (W. V.).—Fore-wings dark shining green, with six red spots, bordered (except in variety *Berolinensis*, Staud.) with white; the sixth spot forms a long crescent within the hind margin; hind-wings red, with a narrow black border, abdomen generally with a red belt. In variety *Flaveola* (Esp.) the red markings are replaced with yellow. Expands rather more than 1 inch. Common in Southern and some parts of Central Europe, and in Northern and Western Asia. The larva is pale green, with a whitish line on the back, beneath which are triangular black spots, and a pale streak on the sides marked with yellow spots. It feeds on *Onobrychis sativa* and *Astragalus glycyphyllos*. The moth is figured at Pl. 21, Fig. 12. (*Z. Sedi*, Fabr., from South-Eastern Europe and Western Asia, formerly considered a variety of this, has three spots, formed of the usual six united in pairs; and the hind-wings are truncated instead of rounded. In *Z. Occitanica*, Vill., from Spain and South France, the spots of the fore-wings are more broadly surrounded with white than in *Onobrychis*, and the sixth is replaced by a white crescent, not marked with red.)

25. *Z. Fausta* (Linn.).—Fore-wings black, with the base and spots orange-red; the latter are bordered with yellowish, and all connected together; the last spot is long and crescent-shaped; the hind-wings, collar, and (generally) a broad belt on the abdomen are orange-red; the club of the antennæ is thick and obtuse, and the thorax has two whitish lines. In the Spanish variety *Faustina* (Ochs.) the spots at the base and in the middle are separated; and in the variety *Vicæa* (Staud.) the spots are not bordered with yellow. Expands about 1 inch. Inhabits a great part of Southern and South-Central Europe, chiefly occurring in mountainous districts on a limestone soil. The larva is pale green, with a brown line on the back and a white one on the sides,


11b
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11c
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1c
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7a
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10a.
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10b.
1.
A.
B.
C.
D.

the latter marked with a large and small black spot on each segment; head red. It feeds on *Ornithopus perpusillus* and *Coronilla minima*. The moth is figured at Pl. 21, Fig. 13. (*Z. Bætica*, Ramb., from Andalusia, differs from *Fausta*, in wanting the pale lines on the thorax and in the narrower red belt of the abdomen. It appears in April and September, and the larva feeds on *Coronilla juncea*. *Z. Hilaris*, Ochs., from South France and Spain, has a white instead of a red collar, and the white lines on the thorax and the red ring round the abdomen are wanting.)

26. *Z. Læta* (Hübn.).—Wings, collar, and abdomen orange-red; fore-wings with the hind margin and the outside of the inner margin bluish-black, and two spots of the same colour before and beyond the middle; abdomen black at the base and tip; the club of the antennæ is rather long, and ends in a blunt point. In the variety *Mannerheimii* (Chard.), from the Ural, the wings are almost wholly red. Expands about 1 inch. It is found in South-Eastern Europe as far north as Moravia. Larva bluish-white, with whitish stripes on the back and sides, and a row of white spots above the latter; head black. It feeds on *Eryngium campestre*. The moth is figured at Pl. 21, Fig. 14.

FAMILY V.—SYNTOMIDÆ.

Rather small moths with slender bodies covered with scales, and broad triangular dark fore-wings with transparent spots, and small hind-wings; the abdomen extends considerably beyond the latter. The antennæ are long and thread-like, the palpi small, the eyes naked, and the tongue spiral. The legs are slender and free from hair; the front tibiæ are furnished with a leaf-like appendage, and the hind tibiæ have four spurs. The larvæ have sixteen legs, and are furnished with warts covered with tufts of hair. They hybernate as larvæ, and undergo their transformations in a loose cocoon. The genus *Syntomis* is very extensive, supplying the place of *Zygæna* in the tropics of the Old World. The two commonest European species of this family, *S. Phegea* and *Naclia Ancilla*, have occasionally been taken in England; but it is still uncertain whether either of them can be considered truly indigenous.

GENUS I.—SYNTOMIS (LATR.).

Hind margin of the fore-wings longer than the inner margin; hind-wings with only one internal nervure; all the wings with white transparent spots. The commonest European species, *S. Phegea* (Linn.), is bluish-black, with one transparent spot at the base of the fore-wings, two in the middle, and three nearer the tip; hind-wings with two or three spots; abdomen with yellow belts at the base and in the middle; antennæ black, with white tips. Varieties occur in which some or all the spots are absent. Expands 1½ inches, or more. Common throughout Southern Europe (except Spain) and Northern and Western Asia. It appears in June and July in glades in woods, and likes to settle on the flowers of the thyme and lavender. It is widely distributed north of the Alps, but its distribution in Western Europe is very sporadic; Holland, Belgium, Brunswick, and Kreuznach may be mentioned as localities. In France it appears to be confined to the extreme south-east. The larva is black, with thick, feathery hair, of uniform length on the back. It feeds on dandelion, scabious, and other low plants in April and May. The moth is figured at Pl. 21, Fig. 15. *S. Caspia* (Staud.), from Astrachan, is smaller, with unicolorous black antennæ, and only one spot on the hind-wings; and a triangular yellow spot on the 1st segment of the abdomen; otherwise as in *Phegea*. In *S. Antiochena* (Led), from Syria and Eubœa, the male differs from that of *Phegea* in having only one large round spot on the hind-wings, which fills up the whole cell; and the wings of the female are imperfectly developed.

GENUS II.—NACLIA (BOISD.).

Hind margin of the fore-wings as long as the inner margin; hind-wings with two internal nervures, unspotted, with broad dark borders; abdomen ochre-yellow, with dark spots on the back. The species are very closely allied, and vary from three-quarters of an inch to an inch in expanse.

1. *N. Ancilla* (Linn.).—Fore-wings ochreous-brown, with three white transparent spots beyond the middle, and often another spot above the inner margin before the middle; hind-wings transparent, dusted with brown, in the male, and ochre-yellow in the female; a broad brown border in both sexes. It is found in dry, flowery woods in June and July in Southern and Central Europe, but is rather local, and not very abundant. The larva is black, with yellow lines on the back and sides. It lives on lichens growing on trees and rocks, in spring. The moth is figured at Pl. 53, Fig. 7. (*N. Punctata*, Fabr., from South Europe and Western Asia, differs from the female of *N. Ancilla* in always having two distinct white spots before the middle. Its varieties are numerous; *N. Servula*, Berce, is smaller, with unspotted fore-wings; *N. Famula*, Freyer, resembles the male of *N. Ancilla*, but the spots of the fore-wings are darker, and there are two spots before the middle of the fore-wings; the hind-wings are nearly transparent, as also in the variety *Hyalina*, Freyer, which has from two to four white spots on the fore-wings.)

BOMBYCES.

FOURTEEN families are included under this heading; and the two last families of the *Sphinges* are very closely related to the two first of the *Bombyces*. As before, we shall treat of the families of the *Bombyces* separately, as they differ widely, and to attempt to indicate common characters for them would be unsatisfactory.

FAMILY I.—LITHOSIIDÆ.

Small or middle-sized moths with slender wings, of a yellow or grey colour, and occasionally black. The fore-wings are generally either without markings or dotted with black, and marked with zigzag transverse black lines in a few cases. The antennæ are rather short and thread-like, ciliated in the male; the legs are slender, with depressed scales; the front tibiæ are furnished with a leaf-like appendage, and the hind tibiæ have four spurs. The abdomen is sometimes shorter and sometimes a little longer than the hind-wings. The larvæ have sixteen legs, hairy worts, and a small, round head. They feed on lichens, and change to a thick obtuse pupa, which is enclosed in a cocoon. In captivity they will eat withered lettuce-leaves. The moths mostly fly at night, though some fly at twilight or in the daytime. They may often be beaten from bushes or thickets, and generally simulate death in the net.

GENUS I.—NUDARIA (STEPH.).

Very delicate species with thinly-scaled wings. Fore-wings rounded at the tip and hind margin; pale, with rows of dark spots or transverse stripes; hind-wings regularly rounded. The larvæ are rather flat, and covered with short hair. They hybernate when small, and change to pupæ at the beginning of June. The moths (except *Murina*) seldom expand much more than three-quarters of an inch. They appear in July, and sit with their wings spread out flat.

* 1. *N. Senex* (Hübn.).—Fore-wings pale ochre-yellow, with a brown spot in the middle, two rows of brown spots, and dark spots on the hind margin; hind-wings paler, with a brown spot in the middle, and one row of spots beyond. Widely distributed in Northern and Central Europe and in the Alps, frequenting damp places in woods, but rarely common. The larva is dark ashy-grey, with a blackish-brown head.

2. *N. Murina* (Esp.).—Fore-wings pale yellowish-grey, with two rows of brown spots; hind-wings whitish, unspotted. Expands rather more than 1 inch. It is found throughout South Europe and Western Asia, but is very scarce and local north of the Alps, though found as far north as Frankfort, and in Holland. It often flies into lighted rooms. The larva is pale grey, with two rows of sulphur-coloured spots on the back, and yellowish-grey warts. It feeds on lichens growing on trees and rocks.

* 3. *N. Mundana* (Linn.).—Fore-wings semi-transparent; dull yellowish-grey, with a brown spot in the middle, and two zigzag transverse stripes; hind-wings without markings. Common in Western and South-Eastern Europe. The larva is pale grey, with two rows of yellow spots on the back, and a blackish transverse spot on the 7th segment. It feeds on lichens growing on walls, rocks, and trunks of trees; and the moth, which is figured at Pl. 22, Fig. 1, may be found in similar places.

GENUS II.—CALLIGENIA (DUP.).

Wings more thickly scaled than in *Nudaria*, and the hind margins less rounded. Antennæ of the male strongly ciliated. Wings spread out flat when at rest. The only species, * *C. Miniata* (Forst.), has ochre-yellow fore-wings, tinged with reddish, the costa and hind margin brick-red, and a black zigzag transverse line beyond the middle, outside which is a row of black spots; hind-wings tinged with rosy. Expands about 1 inch. It is common, without being very abundant, in woods throughout Northern and Central Europe and Siberia in June and July. The larva is dull brown, with long black hairs, grey at the ends, and a reddish-brown head. It lives on lichens on trees in May, and when it becomes a pupa the hairs are loosely spun together so as to form a kind of cocoon. The transformations are figured at Pl. 22, Fig. 2, *a—c*.

GENUS III.—SETINA (SCHRANK).

Fore-wings rounded behind, and occasionally rectangular at the tips. They are yellow, and generally marked with three transverse rows of black spots, which are often connected, and then form black branching longitudinal lines on the nervures. Occasionally there are only two spots on the costa and inner margin. The antennæ of the male are ciliated. Most of the species frequent mountains, and vary according to the height at which they are found. The larvæ are short and thick, and hybernate. They live on lichens growing on trees and rocks, and the moths appear from May to August, and mostly fly by day. When at rest they hold their wings considerably expanded, or else flat.

* 1. *S. Irrorella* (Linn.).—Body black; collar, shoulders, tip of the abdomen, and fore-wings dull yellow, the latter rather thinly scaled, with three rows of black spots, but none at the base; under side blackish-grey in the middle. Hind-wings paler, often with blackish spots before the tip. Expands from three-quarters to one and a half inches. Common in the greater part of Europe and Asia Minor. It is a local insect in Britain, found in a few localities on the coast. The larva is black, with a row of sulphur-yellow spots on the back, and a narrower one on each side, below which is an interrupted stripe. The moth is figured at Pl. 22, Fig. 3.

2. *S. Freyeri* (Nick.).—Body and fore-wings as in *S. Irrorella*, but the latter with a black dot at the base, and the dots are longer. The fore-wings are thinly scaled, and wholly blackish on the under side. Hind-wings with blackish spots before the hind margin. In the variety *Andereggii* (Herr.-Schäff.) the two front rows of spots are wanting, the nervures are blackish, with branches running out to a point, and the wings are paler yellow. These are probably both Alpine varieties of *S. Irrorella*.

3. *S. Aurita* (Esp.).—Body black, the collar (generally), the shoulders, extremity of the abdomen, and both sides of the wings dull yellow. Fore-wings thickly scaled, with a black dot at the base, and three transverse rows of large black dots; hind-wings with black dots before the hind margin. Figured at Pl. 22, Fig. 4. The variety *Ramosa*, Fabr. (Fig. 5), has broad black nervures instead of the two first rows of dots. Expands 1¼ inches. Common in the Alps; but *Ramosa* only occurs above the tree-limit.

4. *S. Kuhlweinii* (Hübn.).—Body, antennæ, and wings rich yellow; fore-wings thickly scaled, with three transverse rows of black spots, but no basal spot; hind-wings spotted with black before the hind margin. Varieties occur with blackish antennæ, and others with the middle of the thorax and the base of the abdomen blackish. Size of *Aurita*. It inhabits the plains of Eastern Europe. The Alpine variety *Alpestris* (Zell.) only differs by its larger size and thicker antennæ. The larva


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13a.
9c.
11.
C.
E
D.
2a.
9b.
2b.

is blackish, thickly sprinkled with pale yellow, coalescing into spots below the sulphur-coloured line on the back. There is also a much narrower stripe on the sides, composed of spots. It feeds on ground lichens.

5. *S. Roscida* (Hübn.).—Body black; shoulders, tip of the abdomen, and wings dull pale yellow; fore-wings with three rows of black spots, but no basal spot; hind-wings spotted with black before the hind margin. Under side of fore-wings smoky, base of the costa black. Antennæ strongly ciliated. Expands about 1 inch. It is common, though local, in Southern and Central Europe, except the north-west; and in Northern and Western Asia. It flies in dry places in woods, and on hills; and the larva does not differ from that of *Kuhlweinii*. The Alpine variety *Melanomos* (Nick.) has the fore-wings suffused with grey, and the nervures and hind-wings are blackish towards the base.

* 6. *S. Mesomella* (Linn.).—Fore-wings with the tip rectangular, pale grey, with the costa and hind margin ochre-yellow, and with one black spot in the middle of the costa, and another in the middle of the inner margin. Hind-wings dark grey with yellow fringes. Expands about 1¼ inches. Common in woods throughout Europe, and in Northern and Western Asia. The larva is dark brown, with blackish hairs, and a shining yellowish brown head. It feeds on lichens growing on the trunks of trees. The moth is figured at Pl. 22, Fig. 6.

GENUS IV.—LITHOSIA (FABR.).

Fore-wings long and narrow, with a short hind margin. The fore-wings and body are yellow or grey, the former occasionally marked with a few black dots. The hind-wings are more than twice as broad, with the tip rather produced. The larvæ are dark, with rows of brightly-coloured spots, and thinly clothed with hair. They hybernate when young, and change to pupæ in May or June. The moths appear in July and August, except *Sororcula* and *Aureola*, which may be found in June, and the former as early as May. The wings are folded round the body when at rest. They fly at dusk, and at intervals during the night.

* 1. *L. Muscerda* (Hübn.).—Fore-wings ashy-grey, with the costa whitish, and a transverse row of black dots beyond the middle, and two dots above the middle of the inner margin; hind-wings pale grey. Expands a little more than 1 inch. It is local in damp woods throughout Central Europe; in England it is confined to Horning Fen, in Norfolkshire. The larva is velvety blackish-brown, marbled with reddish-grey; there are three black lines on the back, and a fine reddish-grey line on the sides; the 2nd and 13th segments are marked with two red spots on the back. It probably feeds on lichens growing on sallows and alders.

* 2. *L. Griseola* (Hübn.).—Fore-wings leaden-grey, with the costa narrowly yellow; hind-wings pale grey; body grey, with the head, and tip of the abdomen pale yellow. The pale ochreous variety *Flava*, Haw. (*Stramineola*, Doubl.), appears to be confined to England. Expands nearly 1½ inches. Common throughout Northern and Central Europe and Northern Asia. The larva is black, with red spots in front, and two red stripes on the back after the 3rd segment. Feeds on lichens growing on trees.

* 3. *L. Deplana* (Esp.), *Depressa* (Esp.), *Helveola* (Ochs.).—Fore-wings of the male pale greyish-yellow, the costa ochre-yellow at the base; hind-wings still paler, with a broad ashy-grey border. Female reddish-grey, fore-wings with the costal streak dull yellow, growing narrower towards the tip; head, tip of abdomen, and fringes dull yellow. Expands about 1¼ inches. Widely distributed throughout Central Europe; common in some localities; in others (England, for example) rare. The larva is greenish-brown, with a yellow stripe on the back, which is bordered and dotted with

black, and marked with a white spot on the 9th segment. It lives on lichens growing on pines, firs, and other trees. The female is figured at Pl. 22, Fig. 7.

* 4. *L. Luridcola* (Zinck.), *Complanula* (Boisd.), (*Common Footman*).—Rather larger than *Complana*, the fore-wings broader behind, and of a darker leaden-grey, costal streak narrowing to a point behind; hind-wings brighter yellow. Common in woods throughout Southern and Central Europe and Western Asia. The larva is blackish-grey, with a black line on the back, and an interrupted reddish-yellow streak on the sides. It lives on lichens growing on trees.

* 5. *L. Complana* (Linn.).—Fore-wings of nearly uniform breadth; pale leaden-grey, with a dull yellow costal streak, of uniform width to the tip; head and tip of the abdomen yellow. Size of *Deplana*. Common throughout Europe, but scarcer in Britain than *Luridcola*. Larva like that of *Luridcola*, but with two rows of round orange spots on each side. It feeds on lichens growing on trees. The moth is figured at Pl. 22, Fig. 9 (upper figure).

* 6. *L. Sericea* (Gregs.), *Molybdeola* (Guén.).—Shape of *Complana*, but the costal streak as in *Luridcola*. Hind-wings strongly tinged with grey at the inner margin, and sometimes over the whole surface. Larva like that of *Complana*, but with wedge-shaped spots, and with a narrower rust-coloured stripe on the sides, divided from a fine line of pale grey by a line of the ground colour. These markings are replaced in *Complana* by one broad rust-coloured stripe. A local insect, confined to the north of England.

7. *L. Unita* (Hübn.).—Also very like *Complana;* fore-wings of uniform breadth, yellowish-grey, with the costa nearly straight; costal streak brighter yellow, of equal width to the tip; hind margins suffused with yellowish. Hind-wings pale yellow, with the costa broadly grey. The variety *Aridcola* (Hübn.) is darker grey on the fore-wings as far as the hind margin, and the hind-wings are brighter yellow, with a darker, definitely bounded costa; the variety *Morosina* (Herr.-Schäff.) is larger than this, with the inner margin of the fore-wings ochraceous at the base; the variety *Flaveola* (Ramb.) has unicolorous hind-wings; variety *Palleola* (Hübn.) has greyish-yellow fore-wings; and variety *Vitellina* (Tr.) has all the wings unicolorous pale grey, with a very narrow costal stripe on the fore-wings. Expands from 1¼ to 1½ inches. *Aridcola* is found in dry places in North Germany, *Flaveola* in Spain, *Morosina* in Turkey, and the other varieties chiefly in South-Eastern Europe. The larva is dark grey, with a black line on the back, below which are orange spots; a black streak on the sides spotted with white, and an orange line below it. It feeds on lichens growing on trees.

* 8. *L. Caniola* (Hübn.).—Fore-wings narrow, of almost uniform breadth, very pale grey, with a yellow costal line; hind-wings whitish, with the costa broadly pale grey; head and tip of abdomen yellow. Expands about 1¼ inches. It inhabits the south and west of Europe, where the larva feeds on lichens growing on old roofs. The most northerly locality is Howth, near Dublin, where the larva feeds at night on the flowers of *Lotus corniculatus*. It is also said to have been taken at Bolthead; we know of no other British localities. The larva is brown, with a narrow black line on the back, and a dusky line on the sides; on each side of the former is a row of cuneiform orange-red marks pointing backwards, and bordered on the side with similar black marks. (*L. Uniola*, Ramb., from Spain, is a brilliant whitish or pearly species very closely resembling this, but with rather broader and less delicate fore-wings, the nervures of which are more divergent.)

* 9. *L. Lutarella* (Linn.).—Wings pale yellow, the fore-wings narrow and of uniform breadth, and sometimes suffused with grey, hind-wings with the costa broadly dark grey; and sometimes almost wholly grey; head blackish in front. The variety *Pallifrons* (Zell.) is paler, the costa of the hind-wings is paler grey, and the head entirely yellow; in variety *Pygmæola* (Doubl.) the fore-wings are pale greyish straw-colour. Expands about 1 inch. Common throughout Central and

Southern Europe; *Lutarella* in woods, *Pallifrons* on the Alps, and *Pygmæola* only in Holland and on the south coast of England; no other form has been taken in Britain. The larva is dark blue, with a yellow stripe on the sides, bordered below with a white one. It is said to feed on lichens growing among moss. (*L. Marcida*, Mann, from Sicily and Andalusia, differs from *Pallifrons* by its peculiar greyish-yellow and slightly shining fore-wings, somewhat resembling the colour of *Griseola*, but much paler; and by the unicolorous dull grey hind-wings, which are scarcely paler on the inner margin, but with paler fringes.)

*10. *L. Sororcula* (Hufn.), *Aureola* (Hübn.).—Front of the body and fore-wings dull yellow, the latter broader behind, and with the costa much curved; hind-wings paler; abdomen grey. Expands a little over 1 inch. Common throughout Central Europe in woods. The larva is black, with two yellow stripes on the back, which are marked with red dots and white spots. It feeds on lichens growing on trees. The moth is figured at Pl. 22, Fig. 8.

11. *L. Cereola* (Hübn.).—Fore-wings wider behind, with the costa nearly straight; ochre-yellow, with the centre grey, and semi-transparent; hind-wings dull yellowish-white; body dark grey, head, collar, and shoulders yellow. Size of *Sororcula*. It inhabits Northern and Eastern Europe.

GENUS V.—ŒONISTIS (HÜBN.).

Fore-wings with an accessory cellule; without markings, or with two round spots; tongue thick. Hind-wings without nervule 5; nervules 3 and 4 on a long stalk. The common species, **Œ. Quadra*, Linn. (the *Large Footman*), flies by night, but may often be met with on tree-trunks in the daytime in July. The fore-wings are pale greyish-yellow in the male, with the base orange, edged with steel-blue on the costa; in the female they are ochre-yellow with a steel-blue spot on the middle of the costa, and another on the inner margin; hind-wings pale yellowish. Expands nearly 2 inches. It is found throughout Europe, and Northern and Western Asia, though commoner in some years and localities than in others. The larva is blackish-grey, the back yellowish, with three black spots in front, behind, and in the middle, and three fine dark lines on each side, on which stand orange-red spots. It feeds on lichens growing on trees and roofs, and may be found in May and June. Both sexes and the larva are figured at Pl. 22, Fig. 9, *a—c* (lower figs.). (*Œ. Bipuncta*, Hübn., from Andalusia, which has been considered a variety of this, is perhaps a true *Lithosia;* the fore-wings are ashy-grey, slightly tinged with rosy, with two spots placed as in the female of *Œ. Quadra;* the hind margin and body yellow, and the costa narrowly so; hind-wings pale yellowish, with the costa yellow.)

GENUS VI.—GNOPHRIA (STEPH.).

The chief structural difference from *Œonistis* is in the hind-wings. Nervule 5 is present, and nervules 3, 4, and 5 are all separated. The only species, **G. Rubricollis* (Linn.), is black, with the collar orange-red, and the extremity of the abdomen orange. It expands about 1¼ inches. It is common in Europe and Northern Asia in woods in May and June. The larva is greenish-grey, dotted with red and white, with dark longitudinal lines, and feeds on lichens growing on rocks and trees in August and September. The moth is figured at Pl. 22, Fig. 10.

FAMILY II.—ARCTIIDÆ.

Middle-sized or large moths with thick bodies, and generally adorned with bright colours and markings. The fore-wings form a rather long triangle, and the hind-wings are rather broad and

rounded, capable of being folded, and extending as far as the extremity of the abdomen, or nearly so. The antennæ are generally less than half the length of the fore-wings, and are usually pectinated in the male. The palpi are short, the eyes naked, the legs are short and often woolly, and the spurs of the tibiæ are very short. The larvæ are furnished with sixteen legs, and have generally warts covered with long stiff hair, and a small round head. They are very active, and generally hybernate, and may be found in spring, feeding on low plants on the sunny side of hedges and bushes in early morning; some hide themselves during the day. They change to a thick obtuse pupa in a soft cocoon. The moths fly at night, and in some cases in the daytime, and rest with their wings sloping. They may be found at rest on rocks, trunks of trees, walls, &c.; and the day-flying species frequent open places in woods. This family comprises the Tiger Moths, the most brilliantly-coloured of all our native moths; and they are not unfrequently called butterflies by those ignorant of entomology, though their thick bodies and the structure of their antennæ at once show them to be true moths. The caterpillar of the common Tiger Moth is often called the "woolly bear," in allusion to its shaggy coat.

GENUS I.—EMYDIA (BOISD.).

Fore-wings very long, pale-coloured, with black dots or longitudinal lines, hind-wings very broad, concave below the tip. Palpi very small, the tongue soft and short, the legs with flattened scales. Body rather slender. The moths appear in July; the larvæ are found in spring, till May.

* 1. *E. Striata* (Linn.), *Grammica* (Linn.).—Fore-wings pale ochre-yellow, with black longitudinal lines on the nervures in the male, and with short lines before the hind margin in the female. Hind-wings yellow, with broad black borders, and a black central lunule. Expands about 1½ inches. Widely distributed in Europe and Western Asia, but very scarce in North-Western Europe. It frequents warm, dry places, especially heaths. The larva is dark brown, with an orange streak on the back, and a white one on the sides, reddish-brown warts, covered with foxy-red hair, and reddish-brown prolegs. It lives on grass, heath, chicory, broom, &c. The moth is figured at Pl. 22, Fig. 11. (I have seen a specimen from Bulgaria, with nearly black hind-wings, which was probably *E. Funerea*, Eversm., a Siberian species, not yet recorded as European.)

* 2. *E. Cribrum* (Linn.).—Fore-wings white, with four transverse rows of black spots, almost connected into bands; hind-wings dark grey. In the variety *Candida* (Cyr.) the black spots have more or less disappeared; the variety *Rippertii* (Boisd.) has blackish wings; variety *Inquinata* (Ramb.), yellowish-white fore-wings; and variety *Chrysocephala* (Hübn.) has an ochre-yellow head, and the marginal spots of the fore-wings are almost wanting. Expands about 1¼ inches. Widely distributed in Europe, but rarely common; the New Forest is the principal locality in England. The larva is greyish-brown, with the sides yellowish-brown, and three whitish lines on the back, with large black spots between them. It lives on heath and other low plants, and hides itself during the day under grass and dead leaves.

3. *E. Bifasciata* (Ramb.).—Resembles *Cribrum*, but with two transverse lines of black dots on the fore-wings, one in the middle and one near the base, which is also marked with some black dots. These lines are better defined and more angulated than in *Cribrum*, and there is often a third irregular one before the hind margin, which is edged with a row of black dots. It occurs in Corsica. The larva is reddish-brown, with indistinct reddish lines on the back.

GENUS II.—DEIOPEIA (CURT.).

Fore-wings long and triangular, hind-wings very broad; body, palpi, and legs with flattened scales, tongue horny. An accessory cellule is produced by the junction of nervules 7 and 10.

The only European species, **D. Pulchella* (Linn.), has yellowish-white fore-wings, with many transverse rows of small black spots, mixed with less numerous rows of larger triangular red spots; hind-wings milk-white, with a broad indented black border, and often one or more black spots at the end of the cell. Expands about 1½ inches. This species is abundant throughout Africa and the south of Asia and Europe in June and September, but is a very scarce insect in Central Europe, including England. The larva is dark grey, with a broad white stripe on the back, and reddish streaks on the sides. It lives in May and July on *Plantago*, *Myosotis arvensis*, *Heliotropium Europæum*, &c. The moth and larva are figured at Pl. 22, Fig. 12, *a*, *b*.

GENUS III.—EUCHELIA (BOISD.).

Fore-wings broad and triangular, hind-wings moderately broad and rounded; body, palpi, legs, and tongue as in *Deiopeia*. The accessory cellule is formed by a small transverse nervule between nervules 11 and 7. The larva has short, scattered hairs, but no warts. The only species, **E. Jacobææ*, Linn. (the *Cinnabar Moth*), has black fore-wings, with a blood-red stripe below the costa, and a shorter one along the inner margin. Two spots on the hind margin, and the hind-wings are of the same colour. Expands from 1¼ to 1¾ inches. It is abundant throughout the greater part of Europe, and in Northern and Western Asia, flying by day in weedy places in May and June. The larva is black, with broad orange-yellow rings; it lives gregariously on ragwort in July and August; and a variety of the moth in which the red markings are replaced with yellow is occasionally met with, when large numbers are reared from the larva. The moth and larva are figured at Pl. 22, Fig. 13, *a*, *b*.

GENUS IV.—CALLIMORPHA (LATR.).

Large species, the fore-wings broad and triangular, dark-coloured, with pale spots or streaks; hind-wings broad and red; body covered with flattened scales. The accessory cellule is formed by an oblique nervule between nervules 10 and 7. The larvæ have pale longitudinal lines and hairy warts, and live from August till May on nettles, raspberries, &c., and may be captured by sweeping. The moths appear in June and July.

* 1. *C. Dominula* (Linn.), (*Scarlet Tiger*).—Fore-wings greenish-black, with large yellowish-white spots, those nearest the base tinged with orange; hind-wings scarlet (yellow in variety *Rossica*, Kol., black in variety *Persona*, Hübn.), with a broad marginal band broken into spots, and a large black spot in the middle; thorax with two longitudinal orange streaks; abdomen scarlet, with a black stripe on the back. Expands from 2 to 2½ inches. Common throughout Europe and Western Asia, frequenting damp woods. The larva is bluish-black, with pale blue warts, and three yellow longitudinal lines dotted with white. The moth and larva are figured at Pl. 23, Fig. 1, *a*, *b*.

* 2. *C. Hera* (Linn.), (*Jersey Tiger*).—Fore-wings dark green, with oblique yellowish-white bands, and the inner margin yellowish; hind-wings and abdomen dark red (yellow in the variety *Lutescens*, Staud.), the former with large black spots, and the latter with a row of black dots on the back; thorax and scapulæ yellowish at the sides. Expands about 2 inches. Common throughout Southern and a great part of Central Europe (including the Channel Islands), and in Western Asia. It is a great rarity in the south of England. It frequents stony places covered with flowers, especially in hilly districts, and flies by day. The larva is brown or blackish, with a bright yellow stripe on the back, and a yellowish-white line on the sides. The moth and larva are figured at Pl. 23, Fig. 2, *a*, *b*.

GENUS V.—PLERETES (LED.).

This genus only contains one European species, but it is the largest of the family. The abdomen is thick, and rounded behind, and the fore-wings are marked with pale spots, and the hind-wings with dark ones. The palpi are comparatively large and, like the legs, are covered with flattened scales. The larvæ are covered with long hairy warts, and generally hybernate twice, changing to pupæ in spring, without eating anything after the second winter. The only species, *P. Matronula* (Linn.), has dark brown fore-wings, with four large yellow spots on the costa, and a small one towards the hinder angle; hind-wings orange, with large irregular black spots. The thorax is brown, with two red stripes on the back, and two yellow ones on the sides; abdomen red, with a row of large black spots on the back. Expands 3¼ inches. It is found in woods throughout Central Europe, except the north-west, but is a scarce insect everywhere. The larva, which is more frequently met with than the moth, is whitish when young, and dark brown afterwards, with long reddish-brown hair. It hides itself during the day among stones and moss, and is very difficult to rear. Only a few must be reared in one cage, which should be kept in a shady place, and the larvæ must be well sprinkled with water at frequent intervals, especially after hybernation. When young, the larva feeds on the leaves of trees (hazel, elm, &c.), and when half-grown, it feeds on smaller plants, such as *Lonicera xylosteum*.. The moth is figured at Pl. 23, Fig. 3.

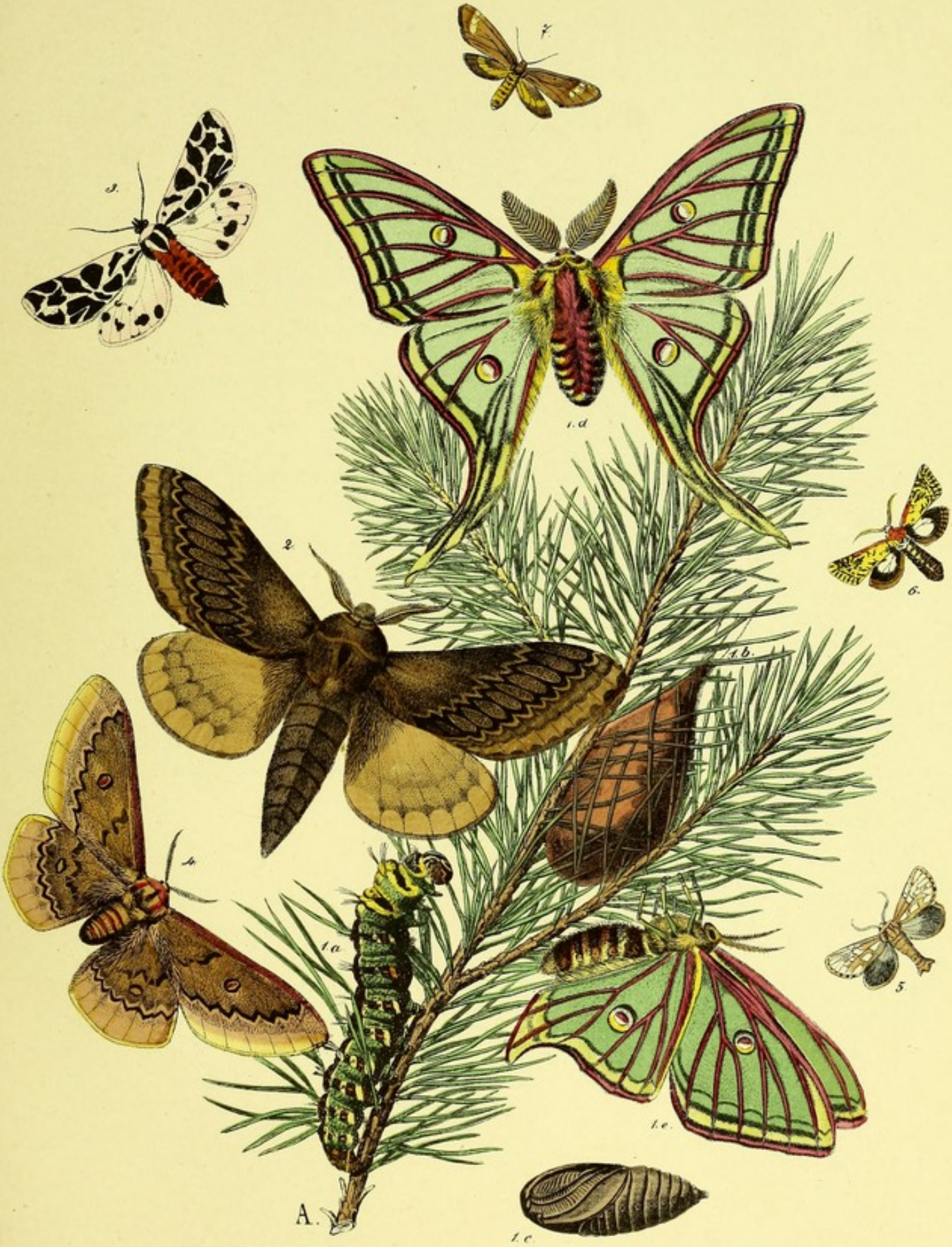
GENUS VI.—EUPREPIA (HERR.-SCHÄFF.).

Fore-wings with the tips more pointed than in *Arctia;* dark-coloured, with pale transverse bands, and an accessory cellule; antennæ of the male ciliated; tongue quite imperceptible. The only species, *E. Pudica* (Esp.), has brownish-black fore-wings, with pinkish-white interlacing stripes, which cover a large part of the wing, leaving only numerous angular spots of the dark ground colour visible; hind-wings pinkish-white, with a variable number of black spots. Abdomen rose-colour, with a row of black spots on the back. Expands from 1¼ to 1½ inches. It is found in the south of Europe and in North Africa in May and June, and produces a slight sound when flying. It flies at dusk. The larva hybernates, and is full-grown in April. It feeds on grass. The moth is figured at Pl. 53, Fig. 3.

GENUS VII.—NEMEOPHILA (STEPH.).

The body of the male rather slender; the tongue horny; an accessory cellule in *N. Plantaginis.* The larvæ have long hairy warts, and are very active. They hybernate and live on various low plants from August to May, and that of *N. Russula* is found again in July. The perfect insects fly by day.

* 1. *N. Russula* (Linn.).—Male with the fore-wings pale yellow, with the fringes, inner margin, and a large spot near the middle of the costa reddish; hind-wings buff, with a brown spot in the middle, and a brown submarginal band; fringes red. The female is smaller, with rusty-yellow wings, the fore-wings with reddish nervures, and the hind-wings with the base, a spot in the middle, and the submarginal band blackish. Expands from 1½ to 1¾ inches. It is common throughout Europe and Northern Asia in June and August in glades in woods, and on heaths. The female is much less active than the male, and is consequently less frequently met with. The larva is blackish-brown, with a yellow streak on the back dotted with red, and foxy-red hairs. The male moth is figured at Pl. 23, Fig. 4. (*N. Spurca*, Ramb., supposed to be an Andalusian species, is reddish-yellow, without markings, but the hind-wings rather darker above; it only expands 1 inch.)


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* 2. *N. Plantaginis* (Linn.), (*Wood Tiger*).—Fore-wings black, with a longitudinal basal streak above the inner margin, two interlacing transverse stripes before the hind margin, and a spot below the middle of the costa, all pale yellow; hind-wings in the male nearly orange, and in the female often reddish, with black streaks from the base, and black spots before the hind margin; abdomen yellow in the male, and reddish in the female, with a broad black streak on the back. In some males the ground colour of the hind-wings is white (variety *Hospita*, W. V.), or almost entirely black (variety *Matronalis*, Friv.). Expands from 1½ to 1¾ inches. Common in woods throughout Europe and Northern Asia; in South Europe it occurs in the mountains. The larva is black, with the six middle segments brick-red. It is figured, with the red variety of the female, and the variety *Hospita*, at Pl. 23, Fig. 5, *a—c*. (*N. Metalkana*, Led., a rare Hungarian species, has yellow fore-wings, and rosy hind-wings, spotted with black; the fore-wings are also suffused with rosy beneath, and have two black spots in the cell. Expands 1½ inches.)

GENUS VIII.—ARCTIA (SCHRANK.).

Body thick in both sexes, the tongue soft; the fore-wings dark-coloured, with white or yellow markings, or yellow, with dark markings; and the hind-wings red or yellow. The larvæ have long hairy warts, and are very active; they feed on many low plants, so that it will seldom be necessary to specify their food. They generally hybernate, and the moths appear in summer.

* 1. *A. Caja* (Linn.), (*Tiger Moth*).—Fore-wings brown, with white interlacing bands crossing each other before the hind margin; hind-wings and abdomen dark red, with large bluish-black spots. Varieties occur in which the white borders of the fore-wings are absent, and the spots of the hind-wings are confluent. Expands from 2 to 3 inches. It is common throughout Europe (except the extreme south) in July and August. The North American *A. Americana* (Harr.) does not appear to differ from *A. Caja* by any constant characters. The larva is black, with white warts and long hair, which is rust-coloured on segments 2—4, and on the sides; but elsewhere black, tipped with white. It may be found late in autumn, and in spring till the beginning of June. Many varieties may be obtained by rearing larvæ on plants placed in salt water; and specimens reared from larvæ which have been fed on walnut-leaves are unusually dark. The transformations are figured at Pl. 23, Fig. 6, *a—c*.

2. *A. Flavia* (Fuessly).—Fore-wings black, with white bands which cross each other obliquely before the hind margin, and a transverse band near the base, with which it is connected by a streak below the costa at nearly right angles; hind-wings pale ochre-yellow, with blackish spots before the hind margin; abdomen rose-colour, with a black streak on the back. Expands from 2 to 2½ inches. It is found at a great elevation in the Alps and Altai in July, but is always a much-prized rarity. The larva is dark brown, with warts of the same colour, and greenish-yellow hairs, with whitish tips. It lives through two winters, and undergoes its transformations in June. It feeds on *Cotoneaster vulgaris*, but on various low plants also, and hides itself in clefts of the rock during the day.

* 3. *A. Villica* (Linn.), (*Cream-spot Tiger*).—Fore-wings black, with large oval white spots (yellow in variety *Angelica*, Boisd.); hind-wings yellow, irregularly bordered and spotted with black. Expands from 2 to 2½ inches. Widely distributed throughout Europe (including the south of England) and Western Asia, but local. The larva is black, with pale brown hairs, and a reddish-brown head. The moth is figured at Pl. 23, Fig. 7.

4. *A. Purpurea* (Linn.).—Body and fore-wings yellow, the latter with many small brownish

spots; hind-wings rose-colour (yellow in variety *Flava*, Staud.), with large round black spots. Expands 1¾ inches. Common in many parts of Central and Eastern Europe and Northern and Western Asia in June and July, frequenting warm, sunny, sandy places. It is, however, not a British species. The larva is black above, with foxy-red hair; the hairs on the sides and the lines on the back and sides are yellowish. The moth and larva are figured at Pl. 23, Fig. 8, *a*, *b*.

5. *A. Fasciata* (Esp.).—Fore-wings yellowish-white, with bluish-black spots and transverse bands, which are often interrupted. Hind-wings yellow, spotted with black; hind margin scarlet. Abdomen rosy, with a row of black spots on the back. Expands 1¾ inches. It is common in South Europe in July. (*A. Thulea*, Dalm., is black, with rows of white spots on the fore-wings, the inner ones interrupted; hind-wings red, with the base and an irregular submarginal band black. *A. Festiva*, Borkh., has dull brown fore-wings, with yellow spots and bands bordered with brown; the hind-wings are brown at the base, and fulvous towards the hind margin, spotted with black. Both these species are found in Lapland.)

6. *A. Hebe* (Linn.).—Fore-wings black, with five white transverse bands narrowly bordered with orange, of which the two last are connected in the middle; hind-wings and abdomen blood-red, the former with large black spots, and the latter with a black streak on the back, and a black tip. Expands 2 inches. Common in Southern and some parts of Central Europe, except the north-west, and in Northern and Western Asia, in July. The larva is black, with greyish-black hairs, and rust-coloured ones on the sides. It lives till May on spurge and other low plants. The moth is figured at Pl. 23, Fig. 9.

7. *A. Aulica* (Linn.).—Fore-wings brown, with small pale yellow spots, hind-wings orange, with rows of broad black spots arranged in bands; abdomen black above, with the segments bordered with yellow. Expands rather more than 1 inch. Common in Eastern Europe, but not found further west than Treves and the Vosges. It is also met with in Northern and Western Asia, and is found in open places in fir-woods in May and June. The larva is black, with very long rust-coloured hair; on the hinder segments the hair is black.

8. *A. Curialis* (Esp.).—Closely allied to *Aulica*, but larger, with larger spots on the fore-wings; hind-wings suffused with scarlet towards the hind margins, and the central spot smaller. It inhabits the valleys of the Tyrol, Piedmont, and Italy, in May and June. The larva is black, with black hair, which is often rust-coloured on the first segments, and is very long on the hinder ones. (*A. Dejeanii*, Godt., from the mountains of Spain, has reddish-brown fore-wings, with a yellow wavy longitudinal streak, and five yellow spots; hind-wings luteous, with six or seven black spots, and the hind margin reddish.)

9. *A. Maculosa* (W. V.).—Fore-wings brown, with three transverse rows of small angular black spots; hind-wings crimson, with a row of large black spots on the hind margin, and a spot nearer the middle. The variety *Simplonica* (Boisd.), has darker fore-wings. Expands about 1¼ inches. Inhabits Eastern Europe and Northern and Western Asia. It is also found in South France, and in the Alps, in July and August. The larva is black, with a yellowish line on the back. Its hair is black on the back, and rust-colour on the sides. It feeds on bedstraw, &c., till June, and hides itself under stones.

10. *A. Casta* (Esp.).—Body and fore-wings dark brown; the latter with two broad white bands suffused with rosy, the outermost forming two angles behind; hind-wings whitish in the male, suffused with rosy; and rosy in the female, with a brown interrupted marginal band. Expands about 1¼ inches. It inhabits the southern half of Central Europe in May, but is not a common species. The larva is blackish, with a paler line, and a row of oblong black spots on the back. It feeds on *Galium* and *Asperula* from July to September.


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9b
5b
1a
5a
9a
6c
6a
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C
6b
A
B

11. *A. Kindermanni* (Staud.).—Fore-wings black, with a white line from the base expanding into a large irregular dentated blotch, which throws off three teeth to the costa, one to the hind margin, and two shorter projections towards the inner margin. There is also a small white spot at the base of the inner margin, and the costa and fringes are narrowly white. Hind-wings yellow, the base, a central spot, and an interrupted submarginal band black. From the Ural. (*A. Latreillii*, Godt., from the mountains of Spain, is smaller than *A. Casta*, and has only one band on the fore-wings, joined to a cross near the base.)

12. *A. Quenselii* (Payk.).—Fore-wings black, with yellowish-white nervures, and many longitudinal and transverse stripes of the same colour, varying in width. Hind-wings blackish, with a zigzag whitish line in the male and an ochre-yellow one in the female before the hind margin; body black, the thorax with yellowish longitudinal lines, and the segments of the abdomen bordered with yellow. In the variety *Cervina* (Fall.) the pattern of the fore-wings is more suffused; the nervures are not so conspicuously paler, and the longitudinal streak is absent, but there are three indistinct pale transverse stripes; the zigzag line on the hind-wings is very indistinct. Expands nearly 1½ inches. It is found in Lapland, Labrador, and in the high Alps. *Cervina* occurs on the Gornergrat in July. The larva is black, with an indistinct pale line on the back, and black hair, reddish on the sides, and longer behind. It feeds on low Alpine plants, hides itself under stones, and may be fed on the leaves of *Lonicera xylosteum*, dandelion, &c., in captivity. It appears to hybernate twice, but when brought down to the plains it becomes full-grown before the second winter, and the moth appears in September. When this and other high Alpine larvæ are reared in confinement, they must be fed on half-withered leaves that have been gathered from twelve to twenty-four hours before, or they will soon die.

13. *A. Spectabilis* (Tausch.).—White; fore-wings with four oblique fawn-coloured bands broken into spots; hind-wings with four submarginal spots, and a row of dots of the same colour. In the female the dark markings are brown, and the hind-wings have a brown submarginal band, partly broken into spots, and brown marginal dots. Expands 1½ inches. It is found in South Russia and in the Altai. The larva is dark brown, with tufts of yellowish bristles placed on orange tubercles, and a yellowish-white line on the sides. It feeds on wormwood, &c.

GENUS IX.—SPILOSOMA (STEPH.).

Body very thick, the thorax with woolly hair, and the tongue quite imperceptible. Fore-wings with black dots or obscure transverse stripes, or else without markings; abdomen with five rows of black dots. The larvæ resemble those of *Arctia* in food and habits.

* 1. *S. Lubricipeda* (Fabr.), (*Buff Ermine*).—Pale ochre-yellow; fore-wings with small black dots, partly arranged in transverse rows; abdomen brighter yellow. In the variety *Zatima* (Cram.) the dots are replaced by transverse lines on the fore-wings. Expands from 1½ to 1¾ inches. Common throughout Northern and Central Europe and Northern and Western Asia, as is also the following species. Both are abundant, even on the walls of London gardens, in June and July, and their larvæ are found in autumn. The larva of *Lubricipeda* is brownish-yellow, with a pale line on the back, and a white stripe on the sides.

* 2. *S. Menthastri* (W. V.), (*White Ermine Moth*).—White; fore-wings rather broad, with many black dots; hind-wings with black spots in the middle and before the hind margin; abdomen ochre-yellow above. In the variety *Walkeri* (Curt.) the spots are united to form longitudinal streaks. The larva is dark brown, with a distinct yellow line on the back, and black hairs. The moth is figured at Pl. 23, Fig. 10.

* 3. *S. Urticæ* (Esp.).—Fore-wings rather longer than in *Menthastri*, with only two dots beyond the middle, and occasionally a few towards the tip; hind-wings unspotted; the pectinations of the antennæ of the male are much shorter than in *Menthastri*. Size of the last two species. Its range is similar, but it is a much scarcer insect, especially in England. The larva is dark brown, with a reddish-yellow head.

* 4. *S. Mendica* (Linn.).—Body, abdomen, and wings ashy-grey in the male, and white in the female; the wings with scattered black spots. A white variety of the male (*Rustica*, Hübn.) is said to occur in Hungary. Expands from 1¼ to 1½ inches. Common throughout Europe and Northern Asia in June and July. The larva, which is brownish-green, with a slightly paler line on the back, reddish-brown hair, and a rust-coloured head, is found in autumn.

5. *S. Sordida* (Hübn.).—Male dark grey, female yellowish-grey; fore-wings with three ill-defined black transverse stripes, sometimes almost unicolorous. Expands rather more than 1 inch. Widely distributed in the Alps and Pyrenees in June and July, but scarce. The larva, which may be found in May and June, is bluish-white, with a white line on the back and a yellowish one on the sides.

6. *S. Luctuosa* (Hübn.).—Sooty black; fore-wings with darker black spots, and the front tibiæ rosy. Size of *Sordida*. Inhabits South-Eastern Europe.

7. *S. Luctifera* (W. V.).—Black; the abdomen and anal angle of the hind-wings ochre-yellow, the former with a row of black spots on the back. Expands about 1¾ inches. Common in South Europe and Western Asia in May and July; it also occurs, though rarely, in Eastern Germany. The larva is black, with a reddish-yellow stripe on the back, and may be found in May and September.

GENUS X.—PHRAGMATOBIA (STEPH.).

Allied to *Spilosoma*, but the antennæ are pectinated, and the tongue is thicker, and distinctly spiral. * *P. Fuliginosa*, Linn. (the *Ruby Tiger Moth*), has brown fore-wings, with two black spots beyond the middle; hind-wings smoky-grey, with three black spots towards the costa, and the inner margin red; a black border ceasing before the anal angle, and red fringes; abdomen red, with three rows of black spots. Expands from 1¼ to 1½ inches. Common throughout Europe, Northern and Western Asia, and North America from May to August, frequenting open places in woods. The larva is unicolorous pale grey, brownish-grey, or black. It feeds on low plants from October to April, and again in June and July. *P. Placida* (Friv.), found in Turkey, has the abdomen purple above, and a purple spot in the middle of the fore-wings. *P. Pudens* (Luc.), from Andalusia, has reddish fore-wings, with three transverse rows of small black spots, and greyish hind-wings, with a submarginal row of similar spots.

GENUS XI.—OCNOGYNA (LED.).

The wings of the female are imperfectly developed, especially the hind-wings, which are triangular and very narrow. The hind tibiæ have only one pair of spurs instead of two.

1. *O. Zoraida* (Grasl.).—Fore-wings pale brownish-grey, slightly tinged with rosy, a black basal spot, and four irregular ones on the costa, two on the inner margin, and some smaller ones towards the hind margin; hind-wings paler, with a row of submarginal spots, and two spots on the costa. Expands rather less than 1½ inches. It is found in the mountains of

Andalusia in May. The larva has reddish hairs on the sides. (*O. Hemigena*, Grasl., from the Pyrenees, appears to be only a northern variety in which the pectinations of the antennæ are shorter, and the wings of the female are rudimentary. The larva is black, with a whitish line on the back, and an interrupted orange streak on the sides. It is full-grown in July and August, and the moth, which flies by day, appears in May.)

2. *O. Parasita* (Esp.).—Brownish-grey; fore-wings of the male with two rows of long black triangular spots; hind-wings unspotted. Female with three rows of shorter and broader spots on the fore-wings, and with black marginal spots on all the wings. The male expands 1¼ inches, and the female three-quarters of an inch. Inhabits the Valais and South-Eastern Europe in March and April. The larva varies from yellowish to brown, with three light lines on the back, and rust-coloured or brown hair. It feeds on nettles, &c., in May and June.

3. *O. Bætica* (Ramb.).—Antennæ pectinated; body very hairy; fore-wings black, banded and spotted with reddish-white; hind-wings with a spot at the base and an angulated submarginal band. The male flies by day, and the female has rudimentary wings. It inhabits Spain, and appears in September and October. The larva is gregarious, and is extremely variable. (In *O. Corsica*, Ramb., which inhabits Corsica and Sardinia, the fore-wings of the male are black, with yellowish-white bands and spots, and the hind-wings are fulvous, with the hind margin spotted with black. In the female the rudimentary wings are ochreous, spotted with brown. The larva feeds on grass, and the moth appears from March to May.)

FAMILY III.—LIPARIDÆ.

Moths of moderate size, with stout hairy bodies; the abdomen is more slender in the male than in the female. The tongue, palpi, and legs are short; the femora are hairy. The antennæ are short, with long pectinations in the male; in the female the pectinations are shorter, or the antennæ are simple. The hind-wings are broad and rounded, often reaching to the tip of the abdomen. They are more slender than the fore-wings, and can be folded; nervule 5 rises near nervule 4, and is sometimes absent. The fore-wings are whitish-grey or brown, often with dark zigzag streaks; and the hind-wings are generally paler, and without markings. The larvæ have sixteen legs, and are either provided with hairy warts or are covered with soft hair; they change to a thick hairy pupa in a cocoon. The position of the wings is sloping when at rest, and many of the species fly at night, while the males of others are active in the daytime.

GENUS I.—ORGYIA (OCHS.).

Male with the body slender, the wings broad, and the hind-wings extending beyond the abdomen. The fore-wings are brown, generally with indistinct transverse lines, and a white spot near the hinder angle. The males fly by day in search of the females, which have thick bodies, and very short and rudimentary wings, and are perfectly incapable of flight. The larvæ have tufts of hair on segments 5 to 8; and two longer tufts of hair on the 2nd, and another on the 12th segment. They feed on trees and shrubs from autumn to June, and the moths appear from June to August.

* 1. *O. Gonostigma* (Fabr.), (*Scarce Vapourer Moth*).—Fore-wings of the male olive-brown, with a marginal row of white spots, bordered inside with orange on the costa and inner margin; fringes spotted with dusky; hind-wings dark brown. Expands from 1¼ to 1½ inches. The female is grey, wingless, and the antennæ have one row of pectinations. Common in most parts of Europe and Siberia, but scarce in the south of England. The larva is black, streaked with rust-colour,

with yellowish-brown tufts of hair and longer black ones. It feeds on most trees and shrubs. The male moth is figured at Pl. 24, Fig. 1.

* 2. *O. Antiqua* (Linn.), (*Vapourer Moth*).—Fore-wings of the male brownish-rusty, with dark transverse lines; a round white spot near the hinder angle, and dark spotted fringes; hind-wings rust-colour. Expands from 1 to 1¼ inches. Female yellowish-grey, with rudimentary wings, and two rows of pectinations on the antennæ. Abundant at the edges of woods, and flying about bushes throughout Europe. It also occurs in Armenia and North Africa. The larva is ash-coloured, striped with reddish-yellow and white; the tufts are yellow or brown, and those on the 2nd and 12th segments, as well as two horizontal tufts on each side of the 5th and 6th segments, are black, with the ends of the hairs thicker. It feeds on all kinds of deciduous trees, and even on the laurel, which is attacked by very few insects. The male, female, and larva are figured at Pl. 24, Fig. 2, *a—c*. (*O. Aurolimbata*, Guén., from Spain and the Pyrenees, is of the size and shape of *Antiqua*, but is of a uniform dull brown, with yellowish fulvous fringes. The female is completely apterous, with the head black and horny; and the larva feeds on broom, &c. *O. Rupestris*, Ramb., from Corsica, more resembles *Antiqua;* the wings are brownish-rusty, and the fore-wings have three indistinct ashy transverse stripes, the last of which descends to the white spot at the hinder angle.)

3. *O. Ericæ* (Germ.).—Fore-wings of the male rusty-brown, paler towards the hind margin, with an indistinct whitish spot near the hinder angle, and unspotted fringes; hind-wings brownish; female pale grey, wingless, with the antennæ not pectinated. The male expands 1 inch. Widely distributed throughout Northern Germany and the adjacent parts of Russia, but exceedingly local, and generally rare. The larva is saffron-yellow, with black longitudinal stripes; the tufts are whitish-yellow, and the longer ones black. There are also raised yellow warts on segments 10 and 11. It lives on boggy heaths, feeding on *Myrica Gale, Andromeda pallida*, &c.

4. *O. Trigotephras* (Boisd.).—Dark brown; fore-wings with a very broad but rather ill-defined undulating transverse fascia; a triangular ashy spot in the middle, a roundish one at the tip, and a white one near the anal angle; hind-wings unicolorous. Female white, apterous. Inhabits South-Western Europe in June and July; the larva lives on various trees and shrubs in May and June. (*O. Ramburii*, Mab., is brown, the fore-wings spotted with darker, and with the usual white spot near the hinder angle; hind-wings paler towards the base. It inhabits Corsica in autumn, and the larva feeds on a species of broom. *O. Ledereri*, Mill., is a large dark brown species from Sicily, more like a *Geometra* than a *Bombyx*. It expands 1¼ inches. There are two transverse grey lines on the fore-wings, indistinctly bordered with black; the outermost is very much dentated. The fringes are spotted with dirty white.)

5. *O. Dubia* (Tausch.).—Brown; fore-wings with two black transverse stripes near the base, a spot in the middle, below the costa, and a spot or streak beyond. Sometimes the second and fourth of these markings extend nearly to the inner margin, meeting so as to form a black U, enclosing the subcostal spot. The fore-wings are more or less varied with tawny, and are sometimes almost entirely tawny, the basal streak being obliterated. Hind-wings either brown, tinged with tawny at the anal angle and inner margin, or tawny, with the costa and hind margin varied with brown or black. Expands about 1 inch. The female is apterous. It inhabits the south of Spain and Russia, and Asia Minor.

GENUS II.—PENTHOPHORA (GERM.).

Body of the male slender, and the wings moderately broad and rounded; the female with rather thick body and narrow wings; the fore-wings are scarcely more than half as long as


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6b.
6a.
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7b.
2c.
4b.
A.
B.
C.
D.

the body, and the hind-wings are one-third as long. The wings are without markings, and nervules 6 and 7 are wanting in the fore-wings of the female. The only species is *P. Morio* (Linn.). The male is blackish, with semi-transparent wings, and the female is yellowish-grey, with yellowish fringes. Expands from three-quarters of an inch to an inch. It is widely distributed in Southern Europe in June, but is commoner, and extends further north in the east than in the west. The larva is blackish-brown, with six rows of rust-coloured tubercles.

GENUS III.—DASYCHIRA (STEPH.).

Body stout, especially in the female; wings moderately broad, fore-wings with the hind margin oblique; grey, with dark transverse stripes; abdomen as long as the hind-wings in the male, and much longer in the female. The larvæ have four or five tufts on the 5th and the succeeding segments; a longer tuft on the 12th, and generally two on the 2nd segment. When the moths are at rest, they stretch out their hairy fore-legs in front.

1. *D. Selenitica* (Esp.).—Fore-wings olive-grey, dusted with darker, in the male, and dark grey in the female, with a white lunule filled up with dark, and a white wavy line before the hind margin; hind-wings black. Expands 1¼ inches. Very local in Germany (except the north-west), and in Russia, in May. The larva is black, with five yellowish-grey tufts, black at the tips, and three longer black tufts of hair. It lives from July to April on low plants, such as *Onobrychis sativa* and *Lathyrus pratensis*, and, local as it is, is often sufficiently abundant to be a destructive insect in the few localities where it occurs. The moth is figured at Pl. 24, Fig. 3.

* 2. *D. Fascelina* (Linn.), (*Dark Tussock*).—Fore-wings ashy-grey, finely dusted with black, with two black transverse lines bordered with orange, a suffused whitish lunule, and unspotted fringes; hind-wings pale brownish-grey. The Lapland variety *Obscura* (Zett.) is darker, and nearly unicolorous. Expands from 1½ to 2 inches. Common in Europe and the Altai in June and July. The larva is grey, with five tufts, white below and black above, and three longer black tufts of hair. It feeds on various trees and plants from autumn to June. The transformations are figured at Pl. 24, Fig. 4, *a—c*.

* 3 *D. Pudibunda* (Linn.), (*Pale Tussock*).—Fore-wings pale grey, dusted with darker, and with three dark grey transverse stripes, of which the first and third are slightly dentated, and the second is quite straight; fringes spotted with dusky; hind-wings pale grey, with a suffused dark stripe before the hind margin. Expands from 1¾ to 2½ inches. Common in most parts of Europe in May and June. The larva is greenish-yellow, with black incisions, yellow tufts, and a long rose-coloured tuft above the tail. It lives on various trees and plants in September and October. The male, female, and larva are figured at Pl. 24, Fig. 5, *a—c*.

4. *D. Abietis* (Esp.).—Fore-wings white, shaded with pale brown, with a sharply-defined lunule in the middle surrounded with black, and three black transverse stripes, the middle one broad, and the others narrow, sharply dentated, the third with a long tooth extending to the lunule; the fringes spotted; hind-wings brownish-grey in the male, and whitish in the female. Expands rather more than 1½ inches. A very scarce species, found in Southern and Eastern Germany, South Sweden, and Russia in June and July. The larva is green, spotted with black and white, and with black incisions, with four brownish tufts, yellow on the sides; two longer black tufts on the 2nd, and a yellow one on the 12th segment. It may be obtained from autumn to May by beating pines and firs (*Pinus picea* and *Abies*). The larva and moth are figured at Pl. 24, Fig. 6, *a*, *b*.

GENUS IV.—LEUCOMA (STEPH.).

Body stout, the wings rather long, the fore-wings with the hind margin oblique; hind-wings nearly as long as the body. The only species, * *L. Salicis*, Linn. (the *White Satin Moth*), is shining white; the antennæ, tibiæ, and tarsi are black, the latter with white rings. Expands about 2 inches. It is common throughout Europe and Northern Asia, and is found on the trunks of poplars in June and July. The larva, which has hairy warts instead of tufts of hair, is black, with the sides yellowish, and a row of whitish spots on the back. It feeds on poplars and willows in May and June. The transformations are figured at Pl. 25, Fig. 1, *a—c*.

GENUS V.—OCNERIA (HERR.-SCHÄFF.).

The male is slender, with broad triangular fore-wings, and the female is stout, with rather narrower fore-wings; hind-wings rounded. The fore-wings are white or grey, and are generally marked with sharply-dentated black transverse lines. The larvæ have a large head and large star-like rounded warts, covered with long hair.

1. *O. Rubea* (W. V.).—Fore-wings reddish-grey, with inconspicuous dark transverse stripes, and a pale central lunule surrounded with darker; the fringes unspotted. Expands nearly 1¼ inches. Inhabits Europe, south of the Alps, in July, but is not common. The larva is yellow, varied with brownish above, and with two blackish lines on the back. It feeds on oak in May.

2. *O. Detrita* (Esp.).—Fore-wings thinly scaled, brownish-grey, with a very indistinct dentated transverse stripe beyond the middle, and the fringes spotted with dusky; hind-wings a little paler. Expands about 1 inch. Very scarce and local in South Europe and North Germany in June and July. The larva is bluish-grey, with a white line on the back, upon which stand round red warts on the 10th and 11th segments, and with black and grey tufted warts, red on the sides. It lives on oak from autumn to May. (*O. Terebinthi*, Freyer, from Turkey, is grey, varied with brown; fore-wings with a row of brown lunules towards the hind margin, and some black dots towards the base; the fore-wings are shaded with brown in the middle, and have a white central spot; the fringes are spotted with white).

* 3. *O. Dispar* (Linn.), (*Gipsy Moth*).—Wings brown in the male, and grey in the female; fore-wings generally with dark brown strongly-dentated transverse stripes, and the fringes spotted with dusky; the body without markings. Expands from 1½ to 2½ inches. Abundant in most parts of Europe, and Northern and Western Asia, as far as Japan, but very scarce in England. The male may be seen flying about bushes and hedges throughout the day in July and August, and the female may be taken at rest on hedges or on the trunks of trees. The larva is grey, with three fine yellow lines on the back, and blue tubercles on the sides in front, and red ones behind. It lives on trees from April to July, and is a very destructive insect on the Continent. The male, female, and larva are figured at Pl. 25, Fig. 2, *a—c*. (*O. Atlantica*, Ramb., from Spain and Algeria, is reddish-brown, with the thorax, the centre of the fore-wings, upon which is a pale central lunule bordered with black, and the hind margin, darker; fringes spotted with paler; abdomen slightly reddish above. Expands 1¾ inches. The sexes do not differ.)

* 4. *O. Monacha* (Linn.), (*Black Arches*).—Fore-wings white, with strongly-dentated black transverse lines; fringes and thorax spotted with black; abdomen reddish, and furnished with a conspicuous ovipositor in the female. In the variety *Eremita* (Ochs.) the wings are dark brown, with black markings. Expands from 1½ to 2 inches. A common and often destructive insect throughout Europe, but local in England. It appears in July and August. The larva


2b.
4.
2c.
7.
3.
2a.
1c.
1a.
5b.
5a.
6.
1b.
A.
B.
C.

is brownish-green, grey, or black, with blue and red warts, and a black spot on the 2nd segment, bordered behind with blue, and with whitish on the sides. It feeds on orchard and forest trees in May and June. The moth is figured at Pl. 25, Fig. 3.

GENUS VI.—PORTHESIA (STEPH.).

Abdomen in the male rather short and slender; in the female it is thick, with a large anal tuft of coloured wool, which is used to cover the eggs after they are laid. The wings are broad and white, and the antennæ are pectinated in the male, and ciliated in the female. The larvæ have short hairy warts, and a slight elevation on segments 5 and 12. They hybernate when young, and live till May or June on hawthorn and other trees, and are frequently very destructive when abundant. The moths appear from June to August, and are found sitting on hedges at dusk, when their white colour makes them very conspicuous. They expand from 1¼ to 1¾ inches.

* 1. *P. Auriflua* (W. V.), (*Gold-tail Moth*).—White; fore-wings with a black spot near the hinder angle; hind-wings with the 5th nervule absent; abdominal tuft yellow. Common in Southern and Central Europe and Northern and Western Asia. The larva has a double red line on the back, and an interrupted white line beneath, a red line on the sides, and white hairy warts on segments 5, 6, and 12. The moth and larva are figured at Pl. 25, Fig. 5, *a*, *b*.

* 2. *P. Chrysorrhœa* (Linn.), (*Brown-tail Moth*).—Similar, but the black spot on the fore-wings is generally absent; nervule 5 is present on the hind-wings, and the abdominal tuft is brown, more or less tinged with golden-yellow. Common in Central and Southern Europe, North Africa, and Western Asia, but is a local insect in England. The larva is dark grey, with two reddish-brown lines on the back, beneath which is a row of whitish streaks. The moth is figured at Pl. 25, Fig. 4.

GENUS VII.—LARIA (SCHRANK).

Body rather stout; fore-wings very broad, with a long hind margin, almost straight and very slightly oblique. The only species, **L. V. nigra* (Fabr.), is white, with a black V at the end of the discoidal cell of the fore-wings. It expands about 2 inches, and is widely distributed throughout Central Europe (including the south of England) from Finland to Piedmont, but is scarce everywhere, and in many localities very rare. The moth appears in June, and the larva is black, with the sides rusty-yellow, and long hair in front and behind. There are eight tufts of hair on the back: three of the middle ones are reddish-yellow, and the others white. It feeds on various trees, especially the lime, from autumn to April. The moth is figured at Pl. 25, Fig. 6.

GENUS VIII.—LÆLIA (STEPH.).

Abdomen slender in the male and thick in the female, extending beyond the anal angle; the wings are moderately broad, and narrower in the female. In the only species, **L. Cœnosa* (Hübn.), the male has light reddish-grey fore-wings, with a row of small indistinct dark spots before the hind margin; the hind-wings are greyish-white; and the legs are yellow. In the female the fore-wings are dirty white and without markings; the hind-wings are whiter. Expands rather more than 1½ inches. Widely distributed throughout Central Europe in marshy places, but extremely local everywhere. The larva is yellowish-grey, with black stripes on the

back and sides, four yellow tufts of hair on the back, and two longer black tufts on each of the 5th, 11th, and 12th segments. It lives on *Cladium Germanicum* and other reeds in June and July.

FAMILY IV.—COSSIDÆ.

Body stout, or rather slender, and covered with flattened hair; abdomen long, extending for at least half its length beyond the anal angle. Wings thick, the fore-wings a little broader behind, generally rounded at the tip, with twelve nervures, a narrow discoidal cell, and an accessory cellule; hind-wings short and rounded, with eight nervures. Head contracted, eyes naked, palpi small, antennæ never more than one-third of the length of the fore-wings, with two rows of lamellæ or pectinations in the male. The tongue is wanting; the legs are short, the thighs are hairy, and the tibiæ have a leaf-like appendage. The sixteen-legged larvæ are naked, with only a few scattered hairs; the jaws are strong, and, as they live in the interior of plants, the prolegs are coronated. They hybernate twice, and form a cocoon mixed with splinters in the interior of their food-plant, and change there into a pupa provided with spines on the hinder segments of the abdomen, by which they push the pupa half out of the plant before they quit it. The moths fly at night, hold their wings sloping when at rest, and may often be found on the trunk or stem of their food-plants after emerging. The presence of the larvæ may be discovered by the rejected sawdust and the exuding sap, and as they devour wood, they must be kept in earthen vessels closed with wire-gauze. The moths are very liable to become greasy in a collection.

GENUS I.—COSSUS (FABR.).

Large stout moths, with coarsely-scaled wings; the fore-wings grey, with black undulating lines; or white, with a dark band-like transverse spot. The larvæ are smooth, with wrinkles on the sides, and a flat head. When young they live under the bark of trees, and afterwards eat into the wood. The moths appear in June and July, emerging from their cocoons towards evening.

* 1. *C. Ligniperda* (Fabr.), (*Goat Moth*).—Fore-wings varied with greyish-brown and pale grey, with many black wavy transverse lines running into one another, of which three or four are thicker and more sharply defined; hind-wings brownish-grey, the hind margin slightly suffused; vertex and collar greyish-yellow. Expands from 3 to nearly 4 inches. Common in Europe and Western Asia. The larva is dirty flesh-colour, with the back dark red. It lives in trees, especially poplars and willows. The transformations are figured at Pl. 26, Fig. 1, *a—c*. (*C. Terebra*, W. V., has more pointed fore-wings, of a more uniform dark grey, with two broad transverse lines; head and thorax dark grey. A scarce species in Eastern Europe; the larva is dirty white, with the back yellowish, and lives in poplars. *C. Balcanicus*, Led., from Bulgaria, is somewhat intermediate between this species and the last, but is paler and more unicolorous than either, both above and below.)

2. *C. Cæstrum* (Hübn.).—Fore-wings with the tip nearly rectangular; whitish, with a large brownish transverse lunule beyond the middle, which is waved with blackish, and edged behind with little angular black spots; hind-wings brownish-grey. A scarce insect in South Europe and Armenia. (*C. Thrips*, Hübn., from South Russia and Siberia, is fawn-colour, with obscure markings; the fore-wings have the discal area brownish, and the abdomen and hind-wings are testaceous.)

GENUS II.—ENDAGRIA (BOISD.).

Small moths, with rather slender bodies, which are longest in the female; the wings are short and broad; the fore-wings have pale spots, and their tips are nearly square. The palpi extend beyond the head. The commonest species, *E. Pantherina* (Hübn.), has olive-grey fore-wings, with large angular white spots, more or less running into one another, and white borders; the fringes are spotted with grey and white. Hind-wings brownish-grey, with whitish borders and spotted fringes. The larva is supposed to feed on the roots of plants. Expands nearly 1 inch. Common in South Europe and Western Asia; it is rare north of the Alps, but has been met with occasionally as far north as Kreuznach. The moth is figured at Pl. 53, Fig. 5. The variety *Marmorata* (Ramb.), from Andalusia, is paler, and nearly twice as large. *E. Psychidion* (Staud.), from Greece and Asia Minor, is of the size of a small *E. Pantherina*, and unicolorous smoky-brown; *E. Salicicola* (Eversm.), from South Russia, has greyish-white fore-wings, with three brown dots in the male, and brown hind-wings.

GENUS III.—ZEUZERA (LATR.).

Wings rather pointed, with the hind margin long; palpi very short; abdomen of the female furnished with an ovipositor. The only European species, **Z. Æsculi*, Linn. (*Wood Leopard Moth*), is white, with many small round or egg-shaped steel-blue spots on the wings and thorax; those on the hind-wings fainter. Expands from 2 to 2½ inches. Widely distributed in Central Europe, and on the shores of the Mediterranean, but nowhere very common; it occurs in July and August. The larva is cylindrical; yellow, with the warts, head, thoracic shield, and anal fold black. It lives in the trunks and branches of ash, young apple-trees, &c., and would be a destructive insect in orchards, if it was commoner. The moth and larva are figured at Pl. 26, Fig. 2, *a*, *b*.

GENUS IV.—PHRAGMATŒCIA (NEWM.).

Fore-wings of nearly uniform breadth, with a short hind margin; palpi very small, abdomen long and slender, especially in the female. The larva is cylindrical, and smooth beneath. The only European species, **P. Arundinis* (Hübn.), has yellowish-white fore-wings, dusted with blackish between the nervures, and dull whitish hind-wings. Expands from 1½ to 1¾ inches. It occurs in June and July in marshes throughout Central Europe, but is very local, and generally scarce. The larva is yellowish, with the back brownish, intersected with a whitish line; the head and thoracic shield are brown. It lives in the stems of the reed.

GENUS V.—STYGIA (LATR.).

Wings rather pointed, with the hind margin long; antennæ short and bipectinated in both sexes; body stout, covered with thick hair; abdomen rather long, crested at the sides, and tufted at the extremity. Tongue nearly obsolete; palpi stout, obtuse, and scaly, projecting a little beyond the head. the male of the commonest species, *S. Australis* (Latr.), has brownish fore-wings, varied with whitish-grey, and white hind-wings, bordered with blackish. The female, figured at Pl. 53, Fig. 6, has reddish-yellow fore-wings, variegated with brownish, and the head, collar, and upper side of the thorax entirely fulvous. (In the male they are brownish.) Hind-wings black, with a large white spot on the disc. Expands about 1 inch. It is common in South France and Spain in June and July. In *S. Colchica* (Herr.-Schaff.), from South Russia and Asia Minor,

the male is dark grey, with the wings (except the yellowish-grey costa and inner margin, and the dark-grey fringes) entirely transparent; the female is pale grey, thinly scaled, with darker fringes; and the upper side of the head and thorax, and the base, and part of the costa of the fore-wings are golden-yellow. The first four segments of the abdomen are also golden-yellow; the extremity is black, and provided with a long ovipositor.

FAMILY V.—COCHLIOPODIDÆ.

Small moths, with moderately stout, hairy bodies; the abdomen does not extend beyond the anal angle. Eyes naked, the antennæ a little more than half the length of the fore-wings, the palpi small and slender, and the tongue consisting of two short soft threads. The legs are short, with hairy thighs. The fore-wings have no accessory cell, and are unicolorous, or marked with two dark transverse stripes. The larvæ are thick and wood-louse shaped, and are furnished with small adhesive pads, instead of prolegs. They live in autumn on various forest-trees, and form a firm barrel-shaped cocoon among leaves, and there change to a soft pupa, in which the limbs of the moth are visible in separate casings. The moths fly at night in woods, in summer, but may often be captured by beating during the day. They rest with their wings sloping. Only two species of this singular family occur in Europe; the exotic species are often adorned with very bright colours.

GENUS I.—LIMACODES (LATR.).

Fore-wings with the tip somewhat rounded; the antennæ of the male obtusely serrated.

* *L. Testudo* (Fabr.) has ochre-yellow fore-wings, paler in the female, with two straight dark brown transverse lines, which diverge from each other towards the inner margin; the intermediate space is dusted with brown in the male. Hind-wings darker, or blackish. Expands about 1 inch. Common in Central and Southern Europe and Western Asia in May and June. Larva green, with three rows of shining warts, and two whitish lines on the back, and a yellow streak on the sides. It lives in oak, &c. The moth is figured at Pl. 26, Fig. 3.

GENUS II.—HETEROGENEA (KNOCH.).

Fore-wings with the tip rather pointed; antennæ simple.

In **H. Asellus* (W. V.) the fore-wings are ochre-brown in the male, and ochre-yellow in the female; hind-wings blackish; all the fringes are paler. Expands about three-quarters of an inch. Widely distributed in Central Europe in June and July, but rather scarce. The larva is yellowish, suffused with red on the sides, and green on the belly; a white line on the back. It feeds on beech, and other trees.

FAMILY VI.—HEPIALIDÆ.

Small or middle-sized moths, the head and thorax covered with woolly hair. The abdomen is very long, extending much beyond the hind-wings, and is clothed with flattened hair. The antennæ are not longer than the thorax, and are simple, or occasionally with short lamellæ; the palpi are small, the eyes are naked, and the tongue is absent. The legs are short and downy, and

the tibiæ are without spurs. All the wings are rather long, with the hinder angle rounded; the fore-wings are rather broader behind, and the hind-wings form a long oval. The neuration is very peculiar. All the wings have an intrusive cell extending to the base, and the fore-wings have also an appendicular cell, and small accessory cells at the base. In the hind-wings, the subcostal nervure throws off two or three branches to the costa. The fore-wings are generally marked with rows of pale spots, which converge towards the inner margin. The larvæ are slender, with sixteen legs, warts on which a few hairs are placed, and a shining head and thoracic shield. They live on the roots of low plants, form a cocoon, and change into a long pupa, with spines on the segments of the abdomen. The moths fly at twilight in woods and meadows, and rest with their wings sloping. The only European genus is

HEPIALUS (FABR.).

* 1. *H. Humuli* (Linn.), (*Ghost Moth*).—Wings of the male white above, unspotted; borders and under side brown; female with the fore-wings dull yellow, with two oblique brick-red stripes, more or less broken into spots, before the hind margin; hind-wings dull reddish. Expands from 2 to 2½ inches. Common in meadows throughout Central Europe in June and July; the male has a peculiar hovering flight. The variety *Hethlandica* (Staud.), in which the hind-wings are very dark, and the colour and markings of the fore-wings are very variable, and interchangeable in both sexes, has only hitherto been found in the Shetlands, and in Holland. The larva is pale yellow, with a brown head and thoracic shield, and feeds on the roots of grass, hops, &c., from autumn to spring. The sexes are figured at Pl. 26, Fig. 4, *a*, *b*.

* 2. *H. Velleda* (Esp.), (*Beautiful Swift*).—Fore-wings yellowish-brown, with a row of silvery-grey spots bordered by a dark double line filled up with brownish-yellow running from the tip to the inner margin, where it turns off at an obtuse angle to the base; hind-wings grey. In the variety *Gallicus* (Led.) the fore-wings are dull reddish. Expands from 1¼ to nearly 2 inches. It is widely distributed in Northern and Central Europe as far as the Pyrenees, and in the Altai, but is local, and in many places scarce. It is found in June and July, and is a mountain insect in the south. The larva is white, spotted with yellowish on the front segments; and the head is brownish-red. It feeds on the roots of the fern (*Pteris aquilina*).

3. *H. Carnus* (Esp.).—Wings dark brown in the male, with two transverse bands of round brownish-black spots, bordered with yellow. There are also two similar spots on the middle of the costa, two at the tip, and one near the base, standing on a large white spot. The female has whitish fore-wings with brownish-red spots, bordered with yellow. Expands about 1½ inches. A scarce Alpine species, found in July and August.

4. *H. Pyrenaicus* (Donz.) is dark brown; fore-wings with many irregular whitish spots; fringe brown, preceded by a row of small whitish dots. Hind-wings brown; fringe white. The male expands 1¼ inches; the wings of the female are rudimentary. It is found in the Pyrenees in July.

* 5. *H. Sylvinus* (Linn.).—Fore-wings of the male reddish-yellow or cinnamon-brown (those of the female brownish-grey), with two white oblique lines bordered behind with dusky, which converge towards the inner margin at a right angle; hind-wings dark brown, the hind margin reddish in the male. Expands from 1¼ to 1¾ inches. Not uncommon in Central Europe from July to September. The larva is greyish-white, with a dark line on the back, and a reddish-yellow head. It lives till June in the roots of dock and sorrel. (*H. Amasinus*, Herr.-Schäff., from Corfu and Asia Minor, resembles a small *Sylvinus*, with very long fringes divided by two dark lines. Hind margin with light oval marks, filled up with dusky in cells 3 to 6. The

outer white transverse stripe is very sharply defined, and bordered outside with dark rusty brown, but the inner one is irregularly broken.)

6. *H. Ganna* (Hübn.).—Fore-wings yellowish-brown, with an irregularly-widened silvery stripe running from the tip to the inner margin; a longitudinal stripe which is broader behind running from the base, and small silvery spots below this, and below the costa; the stripes are often broken into spots. Hind-wings ashy-brown, with the fringes reddish. Expands about 1¼ inches. Widely distributed in the Alps in July and August; it also occurs in Sweden and Finland, but is a scarce insect.

*7. *H. Lupulinus* (Linn.), (*Common Swift*).—Fore-wings yellowish-brown or reddish-brown, with a whitish stripe running from the tip to the inner margin, another running from the base, and a long spot in the middle of the wing above it; hind-wings dark grey. Expands from 1 to 1½ inches. Common over a great part of Europe in May and June. The larva is yellowish-white with black warts and a brown head. It feeds on the roots of various plants from autumn to spring. Figured at Pl. 26, Fig. 5.

*8. *H. Hectus* (Linn.), (*Golden Swift*).—Fore-wings yellowish-brown, dusted with ochre-yellow in the male, and with a pale oblique streak before the middle, and an oblique row of spots before the hind margin, which is bordered with black and white in the male, and is pale grey and broader in the female; hind-wings dark grey. Expands a little over 1 inch. Common throughout the greater part of Europe from May to July. The larva is dirty grey, with two black spots on each segment; head brownish-yellow. It lives on the roots of heath, &c., according to some writers; others say it feeds on the leaves of the dandelion. The moth and larva are figured at Pl. 26, Fig. 6, *a*, *b*.

FAMILY VII.—HETEROGYNIDÆ.

Closely allied to the *Psychidæ*, but the fore-wings have two internal nervures. The body is slender and downy; the antennæ are half the length of the body, with moderately long, finely-ciliated pectinations; the legs are short, and the hind tibiæ have spurs at the end only. The wings are rounded behind, unicolorous, with hairy scales, and slightly transparent; the fore-wings form a rather long triangle, and the hind-wings are nearly as broad as long. The female is apterous and worm-like. The larvæ are short and wood-louse shaped, with fine hairs; they live exposed, and change to pupæ in a rather long and loose cocoon. The commonest species, *Heterogynis Pennella* (Hübn.), has a brownish-black body and blackish wings; the pectinations of the antennæ grow imperceptibly shorter towards the tips. It expands nearly 1 inch, and is common in July in Europe, south of the Alps, including their southern slopes; the larva feeds on different species of broom. *H. Paradoxa* (Ramb.), from Spain, is a little larger, more slender, and paler, and the pectinations of the antennæ are shorter; it appears in August.

FAMILY VIII.—PSYCHIDÆ.

The males are small delicate moths, with hairy bodies, and generally with broad rounded wings, always of a uniform dark or grey colour, and often thinly scaled, and slightly transparent; the discoidal cell is at least divided behind. The fore-wings have one internal nervure. The antennæ have long or short delicately-ciliated pectinations; the eyes are naked, and the


9.
8.
3.
7b
4a
4b
7a
1c
6b
1a
2b
6a
5.
2a
A.
B.
C.
1b

legs are short, with hairy thighs. The females are wingless, and are generally worm-like, and (except in *Fumea*) are almost entirely destitute of antennæ, legs, and palpi. The larvæ, which live in movable cases, are naked, with small warts bearing single hairs, and with horny plates on the back of segments 2 to 4; the prolegs are very short stumps, and coronated. They change to pupæ in the closed-up case; the male pupa is slender, and projects partly from the case when developed; the female pupa remains in the case, which the female itself never quits, even to pair, except in *Fumea*. The males flutter about in the daytime, but live a very short time, and die immediately after pairing. They are generally abundant in their special localities, and are sometimes obtained by sweeping, like the larvæ. Many writers class these insects among the *Tineæ*. There are two sub-families.

SUB-FAMILY I.—PSYCHINÆ.

The internal nervure of the fore-wings not only forms a short fork towards the base, but also divides towards the border into two long curved branches. The wings are more or less transparent, though sometimes only slightly so, and the hind-wings are as broad as the fore-wings. The female is worm-like, with extremely small rudimentary legs and antennæ, and has shining horny plates on segments 2 to 4, and never quits its case. The pupa of the female is rather long, rounded on both sides, and the outer skin is thin.

GENUS I.—PSYCHE (SCHRANK).

Fore-wings triangular or rounded, hind-wings equally broad, but shorter, their discoidal cells divided into two cells to the base. The costal and subcostal nervures are connected by a short disco-cellular nervule, so as to form a third discoidal cell, which is often short. The antennæ and pectinations are short. The larvæ generally hybernate twice, and the moths appear in May and June, and mostly emerge from the cocoon towards evening.

1. *P. Unicolor* (Hufn.), *Graminella* (W. V.).—Male blackish, the wings densely scaled, with the fringes whitish at the ends. The fore-wings are broad and triangular, with eleven nervures; hind-wings with seven nervures; body slender. Expands nearly 1¼ inches. The female is yellowish-white, with dark brown plates on the back; that on the 4th segment, and a horny spot on the 5th, are paler, with dark brown spots. In the male, the case is covered with large pieces of grass and leaves, laid on like scales, and projecting far behind; in the female, these fragments are smaller, and laid close to the case. The larva is greyish-brown, the thoracic shields shining brown, with three yellow longitudinal lines. It lives till May on grass. The pupa of the female is brown, with the back darker. The male and the case are figured at Pl. 26, Fig. 7, *a*, *b*. Common in Central and Eastern Europe; absent from the north-west.

* 2. *P. Villosella* (Ochs.), *Nigricans* (Curt.).—Male reddish-grey, wings rather thinly scaled; shape and neuration as in *Unicolor;* body stout. Expands about 1 inch. The female is whitish-yellow, with brown plates on the back, and an irregular spot on segment 5. It is found in Southern and some parts of Central Europe (including the New Forest) in June and July. The male case is formed of fragments of plants, and the female case of short stalks of grass and plants laid lengthways. The larva is dirty yellowish-brown, with two obscure dark lines on the back, and black plates on the thorax. It lives till May on heath, broom, &c. (*P. Febretta*, Fonsc., is rather more fulvous and shining than *Villosella*, with the fringes always whiter and more shining; and

the pectinations of the antennæ are longer, thicker, and more hairy. The female is covered with a greyish-white down; and the larva feeds on a species of broom. It occurs in the mountains of South Europe. *P. Ecksteini*, Led., from Hungary, also much resembles *P. Villosella*, but is smaller and more slender, with nearly transparent wings, and shorter antennæ, with rather longer pectinations.)

3. *P. Viciella* (W. V.).—The male is dark yellowish-grey, the wings thinly clothed with hair-like scales; fore-wings rounded behind, with eleven nervures, and hind-wings with eight nervures; body stout. Expands nearly 1 inch. The female is very thick, and of a reddish-yellow, with dark yellow plates on the back. The variety *Stettinensis* (Herr.-Schäff.) is smaller and darker, generally with one nervule wanting on each wing. The variety *Viadrina* (Staud.) is also darker, and is blackish, instead of brown. Very local in Southern and some parts of Central Europe in June, but entirely absent in the west. The case is very thick, covered with grass-stems and leaf-stalks laid crosswise. The larva is olive-brown, striped and spotted with black, and feeds on grass; the female pupa is black, reddish-brown at both ends. The male moth is figured at Pl. 26, Fig. 8.

4. *P. Constancella* (Bruand).—Smaller than *Viciella*, body rather short, and very hairy, antennæ with short pectinations, and obtuse; wings blackish, semi-transparent. Female as in *Viciella*, but smaller. The case is like that of *Apiformis*, but shorter, and the larva is stout, resembling that of *Calvella*, but with a head like *Graminella*. Inhabits France.

5. *P. Crassicornis* (Staud.).—Black, semi-transparent at the base, and sometimes ashy; abdomen very hairy, and the pectinations of the antennæ very thick. Expands rather less than 1 inch. Found in Greece in March and April.

6. *P. Apiformis* (Rossi).—Body long, thickly covered with black hair, the hair on the abdomen yellow; antennæ yellowish, long, and pointed; wings sooty-brown, nearly transparent, with brown fringes. In the variety *Melasoma* (Staud.) the abdomen is quite black. Size of *Muscella*. The case resembles that of *P. Atribombycella*, and is found on bramble. It inhabits Italy and Portugal in June. (*P. Præcellens*, Staud., from the mountains of Castile, resembles *Graslinella*, but has smoky-brown semi-transparent wings, with sharply-defined yellowish-white basal streaks, filling the cells of all the wings, and extending further on the hind-wings.)

7. *P. Graslinella* (Boisd.).—Male blackish, the wings thinly covered with hair-like scales, and almost transparent; fore-wings narrow and triangular, with twelve nervures, hind-wings with eight; body rather thick, with very long hair behind. Expands about 1 inch. Female dirty reddish-brown, with brown or yellowish plates on the back. The case is long and very thick, covered with the projecting stalks of plants, over which a slight web is spun; the male case terminates in a long whitish tube. The larva is greyish-brown, with dark triangular spots on the back. It lives on heath till April. The female pupa is black, with the ends pale brown. Local in some parts of France and Germany in May.

* 8. *P. Opacella* (Herr.-Schäff.).—Smaller than *Graslinella*, with shorter hairs on the abdomen, and one nervule less in each wing; the female is yellowish, with dark brown plates on the back. Widely distributed in Northern and Central Europe in May. It frequents dry, sunny places, and emerges from the cocoon in the morning. The case is thin, composed of the stalks of plants arranged lengthways; that of the male ends in a whitish tube. The larva is dirty yellow, with the back dark brown, and the first segments deep black. It lives till April on grass; the female pupa is yellowish-brown, with the back darker. The variety *Senex* (Staud.), from Bulgaria and Armenia, is transparent, with whitish hairs on the thorax and abdomen, and thicker antennæ. (*P. Uralensis*, Freyer, has the neuration of *Opacella*, but is much more slender, and the wings are shaped as in

Hirsutella. It is ashy-grey, thinly scaled, the back and abdomen darker, with fine whitish wool, and the abdomen scarcely extends beyond the inner margin. Expands three-quarters of an inch. It inhabits South-Eastern Europe. *P. Zelleri*, Mann, from Hungary and Dalmatia, has much shorter and rounder wings in the male than *Opacella*, and the female is reddish-yellow.)

GENUS II.—OREOPSYCHE (SPEY.).

Wings with extremely fine, scattered hairs, fore-wings rounded behind, hind-wings rather narrower, with the discoidal cell simply divided; fringes rather long. Antennæ with very long and slender pectinations, lying irregularly over each other; head tufted in front, and abdomen with shaggy hair. Most of the species are mountain insects. This genus may be divided into two sections; in the first, comprising the bulk of the species, the body is stout, and the wings are nearly transparent; and in the second, to which the four last species belong, the body is slender, with much shorter hair, and the wings are opaque.

1. *O. Albida* (Esp.).—Head and body black, covered with white silky hair; wings transparent with a whitish lustre; the veins and costa dark brown, the hind margin blackish. (A variable species; variety *Plumosella*, Ramb., is blackish). Expands about three-quarters of an inch Female pale ochreous. The case is covered with fragments of moss, leaves, &c., and the perfect insect appears from March to June, according to the locality. It is common in France and Spain (*P. Tabanivicinella*, Bruand, appears to be a variety from South France, with shorter antennæ and yellowish-brown hairs on the body, diverging towards the tip of the abdomen. *P. Pyrenæella* Herr.-Schäff., is rather larger than *Albida*, and the body is densely covered with black hair; the antennæ are black and very plumose, and the wings are smoky-brown, semi-transparent, with the costa and hind margin black, and the veins narrow.)

2. *O. Vesubiella* (Mill.).—Wings vitreous, shining black, with the costa deep black, and the fringes narrow, and darker than the ground colour. Body wholly covered with long black hair, tinged with grey on the head and thorax. Antennæ large, deep black, with very large lamellæ. Expands nearly 1¼ inches. The case resembles that of *O. Atra.* The larva, which must pass the winter under a thick covering of snow, is full-grown towards the end of July. It feeds on the scanty grass growing among the boulders in the bed of mountain torrents in the Valley of Lantosque; and the moth appears in August. (*P. Leschenaultii*, Staud., from the Pyrenees, closely resembles *O. Albida*, but the pectinations of the antennæ are much shorter, and wider apart. The fore-wings are rounder, with the fringes and costa blackish, and the white hairs of the abdomen are much longer, especially those at the extremity. The case resembles that of the genus *Epichnopteryx.* *O. Malvinella*, Mill., found in Andalusia in January and February, resembles a small *O. Albida*, with very densely pectinated antennæ. The fore-wings are much more rounded, white, but semi-transparent black towards the margins; and sometimes with black nervures. Hind-wings with a dark border, and white fringes. The female is yellowish, with the front segments brown; and without either legs or wings. The larva feeds on various low plants; and the case is formed of grains of sand, covered with different kinds of leaves, stalks, moss, &c., arranged lengthways. *O. Rahri*, Led., from South Italy and Sicily, resembles *Pyrenæella* in shape and appearance, but the neuration and antennæ are similar to those of *Albida.* There is no whitish coloration on the wings or body.)

3. *O. Atra* (Esp.).—Wings transparent, shining, with blackish fringes; hind-wings much narrower than the fore-wings, with all the nervules separate; abdomen extending much beyond the anal angle of the hind-wings. Expands rather more than half an inch. The case is rather long,

and covered with fragments of plants laid lengthways. It is found in the south of France and Germany. (Variety *Bicolorella*, Boisd., from the Pyrenees, is reddish at the base of the wings. *O. Siculella*, Bruand, from Sicily, is darker, with red palpi, but not red at the base of the wings.)

4. *O. Muscella* (W. V.).—Wings transparent, shining, with brownish fringes; hind-wings a little narrower than the fore-wings; all the nervules separate; the abdomen scarcely reaching beyond the anal angle. Expands nearly three-quarters of an inch. The female is reddish-yellow, with brown plates on the back. The case is covered with fragments of grass and moss. The larva is dark grey, paler on the sides and belly, with black shining plates on the back, and lives on grass till April. The female pupa is pale brown, with the back darker. The moth is common in France, South Germany, and Armenia in May; and the male is figured at Pl. 26, Fig. 9. (*O. Schiffermülleri*, Staud., found in the Austrian Alps in July, has a smaller head, and the palpi and wings are longer. The female is reddish, resembling that of *Psyche Unicolor*, but more slender; the head and thoracic plates are blackish. The case is more slender than that of *Unicolor*, and covered with fragments of leaves, &c. *O. Fulminella*, Mill., resembles *Plumosella*, but is a little smaller; the fore-wings are less angular, and the hind-wings less rounded; the body and wings are uniformly smoky, with no bluish reflection. The case is formed of a bunch of dry leaves of oak or box. It inhabits Castile. *O. Silphella*, Mill., resembles *Fulminella* and *Leschenaultii*, but the wings are longer, nearly opaque, and sooty-black; the tip of the fore-wings is more pointed, and the fringes and nervures are broader, and of a deep opaque black; there is no trace of light hairs on the body. The female is greyish-white, with the plate flesh-colour. The case is clay-coloured, and long and cylindrical. The larva feeds on *Plantago*, *Rumex*, and *Dorycnium;* and the moth appears at Cannes in April and May, in the evening.

5. *O. Plumifera* (Ochs.).—Smaller than *Muscella*, the fore-wings not shining, and nervules 6 and 7 rising from a common stem; hind-wings narrower. The case is thickened, and covered with bits of moss and sand; the larva feeds on thyme. Common in the mountains of Southern and South Central Europe in May. (*O. Mediterranea*, Led., from South France and Italy, is smaller, with very long palpi, and semi-transparent wings. Female as in *O. Atra*. The case is covered with bits of wood. *O. Gondebautella*, Mill., found at Cannes in early spring, is larger than *Plumifera*, with much longer wings, and the case is composed of fragments of moss, laid one over another.)

6. *O. Plumistrella* (Hübn.).—Male dark brown, fore-wings rounded, hind-wings rather long, of nearly uniform breadth, head with very long hair, abdomen extending to the anal angle. Size of *Muscella*. Widely distributed in the Alps.

7. *O. Tenella* (Spey.).—Male with brownish-grey wings, fore-wings broad and rounded, hind-wings broader behind, the head with shorter hair, and the abdomen extending as far as the anal angle. Expands about three-quarters of an inch. It is found in the high Alps in July.

* 8. *O. Hirsutella* (Hübn.), *Fusca* (Haw.), *Calvella* (Ochs.).—Body rather slender, thinly clothed with short yellow hairs, head small, eyes large, antennæ with short pectinations, wings semi-transparent grey, with the nervures darker. Expands nearly 1 inch. Female short and worm-like. The case is constructed of transverse stalks and fragments of plants, irregularly arranged. The larva resembles that of *O. Albida*. The moth is found throughout Central Europe in July. (*O. Standfussi*, Herr.-Schäff., from the mountains of Silesia, is paler, with seven nervures on the hind-wings instead of eight; and nervules 4 and 5, and 7 and 8 of the fore-wings rising from a common stalk.)

SUB-FAMILY II.—CANEPHORINÆ.

The male with moderately broad wings, rounded behind, and the hind-wings as broad as the fore-wings; body slender, with thin hairs, the abdomen extending to the anal angle; pectinations of the antennæ rather short.

GENUS I.—EPICHNOPTERYX (HÜBN.).

Wings semi-transparent, with hair-like scales, and short fringes; fore-wings with ten or eleven nervures, and hind-wings with the discoidal cell divided, and seven nervures. The female is worm-like, but with rudiments of legs and antennæ, which are sometimes jointed; and some species are also provided with an ovipositor; but they never quit their cases. The larvæ feed on grass.

1. *E. Bombycella* (W. V.).—Wings broad, pale ochre-yellow, fore-wings indistinctly reticulated with darker. Female dirty yellow, with shining yellowish-brown plates on the 2nd and 3rd segments, and a black one on the 4th. The antennæ are articulated; and it possesses an ovipositor. The variety *Rotundella* (Bruand), from France and Switzerland, is unicolorous, and not reticulated. The male expands three-quarters of an inch. It inhabits Southern and some parts of Central Europe in June. The case is cylindrical, and covered with stalks of grass, arranged lengthways.

2. *E. Undulella* (Rössl.).—Rather less than *E. Pulla;* head brown; abdomen ochraceous; antennæ with slender yellow pectinations. Wings yellowish-white, tesselated with brown transverse lines, and with brown nervures. It inhabits Hungary and South Russia.

3. *E. Reticulatella* (Bruand).—Brownish-grey; antennæ with slender pectinations, wings rounded, shining, with brown borders, the fringes white and shining. Fore-wings pale whitish-grey, tesselated with transverse brown stripes; hind-wings semi-transparent. It inhabits Dalmatia and Turkey. (*E. Raiblensis*, Mann, from Carinthia, is one-fourth larger, with longer and more thinly scaled, and paler fore-wings, finely and less sharply reticulated. It is found in June and July.)

* 4. *E. Reticella* (Newm.).—Smaller than *Reticulatella* (expands under half an inch), and more transparent; antennæ with fewer pectinations; wings whitish, reticulated with brown; the veins spotted with brown at the extremity; body black, clothed with white hair. Found in June in the south-eastern counties of England.

5. *E. Pectinella* (W. V.).—Wings broad, yellowish-grey, with shining yellowish fringes; body blackish, abdomen with pale hairs at the tip; the pectinations of the antennæ short. It is found in Austria. (*E. Suriens*, Reutti, also from Austria, differs from *Pectinella* in the dark grey colour of the wings and abdomen, and in the much longer pectinations of the antennæ.)

6. *E. Plumella* (Ochs.).—Wings rather long, brownish-grey, with shining yellowish fringes; body black, the abdomen thinly clothed with grey hairs, and the pectinations of the antennæ long. Expands about half an inch. Female reddish-white, slightly brownish above on the thoracic segments, with rudimentary legs and antennæ, and an ovipositor surrounded with white wool. It is found in sunny places in the south and centre of France and Germany from May to July. The case is tube-like, narrower behind, and is brown, covered with grains of earth and sand.

7. *E. Nudella* (Ochs.).—The wings are rather long; pale grey, with whitish shining fringes; body black, and the pectinations of the antennæ shorter. Size of *Plumella*. It inhabits South Germany. The case, which is slender and cylindrical, and narrow behind, is brown, covered with particles of earth. (*E. Nigrolucidella*, Bruand, from France, is darker, with thicker nervures, and the antennæ as in *E. Pulla*. *E. Sappho*, Mill., from Hungary, resembles *O. Hirsutella* in colour, but is darker; and in shape it resembles *E. Pectinella*, though it is twice as large.)

* 8. *E. Pulla* (Esp.).—Wings black, with unicolorous fringes, thickly covered with hair-like scales; fore-wings with the tip but slightly rounded; hind-wings regularly rounded. The pectinations of the antennæ are long, and gradually become shorter towards the extremity. Expands about half an inch. The female is pale reddish-brown, with yellowish plates on segments 2 and 3; a very short ovipositor, surrounded with whitish wool. The case is covered with long stalks of grass; the larva is found in spring, and the perfect insect in May and June. It is common throughout Southern and Central Europe. In this and the following species, the fore-wings of the males have eleven nervures; in the preceding species there are ten. (*E. Tarnierella*, Bruand, from France, has yellowish-brown wings, with silky yellow fringes; the body is stout, the palpi are short and hairy, and the pectinations of the antennæ are thick, but not numerous; the abdomen is thinly clothed with hair. *E. Ardua*, Mann, expands only one-third of an inch; it is uniform black, the wings greyish-yellow, covered with fine long hair-like scales. The fringes are long, and are yellowish at the tips of the fore-wings; the antennæ are one-third of the length of the fore-wings, and the pectinations are wide apart. It inhabits the high Alps in July. *E. Mentonella*, Mill., found at Mentone in April, is perhaps a large variety of *Pulla;* the fore-wings are less pointed at the tip, the antennæ are unusually thick, and the wings are of a deeper uniform black.)

9. *E. Sieboldii* (Reutti).—Wings sooty-brown, fringes and hind margins shining yellowish, thinly clothed with hair-like scales; fore-wings rounded; hind-wings of uniform breadth, the pectinations of the antennæ shorter than in *Pulla*, gradually increasing in length towards the tip. Size of *Pulla*, which the female and case resemble; but the former has four pale yellow plates on the back. It is found in France and Germany in May. In the variety *Heringii* (Heinem.), from North Germany, the hind-wings become gradually broader from the base to beyond the middle, and the pectinations of the antennæ become suddenly short at the tip, so that the three or four last are quite short, and of equal length. (In *E. Helix*, Sieb., found in Germany, France, and Italy, the male is unicolorous dark grey. In *E. Helicinella*, Herr.-Schäff., from South-Western Europe and Sicily, the male is smoky-black, and semi-transparent. The cases in both these species are shaped like snail-shells, and the moths form the new genus *Cochlophanes*, Staud.)

GENUS II.—FUMEA (HAW.).

Differs from *Epichnopteryx* by the dense scaling of the fore-wings, which is not hair-like, at least on the fore-wings, and the fringes are longer. The female has slender jointed legs and antennæ; eyes distinctly facetted; a retractile ovipositor, and pale-coloured wool on the abdomen. The larvæ have horny plates on the thoracic segments, and, after hybernation, live till May. The moths appear in June, and the female quits the case before pairing.

* 1. *F. Nitidella* (Hübn.).—Fore-wings broad, and rounded behind, shining bronzy-brown, with grey fringes, mostly paler at the ends; hind-wings thinly scaled, dark brownish-grey; the antennæ with about sixteen pectinations. Expands about 1 inch. The female is reddish-brown, with square dark spots on the back, and silvery-grey wool on the abdomen. Common in woods throughout the greater part of Europe. The case is covered with long slender stalks of grass. The larva feeds on grass, and also on various trees. (*F. Intermediella*, Bruand, is probably the same as this.)

* 2. *F. Betulina* (Zell.) is a little larger than *Nitidella;* the fore-wings are rather longer, more pointed, and darker, and the antennæ have about eighteen slenderer pectinations. The female is reddish-brown, with white wool on the abdomen, and the case is covered with short stalks of grass and fragments of plants. The larva feeds on lichens growing on trees. Widely distributed in Central Europe.

3. *F. Affinis* (Reutti).—Wings shaped as in *Betulina*, fore-wings shining yellowish-brown; hind-wings distinctly paler; grey, with hair-like scales; the antennæ with twenty-one pectinations. Size of *Betulina*. Female yellowish-brown; the first thoracic plate yellow, the two others spotted with dusky, and the abdomen clothed with yellowish wool. The case is covered with long coarse stalks of grass, projecting a little behind. The larva feeds on grass. This species is found in South Germany. (*F. Crassiorella*, Bruand, from South Europe, is probably the same as this. *F. Comitella*, Bruand, is described as smaller, with the wings a little shorter, and reticulated with darker towards the margins. The larva lives on lichens on old willows, along with that of *Salicicolella*.)

* 4. *F. Sæpium* (Spey.).—Allied to *Affinis*, but the fore-wings are narrower and more pointed, and less widened behind. They are of a shining yellowish-grey or brownish-grey, with an indistinct dark spot beyond the middle; hind-wings paler yellowish-grey, with hair-like scales; antennæ with finer and shorter pectinations. Size of *Nitidella*. Female pale yellow, with grey wool on the abdomen. The case is thick and covered with fragments of lichens, and the larva feeds on lichens growing on trees and walls. This species is widely distributed in Central Europe, and has been found in England.

* 5. *F. Roboricolella* (Bruand).—Shining brownish-black; wings rounded; expands half an inch; female with white wool on the abdomen. The larva feeds on lichens growing on rocks and trees; and the species inhabits France, England, and Ireland. (* *F. Salicicolella*, Bruand, which occurs in France and England, has narrower and longer wings, and the larva lives on lichens growing on willows. The antennæ are very slightly pectinated.)

6. *F. Subflavella* (Mill.).—Size of *Roboricolella*, and colour of *Comitella*, but paler. Wings rather long, with the hind margin rounded; sooty-black, or slightly reddish. The larva is bright yellow in front, and reddish behind. It inhabits South France in June, and the cases of the hybernated larvæ are found on walls in April.

FAMILY IX.—DREPANULIDÆ.

Rather small moths, somewhat resembling *Geometræ*, with which they were formerly classed. Their wings are broad and delicate, and their bodies are rather slender, clothed with flattened hair, and the abdomen does not extend to the anal angle of the hind-wings. The antennæ of the male are bipectinated; the eyes naked, the palpi small, the tongue horny, and the legs slender. The wings are yellow or brown, and occasionally white; and are generally marked with dark transverse lines. The fore-wings have twelve nervures, and the hind-wings eight; nervule 5 is nearer to nervule 4 than to 6. The larvæ have only fourteen legs, the claspers being absent. They have scattered hairs and a hump on the 2nd segment; the head is heart-shaped, and the tail terminates in a point. They are double-brooded, and feed on deciduous trees in June and autumn, and change to pupæ in a loose cocoon. The moths appear in May and August, and rest with their wings sloping. They fly in the evening, but, like other slender-bodied moths, may also be obtained by beating hedges and bushes in the day-time.

GENUS I.—CILIX (LEACH).

The antennæ of the male have short knobbed teeth to the extremity, and those of the female are simple; the frenulum is absent in both sexes, and the wings are rounded. The only species.

* *C. Glaucata*, Scop. (*Spinula*, W. V.), is white, fore-wings with a large brown spot, varied with leaden grey on the inner margin, and a pale grey spot above it, in which the nervures form a fine silvery pattern, resembling a stag's horn. In repose it slopes its wings rather steeply. Expands a little under 1 inch. It is common in Southern and Central Europe, and is often disturbed by beating hedges, when it rushes down to the end of a twig, and sits there, its white colour making it look very conspicuous, notwithstanding its small size. The larva is brown, with a whitish spot on the back, and warty tubercles on the 3rd and 4th segments. The moth is figured at Pl. 30, Fig. 1.

GENUS II.—PLATYPTERYX (LASP.).

The species belonging to this and the following genus have the fore-wings more or less hooked, and are therefore frequently called "Hook-tips." The wings are brown or yellowish, with transverse lines. In *Platypteryx* the antennæ are ciliated to the extremity, the pectinations being shorter in the female, in which sex the frenulum is absent. The hind tibiæ have spurs at the end only. The hind margins of the wings are dentated in the first species. The larvæ are finely hairy, with warty tubercles.

* 1. *P. Lacertinaria* (Linn.).—Fore-wings pale grey, dusted with brown, and with two transverse brown lines; hind-wings whitish. Expands from 1¼ to 1½ inches. It is common throughout Europe, the south excepted. The larva is brown, with large wart-like tubercles on the 3rd and 4th segments, and small warts on the others. It feeds on birch and elder.

* 2. *P. Falcataria* (Linn.).—Pale yellow, with brown waved lines, fore-wings dusted with darker, with a grey egg-shaped spot, veined with black, in the middle. Size of *Lacertinaria*. Common in most parts of Europe and Western Asia. The larva is green, with fleshy points on segments 3 to 6; and reddish-brown on the hinder part of the back. It feeds on birch and elder. The moth is figured at Pl. 30, Fig. 3.

3. *P. Curvatula* (Borkh.).—Violet-brown, with dark brown wavy lines, the fore-wings with two oblique rows of black dots across the middle. Size of the last species. Inhabits the greater part of Central Europe, but is rather scarce, and is the only species of the family not found in Britain. The larva is brown, with fleshy points on the 4th and 5th segments, and lives on elm.

GENUS III.—DREPANA (SCHRANK).

Closely allied to *Platypteryx*, but the fore-wings are less pointed, except in *Sicula*, and therefore less distinctly hooked. The antennæ of the male are not pectinated at the extremity, and those of the female are simple. The hind tibiæ are furnished with four spurs.

* 1. *D. Sicula* (W. V.).—Fawn-colour, with brown zigzag lines, and an irregular brown blotch or band in the middle of the fore-wings, dotted with pale yellow; and with several oblique zigzag dusky lines. Expands about 1½ inches. It is found throughout the greater part of Central Europe, but appears to be scarce everywhere. The larva is reddish-brown, varied with darker; the back is lemon-yellow, with two tubercles on the 4th segment. It feeds on oak and birch.

* 2. *D. Binaria* (Hufn.), *Hamula* (W. V.).—Wings paler or darker rust-colour, suffused with violet-grey, with two pale transverse lines; fore-wings with two large black dots in the middle. Expands from 1 to 1¼ inches. Widely distributed in Central and Southern Europe, but commoner in some localities than in others. The larva is brownish-yellow, and greenish-brown on the front segments, with two pale subdorsal lines. It lives on oak. The moth is figured at Pl. 30, Fig. 2.

*3. *D. Cultraria* (Fabr.), *Unguicula* (Hübn.).—Ochre-yellow, with a broad brown central band bordered with paler. Size of *D. Binaria*. It appears to be common throughout Europe wherever the beech grows. Its larva, which is pale brown, with a rosy spot on the back, feeds on this tree.

FAMILY X.—SATURNIIDÆ.

To this family belong the Atlas and Emperor Moths, formerly placed by Linné in his sub-genus *Attacus*, and it therefore comprises the largest species of *Bombyces*, some of which are among the largest known moths, measuring nearly a foot from tip to tip of the fore-wings. To this family and the true *Bombycidæ* belong all the silkworms of any economic value. The *Saturnidæ* have thick, woolly bodies, a small retracted head, triangular fore-wings, and rounded hind-wings. The palpi and tongue are usually obsolete; the antennæ of the male are plumose, and the legs are woolly. All the wings (except in *Endromis*) are furnished with a coloured or transparent crescent-shaped, or angulated eye-spot in the middle; and the internal nervure of the hind-wings runs to the anal angle. The larvæ are thick and naked, but have generally warty tubercles covered with spines. They change into a thick obtuse pupa enclosed in a cocoon, and generally hybernate in this state. The males fly rapidly and unsteadily during the day, and the females sit quietly awaiting them. The former can frequently be taken in numbers by "assembling."

GENUS I.—ENDROMIS (OCHS.).

The pectinations of the antennæ moderately long and thick in the male, and small in the female; wings chequered, with no eye-spot. The abdomen extends a little beyond the anal angle of the hind-wings. The larva is smooth, with a pyramidal elevation on the 12th segment. The only species, **E. Versicolora*, Linn. (the *Kentish Glory*), has brown fore-wings, chequered with whitish, with two brown transverse lines bordered with whitish, and an angulated brown streak on the hind-wings, which are rusty-yellow in the male, and whitish in the female. Expands from 2¼ to 2½ inches. It seems to be found throughout Europe, except the south, frequenting woods in April, but is seldom common. In the morning the females sit at the ends of the birch-twigs, and may be beaten from them. About eleven o'clock the males begin to fly about in search of the females, which drop off the twigs after pairing, and are then difficult to find. The larva is green, with two white longitudinal streaks on the upper side of the front segments, and with white oblique streaks running upwards and forwards on the sides of the hinder ones. It feeds on birch and alder in May and June. The male, female, and larva are figured at Pl. 27, Fig. 1, *a—c*. (This genus should probably be referred to the *Bombycidæ* rather than to the *Saturniidæ*.)

GENUS II.—AGLIA (OCHS.).

Antennæ with long pectinations in the male, and serrated in the female; the wings with eye-spots with white centres; fore-wings rather pointed. The larva with protuberances on the back. The only species, *A. Tau*, Linn. (the *Tau Emperor*), is ochre-yellow, with a brown streak edged with whitish before the hind margins (absent on the fore-wings in the female), and a blue eye in the middle of each wing, containing a white T-shaped spot, and surrounded with a black ring. Expands from 2¼ to 2½ inches. It is common in many parts of Central Europe (except Britain) and Northern Asia. The moth appears from March to May, and the females are found sitting on the trunks of trees, or on the ground among dry leaves; and the males fly rapidly by day. The larva is green, with five red spines when young, which it loses when full-grown. It has

yellowish-white oblique stripes on the sides, running upwards and forwards, and a yellowish line on the sides, which is broadest on the 4th segment. It feeds on beech, lime, and oak in June and July.

GENUS III.—SATURNIA (SCHRANK).

Antennæ with long pectinations in the male, and short ones in the female; wings with dark zigzag lines, and an eye in each, surrounded with a dark or coloured ring. The abdomen rarely extends as far as the anal angle of the hind-wings. The larvæ have large tubercles, bearing star-like clusters of short bristles. They construct a hard pear-shaped cocoon, which is closed at the thin end by elastic bristles like a weir.

1. *S. Pyri* (W. V.), (*Great Peacock Moth*).—Dark grey, with a marginal white band, brownish behind, and black eyes dusted with violet-blue, surrounded with black and fawn-coloured rings, between which is a white and red crescent on the basal side. It expands nearly 6 inches, and is the largest Lepidopterous insect found in Europe. Common in South Europe and Western Asia in May, and found as far north as Paris and Vienna. The larva is green, with blue warts studded with short hairs, among which are two longer ones, knobbed at the extremity. It lives on apple, sloe, &c., in July and August. The moth and larva are figured at Pl. 27, Fig. 2, *a*, *b*.

2. *S. Spini* (W. V.).—Both sexes are very similar to the female of *S. Carpini*, but the dark double zigzag line ends about the middle of the inner margin, and the pectinations of the antennæ of the female are much longer. Expands from 2½ to 3 inches. It inhabits South-Eastern Europe and Western Asia in May. The larva is black, with golden-yellow tubercles studded with short hair, and feeds on sloe, roses, &c., in June and July.

* 3. *S. Carpini* (W. V.), (*Emperor Moth*).—Male with reddish-brown fore-wings and rusty-yellow hind-wings; female with all the wings grey. The hind margins are white, tinged with dusky externally, and there is a double dark zigzag line which terminates on the inner margin of the fore-wings much beyond the middle, and a black central eye on each wing, which contains a white crescent, but is otherwise similar to that of *S. Pyri*. Expands from 2¼ to 2¾ inches. It is common throughout Europe and Northern and Western Asia in May. The larva is green, with black transverse bands and reddish tubercles studded with short hair. It feeds on sloe, heath, &c., in July and August. Both sexes, and the transformations, are figured at Pl. 27, Fig. 3, *a*—*e*.

4. *S. Cæcigena* (Esp.).—Ochre-yellow, suffused with rosy in the female, with two dark brown zigzag stripes, and a dark brown ring in the middle of each wing. Expands from 3 to 3¼ inches. It is found in South-Eastern Europe and Western Asia in September and October. The larva is greenish-yellow, or brown, with a yellowish stripe on the sides, reddish or dark brown bands, and yellow tubercles, covered with short hairs. It feeds on oak in June. The moth is figured at Pl. 53, Fig. 4.

GENUS IV.—ACTIAS (LEACH).

The only European species, *A. Isabellæ* (Graells), is grass-green, with the hind margins paler, bordered, and on the fore-wings bisected, with dark lines, and the nervures broadly reddish. There is an eye in the middle of each wing, with an oval white pupil, bordered first with reddish-brown, and then with a ring dusky within and yellow without, and finally enclosed by a black ring. The hind-wings of the male terminate in a long tail, curving outwards, and those of the female in one much shorter and broader. Expands nearly 3½ inches. This magnificent insect, which is not closely allied to any other known species, is confined to Spain. The few other species of the genus inhabit South-Eastern Asia, from India to the Amoor; North America; and South


1.b
1.c
2.a
A.
2.b
3.c
3.d
3.a
3.b
1.a
3.c
C.
B.

Africa. The larva is green, with a reddish-brown line bordered with white on the back, and transverse bands, alternately brown and white, on the sides, bearing white tubercles studded with short hair. It feeds on *Pinus maritima* in July, and the moth appears in the following May. The transformations are figured at Pl. 53, Fig. 1, *a—c*.

GENUS V.—ATTACUS (LINN.).

The fore-wings are deeply concave below the tip; the body is stout and very short; and the central spots are crescent-shaped instead of round. I include **A. Cynthia* (Drury)—the well-known Ailanthus Silkworm—in the present work, because, although an East Indian insect, it is naturalised at Colchester, Paris, and probably other places in Europe. The moth is dull olive-green, with a black ocellus, edged internally with a white lunule, a little below the tip of the fore-wings. Both wings are traversed by a broad suffused pink band, edged internally with white and then black, which touches the extremity of a large transparent lunule, edged below with yellow. On the fore-wings the inner extremity of the lunule touches a white stripe running from the costa, which there meets a similar one running from the base. There is also a white transverse stripe towards the base of the hind-wings. Expands from 5 to 6 inches. The larva varies from yellow to greyish-blue and deep green, according to age; it is spotted with black, and studded with long white tubercles, which secrete a waxy powder. It feeds on *Ailanthus glandulosa* (a naturalised tree), but will also eat lilac, &c., and constructs a cocoon resembling course brownish paper, which is folded in a leaf of the tree. The insects pass the winter in the pupa state, and the moths emerge in early summer, when they lay eggs, which hatch within a fortnight. (The oak-feeding silkworms from China and Japan, *Antheræa Pernyi* and *Yama-Mai* of Guérin-Ménéville, only require a passing notice here, as they are never likely to become naturalised in Europe. They are nearly of the shape and size of *Saturnia Pyri*, and are generally of a buff or yellow colour, with a large, round, perfectly transparent spot in the middle of each wing, and a pale line near the hind margins.)

FAMILY XI.—LASIOCAMPIDÆ.

Rather large or moderate-sized moths, with thick, hairy bodies, and strong wings, which are not large in comparison to the size of the insects. The antennæ are short, pectinated in the male, and slightly so in the female. The legs are short and strong, the hind tibiæ have spurs at the end only, and the abdomen extends rather beyond the anal angle of the hind-wings. The fore-wings form a longer or shorter triangle, and are slightly pointed at the tips; the hind-wings are small and rounded, and are not folded in repose. All the wings have a short discoidal cell, and the hind-wings have generally an accessory cell at the base, from which nervule 7 and the costal nervure rise. The larvæ have sixteen legs, and are covered with soft hair or fur, and are sometimes tufted. They change into a thick obtuse pupa, and the moths fly very rapidly by night or in the day-time, and hold their wings steeply sloping when at rest, so that the costa of the hind-wings often projects from under the fore-wings. The female is generally larger than the male, and of a much paler colour.

GENUS I.—GASTROPACHA (OCHS.).

The palpi project in a kind of beak, and the hind margins are dentated; those of the fore-wings being very long and curved. The larvæ cling closely to the trunks and branches of trees. The cocoon is loose, and the pupa is dusted with whitish.

1. *G. Betulifolia* (Fabr.).—Wings reddish-brown, suffused with grey on the hind margins, and with white fringes spotted with brown; the fore-wings are marked with three rows of blackish lunules, and are deeply excavated at the hinder angle. Expands from 1½ to nearly 2 inches. It occurs throughout the greater part of Central Europe and Northern Asia in May, but is scarce in most localities, and absent from Britain and Scandinavia. The larva is grey, with reddish-yellow transverse stripes on the 3rd and 4th segments, and a short tubercle on the last segment but one. The belly is rust-colour, spotted with brown. It lives on oak, birch, &c., in autumn.

* 2. *G. Ilicifolia* (Linn.).—Very like the last species, but more suffused with grey; hind-wings almost entirely grey, with a paler band in the middle; a square greyish-white spot in the middle of the fore-wings. Expands from 1½ to 1¾ inches. It seems to be found throughout Central Europe and Northern Asia in April and May, but is everywhere a scarce and local insect. The larva is rust-coloured, with a black stripe on the back, on which stand white dots; and with reddish-yellow transverse spots on the 3rd and 4th segments; or else it is grey, and the back white, with a broad black central stripe interrupted by rust-coloured spots dotted with black. It feeds on sallow and bilberry in July and August.

3. *G. Suberifolia* (Dup.).—Pale coffee-brown, with reddish fringes. It is of the size of the last two species, but the hind margins are less dentated, the hind-wings are more oblong, and the transverse lines are nearly obsolete. It is found in South France, Spain, and North Africa in August, but is a very scarce insect. The larva feeds on *Quercus Suber* in June.

* 4. *G. Quercifolia* (Linn.), (*Lappet Moth*).—Reddish-brown; the fore-wings with three black lines, more or less dentated; but the inner margin is not concave. It varies much in depth of colouring; the var. *Alnifolia* (Ochs.) is dark brown, and the var. called by the same name by Dahl is pale yellowish-grey, with the markings sharply defined. Expands from 2 to 3 inches. It is found throughout the greater part of Europe and Northern and Western Asia in June and July. The larva is brown or grey, with blue transverse spots on the 3rd and 4th segments, small hairy tubercles on the sides, and a tubercle on the last segment but one. It lives from autumn to May on fruit-trees, sloe, willow, &c., and is often met with in plantations of young trees. The transformations are figured at Pl. 28, Fig. 1, *a—c*.

5. *G. Populifolia* (W. V.).—Resembles the last species, but the wings are longer and paler, and the fore-wings are marked with five rows of dark lunules. A smaller and paler brood of both this species and the last is met with in warm summers. It is found throughout Central Europe (except England) in June, but appears to be scarce everywhere. The larva resembles that of *Quercifolia*, but the transverse spot on the 4th segment is reddish-yellow, bordered with dark grey. It lives on poplars and willows from autumn to May.

GENUS II.—LASIOCAMPA (SCHRANK).

Hind margins of the wings, or at least of the hind-wings, dentated or waved (except in *L. Rubi*), and shorter than the inner margin; fore-wings generally with a pale spot in the middle. The cocoon is rather loose.

1. *L. Pruni* (Linn.).—Reddish-orange; all the wings dentated; fore-wings with a whitish spot in the middle, and two dark transverse lines, the hinder one dentated, and reaching the costa much before the tip. Expands about 2¼ inches. Found throughout a great part of Central and Southern Europe (except Britain) in June and July, but is a scarce insect. The larva is bluish-grey, spotted with whitish, with yellowish longitudinal lines, a reddish-yellow transverse spot on the 4th segment, and a hairy tubercle on the last segment but one. It lives from autumn to May on forest-trees and fruit-trees. The moth is figured at Pl. 28, Fig. 2.


6b.
4c.
8a.
6a.
5.
2.
8b.
4a.
4b.
1c.
7c.
3c.
1a.
7b.
3a.
7a.
3b.
1b.
C.
B.
A.

2. *L. Pini* (Linn.).—Fore-wings with the hind margin waved, grey, but varying much in depth of colour, generally with a reddish-brown band at the base, and another beyond the middle; a white spot before the middle, and two or three dentated black transverse lines, the last of which forms large curves; the hind-wings are dark reddish-brown. Expands about 2½ inches. It is common in pine-forests throughout Central Europe (except Britain) and Northern Asia from the end of June to August. The larva, which is often very destructive, is ashy-grey, with red hairs, and brown lozenge-shaped spots on the back, and brown stripes on the sides, blue transverse spots on the 3rd and 4th segments, and a tubercle on the last segment but one. It feeds on *Pinus sylvestris* from autumn to the beginning of June. The transformations are figured at Pl. 28, Fig. 3, *a—c.*

* 3. *L. Potatoria* (Linn.), (*Drinker Moth*).—Wings with the hind margins slightly waved, ochre-yellow, suffused with purplish-brown in the male, with two white spots before the middle, and a brown line running from the tip to the inner margin. Expands from 2 to 2½ inches. Common throughout the greater part of Europe and Northern Asia in June and July. The larva is dark brown, with a yellow stripe broken into spots on the sides, and a black tuft of hair on the 3rd segment, and also on the last but one. It feeds on grass from autumn to June, and is one of the most frequently observed and easiest reared larvæ among our moths. The male, female, and young larva are figured at Pl. 28, Fig. 4, *a—c.*

4. *L. Lunigera* (Esp.), *Lobulina* (Esp.).—Hind margins dentated, and fringes chequered with black and white; fore-wings dark grey, dusted with pale grey, with a white lunule in the middle, and two black transverse stripes bordered with whitish; hind-wings dark grey. Expands about 2 inches. It is found in Northern Europe and South Germany in August, but is a scarce and local insect. The larva has tufts of hair on the back, and longer ones on the 3rd segment and the last segment but one. It is blue or violet, with black spots on a yellow ground on the back, and oblique yellowish streaks on the sides. It lives on fir-trees from autumn to June.

5. *L. Lineosa* (De Vill.).—Fore-wings ashy-grey, with an oblique white band, bordered on both sides with black, and sinuated and angulated externally, running from the tip to near the base of the inner margin. There are two angulated black spots above it near the tip. The fringes are white, spotted with black, and the hind-wings are uniform dark ashy-grey. Expands about 2½ inches. It is found in South France and Spain in June. The larva feeds on cypress. It hybernates, and arrives at maturity about the end of April. (*L. Otus*, Drury, from South-Eastern Europe and Asia Minor, is the largest species of the genus, expanding 4½ inches. The wings are long and narrow, entire, and of a luteous-brown colour, the fore-wings with two denticulated black transverse lines, and a dark patch near the base. It is figured at Pl. 53, Fig. 2.

* 6. *L. Trifolii* (W. V.).—Wings with the hind margins waved, brownish-red, or reddish-grey; fore-wings with a white central spot, and a curved whitish oblique streak behind. It is very variable; the variety *Medicaginis* (Borkh.) has rusty-brown wings; in variety *Cocles* (Hübn.) the wings are reticulated with yellow; and the variety *Retamæ* (Herr.-Schäff.) has yellow fore-wings, with brown bands. Expands from 2 to 2¾ inches. It is widely distributed, and not uncommon in Southern and Central Europe and Western Asia in July and August. The larva is covered with thick brownish-yellow felty hair. It has dark blue incisions, dotted with white, a yellowish streak on the sides, and an orange-yellow head. It lives from autumn to June on grass and low plants. (*L. Eversmanni*, Eversm., from the Ural, is perhaps a variety of this. It is ochreous, with the hind-wings darker, and the fore-wings have the fringes, a waved stripe near the middle, and a ring in the middle brown. The larva is black, with yellow lines on the back, and yellow dashes on the sides. The 2nd segment, and a broad stripe above the dashes, are orange. It is said to feed either on scabious or on acacia.)

* 7. *L. Quercus* (Linn.), (*Oak Eggar*).—Hind margins scarcely waved; wings chestnut-brown in the male, and ochre-yellow in the female, with a broad pale yellow transverse band, suffused externally, beyond the middle, and a white spot in the middle of the fore-wings. In the variety *Callunæ* (Palmer) the transverse stripe on the inner margin of the hind-wings is rather curved, and the ground-colour of the male is reddish-grey. Expands from 2¼ to 3 inches. Common throughout Europe and Northern and Western Asia in July and August. The male flies very rapidly by day, and can scarcely be captured on the wing, except by "assembling." It is easily bred from the larva, which resembles that of *Trifolii*, but the incisions are black, dotted with white, and the stripe on the sides is white. It feeds on trees, heath, and low plants from autumn to June. In mountainous districts the larva does not form its cocoon till July, and the pupa also hybernates, the moth appearing in the following June. Both sexes of the moth are figured, with their transformations, at Pl. 29, Fig. 1, *a—e*.

* 8. *L. Rubi* (Linn.), (*Fox Moth*).—Wings rounded, cinnamon-brown in the male, and greyish-brown in the female; fringes unspotted; fore-wings with two nearly straight whitish tranverse stripes, but with no white central spot. Expands from 2 to 2½ inches. It is common throughout Europe (except the extreme north and south) and in the Altai in May and June. The male flies on heaths towards evening. The larva, which smells of musk, has rather long hair; when young it is black, with reddish-yellow bands; and when full-grown it is brown, and the sides are black, with dark blue incisions. It lives chiefly on heath, and hybernates when full-grown, becoming a pupa in spring in its winter quarters. It is very difficult to keep alive through the winter. The larva and both sexes of the moth are figured at Pl. 29, Fig. 2, *a—c*.

GENUS III.—CLISIOCAMPA (STEPH.).

Wings rounded, the fore-wings with no pale spot in the middle; the palpi small, generally entirely concealed by the hair. The abdomen of the female is not tufted at the extremity. The cocoon is barrel-shaped.

* 1. *C. Cratægi* (Linn.).—Fore-wings pale grey, with the central area darker grey, and bordered by two black transverse lines, the hindermost of which forms two angles. The long fringes are regularly intersected with dusky, and the hind-wings are brownish. The colour varies from pale to dark, and the central area is sometimes scarcely darkened. Expands from 1¼ to 1½ inches. It is found throughout Europe and Western Asia in September and October. The larva is clothed with thin hair, and is bluish-black, with brick-red hairy warts, white or yellow transverse bands, and a white line, broken into spots, on the sides. It lives on hawthorn, sloe, and willow in May and June. (*C. Ilicis*, Ramb., from Spain, resembles *Cratægi*, but the transverse lines of the fore-wings are more sinuated and angular, and there is an additional line towards the hind margin. Its slender reddish larva feeds on oak in May.)

* 2. *C. Populi* (Linn.).—Wings thinly scaled, with spotted fringes; fore-wings dark grey, with two pale yellow transverse stripes, one near the base and the other beyond the middle; hind-wings pale grey. Expands from 1½ to 1¾ inches. It is not uncommon throughout the greater part of Europe, appearing from September to December, according to the locality. The larva is thinly clothed with hair, and is grey, with a row of darker and often connected spots, small reddish-yellow warts on the back, and a reddish-yellow transverse spot on the back of the neck. It feeds on various trees, and may be found on the trunks during the day in spring and early summer. The moth is figured at Pl. 28, Fig. 5. (*C. Intermedia*, Mill., found at Cannes in December, resembles this, but is more densely scaled, the fore-wings are more varied, and the white basal line is replaced by a large dull fulvous spot surrounded with whitish.)

3. *C. Franconica* (W. V.).—Wings thinly scaled, dark olive-brown in the male, with whitish irregularly-spotted fringes; fore-wings with two indistinct pale yellow transverse stripes; those of the female uniform brownish-red. The fore-wings form an obtuse angle below the tip. Expands about 1¼ inches. It is found in South Europe and Western Asia in July and August, and is also met with in some parts of South-Western Germany. The larva is bluish-black, with yellow hairs, and a blue stripe on the back followed by four yellowish-red lines. There is also a pale blue streak on the sides, and a reddish-yellow line below it. It feeds on various plants in May and June. (*C. Alpicola*, Staud., found in the high Alps, is smaller, with more rounded and opaque wings. The fore-wings of the male are chocolate-brown, with a very broad oblique transverse band, and those of the female are dark reddish-brown, with an indistinct oblique line, but not paler in the centre. It appears from July to September, and the larva lives on different species of willow, and on *Rosa pimpinellifolia*.)

*4. *C. Neustria* (Linn.), (*Lackey Moth*).—Fore-wings ochre-yellow, with two brown nearly straight transverse stripes; or brownish-red, with two pale yellow ones; the intermediate space is generally darker. The hind-wings are paler, and the fringes are irregularly spotted with brown. Expands from 1¼ to 1½ inches. Common throughout Europe and Northern and Western Asia in July and August. The larva is covered with soft, thin hair; there is a white line on the back, and blue, red, and yellow longitudinal streaks. The eggs are laid closely together in a broad ring round a branch; the larvæ hatch in the following April, and live till June under a common web on forest and fruit trees. They are often destructive, but the eggs, or the nests with the young larvæ, are readily discovered and destroyed. The moth and larva are figured at Pl. 28, Fig. 6, *a*, *b*.

*5. *C. Castrensis* (Linn.).—Fore-wings of the male pale yellow, with two brown transverse stripes connected in the middle and shaded with brown beyond; those of the female are reddish-brown, with two indistinct pale yellow transverse stripes; hind-wings brown, fringes irregularly spotted. The variety *Taraxacoides* (Bell.), from South France, has unicolorous straw-coloured wings. Size, times of appearance, distribution, &c., similar to *Neustria*, but *Castrensis* is a much scarcer species. The larva is orange on the back, and blue on the sides, with black streaks and spots, and a whitish line on the back bordered with blue. It lives on heath, spurge, &c., in May and June. The sexes and larva are figured at Pl. 28, Fig. 7, *a—c*. (*C. Neogena*, Waldh., is brown, with an ash-coloured spot in the middle of the fore-wings, and a double row of connected ashy lunules before the hind margin; the hind-wings are also ashy. It occurs in South Russia and Western Asia.)

GENUS IV.—ERIOGASTER (GERM.).

Wings rounded; fore-wings with a white spot in the middle; abdomen of the female with an anal tuft. The moths appear from August to October, except *Lanestris*, which is met with in February. The larvæ live gregariously under a web when young, and disperse when older. They may be looked for in May and June. The moths expand from 1¼ to 1¾ inches.

1. *E. Rimicola* (W. V.).—Fore-wings reddish-grey, with the hind margins more thinly scaled, and with a white spot in the middle; hind-wings paler. Widely distributed in Central Europe, except the north-west. It has not hitherto been recorded as British, but it seems to agree with the description of an insect which has been stated to appear a week before *E. Lanestris*, in Worcestershire; this may really be *E. Rimicola*. The larva is thinly hairy, ashy-grey, with a blue stripe on the back, edged first with black and then with white, on each of which stand reddish-yellow warts. It feeds on oak, and is figured, with the moth, at Pl. 29, Fig. 3, *a*, *b*.

2. *E. Catax* (Linn.).—Fore-wings golden-yellow in the male, with a central white spot, and the hind margin reddish-grey; and rust-red in the female, with a pale transverse stripe behind the white spot; hind-wings paler, without markings. Common in most parts of Central Europe, except Britain. The larva is yellowish-brown, with deep black incisions, bluish-black spots on the back, and blue spots on the sides, streaked and dotted with yellow. It feeds on sloe and birch. The sexes of the moth are figured at Pl. 28, Fig. 8, *a*, *b*.

* 3. *E. Lanestris* (Linn.), (*Small Eggar*).—Fore-wings rusty-brown, often suffused with grey in the male, with a white spot at the base and another in the middle, and an oblique white stripe before the hind margin; the hind-wings are paler, with a whitish streak in the middle. Common throughout Europe. The larva is dark blue, with two rows of large and densely-hairy reddish-yellow warts on the back, and white spots between them; it lives on sloe, hawthorn, &c., and is figured, with the larva, at Pl. 29, Fig. 4, *a*, *b*. (*E. Loti*, Ochs., from Spain, is reddish-brown in the male, and ash-colour in the female, with a white spot in the middle of the fore-wings, and a waved white line behind it. The larva lives on gum cistus.

GENUS V.—CRATERONYX (DUP.).

Wings rounded, rather long; nervules 6 and 7 of the hind-wings rise from the front angle of the discoidal cell, and the costal nervure rises from the base. The pectinations of the antennæ are very long in the male, and a little shorter in the female. The larvæ are covered with thin short hair, and with small warts; they live on low plants in May and June, and hide themselves in the ground during the day. They change to pupæ on the surface of the ground without forming a cocoon, and the moths appear in October.

1. *C. Dumeti* (Linn.).—Wings dark olive-brown, with a slightly-curved ochre-yellow transverse stripe, and an ochre-yellow spot in the middle of the fore-wings. Expands about 2 inches. It is found throughout the greater part of Europe, except Britain, but is considered a scarce insect. The larva is dark grey, with a row of deep black, oval, transverse spots on each side of the back; it feeds on *Hieracium*, dandelion, &c. The moth is figured at Pl. 29, Fig. 5. (*C. Balcanica*, Herr.-Schäff., from Bulgaria and Armenia, is ochreous-grey in the male, and brownish-grey in the female, with a pale stripe near the middle of the wings, and a large brown spot in the middle of the fore-wings, surrounded with paler.)

2. *C. Taraxaci* (W. V.).—Ochre-yellow; the female paler, with a small black dot before the middle of the fore-wings, and black hind-wings. Rather smaller than *Dumeti*. A local species in the southern half of Central Europe. The larva is orange on the back, and dark brown on the sides, with deep black spots on the sides of the back. It feeds on dandelion.

GENUS VI.—MEGASOMA (BOISD.).

Body thick, and extending considerably beyond the hind-wings; palpi stout, projecting beyond the head; antennæ of the male deeply pectinated towards the base, and moderately towards the tip; those of the female slightly pectinated. Wings long and rather narrow; hind margin of the fore-wings very oblique. The only European species, *M. Repanda* (Hübn.), is found in Spain and North Africa. It is reddish-brown, with two red spots on the thorax; fore-wings with a curved brown lunule, a waved white stripe, and a white spot at the base; hind-wings reddish-white. In the male the shoulders and the disc of the fore-wings are darker. Expands from 2 to 2½ inches. The male is much smaller than the female. The larva lives on different species of *Spartium*. It is abundant at Cadiz, where there is a succession of broods throughout the year.


2c.
2b.
2a.
1d.
5.
1a.
1e.
4a.
4b.
A.
3a.
3b.
1b.
B.
1c.
C.

FAMILY XII.—BOMBYCIDÆ.

The only European species is the well-known Silkworm (*Bombyx Mori*, Linn.), which is reared throughout Southern Europe (where its silk is a staple article of trade), and has become naturalised in many places, though it was originally a native of China. The palpi are very short, the body is large and thick, and the abdomen extends beyond the hind-wings. The antennæ are deeply pectinated in both sexes, and the legs are stout and hairy. The wings, which have lost their power of flight in the domesticated races from disuse, expand from 1½ to 2 inches, and are of a yellowish-white, with indistinct dusky transverse lines. The fore-wings are slightly falcate. The larva is creamy-white, with a hump on the last segment but one. Its real food is the white mulberry, but in England it is often fed on lettuce. It spins a small oval yellow or white cocoon, but is not reared for commercial purposes in England. I have been informed by an experienced silk-throwster of Dublin, that British-grown silk, although of excellent quality, is too short to be of any commercial value.

FAMILY XIII.—NOTODONTIDÆ.

Moderate-sized or rather large moths, generally with stout hairy bodies extending beyond the hind-wings. The wings are strong; the fore-wings long and triangular, often with a projecting tooth-like tuft of scales on the inner margin; the hind-wings slenderer, smaller, and folded in repose. The thorax is short, and the antennæ of the male are pectinated, and those of the female are more slightly pectinated, serrated, or simply ciliated. The tongue and palpi are generally slightly developed; the legs are short, and the thighs are densely woolly. Several species have ocelli. The larvæ are naked, or thinly clothed with hair, with sixteen legs, or fourteen when the claspers are absent; and the pupæ are generally thick and obtuse. The moths fly at night, but may often be found resting on tree-trunks, &c., in the day-time, with their wings sloping rather steeply, and the front pair of legs generally extended. Most of the species emerge from the cocoon in the evening. Though widely distributed, many species of this family seem to be rare everywhere.

GENUS I.—CNETHOCAMPA (STEPH.).

The moths resemble the smaller *Lasiocampidæ;* the fore-part of the body is densely woolly, and the fore-wings are broad, rounded, and triangular, with a dark central lunule, two or three dark transverse stripes, of which the hindermost is slightly dentated, and the fringes spotted with paler; the hind-wings are small, rounded, and whitish. The larvæ have sixteen legs, and are clothed with fine barbed hairs; they live in webs, and go to feed in a regularly-arranged order, whence they are called Processionary Caterpillars. They construct firm oval cocoons, mixed with hairs, which are enclosed in a large common web. The insects are not so common as might be supposed from their gregarious habits. The hairs of the larvæ, as well as the dust in the webs, are highly irritating to the skin; a property from which even the hairs of the moths are not wholly free.

1. *C. Processionea* (Linn.).—Fore-wings shining yellowish-grey, with dark grey transverse stripes and an indistinct central lunule; hind-wings with a dark transverse shade. Forehead hairy. Expands rather more than 1 inch. Common throughout a great part of Southern and Central Europe (except Britain), though somewhat local, in August and September. The larva is bluish-

black on the back, and whitish on the sides, with two small reddish-yellow or grey warts on each segment. It lives on oak in May and June, and goes out to feed at night in a pyramidal procession, one larva at the head, then two behind, then three, four, five, &c., in a row. The moth and larva are figured at Pl. 24, Fig. 7, *a*, *b*.

2. *C. Pityocampa* (W. V.).—Fore-wings varied with grey and whitish, with blackish, often indistinct transverse lines and central spot; hind-wings generally with a grey spot at the anal angle. The forehead is naked, with sharp transverse ridges, and the front tibiæ have a curved horny bristle at the extremity. Expands about 1½ inches. It inhabits Southern and South Central Europe in May and June. The larva is bluish-black above, with a brownish-yellow transverse projection on each segment, and whitish beneath; it lives on fir-trees in July and August, and its habits are similar to those of the last species. (*C. Pinivora*, Tr., is only to be distinguished from *Pityocampa* in the larva state. The larva has triangular black spots on the back, and brownish-red warts. It lives on *Pinus sylvestris* in North Germany, and always walks in single file, and the nests are constructed in the sand at the foot of the trees. The inflammation caused by the hair is so severe as often to produce very obstinate itching eruptions of the skin, which are liable to return after a long interval, for years afterwards. *C.* (?) *Herculeana*, Ramb., from Andalusia, has whitish fore-wings, varied with yellowish, and four waved or indented transverse brown lines; the antennæ and anal tuft are also yellowish in the male. The hind-wings are white, and all the fringes are spotted with brown. In the female the lines are sometimes confluent, and the fore-wings are sometimes entirely reddish-brown, with longitudinal white streaks towards the base, and the hind-wings are also tinged with brown. The larva is thick and blackish, and lives on different species of geranium.)

GENUS II.—PYGÆRA (OCHS.).

Thorax densely clothed with flattened hairs, and crested behind, with a dark longitudinal spot; the antennæ are very short, and the wings are rounded. The fore-wings are grey, with three pale transverse stripes; and darker grey behind, or with a large dark spot at the tip; the hind-wings are brownish-grey, and the fringes unspotted. The abdomen of the male is long, with a bifurcated anal tuft, and the abdomen is raised when at rest. The larvæ have sixteen legs, and are thinly clothed with soft hair. They have long hairy warts on the sides, and hairy tubercles on the 5th and 12th segments. They live in June, and again in autumn, on poplars and willows, between leaves loosely spun together, and change to pupæ in a soft hairy cocoon; the moths appear in May, and again in July and August; but the May brood is the only one which is generally met with in Britain.

1. *P. Timon* (Hübn.).—Fore-wings violet-grey, varied with brown, and spotted with reddish-brown before the hind margin; the hindmost transverse stripe across the middle sharply dentated, forming a white lunule on the costa; hind-wings with two pale transverse stripes. Size of *Anastomosis*. Inhabits Eastern Europe and Northern Asia; found as far west as Moravia and East Prussia, where it is extremely rare. The larva is ashy-grey, with rose-coloured warts, and an additional tubercle on the 6th segment; head brown. It feeds on aspen.

2. *P. Anastomosis* (Linn.).—Fore-wings reddish violet-grey, varied with brown and orange beyond the middle, with the transverse stripes a little paler, and not indented; hind-wings uniform greyish-brown. Expands a little over 1 inch. Widely distributed in Europe, except the north-west and south, but not very common. It also inhabits Siberia. The larva is brown,

black above, with two yellow stripes on the back, and warts covered with red hairs. It lives on aspen and willow.

* 3. *P. Pigra* (Hufn.), *Reclusa* (W. V.).—Wings of a paler grey than in *Anastomosis;* the dark marginal half of the fore-wings bordered with white in front, and the transverse lines whiter, especially the hindermost towards the costa, where it is broader and interrupted. Expands from one-third of an inch to an inch. It appears to be common throughout Europe and Western Asia. The larva is grey, yellow above, with blackish dots, and with yellow dots on the sides; the tubercles on the 5th and 12th segments are black.

* 4. *C. Anachoreta* (W. V.).—Fore-wings brownish ashy-grey, greyish-black varied with yellow at the tip as far as the middle of the costa, and to beyond the middle of the hind margin, with whitish transverse stripes, and black spots above the inner margin. Expands about 1¼ inches. Not uncommon throughout Europe and Northern and Western Asia; the only British locality is Folkestone. The larva is brown; the back is greyish, with interrupted blackish lines and black and yellow spots, and the tubercles are reddish-yellow. It lives on poplars and willows. The moth is figured at Pl. 24, Fig. 8.

* 5. *P. Curtula* (Linn.), (*Chocolate Tip*).—Resembles *Anachoreta*, but the fore-wings are paler, and of a more reddish-grey, and the brownish-red tip only extends as far as the hindmost transverse stripe. Expands about 1¼ inches. Common throughout the greater part of Europe. The larva is brownish-grey, with a reddish line on the back, and reddish-yellow spots on the sides; or greenish-grey, with the sides blackish; or flesh-coloured, with two black lines on the back. The tubercles are always black, and that on the 5th segment is rather large. It lives on poplars and willows.

GENUS III.—PHALERA (HÜBN.).

Thorax with short thick hair, projecting behind. It is yellowish-brown above, and grey at the back and sides. The fore-wings are rather long, with fringes waved at the edges. They are of a mixed silvery-white and silvery-grey colour, obscurely waved with darker, and with two dark brown double transverse lines, the hindermost of which borders a large, pale, ochre-yellow spot, varied with pale brown, which extends to the tip. The hind-wings are whitish-yellow, and the abdomen is long, and ochre-yellow. The larvæ have sixteen legs, and are thinly haired. They feed from July to September, and form their pupæ in the ground. The moths appear in May and June.

* 1. *P. Bucephala* (Linn.), (*Buff-tip*).—The fore-wings are silvery-grey, with a pale yellow spot at the tip extending to the middle of the hind margin, and a small yellowish spot in the middle. The abdomen is spotted with brown on the sides. Expands from 2¼ to 2½ inches. Common in Europe and Northern and Western Asia. The larva is blackish, with longitudinal stripes on the back and sides. It feeds on oak, lime, &c., and the moth is figured at Pl. 31, Fig. 1.

2. *P. Bucephaloides* (Ochs.).—Resembles *Bucephala*, but the yellow spot at the tip of the fore-wings is much larger, and extends over two-thirds of the hind margin. The central spot is larger, and the abdomen is not spotted. It inhabits South Europe and Western Asia. The larva is ashy-grey, with dull, dark, longitudinal stripes and small yellow warts. It feeds on oak.

GENUS IV.—CERURA (SCHRANK).

The whole body is woolly, and the wings are rounded, with very short fringes. The fore-wings have a long oblique hind margin, and are whitish or grey, with oblique rows of

black dots towards the base and hind margin, and blackish transverse lines beyond the middle, which are much dentated. There is often a broad dark-grey transverse band, bordered with black and yellow, and the hind-wings are whitish. The larvæ have only fourteen legs. They are naked; green, with a large, smooth, retractile head, and a pyramidal elevation on the 4th segment, from which a triangular violet or brown spot bordered with white runs to the head, and an irregularly-broad streak of the same colour runs to the tail. The abdomen terminates in two long slender tubes, from which soft threads can be protruded. The larvæ live on trees from July to September, and change to pupæ in a firm cocoon composed of fragments of wood, and the moths appear from May to July.

* 1. *C. Vinula* (Linn.), (*Puss Moth*).—Fore-wings white, suffused with greyish, with dull dark-grey transverse lines, which are much dentated. The thorax is spotted with black, and there are two rows of black spots on the abdomen. The Lapland variety *Phantoma* (Dalm.) is almost entirely black. Expands from 2½ to 3 inches. Common throughout Europe and Northern and Western Asia. The larva is blackish when young, and pale green when full-grown; the head is bordered with red, and the spot behind it and the streak on the back are varied with greyish-brown or red; the streak is much widened in the middle, and varied with greenish. It feeds on poplars and willows. When irritated it discharges an acrid fluid from an opening in the throat. The transformations are figured at Pl. 30, Fig. 4, *a—c*.

2. *C. Erminea* (Esp.).—Resembles *C. Vinula*, but the fore-wings are of a purer white, with more distinct black zigzag lines, and the abdomen is black almost to the extremity, with a white stripe on the back. Size of *Vinula*. Widely distributed in Central and North-Eastern Europe, though generally rare, but absent in the north-west. The larva also resembles that of *Vinula*, but the streak on the back is bluish-grey and narrower, and a white transverse stripe runs from it to the legs on the 8th segment. It feeds on poplars and willows. The moth is figured at Pl. 30, Fig. 5.

* 3. *C. Bifida* (Hübn.).—Fore-wings white, suffused with grey, with dark zigzag transverse lines beyond, and a broad dark-grey transverse band before the middle, which is straight in front and slightly hollowed behind. The thorax is dark grey, varied with rusty-yellow. Expands about 1¾ inches. Widely distributed throughout Europe, and not scarce. The Spanish variety *Urocera* (Boisd.) is darker and more uniform in colour. The larva is pale green, and the head is not bordered with red. The spot on the back of the neck is reddish-brown, and that on the back, which does not touch the other, is violet-brown; and the anal appendages are green, tipped with red. It feeds on poplars, and attaches its cocoon to the trunks. The moth is figured at Pl. 30, Fig. 6.

* 4. *C. Furcula* (Linn.).—Smaller than *Bifida* (expands from 1¼ to 1½ inches); the fore-wings are greyer, and the grey transverse band is irregularly hollowed on the outside. Common in Northern and Central Europe. The larva resembles that of *Bifida*, but the spot on the neck and the dorsal stripe are connected. They are violet, spotted with red and yellow, and the hindmost is sometimes rose-coloured. The anal forks are ringed with brown and yellow. It lives on sallow and aspen.

* 5. *C. Bicuspis* (Borkh.).—Resembles the last two species, but the fore-wings are pure white, and the grey transverse band is much indented on both sides beyond the middle. Expands 1¾ inches. Widely distributed throughout Central Europe, but always scarce. The larva differs from those of its allies by the dorsal streak, which widens as far as segment 8, where it touches the spiracles; the streak is reddish-brown, and is not connected with the spot on the neck, but terminates in a black plate. It feeds on birch, and sometimes beech


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4b.

and alder. (*C. Verbasci*, Fabr., from South France, is pure white, with bluish-black spots on the fore-wings, which are mostly arranged in two interrupted bands; and three orange dots. Expands 1¼ inches. *C. Interrupta*, Christoph, from Sarepta, is rather larger than *Bifida*; the fore-wings are chalky-white, spotted with black at the base and hind margin, with a black central band, broadly interrupted in the male, and sinuated on both sides in the female; but with no reddish-yellow markings; hind-wings white. *C. Æruginosa*, Christoph, also from Sarepta, is allied to *Bicuspis*; the head, thorax, and fore-wings are pale ochreous. The latter are spotted with black at the base and hind margin, and marked with a transverse ashy-grey band, waved on the inside, and denticulated, but scarcely waved, on the outside, and bordered with black. Hind-wings whitish, with ochreous fringes. Size of *Bicuspis*. It appears in June.)

GENUS V.—HYBOCAMPA (LED.).

The thorax is densely clothed with flattened hairs; the fore-wings are rather narrow, and pointed at the tips; the hind margins are rounded, and the fringes very short. The larvæ have fourteen legs, and are truncated behind. There are humps on the six middle segments. They become pupæ in a firm cocoon, covered with pieces of bark and moss, and attached to the trunk of a tree. The only species, *H. Milhauseri* (Fabr.), has the fore-wings varied with lighter and darker grey, a broad interrupted blackish stripe on the inner margin, and an oblique pale yellow band beyond the middle, which is not sharply bounded. The hind-wings are white, spotted with black at the anal angle. Expands 1½ inches. Widely distributed in Southern and Central Europe, except Britain, but always scarce. It appears in May and June. The larva is green, granulated with whitish, with a broad pale brown stripe on the sides; there are small red points on the humps of segments 6 to 10, and a branch-like excrescence, divided above, on that of the 5th segment. It lives on oak in July and August, and the cocoons, which are very difficult to distinguish from the bark, are nearly always found hollowed out by woodpeckers. The moth and larva are figured at Pl. 30, Fig. 7, *a*, *b*.

GENUS VI.—UROPUS (BOISD.).

The thorax is clothed with woolly hair; the fore-wings are rather long and pointed, with the hind margin slightly sinuated, and the hind-wings are short and narrow. The tongue is long and horny, and the antennæ are more than half as long as the fore-wings. The larvæ have fourteen legs, and rather long bodies, clothed with fine and short hair, and the abdomen terminates in two short diverging points. They change to pupæ in the ground. The only European species is *U. Ulmi* (W. V.), a moth with dark grey fore-wings, crossed by two black transverse stripes, the hindmost of which is sharply dentated; and white hind-wings. Expands about 1¾ inches. It occurs in South Europe in April and May. The larva is brownish or yellowish green, with a yellow stripe on the back divided with black, an indistinct pale line on each side below it, and a black arrow-shaped protuberance on the 5th segment. It feeds on elm in June.

GENUS VII.—STAUROPUS (BOISD.).

The thorax is woolly, the fore-wings are rather broad and slightly sinuated on the hind margins, and the hind-wings are rounded. The fringes are longer than in *Uropus*, the tongue is weak, and the abdomen is slightly tufted above. The larvæ have fourteen legs. They are naked,

with humps on the middle segments, and two short anal projections. The legs on the 3rd and 4th segments are exceedingly long. When at rest they raise both the head and tail; and it is from their extraordinary appearance that the only European species, * *S. Fagi* (Linn.), derives its English name of the Lobster Moth. The fore-wings of the moth are brownish-grey, with a much waved and dentated whitish transverse stripe, bordered with dusky, and black spots before the hind margin, marked with whitish in front. Expands from 2¼ to 2¾ inches. The larva is chestnut-brown, with a pale line bordered with dark on the back. It lives on oak, birch, beech, and apple in summer and autumn. The pupa is formed in a soft cocoon between leaves. When the larvæ are reared in captivity they are liable to bite off each other's long legs, if too many are kept together. The moth is found throughout the greater part of Europe from May to July, but is not considered very common. The transformations are figured at Pl. 30, Fig 8, *a—c*.

GENUS VIII.—PTILOPHORA (STEPH.).

The thorax is long, and clothed with downy hair; the fore-wings are rather long; the hind margin is waved, and the abdomen is rather narrow. The antennæ are strongly pectinated in the male, and simple in the female. The larvæ, which have sixteen legs, are slender and naked, with no excrescences, and form their cocoons in the ground. The only species, * *P. Plumigera* (W. V.), has rusty-yellow fore-wings, varied with brownish, and a strongly curved and dentated pale transverse stripe beyond the middle. The hind-wings are pale yellowish-grey. Expands nearly 1½ inches. It inhabits Central Europe in October and November. The larva is yellowish-green, darker on the sides, with a bluish line on the back, and three fine whitish lines on each side. It feeds on maple, beech, &c., principally in hilly districts. The moth is figured at Pl. 30, Fig. 9.

GENUS IX.—PTEROSTOMA (GERM.).

Remarkable for the long projecting palpi, which are covered with long scales. The fore-wings have pointed tips and dentated hind margins; and the thorax has three prominent, raised, narrow, longitudinal crests, and long hair behind; the abdomen is slender. The larvæ, which have sixteen legs, are naked and slender, and form their cocoons in the ground. The only species, * *P. Palpina* (Linn.), has pale ochre-yellow fore-wings, varied with brownish, and two dark brown, strongly-dentated transverse lines, and a double row of dark spots at the ends of the teeth of the last line; the hind-wings are brownish-grey. Expands from 1¾ to 2 inches. Common throughout Europe in May and June. The larva is bluish-green, with the sides darker, varied with whitish, with four slender pale lines on the back and a yellow stripe on the sides. It lives on poplar, willow, and oak from July to October. The moth is figured at Pl. 31, Fig. 2.

GENUS X.—SPATALIA (HÜBN.).

The thorax is clothed with rather flattened hair; the fore-wings are rather broad, with a long and much dentated hind margin, and with two tooth-like tufts of scales on the inner margin, a large one near the middle, and a smaller one near the hinder angle. The hind-wings are short and rounded, and the thorax has a crest, projecting in front. The larvæ have sixteen legs, and are smooth, with two small globular elevations close together on the 5th segment, a transverse tuft on the 11th, and small points on the 12th segment. They construct


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3a.
8.
3b.
9b.
C.
A. B.

a slight cocoon under moss. The only species is *S. Argentina* (W. V.). The fore-wings are olive-grey, varied with darker. There is a large triangular silvery spot above the inner margin before the middle, and a small silver lunule behind it; and the space between them is varied with orange. Expands from 1¼ to 1½ inches. It inhabits the southern portions of Central Europe in April and May, but is scarce. The larva is of a mixed reddish-brown and grey, faintly shining, and spotted with yellowish on the sides. It feeds on oak from June to August.

GENUS XI.—LOPHOPTERYX (STEPH.).

The thorax is densely covered with scaly hairs, with a large crest, elevated in front, and depressed in the middle; the abdomen is slender. The fore-wings are pointed at the tips, and the hind margins are dentated; the hind-wings are broad and rounded. The larvæ have sixteen legs, short, scattered, fine hairs, and excrescences on the last segment but one. They change to pupæ beneath the ground.

* 1. *L. Cucullina* (W. V.).—The fore-wings are rusty-brown; the costa is pale ochre-yellow, and the hind margin is alternately white and pale grey. There is an indistinct dentated black transverse line beyond the middle; and the hind-wings are brownish-grey. Expands about 1½ inches. Widely distributed in Central Europe in May and June, but rather scarce. The larva is green or pale red, with a dark heart-shaped spot on the back of the neck, a dark line on the back, two short protuberances on each of the middle segments, and a pyramidal elevation on the last segment but one. It feeds on maple in July and August.

* 2. *L. Camelina* (Linn.).—The fore-wings are rusty-brown, varied with rusty-yellow, with black zigzag transverse lines. The hind-wings are yellowish-grey, with the hind margin brownish, and a bluish-black spot at the anal angle. The variety *Giraffina* (Hübn.) is much darker, and nearly blackish. Expands from 1½ to 1¾ inches. It is common in most parts of Europe from April to June. The larva is green or reddish, and the back is whitish. There is a yellow stripe on the sides, dotted with red, and two red points on the 12th segment. It feeds on oak, birch, &c., from June to October; and when at rest it leans its head and front segments backwards, and raises the hinder part of its body at the same time. The larvæ are gregarious when young, but afterwards separate. The moth and larva are figured at Pl. 31, Fig. 3, *a*, *b*.

GENUS XII.—ODONTOSIA (HÜBN.).

The thorax is covered with smooth hair, crested behind, and the hind margins are dentated. The fore-wings are pointed at the tips, and they project a little in the middle of the hind margin; and the hind-wings project at the anal angle. The larvæ are naked and wrinkled, with sixteen legs, but with no protuberances, and change to pupæ in a soft cocoon in the ground.

* 1. *O. Carmelita* (Esp.).—The fore-wings are violet-grey, with indistinct dark lines, and the costa is dark chestnut-brown, and marked with two white spots. The hind-wings are reddish-grey, with a blackish spot at the anal angle. Expands about 1¾ inches. A scarce insect throughout Central Europe in April and May, which may be captured by beating the trunks of young birch-trees. The larva is yellowish-green, with two yellow lines, and a streak of orange-red spots on the sides. It feeds on birch in June and July. The moth is figured at Pl. 31, Fig. 4.

2. *O. Sieversi* (Mén.).—The male is greyish-brown; on the fore-wings there is a narrow

reddish fascia, and the stigmata are bordered with white on both sides. The female is greyish-white, more transparent, and less distinctly marked. Expands 1¾ inches. It is found in Russia and Gallicia in April and May, and the larva is supposed to feed on birch.

GENUS XIII.—MICRODONTA (DUP.).

The thorax is covered with loose woolly hair; the fore-wings are rounded, with the tip rectangular, and the hind-wings are also rounded. The larvæ have sixteen legs. They are smooth, without protuberances, and change to pupæ in a loose cocoon beneath the ground. The only species, * *M. Bicolora* (W. V.), is white, and the fore-wings have a row of orange spots before the middle, bordered in front with black. The two lowest are connected, and produced behind into a longitudinal streak. Expands nearly 1½ inches. Widely distributed in Northern and North-Central Europe from May to July, but not very common. Varieties named *Albida* (Boisd.) and *Unicolora* (Mén.) are sometimes found in Russia, in which the fore-wings are almost or wholly white. The larva is grass-green, whitish above, with four dark lines on the back, and a yellow stripe on the sides. It lives on birch in July and August. The moth is figured at Pl. 31, Fig. 5.

GENUS XIV.—GLUPHISIA (STEPH.).

The thorax is densely hairy; the fore-wings are broad, with long hind and inner margins, the former waved; and the hind-wings are short. The larvæ have sixteen legs, and are naked, without protuberances. They live and undergo their transformations between leaves which they have spun together. The only European species, * *G. Crenata* (Esp.), has dark grey fore-wings, with two black transverse lines bordered with paler before and behind the middle, a similar line, dentated in the middle, before the hind margin, and a pale grey central lunule. The hind-wings are grey, with the hind margin broadly blackish. Expands about 1¼ inches. It appears to be distributed throughout Central Europe, but is a great rarity everywhere. It is double-brooded, appearing in April, and again in July. The larva is yellowish-green, with a whitish line on the back, bordered with yellow, and spotted or intersected with red, and a yellowish stripe on the sides. It feeds on poplar in June and autumn.

GENUS XV.—LEIOCAMPA (STEPH.).

In this and the following genera, the thorax is densely woolly, slightly crested behind; the hind margin of the fore-wings is slightly undulating, and the inner margin has only a slight tooth of scales. The eyes are naked, and the larvæ are sixteen-legged and naked (except in *Notodonta*); the latter live on trees in summer, and form their cocoons in the ground; and the moths appear in spring. In *Leiocampa* the fore-wings are rather long, with an oblique hind margin, the tips truncated, and a slight tooth on the inner margin. They are brown and white, with no transverse markings. The larvæ are smooth, with a slight pyramidal elevation on the 12th segment.

* 1. *L. Dictæa* (Linn.), (*Swallow Prominent*).—Fore-wings pale brown, broadly whitish beneath the costa, with two dark brown longitudinal spots before the tips, and a dark brown longitudinal streak above the inner margin, intersected by whitish dashes, and behind by the whitish nervures; the hind-wings are whitish, with a dark grey spot at the anal angle.

Expands from 2 to 2¼ inches. Not uncommon in most parts of Europe from May to August. The larva is pale shining brown, varied with darker, with a small dark transverse wart on each segment, but with no pale stripe on the sides, or only an indistinct one. It is found in June and autumn on poplar, willow, and birch. The moth is figured at Pl. 31, Fig. 6.

* 2. *L. Dictæoides* (Esp.).—Very like *Dictæa*, but the dark brown longitudinal streak above the inner margin of the fore-wings contains, instead of a white line, a long white triangular spot, the base of which is placed on the hind margin, and is nearly half as long as its height. The polar variety *Frigida* (Zett.) is much darker. Expands from 1½ to 2 inches. Common in most parts of Northern and Central Europe in May and June. The larva is much more glossy than that of *Dictæa*, and is darker, and of a more uniform violet-brown, purplish-brown, or green, with a broad sulphur-yellow stripe on each side. It is found only on birch in July, September, and October.

GENUS XVI.—DRYNOBIA (DUP.).

Fore-wings broad, with the tips rectangular, and a well-marked tooth of scales on the inner margin. They are violet-grey, with double black transverse stripes, filled up with paler. The larvæ are naked, and without lustre. They feed in August and September, and the moths appear in May and June.

1. *D. Velitaris* (Knoch.).—Fore-wings with the first stripe curved, and the hindmost slightly dentated; the tips are whitish on the costa, and dark brown on the inner margin. The hind-wings are brownish-grey, with a suffused pale streak in the middle. Expands from 1½ to 2 inches. A rather scarce and local insect in Central Europe, but not found in Britain. The larva is yellowish-green, with six longitudinal lines formed of white dots, and a carmine-red stripe on the sides, bordered with whitish below. It feeds on oaks, preferring stunted bushes.

2. *D. Melagona* (Scriba).—Resembles *Velitaris*, but the first transverse stripe forms two angles, and the tip of the fore-wings is dark brown on the costa, and ashy-grey on the hind margin. Expands from 1¼ to 1½ inches. Confined to the southern half of Central Europe, and still scarcer than the last species. The larva resembles that of *Velitaris*, but is whitish-green, and the lateral stripe is not red above, but only slightly marked with reddish here and there. It lives on beech.

GENUS XVII.—DRYMONIA (HÜBN.).

Fore-wings broad, with the tips obtuse, grey, with double black lines, filled up with paler, the last of which is dentated. There is also an indistinct waved line before the hind margin, and the tooth of scales on the inner margin is very slight. The larvæ are without protuberances. They feed from June to August, and the moths appear from March to May.

1. *D. Querna* (W. V.).—The fore-wings are violet-grey, with two double black transverse stripes filled up with white; the hinder portion of the central area is whitish, with a large white central lunule; hind-wings white. Expands from 1½ to 1¾ inches. A scarce and local insect in Central Europe, except Britain. The larva is dark green, with two yellow lines on the back, and a yellow stripe on the sides. It lives on oak.

* 2. *D. Chaonia* (W. V.).—The fore-wings resemble those of *Querna*, and are likewise more or less whitish before the hinder transverse stripe, but they are darker grey, and the white lunule is replaced by a black one. The hind-wings are pale grey, with a whitish stripe in the middle. Size of *Querna*. Found throughout Central Europe, but commoner in some

localities than others. The larva is pale shining green, with two whitish lines on the back, and a yellow one on the sides; it feeds on oak. The moth is figured at Pl. 31, Fig. 7.

* 3. *D. Dodonæa* (W. V.).—Resembles *Chaonia*, but very variable. It is more or less varied with whitish, but may be known by the absence of either a white or black lunule on the fore-wings, and by the brownish-yellow abdomen. Rather smaller than *Chaonia*. It appears to be confined to the western portions of Central Europe, and is not very common. The larva is shining green, with two yellowish-white lines on the back, and a golden-yellow stripe on the sides, sometimes spotted with red. It feeds on oak and birch.

GENUS XVIII.—PERIDEA (STEPH.).

The fore-wings are rather long, with the hind margin oblique, and a well-marked tooth of scales on the inner margin. The larva is without protuberances. The only species is * *P. Trepida* (Fabr.), in which the fore-wings are grey, varied with rusty-yellow, with three zigzag rusty-brown double transverse stripes, and a row of rusty-brown spots before the hind margin. The hind-wings are white, with the costa grey. Expands from 2¼ to 2½ inches. Widely distributed in Europe in May and June, but generally rather scarce. The larva is yellowish-green, with a dark green stripe on the back, bordered with yellow; yellow subdorsal lines, and oblique yellow streaks on the sides, bordered above with red. It feeds on oak in July and August.

GENUS XIX.—NOTODONTA (OCHS.).

Differs from the preceding genera in its hairy eyes. The fore-wings are tolerably broad, with the hind margin slightly rounded, and a distinct tooth of scales on the inner margin. The larvæ, which have sixteen legs, are naked, with from two to four fleshy humps on the middle segments, which are curved backwards, and a hump on the 12th segment. When at rest they elevate both extremities of the body. They generally change to pupæ in a cocoon between leaves, and more rarely in the ground. Some species are double-brooded.

1. *N. Torva* (Ochs.).—The fore-wings are brown, dusted with grey, with indistinct dark transverse stripes, and a dark lunule surrounded with paler; the hind-wings are brownish-grey. Expands from 1¾ to 2 inches. Widely distributed in Central Europe, except the north-west, in May. The larva, which is scarcely to be distinguished from that of *Ziczac*, lives on aspen from June to September.

* 2. *N. Tritophus* (W. V.).—Fore-wings dark grey, varied with rusty-brown; the middle of the costa is dusted with whitish. They are marked with dark indistinct transverse stripes, and a large yellowish-brown lunule, surrounded with white. The hind-wings are pale grey, with a suffused whitish stripe in the middle. Expands from 1¾ to 2¼ inches. It is found in May and June, and again in August, throughout Central Europe, but is generally very scarce. The larva is dark green, with three large red humps on segments 6 to 8, and two smaller ones on segments 5 and 9; a red streak on the back as far as the first hump, and an interrupted red stripe on the sides. It lives from July to September on poplars, and undergoes its transformations in the ground. The moth is figured at Pl. 31, Fig. 8.

* 3. *N. Dromedarius* (Linn.).—Fore-wings dark grey, varied with ashy-grey and rusty-red, with dark transverse stripes, bordered with paler; a small whitish central spot, with the centre rust-red, and a rust-red wavy line; the hind-wings are brownish-grey, with a pale stripe in the middle. Expands from 1¾ to 2 inches. Common in Northern and Central Europe from

May to August. The larva is yellowish-green, with red-tipped humps on segments 5 to 8, and a red stripe as far as the first hump. It feeds on birch and alder in May and June, and again in September and October.

*4. *N. Ziczac* (Linn.).—Fore-wings pale reddish-brown, dusted with whitish in the middle below the costa, and with a large oblique dark rusty-brown central lunule, broadly shaded with grey behind; the transverse stripes are only distinct on the costa. The hind-wings are whitish, dusted with pale brown. Expands from 1½ to 1¾ inches. It is common throughout Europe in April and May, and again in July and August. The larva is violet, rose-red, or reddish-brown, varied with whitish, and yellowish on the hinder segments, with two humps on the 6th and 7th segments, and a reddish-brown stripe on the back as far as the first hump. It lives in June and July, and again in September and October, on oaks, poplars, and willows. The transformations are figured at Pl. 31, Fig. 9, *a—d*.

FAMILY XIV.—CYMATOPHORIDÆ.

The species somewhat resemble those belonging to the latter genera of the *Notodontidæ*, but differ both from these and from the *Noctuæ* (among which they are included by Guénée and others) in the neuration of the hind-wings. The moths are of middle size, generally with thick bodies; the thorax is short and woolly, and the abdomen is tapering, and extends a little beyond the anal angle of the hind-wings. The fore-wings are rather long and triangular, with the tip rectangular, and the hind margin scarcely waved. An accessory cellule is also present. The hind-wings are more slender, and are folded when at rest, and covered by the fore-wings. The costal and subcostal nervures of the hind-wings run close together, and do not separate till they reach the point where nervule 7 rises. The antennæ are generally slightly pectinated in the males, and simple in the females; the palpi are small and projecting, and the tongue is stiff and horny. The legs are short; the front tibiæ are provided with a leaf-like appendage, and the hind tibiæ have four spurs. The larvæ are naked, and have sixteen legs. They are remarkable for sitting on a leaf when at rest with their bodies curved like a hook. They change to pupæ in a loose cocoon, and the pupæ are cylindrical in front and tapering behind. The moths fly late in the evening, and are fond of apple-flavouring.

GENUS I.—GONOPHORA (BRUAND).

The head is contracted; the abdomen is furnished with small crests on the upper side of the front segments, and with thick tufts of hair on the sides; the antennæ are scarcely ciliated in the male; the legs are very short, and the middle pair of tibiæ are woolly. The fore-wings are broad, and the hinder angle is rather prominent. The only species, **G. Derasa* (Linn.), has olive-grey fore-wings, with the central area orange. There are four dark zigzag lines beyond the middle, an oblique white line before the hind margin, one running from near the base of the costa to beyond the middle of the inner margin, and two small stigmata, surrounded with paler, below a broad white stripe which runs along the middle of the costa. Hind-wings yellowish-grey. Expands about 1¼ inches. Widely distributed in Central Europe in June and July, but not always common. The larva is reddish-brown, with a dark line on the back, and small round whitish spots on the upper part of the sides of segments 5 and 6. It feeds on bramble and raspberry in August and September, and likes to hide itself during the day in dry rolled-up leaves.

GENUS II.—THYATIRA (OCHS.).

Fore-wings more rounded at the tip than in *Gonophora;* the antennæ filiform in both sexes; the palpi straight, and extending beyond the head. The side tufts on the abdomen in the male of *Gonophora* are absent in *Thyatira*, and the middle pair of tibiæ are not woolly. The only European species, * *T. Batis*, Linn. (the *Peach-blossom Moth*), has dark greenish-brown fore-wings, with five round spots, either rosy or whitish, with the centres brownish; placed at the base; in the centre of the inner margin; at the hinder angle; at the tip; and on the costa before the tip. The hind-wings are brownish-grey. Expands about 1½ inches. Common throughout Europe and Northern and Western Asia. The larva is chequered with brown and rust-colour, with a bifurcated excrescence on the 3rd segment projecting forward, and five tubercles on segments 6 to 10. Habits, times of appearance, and food-plants the same as *G. Derasa.* The moth and larva are figured at Pl. 32, Fig 1, *a*, *b*.

GENUS III.—CYMATOPHORA (TR.).

Body stout, with narrow wings, or slender, with broad wings; fore-wings brownish or grey, with two indistinct dark bands before and behind the middle, each composed of two dark wavy double stripes, and a pale wavy line before the hind margin. The antennæ are not ciliated, the collar is very small, and the abdomen is crested behind on the sides in the male, but not above. The larvæ are tapering behind, with a large round head, and are found between united leaves in summer. The moths appear in spring, and may be dislodged from the trunks of young trees. The genus may be divided into two sections.

A. *Body stout, head contracted, abdomen extending beyond the anal angle of the hind-wings; the legs and palpi very hairy.* The moths (except *Fluctuosa*) are double-brooded, and appear between April and September, and the larvæ are met with in summer and autumn.

* 1. *C. Or* (W. V.).—The fore-wings are brownish ashy-grey, with two dark transverse stripes converging towards the costa, each composed of four black lines. Between these is a small round spot, and a whitish 8-shaped one, filled up with dusky. The tips are divided by a black streak, and the hind-wings are brownish-grey. Expands about 1½ inches. Common in Northern and Central Europe and Northern Asia. The larva is pale green, with a dull dark line on the back, and a dull whitish line on the sides. The head is brownish-yellow, and the mouth is black. It feeds on poplar. The moth and larva are figured at Pl. 32, Fig. 2, *a*, *b*.

* 2. *C. Ocularis* (Linn.).—Differs from *C. Or* by the paler reddish ash-colour of the fore-wings, and the hinder transverse band only consists of two or three lines, approaching the first band on the costa. The two spots are more distinctly filled up with black; and the hind-wings are paler, and have a more distinct pale transverse stripe. Expands from 1¼ to 1½ inches. Common throughout Europe, and Northern and Central Asia. The larva is dull milky-white, with an obscure pale line on the back; head brownish-yellow, with the mouth black, and two small black spots near it. It feeds on aspen.

B. *Body slender, the head not contracted; the legs and palpi are thinly clothed with hair, and the abdomen does not extend beyond the anal angle.*

* 3. *C. Duplaris* (Linn.).—The fore-wings are brownish-grey, pale grey at the base and beyond the middle, with dark wavy lines, and two black dots one above another, instead of spots; hind-wings brownish-grey, with a pale transverse stripe. Expands about 1¼ inches.


7b
5.
8.
3b
2b
2a
3a
6b
6a
1b
1a
7a
4a
9a
9b
4b
C.
A. B. D.

Common in most parts of Europe, and in the Altai. The larva is green, dotted with white when young; when full-grown it is dirty white, with a black plate behind the head (which is reddish-brown, with the mouth black), and two black dots on the sides. It lives on birch and alder.

*4. *C. Fluctuosa* (Hübn.) is darker, more distinctly marked, and differs from *Duplaris* in wanting the two black dots on the fore-wings. Expands 1½ inches. It is found throughout Central Europe in June and July, and sometimes in September and October. The larva is yellowish-white, with a brownish head, and feeds on birch in autumn.

GENUS IV.—ASPHALIA (HÜBN.).

Body thick, fore-wings grey, or brownish, with dark transverse lines; the antennæ of the male rusty-yellow, thickened, and simple (or with short pectinations in *A. Ruficollis* only). The legs are very woolly, and the other characters are those of *Cymatophora*. *A. Diluta* has a small crest on the 3rd segment of the abdomen.

1. *A. Ruficollis* (W. V.).—Fore-wings dark violet-grey, with faintly-marked dark transverse lines, and a small dark oval central ring, filled up with paler; hind-wings pale grey, collar rusty-yellow. Expands rather under 1¼ inches It is found in April, May, and September in Southern Europe, but is a scarce insect, and it is the only species of this family which has not been met with in Britain. The larva is pale yellow, with a dark line on the back, and a whitish line on each side a little below it. It feeds on oak from June to October.

*2. *A. Diluta* (W. V.).—The fore-wings are obtuse at the tip; violet-grey, with two rusty-brown transverse bands, bordered on both sides by double lines; the two last lines, which run straight, are filled with paler colour, and dentated; the hind-wings are pale yellowish-brown, with a light transverse stripe. Expands about 1¼ inches. It occurs throughout Central Europe from August to October. The larva is greenish-grey above, with a pale line on the back, and the sides yellowish. The head is brownish-yellow, with the mouth black. It lives on oak in May and June.

*3. *A. Flavicornis* (Linn.).—Fore-wings rather pointed, grey, or greenish-grey, whitish along the costa to beyond the middle, with black double or triple transverse lines, which are not dentated, and one or two paler spots. The hind-wings are whitish, with a grey transverse stripe and hind margin. Expands about 1½ inches. Common in Northern and Central Europe. It is found on the trunks of birch-trees in March and April, and again, though less commonly, in August. The larva is greenish-grey, with many indistinct whitish dots, and two large black spots, bordered above with white, on the back of each segment, and one on each side; the head is pale brown, with two black dots in front. It feeds on poplar, birch, and oak in June, July, and September. The moth and larva are figured at Pl. 32, Fig. 3, *a*, *b*.

*4. *A. Ridens* (Fabr.).—Fore-wings narrow, varied with green and brown, with two double black transverse stripes, filled up with whitish, and a white wavy line, all much dentated; the hind-wings are white, with the hind margins brownish. Expands about 1½ inches. It is found in Central and South-Western Europe in April and May. It sits on the trunks of oaks, and may be dislodged by the mallet. The larva is yellowish or bluish, with four dark green interrupted longitudinal lines, and dotted with white; head reddish-yellow. It lives on oak in June and September, and is a cannibal. The moth and larva are figured at Pl. 32, Fig. 4, *a*, *b*.

NOCTUÆ.

The extensive group of moths included under the above heading is tolerably homogeneous, but is divided into several families. The *Noctuæ* are moths varying considerably in size, and have generally stout bodies, often crested or tufted, and tapering behind. The eyes are globular, the antennæ rather longer than half the length of the fore-wings; the palpi are generally thick and prominent, seldom depressed; and the tongue is long, horny, and spiral, and rarely soft and weak. The fore-wings are stout and triangular, with an internal nervure angulated at the base, and almost always an accessory cellule, extending from nervule 6 to nervule 9; nervules 8 and 9, and frequently 10 also, rise from a common stem. The pattern generally consists of three or four transverse lines, and three stigmata (Introduction, p. x.), but often diverges considerably from this. The hind-wings are generally rather small, slenderer than the fore-wings, and folded in repose. They are generally unicolorous grey, paler towards the base, or white, with a dark central lunule, and are seldom brightly coloured or banded. The legs are strong, the front tibiæ have a leaf-like appendage, and the hind tibiæ have four spurs. The larvæ have sixteen legs, but occasionally only fourteen or twelve, when the first pairs of prolegs are undeveloped. A few species are hairy, but the majority are smooth. They change to pupæ in the ground, or in a cocoon. The pupæ are generally slender, and tapering behind. The moths fly at night, or late in the evening; a few species are diurnal. They suck honey from flowers, the sap of trees, and honeydew from leaves and grass, and may be attracted by sugar or light. During the day they may be found at rest on the trunks of trees, or on palings, in outhouses, or among grass or dry leaves, &c.

FAMILY I.—BOMBYCOIDÆ.

These are moths scarcely reaching the middle size, and resembling *Bombyces* in appearance. The thorax is rounded in front, and not crested. The fore-wings are rounded at the tips, and are brownish, black and white, or green; the pattern is somewhat irregular. The legs are woolly, the hind tibiæ a little longer than the femora, and the spurs short. The larvæ have sixteen legs, and are hairy, seldom naked, and construct cocoons. The moths fly at night, and slope their wings when at rest. The genera of this family are included by some authors among the *Notodontidæ* and *Acronyctidæ*.

GENUS I.—DILOBA (BOISD.).

The thorax is short and broad, and the last joint of the palpi is rather long and thread-like. The only species, **D. Cæruleocephala*, Linn. (*the figure of* 8 *moth*), has the fore-wings varied with violet-brown and violet-grey, with two sharply-defined and zigzag interrupted transverse lines, and three large contiguous greenish-yellow spots, dusted within with grey. The hind-wings are pale grey, with a blackish spot at the anal angle. Expands from 1¼ to 1½ inches. Common throughout Europe and Western Asia in August and September. The larva, which is much more frequently noticed than the moth, is thick, bluish-white, with small black raised spots, on which single hairs stand, and pale yellow stripes on the back and sides; the head is bluish, spotted with black. It feeds on apple, sloe, &c., in May and June.

GENUS II.—DEMAS (STEPH.).

The thorax is short and broad, the abdomen with a rather prominent crest, the palpi with thin hairs, and the last joint short and obtuse. The only species, **D. Coryli* (Linn.), has the fore-wings rusty-brown in front and ashy-grey behind, with the round orbicular stigma surrounded with black, and two black transverse lines, the first of which has a strong tooth in the middle, pointing backwards, and the second is nearly straight in the middle of the wing. The subterminal line is whitish, and the hind-wings are brownish-grey. Expands from 1¼ to 1½ inches. It is not uncommon in Northern and Central Europe, and is found sitting on the trunks of trees in May and June. The larva is hairy, flesh-coloured, with a grey spot behind the head, and a dark stripe on the back; two black tufts on the 2nd and 12th segments, and short red tufts on the 5th and 6th. It feeds on various trees from July to October.

GENUS III.—RAPHIA (HÜBN.).

Thorax not crested; palpi projecting beyond the head, with the last joint small and curved. The antennæ are pectinated nearly to the extremity in the male, and have two stiff bristles on each joint in the female. The only species, *R. Hybris* (Hübn.), from South France and Spain, has grey fore-wings, more or less varied with brown, with the stigmata and all the transverse lines distinct. The subterminal line is marked with dark lunules between the nervures, and the fringes are intersected with a dark line, and are light at the ends of the nervules. The hind-wings are white, with a dark spot towards the anal angle. It expands about 1¼ inches. The larva feeds on poplar, and is figured, with the moth, at Pl. 54, Figs. 10*a*, *b*.

GENUS IV.—CLIDIA (BOISD.).

The thorax slightly crested behind, the palpi slender, hairy, with the last joint short and concealed.

1. *C. Geographica* (Fabr.).—Fore-wings varied with white and pale brown, with the fringes spotted with brown and white. There are two white dentated transverse lines bordered with brown behind, the middle of the elbowed line projecting considerably towards the hind margin. The hind-wings are whitish in the male, and grey in the female. Expands about 1 inch. It inhabits South-Eastern Europe in May and June. The larva is black, with hairy warts, and two white lines on the back. It is white on the sides, spotted with black, and with a yellow lateral line. The incisions are bordered with reddish-yellow. It lives on *Euphorbia* in June and August.

2. *C. Chamæsyces* (Guén.).—Fore-wings pale brown, spotted with white on the costa and hind margin, with the two central lines distinct, white, and bordered externally with dark brown. The elbowed line is much curved and denticulated, with a very prominent projection. The stigmata are absent, and the fringes are spotted. The hind-wings are uniform dark brown in both sexes. Smaller than *C. Geographica*. It is found in South France and Piedmont in May and July, and the larva lives gregariously on different species of *Euphorbia*. The moth is figured at Pl. 54, Fig. 5.

GENUS V.—PANTHEA (HÜBN.).

The thorax is densely woolly, but neither thorax or abdomen is crested. The palpi are very small, with the last joint inconspicuous. The only species, *P. Cœnobita* (Esp.), has

white fore-wings, with black spots and dentated transverse lines; the fringes are chequered with black and white. The hind-wings are dark grey, chequered with lighter, and the thorax is white, spotted with black. Expands from 1½ to 2 inches. Local in Central Europe in May, but absent in the north-west. The larva is hairy, with tufts of hair on the 5th and 12th segments. It is brownish-grey; the incisions are blue, and there is a whitish line intersected with white transverse lines on the back, and a reddish-yellow stripe on the sides. It feeds on pine and other trees in August and September. The moth is figured at Pl. 25, Fig. 7.

GENUS VI.—DIPHTHERA (OCHS.).

The thorax is short and broad, with thick smooth hair, the abdomen is crested, and the palpi are thickly covered with short hair beneath, with the last joint short and naked. The only species, *D. Ludifica* (Linn.), has pale yellowish fore-wings, with many black dentated transverse stripes, the orbicular and reniform stigmata white, the former surrounded and the latter edged on both sides with black, and the fringes chequered with black and white. The hind-wings are grey (whiter in the male than in the female), with the inner margin broadly ochre-yellow; the abdomen is ochre-yellow, with black spots on the back. Expands from 1½ to 1¾ inches. Local in Northern and Central Europe in May, but absent in the north-west. The larva has hairy warts, and a hairy tubercle on the 12th segment. It is greyish-blue, with three yellow lines on the back, and white spots beneath. There is also a white line on the sides. It feeds on *Sorbus aucuparia* in September and October, and changes to a pupa in a cocoon among stones. The moth is figured at Pl. 33, Fig. 1.

FAMILY II.—ACRONYCTIDÆ.

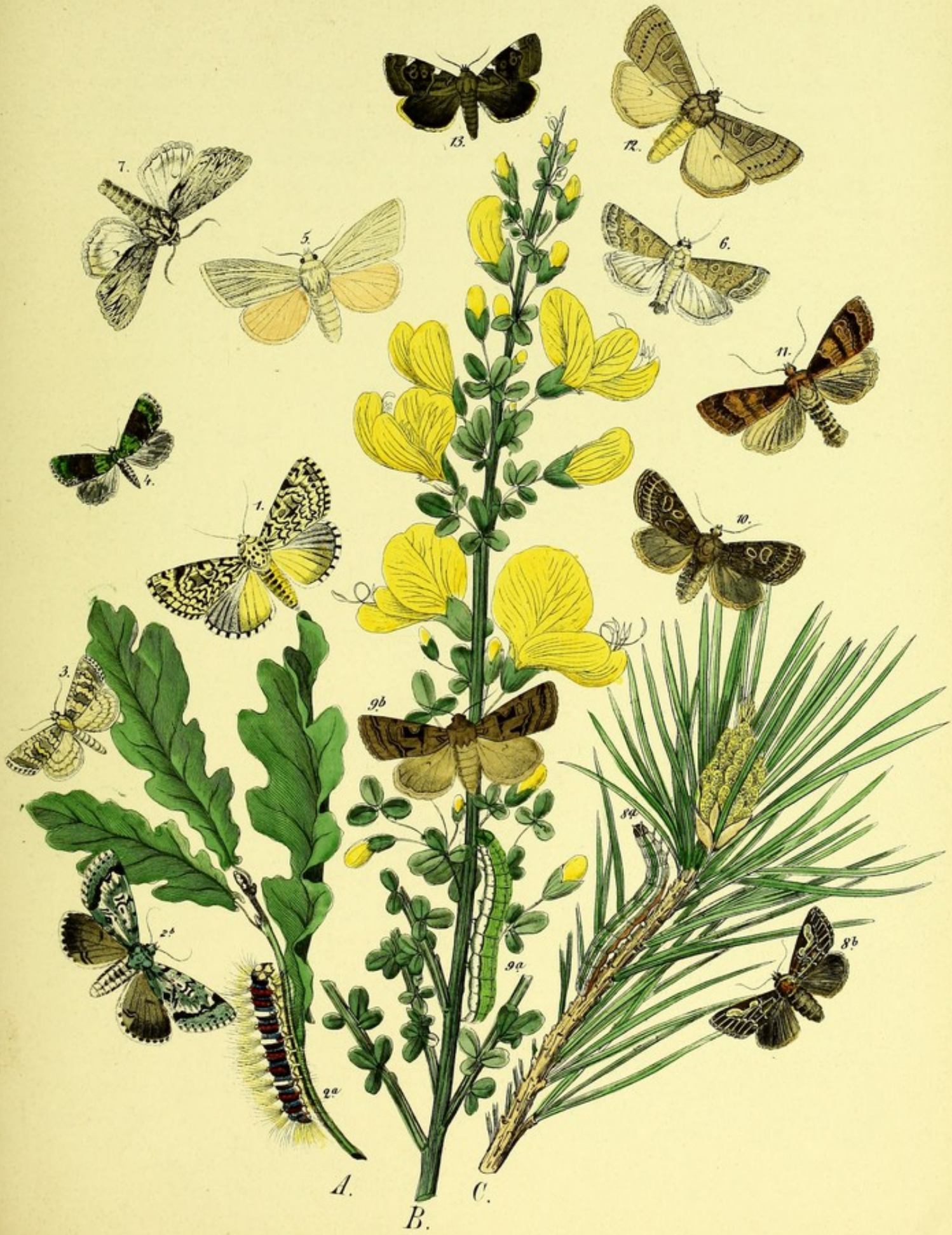
Slender, middle-sized or small moths; the antennæ not pectinated, but slightly ciliated in the male. The palpi are of ordinary size, with the last joint short, naked, and indistinct; the tongue is horny, the hind tibiæ are longer than the femora, the spurs are strong, and the fore-wings are rather obtuse at the tips. The larvæ have sixteen legs, and hairy warts, and sometimes fleshy tubercles, or long tufts of hair; they change to pupæ in a firm cocoon, and most species bore into rotten wood to construct it, with which they must be supplied for the purpose when reared in captivity. They fly at night, and rest with their wings sloping.

GENUS I.—CRANIOPHORA (SNELL.).

Chiefly differs from *Acronycta* by scales being mixed with hairs on the thorax, and in the strong crest on all the segments of the abdomen. The only species, * *C. Ligustri* (Linn.), has violet-brown fore-wings, varied with dark green; behind the inconspicuous reniform stigma they are pale grey, with double black transverse lines; the orbicular stigma is whitish, surrounded and filled up with dusky, and the hind-wings are brownish-grey. Expands about 1½ inches. Not uncommon throughout Europe from May to July. The larva is covered with thin hair; it is yellowish-green, with a yellowish-white stripe on the back, and yellow subdorsal stripes; it lives on lilac, ash, and privet in August and September.

GENUS II.—ACRONYCTA (OCHS.).

The thorax is not crested in front, but slightly so behind, and the abdomen is not crested, except very slightly on the 1st segment; the legs are woolly. The fore-wings are


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7.
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11.
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10.
3.
9b
8a
2b
9a
8b
2a
A.
B.
C.

rather long, with an oblique regularly rounded hind margin, and fringes only slightly waved. They are grey or white, generally with the *Noctua*-pattern, but the claviform stigma is wanting. Several species have a strong black branching longitudinal streak running from the base, and black longitudinal streaks on the elbowed line above the middle and at the hinder angle. The elbowed line is placed very far back, and forms a large curve round the reniform stigma; and the hind-wings are slightly contracted below the tip. The larvæ are often warty or tufted. Several species resemble each other so closely that they can only be distinguished with certainty by rearing them from the larvæ. The moths come freely to sugar, &c.

* 1. *A. Leporina* (Linn.), (*Miller*).—White; fore-wings with a short black basal streak, and scattered black spots and dots, especially on the costa, in the position of the transverse lines, and of the central shade. The variety *Bradyporina* (Tr.) has greyish fore-wings. Expands from 1½ to 1¾ inches. Common in Northern and Central Europe, and in Siberia, from May to July. The larva is green, thickly covered with long white hair, and has slender black tufts on the 5th, 7th, 9th, and 12th segments. It feeds on trees, especially alders and willows, in August and September. The moth is figured at Pl. 32, Fig. 5.

* 2. *A. Alni* (Linn.).—The fore-wings are pale ashy-grey, dark brown towards the inner margin, and between the stigmata, with a thick black longitudinal stripe running from the base above the inner margin; the hind-wings are white, with grey hind margins. Expands about 1½ inches. Widely distributed in Central Europe in May and June, but always scarce. The larva, which is much more frequently seen than the perfect insect, is dull black, with large bright yellow spots on the back, and long scattered hairs, clubbed at the tips. It lives on oak, alder, and other trees from July to September. The moth and larva are figured at Pl. 32, Fig. 6, *a*, *b*.

* 3. *A. Strigosa* (W. V.).—Fore-wings ashy-grey, varied with brown, with three black longitudinal stripes above the inner margin, to which the middle one is nearest. The transverse lines are double; the elbowed line is strongly dentated; the stigmata are separate, and the reniform stigma is pale yellow. The hind-wings are pale grey, with a dark spot in the middle, and a curved stripe. Expands about 1¼ inches. Found throughout Central Europe and Siberia from May to July, but not very common. The larva is thinly hairy; green, with a broad brown streak on the back, divided by a pale line, and bordered with yellow; and hump-like prominences on segments 5 and 12. It feeds on sloe in August and September. (*A. Senica*, Eversm., is whitish; fore-wings with two black lunules on the disc, two costal and two submarginal black stripes; the hind-wings are dark grey, with the base paler. It occurs in South Russia and Siberia.)

* 4. *A. Tridens* (W. V.), (*Scarce Dagger Moth*).—Fore-wings reddish ashy-grey, with a black branching longitudinal basal streak, and two black longitudinal streaks on the elbowed line; the transverse lines are simple and dentated; the stigmata touch each other, or are connected by a short streak, and the hind-wings are whitish, with the nervures and hind margin dusted with brown, especially in the female. Expands from 1¼ to 1½ inches. Common throughout Europe and the north of Asia and Africa in May and June. The larva is thinly hairy, dark grey, spotted with red and white on the sides, and has a yellow stripe on the back, divided with black; there is a small black wart on the 5th segment, and a long hairy tubercle on the 12th. It feeds on sloe, hawthorn, willow, &c., in August and September.

* 5. *A. Psi* (Linn.), (*Common Dagger Moth*).—Resembles *Tridens* in markings, localities, and times of appearance, but rarely expands less than 1½ inches. It is generally of a paler brownish-ashy colour, but can only be determined with certainty by rearing from the larva,

which is thinly hairy, black, with a broad sulphur-yellow stripe on the back, a whitish stripe on the sides, and red dashes between these; there is a very long black fleshy tubercle on the 5th segment, and a small prominence on the 12th. It feeds on elm, but also on sloe, roses, &c., and is figured, with the moth, at Pl. 32, Fig. 7, *a*, *b*.

6. *A. Cuspis* (Hübn.).—Very like the two last species, but the fore-wings are of a more bluish ashy-grey, clouded with darker, and the hind-wings are more thickly dusted with grey in both sexes. Expands from 1½ to 1¾ inches. It inhabits the greater part of Central Europe (except Britain) and Northern Asia in June, but is always scarce. The larva resembles that of *A. Psi*, but has a long and thick tuft of black hair on the 5th segment instead of a fleshy tubercle. It lives exclusively on alder in August and September.

*7. *A. Menyanthidis* (View.).—Fore-wings pale grey or bluish-grey, clouded with darker, with short black longitudinal streaks running from the base and above the hinder angle; the transverse lines are indistinctly double, the elbowed line slightly dentated, filled up with whitish, and shaded behind with darker; the orbicular stigma is a pale spot surrounded with darker, and the reniform stigma is indistinct. The hind-wings are dusted with brown. The English variety *Salicis* (Curt.) is nearly unicolorous dark grey. Expands about 1½ inches. Common in Northern and Central Europe (except France) from May to July, inhabiting damp moors. The larva is black, with hairy warts, and a broad dark red stripe on the sides. It feeds on *Vaccinium Oxycoccos*, bog-myrtle, heath, &c., in July and August, but will eat oak and willow in confinement.

*8. *A. Auricoma* (W. V.).—Fore-wings varied with paler and darker grey, with a black basal streak, and another above the hinder angle; the transverse lines are double, the elbowed line strongly dentated, and filled up with paler; the orbicular stigma is moderately large, the reniform stigma is indistinct, and the hind-wings are dusted with brownish. Expands from 1¼ to 1½ inches. Not uncommon in Northern and Central Europe and Northern and Western Asia from May to July, but rare in England. The larva is black, with rust-coloured warts, covered with yellow hair. It feeds on sloe, bilberry, &c., in June, and again from August to October. The moth and larva are figured at Pl. 32, Fig. 9, *a*, *b*. (*A. Acuta*, Freyer, from Turkey, resembles a small *Rumicis*. The thorax and fore-wings are yellowish-grey, clouded with black, and with well-defined spots and markings, of which the most distinct is a black shaded band running through the two stigmata from the costa to the inner margin. Hind-wings and abdomen mouse-coloured. Fringes white, chequered with black on the fore-wings. Under side mouse-coloured; hind-wings paler, with a distinct band, but no lunule.)

*9. *A. Euphorbiæ* (W. V.).—Fore-wings pale grey, dusted with darker, with a row of indistinct pale spots before the hind margin; the transverse lines are double, the elbowed line much dentated, a little paler on the inside; the orbicular stigma small, and the reniform stigma inconspicuous; hind-wings white in the male, and brownish-grey in the female. The variety *Euphrasiæ* (Borkh.) is more finely scaled, and varied with yellowish on the thorax; and the variety *Montivaga*, Guén. (= *Myricæ*, Guén.), from Scotland and the Alps, is darker, with more unicolorous bluish-grey fore-wings. Expands from 1¼ to 1½ inches. Widely distributed in Europe and Northern and Western Asia from May to July, but only abundant in certain localities, and *Montivaga* is the only British variety. The larva is blackish, with hairy warts, and a yellowish-red stripe on the sides. There is a large red spot on the 3rd segment, and the succeeding segments are spotted with black and white. It feeds on spurge, bog-myrtle, and other low plants in June, and again in August and September.

10. *A. Abscondita* (Tr.).—Differs from *Euphorbiæ* by the rather pointed fore-wings, which are uniform dark grey, dusted with whitish, so that the pattern is wholly obliterated. Expands about 1¼ inches. It occurs in North-Eastern Germany, Lapland, and probably Russia in May and July. The larva differs from that of *Euphorbiæ* in having a red stripe on the sides, but no red spot on the 3rd segment. It feeds on heath and spurge in June, August, and September.

* 11. *A. Rumicis* (Linn.).—Fore-wings brownish-grey, varied with pale grey, with a row of whitish spots before the hind margin. The transverse lines are double, the elbowed line strongly dentated, and there is a white spot above the inner margin. The stigmata are distinct and the hind-wings are grey, with the hind margin broadly darker. Expands from 1¼ to 1½ inches. Common throughout Europe, North Africa, and Northern and Western Asia from May to August. The larva is dark brown, covered with short rusty-yellow hair, with a white stripe on the sides spotted with red, and two oblique white spots on both sides of the back. It feeds on low plants in June, and in August and September.

* 12. *A. Megacephala* (W. V.).—Resembles *Aceris*, but the fore-wings are darker grey, and more thickly and coarsely dusted with brownish; and between the reniform stigma and the elbowed line is a conspicuous pale yellowish-white space; the hind-wings are dusted with brown, but in the male only at the hind margin. Expands from 1½ to 1¾ inches. Common throughout Europe and Northern and Western Asia from May to July. The larva is pale brown, with the back blackish; with hairy warts, and a large square yellowish-white spot on the 11th segment, bordered with black. It feeds on poplar, &c., from July to October.

* 13. *A. Aceris* (Linn.).—Fore-wings pale grey, dusted with darker, with wavy fringes, and double transverse lines; the stigmata are large and separate, but the black longitudinal streaks are either wanting, or else only the basal one is faintly indicated; the hind-wings are white, with the nervures dusted with darker. Size of *Megacephala*. Common in most parts of Europe in May and June. The larva is yellow, with thick yellowish-white hair, and large white spots on the back, bordered with black, adjoining long tapering red and yellow tufts of hair. It feeds on various trees, especially sycamore and horse-chestnut, in August and September. The moth is figured at Pl. 32, Fig. 8.

GENUS III.—MOMA (HÜBN.).

The thorax is short and broad, and slightly crested in front, with its hairs widened at the extremities like scales; and the abdomen is crested. The legs are thinly hairy, and the fore-wings have a slightly oblique, regularly curved hind margin, with rounded fringes; and the hind-wings are also rounded. The only species, **M. Orion* (Esp.), has pale green fore-wings, with three white longitudinal streaks, three irregular black transverse stripes, composed of spots and dashes, and triangular black spots on the hind margin, edged with white in front. The hind-wings are greyish-brown, with a black spot divided with white at the anal angle, and all the fringes are chequered with brown and white. Expands from 1¼ to 1½ inches. It is common on tree-trunks in May and June in many parts of Europe, though rare in England. The larva is black, with large pale yellow spots on the back of segments 3, 5, and 8. It feeds on oak from July to September. The moth and larva are figured at Pl. 33, Fig. 2, *a*, *b*.

GENUS IV.—BRYOPHILA (TR.).

Small moths, with slender bodies; the palpi small, the thorax not crested in front, but the hair raised behind, and the legs thinly haired. The fore-wings are broad, with the tips nearly

rectangular, and the fringes rounded, but slightly oblique at the hinder angle; brown, grey, white, or greenish, with the *Noctua*-pattern more or less marked; the hind-wings are rather contracted below the tips. The larvæ have small heads, and warts covered with short hair. They feed on lichens, and hide themselves in clear weather during the day, so that they must be looked for in dull, damp weather. The larvæ hybernate, and feed till May, and the moths appear in July and August.

* 1. *B. Perla* (W. V.).—Fore-wings yellowish-white, varied with grey, with two single black zigzag transverse lines; the stigmata large and grey, and the orbicular and reniform stigmata connected; the hind-wings are greyish-white, with two grey curved stripes, and a grey spot in the middle. Expands a little under or over 1 inch. Common in Central and Southern Europe and Western Asia. The larva is dark blue, with a reddish-yellow stripe on the back divided with black, and white lines on the sides. The moth is figured at Pl. 33, Fig. 3. (The variety (?) *Perloides*, Guén., from the Pyrenees and Spain, has the fore-wings more oblong, and a little more pointed, and strongly dusted with yellowish or greenish-grey. The elbowed line is shaped as in *Muralis*. The hind-wings are darker than in *Perla*, and not spotted with white at the hind margin, and the palpi are more curved, and ascending. The variety (?) *Galathea*, Mill., from South France, has very dark fore-wings, so that it is difficult to trace the markings, and the hind-wings are whitish, with a black lunule in the centre, and the hind margins dusky.)

* 2. *B. Muralis* (Forst.), *Glandifera* (W. V.).—Fore-wings pale green, varied with brownish, with single black transverse lines, the inner line connected with the pale transverse stripe above the inner margin, and the elbowed line slightly dentated. The stigmata are brownish, and the orbicular and reniform stigmata are connected. The hind-wings are dusted with pale grey, and marked with a slender dark curved line. Expands from 1 to 1¼ inches. The larva is green, with a dark stripe on the back divided with white, and white dashes on the sides. (The variety *Par*, Hübn., is paler, with the stripes of the fore-wings indistinct. *B. Umovii*, Eversm., from Russia, is green, the fore-wings with a submarginal row of spots, the two lines waved and dentated, and the stigmata black; hind-wings whitish, darker towards the hind margins, with a central lunule, and a waved stripe beyond it, black.)

* 3. *B. Algæ* (Fabr.).—Fore-wings green, varied with brownish, and blackish in the position of the claviform stigma. The transverse lines are not dentated, the inner line is straight and simple, and the elbowed line is indistinctly double, and strongly curved; the stigmata and the submarginal line are indistinct, and the hind-wings are brownish-grey. The variety *Degener* (Esp.) is nearly unicolorous grey; the variety *Calligrapha* (Borkh.) has the fore-wings spotted with dark yellow. Size of *Perla*, or a little smaller. It is in the habit of resting on the trunks of lichen-covered trees; and the larva, which feeds on lichens in similar situations, is grey, bluish on the sides, with a grey stripe on the back. It inhabits Central and Southern Europe and Western Asia, but is a great rarity in England. The moth is figured at Pl. 33, Fig. 4.

4. *B. Fraudatricula* (Hübn.).—Fore-wings dark brownish-grey, tending towards reddish, with black longitudinal stripes above the inner margin in the central and outer portions of the wing; the transverse lines are single and not dentated, bordered with paler, the inner line oblique and arched, and the elbowed line strongly curved. The hind-wings are brownish-grey, with the fringes scarcely paler. Size of *Muralis*. Inhabits the greater part of Central Europe, except the north-west, but is local. It is generally found resting on palings and on the trunks of trees.

5. *B. Strigula* (Borkh.), *Receptricula* (Hübn.).—Fore-wings unicolorous dark slate-colour, with black longitudinal stripes as in *Fraudatricula*, but the other markings are very indistinct; the

transverse lines are not dentated, and scarcely bordered with lighter, and the elbowed line is slightly curved. The hind-wings are pale brownish-grey, with the fringes whitish at the ends. Size of *Perla*. Inhabits Southern Europe, Austria, Bohemia, and, it is said, also Sweden and Alsace; it likewise occurs in Western Asia.

6. *B. Raptricula* (Hübn.).—Fore-wings blackish slate-colour, with the markings very indistinct; the transverse lines are slender, not dentated, and indistinctly double, the inner line composed of two crescents, and the elbowed line slightly curved, and filled up with whitish above the inner margin; the hind-wings are whitish, and brown towards the hind margins. The variety *Deceptricula* (Hübn.) is reddish, with a broad brownish longitudinal stripe running across the fore-wings. Size of *Muralis*. Inhabits a great part of Europe, except the north-west, and Western Asia. The larva is bluish-grey, with two stripes on the back, spotted with yellow and white. It feeds on *Sticta pulmonaria*. (*B. Oxybiensis*, Mill., found at Cannes in August and September, has broader and paler fore-wings, and the black longitudinal line is better marked, traversing the whole wing, and even extending to the base. The antennæ are more slender than in *Raptricula*. There is a reddish variety corresponding to *Deceptricula*. The larva is supposed to feed on lichens growing on the trunks of olive-trees.)

7. *B. Ereptricula* (Tr.).—Fore-wings dark brown, with the base, tip, and inner margin whitish; the transverse lines are not dentated, and the elbowed line is indistinctly double, and slightly curved; the hind-wings are pale grey. The variety *Ravula* (Hübn.) is varied with reddish in the middle, and behind the elbowed line; and the Spanish variety *Vandalusiæ* (Dup.) is smaller and paler. Size of *Perla*. Common in Southern and South-Central Europe in gardens, and on walls and houses. The larva is blue, with a black line on the back, and a zigzag yellowish-red stripe on the sides, bordered below with black. It feeds on lichens on walls. (*B. Contristans*, Led., from Greece and Syria, is allied to *Strigula*, but is a third larger; the fore-wings are very variable, but generally dull greenish-ash, more or less suffused with copper, and the hind-wings are reddish-copper. *B. Petrea*, Guén., from Andalusia, has the fore-wings clouded with greenish-brown, grey, and black; the stigmata are black, the reniform stigma varied with yellowish-grey, and the hind-wings are coppery-brown. *B. Pineti*, Ramb., also from Spain, has brown fore-wings, the lines darker, the innermost edged outside with yellowish, and composed of two crescents, meeting in a sharp angle turned outwards, and the hindmost much curved; the other markings indistinct. Hind-wings whitish, darker towards the hind margins.)

FAMILY III.—ORTHOSIIDÆ.

Small or middle-sized moths, the body generally stout, rarely slender; the palpi of ordinary size, with the last joint distinct; the tongue generally strong, and the antennæ of the male often pectinated. The thorax is rounded in front, seldom with rectangular, and never with projecting shoulders; the hind-wings are contracted below the tips, and the hind tibiæ are longer than the femora, with strong spurs. The species included in this family differ considerably, and have been divided into five families; but they all pass insensibly into one another. We may include in the *Leucaniidæ* the genera *Simyra* to *Segetia;* in the *Caradrinidæ*, *Stilbia* to *Rusina;* in the *Orthosiidæ*, *Asteroscopus* to *Gortyna;* in the *Cerastidæ*, *Xanthia* to *Orrhodia;* and in the *Amphipyridæ*, *Mecoptera* to *Amphipyra*. They fly at night, and the first and third groups slope their wings when at rest, and the others lay them flat over one another. The larvæ are generally naked, and without protuberances.

GENUS I.—ARSILONCHE (LED.).

Fore-wings rather broad, with the hind margin oblique and sinuated, the tips pointed, and the fringes rounded; pale-coloured, and almost without markings. The antennæ and tongue are short; the former are not pectinated, and the latter is horny; the abdomen is considerably longer than the hind-wings. The larva has hairy warts, and the pupa is enclosed in a slight cocoon. The only species, **A. Albovenosa* (Goeze), *Venosa* (Borkh.), has yellowish-white fore-wings, finely dusted with brown, with brownish longitudinal stripes running from the base, as well as from the middle to the hind margin; hind-wings white. The variety *Centripuncta* (Herr.-Schäff.), from South Russia, has a black spot in the middle of the fore-wings. Expands from 1¼ to 1½ inches. It is found in damp meadows in the northern half of Central Europe in May, June, and August. The larva is brownish-grey, with yellow stripes on the back and sides, and rust-coloured warts and hairs. It lives on grass in June, September, and October. The moth is figured at Pl. 33, Fig. 5, and at Pl. 54, Fig. 12.

GENUS II.—SIMYRA (OCHS.).

Resembles *Arsilonche*, but the antennæ of the male are shortly pectinated, the tongue is soft, and the fore-wings are narrow, with the hind margin more oblique. The moths expand from 1¼ to 1½ inches, and appear in August and September.

1. *S. Buettneri* (Hering).—Fore-wings pale ochre-yellow, reddish-grey below the discoidal cell, and on the inner margin, with a transverse row of black dots beyond the middle, and dark streaks before the hind margin; the hind-wings are pale reddish, and grey towards the base. Has been taken at Stettin sitting on the trunks of trees, or flying at dusk.

2. *S. Nervosa* (W. V.).—Fore-wings brownish-white, with white nervures bordered with ashy-grey; hind-wings white, dusted with brown. The variety *Argentacea* (Herr.-Schäff.), from Sarepta, has whitish wings. It inhabits South-Central and Eastern Europe and Western Asia, but is not common. The larva is dark grey, with yellowish hairs, whitish longitudinal lines, and a broad macular stripe on the back. It lives on spurge, sorrel, &c., in June; and prefers dry places. (*S. Dentinosa*, Freyer, from South-Eastern Europe and Western Asia, is grey, with whitish wings, the disc of the fore-wings striped with brown. The abdomen and palpi are longer than in either of the other species.)

GENUS III.—EOGENA (GUÉN.).

Body stout, antennæ simple, abdomen extending a little beyond the hind-wings. The wings are broad, the fore-wings are rounded at the tips, and the hind margin is scarcely oblique. The only species, *E. Contaminei* (Eversm.), from Sarepta, is rosy fawn colour, the fore-wings with some brown dots on the disc, and the hind-wings very pale rosy, with the base whitish. It is figured at Pl. 54, Fig. 9.

GENUS IV.—NONAGRIA (HÜBN.).

Small or middle-sized moths, with the fore-wings short, and rounded above the hinder angle. They vary from pale ochreous to reddish-brown, and do not exhibit the *Noctua*-pattern; only the reniform stigma is sometimes visible, and the lines are frequently indicated by rows of dots. The abdomen extends considerably beyond the anal angle of the hind-wings, and the tongue is strong. The larvæ are naked, with horny plates on the 2nd and last segments. They live from autumn till the following summer in the stems of reeds and rushes, and change to pupæ within them, and

the moths appear in summer and autumn. From the nature of their food, most of the species are fen insects. The infested plants may be known by their withered leaves, and then the pupæ should be looked for, for rearing; but they must not be removed from the stems in which they are enclosed. The species of *Nonagria* differ considerably in structure, and may be divided into several groups.

A. *The antennæ of the male dentated and ciliated; fore-wings with the hind margin oblique, and the fringes waved. The pupa is placed with the head downwards.*

* 1. *N. Arundinis* (Fabr.), *Typhæ* (Esp.).—Fore-wings ochreous, varied with grey, with white nervures and black marginal lunules; the reniform stigma indicated. Hind-wings yellowish-white, with a dark central lunule, and the hind margin dusted with darker. The variety *Fraterna* (Borkh.) has reddish-brown fore-wings, almost without markings. Expands from 1½ to 2 inches. Common throughout Central Europe in August and September. The larva is dirty flesh-colour, with three pale lines on the back, and the head and plates black. It lives in the stems of *Typha latifolia* and *angustifolia* from May to August. The moth is figured at Pl. 34, Fig. 1.

B. *The antennæ as in Section A; the fore-wings truncated, with the fringes entire. The pupa is placed with the head upwards.*

* 2. *N. Sparganii* (Esp.).—Fore-wings pale ochre-yellow or brownish-yellow, with dark longitudinal streaks, three black spots in the position of the reniform stigma, a row of black dots beyond, and black marginal dots; hind-wings whitish-yellow, dusted with brown at the base. Expands from 1¼ to 1½ inches. Not uncommon in Central Europe in August and September, but has only just been discovered in Britain. The larva is green, with four dark lines on the back, a pale brown head, and greenish plates. It lives in the stems of *Sparganium ramosum*, *Typha*, and other water-plants in July and August.

* 3. *N. Cannæ* (Hübn.).—Fore-wings of the male brownish-yellow or reddish-brown, and those of the female greyish ochre-yellow, with dark longitudinal streaks, a row of black spots beyond the middle, and a black marginal line; hind-wings brownish-grey. Size of *Sparganii*. Widely distributed in Central Europe in August and September. The larva is yellowish or greenish, with a pale brown head; the plates greenish-white. It lives in the stems of *Typha latifolia* from May to July. The moth is figured at Pl. 34, Fig. 2.

C. *The antennæ of the male serrated and ciliated; the fore-wings and fringes as in Section B.*

4. *N. Nexa* (Hübn.).—Fore-wings reddish-brown, with a narrow white reniform stigma, which is produced beneath in a long streak running towards the base; hind-wings dark grey. Expands a little more than 1 inch. A local species, found in the north of France and Germany, and the south of Sweden. It is met with in marshes in August. The larva is dirty white, with two reddish stripes on the back, and a black line on the sides; the plates are yellowish. It lives till June in the stems of *Carex*.

D. *The antennæ finely ciliated, but not dentated, otherwise as in Section B.*

* 5. *N. Geminipuncta* (Hatch.).—Fore-wings reddish-grey or reddish-brown, with the nervures dusted with pale grey, a small white spot surrounded with black, and sometimes double, in the position of the reniform stigma, fringes unspotted; hind-wings brownish-grey. Sometimes the white centre of the spot is absent, and occasionally the wings are entirely blackish (variety *Nigricans*, Staud.), and the markings are quite indistinct. Expands from 1 to 1¼ inches. Inhabits Central Europe in August. The larva is yellowish-white, with four black raised spots on each segment, which are arranged in two rows on each side of the back; head and plates dark brown. It lives in the stems of the reed till June, selecting plants which do not grow in the water.

* 6. *N. Dissoluta* (Tr.).—Slender, fore-wings straw-colour, brownish-red, or dark brown, with a

dark longitudinal streak in the middle, suffused on the inner side, a small black spot in the place of the reniform stigma more or less surrounded with white, and black marginal dots; hind-wings whitish, with the hind margin grey. All the wings with a dark central lunule beneath. Expands from 1 to 1¼ inches. Local in Central Europe, occurring in July and August. The larva is dirty white, with the back pale reddish, and eight small brown raised spots on the 4th and 5th segments, and four black ones on each of the following segments. The head and plates are brownish. It feeds in *Typha* till June, and the pupa is placed with the head downwards.

7. *N. Neurica* (Hübn.).—Very near the last species, but the central spots of the under side are wanting, and the hind-wings are unicolorous brownish-grey. It inhabits Germany, and probably other countries, in July and August, but has been confounded with the last species. The larva is bluish-grey, with three pale yellow stripes on the back, and four small black raised spots on each segment; the head is dark brown. It lives in *Typha* till June.

* 8. *N. Brevilinea* (Fenn).—Fore-wings brownish-ochreous, with scattered black scales, a short black dash from the middle of the base, a curved transverse row of black dots, but no marginal dots; hind-wings grey, paler at the base, with the transverse row of dots very indistinctly marked. Expands 1⅛ inches. It has been taken, flying among *Typha latifolia* at dusk, at Ranworth, in Norfolk.

9. *N. Stigmatica* (Eversm.).—Straw-colour, more or less shaded with black or brown, a brown streak on the median nervure, a whitish dot in the middle, and the nervures blackish towards the hind margin; hind-wings pale grey. Inhabits South Russia and Siberia.

GENUS V.—CŒNOBIA (STEPH.).

Small; fore-wings with the tip somewhat rounded and truncated behind; rounded above the anal angle, and narrower in the female; almost without markings. The antennæ are not dentated, but finely ciliated; the palpi are slender, with the last joint very short, and the tongue is long and slender; the abdomen is very long. The only species, * *C. Rufa* (Haw.), *Despecta* (Tr.), is reddish-ochreous, with the nervures finely dusted with grey and white, and a row of black dots beyond the middle; hind-wings white, thinly dusted with grey. Expands rather less than 1 inch. It is found in marshy places in June and July throughout the northern half of Central Europe. The larva lives in the stems of *Juncus lamprocarpus*, where it becomes a pupa in June.

GENUS VI.—SENTA (STEPH.).

Fore-wings nearly three times as long as broad; the costa and inner margin nearly parallel, with the tip sharply rectangular and truncated in front; the hinder angle slightly concave; only the orbicular and reniform stigmata are marked. Hind-wings broad, slightly contracted below the tip. The tongue is horny, and the antennæ are not dentated. The only species, * *S. Maritima* (Tausch.), *Ulvæ* (Hübn.), has the fore-wings ochreous, with the costa and inner margin pale grey; sometimes the wings are wholly brownish-grey, with white veins, and a row of black dots beyond the middle; the two stigmata are round and of equal size, and are generally finely surrounded with white, but are often indistinct; the hind-wings are white. It is very variable; sometimes the spaces between the pale veins are filled up with black as far as the row of dots (as in *Ulvæ*, figured by Herrich-Schäffer, *Noctuæ*, Fig. 397); in variety *Bipunctata* (Haw.) the veins are scarcely paler, and the stigmata are deep black

inside; and in variety *Wismariensis* (Herr.-Schäff.) a broad black longitudinal streak runs through the middle of the fore-wings to the hind margin. Expands about 1¼ inches. Very local in Central Europe, inhabiting marshy places in June and July. The larva is slender, naked, yellowish-grey, with pale longitudinal lines, and the head and a plate on the back of the neck brown. It feeds on the leaves of the reed, hiding itself in the dry stems during the day, but also feeds on other reed-frequenting insects, especially after hybernation. It may be looked for in spring in the stems of leaves, especially after it has become a pupa, as such stems may then be recognised by being covered with a web at the top.

GENUS VII.—MYCTEROPLUS (HERR.-SCHÄFF.).

Fore-wings moderately broad, angular at the tips, and the hind margin nearly straight. The antennæ are simple, the palpi extend very little beyond the head, and the third joint is small and conical. The tongue is rather long and the body moderately stout, the abdomen extending a little beyond the hind-wings. The only species, *M. Puniceago* (Boisd.), from South Russia and North Turkey, is pale straw-colour, the fore-wings with two suffused fasciæ bordered with white, and with indistinct spots; the hind-wings are white.

GENUS VIII.—MELIANA (CURT.).

Fore-wings nearly thrice as long as broad, with the tips acutely pointed and the hind margins long and oblique, almost without markings. The antennæ are simple, and the tongue is horny. The only species, **M. Flammea* (Curt.), is pale ochreous, with whitish veins finely bordered with brown, a row of brown dots beyond the middle, and a grey longitudinal stripe across the centre of the wings, sharply bounded in front. The hind-wings are whitish, suffused with grey. Expands nearly 1½ inches. Widely distributed in Central Europe, but scarce and local, occurring in marshy places in May and June. The larva is rather long and slender, naked, pale bone-colour, with indistinct pale longitudinal lines; head and thoracic shield pale brown. It lives on reed, and changes to a pupa in the stems in autumn.

GENUS IX.—TAPINOSTOLA (LED.).

Small, but stout-bodied moths, the fore-wings varying in length, with the tips somewhat rectangular, and sometimes rounded off; straw-colour or brownish-red, almost without markings. The antennæ are not dentated, but densely ciliated in the male; the last joint of the palpi is short, and the tongue is horny. The larvæ are naked, and live in the stalks of grasses.

* 1. *T. Musculosa* (Hübn.).—Fore-wings with the hind margin oblique and the tip rounded; pale greenish-yellow, with dark veins, pale yellow longitudinal stripes running through the middle to the tip and along the folds; the two stigmata indicated by light spaces; the hind-wings white, dusted with grey in the female. Expands about 1¼ inches. A scarce species everywhere, though widely distributed in Central and Southern Europe. It is generally found in corn-fields in August.

* 2. *T. Fluxa* (Hübn.).—Fore-wings short, straw-coloured (bright reddish-yellow in variety *Fulva*, Hübn.), dusted with darker on the margins and nervures, especially on the median nervure; sometimes with a row of small black dots beyond the middle; hind-wings grey, and

the abdomen extending far beyond the anal angle. Expands about 1 inch. Inhabits Central Europe and the Altai from July to September, occurring in woods and damp meadows. The larva is dirty white, with two indistinct and interrupted suffused yellow stripes on the back. It lives in the stalks of different grasses in May and June.

* 3. *T. Hellmanni* (Eversm.).—Fore-wings short, with the tips pointed and rather produced; straw-colour, often suffused with reddish, and dusted with brownish; the reniform stigma is indicated by a pale space, filled up beneath with darker, and the elbowed line is indicated by an indistinct row of dots. The hind-wings are dusted with grey, and the abdomen only extends a little beyond the anal angle. Expands from 1 to 1¼ inches. A local insect, but found throughout Central Europe from June to August, and also in the Altai. The larva is spindle-shaped, white, with the back reddish, the head yellowish-brown, and the plates yellowish. It lives from August to June in the stalks of *Calamogrostis epigejos.*

* 4. *T. Extrema* (Hübn.).—Fore-wings whitish-ochreous, suffused with grey, with a row of black dots beyond the middle; hind-wings grey. Expands about 1 inch. Widely distributed throughout Central Europe in June, but local, and generally rare. It is a fen insect, and is now extinct in many places.

* 5. *T. Bondii* (Knaggs).—Much resembles *Extrema*, but rather larger; the fore-wings are paler above and much darker below, and the hind-wings are darker above. It is a more slender insect, with longer antennæ, and the legs and palpi are much less hairy. It occurs at Folkestone in July, and has also been taken in Greece. It is figured at Pl. 54, Fig. 6.

* 6. *T. Elymi* (Tr.).—Fore-wings long, with the costa and inner margin parallel; greyish-yellow, dusted with grey, especially below the costa, along the costal nervure, and on the nervules before the hind margin; a row of black dots beyond the middle. Hind-wings white, and the abdomen long. Expands about 1½ inches. It is found in sandy places on the south coast of the Baltic, and has also been met with in the Norfolk Fens, occurring from June to August. The larva is thick, whitish, with a pale brown head and dull red back. It lives in the lowest joints of *Elymus arenarius* from September to May.

GENUS X.—SESAMIA (GUÉN.).

Body stout, fore-wings nearly rectangular at the tips, brownish, without any distinct pattern; antennæ and tongue rather short; palpi extending rather beyond the head, the last joint nearly one-third of the length of the second. The commonest species, *S. Nonagrioides* (Lef.), has greyish-yellow fore-wings, with the hind margin and a streak on the disc darker; a black discal spot, and an outer row of black dots; hind-wings white. Inhabits Spain, North Africa, and Madeira. The larva lives in the stalks of maize, corn, reed, sugar-cane, &c. (In *S. Cretica*, Led., which inhabits South-Eastern Europe, the antennæ of the male, which are slightly pectinated in *Nonagrioides*, are filiform and ciliated, and the larva is shorter, and whitish, instead of being suffused with violet.)

GENUS XI.—ARGYROSPILA (HERR.-SCHÄFF.).

Body slender, fore-wings long and narrow, with the tip truncated and the hind margin oblique. The antennæ are short, slender, and setose, very finely ciliated in the male; the tongue is spiral. The only species, *A. Succinea* (Esp.), is white, the fore-wings greyish-yellow, with oblique interrupted white fasciæ, a brown stripe on the disc, the fringes spotted with brown; and the hind-wings brownish at the hind margin. It inhabits damp meadows in the Ural.

GENUS XII.—CALAMIA (LED.).

Middle-sized moths, with stout bodies, fore-wings nearly as in *Leucania*, ochreous, with pale veins, but without the *Noctua*-pattern; the antennæ not dentated, the palpi erect, the tongue slender but horny, and the abdomen extending beyond the hind-wings. The larvæ are naked, and live in the stalks of the reed.

* 1. *C. Lutosa* (Hübn.), *Crassicornis* (Haw.).—Fore-wings rather long, pale greyish-yellow, finely dusted with darker, with the veins rather paler; hind-wings white, dusted with brown; all the wings with a row of black dots towards the hind margins. Expands from 1½ to 2 inches. Occurs throughout Central Europe from August to November, but is not very common. The larva is flesh-colour, shaded with brown, with a row of crescent-shaped brown hooks on the outside of the prolegs; head and plates brown. It lives in the stalks and roots of reeds which do not grow in the water till June, and changes to a pupa in the stalks.

* 2. *C. Phragmitidis* (Hübn.).—Fore-wings short, pale ochre-yellow, shading into rusty-yellow behind, with fine white veins and brownish fringes; hind-wings brownish-grey. Expands about 1¼ inches. Local and generally scarce in marshes throughout Central Europe in July. The larva is slender, dirty white, with a double row of violet-brown spots on the back, and brown warts; head and plates brown. It lives in the reed in May, and becomes a pupa in the ground.

GENUS XIII.—LEUCANIA (OCHS.).

Middle-sized moths, the fore-wings a little broader behind, generally with the tip pointed, but occasionally more rounded; hind margin a little oblique, rounded above the hinder angle. The fore-wings are ochreous or reddish-brown, generally with pale nervures, bordered on both sides with slender dark lines, and additional dark lines between them beyond the middle; the *Noctua*-pattern is rarely visible. The palpi and tongue are thick; the hairs on the thorax are smoothed down flat, and seldom slightly crested behind; the abdomen is thick, and extends considerably beyond the anal angle of the hind-wings; and the legs are very hairy. The larvæ are naked, pale yellowish or brownish, with fine longitudinal lines, and the plates on the back of the 2nd and last segments are not conspicuous. They live from autumn to spring on grass, rushes, and low plants, and many of them conceal themselves in the day-time in the stalks of reeds, and change to pupæ either there or in the ground. They may be obtained by sweeping, especially before hybernation. The moths may be captured at dusk at flowers, or at sugar, and may frequently be met with in meadows in the day-time.

* 1. *L. Pudorina* (W. V.). — Fore-wings pale yellow, suffused with rosy and dusted with blackish, with pale veins and indistinct blackish lines between; hind-wings dark grey, with rosy fringes. Expands about 1½ inches. A common insect in Central and South-Eastern Europe in July and August; it also occurs in Siberia. The larva is dirty white, with three white lines on the back, the two outermost bordered with black above, and with three fine whitish lines on each side, and a grey stripe above the feet. It lives on grass from March to May.

* 2. *L. Pallens* (Linn.), (*Common Wainscot*).—Fore-wings pale ochre-yellow, rarely reddish (variety *Ectypa*, Hübn.), with white veins bordered with brown, and three indistinct black dots, one at the hinder angle of the discoidal cell, and two beyond it on nervules 2 and 5; hind margin without dots. Hind-wings white, the hind margin slightly dusted with brownish.

Expands from 1¼ to 1½ inches. Common throughout the greater part of Europe and Western Asia from May to September. The larva is shining yellowish or reddish, with a whitish line on the back bordered with dusky, and a yellowish-white stripe on the sides bordered with black. It lives in June, and from autumn to April, on grass and low plants. The moth and larva are figured at Pl. 34, Fig. 3, *a*, *b*.

* 3. *L. Impura* (Hübn.).—Allied to *Pallens*, the fore-wings browner, with the borders of the nervures and the intermediate lines darker and better marked; hind margin dotted with black, and hind-wings brownish-grey. Expands from 1¼ to 1½ inches. Common in Central Europe and Northern Asia from June to September. The larva is yellowish-grey, with a broad dirty yellow stripe on the back divided with white, and a yellow stripe on the sides bordered with brown. It feeds on grass in July, and from autumn to May.

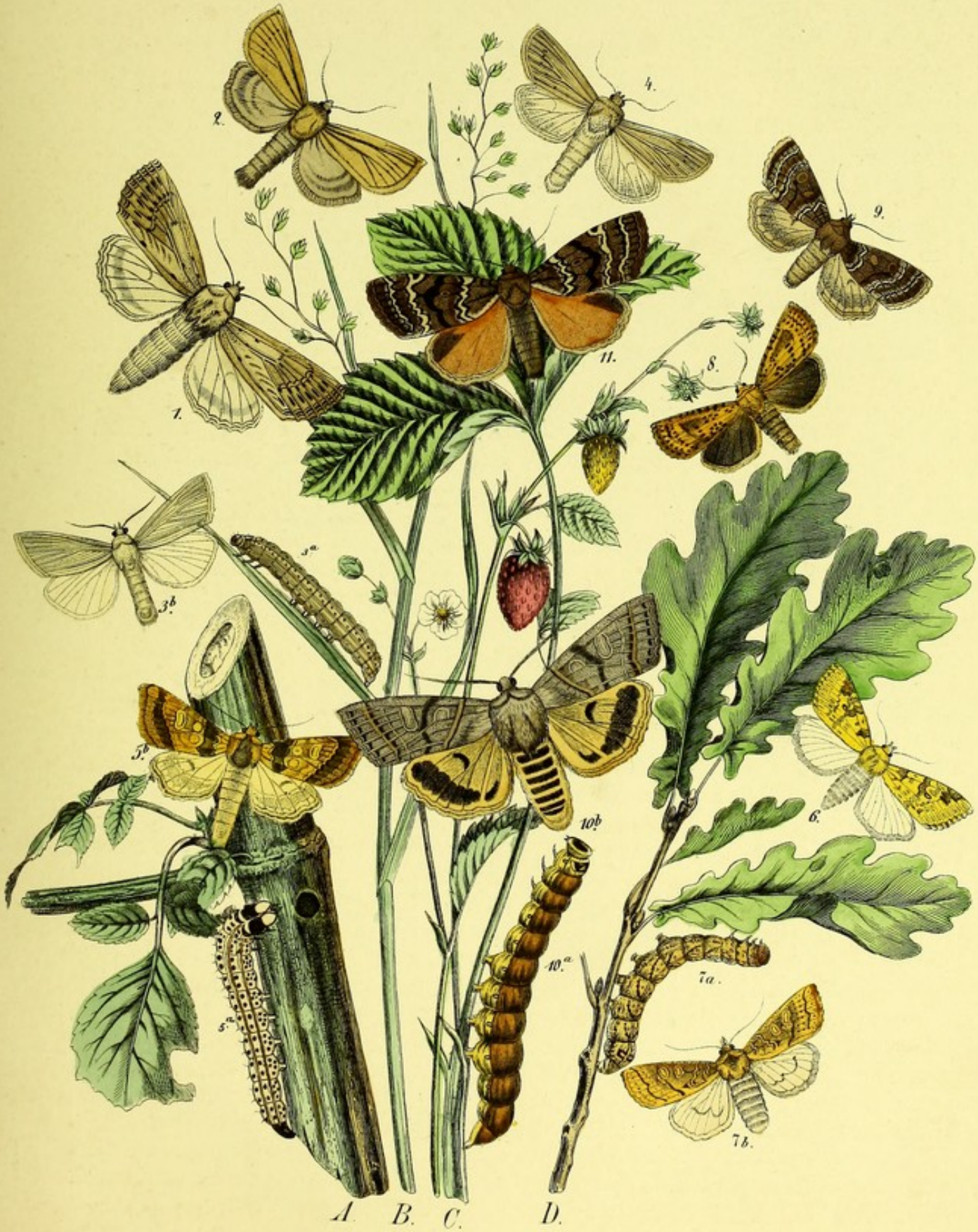
* 4. *L. Straminea* (Tr.).—Fore-wings rather broad, straw-coloured, with white veins bordered with dusky, and dark intermediate lines, as well as with a dark basal streak, and three black dots arranged as in *L. Pallens;* hind-wings white, dusted with grey, with a row of black dots across the middle. Expands from 1¼ to 1½ inches. Occurs in the northern half of Central Europe in June and July, but not very common. The larva is slender; straw-colour, with five whitish longitudinal lines, the middle one most conspicuous, and narrowly edged with black. It feeds on reed till May.

* 5. *L. Obsoleta* (Hübn.).—Fore-wings reddish ochre-yellow, with white veins bordered with black, and intermediate black lines, as well as with a row of black dots beyond the middle; hind-wings white, dusted with brown on the nervures and towards the hind margin. Expands about 1½ inches. Common in Central Europe in May and June among reeds. The larva is whitish-grey, with dark lines, and feeds on reed in autumn. It passes the winter full-grown, enclosed in a cocoon. The moth is figured at Pl. 34, Fig. 4.

6. *L. Hispanica* (Bell.).—Very similar to *Pallens;* straw-colour, with the white nervures very distinct. The two outer dots are absent, and the inner margin is a little speckled with black. Hind-wings whitish, with the hind margins darker, and marked with a row of black dots between the nervures. Expands 1¼ inches. The larva is yellowish, with two broad white stripes on the sides, and fine brown lines between them and on the back. It lives on grass, especially on species of *Piperaterum* growing in dry stony places. The moth is double-brooded, appearing first towards the end of May, and again from the end of August to December. It is met with in the neighbourhood of Barcelona, and is still rare in collections.

7. *L. Sicula* (Tr.).—Fore-wings straw-colour, dusted with black, with a blackish central stripe, marked with a white dot in the middle of the wing; hind-wings greyish, with the veins darker. Size of *Impura*. It occurs in Sicily; and the French variety *Fuscilinea* (Grasl.) is a little smaller, with a more distinct brown stripe in the middle of the fore-wings. The larva lives on the sea-coast in La Vendée in August, and the moth appears in the following June. (*L. Albivena*, Grasl., found on the coasts of France and Belgium in August, is very similar, but the fore-wings are pale yellowish-grey, shaded with dark brown in the middle, with a central white dot, followed by a smaller black one; the veins are whitish-grey. There are traces of two transverse rows of black dots, and the hind-wings are greyish-white and slightly iridescent.)

8. *L. Scirpi* (Dup.).—Fore-wings rather long, with the hind margin sinuated; straw-colour, suffused with yellowish or reddish, and finely dusted with blackish, with a small white spot at the end of the discoidal cell, a single or double row of blackish dots beyond the middle, and white hind-wings. In variety *Cyperi* (Boisd.), from Calabria, the fore-wings are reddish, with the


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median nervure whitish; and variety *Montium* (Boisd.), from the Lower Alps, has reddish-ashy fore-wings, densely dusted with darker, and pale grey hind-wings, whitish towards the base. Expands about 1¼ inches. It inhabits Southern Europe as far north as Nassau in May; and the larva, which resembles that of *L. L.-album*, feeds on grass.

9. *L. Zeæ* (Dup.).—Fore-wings shining reddish-grey, with a small white central spot, and blackish veins; a transverse row of very small black dots on the nervures. Hind-wings and fringes white, with a row of black dots on the hind margin. The larva lives on maize, inside the leaves which enclose the ear, and is often very destructive. The moth appears in July, and is common throughout the south of Europe.

10. *L. Punctosa* (Tr.).—Fawn-colour; head and thorax with brown bands; fore-wings with white nervures and a longitudinal brown shade in the middle, and the hind margins brown. A small white discoidal spot and small reddish-yellow streaks between the nervures. The elbowed line is indicated by a row of small black dots. Hind-wings white in the male, and dusted with brown along the nervures and towards the hind margin in the female. Common in South France and Spain in July. The larva lives on grass in March.

* 11. *L. Putrescens* (Hübn.).—Very like *Punctosa;* fore-wings ochreous-brown, with a thick black basal streak, as in *Comma*, and very distinct white veins; and the spots of the elbowed line are very distinct, running across the whole wing. The discoidal spot is of a dirty white. The long reddish lines between the nervures end in black dots on the hind margin, and the fringes are blackish, spotted with yellow. Hind-wings white in the male, with a marginal row of very small black dots; hind margins and veins dotted with brown in the female. Size of *Obsoleta*. Inhabits Western Europe, including Torquay, where it is found flying over bramble blossoms in the evening in June and August. The larva is pale greyish-ochreous, with whitish lines on the back, and greyish-brown stripes on the sides. It feeds on grass in September and October. (*L. Herrichii*, Herr.-Schäff., from Crete, is pale reddish, the fore-wings with incomplete suffused ashy bands, and a white discal spot; hind-wings white, with the hind margins ashy. *L. Velutina*, Eversm., from the Ural and Altai, is ashy; fore-wings white along the nervures, an oblique grey band beyond, and submarginal black dashes; hind-wings grey, with the hind margins broadly ashy.)

* 12. *L. Comma* (Linn.).—Fore-wings pale reddish-ochreous, the costa paler, with a black longitudinal dash running from the base, and black lines before the hind margin, the median nervure white, shaded with brownish, and the branches whitish; hind-wings grey, whitish at the base; all the fringes reddish. Expands from 1¼ to 1½ inches. Common throughout Europe and Northern and Central Asia from May to October. The larva is reddish-brown, with three fine black lines on the back; head brown, and a plate behind black, with three white lines. It lives on grass till April, and in July.

13. *L. Andereggii* (Boisd.), *Valesicola* (Guén.).—Very like *Comma;* fore-wings ochre-yellow or yellowish-brown, with grey fringes; under side uniform dark grey. The variety *Cinis* (Freyer) is dark brown, with white veins. It occurs on the Alps in June and July. (*L. Lineata*, Eversm., from Sarepta, is brown, fore-wings with the median nervure broadly edged with black beneath, and with from two to four short black basal streaks; hind-wings brownish-grey. *L. Alopecuri*, Boisd., also from Sarepta and Siberia, has the fore-wings pale straw-colour, with an indistinct brown line in the middle, and the hind margins and the marginal streaks brown; a white dot adjoining a black one at the end of the cell, and whitish hind-wings. In the female the brown line of the fore-wings is wanting, and there is a double row of very numerous dots towards the hind margin. *L. Furcata*, Eversm., another species

from the Ural, is cinnamon-brown; the fore-wings with white veins, and the hind-wings white.)

* 14. *L. Conigera* (W. V.).—Fore-wings reddish-ochreous, with two dark brown transverse lines, the first of which is sharply interrupted, and two golden-yellow stigmata, the reniform stigma ending below in a white arrow-headed spot; hind-wings reddish-brown. Expands from 1¼ to 1½ inches. Common in Northern and Central Europe and Western Asia in June and July. The larva has straw-coloured bands, separated by black and white lines; head pale brown, with two black lines. It feeds on grass and other low plants till May.

15. *L. Evidens* (Hübn.).—Fore-wings with the tips slightly rounded, and the hind margins slightly waved; brownish-red, with the costa pale yellow, and two slender brown transverse lines, the elbowed line slightly dentated and strongly curved in front. There are also three rather large stigmata, narrowly surrounded with brown, and a suffused pale submarginal line; hind-wings reddish-grey. Expands about 1¼ inches. A rarity in South-Eastern Europe and Western Asia in August.

* 16. *L. Extranea* (Guén.).—Pale fawn-colour; fore-wings rather pointed, and speckled with black; an oblique row of black dots curved inwards in front, and a subapical brown stripe; hind-wings brownish, with white fringes. Expands nearly 1¾ inches. Common in America and the East Indies, but occasionally taken in Madeira, and on the coasts of France and England in autumn.

* 17. *L. Vitellina* (Hübn.).—Fore-wings rather pointed, pale yellowish, dusted with rusty-red, with two slender rusty-brown transverse lines, which are close together on the inner margin and diverge widely at the costa; the submarginal line is rusty-brown. Orbicular stigma small and surrounded with brown; reniform stigma narrow; hind-wings greyish-white. Expands about 1½ inches. Rare in South Europe in July and August; and has been occasionally taken in England. The larva is pale flesh-colour, with three white lines on the back, a yellowish stripe on the sides, and a brown head, dotted with black. It lives on grass till April.

* 18. *L. Littoralis* (Curt.).—Fore-wings greyish-brown, pale ochre-yellow on the costa, with indistinct dark lines before the hind margin, and a white central longitudinal streak, bordered with black and shortly dentated beyond the middle, extending to the hind margin; hind-wings white. Expands from 1¼ to 1½ inches. Common, but local, on the coast sand-hills of England, France, Holland, and North Germany from June to August. Larva reddish-grey, with seven white longitudinal stripes bordered with black, and a white stripe on the sides. It lives on *Calamagrostis arenaria*, and hybernates when full-grown; and the larvæ of the second brood appear in July. (*L. Alboradiosa*, Eversm., from the Lower Volga, has pale straw-coloured fore-wings, with the median nervure white from the base to the hind margin, and bordered on both sides with black; hind-wings white.)

* 19. *L. Lorcyi* (Dup.).—Fore-wings very pointed, brownish-yellow or rusty-brown, with a dark brown longitudinal shade on the median nervure, which extends to the tip; a round white central spot, and sometimes a row of dark dots beyond the middle; hind-wings white. Expands about 1½ inches. It occurs in Southern and Western Europe from May to July, but is a rarity in most localities. The larva lives on grass in spring and autumn, and changes to a pupa in the ground.

* 20. *L. L.-album* (Linn.).—Fore-wings straw-colour, with a broad brown longitudinal shade running across the middle to the tip, and brown hind margins; the median nervure is thickly bordered with white behind, and bent into a hook; the branches are narrowly white,

and there are short black longitudinal streaks between them, and at the base; hind-wings whitish, dusted with brownish. Expands about 1¼ inches. Common in Central and Southern Europe in June, August, and September, but very rare in England. It also occurs in Western Asia. The larva is flesh-coloured, with a dark double line on the back, and two dark green stripes on each side. It feeds on grass, and hybernates; and may be found in spring and in July.

21. *L. Riparia* (Ramb.).—Resembles *L.-album;* fore-wings rosy-white, varied with yellowish-brown, and with an oblique paler stripe at the tip; an interrupted row of transverse dots, the nervures, especially the median, rosy-white; hind-wings brown, with the base whitish. A scarce species, found in South France and Corsica in May, August, and September. The larva is met with in April.

22. *L. Congrua* (Hübn.).—Somewhat resembles *L. Obsoleta;* fore-wings yellowish-red, with the median nervure dilated into a yellowish-white spot; an oblique interrupted row of transverse dots, scarcely curved, and sometimes almost wanting; hind-wings yellowish-brown. Under side of all the wings pearly-white. Common in South Europe and Western Asia in spring and autumn. The young larva may be found late in autumn on the stalks of maize, hidden between the leaves; and again in summer.

*23. *L. Albipuncta* (W. V.).—Fore-wings reddish-grey or cinnamon-brown, with a small white spot in the middle, and two rather indistinct dark transverse lines bordered with paler, the elbowed line slightly dentated; hind-wings brownish-grey, and shining reddish-grey beneath. Expands about 1¼ inches. Inhabits various parts of Central and Southern Europe and Western Asia in June and July, but is rather local; in England it has only occurred at Folkestone. The larva is reddish-grey, with a white line on the back bordered with dusky, below which is a dark grey stripe on each side, and under this again a white, a blackish, and a yellowish line. It lives on grass till May.

24. *L. Loganæ* (Rössl.).—Fore-wings pale yellowish, finely dusted with darker, with a white central lunule, pupilled with black, a row of dark dots beyond the middle, and the nervures a little lighter; hind-wings light brownish-grey, with the base whitish. Under side of the fore-wings dark grey, and of the hind-wings white, in both cases with a leaden lustre. Expands about 1¼ inches. A little-known species, found in the valley of the Lahn.

*25. *L. Lithargyrea* (Esp.).—Fore-wings reddish-ochreous, with a pale central lunule, white beneath, and two indistinct dark transverse lines, the elbowed line strongly curved; and a row of black dots towards the hind margin; hind-wings brownish-grey; the under side suffused with reddish, with a row of black dots. The variety *Argyritis* (Ramb.), from South Europe, has paler fore-wings, and the row of spots on the hind-wings is placed nearer the hind margin Expands about 1½ inches. Common throughout Europe and Western Asia in June and July. The larva, which feeds on grass till May, resembles that of *Conigera,* but the black lines are wider apart, and the head is reticulated with brown. (*L Vulpecula,* Eversm., from the Ural, is rusty-red, with two dark transverse stripes on the fore-wings, and the orbicular and reniform stigmata ochreous; hind-wings pale reddish.

*26. *L. Turca* (Linn.).—Fore-wings brownish-yellow, thickly and obliquely streaked with rusty-brown, with two brown transverse lines, which are not dentated, and a whitish transverse streak instead of the reniform stigma; hind-wings dark grey, with red fringes. Expands from 1½ to 1¾ inches. Widely distributed in Central and Southern Europe, but not very common. The larva is thick, reddish-brown, with a white line on the back, a yellowish-brown stripe on the sides, and a waved blackish line between them. It lives on grass till June.

GENUS XIV.—MYTHIMNA (LED.).

Fore-wings triangular, narrower in the female, and gradually rounded behind; orbicular and claviform stigmata absent; the tongue strong, the thorax covered with downy hair, and the abdomen long and rather slender. The commonest species, *M. Imbecilla* (Fabr.), has the fore-wings yellowish in the male, and rusty-brown in the female, with two brown transverse lines, which are not dentated, and a small reniform stigma, which is whitish behind. Expands from 1 to 1¼ inches. Widely distributed in the mountains of Europe (except Scandinavia and the north-west), and in Northern Asia, but local. It is found on flowers in the day-time. The larva is dirty grey, with oval spots on the back divided by a white line, and a dark grey stripe on the sides; it feeds on low plants. *M. Impar* (Staud.), from Sarepta, differs from *Imbecilla* chiefly in its perfectly simple antennæ; those of the latter being shortly and thickly pectinated in the male, and setose and densely clothed with hair in the female, which makes them appear spindle-shaped.

GENUS XV.—SEGETIA (BOISD.).

Fore-wings triangular, narrow at the base, and nearly rectangular at the tips; the *Noctua*-pattern present, the tongue spiral, the thorax covered with flattened scaly hair, and slightly crested before and behind; and the abdomen conical. *S. Viscosa* (Freyer), from the extreme south of Europe, is fawn-colour; the fore-wings with a broad dusky fascia bordered by the whitish central transverse lines, and enclosing the orbicular and reniform stigmata, which are also bordered with whitish, and the submarginal line whitish; hind-wings paler, with the hind margin broadly darker. (*S. Sareptæ*, Guén., from South Russia, hardly belongs to this genus. The fore-wings are broad, shining dark brown, and dentated, with the central area tinged with reddish; hind-wings brownish-grey, very slightly tinged with reddish, with blackish marginal lunules.)

GENUS XVI.—STILBIA (STEPH.).

Fore-wings with the tips rounded, the hind margin slightly curved, with long rounded fringes; the *Noctua*-pattern indistinct, the antennæ simple, the last joint of the palpi very short, and the tongue strong. The only species, **S. Anomala* (Haw.), has ashy-grey fore-wings in the male, with the costa brownish, and dark violet-grey fore-wings in the female. The transverse lines are indistinct and double, and the two stigmata are of equal size; the orbicular stigma is long and oblique, and surrounded with whitish. The hind-wings are white, suffused with brownish. Expands from 1 to 1½ inches. It is found in England, France, and Nassau in August and September, but is local and seldom common. The larva is brown or yellow, with three fine whitish lines on the back, and a bluish-white stripe on the sides. It lives on grass from autumn to May. The moth is figured at Pl. 54, Fig. 7.

GENUS XVII.—ANOMOGYNA (STAUD.).

The fore-wings are triangular, obtusely pointed at the tips, and the hind margin is but little curved. The palpi and abdomen are rather long, the latter with tufts on the sides, and in the male, which is larger than the female, with an anal tuft also. The *Noctua*-pattern is well marked. The only species, *A. Lætabilis* (Zett.), from the extreme north of Europe and Asia, has yellowish-grey fore-wings, with the stigmata very large, white, and edged with

black, and several zigzag black transverse lines edged with white; between the outermost white line and the hind margin the nervures are white, forming white arches standing on the margins, which are intersected in the male with another curved black line. Hind-wings whitish, more or less varied with grey. Expands from 1¼ to 1½ inches.

GENUS XVIII.—CARADRINA (TR.).

Rather small moths; the fore-wings with a short and slightly curved hind margin, the tips obtuse, and the fringes rounded. They are yellowish-brown or grey, with two dark transverse lines, the inner line indented and the elbowed line dentated, often bordered with paler, and with black spots at the tip. The claviform stigma is wanting, the orbicular stigma is round and sometimes very small, and the reniform stigma is generally large, and both are usually surrounded with a narrow pale line; the submarginal line is pale and slightly curved; and the hind-wings are broad. The antennæ are ciliated, but not dentated; the tongue is strong; and the abdomen extends rather beyond the hind-wings. The larvæ are naked, with pale longitudinal lines, and feed on low plants from autumn to spring, and construct their pupæ on or in the ground. They may be obtained by sweeping, or by searching among dry leaves. The moths appear between May and August, and may be taken at sugar, or flying in weedy places at dusk. They are widely distributed, but many species are rare, probably because they are small dull-coloured insects, and therefore liable to be overlooked.

* 1. *C. Exigua* (Hübn.).—Fore-wings narrow and triangular, with the hind margin oblique; yellowish-grey, with two dark double transverse lines, the submarginal line white and indented, and well-marked black marginal spots bordered with white; the stigmata pale yellow, the small round orbicular stigma with a rusty-yellow centre, and the reniform stigma with a brown centre. The hind-wings are broadly triangular, of a slightly transparent white, with brown nervures. Expands from 1 to 1¼ inches. It inhabits South Europe and Western Asia from May to August, and is occasionally met with in the south of England in June. The larva lives on convolvulus, &c., growing in damp places, and forms a slight cocoon under moss.

* 2. *C. Morphœus* (Hufn.).—Fore-wings broad, narrower in the female, brownish-grey, with a dark grey band sharply bounded in front before the submarginal line; the stigmata are rather large, surrounded with rusty-brown and filled up with grey; the hind-wings are whitish, dusted with grey at the hind margin. Expands about 1¼ inches. Common in Central and Northern Europe from June to August. The larva is reddish-ashy, with a white line on the back, and oblique black stripes, widened triangularly, on the sides. It feeds on convolvulus, lettuce, &c., and hybernates when full-grown. (*C. Vicina*, Staud., from Sarepta, is closely allied to *Cubicularis*. It is whitish-grey, the hind margin blackish—never reddish-brown—and intersected by the white submarginal line; the orbicular stigma is almost or quite obsolete, the reniform stigma is blackish instead of reddish-brown, the costa is much more distinctly spotted with black, and the transverse lines are indicated by interrupted black dashes; hind-wings as in *Cubicularis*.)

* 3. *C. Cubicularis* (W. V.).—Fore-wings yellowish-grey, with black finely indented transverse lines, and a zigzag whitish submarginal line, bordered with rusty-red in front; the stigmata are small and dark, the reniform stigma is marked with white dots on the edges; and the hind-wings are rounded, and of a translucent white. Expands from 1 to 1¼ inches. Common in Europe and Northern and Western Asia from June to August. The larva is reddish-grey

with a pale line on the back, and a black head, and plate behind it. It lives on chickweed, &c., till May. The moth is figured at Pl. 33, Fig. 6. (*C. Albina*, Eversm., from the Ural, appears to be a variety with yellower fore-wings. *C. Fuscicornis*, Ramb., from Corsica, has ashy fore-wings, with three indistinct transverse reddish lines; the reniform stigma is red, dotted with white in the middle, and the hind-wings are white. *C. Anceps*, Herr.-Schäff., also from Corsica, is brownish-ashy, the fore-wings with a pale waved line interrupted by the nervures, and the hind-wings ashy.)

4. *C. Selini* (Boisd.).—Fore-wings dark ashy-grey, the transverse lines black, and the elbowed line finely dentated, adjoining a second dark stripe; the orbicular stigma is small, and the reniform stigma is filled up with darker; the subterminal line is narrow in front, and bordered with dusky behind as far as the hind margin; hind-wings white, with grey hind margins. Expands about 1¼ inches. A rare species, found in the Pyrenees, Valais, Harz Mountains, &c., in July. (*C. Noctivaga*, Bell., from Southern Europe, resembles *Cubicularis*, but the markings are much less distinct, and the reniform stigma is reduced to some whitish streaks and a small yellow crescent. The hind-wings are darker, and more varied with brown. This insect flies from June to August, and may be a variety of *C. Selini*. *C. Selinoides*, Bell., from Corsica, has longer fore-wings, of a dark violet-brown. The lines are broader and better marked, the stigmata are well marked, the reniform stigma is bordered with white as in *Cubicularis*, and the central shade is more distinct. Hind-wings shining yellowish-brown, darker in the female. Found in July under bark and among dead leaves; the pupa is found under stones.)

5. *C. Kadenii* (Freyer).—Fore-wings reddish ashy-grey, with indistinct transverse lines, and a rusty-brown spot instead of the orbicular stigma; the reniform stigma is rusty-brown, with the edges dotted with white; the subterminal line is edged in front with rusty-brown. Expands 1¼ inches. It is found from May to August in Southern Europe, and the larva feeds on various low plants in March and April. (*C. Petræa*, Tengstr., from Finland, is smaller and more slender than *C. Cubicularis*, and is uniform pale greyish-ashy, thickly dusted with black atoms. The fore-wings are rather broad, with rather indistinct lines, and the orbicular stigma is punctiform; the hind-wings are whitish at the base, with a large and distinct black spot in the middle on the under side.)

6. *C. Terrea* (Freyer).—Fore-wings reddish-grey, with the markings indistinct, the stigmata of moderate size, partly bordered with white, the subterminal line pale, spotted with black on the basal side (except in variety *Dubiosa*, Staud.); hind-wings white, with the hind margin dusted with brownish. Expands 1¼ inches. It is found in the mountains of South Europe in July.

7. *C. Germainii* (Dup.).—Fore-wings dark brown, with the two central lines black and waved; the subterminal line is formed by a row of small pale yellow dots, with small black triangular spots resting on them. The stigmata are indistinct, the reniform stigma marked with one white and three fulvous spots; hind margin edged with fulvous dots. Hind-wings shining yellowish-white, with the hind margin greyish-brown. It inhabits South France and Spain in June.

8. *C. Pulmonaris* (Esp.).—Fore-wings short, rusty-yellow, varied with reddish-brown; stigmata large, partly bordered with whitish, the reniform stigma filled up with blackish; and the hind-wings brownish-grey. Expands about 1 inch. Local in Southern and Central Europe in June and July, but absent in the north-west. Larva dingy green, with a whitish line on the back, and a yellowish-brown head. It lives on *Pulmonaria* till May. (*C. Variabilis*, Bell., bred from pupæ found under the sand on the coast of Corsica in April, is of the size

of *Respersa*, but the wings are narrower. Fore-wings rosy-grey, tinged with yellow, but very variable. Sometimes they are crossed by slender brown denticulated lines, resembling those of *Agrotis Latens;* sometimes no markings are visible except the narrow brown reniform stigma, with its white centre, and three brown dots on the pale costa, corresponding to the ordinary lines. The orbicular stigma is reduced to a mere dot; and there is usually a submarginal row of brown spots. Hind-wings white, darkest towards the hind margins. Fringes broad, silky-white. It expands 1¼ inches.

9. *C. Respersa* (W. V.).—Fore-wings pale ashy-grey, the oblique lines black and well marked, the elbowed line strongly dentated, the stigmata rather small and indistinct, scarcely bordered with paler, the subterminal line narrowly bordered with dusky in front; hind-wings brownish, paler at the base. Expands from 1 to 1¼ inches. Inhabits Central and Southern Europe in June and July, but scarce and local, and absent in the north-west. Larva dark brown, with a paler stripe on the back, edged with whitish lines. It is finely suffused with blackish, and there are two white spots on each segment. It lives on grass, &c., in dry meadows, and hybernates under stones. (*C. Aspersa*, Ramb., a rare species, found in South France in July, has reddish-grey fore-wings, dusted with brownish, with four indistinct waved and dentated lines; the reniform stigma is crescent-shaped and blackish, and the orbicular stigma is scarcely visible; hind-wings whitish, with the hind margin brown.)

* 10. *C. Alsines* (Brahm).—Fore-wings broad, yellowish copper-brown, with large dark stigmata surrounded with whitish, and a whitish subterminal line narrowly edged with dusky in front; hind-wings grey, paler at the base in the male. Expands about 1¼ inches. Common in Central and Northern Europe and Northern Asia in June and July. The larva is thick, clay-coloured, and the back is pale reddish-grey, with three fine whitish lines bordered with dusky. It feeds on low plants till May.

11. *C. Sericea* (Speyer).—Fore-wings yellowish-grey, very shining, and much narrower than in *Alsines;* the stigmata narrowly bordered with paler; hind-wings iridescent greyish-white. A scarce species, found in Holland and North Germany in July.

* 12. *C. Taraxaci* (Hübn.), *Blanda* (Tr.).—Very near *Alsines*, fore-wings with the same markings, but paler; pale chocolate-brown, slightly suffused with violet-grey; hind-wings dirty white, and with the hind margin dusted with brownish. Expands 1¼ inches. Common throughout Central Europe and Western Asia in June and July. The larva is dark grey, with three fine whitish lines on the back and a light stripe on the sides.

13. *C. Superstes* (Ochs.).—Also like *Alsines*, but the thorax and fore-wings are ashy-grey, thickly and finely dusted with black; fore-wings reddish between the nervules on the hind margin beyond the subterminal line; hind-wings white, suffused with brownish-black on the hind margin. A rather scarce species, inhabiting the mountains of Southern Europe and Nassau. The larva is grey, with a darker line on the back, a pale stripe on the sides, and oblique dashes between them.

14. *C. Gilva* (Donz.).—Fore-wings ashy, varied with whitish on the first half of the wing, with the three lines darker, waved, and rather indistinct, the subterminal line varied with whitish. The stigmata are absent, the reniform stigma being replaced by a group of brown dots. Hind-wings white, the hind margin broadly washed with pale ashy. Expands 1½ inches. A rare species, inhabiting the mountains of South Europe in July, and classed as an *Agrotis* by some writers.

* 15. *C. Ambigua* (W. V.), *Plantaginis* (Hübn.).—Differs from *C. Superstes* by the narrower yellowish-grey fore-wings; hind-wings white, only slightly suffused with brownish on the

hind margins in the female. Expands 1¼ inches. Inhabits South Europe in July, but rather scarce; has also been found in England. Larva brownish-grey, finely shaded with blackish, with three fine pale lines on the back, and dark oblique dashes, and a black line on the sides.

16. *C. Gluteosa* (Tr.).—Fore-wings triangular, broad in the male, and narrower in the female; dark ashy-grey, with a reddish shine, and a dark central shade, interrupted below the costa. The subterminal line is a little paler, and the transverse lines and reniform stigma are indistinct; the orbicular stigma is represented by a black spot. The hind-wings are very broad, and whitish, dusted with grey. Expands from 1 to 1¼ inches. A scarce species, found in the Southern Alps in May. (*C. Lenta*, Tr., from Hungary, has narrower fore-wings in the male, the reniform stigma is distinctly surrounded with dusky, the central shade is less interrupted, and the hind-wings are much narrower, and brownish-grey.)

* 17. *C. Palustris* (Hübn.).—Male with the fore-wings broad and triangular, pale reddish-grey, with two brown transverse lines, the elbowed line indented, the orbicular stigma represented by a brown dot, and the reniform stigma by a darker brown spot; the hind-wings are broad, and light grey. The wings are much smaller in the female; the fore-wings narrow and parallel, dark grey, dusted with blackish, but with the same markings as in the male; the hind-wings are short, and dark grey. Expands from 1¼ to 1½ inches. Widely distributed in Northern and Central Europe from May to July, but rare, flying in grassy places in woods by day. The larva is clay-colour, with a white interrupted line on the back, below which are dark angular spots. (*C. Abolene*, Guén., from South Russia, has ochreous fore-wings, varied with black; the central lines are indistinct, and the extremities of the nervules are darker; hind-wings dirty white, with ashy marginal lines. It may be distinguished from *Palustris* by its less hairy palpi.)

18. *C. Lepigone* (Möschl.).—Fore-wings narrow, oblong, nearly parallel, shining greyish-brown, with the lines scarcely indicated by paler atoms. The stigmata are indistinct, but brown, and the reniform stigma contains a small yellow spot. Hind-wings white, the costa tinged with dark greyish-brown. A rare species, hitherto only observed in the south of France and Russia, and in Armenia.

19. *C. Hospes* (Freyer).—Brown; fore-wings with the nervures indistinctly shaded with black and white, a fulvous submarginal line, and the stigmata black; hind-wings white, brownish at the hind margins. Inhabits South France, Spain, and Sicily.

GENUS XIX.—ACOSMETIA (STEPH.).

The hind margin of the fore-wings is long and nearly straight in the male; in the female the wings are narrower and the hind margin shorter. The stigmata are absent. The hind-wings are very broad, with the tips obtusely rounded, and the abdomen is slender, and does not extend beyond the anal angle. The antennæ of the male are not dentated, and the tongue is horny. The only species, **A. Caliginosa* (Hübn.), has brownish-grey fore-wings, with a reddish lustre, and indistinct dark transverse lines, beyond which is a row of dark spots. The hind-wings are thinly scaled with brownish. Expands from 1 to 1¼ inches. It is found throughout Central Europe, flying at dusk or during the day in damp meadows, especially near woods, from May to July, but is local. It is figured at Pl. 54, Fig. 11.

GENUS XX.—LAMPETIA (BOIE).

Fore-wings with the tips nearly rectangular and rather truncated, rounded above the hinder angle, with rounded fringes and indistinct markings; hind-wings with the tips rounded.

The female has narrower and rounder wings. The antennæ are not dentated, and the abdomen is slender and tufted at the sides. The only species, **L. Arcuosa* (Haw.), has pale ochre-yellow fore-wings, varied with rusty-red, with two slender indistinct blackish transverse lines, the elbowed line strongly curved, beyond which is a row of small black dots; hind-wings dusted with grey. Expands from three-quarters to one and a quarter inches. Common in Central Europe in June and July. The larva is dirty yellowish-white, with small dark warts. It lives from autumn to May in and between the stems of *Aira cæspitosa.*

GENUS XXI.—GRAMMESIA (STEPH.).

Body stout, fore-wings short and broad, with the hind margin a little oblique and slightly curved; fringes rounded, stigmata absent. Hind-wings with the tips rounded; the thick abdomen extends beyond the anal angle. The only species, **G. Trigrammica* (Hufn.), *Trilinea* (W. V.), has greyish-ochreous fore-wings, finely dusted with rusty-brown, and three nearly straight rusty-brown transverse lines (the middle line wanting in variety *Bilinea*, Tr.), and the hind-wings dusted with brown. Expands about 1½ inches. Common in Central and Southern Europe from May to July. The larva is thick, violet-brown, with a light stripe on the sides and black oblique stripes on the back. It lives on low plants from autumn to May.

GENUS XXII.—DICYCLA (GUÉN.).

Body rather stout, fore-wings narrow, a little broader behind, with the hind margin only slightly oblique, and rounded fringes; the complete *Noctua*-pattern is present. The abdomen extends a little beyond the anal angle of the hind-wings. The only species, **D. Oo* (Linn.), has pale yellow fore-wings, rusty-brown and dusted with grey towards the base and in the suffused band; the two double transverse lines, the central shade, on which the reniform stigma is placed, and the neighbourhood of the three stigmata all rusty-brown; hind-wings whitish. Expands from 1¼ to 1½ inches. Common in Central and Southern Europe from June to August. The larva is slender, reddish-brown, with white longitudinal lines. It lives on oak, in May and June, between leaves which it has spun together.

GENUS XXIII.—CLEOCERIS (BOISD.).

Fore-wings broader behind, gradually rounded above the hinder angle; the tips truncated, the fringes rounded, and the complete *Noctua*-pattern marked; hind-wings narrow, the abdomen rather long and tufted at the sides. The only species, **C. Viminalis* (Fabr.), has violet-grey fore-wings, varied with brown, with a black basal streak, and the three stigmata narrowly surrounded with black; the orbicular and reniform stigmata are whitish, with dark centres, and the claviform stigma extends to the elbowed line; the lines are indistinctly double, and the elbowed line is strongly curved round the reniform stigma; hind-wings pale grey. Expands from 1¼ to 1½ inches. Common in Europe and the Altai in July. The larva is slender, green, with five white longitudinal lines, and the mouth and back of the head black. It feeds on willow in May and June.

GENUS XXIV.—ANCHOCELIS (GUÉN.).

Rather slender, the fore-wings rather narrow, and the tips somewhat rounded and not prominent; hind-wings comparatively small. The forehead with a small projecting hairy tubercle, truncated at the end; the palpi long and drooping, with the last joint short and truncated.

The only species, * *A. Lunosa* (Haw.), is dark grey, with the transverse lines and nervures yellow, and the subterminal line bordered inside with triangular black spots, which are most distinct towards the costa. Stigmata brownish-black, bordered with yellow. Hind-wings shining white, with a discoidal lunule, and a marginal row of more or less distinct blackish spots. Expands about 1¼ inches. It appears to be confined to Britain, France, and Spain, and occurs from July to September. The larva is greenish, with white longitudinal lines, and lives on grass in dry elevated localities in April.

GENUS XXV.—RUSINA (BOISD.).

Body rather stout, fore-wings with the hind margin a little oblique, and curved behind, and the fringes rounded; the stigmata are indistinct, and the claviform stigma is absent; the hind-wings are broad, the last joint of the palpi is straight, and the abdomen is short. The only species, * *R. Tenebrosa* (Hübn.), has russet-brown fore-wings, with a yellowish lustre, and two single slender black transverse lines, rising from white costal spots; the subterminal line is indistinctly edged with white, and broken into spots, and the hind-wings are grey. Expands about 1¼ inches. Widely distributed in Europe in June and July. The larva is thick, reddish-brown, with the back redder, and marked with three pale lines, between which are oblique blackish dashes, and a grey stripe on the sides. It feeds on low plants in autumn, and hybernates when full-grown.

GENUS XXVI.—ASTEROSCOPUS (BOISD.).

Rather large moths, resembling *Bombyces*, to which many authors refer them, placing them among the *Notodontidæ*. Fore-wings rather long, with a long curved oblique hind margin, and the fringes slightly convex. They are grey, with dark longitudinal stripes; the hind-wings are small, with a dark spot in the middle; the abdomen extends much beyond the anal angle, and is tufted on the sides. The larvæ are thick and naked, with the last segment but one somewhat raised, and when at rest they erect the front part of their bodies; they change to pupæ in the ground. In the first species the tongue of the moth is rudimentary, and the stigmata are indistinct; in the second, which forms the genus *Selenoscopus* (V. Hein.), the tongue is short and weak, but spiral, and the three stigmata are well marked.

* 1. *A. Sphinx* (Hufn.), *Cassinea* (W. V.).—Fore-wings pale grey, varied with brownish yellow, with many short black longitudinal dashes, and a small oblong orbicular stigma surrounded with black; hind-wings greyish, with the nervures and a round central spot brown. Expands about 1½ inches. Common in Central Europe in October and November. The larva is yellowish-green, with three white lines on the back, and a yellowish-white stripe on the sides, shaded with dusky above. It lives on willow, lime, &c., from May to August. The moth is figured at Pl. 33, Fig. 7.

* 2. *A. Nubeculosa* (Esp.).—Fore-wings dark ashy-grey, varied with darker grey, with two light transverse stripes, not sharply defined, the last oblique and zigzag, and placed very far back. The nervures are thick and black, and the three stigmata are broadly surrounded with black; the orbicular stigma is small, and the reniform stigma is very large, and filled up with whitish-grey above; the hind-wings are dusted with brown. Expands from 1 to 1¾ inches. A scarce insect, occurring in the north of Central Europe in March and April. The chief British locality is Rannoch, in Perthshire. The larva is green, with a perpendicular yellow dash on the sides of the 4th segment. It feeds on birch, elm, &c., from May to July.

GENUS XXVII.—DASYPOLIA (GUÉN.).

Fore-wings with a long oblique curved hind margin, the tips rounded, and the fringes slightly waved; the markings indistinct; hind-wings small, with the tips broad and rounded. The antennæ are not dentated, and the abdomen is thick and extends for one-third of its length beyond the anal angle of the hind-wings. The only species, **D. Templi* (Thunb.), has brownish-grey fore-wings, varied with ochre-yellowish, the transverse lines and stigmata only represented by light spaces; the subterminal line pale grey, zigzag, bordered with dusky in front; hind-wings pale grey, tinged with ochreous, and marked with two darker stripes. Expands about 1¾ inches. It is found throughout Northern and Central Europe in October and November, chiefly in mountainous districts, where it hides itself under stones. The female hybernates, and lays her eggs in early spring. The larva lives in the stalks and roots of *Heracleum Sphondylium*. The moth is figured at Pl. 54, Fig. 2.

GENUS XXVIII.—LUPERINA (BOISD.).

Body stout, the fore-wings a little broader behind, with the hind margin nearly straight, but curved above the hinder angle, and the fringes slightly waved; only the reniform stigma visible; hind-wings small, and the abdomen extending considerably beyond the anal angle; and the tongue strong. The only species, *L. Virens* (Linn.), is uniform green, with a white spot in the middle; hind-wings white, suffused with greenish. In the variety *Immaculata* (Staud.), from Hungary and Russia, the white spot on the fore-wings is wanting. Expands about 1¾ inches. Not uncommon throughout Central Europe and Western Asia in July and August, on thistle-blossoms, but not found in Britain. The larva, which is dirty green, with a black head, feeds on low plants in May and June. The moth is figured at Pl. 37, Fig. 1.

GENUS XXIX.—PANOLIS (HÜBN.).

Body stout, fore-wings rather long, with the hind margin oblique, and the fringes slightly waved; the claviform stigma absent. Hind-wings rather long, abdomen depressed, and not extending far beyond the anal angle; tongue horny. The only species, **P. Piniperda* (Panz.), has reddish fore-wings, varied with yellowish-grey, with two double reddish-brown transverse lines, converging towards the inner margin; the two stigmata are large and whitish, and concave behind, and the reniform stigma is oblique; the hind-wings are brownish-black. Expands from 1¼ to 1½ inches. Common in Northern and Central Europe from March to May. The larva is slender and naked, green, with three broad white lines on the back, and a yellow or red line on the sides. It lives on fir and pine in July and August. The moth and larva are figured at Pl. 33, Fig. 8, *a*, *b*.

GENUS XXX.—CHARÆAS (STEPH.).

Fore-wings broad behind, with the tips rectangular and truncated, the hind margin straight, curved towards the hinder angle; the three stigmata are visible. The hind-wings are small, and the abdomen extends far beyond the anal angle. The only species, **C. Graminis* (Linn.), has brownish-red or olive-grey fore-wings, with the three stigmata paler. The reniform stigma is white below, and produced into two teeth; the claviform stigma is long, and the subterminal line is replaced with blackish triangles; hind-wings brownish-black. The variety

Tricuspis (Esp.) has unicolorous reddish-brown fore-wings, with a large three-lobed white spot. Expands from 1¼ to 1½ inches. Common in Central and Northern Europe and Northern Asia from July to September. The larva is thick and naked, brown, with three pale lines on the back, and black plates on the 2nd and last segments. It feeds on the roots of grass from autumn to June, and is often injurious.

GENUS XXXI.—PERIGRAPHA (LED.).

Body stout, the fore-wings a little broader behind, with the tips pointed, and the fringes waved; the stigmata contiguous, the hind-wings small and narrow, the abdomen small, though extending beyond the anal angle; legs and palpi covered with long hair; the tongue strong. The best known species, *P. I-cinctum* (W. V.), has dark violet-grey fore-wings; the three stigmata are very large, reddish ashy-grey, and united on the median nervure, and are placed on a deep black ground; the hind-wings are brownish-grey. Expands about 1¾ inches. It is not a common species, but occurs in Eastern Europe and the Altai in April and May. Larva reddish, shaded with grey, with three yellowish-white lines on the back, and a yellow stripe on the sides. It lives on low plants in June and July. *P. Circumducta* (Led.), from Sarepta and the Altai, is allied to *I-cinctum*, but the antennæ of the male are more strongly pectinated, and the stigmata are wider apart, very pale, and bordered with pale yellowish. The stigmata stand on a coffee-brown ground, shading into deep black immediately around them. The reniform stigma slopes oblique outwards from the costa, and is much widened on both sides at the median nervure by a straight, sharply-defined dash, which forms an acute angle on the inner side, where the stigma is much further from the inner line than in *I-cinctum*, and it is much less curved between them.

GENUS XXXII.—TÆNIOCAMPA (LED.).

Middle-sized or rather small moths, with stout bodies; the fore-wings rectangular, slightly rounded above the hinder angle, with rounded, or at most with very slightly waved fringes. The wings are yellow, brown, or grey, with the orbicular and reniform stigmata large, and the claviform stigma generally wanting. The transverse lines are seldom distinct, the submarginal line is not indented, brownish-grey, and seldom white. The abdomen extends a little beyond the anal angle; the legs and palpi are hairy, and the last joint of the latter is distinctly visible. The antennæ of the males are either pectinated or ciliated. The larvæ are cylindrical and naked, and feed with a few exceptions, which will be noticed, in June and July. Most of them live on trees, and the moths all appear in April and May, and may be taken at sugar or at sallow-blossoms.

* 1. *T. Gothica* (Linn.).—Fore-wings brownish-red, varied with violet-grey, with the transverse lines pale, and a deep black longitudinal streak above the claviform stigma; the discoidal cell between the inner line and the reniform stigma filled up with deep black, except in variety *Gothicina* (Herr.-Schäff.), the orbicular stigma produced in front. Expands from 1¼ to 1½ inches. Common throughout Europe and the Altai. The larva is green, with three dull pale lines on the back, and a white stripe on the sides. It lives on various shrubs and low plants. The moth and larva are figured at Pl. 33, Fig. 9, *a*, *b*.

2. *T. Porosa* (Eversm.).—Dark brown, the markings of the fore-wings violet-grey, with the outlines of the orbicular and reniform stigmata reproduced by dark lines within them. Two spots near the base, the claviform stigma, a square spot between the other stigmata, a triangle

behind the reniform stigma, a transverse spot within the elbowed line, and two on the subterminal line all black. Expands 1¼ inches. It inhabits South Russia in June and July. (*T. Rorida*, Herr.-Schäff., from Turkey, is pale ashy, the fore-wings varied with brown, and the markings very indistinct; the reniform stigma is small and black.)

* 3. *T. Populeti* (Fabr.).—Fore-wings violet-grey, with indistinct transverse lines, and an interrupted whitish subterminal line, marked with black or rusty-brown in front; the two stigmata are dark, bordered with paler. Expands nearly 1½ inches. It occurs throughout Central Europe. The larva is yellow, with the mouth and the sides of the head black. It lives on poplar.

* 4. *T. Miniosa* (W. V.).—Fore-wings yellowish-grey, thickly dusted with red-lead colour, especially in the central area, with light transverse lines; the two stigmata are darker, and surrounded with paler. Hind-wings white, thinly dusted with grey, with a dark central spot, and two reddish curved lines; fringes reddish. Expands from 1¼ to 1½ inches. Found throughout Central Europe, but not very common. The larva is pale blue, with broad yellow stripes on the back and sides, between which are round, black, and often connected spots; head dotted with black. It lives on oak, birch, and willow in April and May, at first gregariously, and afterwards singly.

* 5. *T. Pulverulenta* (Borkh.), *Cruda* (Tr.).—Fore-wings greyish-yellow, with the transverse lines replaced with black dots, and the subterminal line indistinct. The stigmata are darker, and surrounded with paler, and the orbicular stigma is small. Expands from 1 to 1¼ inches. Common in the greater part of Europe. The larva is green or brown, with small black warts, three white lines on the back, a yellow stripe on the sides, and a transverse one on the 12th segment; head black. It lives on oak in May.

* 6. *T. Munda* (W. V.).—Fore-wings greyish-ochre, with grey stigmata surrounded with paler, and black spots (absent in variety *Immaculata*, Staud.) in front of the rather indistinct subterminal line, especially at and above the middle. Expands from 1½ to 1¾ inches. The larva is yellowish-grey, with a black line on the back, suffused black transverse stripes, and a broad reddish-grey stripe on the sides, bordered above with a wavy black line, which is marked with triangular white spots on the 5th and 6th segments.

* 7. *T. Stabilis* (W. V.).—Fore-wings short, reddish-yellow, with black dots beyond the middle, and a whitish nearly straight subterminal line; the nervures near the hind margin are pale and slender, the two stigmata are of nearly equal size and close together, and surrounded with paler; in the female the antennæ are serrated. Expands from 1¼ to 1½ inches. Common in Central and Southern Europe. The larva is green, with three yellowish lines on the back, a yellow stripe on the sides, and a yellow transverse line on the 12th segment. It feeds on elm, oak, and beech.

* 8. *T. Gracilis* (W. V.).—Resembles *Stabilis*, but the fore-wings are longer and more pointed; much paler reddish-grey, with the orbicular stigma smaller; hind-wings lighter, with the black central spot of the under side showing through; female with the antennæ simple. In all the preceding species the antennæ are pectinated in the male; in this and in the two following species they are ciliated. Larva green or brown, varied with white, with three slender white lines on the back, and a broad yellow stripe on the sides, bordered with white lines, and shaded above with deep black. It lives on willow, wormwood, &c., spinning together the leaves at the ends of the shoots.

* 9. *T. Incerta* (Hufn.), *Instabilis* (Tr.).—Fore-wings violet-grey, varied with reddish-brown, with a whitish subterminal line bordered in front with brown, and set backwards below the

costa; the two stigmata large, bordered with white, the orbicular stigma oval and oblique, the reniform stigma bordered with blackish beneath. It varies considerably in colour and in the distinctness of the markings. Expands from 1¼ to 1½ inches. The larva is green, varied with white, with a yellow line on the back, and a yellow stripe on the sides, bordered above with black. It feeds on oak, birch, willow, and sloe in May and June.

* 10. *T. Opima* (Hübn.).—Fore-wings not rounded at the hinder angle, violet-grey, brown in the central area, with the subterminal line straight and white, narrowly bordered in front with brown; the stigmata large and bordered with white; the orbicular stigma round. Hind-wings brownish-grey. Expands about 1½ inches. Found throughout Central Europe, but not very common. The larva is brown, with a yellowish head, and feeds on oak.

GENUS XXXIII.—PACHNOBIA (LED.).

Middle-sized, stout-bodied moths, with broad fore-wings, truncated behind, and rounded above the hinder angle; fringes rounded. The fore-wings are reddish-brown, with the two stigmata and the very sinuous subterminal line paler; the transverse lines dark and slender, the inner line with round projections, and the elbowed line dentated; hind-wings broad and grey. The thighs and palpi are covered with long hair, and the abdomen extends a little beyond the anal angle. The larvæ feed on low plants, such as dock and plantain, and resemble those of *Tæniocampa*, and the moths appear in April and May.

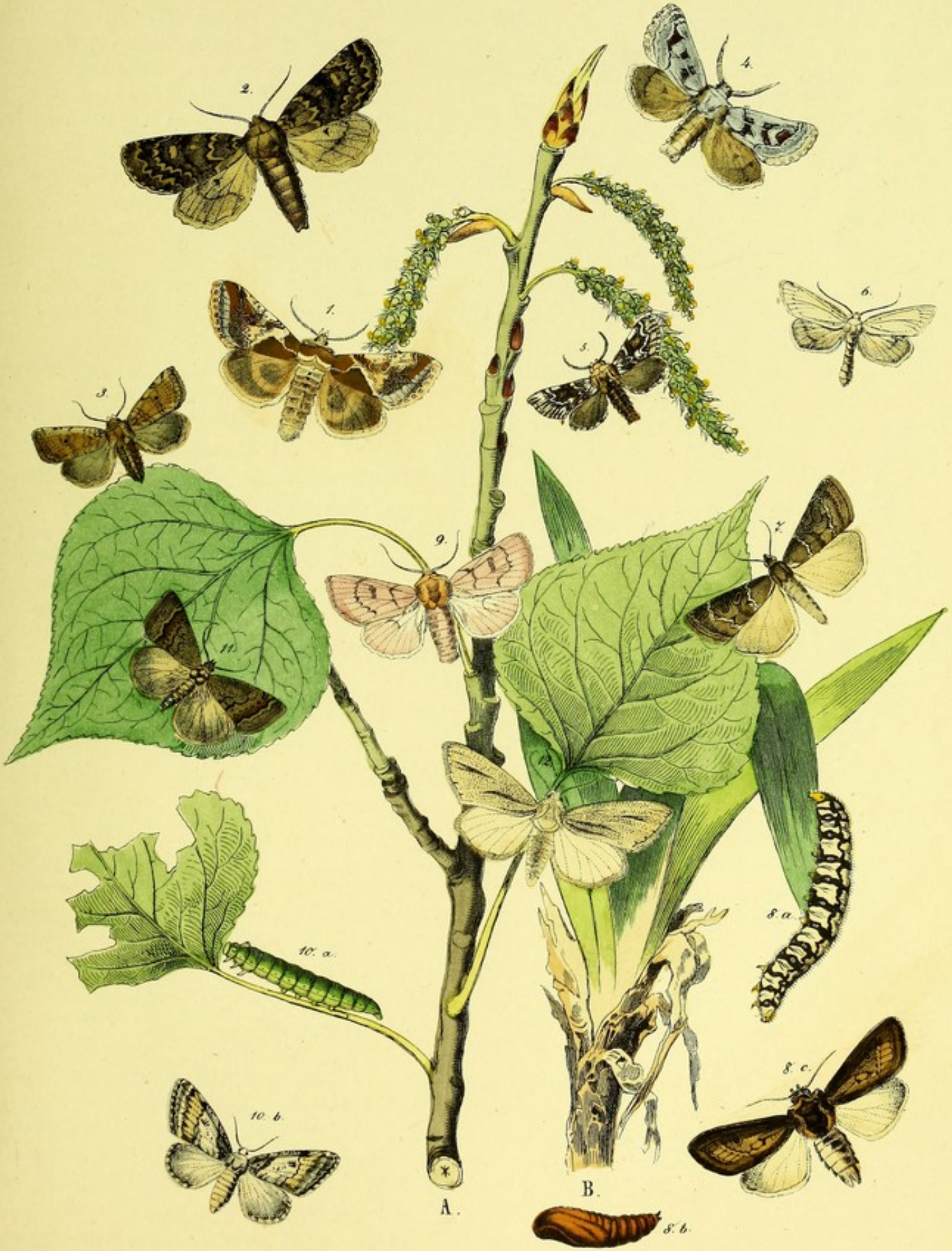
* 1. *P. Leucographa* (W. V.).—Fore-wings reddish-brown, with the stigmata dusted with whitish, and the hind margin darker as far as the subterminal line. Expands nearly 1¼ inches. Found throughout Central Europe, but not common. Larva green, finely dusted with black and white on the back, and with oblique brownish stripes; a rusty-yellow band on the sides, bordered with black above. (*T. Faceta*, Tr., is brown, with the head, prothorax, and orbicular stigma straw-colour; the reniform stigma is rust-colour. A very scarce species, found at Naples and in Sicily.)

* 2. *P. Rubricosa* (W. V.).—Fore-wings reddish-brown, the costa violet-grey, with three brown spots; the transverse lines bordered with pale, and the subterminal line violet-grey. Expands from 1¼ to 1½ inches. Found throughout the greater part of Europe and Northern Asia. The larva is reddish-brown, with two yellowish lines on the back (adjoining which are some white dots bordered with black), and a straw-coloured stripe on the sides.

3. *P. Carnea* (Thunb.).—Brownish-ashy; fore-wings with angulated grey and blackish lines, and a dark brown stripe on the disc; the orbicular stigma is whitish, very large, and somewhat oval, and the reniform stigma is bordered with whitish; they are connected by a fawn-coloured streak. Inhabits Norway, Lapland, and Labrador. The moth is figured at Pl. 54, Fig. 3.

GENUS XXXIV.—ORTHOSIA (TR.).

Small or middle-sized moths, with stout bodies; the fore-wings more or less produced, generally with the tips pointed and the hind margin oblique, rarely with the tips rounded and rectangular, or with the hind margin straight, and curved above the hinder angle. The fore-wings are smooth, and yellow, brown, or grey, with the *Noctua*-pattern complete, only the claviform stigma is indistinct; the fringes are slightly, if at all, waved; hind-wings grey. The antennæ of the male are ciliated, and the abdomen extends for a quarter of its length beyond the anal angle of the hind-wings. The larvæ are thick and cylindrical, with a small head. They generally feed


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8. b.

in May and June, hide themselves by day, and change to pupæ in the ground. The moths appear from August to October, and most of the species hybernate and reappear in spring.

1. *O. Ruticilla* (Esp.).—Fore-wings a little broader behind, reddish or yellowish-grey, with indistinct double transverse lines and stigmata, the latter surrounded with paler, and the reniform stigma filled up with dark grey beneath. The central shade is marked with a double row of black dots, intersected with paler, and the submarginal line is rather sinuous. Expands from 1 to 1¼ inches. Common in the south of Europe, but very rare and local in Central France and Northern Germany. It appears in April. The larva is brown, with dark angular shades, and a black head. It feeds on oak, living first in the buds.

2. *O. Humilis* (W. V.).—Fore-wings yellowish ashy-grey, with pale nervures, the two large stigmata surrounded with paler, and the transverse lines double and not dentated, the elbowed line bent below the costa, but otherwise nearly straight; the fringes marked with a double row of black dots. Expands from 1¼ to 1½ inches. A scarce insect in the southern half of Central Europe. Larva green, with three white lines on the back, and a white stripe on the sides, bordered above with black. It feeds on low plants.

3. *O. Nitida* (W. V.).—Fore-wings short, pale rusty-brown, with pale nervures; the stigmata as in *Humilis*, the double transverse lines very slightly dentated, the elbowed and subterminal lines slightly curved, the latter spotted with dusky in front; and the hind margin with a dark terminal line. Expands from 1¼ to 1½ inches. Widely distributed in Central Europe, except the north-west. The larva resembles that of *Orrhodia Vaccinii*, but may be distinguished from it by the dark angles on the back and the dull black plate on the back of the neck divided by two white lines. It lives on low plants. (*O. Insueta*, Freyer, is of the shape and size of *Pistacina;* thorax and fore-wings pale grey, with zigzag waved lines; stigmata indistinct. Abdomen, hind-wings, and under side brownish-grey; there is a distinct central lunule on all the wings beneath. Inhabits Turkey in June; the larva is found in April.)

4. *O. Hæmatidea* (Dup.).—Fore-wings very pointed, dark reddish-brown, with the lines lost in the ground-colour, the subterminal line only indicated by a row of black dots. The stigmata rust-colour, and the orbicular stigma very oblique. Fringes paler, and preceded by a black line divided by the nervules. Hind-wings blackish-grey, with reddish fringes. Abdomen with a tuft of fulvous hairs at the tip. Expands about 1¼ inches. A rare species, found in France and Italy.

* 5. *O. Pistacina* (Fabr.).—Fore-wings narrow, brownish-yellow, with pale nervures, indistinct double transverse lines, and dark stigmata bordered with paler; the orbicular stigma oblique and narrow, and the space between the elbowed and subterminal lines dark grey. The variety *Canaria* (Esp.) is darker, almost black; the variety *Serina* (Esp.) is very pale, almost unicolorous; and the variety *Rubetra* (Esp.) is unicolorous reddish. Expands from 1¼ to 1½ inches. Common in Central and Southern Europe and Western Asia. Larva green, with three rust-coloured or dark longitudinal lines, and a white stripe on the sides bordered above with rust-colour. It feeds on *Centaurea*, preferring the buds.

* 6. *O. Rufina* (Linn.).—Fore-wings olive-grey or cinnamon-brown, darker on the basal area, and between the elbowed and subterminal lines, the transverse lines single, consisting of dark lunules bordered with paler, the subterminal line suffused and spotted with dusky in front; the stigmata surrounded with pale, and the reniform stigma filled up with dark beneath; hind-wings broadly reddish on the costa and hind margin. Size of *Pistacina*. Common in Europe and Northern and Western Asia. The larva is brownish-red, with a snow-white stripe on the sides and a dull line on the back; it feeds on oak. The moth is figured at Pl. 33, Fig. 11.

* 7. *O. Circellaris* (Hufn.), *Ferruginea* (Tr.).—Fore-wings ochre-yellow, suffused with grey, with brown transverse lines and stigmata surrounded with reddish; the reniform stigma filled up with blackish below, and the subterminal line curved, and bordered in front with rusty-red. Expands about 1½ inches. Common in Central Europe. The larva is pale reddish-brown, with dark spade-shaped spots on the back divided with paler, and a pale line on the sides spotted with dark above. It feeds on low plants.

* 8. *O. Lota* (Linn.).—Fore-wings rather broad at the base; brownish or reddish-grey, with small black and white spots beyond the indistinct dentated elbowed line, and a straight subterminal line bordered with rusty-red in front, and set back below the costa; the stigmata are bordered with paler, and the reniform stigma is filled up beneath with black. Expands about 1¼ inches. Common throughout Europe and Northern and Western Asia. The larva is brownish-grey, with three pale lines on the back and a dull greyish-white stripe on the sides. It lives on sallow, between leaves which it has spun together.

* 9. *O. Macilenta* (Hübn.).—May be distinguished from *Lota* by the yellowish-ochreous fore-wings, which are narrower at the base, and by the hind-wings, which are yellowish on the costa and hind margin. Expands from 1¼ to 1½ inches. Common in Central Europe. The larva is reddish-brown, with white lines on the back and sides. It feeds on oak and birch.

* 10. *O. Litura* (Linn.).—Fore-wings violet-brown, with four deep black costal spots, and dark stigmata surrounded with white; the lines rather indistinct, but double, except the elbowed line, which is single. Expands about 1¼ inches. Common throughout Europe. The larva is brownish or reddish, with black and white spots, a pale line on the back, and a white stripe on the sides, yellow below. It lives on low plants. (*O. Iris*, Zett., from Sweden and Lapland, has dirty-grey fore-wings, the hind margin with a row of reddish-brown dots, and the stigmata bordered with black; hind-wings grey.)

11. *O. Kindermannii* (Rössl.).—Brownish; fore-wings with very many fawn-coloured stripes and dots; the marginal spots brown; the stigmata bordered with fawn-colour, and the reniform stigma marked with black. Hind-wings grey, with darker fringes. It occurs in Dalmatia.

GENUS XXXV.—DYSCHORISTA (LED.).

Rather small, stout-bodied moths, the fore-wings considerably broader behind, with the tips pointed, the hind margin a little oblique and sloping backwards, and the fringes slightly waved. The fore-wings are brownish-grey or pale grey, with double transverse lines, the elbowed line slightly dentated, with black dots at the ends of the teeth, the two stigmata indistinctly pale and narrowly edged with dusky, the subterminal line faint and curved, and set back below the costa; hind-wings brownish-grey. The antennæ of the male are simple (ciliated in the first species); and the abdomen extends for one-third of its length beyond the anal angle of the hind-wings. The larvæ are slender and naked, and feed in May and June, and the moths appear in August.

1. *D. Lævis* (Hübn.).—Fore-wings pale grey; the claviform stigma absent, and the reniform stigma filled up with blackish beneath; the subterminal line not dentated. Hind-wings grey, with the fringes paler. Expands from 1¼ to 1½ inches. Scarce and local, though widely distributed in Central Europe. The larva is light brown, with a yellowish stripe on the back, a brown head, and a black plate on the back of the neck; it feeds on low plants.

* 2. *D. Suspecta* (Hübn.).—Fore-wings brownish violet-grey, varied with reddish; the claviform stigma absent, the reniform stigma filled up with grey beneath, and the subterminal line forming two short angles below the middle. Hind-wings dark grey, with a large central spot. Expands

from 1 to 1¼ inches. Widely distributed in Central Europe and Northern Asia. The larva is uniform green, and feeds on low plants.

* 3. *D. Ypsilon* (W. V.).—Fore-wings dark greyish-brown or rusty-brown, the orbicular and reniform stigmata converging beneath, and the subterminal line forming two short angles below the middle; hind-wings brownish-grey. Expands from 1¼ to 1½ inches. Common throughout the greater part of Europe and Northern and Central Asia. The larva is greyish-brown, with a whitish stripe on the back widened at the incisions, light subdorsal lines, and a reddish-grey stripe on the sides. It feeds on poplars and willows, and hides itself by day in the fissures of the bark.

GENUS XXXVI.—HIPTELIA (GUÉN.).

Stout-bodied moths, the fore-wings triangular, with the tips pointed, the hind margin slightly curved, and the fringes rounded; the *Noctua*-pattern present. The antennæ are long and pectinated in the male, the tongue is strong, the thighs are woolly, and the abdomen extends a little beyond the anal angle of the hind-wings. The commonest species, *H. Ochreago* (Hübn.), has yellowish fore-wings, with indistinctly double and slightly dentated transverse lines, the three stigmata and the inside of the subterminal line finely bordered with rusty-brown, the reniform stigma blackish below, and the hind-wings dusted with grey. Expands about 1½ inches. A mountain insect in France, Switzerland, and Italy, occurring in July and August. It sometimes flies by day, but may also be attracted by light in the evening. It is figured at Pl. 55, Fig. 9. *H. Miniago* (Freyer), from South Russia and the Altai, is reddish-ochreous; fore-wings with all the lines paler, and not dentated, the stigmata filled up with brown, and the orbicular stigma oblique, and a row of black dots on the nervures beyond the subterminal line; hind-wings whitish.

GENUS XXXVII.—MESOGONA (BOISD.).

Large stout-bodied moths, the fore-wings broad, with the costa straight, the hind margin a little oblique, and the fringes scarcely waved. Fore-wings brownish, with two straight transverse lines converging towards the inner margin. The two large stigmata are surrounded with paler, and the claviform stigma is absent; the hind-wings are reddish-grey. The antennæ are not dentated; the palpi are thick, and hairy below; the thighs are woolly, and the abdomen is stout, and extends for one-third of its length beyond the anal angle. The larvæ are slender, with scattered hairs, and a horny plate on the back of the neck. They feed in May and June, and hide themselves during the day, and the moths appear in August and September. The latter expand about 1½ inches.

1. *M. Oxalina* (W. V.).—Fore-wings violet-brown; the transverse lines, which are straight and very close together, the subterminal line, which is bordered in front with black spots, and the borders of the stigmata all pale yellowish. Inhabits various parts of Central Europe, but is scarce and local. The larva is pale brown, with a lighter line on the back and a blackish one on the sides, bordered below with yellowish-white; head brown, and a plate behind black. It lives on alders and poplars.

2. *M. Acetosellæ* (W. V.).—Fore-wings reddish-ashy; the transverse lines divide the inner margin into three nearly equal portions, and are, like the borders of the stigmata, whitish; the subterminal line is indicated by a row of black spots. Widely distributed in Central Europe, but scarce and local towards the north. The larva is dirty flesh-colour, dusted with blackish, with a dull greyish-yellow stripe on the back, and the head and a plate behind brown; it feeds on oak. The moth is figured at Pl. 33, Fig. 12.

GENUS XXXVIII.—PLASTENIS (BOISD.).

Rather small moths, with slender bodies, the fore-wings short and broad, brownish, with the pale transverse lines not dentated, and at least two stigmata surrounded with paler; the subterminal line slightly indented, and rather indistinct; hind-wings short and broad, brownish-grey. The antennæ of the male shortly ciliated, and the thighs clothed with long hair. The larvæ are slender, with small raised spots, and live in May between leaves spun together; and the moths appear in July and August, and are common throughout Central Europe and Northern Asia. They expand from 1 to 1¼ inches.

* 1. *P. Retusa* (Linn.).—Fore-wings broad, reddish-brown, and partially dusted with violet-grey, with two pale parallel transverse lines, and two dark stigmata, narrowly surrounded with paler. The larva is whitish-green, with five white longitudinal lines, and a grey head; it feeds on willow.

* 2. *P. Subtusa* (W. V.).—Fore-wings brownish-grey, with two pale transverse lines converging towards the inner margin, and three dark stigmata bordered with paler. The larva resembles that of *Retusa*, but has a black head. It feeds on poplars and willows.

GENUS XXXIX.—CIRRHŒDIA (GUÉN.).

Rather small moths; the fore-wings broad, with the hind margin rather curved, and the tips prominent; brown or yellow, with two pale transverse lines, which are not dentated and converge towards the hind margin; but the orbicular and claviform stigmata are scarcely marked. Hind-wings short and whitish, dusted with reddish towards the hind margin. Antennæ and legs as in *Plastenis;* the abdomen scarcely extends beyond the anal angle of the hind-wings. The larvæ are short and thick, with a small head, and a horny plate behind. They feed in May, and the moths appear in August and September.

1. *C. Ambusta* (W. V.).—Fore-wings reddish-brown, darker in the central area; the transverse lines, the subterminal line, and the borders of the reniform stigma whitish. Size of *Xerampelina.* Scarce and local in Central Europe, but absent in the north-west. The larva is dirty flesh-colour, with three whitish lines on the back, oblique brownish streaks between, and a yellowish stripe on the sides. It feeds on apple and pear trees.

* 2. *C. Xerampelina* (Hübn.).—Fore-wings golden-yellow or reddish-grey, the central area nearly to the costa, the reniform stigma, and the hind margin brownish-red; the transverse lines pale yellow. Expands nearly 1½ inches. Extremely local in Central Europe; somewhat commoner in England, France, and Ireland. The larva is greyish-brown, with a yellowish line on the back, black subdorsal lines, and black longitudinal streaks between them; it feeds on ash. (*C. Ulicis*, Staud., from Spain, is a third larger; the fore-wings are longer, the inner line more oblique, and much further from the base on the inner margin, where it nearly meets the elbowed line. Two stigmata are visible between them, and are surrounded with darker; the orbicular stigma is reduced to a spot. The subterminal line is composed of pale lunules, bordered with dusky towards the base. The male is reddish or yellow, and the female is dull greenish-grey.)

GENUS XL.—COSMIA (OCHS.).

Rather small moths, with broad truncated fore-wings, rounded above the hinder angle; they are brown, yellow, or pale grey, with two pale or dark transverse lines, which are not

dentated; the stigmata are generally indistinct, and the claviform stigma is absent; the hind-wings are rather large, and the abdomen, which is slender in the male, extends rather beyond the anal angle. The antennæ are simple, and slightly ciliated. The larvæ are naked, with small raised warts, and feed on trees in May and June, but are formidable cannibals, and must never be placed with other larvæ; the moths appear in July and August, and may be taken at sugar.

* 1. *C. Paleacea* (Esp.), *Fulvago* (Hübn.).—Fore-wings reddish ochre-yellow, with brown or reddish marginal dots and fringes and two brown transverse lines; the inner line forms a right angle, and the elbowed line is slightly curved; the stigmata are surrounded with brown, the reniform stigma contains a brown spot below; and the hind-wings are yellowish-white. Expands nearly 1¾ inches. Not uncommon in Northern and Central Europe and in the Altai. The larva is yellowish-green, with three whitish lines on the back, and a dark line on the sides, bordered with white. It lives on oak, birch, and alder.

2. *C. Abluta* (Hübn.).—Fore-wings pale grey, marked as in *Paleacea*, the transverse lines bordered with whitish, the stigmata very indistinct, the hind margin not dotted, and the hind-wings pale grey. Expands about 1½ inches. A scarce species, said to occur along a narrow zone, from Piedmont to the Ural, but chiefly in Hungary. The larva is green, dusted with white, with a sulphur-yellow stripe on the sides; it feeds on willow. (*C. Imbuta*, Boisd., from Sarepta, has luteous fore-wings; the central area is brick-red, with pale stigmata, the reniform stigma is brownish behind, the inner line is much curved, and the hind-wings are tinged with orange.)

3. *C. Contusa* (Freyer).—Fore-wings rusty-brown, with two rather lighter and slightly waved transverse lines, and a darker central shade; the stigmata indistinct, surrounded with paler, the orbicular stigma small, and the reniform stigma narrow, contracted in the middle, and filled up with blackish beneath; hind-wings brownish-grey. Expands from 1¼ to 1½ inches. A rare and local species, inhabiting North Germany. Larva pale green, whitish above, with white warts, a dull pale line on the back, and a white stripe on the sides. It lives between united leaves of aspen.

* 4. *C. Trapezina* (Linn.).—Fore-wings ochre-yellow or greenish-grey, with two whitish transverse lines bordered with brown, the inner line straight and very oblique, the elbowed line curved, the stigmata surrounded with paler, and the hind-wings brownish-grey. Size of *Contusa*. Common throughout the greater part of Europe. Larva pale green, with black warts surrounded with white, three whitish lines on the back, and a yellowish stripe on the sides. It feeds on oak, willow, &c.

* 5. *C. Affinis* (Linn.). — Fore-wings yellowish-brown, varied with blackish, with two transverse lines a little paler, and white in front, the elbowed line strongly curved outwards below the costa, the stigmata dark in the middle, and the hind-wings blackish, with ochreous fringes. Common in Central and Southern Europe. The larva is yellowish coppery-green, with five white longitudinal lines, and lives between united leaves of elm. The moth is figured at Pl. 33, Fig. 13.

* 6. *C. Diffinis* (Linn.).—Fore-wings violet-red, varied with reddish-brown, with two pale transverse lines expanding into two large white spots on the costa; the elbowed line much angulated below the costa; the stigmata absent. Hind-wings dark grey. Expands about 1¼ inches. Common in Central and Southern Europe and Western Asia. The larva is whitish-green, with a black head, but otherwise resembles that of *Affinis*.

* 7. *C. Pyralina* (W. V.).—Resembles *Diffinis*, but the fore-wings are more unicolorous

violet-brown, the transverse lines are more indistinct, and only the elbowed line is narrowly white on the costa; stigmata absent. Expands about 1¼ inches. Appears to occur throughout Central Europe. The larva is yellowish-green, varied with whitish, with three white longitudinal lines; it lives between united leaves of elm, like those of the two preceding species, but is also found on fruit-trees.

GENUS XLI.—PYRRHIA (HÜBN.).

Fore-wings short, broad behind, with the hind margin somewhat waved, and curved towards the hinder angle; all the transverse lines, the central shade, and the borders of the orbicular and reniform stigmata consist of simple fine dark lines; the inner line is much curved, the elbowed line nearly straight and very oblique, and the subterminal line slightly dentated. The hind-wings are small, pale yellow, with a broad blackish hind margin, and a blackish spot in the middle. The antennæ are simply ciliated, and the abdomen is cylindrical, extending considerably beyond the anal angle, and is slightly crested above. The larvæ are slender and naked, with raised dots.

* 1. *P. Umbra* (Hufn.), *Marginata* (Fabr.).—Fore-wings golden-yellow, violet-grey towards the hind margin, with fine rusty-brown markings. Expands about 1¼ inches. Common throughout Central Europe and Northern Asia from May to July. The larva is green or brownish, with raised black dots, a dark line on the back, two whitish subdorsal lines, and a whitish stripe on the sides. It feeds on rest-harrow in July and August.

2. *P. Purpurites* (Tr.).—Fore-wings olive-grey, reddish-purple towards the hind margins, with fine reddish-purple markings. Size of *Umbra*. Found in Hungary, Turkey, and the Altai in May. The larva resembles that of *Umbra*, but has a darker line on the sides instead of a whitish stripe. It feeds on *Centaurea* in May.

GENUS XLII.—HYDRŒCIA (GUÉN.).

Middle-sized, stout-bodied moths, with the fore-wings broad and triangular, and the hind margin oblique, and curved above the hinder angle. The fore-wings are brownish, with simple dark transverse lines, which are not dentated; the inner line is interrupted above and much curved below, and the elbowed line is parallel to the hind margin, and strongly curved forwards just below the costa; the subterminal line is zigzag and indistinct, the orbicular and reniform stigmata are large and finely surrounded with dusky, the claviform stigma is absent; the hind-wings have generally a dark line in the middle, and the antennæ are slightly dentated and ciliated in the male; the tongue is strong, and the abdomen extends a little beyond the anal angle. In *H. Nictitans* the pattern of the wings is rather different. The larvæ are cylindrical, with a horny plate behind the head, and small black raised dots bearing scattered hairs. They live in the roots of marsh plants in May and June, and the moths mostly appear in August and September.

* 1. *H. Nictitans* (Linn.).—Fore-wings rusty-brown or olive-grey, with fine dark double transverse lines; the orbicular stigma small, round, and orange; the reniform stigma orange, or white, divided by fine dark lines; the subterminal line fine and dark; hind-wings brownish-grey. Expands from 1¼ to 1½ inches. Common in Northern and Central Europe, North Asia, and North America in July and August. The larva is brownish-grey, with raised black dots and a yellow head, and feeds on the roots of grass.

* 2. *H. Micacea* (Esp.).—Fore-wings violet-red, the central area violet-brown, with fine rusty-

brown transverse stripes; the borders of the stigmata, the nervures, and the hind-wings whitish-yellow. Size of *Nictitans*. Common in Northern and Central Europe and in Northern Asia. Larva flesh-colour, with a reddish line on the back and a row of black dots on the sides, head reddish-brown, the plates on the 2nd and 13th segments yellowish. It lives in the roots of *Glyceria spectabilis* and other marsh plants.

* 3. *H. Petasitis* (Doubl.).—Very like *Micacea*, but the fore-wings greyish-brown, slightly suffused with reddish, and the central area darker brown; the nervures dusted with whitish towards the hind margins, and the hind-wings greyish-brown. Expands about 1¾ inches. Widely distributed, but very local, Edinburgh, Manchester, South Germany (where it is very rare), and the Altai being almost the only recorded localities. The larva is dull whitish, with a dark line on the back, and the head and plates brown. It lives in the stems and roots of the butterbur.

GENUS XLIII.—GORTYNA (LED.).

Middle-sized, stout-bodied moths, the fore-wings broad and triangular, with the hind margin slightly curved, and the complete *Noctua*-pattern; the antennæ simply ciliated in the male, and the abdomen extending for half its length beyond the anal angle of the hind-wings.

* 1. *G. Flavago* (W. V.).—Fore-wings golden-yellow, dusted with rust-colour, and violet-brown in the hinder part of the basal area and before the hind margin; the double transverse lines, the borders of the three large stigmata, and the nervures are rusty-brown; the elbowed line is slightly dentated in front, and the hind-wings are yellowish-white. Expands from 1¼ to 1½ inches. It is common throughout Central Europe and the Altai in August and September. The larva is dirty white, with raised black dots, the head and plate behind brown, and a black anal fold. It lives in the stalks of thistles, burdock, &c., in May and June. The moth and larva are figured at Pl. 34, Fig. 5, *a*, *b*. (*G. Mæsiaca*, Herr.-Schäff., from the Balkans, is yellow, fore-wings rather pointed and spotted with brown, the hind margins concolorous, and the elbowed line shaded with brown on the basal side; hind-wings whitish. *G. Xanthenes*, Germ., is luteous, varied with violet-grey; hind-wings ashy. It occurs in Sicily and Andalusia.)

2. *G. Cervago* (Eversm.).—Brown; fore-wings with the central area darker, the base reddish, the inner line ochreous or absent, the elbowed line ochreous or rusty-brown, parallel to the hind margin, and curved inwards at the tip; hind-wings whitish, with an outer blackish stripe. Taken at Orenburg.

3. *G. Leucographa* (Borkh.), *Lunata* (Freyer).—Rusty-grey, abdomen fawn-colour; fore-wings rusty, with three white stigmata, the claviform stigma divided by a curved transverse line; hind-wings whitish. Expands 1¾ inches. A scarce and local insect, though widely distributed in the southern half of Central Europe in September. The larva, which lives from October to July in the stalks of *Peucedanum officinale*, is pale rosy, with a darker line on the back.

GENUS XLIV.—XANTHIA (TR.).

Rather small and slender-bodied moths, expanding from 1¼ to 1½ inches; the fore-wings broad and triangular, with the hind margin a little oblique, slightly waved, and curved above the hinder angle. Fore-wings yellow, often spotted with dusky, and the *Noctua*-pattern frequently ill-defined; hind-wings short, whitish or yellowish; the antennæ of the male ciliated, but not dentated, and the abdomen extending a little beyond the anal angle. The larvæ are slender, with a small head, and a horny plate behind it. They live on trees and low plants

in May and June, and the moths, which may be captured at sugar or by beating, appear in August and September.

* 1. *X. Gilvago* (Esp.). — Fore-wings with the tips not prominent, ochre-yellow, often blotched with dark grey, with dark double transverse lines composed of lunules, and the orbicular and reniform stigmata narrowly surrounded with dusky, the latter filled up with blackish beneath; hind-wings yellowish-white. Common in many parts of Central Europe. The larva is reddish, with pale lines on the back and sides. It lives on the seeds of the elm when young, and afterwards on low plants.

2. *X. Ocellaris* (Borkh.).—Very like *Gilvago*, but the fore-wings are distinctly pointed, and vary considerably in colour. The nervures are narrowly paler, and there is a white dot below the reniform stigma. Found throughout Central Europe, but less common than *Gilvago;* its reported occurrence in England is somewhat doubtful. The larva lives in the buds of poplars, and the moth is frequently taken at rest on the trunk of this tree.

* 3. *X. Fulvago* (Linn.), *Cerago* (Tr.).—Fore-wings lemon-yellow, spotted with rusty-brown, especially beyond the middle, with the markings indistinct. There is a whitish spot surrounded with brown at the lower end of the reniform stigma. Hind-wings white; head and collar unicolorous yellow. In the variety *Flavescens* (Esp.) the fore-wings are almost destitute of markings, except the spot at the reniform stigma. Common in Northern and Central Europe and Northern Asia. The larva is greyish-brown, with a white line on the back, oblique blackish dashes, and a grey stripe on the sides. When young it feeds in the catkins of willows, and afterwards on bramble, plantain, &c. The moth is figured at Pl. 34, Fig. 6.

* 4. *X. Flavago* (Fabr.).—Resembles *Fulvago*, but the head and collar are violet-red. The fore-wings are more golden-yellow, and spotted with violet-brown, and the pattern is more distinct; the elbowed line is composed of two rows of lunules, and the reniform stigma is filled up below with dusky; hind-wings yellowish-white. Common in Europe and Northern and Western Asia. The larva is brownish-grey, with dark stripes on the back and sides. Its habits are similar to those of *Fulvago.*

* 5. *X. Aurago* (W. V.).—Fore-wings paler or darker golden-yellow in the central area, and often dusted with orange, violet-brown in the basal and marginal areas; the transverse lines pale, dentated, generally only indicated by the boundaries of the areas; the stigmata brownish, bordered with paler; and the hind-wings pale yellow. Common throughout Central Europe. Larva grey, with darker transverse stripes. It feeds on beech between connected leaves.

6. *X. Sulphurago* (W. V.). — Fore-wings pale ochre-yellow, with interrupted double rusty-brown lines, and brown spots and dark brown central shade; the reniform stigma composed of two small brown rings; hind-wings yellowish-white. A scarce species in the southern half of Central Europe. The larva is ashy-grey, with three white lines on the back, with brown oblique dashes between, and a broad white stripe on the sides, washed with reddish. It lives between connected leaves of maple.

* 7. *X. Citrago* (Linn.).—Fore-wings golden-yellow, finely dusted with reddish-brown, two single transverse lines, which are not dentated; the broad intermediate central shade, the borders of the stigmata, and the nervures brownish-red; hind-wings yellowish-white. The variety *Subflava* (Eversm.), from the Ural, has a dark basal band and a broad dark hind margin. Common in Northern and Central Europe. Larva slaty-grey, with three white lines on the back, between which are black spots, and a broad yellowish-white stripe on the sides. It lives on lime between connected leaves.

GENUS XLV.—HOPORINA (BOISD.).

Fore-wings a little broader behind, with the tips rectangular, the hind margin straight, and rounded at the hinder angle; the antennæ simple, pubescent in the male; the thorax short, smoothly clothed with hairy scales, the thighs covered with downy hair, the abdomen obtuse, with hairy tufts on the sides, not extending far beyond the anal angle. The only species, **H. Croceago* (W. V.), has pale orange fore-wings, with an interrupted blackish central shade, a row of blackish spots beyond the middle, and the two stigmata surrounded with paler; the transverse lines indistinct, and two-thirds of the costa narrowly edged with white; hind-wings whitish, with a curved brownish stripe. The southern variety *Corsica* (Mab.) is straw-colour. Expands about 1¼ inches. It is found throughout Southern and Central Europe in September and October, and hybernates, reappearing in March and April. The larva is reddish-brown, with oblique stripes forming acute angles on the back, a thick black transverse stripe on the 12th segment, and two straw-coloured spots behind. It feeds on oak from May to July. The moth and larva are figured at Pl. 34, Fig. 7, *a*, *b*.

GENUS XLVI.—SCOPELOSOMA (CURT.).

Fore-wings rather long, a little broader behind, with the tips pointed, a paler reniform stigma, and a rather oblique and curved hind margin. The antennæ of the male are ciliated, but not dentated, and the tongue is strong. The only species, **S. Satellitia* (Linn.), has coppery-brown fore-wings, varied with darker, with two fine blackish transverse lines, and a white spot and two adjoining white dots representing the reniform stigma; hind-wings brownish-grey. Expands about 1¾ inches. Common in most parts of Europe and the Altai, appearing at the same seasons as *H. Croceago*. The larva is black, with white spots on the sides of the 2nd, 3rd, 5th, and 11th segments. It lives on trees in May and June, but must be reared by itself, as it is one of the most formidable cannibals.

GENUS XLVII.—ORRHODIA (HÜBN.).

Small or middle-sized moths, with stout bodies; the fore-wings a little broader behind, hind margin convex in the middle and rounded above the hinder angle; brownish, sometimes with the orbicular and reniform stigmata, and double transverse lines, which are generally dentated; but all the markings are frequently very indistinct; hind-wings brownish. The antennæ of the male are shortly ciliated, the tongue is strong, the thorax moderately broad, with the shoulders rounded, and the abdomen extends for about one-third of its length beyond the hind-wings. The larvæ are thick, smooth, or thinly clothed with hair, and hide themselves during the day; and the moths appear from September to November, and reappear after hybernation, from February to April, and may be taken at sugar.

* 1. *O. Rubiginea* (W. V.). — Fore-wings rusty-yellow, varied with rusty-red, and brown before the hind margin, the markings lost in a number of brown dots, the two stigmata indistinct, and the reniform stigma filled up with blackish beneath. Expands nearly 1½ inches. Inhabits the greater part of Europe, but not common. The larva is thinly clothed with hair, dark grey, with a row of black spots on the back, and lives on sallows. The moth is figured at Pl. 34, Fig. 8. (*O. Staudingeri*, Grasl., has grey fore-wings, varied with darker; a double row of black dots before the hind margin, the outermost lost in the dark marginal band;

head, collar, and fringes rusty-red; thorax brown; hind-wings and abdomen coppery-brown, the latter whitish at the base. It inhabits South France and Spain.)

2. *O. Veronicæ* (Hübn.).—Fore-wings reddish-grey, with the nervures narrowly paler, and black spots before the hind margin; the stigmata dark grey, finely surrounded with pale and brown; all the lines indistinct. Expands from 1¼ to 1½ inches. A rare species, inhabiting South France, Austria, and Hungary.

3. *O. Silene* (W. V.).—Fore-wings dark violet-grey, with the nervures narrowly whitish, the stigmata narrowly surrounded with paler, except in front, and filled up with deep black, the reniform stigma finely divided with paler. The variety *Gallica* (Led.) has the lines and stigmata obliterated, the fore-wings being concolorous, except that the central shade and subterminal line are indicated by a reddish shade towards the costa. Expands about 1¼ inches. Inhabits Central Europe (England excepted), but scarce. Larva like that of *Vaccinii*, but with oblique stripes meeting in angles on the back, and a deep black plate on the 2nd segment, divided by two white lines; it feeds on low plants.

4. *O. Daubei* (Dup.).—Fore-wings pale ochre-yellow, the subterminal line indicated by a row of black dots; the other lines only indicated by black atoms on the costa and hind margin. Central shade indistinct, but continuous. Reniform stigma composed of little blackish marks; orbicular stigma absent. Fringe concolorous, preceded by a row of black dots. Hind-wings blackish, with the costa and fringe ochreous. A rare species, found at Montpellier, where the larva feeds on box. (*O. Intricata*, Boisd., from South France has the fore-wings ashy-grey, dusted with brown, with the nervures and outline of the stigmata paler grey. The costa is marked with several brown spots, the middle one extending to the reniform stigma, which contains a black dot. A row of brown spots bordered with pale yellow towards the hind margin; fringes reddish-brown. Hind-wings grey, with the fringes paler.)

*5. *O. Vaccinii* (Linn.), (*Chestnut Moth*).—Fore-wings with the tips not prominent and the hind margin very convex; the colour varies from rust-colour to dark grey, with pale nervures; the subterminal line is replaced by a row of black dots, the transverse lines are brown, and narrowly double, the elbowed line is dentated, and the reniform stigma is filled up with blackish below. In dark specimens the markings are more or less indistinct. It varies very much in colour and markings, and has sometimes no transverse bands, or these when present may be either pale (variety *Mixta*, Staud.) or dark (*Spadicea*, Hübn.). Expands about 1¼ inches. Common throughout Northern and Central Europe and Northern and Western Asia. The larva is dark cinnamon-brown, whitish beneath, with three indistinct pale lines on the back, and is chequered with paler between; the plate on the back of the 2nd segment is brown, with three white lines. It feeds on low plants and on oak. The moth is figured at Pl. 34, Fig. 9.

*6. *O. Ligula* (Esp.).—Very like *Vaccinii*, but the tip of the fore-wings is more pointed, and the hind margin beneath it is slightly curved and less convex; the colour varies from dark rusty-brown to blackish, and the markings are generally indistinct; the subterminal line is more continuous, and marked with a whitish transverse band instead of black dots. The variety *Polita* (Hübn.) is blackish, marbled with grey, and the variety *Subspadicea* (Staud.) is reddish-brown or dark brown, reticulated with whitish. Size of *Vaccinii*, and almost equally common in Central and Western Europe. The larva is dark brown, with paler longitudinal lines, and lives on bushes and low plants. (*O. Torrida*, Led., from Sicily, is dark brown, reddish towards the costa, the stigmata filled up, and the double zigzag transverse lines marked, with grey or reddish; the subterminal line zigzag, paler, and broader towards the costa. Hind-

wings brownish-grey, with reddish fringes. All the wings beneath with a dark central lunule, and a dark transverse stripe beyond the middle.)

* 7. *O. Erythrocephala* (W. V.).—Very variable; the unicolorous specimens resemble *Veronicæ*, but the reniform stigma is marked with a deep black spot on its lower edge; there are no black dots before the hind margin, and the head and collar are brighter grey. The fore-wings vary from ashy-grey to reddish-brown, and the costa and the space before the subterminal line are generally lighter. The variety *Glabra* has brown fore-wings, darker in the central area, and the subterminal band and stigmata are pale grey. Expands about 1½ inches. The larva is brownish-grey, with three pale lines on the back, and feeds on low plants. Widely distributed in Central Europe, but rarely common.

GENUS XLVIII.—MECOPTERA (GUÉN.).

Large and stout-bodied moths, the fore-wings broad, even at the base, the hind margin moderately oblique, and not much curved above the hinder angle; the hind-wings with the hind margin a little rounded, the antennæ of the male dentated and strongly ciliated; the tongue strong. The thorax and abdomen are very broad, and the latter extends for one-third of its length beyond the anal angle. The only species, *M. Fragariæ* (Esp.), has reddish-grey fore-wings, the nervures, the two transverse lines, the borders of the two large stigmata, and the thick and straight subterminal line are pale ochre-yellow. The transverse lines are not dentated; the inner line is straight and oblique, and the elbowed line is slightly curved. Hind-wings ochre-yellow, dusted with blackish, especially towards the hind margins, and with a large black central lunule; the segments of the abdomen are blackish, bordered with pale yellow. Expands from 2 to 2½ inches. A rare species, inhabiting South-Eastern Europe and Northern Asia in September and October, and reappearing after hybernation very early in spring. It may be taken at sugar. The larva is naked, orange-coloured, with a brown head, and a black plate behind it. It lives on grass from May to July, and is a cannibal. It is figured with the moth at Pl. 34, Fig. 10, *a*, *b*.

GENUS XLIX.—SCOLIOPTERYX (GERM.).

Fore-wings broad behind, the tips and the middle of the hind margin strongly projecting, with very short fringes; stigmata absent. The antennæ of the male are shortly pectinated, the collar has a projecting crest in the middle, and the thorax and abdomen are broad, the latter extending a little beyond the anal angle, and tufted with hair in front and at the sides. The only species, **S. Libatrix*, Linn. (the *Herald Moth*), has reddish-violet-grey fore-wings, yellow, dusted with scarlet at the base and in the middle, the two transverse lines nearly straight and not dentated, whitish, dusted with grey; and a white dot at the base and another in the middle of the wing; hind-wings indented below the costa. Expands about 1¾ inches. Abundant throughout the greater part of Europe, Northern and Western Asia, and North America from August to spring. The larva is slender, naked, grass-green, with a yellowish stripe on the sides. It feeds on willows and poplars, and the pupa is placed between connected leaves. The moth is figured at Pl. 39, Fig. 1.

GENUS L.—AMPHIPYRA (OCHS.).

This genus includes moths rather under or over the middle size, with the body and fore-wings stout, the latter rather broader behind, with the tips rounded, and the hind margin slightly

and regularly curved, but not oblique; brown or blackish, with the *Noctua*-pattern incomplete or entirely absent; the antennæ of the male are simply and shortly ciliated, the tongue is strong, the hind-wings are rounded, and the abdomen is generally flattened, and rarely convex. The larvæ are naked and cylindrical, generally with a slight prominence on the 12th segment, and undergo their transformations between leaves in a loose cocoon. The moths are very wary, and hide themselves under loose bark, in crevices, &c., and are sometimes to be taken at sugar. Most of the species appear in July and August, and the larvæ feed on low plants in May and June.

*1. *A. Tragopogonis* (Linn.).—Fore-wings brownish-black, with three large black spots instead of the usual two stigmata, hind-wings grey, with the hind margin brownish. Expands from 1¼ to 1½ inches. Common in Europe and Northern and Western Asia, and when disturbed in the day-time it falls down and shuffles about in such a manner that it has acquired the name of "the mouse." The larva is green, more slender in front, with three white longitudinal lines on the back, and a white stripe on the sides. It feeds on *Tragopogon pratensis*, *Rumex*, &c.

2. *A. Styx* (Herr.-Schäff.).—Dark brown, fore-wings with the inner line pale behind, two black discoidal spots, a submarginal fawn-coloured stripe edged within with paler, and black marginal dots; hind-wings ashy, with the hind margin broadly blackish. Inhabits Turkey. (*A. Molybdea*, Christoph, from Sarepta, resembles *Tragopogonis;* the fore-wings are greyish-brown, not so reddish, and only dusted with whitish along the extremities of the nervures; the reniform stigma is replaced by two very distinct white spots, the lowest larger; the orbicular stigma is indicated by a very faint black dot; hind-wings greyish-brown, not paler towards the base, and wholly without markings.)

3. *A. Tetra* (Fabr.).—Fore-wings dark brown, with three white dots on the costa towards the tip; hind-wings brownish-grey. Expands about 1¼ inches. Inhabits Southern and South-Central Europe and Northern and Western Asia. The larva is green, with a dark line on the back, and whitish subdorsal lines.

4. *A. Livida* (W.V.).—Fore-wings dull bluish-black, without markings; hind-wings pale rusty-yellow, the costa brownish-grey. Expands about 1½ inches. Range of *Tetra*. Larva yellowish-green, with a darker line bordered with paler on the back, yellowish subdorsal lines, and a yellow stripe on the sides.

5. *A. Perflua* (Fabr.).—Fore-wings dark violet-brown, the transverse lines are double, dentated, far apart, and marked with white, the subterminal line is whitish, and the orbicular stigma is small, and surrounded with paler; hind-wings brownish-grey. This and the following species expand from 2 to 2¼ inches. Found throughout Central Europe (except Britain) and Northern Asia, but scarce. The larva resembles that of *Pyramidea*, but the red-tipped protuberance on the 12th segment is absent, and the white lines running from the 12th segment are broader. The stripe on the sides is interrupted from the 3rd to the 6th segment. It feeds on sallows, elms, &c. (*A. Effusa*, Boisd., has brown fore-wings, with dark brown transverse lines, which are waved and interrupted, and a row of marginal dots; hind-wings rusty-brown and shining. It inhabits South Europe.)

*6. *A. Pyramidea* (Linn.), (*Copper Underwing*).—Fore-wings yellowish-brown, varied with dark brown, whitish between the elbowed and subterminal lines, with a small orbicular stigma surrounded with white. The two transverse lines are black, double, and dentated, filled up with whitish, the subterminal line is broken into white spots, and marked with blackish triangular spots in front; hind-wings cinnamon-red. Common throughout Europe and Northern and Western Asia. The larva is pale green, with a white line on the back, and a yellowish-white stripe on the sides. There is a pyramidal elevation on the 12th segment, tipped with red, from which

two broad white oblique lines run forward, and two similar but narrower lines run backward. It lives on trees and bushes. The moth is figured at Pl. 34, Fig. 11.

7. *A. Cinnamomea* (Borkh.).—Fore-wings dark cinnamon-brown, with pale yellow and dark brown longitudinal lines, but with no other distinct markings; hind-wings cinnamon-red. A rather scarce species, appearing in the southern half of Central Europe in September; and from hybernated pupæ in May. The larva is yellowish-green, with whitish lines on the back, yellow oblique streaks on the 11th and 12th segments, and a yellow stripe on the sides. It feeds on elm and spindle-tree in June and July.

FAMILY IV.—AGROTIDÆ.

Stout-bodied moths, of about the middle size, or a little over or under; the thorax flat, broad, and square, with the shoulders obtusely angulated; thorax covered with smooth hair or scales, and rarely with a slight crest, or raised in the middle. The antennæ of the male are generally simple, though sometimes slightly pectinated; the tongue and legs are strong, and the hind-legs are rather long; the fore-wings vary in length, and are a little broader behind, with the tips nearly rectangular, but generally truncated; and the hind margin is slightly rounded above the hinder angle. The scales are smooth, and the *Noctua*-pattern is more or less distinct; the hind-wings are broad, slightly contracted below the tip, and the abdomen is cylindrical or flattened, and only extends a little beyond the anal angle. The sixteen-legged larvæ are thick and naked, with a small head, and often with dark angular or horse-shoe shaped markings. They hybernate and undergo their transformations in the ground in spring, feed on grass and low plants, and hide themselves during the day. They may be obtained in autumn by sweeping, and in spring by searching among dry leaves and under stones. The moths appear in summer, and fold their wings flat over each other when at rest. Most of them fly late in the evening, and may be taken at sugar or flowers.

GENUS I.—TRIPHÆNA (HÜBN.).

Large or middle-sized moths, with brownish fore-wings, generally with two large stigmata surrounded with paler; the claviform stigma absent, the transverse lines generally indistinct, the subterminal line pale and slightly waved, the antennæ of the male slightly ciliated, and the thorax quite flat. Hind-wings yellow, with a black border. The moths appear from June to August, and the larvæ mostly feed on low plants. The moths are known as "Yellow Underwings."

*1. *T. Fimbria* (Linn.), (*Broad-bordered Yellow Underwing*).—Fore-wings olive-green, varied with whitish or violet-grey, the transverse lines not dentated, the inner line oblique and indistinctly dusky, the elbowed line whitish and interrupted; the abdomen and hind-wings orange, the latter with a very broad black submarginal band. Expands from 2 to 2¼ inches. Inhabits Central and Southern Europe. The larva is yellowish-brown, with a pale line on the back, brown transverse curves bordered with white behind, and a whitish stripe on the sides. It lives on low plants, especially primroses, till May. The transformations are figured at Pl. 35, Fig. 1, *a—c*.

*2. *T. Ianthina* (W. V.).—Fore-wings dark greenish-brown, varied with greyish-violet, with no transverse lines; hind-wings bright ochre-yellow, with the base and a broad submarginal band black; the head and collar are yellowish-white in front. Expands from 1½ to 1¾ inches. Common in Central and Southern Europe in July and August. The larva

is reddish-grey, with a pale line on the back, black oblique arrow-headed marks broader behind, and a pale stripe on the sides. It lives on arum in May. The moth and larva are figured at Pl. 35, Fig 2, *a*, *b*.

*3. *T. Interjecta* (Hübn.).—Fore-wings brownish-ochreous, with the stigmata indistinct; hind-wings bright ochre-yellow, with a rather broad black submarginal band, and a black central spot, most distinct on the under side. Expands about 1¼ inches. Inhabits Southern and Western Europe. The larva is greyish-yellow, varied with brownish, with three white lines on the back, and a dark brown stripe on the sides, bordered below with paler. It lives on grass till April. (*T. Chardinyi*, Boisd., from Russia and Siberia, has brown fore-wings, with a waved whitish submarginal stripe; hind-wings luteous, with a rather broad black submarginal band, and the segments of the abdomen bordered with luteous.)

*4. *T. Comes* (Hübn.), *Orbona* (Fabr.).—Fore-wings brownish-ochreous, with the stigmata surrounded with paler, and the subterminal line slightly bordered with darker below the costa; hind-wings ochre-yellow, with a narrow black submarginal band, and a black central lunule. Expands from 1½ to 1¾ inches. Common in Central and Southern Europe, North Africa, and Western Asia. Larva pale reddish-grey, with two fine black longitudinal lines on the sides of the back, large black horse-shoe shaped spots bordered with pale yellow on the 11th and 12th segments, and with dark oblique stripes on the sides. It feeds on primroses, &c., till May. The moth and larva are figured at Pl. 35, Fig. 3, *a*, *b*.

*5. *T. Orbona* (Hufn.), *Subsequa* (W. V.).—Very like *Comes*, but the fore-wings are narrower, and there are one or two small deep black spots below the costa in front of the subterminal line. Expands 1½ inches. Found throughout the greater part of Europe and Western Asia, but not common. The larva is brownish-grey, with three fine whitish lines on the back, square black spots on the two outer lines, and a black spot bordered with yellow on the last segment. The sides are paler, with a reddish-grey stripe. It lives on primroses, &c., till May. The moth is figured at Pl. 35, Fig. 4. (*T. Sarmata*, Ramb., from France, chiefly differs from this in having the black border of the hind-wings strongly emarginate.)

*6. *T. Pronuba* (Linn.), (*Common Yellow Underwing*).—Much larger than *Orbona* (expands from 1¾ to 2¼ inches), and with no central black lunule on the hind-wings. The colour of the fore-wings varies from dark brown to brownish-red, more or less varied with whitish; the head and front of the collar are whitish, or are of the same colour as the fore-wings. Abounds throughout Europe, Northern and Western Asia, and North Africa, in meadows and gardens. The larva is dirty white, or brown when varied with blackish, with two subdorsal stripes, with large black spots above them, and a pale yellow stripe on the back. It lives on low plants. The larva and two varieties of the moth are figured at Pl. 35, Fig. 5, *a—c*.

GENUS II.—HIRIA (DUP.).

Fore-wings with the *Noctua*-pattern distinct; a tuft of hair on the forehead; the antennæ of the male slightly pectinated at the base; and the front tibiæ without spurs. The only species, *H. Linogrisea* (W. V.), has violet-grey fore-wings, broadly whitish below the costa, and tinged with reddish-purple beyond the subterminal line; the stigmata are bordered first with whitish and then with black, and the hind-wings are ochre-yellow, with a black submarginal band. Expands from 1¼ to 1½ inches. Inhabits the southern half of Central Europe in June and July, but not common. The larva is brown, varied with darker, with dull lines on the back bordered with dusky, and white subdorsal lines bordered below with reddish, and above with thick black streaks. It feeds on primroses, &c., in May. The moth is figured at Pl. 35, Fig. 6


5 b.
5c.
4.
2b.
6.
2a.
1a.
3a.
1c.
5a.
3b.
1b.
A
B
C.

GENUS III.—OPIGENA (BOISD.).

Fore-wings narrow, with the *Noctua*-pattern distinct; the forehead with a divided crest of hair; the middle joint of the palpi with a projecting pointed tuft; the front tibiæ with spurs; and the abdomen convex. The only species, *O. Polygona* (W. V.), has dark violet-brown fore-wings, violet-grey in the lower half of the central shade, with fine double black transverse lines; the two stigmata large, and the discoidal cell deep black between them, and as far as the elbowed line; hind-wings pale grey. Expands about 1½ inches. Found throughout a great part of Central Europe (Britain excepted) in July, but not common. The larva is green, with a dark green stripe on the sides, bordered with white, and a whitish subdorsal line on the front segments. It feeds on low plants till May.

GENUS IV.—AGROTIS (HÜBN.).

Small or middle-sized moths, with stout bodies; the fore-wings, which vary in breadth, are brown or grey, rarely green, with the *Noctua*-pattern more or less distinct; the discoidal cell often filled up with black, the transverse lines single or double; dark, generally dentated, and often marked with black dots at or beyond the extremities of the teeth; the subterminal line nearly always simply waved; the hind-wings whitish or greyish, with no well-marked dark marginal band. The thorax is rounded in front, or with obtusely angulated and sometimes almost rectangular shoulders. The larvæ of some species (*Xanthographa*, *Umbrosa*, &c.) lie underground for three months after they are full-grown, before assuming the pupa state, and die if they are disturbed. This great genus, which is one of the most typical among the *Noctuæ*, may be divided into several sections.

A.—Graphiphora (Ochs.).—*Front tibiæ not shorter than the first joint of the tarsi, without bristles, or with a row on the inside only; on the outside there are at most one or two scattered bristles.*

*1. *A. Augur* (Fabr.).—Fore-wings greyish-brown, with a slight reddish-violet lustre; two simple dark transverse lines, narrowly bordered with lighter, and strongly dentated; the three stigmata broadly surrounded with black, and the subterminal line suffused; hind-wings dark grey. Expands about 1¾ inches. Common in Northern and Central Europe and the Altai in June and July. The larva is brown, with dark angular spots, two white dots on the back of each segment, and a dull brown stripe on the sides, bordered above with black. It lives on low plants till May.

*2. *A. Neglecta* (Hübn.).—Fore-wings reddish-grey or reddish-brown, with the markings very indistinct, the reniform stigma filled up with dusky beneath. There is often a row of black dots beyond the elbowed line; the subterminal line may be regularly and narrowly bordered with darker, or not shaded at all; the antennæ of the male are serrated, and the palpi are dark brown. Expands about 1½ inches. It is found on heaths throughout Central Europe in July and August, but is not common. The larva is brownish, ochre-yellow, or green, with three dull pale lines on the back and a whitish stripe on the sides. It feeds on heath and bilberry till June. (*A. Quadrangula*, Eversm., from South Russia, is dark brown, fore-wings tinged with grey, with the transverse lines waved and darker, the orbicular and reniform stigmata indistinct, and separated by a dark brown square spot; hind-wings dark grey.)

*3. *A. Sobrina* (Boisd.).—Fore-wings violet-grey, varied with yellowish-brown, with indistinct markings; a row of black spots beyond the elbowed line; the subterminal line suffused, broadly

bordered with brown towards the costa in front; the reniform stigma filled up with dusky below; hind-wings pale grey. Head, collar, and palpi rusty-red. Expands from 1¼ to 1½ inches. A scarce and local insect, though widely distributed in Northern and Central Europe and the Altai in June and July; in Britain it occurs at Rannoch. The larva is greyish-brown, varied with pale yellow, with three dirty yellow macular lines on the back, and a pale line on the sides, suffused below. It feeds on low plants till May.

*4. *A. Xanthographa* (W. V.).—Fore-wings paler or darker cinnamon-brown, or brownish-grey, rarely pale grey (variety *Cohæsa*, Herr.-Schäff.), with single dark transverse lines, strongly dentated, but often indistinct, and black dots beyond the elbowed line; the orbicular stigma is surrounded with pale yellow, and the reniform stigma is pale yellow, marked with dusky both above and below; hind-wings whitish in the male and brownish-grey in the female. Expands about 1½ inches. Abundant in Central and Southern Europe in August and September. The larva is clay-colour, with three whitish lines on the back, the two outermost shaded with black above; and a dark brown stripe on the sides. It feeds on grass, primroses, &c., till May. (*A. Kermesina*, Mab., found in Corsica in August, is reddish, the transverse lines black, nearly straight, interrupted, and but little marked; the stigmata absent, but the costa marked with two black spots, one near the base and the other about the middle; hind-wings white.)

*5. *A. Umbrosa* (Hübn.).—Fore-wings yellowish-brown, with narrow brown nervures and two single narrow transverse lines, scarcely dentated. The two stigmata are brownish, surrounded with rusty-brown, the central shade is brownish and angulated, and the subterminal line is replaced by a suffused brownish stripe. Hind-wings brownish-grey, whitish towards the base. Expands 1½ inches. Common in the west of Europe in August and September. The larva is yellowish-brown, varied with greenish, with three pale lines on the back, the two outermost bordered above with blackish; and a greyish-brown stripe on the sides, bordered below with a yellowish-grey one. It feeds on grass growing in dry sandy places, till the end of April.

*6. *A. Rubi* (View.), *Bella* (Tr.).—Fore-wings reddish-violet-brown, darker between the pale grey stigmata, with two double brown transverse lines, which are not dentated; and the subterminal line shaded with dusky behind. Hind-wings dusted with grey. Expands from 1¼ to 1½ inches. Common in Central Europe in July and August. The larva is smoky-brown, with three pale lines on the back bordered with black, and a broad pale brown stripe on the sides. It lives on grass, plantain, &c., till May.

7. *A. Florida* (Schmidt).—Scarcely differs from *Rubi*, but more robust, and larger, rarely expanding less than 1½ inches; the colouring is also lighter and brighter. Inhabits damp meadows at Wismar and in Jutland in June and July. The larva is coffee-coloured, with three whitish lines on the back; the sides are paler, with two fine whitish waved lines, and a reddish-brown longitudinal stripe below. It feeds chiefly on *Caltha palustris* till April.

8. *A. Punicea* (Hübn.).—Fore-wings reddish-violet, with two double brown transverse lines, not dentated, but filled up with paler, and a square rusty-brown mark between the two rusty-yellow stigmata; the central shade and suffused submarginal band reddish-brown; hind-wings yellowish-white, dusted with grey. Expands from 1¼ to 1½ inches. Widely distributed in Central Europe (except Britain) and the Altai in May and June, but very local, and always scarce. The larva is clay-colour, with a pale line on the back, beneath which are dark dashes bordered below with paler; and a dark stripe on the sides. It feeds on raspberry, dandelion, &c., till April.

*9. *A. Festiva* (W. V.).—Fore-wings greyish or reddish ochreous, varied with brown, with two brown double dentated transverse lines, and a black or dark spot between the two stigmata, and sometimes an additional spot before the orbicular stigma; the central shade and suffused

submarginal band brownish-red on the costa; hind-wings pale grey, with rosy fringes. Expands from 1¼ to 1½ inches. Common throughout Central Europe and the Altai in July and August. The larva is purplish-brown, with three yellowish lines on the back, and indistinctly darker angular spots, black oblique dashes bordered below with yellowish, and a reddish-grey stripe on the sides. It feeds on primroses, &c., till June. The moth is figured at Pl. 36, Fig. 1.

10. *A. Conflua* (Tr.).—Resembles *Festiva;* the fore-wings are narrower at the base and broader behind, and redder and more unicolorous; the transverse and submarginal lines are indistinct, and the latter is shaded with dusky behind. Expands rather under 1½ inches. It inhabits Northern Europe and some of the German and Swiss mountains in July and August. The larva is greyish-brown, with an obscurely paler line on the back, and a black waved line on the sides. It feeds on *Polygonum bistorta* till July.

*11. *A. Dahlii* (Hübn.).—Fore-wings broad, varied with pale rusty-brown and violet-grey, with two rather indistinct double dentated brown transverse lines, beyond which is an interrupted double row of pale dots. The central shade is broad and dark, the two stigmata are large, and often surrounded with white, and the subterminal line is slightly waved, and bordered behind with darker as far as the hind margin. The hind-wings are yellowish-grey, with yellowish fringes, and the antennæ of the male are slightly dentated. Expands from 1¼ to 1½ inches. Inhabits Central Europe and the Altai in July and August. The larva is cinnamon-brown, varied with blue on the sides, without the yellow transverse dash behind the 12th segment, which is present in that of *Brunnea*, which it otherwise much resembles. It feeds on grass, plantain, &c., till May or June.

*12. *A. Brunnea* (W. V.).—Fore-wings rather narrow, varying from rusty-yellow to brownish-red, much varied with violet-grey; darker between the two large stigmata, which are surrounded with black and paler; with two indistinct slightly dentated double transverse lines, and the subterminal line irregularly zigzag. The reniform stigma is filled up with yellowish, and the hind-wings are brownish-grey with rosy fringes. Expands from 1½ to 1¾ inches. It is common in Central and Northern Europe, and in the Altai in June and July. The larva is coffee-brown, with three pale lines on the back, between which are oblique dull yellow dashes bordered with dusky; there is a dull yellow transverse dash behind the 12th segment, and a whitish-grey stripe on the sides. It lives on bilberry and other low plants till May.

*13. *A. Baja* (W. V.).—Fore-wings brownish-violet-red, or violet-grey, with indistinct markings; the two stigmata are large, and surrounded with paler; the reniform stigma is filled up below with blackish, and the subterminal line is marked in front below the costa with two small deep black spots; hind-wings brownish-grey. Expands about 1½ inches. Common in Northern and Central Europe, and in the Altai in July and August. The larva is flesh-colour or ochre-yellow, mottled with brownish, with three whitish lines on the back, and brown angular spots, connected together like a chain, which become blacker and spade-shaped behind; and a grey stripe on the sides. It feeds on low plants till May.

*14. *A. Rhomboidea* (Esp.).—Fore-wings violet-brown, with a square dark brown spot between the stigmata, and a triangular one before the orbicular stigmata. The stigmata are large, and surrounded with paler; the transverse lines are indistinct, and the subterminal line is zigzag, shaded with darker in front; and the hind-wings are brownish-grey. Expands from 1½ to 1¾ inches. Inhabits Central Europe in June and July. The larva is reddish-brown, and resembles that of *Baja*, but the lateral stripe is bordered above with a snow-white line. It feeds on low plants till May.

*15. *A. Triangulum* (Hübn.).—Fore-wings brownish-yellow, varied with violet-reddish and greyish-white, the orbicular stigma bordered by two large black spots, united below it; the central

area comparatively narrow, and scarcely more than half as broad again in the middle as the marginal area, the subterminal line edged in front with deep black on the costa; hind-wings brownish-grey; front of the collar pale. Expands from 1½ to 1¾ inches. Common in a great part of Europe from June to August. The larva is pale brown, chequered with darker above, with three whitish lines on the back, between which are oblique blackish streaks, and a reddish-grey stripe on the sides. It feeds on low plants till May.

*16. *A. Ditrapezium* (Borkh.).—Resembles *Triangulum;* the fore-wings are darker, violet-brown, and the central area is twice as broad as the marginal area, the stigmata wider apart, and the black spots in the discoidal cell are longer and straighter; collar uniformly dark. Size of *Triangulum.* Widely distributed in Central Europe and the Altai in May and June, but rarely common. The larva is violet-brown, with dark angular spots on the back, which are deep black, and more spade-shaped on the 11th and 12th segments; the stripe on the sides is indistinct. It lives on low plants till May.

17. *A. Sareptana* (Herr.-Schäff.).—Ashy-grey, the costa and the two stigmata concolorous, the latter surrounded with paler; no black costal streaks, but the subcostal spaces black, the first small and triangular, the second larger, and oval; the transverse lines indistinctly paler; hind-wings ashy. Occurs at Sarepta.

*18. *A. C. nigrum* (Linn.).—Fore-wings dark violet-brown, with a reddish-white triangular orbicular stigma expanded towards the costa on a deep black ground, and the subterminal line spotted with black in front below the costa; hind-wings whitish, dusted with grey towards the hind margin; the front of the collar is pale grey. Expands from 1½ to 1¾ inches. Common throughout Central Europe and Northern Asia from May to August. The larva is marbled with ashy-grey, darker on the back, with oblique black dashes, which become broader and darker on the four last segments; and a dirty yellow stripe on the sides. It lives on low plants till April, and again in August. The moth is figured at Pl. 36, Fig. 2. (*A. Quadrangula*, Eversm., from South Russia, is dark brown, fore-wings tinged with grey, with waved transverse darker lines; the two stigmata are indistinct, and separated by a square dark brown spot; hind-wings dark grey.)

*19. *A. Carnica* (Hering).—Fore-wings narrow, varied with reddish-grey and brown, with a black basal streak, dark dentated transverse lines bordered with paler, and the discoidal cell filled up with blackish near the two stigmata; the orbicular stigma is oblique, and filled up with pale red, the reniform stigma is brownish-red, the subterminal line is indistinct, and marked with more or less distinct arrow-headed spots; the hind-wings are reddish-grey, and the antennæ of the male are pectinated. Expands about 1½ inches. It inhabits the Carinthian Alps and some of the mountains of Scotland. (*A. Hyperborea*, Zett., is very like *Carnica*, but the fore-wings are broader; violet-grey, and a little varied with rusty-red; the orbicular stigma is filled up with pale grey, and the hind-wings are uniform grey. It is found in larch woods in Lapland, and in the mountains of Norway, Silesia, and the Eastern Alps.)

20. *A. Collina* (Boisd.).—Fore-wings purplish-brown, with a black basal streak, and dentated black transverse lines; the orbicular stigma is oblique, and open in front, and the reniform stigma stands on a deep black pyramid; the claviform stigma is also surrounded with black. The subterminal line is zigzag, and the hind-wings are grey. Expands nearly 1½ inches. It is found in the Alps and in the mountains of Silesia in July.

21. *A. Sigma* (W. V.).—Fore-wings dark ochreous-brown, reddish-ochreous on the costa, with double dentated transverse lines filled up with paler, the stigmata bordered with black on the sides, and a small square black mark between them; the claviform stigma small; hind-wings brownish-grey; and the collar light. Expands from 1½ to 1¾ inches. Widely distributed in

Central Europe (except Britain) and Northern and Western Asia in June and July, but not very common. Larva pale copper-colour, with three pale lines on the back, and yellow transverse lines between, bordered with brown in front, and curved forwards on the sides; and with two white dots before each transverse line. It lives on grass and low plants till April. The moth is figured at Pl. 36, Fig. 3.

*22. *A. Subrosea* (Steph.).—Fore-wings reddish-brown, tinged with rosy, with the dentated transverse lines, some costal spots, and a broad streak on the disc brownish or rust-colour, the stigmata rather indistinct; hind-wings whitish-ashy, with a central spot, and a broad marginal band brown; the antennæ are pectinated in the male. Expands 1¾ inches. Formerly common in the English fens in July; a variety with the fore-wings tinged with bluish (variety *Subcærulea*, Staud.) has lately been discovered in Livonia and Finland. The larva is greyish flesh-colour, varied with brown, with three yellow lines on the back, edged with brown, and a broader one on the sides. It feeds on bog-myrtle in May and June.

*23. *A. Depuncta* (Linn.).—Fore-wings yellowish-violet-grey, with the stigmata narrowly surrounded with white, and pale transverse lines scarcely dentated. There are two dark brown spots at the base below the costa, and three on the inner line; and the elbowed and subterminal lines are also spotted with dark brown on the costa in front; hind-wings brownish-grey. Expands about 1½ inches. Inhabits Central Europe in July and August, but local. The larva is yellowish-grey, with a row of dark spots on the back divided by a pale line; and a yellowish stripe on the sides, bordered with blackish above. It feeds on nettles, &c., in May.

*24. *A. Glareosa* (Esp.).—Fore-wings reddish-ashy, with slender pale transverse and subterminal lines, which are not dentated; one deep black spot between the two large stigmata, three before the orbicular stigma, and two towards the base; hind-wings greyish-white. Expands from 1¼ to 1½ inches. Inhabits Central Europe, especially the west, in August and September. The larva is clay-colour, with three pale lines on the back, and a sharply-defined yellowish-white stripe on the sides. It lives on the flowers of *Hieracium murorum* till June.

25. *A. Margaritacea* (Borkh.).—Fore-wings ashy-grey, with slender brown transverse lines, which are double and dentated, and three black costal spots. The subterminal line is often broadly bordered with dark brown in front on the costa, and the space between the two indistinct stigmata is filled up with black; hind-wings white. Size of *Glareosa*. Inhabits the southern half of Central Europe and the Altai in July. The larva is yellowish-brown, with three white lines on the back, between which stand short black dashes, and with a suffused red-and-white stripe on the sides, above which are oblique black arrow-headed spots. It lives on the flowers of hawkweed, &c., till April.

26. *A. Elegans* (Eversm.).—Fore-wings dark brown with a slight violet shade, and greyer towards the hind margin; the lines, stigmata, and nervures as far as the elbowed line white. The inner line forms a very acute angle towards the inner margin, and the elbowed line is rounded; both bordered with black. The grey subterminal line is bordered inside by a row of arrow-headed spots. The stigmata are bordered with white, and the claviform stigma is very large. Hind-wings white in the male, and smoky in the female, slightly bordered with reddish towards the hind margin. Inhabits the mountains of Southern Europe and the Altai in July, and may be captured on thistles in the evening with the aid of a lantern. Expands about 1¼ inches. (*A. Larixia*, Quens., a rarer species found in the French Alps in July, is larger and more oblong, the fore-wings are yellowish-ashy, unmixed with violet, the markings are duller and less sharply defined, and there is a distinct ochreous line before the fringes; hind-wings of the male blackish, with white fringes.)

27. *A. Candelisequa* (W. V.).—Fore-wings ashy-grey, varied with reddish, with the black transverse lines single and dentated, frequently indistinct, and bordered inside with blackish spots on the costa; the subterminal line narrowly shaded with darker in front, and the hind-wings dusted with reddish-grey. Variety *Signata* (Staud.) is paler, with very distinct black dentated transverse lines. Expands from 1½ to 2 inches. A scarce species, inhabiting Central Europe, except the north-west, in June. The larva is dark brown, with two pale lines on the back, on which rest deep black arrow-headed spots, which become larger behind. It feeds on *Rumex*, golden rod, &c., till April.

*28. *A. Ashworthii* (Doubl.).—Allied to *Candelisequa*, but the fore-wings are of a more bluish grey; the transverse lines are black and dentated, and the stigmata are very indistinct, with a square black spot between them; hind-wings grey. Expands 1¼ inches. Common in Wales in July, sitting on plants and rocks. The larva is dull green, with indistinct pale longitudinal lines on the back and sides, and a row of black spots above the latter. It feeds on low plants.

29. *A. Insignata* (Led.).—Fore-wings grey, the three stigmata a little darker, and bordered with pale; the transverse lines are double, near together, and rather indistinct, and each commences in a black spot on the costa; there is a suffused blackish shade towards the hind margin; hind-wings white. Inhabits South Russia and the Altai.

30. *A. Chaldaica* (Boisd.).—Pale grey, fore-wings whitish along the costa, and with a slight coppery lustre, with three black transverse lines; the stigmata are coppery, with triangular black spots between them. Hind-wings white, unspotted. Also from South Russia and the Altai. (*A. Glossematis*, Wallengr., from Sweden, has ochreous-grey fore-wings, the stigmata large, with the spots between them quadrangular and reddish-brown; the transverse lines double and indistinct, the subterminal line pale, shading into brown outside; a brown line at the base of the wings, and a row of small dark triangular spots before the fringes; hind-wings grey, with yellowish fringes. Appears in August. Resembles *Chaldaica*, but easily distinguishable by the colour of the hind-wings.)

*31. *A. Saucia* (Hübn.).—Fore-wings yellowish or greyish-brown, often slightly suffused with reddish on the costa, with the markings indistinct; the subterminal line forms a short W; the hind-wings are whitish, with brown nervures, and the hind margin is brownish-grey; the thorax is crested in front. The variety *Æqua* (Hübn.) is more yellowish-brown, especially on the costa and towards the hind margin. Expands from 1½ to 1¾ inches. Inhabits Western and Southern Europe, North Africa, and Western Asia, but is not considered very common. It is taken at ivy-blossom in August and September. The larva is greyish-brown, with dark lozenge-shaped spots on the back divided by a pale line, and a pale grey stripe on the sides. It feeds on low plants till April.

*32. *A. Plecta* (Linn.).—Fore-wings reddish-violet-brown, the costa broadly whitish as far as the elbowed line, the two stigmata pale, and a black longitudinal streak, suffused towards the inner margin, running from the base to the reniform stigma; hind-wings white; thorax narrowly black in front; abdomen reddish-grey, tipped with reddish. Expands from 1 to 1¼ inches. Common throughout Europe and Western Asia in May, June, and September. Larva yellowish-grey, reddish on the back, and suffused with greenish on the sides, with three reddish-cinnamon lines on the back, and a yellow stripe on the sides. It feeds on low plants in July, and from autumn to April. The moth and larva are figured at Pl. 36, Fig. 4, *a*, *b*. (*A. Leucogaster*, Freyer, from South Europe, much resembles *Plecta*, but the fore-wings are narrower, with the costal band yellowish-white, and extending nearly to the tip, and the abdomen

is white, with the tip reddish. There appears to be a succession of broods; and the larva feeds on *Lotus* and other low plants.)

*33. *A. Putris* (Linn.).—Fore-wings pale reddish-yellow, with the costa broadly brown, the two stigmata darker, and the fringes irregularly chequered with darker; hind-wings yellowish-white. Expands about 1¼ inches. Inhabits Central Europe and the Altai from May to July. The larva is copper-colour, with black arrow-headed spots on the back, and a large white blotch on the side of the 12th segment. It feeds on convolvulus, plantain, bedstraw, &c., in August. The moth is figured at Pl. 36, Fig. 5.

*34. *A. Porphyrea* (W. V.).—Fore-wings brownish-red, with whitish nervures and black longitudinal dashes, the transverse lines are double, dentated, and filled up with whitish; the three stigmata are small and surrounded with black, and the hind-wings are brownish-grey. Expands from 1 to 1¼ inches. Common on heaths in Northern and Central Europe in June and July. The larva is dull red or brownish-red, with dark brown spots on the back, adjoining yellow ones; and a whitish stripe on the sides, above which are brown and whitish spots. It feeds on heath till April, and is generally found under moss.

*35. *A. Agathina* (Dup.).—Fore-wings violet-red, rarely brownish-red (variety *Scopariæ*, Mill.), with the costa reddish-white, a black basal streak, indistinctly double dentated transverse lines, and three stigmata; the orbicular stigma whitish, and placed with the reniform stigma on a black pyramid; the subterminal line is marked with black arrow-headed spots, the hind-wings are pale grey, and the antennæ of the male are serrated. Expands from 1 to 1½ inches. Inhabits Western Europe from June to September. The larva is green, brown, or reddish, according to age, with longitudinal white lines, and hides itself during the day. It feeds on different species of heath, preferring the flowers.

36. *A. Ericæ* (Boisd.).—Fore-wings dark bluish-grey, with a black basal streak bordered in front with ashy-grey, three ashy-grey stigmata surrounded with black, and a black spot between the orbicular and reniform stigmata; the lines indistinct, the inner and elbowed lines dentated; hind-wings white, dusted with grey towards the hind margin in the female; the antennæ of the male slightly pectinated. Size of *Agathina*. It is found on heaths in France and Germany in June, but is not common.

B.—Spælotis (Boisd.).—*The front tibiæ not shorter than the first joint of the tarsi, and furnished with a row of bristles on each side.* The thorax is hairy, except in *A. Præcox*, in which it is clothed with flattened scales.

37. *A. Ocellina* (W. V.).—Fore-wings dark violet-brown, the three stigmata with dark centres, surrounded with paler, and placed on a black pyramid, and black arrow-headed spots before the subterminal line; the transverse lines are indistinctly double, and filled up with paler; the elbowed line is slightly dentated; the nervures are whitish in the central area, but unicolorous in the marginal area, and the hind-wings are dark grey. Expands from 1 to 1¼ inches. Common on the Alps, and in Russia and Siberia in July. (*A. Engadinensis*, Mill., from the Upper Engadine, is allied to *Ocellina;* the fore-wings are rather long and narrow, coppery-yellow, with the transverse lines brown, but indistinct. The inner line does not extend to the costa, and is crossed by a brown basal streak. The elbowed line is entire, rather broad, and slightly arched outwards. Five black arrow-headed spots radiate towards the fringes, which are concolorous, and preceded by seven small black triangles. Only the reniform stigma is visible, which is bordered with black inside, and with whitish outside. The hind-wings are smoky-brown.)

38. *A. Alpestris* (Boisd.).—Very like *Ocellina*, but larger; the fore-wings paler, reddish-violet-grey; the nervures narrowly black on a reddish-white ground in the marginal area; the

pyramidal spot generally less distinct, and the hind-wings brownish-grey. Found in the Alps, Altai, and the mountains of Southern Europe in July and August, but not so common as *Ocellina*.

39. *A. Cuprea* (W. V.).—Fore-wings coppery-brown, darker in the central area, in which the nervures are narrowly whitish, as well as the borders of the three grey stigmata; the transverse lines are only indicated by the light edges of the central area, and the zigzag subterminal line by the dark shading in front; hind-wings brownish-grey. Expands about 1½ inches. Common in the mountains of Central Europe in July and August. The larva is brown, with three dull whitish lines on the back, with blackish dashes between, and a greyish-brown line on the sides. It lives on low plants till April. (*A. Luperinoides*, Guén., from South Russia, resembles a *Triphæna*; the fore-wings are dull olive, with waved transverse brown lines, the subterminal line broader on the costa, and the stigmata replaced by an irregular black spot, with rust-coloured veins; abdomen and hind-wings yellow, the latter with a black border.)

40. *A. Rectangula* (W. V.).—Fore-wings reddish-coppery-brown, the three lines indistinct, and not paler on the inside; the elbowed line scarcely double, and slightly dentated; the three stigmata narrowly surrounded with paler, the reniform stigma projecting a long angle on the lower side as far as the orbicular stigma; above this is a square black mark between them; the claviform stigma is filled up with black at its base; the hind-wings are dusted with grey, and the collar is black in front, or marked with a black transverse line. The variety *Anderreggii* (Boisd.) is smaller, with darker violet-brown fore-wings. Expands nearly 1½ inches. It inhabits South Germany, Switzerland, the Ural, and the Altai in July. The larva is grey, with a dark stripe on the back divided with yellowish, and two yellowish lines on each side below it. It lives on clover, &c., till April.

41. *A. Deplanata* (Eversm.).—Fore-wings brownish-grey, with a reddish shade; two transverse paler lines, the inner line nearly straight, and the elbowed line waved, the subterminal line irregular; the claviform stigma and three subcostal curves dark brown, the other stigmata pale; hind-wings brownish. Size of *Strigosa*. Inhabits the Ural in June.

42. *A. Multangula* (Hübn.).—Fore-wings paler or darker violet-brown, often varied with pale grey, the transverse lines are a little lighter on the inside, the elbowed line is scarcely double, and slightly dentated, the three stigmata are slightly and narrowly edged with dusky, and the orbicular and reniform stigmata are placed on a black pyramid, which is continued in a narrow streak as far as the elbowed line; the claviform stigma is blackish at its base, as well as the space behind it, and the subterminal line is indented. Hind-wings pale grey, the collar with three dark transverse bands. Expands from 1¼ to 1½ inches. Inhabits the southern half of Central Europe and the Altai in June. The larva is clay-colour, with an interrupted white line on the back bordered with black, pale subdorsal lines spotted with black above, and a whitish stripe on the sides. It lives on low plants till May.

43. *A. Fimbriola* (Esp.).—Fore-wings shining yellowish-grey, dark brownish-grey towards the hind margins, with a dark spot or central shade between the two stigmata, the transverse lines double, the inner line nearly straight, and the elbowed line shortly dentated, and forming one curve in cell 1*b*; the subterminal line is yellowish, finely indented, and the hind-wings are brownish-grey. Expands about 1¼ inches. Inhabits South Europe as far north as Hungary in June. The larva is brownish-grey, with three pale lines on the back, between and below which are oblique black dashes, and a dark longitudinal stripe on the sides. It feeds on *Cochlearia*, &c., till April.

44. *A. Grisescens* (Tr.).—Fore-wings ashy-grey, with dark grey transverse lines, single and much dentated; and a black spot between the two nearly obliterated stigmata, which often expands into a broad central shade, touching the elbowed line on the inner margin; the

subterminal line indistinct, and the hind-wings whitish, with the hind margin and a central lunule grey. Expands from 1½ to 1¾ inches. A rather scarce species, found in the Alpine ranges and in Silesia in July. The larva is said to resemble that of a *Leucania*.

45. *A. Latens* (Hübn.).—Fore-wings light shining grey, with the dark transverse lines double and dentated, and the central shade suffused; the elbowed line forms two curves in cell 1*b*; the two stigmata and the subterminal line are indistinct; hind-wings brownish-grey, whitish beneath, with an indistinctly darker central lunule and hind margin. Size of *Grisescens*. A scarce species in the southern half of Central Europe in July. The larva is yellowish-brown, with three pale lines on the back, the outer ones bordered with black above, and with an interrupted black line on the sides. It feeds on grass and other low plants till May. (*A. Rava*, Herr.-Schäff., from Iceland and Labrador, is grey, with the transverse lines much waved, and the elbowed line 8-shaped. The stigmata are generally indistinct, with a darker shade between them; the claviform stigma is often scarcely visible, but terminates in a brown spot; hind-wings unicolorous grey. It is a very variable species, and is found on flowering thyme in July.)

46. *A. Nyctimena* (Boisd.).—Fore-wings greyish clay-colour, darker in the marginal area, and with dark transverse lines and central shade; the elbowed line single and strongly dentated, with one curve in cell 1*b*; the stigmata and subterminal line indistinct; hind-wings pale brownish-grey, lighter at the base; the under side of all the wings yellowish, with a grey curved line. Expands from 1½ to 2 inches. A rather scarce French species, which appears in June and July. The larva lives on *Festuca ovina*, and hybernates under stones in dry places. The moth is often found at rest on stone walls in the day-time.

47. *A. Constanti* (Mill.).—Fore-wings pale clay-colour, finely dusted with brown, the transverse lines brown, and much waved, most distinctly marked at the extremities; subterminal line replaced by a row of brown dots. Stigmata indistinct, and the claviform stigma absent. Fringes unicolorous. Hind-wings whitish, with a narrow clay-coloured border. Inhabits Ardèche in September.

48. *A. Culminicola* (Staud.).—Very close to *Nyctimena*, but the thorax is densely hairy and crested; the fore-wings are yellowish-grey, not darker on the hind margin; the transverse lines are distinct, the elbowed line very sharply dentated, and the under side of all the wings has an indistinct central lunule and curved stripe. Size of *Nyctimena*. It is found in the Eastern Alps in June, on the flowers of *Silene Acaulis*.

*49. *A. Lucernea* (Linn.).—Also resembles *Nyctimena*, but the fore-wings are iron-grey, and the hind-wings are dark grey, a little lighter towards the base. On the under side the fore-wings are grey, and the hind-wings are white, all with broad blackish marginal bands. Expands from 1¼ to 1¾ inches. It is found flying over loose stones by day in the mountains of Northern and Central Europe in July and August. The larva is dark greenish-grey, with a double row of white spots on the back, shaded in front. It feeds on low plants till March.

50. *A. Lucipeta* (W. V.).—Fore-wings bluish-grey, varied with clay-colour, the two transverse lines double, dentated, and filled up with yellowish, the elbowed line forming two curves in cell 1 *b*, and marked with dark and pale spots at the ends of the teeth; the borders of the two stigmata and the indented subterminal line are yellowish; hind-wings yellowish-grey, unicolorous pale yellowish on the under side. Expands from 2 to 2½ inches. A rare species, inhabiting the southern half of Central Europe in June and July. The larva is greenish-grey, paler on the sides, with a dark line on the back, and raised black dots. It lives on *Tussilago Farfara* till May.

*51. *A. Simulans* (Hufn.), *Pyrophila* (W. V.).—Fore-wings yellowish-brown, with dark double dentated transverse lines, the elbowed line forming two curves in cell 1*b*, and marked

with black and pale spots at the ends of the teeth; the orbicular stigma is small and yellowish, and the reniform stigma has a dark centre; the subterminal line is not indented, and is indistinctly spotted with dusky in front; the hind-wings are brownish-grey, and whitish beneath, with a dusky curved line and hind margin. Expands from 1½ to 1¾ inches. Inhabits Europe, except the extreme north and south; and the Altai in June and July. The larva is dull greyish-brown, and lives on grass and low plants till April.

*52. *A. Ravida* (W. V.).—Fore-wings rather narrow, greyish-brown, the costa slightly tinged with reddish-violet, with a black basal streak, and double blackish dentated transverse lines, filled up with paler; the elbowed line forming two curves in cell 1*b*, the two stigmata surrounded with black, and the subterminal line yellowish and indented. Hind-wings dirty white, dusted with brown towards the hind margin; under side with traces of a curved stripe on the costa. Expands about 1¾ inches. Common in Northern and Central Europe and Northern Asia in May, July, and August. The larva is brown, with dark oblique dashes in front, and dark angular spots behind; on the back of the 12th segment is a horse-shoe shaped mark; and there is a dark stripe on the sides. It feeds on low plants till April.

53. *A. Erythrina* (Ramb.).—Fore-wings rounded at the tips; dark porphyry-brown, the lines replaced by white atoms, only distinctly marked towards the inner margin. The elbowed line is followed by a row of small and indistinct white dots placed on the nervures. The costa is marked with four large white spots shaded with black at the commencement of the lines; the stigmata are wanting. Hind-wings grey, with the centre rather paler. A rare species, found in France in June.

54. *A. Senna* (Hübn.).—Fore-wings rather narrow, and truncated behind; dark grey, the costa lighter, with a black basal streak; the transverse lines are dark, dentated, indistinctly double, and filled up with pale grey; the elbowed line has white dots at the ends of the teeth, and forms one curve in cell 1*b*; the subterminal line and the two stigmata are indistinct, and the latter are connected by a square black spot; the hind-wings are brownish-grey, the under side with the commencement of a black curved line on the costa. Expands about 1½ inches. Widely distributed in the Southern Alps in August.

55. *A. Forcipula* (W. V.).—Fore-wings brownish-ashy, with a black basal streak, single dark dentated transverse lines, the three stigmata surrounded with black, and fine black arrow-headed spots before the subterminal line, which is dotted with white; hind-wings brownish-grey. Expands from 1½ to 1¾ inches. Inhabits Southern and South-Central Europe and Western Asia in June and July, but not common. The larva is dirty brown, with dark lozenge-shaped spots, and a light line on the sides. It feeds on *Rumex*, &c., till May.

56. *A. Signifera* (W. V.).—Fore-wings brownish-ashy, varied with darker brown, with a black basal streak, and the three stigmata surrounded with black, the orbicular and reniform stigmata connected by a black longitudinal stripe which extends to the hind margin; the claviform stigma is often absent. The double transverse lines and the subterminal line are indistinct, and the hind-wings are whitish, dusted with brown. Expands about 1½ inches. Inhabits South Europe and Northern and Western Asia in July. The larva is brownish-green, with dull dark lozenge-shaped spots, and on the upper part of the sides is a black line expanding into a triangular spot on each segment. It feeds on low plants till May.

57. *A. Celsicola* (Bell.).—Fore-wings grey, shaded with brown; the costa paler, the subterminal line represented by a series of black arrow-headed spots, the orbicular stigma oval, and nearly united to the reniform stigma, from which it is separated by a black space; the reniform stigma is white, varied with brown in the centre, and is constricted in the middle. Fringes spotted. Hind-wings brown, lighter in the middle and towards the anal angle. The ovipositor of the

female is unusually prominent. Size of *Signifera.* It flies by day in July, in warm stony localities in the French Alps.

* 58. *A. Præcox* (Linn.).—Fore-wings rather narrow, dull greenish, with double blackish dentated transverse lines, and a lighter submarginal line, slender and indented, and bordered in front with rusty-red; the three stigmata are large, greenish-white, with the centres often darker, and narrowly surrounded with black; hind-wings brownish-grey. Expands from 1½ to 1¾ inches. It is found throughout Central Europe and Northern Asia in sandy places, on the coast and elsewhere, but is local and not always common; it appears in June and July. The larva is pale grey, with white stripes on the back and sides, and yellowish subdorsal stripes. It feeds on wormwood, viper's bugloss, &c., till May, and hides itself in the sand during the day. The moth is figured at Pl. 36, Fig. 6.

C.—Agrotis (Hübn.).—*The front tibiæ considerably shorter than the first joint of the tarsi, with a row of bristles on each side.*

59. *A. Musiva* (Hübn.).—Fore-wings reddish-violet-brown, with the costa broadly pale yellow, and bordered below with deep black as far as the reniform stigma. The orbicular stigma is whitish, and suffused with the costa, and the reniform stigma is grey, surrounded with whitish, and all the lines are very indistinct. The hind-wings are white, and the collar is whitish in front, and dark brown behind. Expands from 1¼ to 1½ inches. Inhabits South Europe and Northern and Western Asia in July. The larva is yellowish-green, with a dark line on the back and a dark green stripe on the sides. It feeds on low plants till April.

* 60. *A. Flammatra* (W. V.).—Fore-wings dark violet-grey, broadly ashy-grey on the costa, with a deep black basal streak thickened behind, and a long black triangle before the light orbicular stigma, which is produced in front; the elbowed line is single and much dentated, and the subterminal line is indented, with short black arrow-headed spots in front; hind-wings brownish-grey; the collar black behind. Expands about 1¾ inches. It occurs in the south of Europe and Asia in June and July, and has once been taken in the Isle of Wight. The larva is green, with paler stripes on the sides, and feeds on wild strawberry, dandelion, &c., till April.

61. *A. Candelisequa* (Hübn.).—Fore-wings pale ashy-grey, with suffused brownish transverse lines, and black streaks running from the base, and from the orbicular stigma to the subterminal line, which latter is only indicated by the dark shading behind it, with two long teeth in the middle, and is often marked with blackish arrow-headed spots also; hind-wings white. Expands from 1½ to 1¾ inches. Inhabits South Europe and Northern and Western Asia in June and July. The larva is brownish-grey, with dark stripes on the back and sides, and whitish beneath. It feeds on *Jurinea mollis* till June.

62. *A. Fennica* (Tausch.).—Dark grey; fore-wings brown behind, with the transverse lines black, double, and waved, the stigmata edged with black, the claviform stigma rather long, the orbicular stigma white and nearly round, and the reniform stigma brown; the subterminal line grey, and angulated on the outside; hind-wings grey. Expands 1¾ inches. It inhabits the north of Europe, Asia, and America in July and August, and is said to have been occasionally taken in England.

63. *A. Fugax* (Tr.).—Fore-wings coarsely scaled, grey varied with yellowish, with rather indistinct dark transverse lines, the inner line double, and the elbowed line single and indented, forming two curves in cell 1*b*, and bordered with yellowish externally. The subterminal line is zigzag, whitish, with suffused brownish-grey spots in front, and the stigmata indistinct. Hind-wings dusted with grey, with a central lunule and curved stripe on the under side. Expands from 1¾ to 2 inches. It inhabits Austria and Russia in June and July. The larva is shining clay-

colour, with a dark double line on the back, and a stripe on the sides, bordered on both sides with dirty white. It feeds on grass till May.

64. *A. Birivia* (W. V.).—Fore-wings bluish-grey, with whitish transverse lines scarcely bordered with dusky, a pale curved subterminal line, and the two stigmata surrounded with whitish. Hind-wings whitish, with the hind margin grey, and a dark central lunule on the under side. Expands about 1¾ inches. A scarce species, found throughout the Alpine ranges in August.

65. *A. Cos* (Hübn.).—Fore-wings yellowish-grey, with the transverse lines a little darker, double, and slightly dentated, the subterminal line slightly curved, with two small curves in cell 1*b*, the stigmata and subterminal line indistinct, the latter very near the hind margin, and slightly shaded with darker in front; hind-wings pale brownish-grey, with no curved stripe beneath. Expands 1¾ inches. Inhabits the Southern Alps in August, but scarce. (*A. Cycladum*, Staud., is yellowish-grey; fore-wings with three or four waved blackish transverse lines; the two stigmata bordered with black, and the hind-wings ashy. It is a little smaller than *Cos*, of which it may be a variety, and occurs at Naxos in July. *A. Fœda*, Led., is of the size and shape of *Forcipula* or *Signifera*; fore-wings dull brownish clay-colour, with the half-line and two transverse lines blackish; the claviform stigma is surrounded with black; the elbowed line curves round the reniform stigma, which is shaped as in *Signifera*, and is parallel to the hind margin below; the orbicular stigma is rather long, and the pale subterminal line is indistinct; hind-wings ashy-grey, with the base and fringes paler. Inhabits Sarepta and the Altai.)

66. *A. Helvetina* (Boisd.).—Fore-wings with the tips prominent; dark bluish-grey, darker in the central area, the transverse lines scarcely indicated, the two stigmata indistinctly paler, and not distinctly bounded; hind-wings reddish-grey. Expands from 1¾ to 2 inches. Inhabits the Alpine ranges in July and August, but always rather scarce.

67. *A. Decora* (W. V.).—Fore-wings ashy-grey, with single dark dentated transverse lines, the elbowed line strongly waved, with two curves in cell 1*b*, the two stigmata suffused with clay-colour, the subterminal line indistinctly whitish, and shaded with darker in front; hind-wings grey, whitish towards the base in the male, and with a dark curved stripe on the under side. Expands from 1½ to 1¾ inches. Inhabits the southern half of Central Europe in August. The larva is whitish, with a dark line on the back, and lives on grass till June.

68. *A. Renigera* (Hübn.).—Fore-wings rather pointed, bluish-grey, with all the markings suffused and ill-defined. The central transverse lines are waved and blackish, and the subterminal line is only indicated by a few white atoms; there is a row of blackish dots before the fringes. The stigmata are large, tinged with yellowish-white, and separated by some blackish atoms, but very indistinct. The reniform stigma is divided at the extremity; of the claviform stigma only the blackish extremity is visible, placed on a yellowish-white streak, which extends from the half-line to the elbowed line. Hind-wings blackish, the base lighter, and the fringes ochreous. Expands about 1½ inches. Widely distributed in the Alpine ranges in July and August, but very rare.

69. *A. Leonina* (Staud.).—Fore-wings dull sandy yellow, the half-line scarcely marked, the central lines zigzag, and an irregularly zigzag dark marginal band. The orbicular stigma is much smaller than the reniform stigma. Hind-wings dirty grey, whitish at the base. The antennæ of the male are strongly dentated. It occurs at Sarepta in July.

70. *A. Simplonia* (Boisd.).—Fore-wings pale bluish-grey, varied with yellowish; the transverse lines are single, thick, blackish and dentated, the elbowed line strongly curved, with two curves in cell 1*b*, the orbicular and claviform stigmata absent, the reniform stigma dark, and the subterminal line only indicated by the dark shading in front. Hind-wings brownish-grey, the collar with a

curved black mark, and the antennæ of the male serrated. Expands from 1¼ to 1½ inches. Inhabits the Alps and Pyrenees in May. The larva is grey, with a black head, and lives on grass in August and September.

*71. *A. Cinerea* (W. V.).—The fore-wings vary from pale reddish-grey to reddish-brown, with single dark transverse lines; the elbowed line forms two curves in cell 1 *b*; the reniform and claviform stigmata are absent, and the orbicular stigma is dark and narrow; the subterminal line is indistinct. Hind-wings whitish in the male, and brownish in the female, with a dark central lunule and curved stripe; the collar with a curved black mark, and the antennæ of the male slightly pectinated. Expands from 1¼ to 1½ inches. Found throughout Central Europe and Western Asia in June, but not very common. The larva is shining greenish-brown, with three dark lines on the back, and dark angular spots between. It feeds on the roots of grass, sorrel, &c., till April.

*72. *A. Ripæ* (Hübn.).—Very variable. The transverse lines dark, the inner line generally double, the elbowed line single and dentated; the three stigmata distinct, and surrounded with brown; the orbicular and reniform stigmata darker inside, the claviform stigma small, the subterminal line slightly curved, consisting of white dots or angular spots, and moderately shaded with brown in front, or with black longitudinal spots. The ground-colour is brownish-yellow, with the costa ashy, or whitish, varied with yellowish; and the paler the colour, the more indistinct become the markings, till, when it becomes pure white, only the fine outlines of the three stigmata are left (variety *Obotrica*, Herr.-Schäff.). Hind-wings white, slightly dusted with grey in the female; the collar with a black curved mark. Expands from 1¼ to 1¾ inches. A coast insect in North-Western Europe in June and July. The larva varies from dirty yellow to greyish-brown, with three dark double lines on the back. It is yellowish-grey on the sides, and whitish on the belly, and feeds on plants growing on the sand-hills. It is full-grown in autumn, but does not become a pupa till May. (*A. Desertorum*, Boisd., from Sarepta and Siberia, is larger and greyer, and is perhaps an inland representative of *A. Ripæ*.)

*73. *A. Cursoria* (Borkh.).—Fore-wings pale yellow, more or less dusted and varied with brown, darker in the discoidal cell and between the stigmata; sometimes wholly reddish-brown, with the nervures whitish; the transverse lines double, the elbowed line dentated, the orbicular and reniform stigmata large, pale, and surrounded with darker, and grey internally; the claviform stigma often absent; the subterminal line whitish, much waved, and bordered behind with grey as far as the hind margin; hind-wings whitish, with the hind margin grey; the collar with a black curved mark. Expands from 1¼ to 1½ inches. Inhabits Northern and North-Western Europe, chiefly on the coasts, in July and August. The larva is brownish-grey, with the sides yellowish; a darker line on the back, and a whitish one on the sides. It feeds on spurge, *Verbascum*, &c., till May.

74. *A. Sagitta* (Hübn.).—Straw-colour, fore-wings with a short broken reddish discal streak intersected with spots, beyond which are interrupted blackish lanceolate stripes, with the stigmata partially bordered with black and white; the orbicular stigma small and round; hind-wings whitish, with the hind margins grey. From South Russia. (*A. Lutescens*, Eversm., from the Ural, is orange-brown, with the stigmata very small, and with simple brown transverse lines; hind-wings whitish, bordered with brown. *A. Deserta* (Staud.), from Sarepta, resembles *Cursoria*, but the two stigmata are wholly filled up with white, and the hind-wings are dusky, only rather lighter towards the base.)

75. *A. Lidia* (Cram.).—Fore-wings violet-black, reddish on the costa, and along the suffused submarginal band, with double transverse lines, filled up with lighter, and the elbowed line dentated; the orbicular and reniform stigmata and the subterminal line whitish; the latter widens into a spot

on the costa, and is marked with black arrow-heads in front. The claviform stigma is absent, the hind-wings are brownish-grey, and there is a black curve on the collar, which is whitish in front. Expands from 1¼ to 1½ inches. A scarce species, apparently confined to North Germany in July and August. (*A. Islandica*, Staud., from Iceland and Labrador, is grey; fore-wings, with the costa, and orbicular and reniform stigmata white; a suffused pale band towards the hind margin; hind-wings white, dusted with grey, generally with a dark central spot; the antennæ are slightly serrated in the male. The larva feeds on *Plantago latifolia*, becomes a pupa in June, and the moth, which like most polar species is very variable, flies over thyme in July and August. (*A. Norvegica*, Staud., from the Dovre Fjeld, has dark chocolate-grey fore-wings; basal area, nervures, and orbicular stigma dusted with ashy-grey. The 2nd and 3rd lines, and the black lunules before the hind margin, are much more distinct than in *Tritici* or *Islandica*. Hind-wings dirty white at the base, and greyish-black towards the margins, and with a distinct transverse line beneath.)

76. *A. Nigricans* (Linn.).—Fore-wings uniform violet-black, with a black basal streak, indistinct double transverse lines, and the three stigmata narrowly bordered with black, and not paler than the ground-colour within; the subterminal line indistinct, or consisting of pale angles; hind-wings dirty white, with the hind margin brownish; and the antennæ of the male serrated. Expands about 1½ inches. Common in Europe and Northern Asia in July and August. The larva is shining brown, with a paler zigzag stripe on the sides; it lives on low plants till April.

77. *A. Adumbrata* (Eversm.).—Pitchy brown, fore-wings with waved brown transverse lines, the stigmata bordered with whitish, the claviform stigma short, and the orbicular stigma nearly round; the subterminal line composed of whitish dots; and a row of black dots before the fringes. Hind-wings grey, with a darker central spot, and the hind margins very broadly darker. It inhabits South Russia.

78. *A. Recussa* (Hübn.).—Resembles *Tritici*, but darker; brown varied with violet-grey, especially towards all the margins; the markings better defined, the transverse lines distinctly double, the orbicular and reniform stigmata reddish ashy-grey, placed on a sharply-defined black pyramid; the subterminal line pale, rather shortly dentated, and broadly bordered with dusky on the costa, but with no distinct arrow-headed spots. Hind-wings grey, whitish in the male to beyond the middle; the under side of all the wings with a darker lunule, and the antennæ of the male slightly serrated. Expands about 1½ inches. It is found in Northern and Alpine Europe, and in the Altai in July. (*A. Transylvanica*, Herr.-Schäff., from Hungary, has dark brown fore-wings, rather shorter and broader than in *Obelisca;* the costa not paler; the three stigmata well marked, the orbicular stigma large, paler than the others; subterminal line indistinct, scarcely dentated, and shaded with darker on the inside.)

79. *A. Distinguenda* (Led.).—Much resembles *Tritici*, but the fore-wings are shorter, and broader behind. Pale grey, with the costa broadly whitish, and the markings very sharply defined, especially the large, pointed, arrow-headed spots on the subterminal line, and a pale oblique streak behind the reniform stigma; the antennæ of the male strongly serrated. Inhabits South Europe and the Altai.

* 80. *A. Tritici* (Linn.).—Fore-wings moderately broad, grey, a little lighter on the costa, with double dentated transverse lines, the orbicular and reniform stigmata dusted with whitish, the claviform stigma surrounded with blackish, the subterminal line light, with two large teeth in the middle, and with black arrow-heads in front. Hind-wings dirty white, with the hind margin broadly grey, and the under side with no curved stripe; the antennæ of the male dentated. Very variable; sometimes all the lines, the black arrow-heads, and the claviform stigma are indistinct;

the stigmata stand on a more or less dark pyramid, and there is sometimes a short black basal streak. Specimens with a broad whitish costa and more distinct markings belong to the variety *Vitta* (Esp.); and brownish-yellow specimens without transverse lines, but with a black pyramid and arrow-heads, belong to the variety *Aquilina* (W. V.). Expands from 1¼ to 1½ inches. Common throughout Europe and Northern and Western Asia in July and August. The larva is shining brownish-grey, with lighter longitudinal lines, and darker oblique streaks on the back. It feeds on low plants till May. (*A. Christophi*, Staud., from Sarepta, appears to be a variety with the antennæ of the male more pectinated. *A. Hilaris*, Freyer, from Turkey, is grey; fore-wings with the transverse lines distinct, blackish, and double; the stigmata bordered with blackish, the claviform stigma long, the orbicular stigma small and round, and the reniform stigma large. *A. Vitta*, Hübn., from the Southern Alps, has brownish fore-wings, with a very broad white stripe, dusted with reddish on the costa, whitish stigmata, with angular black spots between, and two black marks at the base.)

*81. *A. Obelisca* (W. V.).—Fore-wings broad behind, brown shaded with reddish-violet; ochreous-grey on the costa, with a black basal dash; the stigmata bordered with black, and the orbicular and reniform stigmata placed on a black pyramid; the subterminal line whitish, with two strong teeth in the middle, but no arrow-heads; the transverse lines are indistinct. The hind-wings are whitish, with the hind margin narrowly brownish, but with no central lunule; the antennæ of the male are dentated. The variety *Sordida* (W. V.) is unicolorous grey, with no basal streak or distinct claviform stigma, and with whiter hind-wings. Expands from 1¼ to 1½ inches. Found throughout Central Europe in July and August. The larva is brownish-grey, with three pale lines on the back, between and below which are oblique brownish dashes; and a grey stripe on the sides. It feeds on low plants till June. The variety *Hastifera*, Donz., from the French Alps and the Altai, is reddish-black, with a very distinct white costal streak; the orbicular stigma is grey, and the reniform stigmata tinted above with yellow. (*A. Basigramma*, Staud., from Sarepta, is very close to *Obelisca*, but the fore-wings are of a paler reddish-grey, and the claviform stigma is replaced by a very distinct black line running from the base. *A. Conspicua*, Hübn., from South Europe and Western Asia, is of the size of *Saucia;* the fore-wings are grey, varied with brown, with brown transverse lines and pale grey stigmata; the orbicular stigma is rather large, oval, and oblique; and the hind-wings are violet-brown. *A. Squalida*, Boisd., from South Russia and Northern and Western Asia, is greyish-brown, varied with darker, with a waved line shaded with darker towards the base, and the stigmata bordered with paler.)

82. *A. Ruris* (Hübn.).—Perhaps another variety of *Obelisca;* fore-wings longer, unicolorous yellowish-brown, or with the costa paler; a distinct black basal streak, transverse lines, claviform stigma, and black pyramid; the subterminal line sometimes marked with small black arrow-heads; hind-wings paler, nearly pure white in the male, with no lunule on the under side; the antennæ of the male shortly but distinctly pectinated. Expands from 1½ to 2 inches. Inhabits the southern half of Central Europe in July and August. The larva is brown, with a reddish-grey stripe on the back divided with paler. It lives on low plants till June.

83. *A. Trux* (Hübn.).—Fore-wings yellowish-grey or brownish-grey, often suffused with greenish, and dusted with rust-colour; dark grey on the hind margin; the transverse lines double and indistinct, the elbowed line slightly dentated, and sometimes marked with black dots behind; the reniform stigma filled up with dusky; the subterminal line faint and nearly straight, broadly bordered with dusky on the costa in front; the claviform stigma generally, and the orbicular stigma and all the transverse lines frequently, absent; hind-wings white, with the hind margin brownish in the female; the collar unicolorous, and the antennæ of the male serrated and ciliated.

Expands from 1½ to 1¾ inches. Inhabits the Valais and South-Western Europe from May to September. The larva feeds on low plants growing in dry places in spring.

* 84. *A. Lunigera* (Steph.).—Closely allied to *Trux;* fore-wings brown, more or less varied with grey, the stigmata edged with black; the orbicular stigma grey, and the reniform stigma brown; hind-wings white in the male and bordered with grey, and with a grey central lunule in the female. Expands from 1¼ to 1½ inches. A local insect, found on the coasts of Britain in August; the larva is ochreous, mottled with dark brown on the back; it feeds on low plants.

* 85. *A. Putu* (Hübn.).—Fore-wings reddish-grey, dark grey in the central area, and on the costa above the reniform stigmata, with slender dark transverse lines, the elbowed line single and dentated, with black dots at the ends of the teeth; the three stigmata narrowly bordered with black, the orbicular stigma wide and pale, the reniform stigma dark grey, the subterminal line indistinct and much dentated; hind-wings white; the antennæ of the male serrated. Expands 1¼ inches. Inhabits Central and Southern Europe, Algeria, and Syria from July to September, but somewhat local.

86. *A. Segetum* (W. V.).—Fore-wings yellowish-grey or brownish-grey, dusted with darker, with the transverse lines double and dentated, but often indistinct; the three stigmata filled up with dusky, and surrounded with blackish; the claviform stigma short, and the subterminal line indistinct; hind-wings white, with brownish nervures, the collar with a narrow black curved mark, and the antennæ of the male pectinated. Expands from 1¼ to 1¾ inches. Abundant throughout Europe and Northern Asia from June to September. The larva is clay-coloured, with three dark lines on the back, the middle one double, and the others slightly waved; belly dirty white. It lives on the roots of grass and corn till May, and is often very destructive. The moth is figured at Pl. 36, Fig. 7. (*A. Sicula*, Boisd., from Sicily and Naples, is intermediate between *Cos* and *Segetum;* the fore-wings are rather narrow, greyish-brown, with the transverse lines dentated and darker; the stigmata are pale grey, the orbicular stigma suffused, oblong, and placed longitudinally; hind-wings whitish.)

* 87. *A. Clavis* (Hufn.), *Corticea* (Hübn.).—Allied to *Segetum*, but the fore-wings are shorter and more obtuse, finely scaled, and of a more violet-grey or violet-brown colour, with the costa darker; hind-wings much darker, and broadly brownish towards the hind margin. Common in a great part of Europe and Northern Asia in June and July. The larva is dirty brownish-grey, with a light line on the back, and a dark-grey stripe on the sides. It feeds on low plants till June.

* 88. *A. Exclamationis*, Linn. (*Heart and Dart Moth*).—Fore-wings yellowish-grey or dark brown, with double dentated transverse lines which are often indistinct; the orbicular and reniform stigmata are surrounded with black, and the claviform stigma is large and filled up with black; the subterminal line is light, and more strongly dentated in the middle; the hind-wings are white, with the hind margin broadly brownish-grey in the female; and the collar has a blackish curved mark, broader in the middle. Expands from 1¼ to 1½ inches. Common in Europe and Northern and Western Asia from June to August. The larva is brownish-grey with a pale line on the back, and a dark suffused stripe on the sides. It lives on grass, &c., till April.

89. *A. Spinifera* (Hübn.).—Fawn-colour, abdomen pale brown, fore-wings with a submarginal fascia composed of black spots; the tip marked with a brown spot; the stigmata bordered with black, and the claviform stigma rather long; hind-wings whitish. Inhabits South-Western Europe. (*A. Spinosa*, Staud., from Astrachan, has yellowish-grey fore-wings; the claviform stigma forms a broad white dash, and the other stigmata are surrounded with white; the reniform


5.
4b.
7.
6.
2.
1.
4a.
10.
3.
9b
11.
12a
9a
8a
8b
A.
B.
C.

stigma is small, but the orbicular stigma is very long and pointed; the elbowed line is mostly composed of long black and white teeth; hind-wings grey with white fringes. *A. Arenicola*, Staud., from Corsica, may be known from any allied species by the under side of the fore-wings, which have a dark central lunule, and two narrow dark parallel stripes beyond. *A. Arenosa*, Staud., from Andalusia, is allied to *Spinosa;* the fore-wings are varied with grey, whitish along the costa and submarginal line, and with two long white dashes in the place of the claviform stigma; the other stigmata are small and bordered with white, with a square black spot between, and a triangular one within, and with long black spots resting on the submarginal line.)

90. *A. Ypsilon* (Rott.), *Suffusa* (Hübn.).—Fore-wings brownish-yellow or dark brown, paler in the suffused submarginal band, with double transverse lines, and three dark-grey stigmata, the reniform stigma with a black streak behind, the subterminal line forming a distinct W, and with black arrow-headed spots upon it; hind-wings whitish with brownish nervures; the antennæ of the male pectinated. Expands from 1¾ to 2 inches. Common in the greater part of Europe and Northern and Western Asia in July and August.

*91. *A. Vestigialis* (Hufn.), *Valligera* (W. V.).—Fore-wings ashy-grey, varied with dark grey and brownish, with slender black nervures and double transverse lines, the inner line very oblique, the orbicular stigma small, the reniform stigma dark grey, and the claviform stigma very large and filled up with black; the subterminal line light, with two rather strong teeth in the middle, and black arrow-heads in front; hind-wings whitish, with the hind margin grey. Antennæ of the male pectinated. Expands from 1¼ to 1½ inches. Inhabits the greater part of Central Europe in July and August, preferring sandy places on the coast and elsewhere. The larva is ashy-grey, with a slender double black line on the back, and two whitish lines on the sides. It feeds on grass till May.

92. *A. Fatidica* (Hübn.).—Fore-wings brown, with slender black nervures bordered with whitish-grey, and indistinct dark double transverse lines, the three stigmata bordered with black, the reniform stigma with a black streak behind, and the claviform stigma indistinct, marked with black arrow-headed spots in front; the hind-wings are pale grey, and the antennæ of the male are pectinated. The female has much shorter and narrower fore-wings. Expands from 1¼ to 1¾ inches. It inhabits the Alps, Ural, and Altai in August. (*A. Rogneda*, Staud., from the Crimea, has a superficial resemblance to *Neuronia Popularis*, but the fore-wings are brownish-grey, with the nervures much more broadly white; the hind-wings are quite white, and the abdomen is slender.)

93. *A. Crassa* (Hübn.).—Fore-wings brownish-grey, with dark double transverse lines, and the three stigmata unicolorous, and surrounded with dusky; the elbowed line slightly dentated, the subterminal line white and strongly dentated, forming a distinct W, and often marked with black arrow-headed spots; hind-wings white, broadly brownish towards the hind margin in the female; the antennæ of the male pectinated. Expands from 1¾ to 2 inches. The larva is dirty brown, with a double black line on the back. It lives on the roots of grass till May. (*A. Dirempta*, Staud., found in Andalusia in August, has greyish-white fore-wings, with two waved transverse lines. Within the innermost stands the claviform stigma; the other stigmata, and an additional spot near the reniform stigma, stand between the lines; hind margin with black triangles. Hind-wings whitish at the base, and broadly black beyond the middle, and with a central dot beneath.)

94. *A. Obesa* (Boisd.).—Fore-wings pale yellowish-brown, with the principal nervures white; the transverse lines are brown; the elbowed line is edged with white outside, and curves round beyond the reniform stigma; the latter is large and brown, bordered with black outside, and

with white inside. The orbicular stigma is narrow, and produced horizontally, and only separated from the reniform stigma by two little black spots; the claviform stigma is dark brown, and bordered with black; the subterminal line is white and waved, and a row of black arrow-headed spots stands upon it. There are two little black dashes at the base; hind-wings white, antennæ pectinated. Expands 1½ inches. It is found in the south of France in autumn, and the larva lives on the roots of plants, and sometimes injures the vines. (*A. Graslinii*, Ramb., which inhabits the coast of La Vendée in September, has rather narrow yellowish-grey fore-wings, varied with ashy-white at the tip, costa, and in the cell. The elbowed line is often replaced by dots, and marked with arrow-headed spots, and the inner line is obliterated. The reniform stigma is dark grey, with the inner edge white; the orbicular stigma is small and white, pupilled with grey, and separated from the reniform stigma by a brown shade; the claviform stigma is brown and oblong, and the subterminal line is composed of well-marked black lunules; hind-wings dull white. Expands about 1¾ inches. *A. Trifurca*, Eversm., from the Ural and Altai, is greyish, with a dark-brown stripe in front of the thorax; fore-wings, with the costa, hind margin, and part of the disc, brown, with black transverse lines and submarginal lunules; the stigmata are bordered with black, the orbicular and reniform stigmata are very long, and the latter is crescent-shaped; hind-wings white, with brownish hind margins.)

GENUS V.—BRITHYS (HÜBN.).

Antennæ short, very slightly pubescent; palpi straight, slender, the last joint indistinct; tongue rudimentary; thorax convex, and clothed with depressed hair. Abdomen stout, cylindrical in the male, and slightly flattened in the female; fore-wings rounded at the tips. The larvæ are smooth and cylindrical, with a small round head, and small shining raised spots. The pupa is constructed in the ground, and protected by an earthen cocoon.

1. *B. Pancratii* (Cyr.).—Fore-wings dark brown; the hind margin greyish, bordered within with reddish. Transverse lines black and dentated, and the lower part of the reniform stigma bordered with pale yellow; hind-wings pure white in the male; in the female, the costa and hind margin are dark brown; thorax blackish; abdomen whitish, with the tip brown. Expands 1½ inches. It inhabits South Europe and North Africa in May, and the larva lives in June in the leaves, bulbs, and stalks of *Pancratium maritimum*. (*B. Encaustus*, Hübn., from Sicily, is paler, with the hind margin sharply whitish, and the reniform stigma surrounded with reddish.)

FAMILY V.—HADENIDÆ.

Stout-bodied moths, generally about the middle size; the thorax convex, broad, and quadrangular, with the shoulders obtusely angulated, and usually with a strong crest before and behind; when the crest forms a longitudinal ridge, it expands and is raised behind. The antennæ of the male are often pectinated or serrated; the tongue is nearly always strong; the legs are strong, the hind pair long, and the tibiæ seldom spurred. The fore-wings are considerably broader behind, and the hind margin is either oblique or truncated, and rounded towards the hinder angle. The *Noctua*-pattern is usually distinct; the fringes are generally much waved, and only occasionally entire. They are slightly intersected by the extremities of the nervures, which are seldom spotted with dusky. The hind-wings are broad, and generally somewhat contracted below the tips. The abdomen is nearly always convex, with a distinct crest

on the back, or else the hair on the first segments is loose and erect. The larvæ have sixteen legs, and are naked, often with dark spots on the back, or a pale stripe on the sides; they generally hide themselves during the day. Many hybernate, and others become pupæ in autumn, and the moths emerge in spring. The latter fly in the evening, and slope their wings when at rest.

GENUS I.—APLECTA (BOISD.).

Rather large moths, the antennæ of the male shortly ciliated; the fore-wings broad and triangular, with the fringes entire or waved; grey or green, with dark double dentated transverse lines, and the three stigmata surrounded with darker; the orbicular and reniform stigmata large, the former oblique and the latter with a dark centre; the subterminal line generally marked with black arrow-heads in front; the thorax smooth and woolly, with the scapulæ projecting behind, and the abdomen extending a little beyond the hind-wings. The front tibiæ are furnished with bristles in *A. Occulta* only. The larvæ are marked with dark angular or lozenge-shaped spots. They hybernate, and change to pupæ in the ground or in moss; and the moths appear in summer, and may be taken at sugar.

* 1. *A. Occulta* (Linn.).—Fore-wings bluish-grey, varied with brown and yellowish, with a black basal streak; the transverse lines are filled up with whitish; the reniform stigma is dark grey, and larger than the orbicular stigma, which is whitish, as well as the broad claviform stigma; the subterminal line forms an obtuse W in the middle, above which are two more distinct black arrow-headed spots; the fringes are intersected with paler, and the hind-wings are brownish-grey. Expands from 2 to 2¼ inches. Common in Central Europe and Northern Asia from June to August; the smaller and paler variety *Implicata* (Lef.) is circumpolar. The larva is dark brown on the back, with a whitish line in the middle, and yellowish longitudinal stripes, on which rest oval black spots, the hindermost of which are broader; the sides are pale yellowish-brown mottled with darker, with a pale yellow longitudinal stripe spotted with bright yellow. It lives on bilberry, dandelion, &c., till May.

2. *A. Sincera* (Herr.-Schäff.).—Fore-wings ashy-grey, varied with brown in the central area, with a black basal streak; the orbicular and reniform stigmata are of nearly equal size, and the former is pale; the claviform stigma is small, the subterminal line is not dentated, and there are black rays before it; the fringes are intersected by a darker line, interrupted with paler; and the hind-wings are whitish, slightly dusted with grey, with a dark central lunule. The variety *Rhætica* (Staud.), from the Upper Engadine, is brownish-grey. Expands about 1¾ inches. A rare species, found in the Harz and Oberpfalz in July.

3. *A. Speciosa* (Hübn.).—Fore-wings light grey, suffused with yellowish, with a short black basal streak; the transverse lines are black, filled up with yellowish; the elbowed line is marked with black and white dots at the ends of the teeth; the orbicular and reniform stigmata are of equal size, with the centres brownish; the claviform stigma is small, the subterminal line nearly straight and not dentated, with broad deep black arrow-heads in front; and the fringes are entire, white, and spotted with dusky at the ends of the nervures; hind-wings whitish, slightly dusted with grey, with a dark central lunule, and two dark curved stripes. Expands about 2 inches. A rare species, though less so than the last; it occurs in the Alps, and in the mountains of Germany in June and July. (The variety *Arctica*, Zett., from Northern Europe, is unicolorous mouse-colour; the stigmata and transverse lines are a little paler within, and the claviform stigma is absent; the fringes are grey.) The larva is dull pale green, yellowish before the incisions, with three greenish-white lines on the back bordered with darker, and a greenish-

yellow stripe on the sides, broadly bordered above with brownish-red; head brownish-yellow. It feeds on the flowers of the golden rod and hawkweed in autumn, but hybernates before the first moult, and feeds on trefoil in spring.

*4. *A. Herbida* (W. V.).—Fore-wings varied with green and brown, with no basal streak; the reniform and orbicular stigmata are filled up with brownish; the former is the largest, and there is a large white spot beyond it; the subterminal line is zigzag, and marked with black arrow-heads; the fringes are waved, and spotted with dusky at the ends of the nervures; the hind-wings are brownish-grey. Expands from 1¾ to 2 inches. Common in Central Europe and Northern Asia in June and July. The larva is pale grey, with three light lines on the back, and large connected dark-brown spade-shaped spots between them. It feeds on primroses and other low plants from autumn to May, and may be taken in abundance by sweeping.

GENUS II.—AMMOCONIA (LED.).

Middle-sized moths, the fore-wings pale grey, with the markings very ill-defined; the orbicular and reniform stigmata large and rather lighter; the transverse lines double and slightly dentated, the inner line with a black dash in the position of the claviform stigma; the subterminal line zigzag, bordered with darker in front; the hind margin marked with small black dots, and the fringes waved; the hind-wings are whitish, dusted with darker on the nervures and at the hind margin; and the abdomen extends for one-third of its length beyond the hind-wings. The larvæ are naked, with sixteen legs, and hybernate, and the moths come to sugar.

1. *A. Cæcimacula* (W. V.).—Fore-wings rather broad, pale reddish-grey, with a deep black dash in the middle of the inner line; hind-wings dirty white. Expands about 1¾ inches. Widely distributed in Central Europe, except the north-west, and in the Altai in August and September, but always scarce. The larva is greenish-brown, with the back darker, and marked with three brown longitudinal lines, and there is also a greyish-white stripe on the sides. It feeds on low plants till June, and forms its pupa in the ground.

2. *A. Vetula* (Boisd.).—Very like the last species, but the fore-wings are narrower, and ashy-grey, only slightly varied with yellowish in the position of the claviform stigma and of the suffused submarginal band; the dark streak on the inner line is less conspicuous, and the hind-wings are of a purer white. Inhabits South France and the Tyrol.

GENUS III.—APAMEA (TR.).

Rather small moths, the head somewhat depressed, the palpi small, and the antennæ of the male dentated and ciliated; the fore-wings brownish or yellowish, with indistinct markings, the transverse lines more or less blackish on the sides opposite to each other, the elbowed line slightly dentated, the orbicular and reniform stigmata small and rather lighter, with the centres dark; the claviform stigma small, or scarcely indicated; the subterminal line curved, but not zigzag, and composed of indistinct light spots; the fringes are waved, and intersected with paler on the nervures; the hind-wings are small and white, and considerably shorter than the abdomen. The larvæ are thick and cylindrical. They hybernate, and form their pupæ in the ground, and the moths may be found resting on palings, &c., in August and September.

* 1. *A. Testacea* (W. V.).—Fore-wings pale brownish, darker in the central area and beyond the subterminal line; the stigmata rather indistinct, and the fringes of the hind-wings unspotted.

The variety *Guéneei* (Doubl.), from Wales and France, has the fore-wings more uniform in colour, irrorated with black and white, and the hind-wings whiter than in typical *Testacea*. Expands from 1¼ to 1½ inches. Common throughout Central Europe. The larva is dirty flesh-colour, with yellowish-brown plates on the back of the second and the two last segments. It feeds on grass till June, hiding itself in the ground during the day.

2. *A. Nickerlii* (Freyer).—Very like *Testacea;* fore-wings brown, the transverse lines filled up with paler, and the two stigmata, especially the reniform stigma, filled up with white; the hind margin marked with fine white dots, and the fringes of the hind-wings divided by a darker line. It is found in Bohemia in July and August.

* 3. *A. Dumerilii* (Dup.).—Fore-wings yellowish-grey, with the central area and hind margin brown; the transverse lines brownish, moderately convergent on the inner margin, and bordered outside with yellowish-white; the subterminal line is little marked, and this and the stigmata are yellowish-white; the fringes are yellowish, and intersected with brownish; and the hind-wings are white, with no markings. The variety *Desyllesi* (Boisd.), from the west coast of France, has nearly unicolorous fore-wings. *A. Dumerilii* is found in Western and South-Eastern Europe, but is rare in many places.

GENUS IV.—EPISEMA (OCHS.).

Moderate-sized moths, with the fore-wings obliquely truncated behind and at the tips, and strongly rounded or regularly curved at the hinder angle; grey or brownish, with double transverse lines, not dentated, which converge towards the inner margin; the elbowed and subterminal lines are slightly curved; the stigmata are pale, but the claviform stigma is absent or very short; and the hind-wings are short; the antennæ are strongly pectinated in the male. The larvæ have small heads, and horny plates on the 2nd and last segments. They hybernate, and live till May in the ground, feeding on the bulbs of *Anthericum liliago*, &c., and form their pupæ on or in them. The moths appear in September, and expand from 1¼ to 1½ inches.

1. *E. Trimacula* (W. V.).—Very variable; fore-wings ashy grey, varied with brownish, the two stigmata very large, and connected behind, and marked with large dark-brown angular spots, sometimes only between the stigmata and before the orbicular stigma, and sometimes beyond and beneath the reniform stigma also; hind-wings brownish-grey. The variety *Tersa* (Hübn.) has reddish-grey or reddish-brown fore-wings, with the markings nearly obliterated; only the stigmata are indicated, but the surface on which they stand is scarcely darker. Common in the southern half of Central Europe. The larva is greyish-brown, with a lighter line on the back, and the plates dark brown; the belly is pale grey. The moth is figured at Pl. 54, Fig. 4. (*E. Hispana*, Ramb., from Andalusia and Algeria, has whitish or reddish-grey fore-wings, with the stigmata darker, and with two transverse lines, the inner line angulated, and the white submarginal area edged within with large oblong brown spots; hind-wings white.)

2. *E. Scoriacea* (Esp.).—Fore-wings ashy grey, dark brown in the central area, the two stigmata small and separated, and the reniform stigma partly filled up with reddish; hind-wings white, dusted with brown on the hind margin in the female. Inhabits the southern half of Central Europe. The larva is green, with three white lines on the back and a broad white stripe on the sides.

GENUS V.—METOPOCERAS (GUÈN.).

Antennæ simple; forehead with a horny prominence, from the middle of which projects a small truncated horn; abdomen very short; fore-wings with indistinct markings, and patches of

very coarse scales. The moths are rare, and are met with in South France and Spain in May. They expand about 1¼ inches.

1. *M. Canteneri* (Dup.).—Fore-wings reddish-grey, with the blackish transverse lines waved and dentated, the subterminal line indistinct, bordered with black in front, and a very fine marginal line, strongly dentated. The orbicular stigma is round, with a dark spot in the middle, and the reniform stigma is only indicated by a black dash on the inner side; there is a row of very distinct white spots beyond the elbowed line. Hind-wings rosy grey, with the hind margins and a central stripe darker.

2. *M. Felicina* (Donz.).—Fore-wings rusty red or pale brick-red, tinged with violet, and marked here and there with more or less prominent patches of large ochre-yellow scales, the transverse lines and stigmata of the ground-colour, the reniform stigma small and annular, the subterminal line replaced by some isolated ochreous dots, and the fringes broad and reddish-ochreous; hind-wings greyish-ochreous, with flesh-coloured fringes.

GENUS VI.—ONCOCNEMIS (LED.).

Middle-sized moths, moderately stout, with depressed hair; the thorax and abdomen not crested, the latter with a very short ovipositor in the female. The palpi are short and projecting, and the forehead has no prominence. The tongue is spiral, and the antennæ are setose, and very shortly ciliated. The fore-wings are moderately widened externally, and are rounded at the tip and hinder angle. The moths fly over flowers in the Ural and Altai. *O. Confusa* (Freyer) has clay-coloured fore-wings (reddish in variety *Rufescens*, Staud.), varied with grey and blackish, with some blackish spots on the disc and costa, and blackish transverse lines; hind-wings yellowish-grey, with a broad blackish suffused marginal band, better defined on the under side. It is figured at Pl. 55, Fig. 7. *O. Nigricula* (Eversm.) is smoky blackish, with the stigmata and transverse lines black and very indistinct; hind-wings pale ashy grey, with darker hind margins. It occurs at Sarepta and in the Altai.

GENUS VII.—CLADOCERA (RAMB.).

Stout middle-sized moths, clothed with woolly hair, but not crested; there is a small rounded projection on the forehead between the antennæ, which is concealed by the hair. The palpi are short and drooping, and the tongue is absent. The antennæ are pectinated in the male, and simple in the female. The wings are shaped as in *Oncocnemis*.

1. *C. Optabilis* (Boisd.).—Fore-wings yellowish-white, with the costa whitish and the central area brownish; stigmata rusty-red. The claviform stigma is pale yellow, bordered with black, and runs from the base, parallel to the inner margin, as far as the middle of the wing. The hind margin is marked with a row of dark-brown arrow-headed spots. Hind-wings dirty white, with the nervures reddish; all the fringes reddish. Expands about 1¼ inches. A rare species, inhabiting South France and Spain in April.

2. *C. Bætica* (Boisd.).—Whitish; thorax brown, banded and spotted with black; fore-wings varied with brown, the transverse lines, the borders of the stigmata, and the submarginal spots black. Inhabits Andalusia.

GENUS VIII.—NEURONIA (HÜBN.).

Stout, middle-sized moths, the thorax crested before and behind, and the antennæ pectinated in the males, but not to the tip. The fore-wings are truncated behind, with the

hinder angle rounded, and are brown, with double dark transverse lines, a little darker inside, the elbowed and light-coloured subterminal lines slightly dentated, the orbicular and reniform stigmata bordered with paler, and filled up with dusky, the fringes rounded; hind-wings short. The larvæ live on grass, and conceal themselves after the last moult. They hybernate, and change to pupæ in the ground in June, and the moths appear in August and September.

*1. *N. Popularis* (Fabr.).—Fore-wings brown, with whitish nervures and dark brown arrow-heads placed on the subterminal line, the reniform stigma large, and broadest in front, the claviform stigma large; the hind-wings dirty white, with the hind margin brownish-grey. The antennæ of the male have longer pectinations than in *Cespitis*. Expands from 1½ to 1¾ inches. Common in Central Europe and Northern and Western Asia. The larva is dark brown, reticulated with blackish, with a light grey stripe on the sides.

* 2. *N. Cespitis* (W. V.).—Fore-wings dark-brown, the transverse lines filled up with rust-colour, the borders of the stigmata and the subterminal line yellowish; claviform stigma small. Hind-wings white, clouded in the female, with the hind margin brownish. Expands about 1½ inches. Found throughout Central Europe, but not very common. The larva is green (dark brown after the last moult), with three narrow white stripes on the back, and a broad one on the sides.

GENUS IX.—HELIOPHOBUS (BOISD.).

Allied to *Episema*, but more slender, with the hair much more depressed and the forehead with no projection. The wings of the female are fully developed. The commonest species, **H. Hispidus* (Geyer), has violet-brown fore-wings, with yellowish stigmata and yellowish-grey transverse lines; the elbowed line curves round the reniform stigma, so as to enclose a triangular brown spot beyond it. Before the fringes runs a black festooned line, followed by a reddish one, and then by a well-marked whitish line, on which rest some brown arrow-headed spots. Hind-wings dirty white, with the hind margin washed with rust-colour; or entirely rust-colour in the female. The antennæ are strongly pectinated in the male, and simple in the female. Expands 1¼ inches. It inhabits Western Europe in September, and the larva, which is grey, dotted with black, lives on low plants, and hides itself at the roots after the third moult. The moth is sometimes captured flying over flowering heath. *H. Fallax* (Staud.), found at Sarepta in September, much resembles *Ulochlæna Hirta*, but is more brightly coloured; the dark hind-wings have a white central spot above, and the antennæ of the female are serrated. In the smooth hair, the winged female, and the larva, it closely resembles *H. Hispidus*.

GENUS X.—ULOCHLÆNA (LED.).

Differs from *Heliophobus* chiefly in the shaggy hair of the male and the rudimentary wings of the female. The male of the only species, *U. Hirta* (Hübn.), has brown or grey fore-wings, with white nervures and transverse lines, the latter bordered with white inside. The three stigmata are dull rosy, bordered with black; and there is a row of small arrow-headed marginal black spots placed between the nervures; hind-wings grey. Expands 1½ inches. It inhabits South France, South-Eastern Europe, and Western Asia in October. The larva feeds on grass at night, and hides itself during the day in a silken case underground or under a stone, and when full-grown, at the end of April, it remains in it, without taking food, till it becomes a pupa in August. The moth and larva are figured at Pl. 55, Fig. 12, *a*, *b*.

GENUS XI.—APOROPHYLLA (LED.).

Middle-sized moths, the fore-wings with the hind margin moderately curved, and the tips truncated; the markings not very prominent, the transverse lines slender, black, indistinctly double, and slightly dentated; the three stigmata narrowly surrounded with black, the subterminal line indistinct and zigzag; hind-wings white, darker in the female, with the hind margin brownish, and the abdomen extending considerably beyond the anal angle. The larvæ are green, with reddish longitudinal lines. They live on low plants in May and June, and change to pupæ in the ground. The moths appear in September and October.

* 1. *A. Nigra* (Haw.).—Fore-wings narrow, coal-black, with a reddish-violet shade, and strongly waved fringes; the reniform stigma is bordered with yellowish dots behind, and the claviform stigma is large; the subterminal line is very indistinct, but bordered with a few dark arrow-heads in front; the antennæ of the male are dentated. Expands from 1½ to 1¾ inches. The larva is yellowish-green, with three brick-red stripes on the back and one on the sides. It feeds on sorrel, &c. (*A. Mioleuca*, Tr., from Sicily and Andalusia, has the fore-wings marbled with brown and yellow, with the central area darker, and the reniform stigma and a transverse stripe at the tip, yellowish.)

* 2. *A. Lutulenta* (W. V.).—Fore-wings broad, violet-brown, with the fringes slightly waved, the reniform stigma very narrowly bordered with paler behind, the transverse lines nearly single, and slightly bordered with paler on the opposite sides, the subterminal line zigzag, slightly bordered with dusky in front, and the antennæ of the male pectinated. Expands about 1½ inches. Local throughout Central Europe. The variety *Luneburgensis* (Freyer), from North Germany, is smaller, with dark violet-grey fore-wings, dark grey in the central area, with all the markings more sharply defined; and variety *Sedi* (Guén.), from South-Western Europe, is uniform grey, with distinct black bands. The larva is green, rose-red on the sides, with a red line on the back, and a dull yellow stripe on the sides. It feeds on *Stellaria*, &c.

* 3. *A. Australis* (Boisd.).—Very variable; fore-wings of a more or less whitish-grey, and often shaded with red; sometimes entirely red, or even blackish, in which case the transverse lines are more or less bordered with whitish-grey. The lines are slender, black, more or less visible, very zigzag, and united lower down to form an oval figure, crossed by the submedian nervure. The stigmata are more or less visible, and are brown, narrowly surrounded with black; the fringes spotted with brown and ashy. In the female the markings are better defined. Expands 1½ inches. It inhabits Southern and Western Europe, and is rare in the south of England. The larva is reddish-yellow, with a pale line on the back, and a row of black spots on the sides. It feeds on grass, chicory, &c., in March. (*A. Multicuspis*, Eversm., from South Russia, has brownish fore-wings, with whitish nervures, and the inner spot placed horizontally. *A. Catalaunensis*, Mill., from Spain, is of the size of *Australis;* the fore-wings are long and rectangular, whitish, washed with brown; the base, costa, and discoidal cell violet-brown; two black basal streaks, one on the costa and the other in the middle opposite to the reniform stigma, which is large, brown, bordered with black, and traversed by a third black dash, which extends to the fringes, which are preceded by a run of small black arrow-headed spots; two small oblong spots, one white and the other brown, before the reniform stigma. Hind-wings whitish, with brown nervures, and white fringes, preceded by a row of brown lunules. During the day the larva hides itself in the sand, which it resembles in colour, under tufts of *Ononis ramosissima*).

GENUS XII.—CERIGO (BOISD.).

Fore-wings broad, with the hind margin a little oblique below the middle, and the inner margin distinct, with the complete *Noctua*-pattern, the transverse lines dark, double, and not dentated; the hind-wings yellow, short, and rounded, and scarcely contracted below the tips. The commonest species, * *C. Matura* (Hufn.), *Cytherea* (Fabr.), has dark reddish-brown fore-wings, with the transverse lines filled up with whitish, and three stigmata; the subterminal line is composed of three light crescents, and intersected with whitish lines on the nervures, and black streaks between; hind-wings pale yellow, with a broad brown marginal band. Expands from 1½ to 1¾ inches. Common in Central Europe from June to September. The larva is greyish-brown, greyish-yellow above, with fine light and dark longitudinal lines adjoining each other, two dark lines on the back, and a more distinct white line below, on the sides. It feeds on grass from September to May, and may be obtained by sweeping in autumn. (*C. Amathusia*, Ramb., from Perpignan, has the lines of the fore-wings less dentated, and the hind-wings paler, with a broader black band. *C. Vittalba*, Tr., a scarce species from South Europe, has brown fore-wings, with the fringes and all the markings rosy-white, except the claviform stigma, which is concolorous; hind-wings whitish, with a darker submarginal band.)

GENUS XIII.—POLYPHÆNIS (BOISD.).

Fore-wings broad, with the hind margin a little oblique, and moderately curved; the *Noctua*-pattern present; hind-wings yellow, short, and broad, rounded, and not contracted below the tip; abdomen extending a little beyond the anal angle. *P. Sericata* (Esp.), has the fore-wings varied with olive-green and brownish, with double black transverse lines and blackish longitudinal streaks, the elbowed line slightly curved and sharply dentated; the stigmata and subterminal line rather indistinct; hind-wings orange, with a brown central lunule, and a broad black marginal band. Expands about 1¾ inches. Inhabits South Europe. The larva is pale grey, with a light line on the back bordered with blackish; belly dark brown. It feeds on honeysuckle, privet, &c., from autumn to May. The moth is figured at Pl. 55, Fig. 2. (*P. Xanthochloris*, Boisd., from Spain and Sicily, is nearly twice as large; fore-wings green, varied with whitish; the reniform stigma is large, snow-white, and bordered with black. Hind-wings fulvous with a black border.)

GENUS XIV.—VALERIA (GERM.).

Middle-sized moths, the fore-wings very broad behind, with a long, regularly-curved hind margin, and a distinct hinder angle; the transverse lines are indistinctly double, blackish, the elbowed line dentated; the subterminal line consists of fine whitish lunules, hollowed out and filled with darker in front, and the fringes are very long; hind-wings generally white, with a broad grey hind margin, and a curved line before it; abdomen stout. The larvæ are slender, brownish-grey, with small warts with scattered hairs; and two obtuse points on each of the last two segments. They feed on sloe in May and June, and hide themselves by day, and must therefore either be beaten from the bushes, or sought for with a lantern at night. They form their pupæ in the ground, and the moths appear in March and April.

* 1. *V. Oleagina* (W. V.).—Fore-wings dark violet-grey, with shining moss-green nervures and hind margin, the orbicular stigma bordered with pale, the reniform stigma white, with a small dark spot within, above, and below; the antennæ with slender pectinations, longest in the male. Expands from 1½ to 1¾ inches. Inhabits Central and South-Western Europe, and

is said to have once occurred in Pembrokeshire. The larva is brownish-grey, with paler oblique stripes, two light lines on each side, and an orange-red collar. The moth and larvæ are figured at Pl. 38, Fig. 1, *a*, *b*.

2. *V. Jaspidea* (Vill.).—Very like *Oleagina*, but the reniform stigma has a dark centre, and the hind-wings are somewhat yellowish. The antennæ are simple in the female, and furnished with short, thick, blunt processes in the male. Size of *Oleagina*. A rare species, inhabiting France and Thuringia. The larva resembles that of *Oleagina*, but has a black horse-shoe mark, bordered with white behind, on the 12th segment.

3. *V. Spilogramma* (Ramb.).—Fore-wings broad, varied with brown, green, and dull yellowish, with indistinct and very irregular interrupted black transverse lines, the elbowed line strongly curved behind, where it is composed of darker double lunules; the two stigmata brown, bordered below with yellowish-white, and the claviform stigma indistinct; hind-wings whitish, broadly bordered with black. Inhabits South Russia.

4. *V. Orbiculosa* (Esp.).—Brownish-grey; fore-wings with the lines double, the inner line pale grey and much angulated, the elbowed line black, bordered with whitish; the reniform stigma and a spot at the tip are reddish, and there are some whitish markings on the costa; hind-wings white, with a central lunule, hind margin very broadly black. Inhabits Hungary. This species (and perhaps the last also) belongs to Staudinger's still uncharacterised genus *Oxytripia*. It is figured at Pl. 55, Fig. 11.

GENUS XV.—MISELIA (STEPH.).

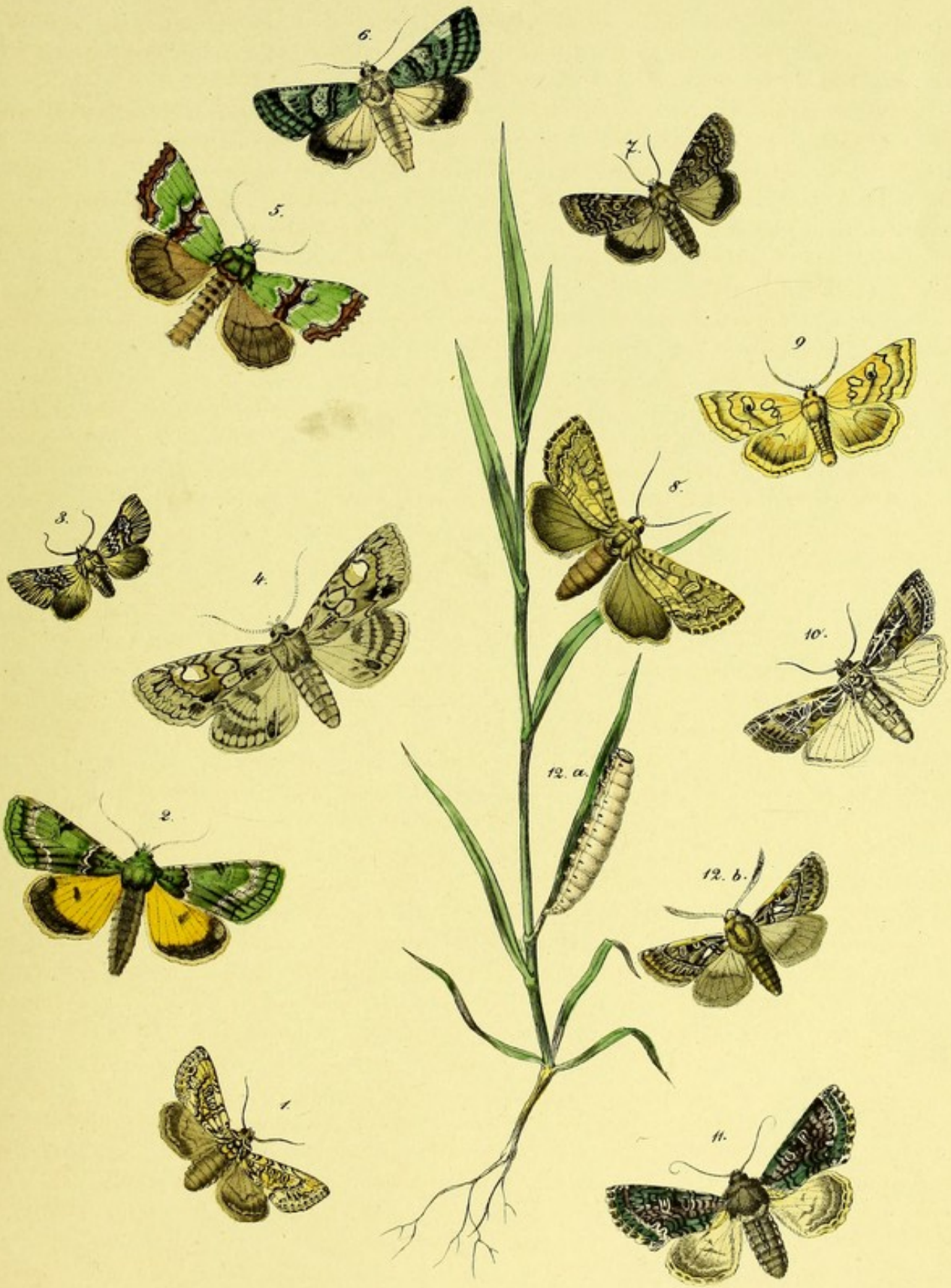
Fore-wings with a long, oblique, and moderately-curved hind margin, with the hinder angle distinct. There is a black streak at the base; all the lines are rather indistinct; the two upper stigmata are very large and oval, the fringes are very long, almost festooned; and the hind-wings are moderately rounded, and considerably shorter than the abdomen. The larvæ have a smooth head and are mottled; there are short points on the twelfth segment. They feed on trees in May and June, concealing themselves in the crevices of the bark by day, and the moths appear in autumn, and may be taken at sugar.

* 1. *M. Oxyacanthæ* (Linn.).—Fore-wings varied with paler and darker brown, dusted with green on the nervures and along the hind margin; the transverse lines are not dentated, and the elbowed line forms a white lunule above the inner margin; hind-wings brownish-grey. Expands from 1½ to 1¾ inches. Common throughout Central Europe; a variety with brown fore-wings (*Capucina*, Mill.) is sometimes taken in England. The larva is pale grey or greenish-grey, with blackish streaks and dark spots on the back, on which stand small pale warts, and there are four points on the 12th segment. It feeds on sloe, hawthorn, &c. The moth is figured at Pl. 37, Fig. 2.

* 2. *M. Bimaculosa* (Linn.).—Fore-wings pale grey, varied with pale brown, the transverse lines dentated; hind-wings white, dusted with brownish, with two large dark-brown spots, one in the middle and another near the anal angle. Expands from 2 to 2½ inches. Inhabits the southern half of Central Europe, and is said to have been once taken at Bristol. Larva brownish-grey, darker in front, with a pale stripe on the back and a somewhat waved stripe on the sides, darker above and paler below. It feeds on elm. The moth is figured at Pl. 55, Fig. 4.

GENUS XVI.—CHARIPTERA (GUÉN.).

Fore-wings with a long, oblique, and moderately-curved hind margin, and a distinct anal angle; the three stigmata are large, and the claviform stigma coalesces with the orbicular



A.

stigma; the transverse lines are double, the elbowed line dentated, the subterminal line interrupted, and generally only indicated by white dots; hind-wings small and rounded. The larvæ are thickened in front, and have four points behind. They hide themselves during the day, and become pupæ in the ground. The only species, *C. Culta* (W. V.), has olive-brown fore-wings dusted with greenish-yellow; black before the hind margin, and the nervures dotted with white; the transverse lines and the three large stigmata white, the latter marked with dusky inside; fringes chequered with brown and white; hind-wings white, with the hind-margin and a curved stripe brown. Expands from 1¾ to 2 inches. A rather scarce insect, inhabiting the southern half of Central Europe in June. The larva is green or brown, with dark anchor-shaped marks on the front segments, and with dark angular spots on the sides. It feeds on hawthorn and sloe in August and September. The moth is figured at Pl. 38, Fig. 2.

GENUS XVII.—DICHONIA (HÜBN.).

Small or middle-sized moths; the fore-wings rather long, with the hind margin oblique and moderately curved; green or brown, with a black basal streak or spot, the elbowed line dentated, and the subterminal line zigzag; the three stigmata large and bordered with black; the claviform stigma connected with the elbowed line by a short streak or spot, the fringes nearly festooned; hind-wings rather long and slightly contracted below the tip, usually with a pale stripe before the hind margin. The larvæ live on oak in May, and change to pupæ in the ground; and the moths appear in August and September, and may be taken at sugar.

* 1. *D. Aprilina* (Linn.).—Fore-wings pale green, with broad, single, black transverse lines bordered with white; the central shade spotted with black, and black arrow-heads on the subterminal line. The fringes are white, interrupted with blackish, and the hind-wings are dark grey. Expands from 1½ to 2 inches. Common throughout Central Europe. The larva is dirty white, varied with grey, with a whitish line on the back, dark-brown connected lozenge-shaped spots, and a dark-brown stripe on the sides, spotted with whitish and indented above. It hides itself by day in the chinks of bark. The moth and larva are figured at Pl. 37, Fig. 3, *a b.*

2. *D. Æruginea* (Hübn.).—Fore-wings dark violet-grey, the base of the costa and the two stigmata whitish-green, with slender, dark, double transverse lines, a dash above the hinder angle in front, and the middle of the collar golden yellow; hind-wings white in the male and grey in the female. Expands about 1½ inches. It occurs in the southern half of Central Europe; and the variety *Mioleuca* (Geyer), in which the fore-wings and thorax are uniform grey, is found in South Europe. The larva is pale yellow, with spade-shaped spots on the back divided by a white line, and two rather widely separated reddish-yellow stripes on the sides.

3. *D. Convergens* (W. V.).—Fore-wings brownish-grey, the marginal area, the base of the costa, and the two stigmata pale reddish-grey, with slender, dark, double transverse lines, and a rust-coloured dash above the hinder angle in front; hind-wings brownish-grey. Expands about 1½ inches. Inhabits many parts of Central Europe, but not Britain. The larva is pale yellow above, with three whitish lines on the back and brown spade-shaped spots between; the sides are washed with brown, and marked with a yellowish-white stripe.

GENUS XVIII.—DRYOBOTA (LED.).

Rather small moths; the shape and fringes of the wings as in *Dichonia*, the fore-wings grey or green, the transverse lines slender and double, the elbowed line slightly dentated, the

subterminal line light, forming a distinct W; the stigmata of average size. A pale streak (rarely indistinct) runs from the orbicular stigma close to the claviform stigma as far as the elbowed line; the hind-wings are marked with a pale stripe before the hind-margin. The larvæ feed on oak by day in May and June, and change to pupæ in the ground. The moths appear in August and September (or October and November in the south), and come freely to sugar. They expand about 1¼ inches or a little more.

* 1. *D. Protea* (W. V.).—Fore-wings brownish-grey, varied with green and rust-colour; the orbicular stigma and the dash below are generally pale grey, and the hind-wings are brownish-grey. Common in Central and Western Europe. The larva is grey, with pale yellow lines on the back and sides.

2. *D. Monochroma* (Esp.).—Very like *Protea*, but the fore-wings are brownish-grey, unmixed with green, and the suffused submarginal band is pale grey; hind-wings dusted with brownish towards the hind margin. Inhabits South Europe and Austria. The larva is pale green, with a yellow stripe on the sides.

3. *D. Saportæ* (Dup.).—Fore-wings reddish-brown, the central and marginal areas brownish-black. Transverse lines paler than the ground-colour, the inner line festooned, and the elbowed line dentated, rounded above, and running in a nearly straight line from the median nervure to the inner margin, where it approaches the other; the subterminal line is waved, lighter towards the tip, and forms a small W in the middle. Stigmata brown, bordered with pale grey; the orbicular stigma stands on an oblique pale band of the same breadth as itself running from the costa, and terminating in two teeth, one of which rests on a thick black horizontal dash, connecting the inner and elbowed lines. Fringes dotted with grey. Hind-wings greyish-white, with the nervures, hind-margin, and a central spot and curved line blackish. Common in France and Italy. The larva, which feeds on the evergreen oak, is green when young, and grey when full-grown.

4. *D. Roboris* (Boisd.).—Fore-wings light moss-green, varied with brownish, and whitish in the marginal area, darker above the hinder angle; the orbicular stigma pale, and the reniform stigma flesh-colour; hind-wings light brownish-grey. Common in Southern Europe, as far north as Hungary. The larva is reddish-grey, with a pale line and dark curved transverse lines on the back; the sides are marked with two longitudinal lines, the upper one dusky and the lower one brown.

5. *D. Furva* (Esp.).—Fore-wings dark shining brown, varied with reddish, with the transverse lines and half-line blackish and double, but rather indistinct; the subterminal line is slender, fulvous, and dentated, but without forming a W; it is bordered by small black spots. The reniform stigma is chamois-coloured, the orbicular stigma is concolorous and often indistinct, and the claviform stigma is blackish. Fringes brown, slightly festooned, and dotted with yellowish. Hind-wings dull grey, with an indistinct transverse line. Common in South Europe. The larva lives on different kinds of oak, especially the flowers of the evergreen oak, and forms a hard cocoon of earth and silk in the ground, where it remains for three months before becoming a pupa.

GENUS XIX.—THECOPHORA (LED.).

Fore-wings with an oblique, moderately curved hind margin passing into the inner margin; the *Noctua*-pattern complete; the transverse lines double and slightly dentated, the subterminal line indistinct and scarcely zigzag; the fringes strongly waved; the hind-wings short and narrow, not contracted below the middle, smaller in the male, and with a seam in the centre;

abdomen very slightly crested. The only species, *T. Fovea* (Tr.), has dark violet-brown fore-wings, with a large claviform stigma filled up with black, and black spots in front on the subterminal line; the reniform stigma and the suffused band above the inner margin pale yellow; hind-wings dark brownish-grey. Expands about 1½ inches. A rather scarce species, inhabiting Hungary, Carinthia, and Dalmatia in September and October; it produces a sound when flying. The larva is yellowish, with yellowish-red heart-shaped spots on the back, divided with paler, and oblique streaks of the same colour on the sides. It lives on oak-bushes in July and August.

GENUS XX.—EPUNDA (DUP.).

Allied to *Polia*, but the abdomen is not crested, and the antennæ are pectinated in the male. The only species, **E. Lichenea* (Hübn.), has olive-grey fore-wings, varied with grey, blackish, and reddish, which confuses the markings; but the transverse lines are grey, and bordered with black; the subterminal line is preceded by a row of black arrow-headed spots; the stigmata are outlined with paler, the reniform stigma is spotted, and the orbicular stigma pupilled with black within; the claviform stigma is short and blackish. The fringe is yellowish, preceded by a row of black dashes; hind-wings dirty white, with a central lunule and dentated line, and the marginal line blackish. The female is greener, with the markings better defined. Expands from 1¼ to 1½ inches. Common in Western Europe from July to September. The variety *Viridicincta* (Freyer), from Sicily, has pale grey fore-wings and pale olive-green markings. The larva is green till the third moult, and then brown; it lives on sorrel, ragwort, &c., till April.

GENUS XXI.—POLIA (TR.).

Middle-sized moths, with both thorax and abdomen slightly crested, and the antennæ of the male dentated. The fore-wings have a long, oblique, and moderately-curved hind margin, which passes into the inner margin. They are of a paler or darker grey, and the markings resemble those of lichen-covered rocks, and are generally confused and seldom sharply defined; the elbowed line is dentated, and the subterminal line is faint, frequently consisting only of small spots, and it forms a slight W; the hind-wings are broad and rounded, scarcely contracted below the tips; they are whitish in the male, and grey in the female. The larvæ are slender and cylindrical, and feed on low plants. Most of them hybernate, and change to pupæ in the ground. The moths usually appear in autumn, and may be found sitting on rocks; but *Polymita* and *Chi* also rest on tree-trunks.

1. *P. Serpentina* (Tr.).—Fore-wings dark moss-green, with slender black transverse lines and a white reniform stigma; the subterminal line is indicated by white dots, in front of which stand black triangles; the hind margin is marked with black lunules, and the fringes are spotted with yellowish; hind-wings white in the male, and dark grey, with the base lighter, in the female. Expands about 1½ inches. Occurs in Carinthia, Dalmatia, and Corcyra in September. The larva is flesh-coloured, with a dark brown stripe on the back and a brown line on the sides; belly yellowish. It feeds on chickweed, &c., till May.

2. *P. Polymita* (Linn.).—Fore-wings dark olive-brown, with distinct simple black transverse lines bordered with white, and black triangles on the hind margin; the two stigmata and the suffused band are varied with white, and the thorax is spotted with white. Size of *Serpentina*. Found in a great part of Central Europe except the west, in July, but rather scarce. Larva

dull rose-colour, with three white lines on the back, and a reddish-brown suffused stripe on the sides; belly pale yellow. It lives on primrose, &c., till May.

* 3. *P. Flavicincta* (W. V.).—Fore-wings grey, coarsely dusted with brownish-grey, darker in the central area, with distinct black dentated transverse lines, scarcely double; varied with orange, especially near the transverse lines and around the stigmata; the subterminal line consists of orange spots, bordered in front with dark angles; the marginal line is narrowly black, and the fringes are marked with fine dark lunules; hind-wings dusted with grey, with a dark hind margin and a curved zigzag dark line. The much darker variety *Meridionalis* (Boisd.) is found in South-Western Europe. Expands from 1½ to 1¾ inches. Found throughout Central Europe in August and September. The larva is green, with a dark line on the back and a pale yellow one on the sides. It feeds on sorrel, chickweed, &c., till July.

4. *P. Rufocincta* (Hübn.).—Allied to *Flavicincta;* fore-wings smooth, dusted with bluish-grey, the markings suffused, the orange shade particularly distinct in one or two basal streaks, and on the stigmata and subterminal line, but nearly absent in variety *Mucida* (Guén.); the hind margin is unspotted, but the fringes are spotted with darker; hind-wings paler, with a curved line, which is not zigzag. Expands from 1¾ to 2 inches. Occurs throughout Southern Europe, as far north as the Alps, in September. The larva differs from that of the last species in having a brownish head. It feeds on *Asplenium Ruta-Muraria* and the flowers of *Silene nutans*, and hawkweed growing in rocky places, till June.

5. *P. Dubia* (Dup.).—Fore-wings whitish-ashy, very rarely yellowish, with the central area and hind margin dull bluish-ashy. The transverse lines are much dentated, ill-defined, and not bordered with yellowish. The stigmata are of the ground-colour and indistinct, the orbicular stigma is pupilled with grey, and the claviform stigma is very slightly marked, and followed by a slight yellowish streak. There is a row of small black dots on the hind margin. Hind-wings dirty white (grey in the female), with traces of a central lunule and curved line. Expands about 1¾ inches. Inhabits South France and Spain in September and October, and the larva lives on *Cistus*, box, henbane, and various allied plants, in December and January.

* 6. *P. Nigrocincta* (Tr.).—Fore-wings bluish-grey, dusted with black, and blackish in the central area, varied with orange (sometimes very slightly), chiefly on the transverse lines, the stigmata, and the subterminal line; the latter is shaded with brown behind; hind-wings white in the male and dark grey in the female, with no dark curved line. Expands about 1½ inches. Inhabits Southern and some parts of Central Europe in August. The larva is reddish-brown, with three dark stripes on the back and an ochre-yellow head. It feeds on low plants till April.

7. *P. Venusta* (Boisd.).—Very variable; fore-wings pale ochre-yellow, sometimes varied with rosy, with the central area more or less blackish and the marginal area reddish; the stigmata of the ground-colour, or paler; the transverse lines double or triple, waved and dentated, and a row of small yellow dots at the ends of the teeth formed by the elbowed line; subterminal line waved, yellow; fringes yellow. Hind-wings pure white in the male and grey in the female; thorax pale yellow, with some black dots. Expands from 1¾ to 2 inches. Inhabits France in September. The larva feeds on *Cistus, Ilex*, thyme, &c., but chiefly on *Genista Scorpius*, till March, and hides itself during the day.

8. *P. Canescens* (Dup.).—Fore-wings white, slightly dusted with grey, with all the lines more or less distinct; the inner and elbowed lines converge towards the inner margin; the former is much angulated, and the latter is often reduced to dots; the subterminal line is formed of brownish suffused spots. The stigmata are generally obliterated; fringes whitish, preceded

by a series of small black lunules. Hind-wings shining white in the male, often dusted with grey on the nervures, and dark grey in the female. Found in South Europe in September and October. The larva lives on various plants, especially asphodel, in May and June.

9. *P. Suda* (Hübn.).—Fore-wings pale bluish-grey, darker in the central area, and varied with pale yellow; the transverse lines single, and narrowly black, the elbowed line strongly curved and sharply dentated, the subterminal line continuous and whitish; hind-wings white, with two dark curved stripes in the female. Expands about 1½ inches. A rare species, found in the Valais in August.

10. *P. Pygmæa* (Staud.).—Resembles a species of *Dianthœcia;* fore-wings greenish-grey, varied with black. The transverse lines are pale yellowish, zigzag, and edged on the sides opposite to each other with black; the stigmata are pale, and bordered with black. The fringes are chequered with grey and white, and are preceded by a marginal line of black connected lunules. Hind-wings dark grey, with the fringes whitish. Expands a little more than 1 inch. It occurs at Naxos and Smyrna in May.

* 11 *P. Chi* (Linn.).—Fore-wings pale grey (olive-grey in the Scotch variety *Olivacea*, Steph.), with dark grey double transverse lines filled up with whitish, and a whitish subterminal line marked with small black arrow-heads in front. The claviform stigma is connected with the elbowed line by a thick black streak; hind-wings white, dusted with grey in the female, with two darker curved stripes. Expands about 1½ inches. It is found throughout Europe and the Altai in May, July, August, and September. The larva is grass-green, mottled with yellowish, with two white lines on the back and a yellowish-white stripe on the sides. It feeds on sow-thistle and other low plants in May, June, August, and September. The moth is figured at Pl. 37, Fig. 4.

GENUS XXII.—DIANTHŒCIA (BOISD.).

Rather small moths; the fore-wings with the hind margin slightly oblique and gradually curved, with the hinder angle distinct; grey, brown, or yellowish, and sometimes white, nearly always with the complete *Noctua*-pattern; the subterminal line has generally two projections at and below the middle, which form a more or less distinct W; the hind-wings are contracted below the tips, and are short and brownish-grey, generally with a small white spot on nervule 2, just before the hind margin. The abdomen, which extends beyond the hind-wings, is pointed in the female, and furnished with a projecting ovipositor. The larvæ are cylindrical, slenderer in front, and live almost exclusively in the capsules of plants allied to the carnation, feeding on the seeds. The moths are generally captured flying over the flowers of their food-plants in the evening.

* 1. *D. Cæsia* (W. V.).—Fore-wings smooth, bluish-grey, slightly varied with ochre-yellow, and paler in the central area, the fringes very slightly waved; hind-wings dark grey. Expands from 1½ to 1¾ inches. It is found in the Alps in July; and a dark variety is met with in the British Isles, most commonly flying over *Silene* on the sea-cliffs of the Isle of Man, where its capture is frequently a matter of considerable difficulty and danger. The larva is sea-green, with a white stripe on the sides, and feeds on primrose, strawberry, &c., in April and May. The moth is figured at Pl. 55, Fig. 6.

2. *D. Filigramma* (Esp.).—Fore-wings olive-brown, or varied with brownish or bluish-grey, and dusted with rusty-yellow here and there; the transverse lines black, indistinctly double, bordered with lighter, and sharply dentated; the subterminal line curved and angulated, forming

a slight and obtuse W; hind-wings dark grey, lighter at the base, with a dark zigzag angulated line. There is also a grey variety, varied with whitish, called *Xanthocyanea* (Hübn.). Expands about 1½ inches. Widely distributed in Central and Eastern Europe in May. The larva feeds on *Silene nutans* in July and August.

3. *D. Tephroleuca* (Boisd.).—Resembles *Filigramma;* fore-wings olive-brown, varied with bluish-white, but not dusted with yellow; the transverse lines bordered with whitish, the subterminal line better defined, with blacker and sharper arrow-heads in front, and the orbicular stigma small, round, surrounded with black, and with a brown centre; hind-wings as in *Filigramma.* Expands about 1¼ inches. A scarce species, found in Switzerland, Piedmont, and the Pyrenees in July.

4. *D. Magnolii* (Boisd.).—Fore-wings dark olive-brown, dark grey in the central area and before the hind margin; the transverse lines are black, single, sharply dentated, and narrowly bordered with white; the subterminal line is sharply white, slightly zigzag, and spotted with black in front; the two stigmata have brown centres and are surrounded with black, and the orbicular stigma is small and round; hind-wings as in *Filigramma;* thorax varied with white. Expands from 1¼ to 1½ inches. The larva, which resembles that of *Albimacula*, feeds on *Silene nutans* in August and September. (*D. Conspurcata*, Freyer, from South Russia and Siberia, has brown fore-wings, with an ochreous spot at the base, and the transverse lines waved; the borders of the stigmata and a row of marginal dots are white. Expands about 1¼ inches.)

* 5. *D. Albimacula* (Borkh.).—Fore-wings olive-brown, with single sharply-dentated black transverse lines, narrowly bordered with white, and a fine white zigzag subterminal line spotted with black in front; the orbicular stigma and an angulated spot beneath it white, the former with a brownish centre; hind-wings yellowish-grey, with the hind margin brownish; the thorax varied with whitish. Widely distributed in Europe and Northern and Western Asia in May, but not common. The larva is pale reddish-grey, with a dark macular stripe on the back, transverse stripes projecting forwards, and a pale stripe on the sides. It feeds on *Silene nutans* in July and August. The transformations are figured at Pl. 37, Fig. 5, *a—c.*

* 6. *D. Barrettii* (Doubl.).—Fore-wings brown, with a pale spot at the base, and a broad oblique interrupted pale band running from the middle of the costa to the hinder angle. Hind margin pale, bordered by the indistinct paler subterminal line, which forms a rather obscure W towards the hinder angle. The transverse lines are indistinct, but connected by a very distinct black line, emitting a branch which divides the oblique pale fascia into two unequal parts, of which the upper is the larger; the fringes are spotted with brown and white. The stigmata are indicated by two pale spots, but the markings of the fore-wings are much obscured by their being dusted all over with brown. Hind-wings brown, with a paler curved line. Expands from 1¼ to 1½ inches. It is found on the sea-slopes of the Hill of Howth, near Dublin, in June, flying over *Silene.* The larva is flesh-colour, with a paler shining plate behind the head. It feeds in the roots and occasionally in the seed-capsules of *Silene maritima* from July to September. This insect is now believed to be a local form of *D. Luteago* (No. 17, *infra*).

* 7. *D. Conspersa* (W. V.).—Fore-wings dark grey, with dark double slightly-dentated transverse lines, and a white zigzag subterminal line, which widens into a large spot at the tip; the large orbicular stigma and the angular spot beneath it pure white; hind-wings as in *Albimacula;* thorax much varied with white. Expands about 1¼ inches. Common in Europe and Northern and Western Asia from May to August. The larva is yellowish-grey, with a


11.
7b
4.
6c
7a
6a
8.
9.
1.
10a
3b
10b
5c
3a
5a
A.
B.
C.
D.
E.
6b
5b.

slender dark line on the back, and dark oblique streaks and two dark lines on each side. It feeds on ragged robin, and on different species of *Silene* in June and July.

*8 *D. Compta* (W. V.).—Resembles *Conspersa*, but the white spot below the pure white orbicular stigma is expanded into a band, which fills up the whole central area as far as the inner margin. Size of *Conspersa*. Found in many parts of Central and Southern Europe and Northern and Western Asia in May and June, but very rare in Britain. The larva is reddish-grey, with a reddish-brown stripe on the back divided with white and expanded into spots, and a yellowish-grey stripe on the sides. It feeds on various species of *Silene*, and also on *Dianthus Carthusianorum*, from July to September. The transformations are figured at Pl 37, Fig. 6, *a—c*.

*9. *D. Capsincola* (W. V.).—Fore-wings greyish-brown, with dark double slightly-dentated transverse lines; the two stigmata bordered with white, the orbicular stigma long and oblique, the claviform stigma broad and filled up with blackish; the subterminal line white, with a strongly marked W, and with dark arrow-heads in front; hind-wings brownish-grey. Expands from 1¼ to 1½ inches. Common in most parts of Europe in May, June, and August. The larva is brownish-grey, with dark spots on the back divided with paler, and a brownish stripe on the sides. It feeds on red campion in August and September.

*10. *D. Cucubali* (W. V.).—Fore-wings varied with brown and purplish, with double blackish transverse lines, the elbowed line consisting of a row of small lunules and a single line beyond; the stigmata and subterminal line as in the last species, but the line with a sharper W; hind-wings brownish-grey. Expands from 1¼ to 1½ inches. Common in Central Europe and the Altai in May and June, and again in August and September. The larva is green, with rust-coloured angular spots on the back, and oblique spots of the same colour on the sides; it lives on *Silene inflata* in July and August.

*11. *D. Carpophaga* (Borkh.).—Fore-wings yellowish-brown, with indistinct double slightly-dentated transverse lines, and the two upper stigmata surrounded with paler, and with brown centres; the claviform stigma is small, and surrounded with black; the subterminal line is pale yellow, with a distinct W and with small black arrow-heads; the hind margin with dark lunules, and the fringes slightly intersected with paler; hind-wings yellowish-grey, broadly brownish on the hind margin, with a curved dark line. Expands about 1¼ inches. Inhabits Europe and Northern and Western Asia from May to July. The larva is grey, with changeable bluish-white and ashy-grey, or white and pale brown longitudinal stripes, and a dark brown plate with three white streaks on the back of the neck. It lives on *Silene inflata* in August and September.

*12. *D. Capsophila* (Dup.).—Very like *Carpophaga*, but rather larger; dark brown, the transverse lines distinctly double, the space between above the inner margin, the borders of the stigmata, and the subterminal line whiter, the latter with rather sharper teeth and longer black arrow-heads; hind-wings darker grey; the thorax varied with white scales. A rare species, frequenting the mountains of Switzerland and South-Western Europe; it is commoner on the sea-cliffs of Ireland and the Isle of Man from June to August, and the larva, which is darker than that of *Carpophaga*, feeds on the unripe seeds of *Silene maritima* at the same time. The moth is figured at Pl. 55, Fig. 1. (*D. Nisus*, Germ., from Sicily, is larger than *Carpophaga*, and the wings are more pointed, and more varied with white.)

13. *D. Silenes* (Hübn.).—Fore-wings reddish, with the transverse lines double, waved, and dark brown; the subterminal line is white, forming three acute angles in the middle, each surmounted by a very distinct arrow-headed spot; the stigmata are paler, bordered with

black, and the claviform stigma is brown and concave; hind-wings reddish-brown, with two paler transverse lines, and all the fringes interrupted with brown. Expands about 1¼ inches. Rare in South France and Spain in June. The larva lives in the capsules of *Silene viscosa*, and the pupa sometimes passes three or four years before the perfect insect emerges. (*D. Sejuncta*, Herr.-Schäff., from Turkey, is grey, the fore-wings with the transverse lines brown and waved, and the stigmata varied with white ; there is also a white costal spot near the tip, and a sharply-dentated white subterminal line. This insect is perhaps a variety of *Silenes*.)

14. *D. Sancta* (Staud.) has darker fore-wings than *Silenes*, and only the orbicular stigma is distinctly surrounded with white. The white subterminal line forms two large zigzags ; the other lines are indistinct. Hind-wings paler at the base, and darker towards the margins. Found in Spain in May.

15. *D. Christophi* (Möschl.).—Fore-wings yellowish-brown, varied with black ; the reniform stigma brown, surrounded with white, the orbicular stigma white, with a dark centre, the claviform stigma brown, surrounded with black ; the basal area and subterminal line, as well as a spot beyond the elbowed line on the inner margin, and another at the tip, all white ; hind-wings yellowish-grey, with a darker central spot, a narrow curved brown stripe, and a broad blackish submarginal band. Bred from a dull yellowish-green larva, with whitish longitudinal stripes, found near Sarepta in July.

*16. *D. Irregularis* (Hufn.), *Echii* (Borkh.).—Fore-wings varied with pale yellow and yellowish-brown, with double dentated transverse lines, and a pale subterminal line, slightly dentated, and bordered with brownish in front, the marginal line unspotted, and the fringes broadly intersected with whitish; hind-wings brownish-grey; the hind margins and a curved line darker. Expands about 1¼ inches. Widely distributed in Central Europe in May and June, but very rare in Britain. Larva yellowish-grey, with oblique dark stripes on the back. It feeds on *Gypsophila Paniculata* in July.

17. *D. Luteago* (W. V.).—Fore-wings ochre-yellow, varied with rusty-brown, especially in the central area, which is bounded by the brown dentated transverse lines, edged with paler ; the subterminal line is slightly indented and curved, and bordered with brownish behind ; and the two stigmata are indistinct ; hind-wings brownish-grey, with an indistinct curved stripe. Expands from 1¼ to 1½ inches. A rare species in the southern half of Central Europe and in the Altai in May, June, and August. The larva is dull brownish-grey, darker above, with a dark dorsal line. It lives in the stalks and roots of *Silene nutans* and *inflata* in July and August. The moth is figured at Pl. 55, Fig. 8. (*D. Literata*, Fisch., from Sarepta, has denticulated brown wings with irregular white bands and stripes.)

18. *D. Andalusica* (Staud.), from Andalusia, resembles *Sancta*. Dark grey, varied with ochre ; the two stigmata and adjoining spot pale grey ; beneath is a very dark dash. Hind margin pale ; subterminal line simply curved ; the three other dark transverse lines strongly dentated. Wings with a well-marked dark transverse band beneath, but no central spots.

19. *D. Proxima* (Hübn.).—Fore-wings rather long, bluish-grey, varied with brownish ; the marginal area lighter. There is a black basal streak, bordered with light in front, and dark double slightly-dentated transverse lines. The two stigmata are surrounded with paler, the orbicular stigma is long and oblique, and the subterminal line forms a short W ; hind-wings brownish-grey. The variety *Extensa* (Eversm.) has a broad dark band in the middle of the fore-wings. Expands about 1½ inches. It is found in the mountains of Central and Eastern Europe in July and August. (*D. Meissonieri*, Guén., from Marseilles, differs from *Proxima* chiefly by its white hind-wings. *D. Skraelingia*, Herr.-Schäff., from Lapland, resembles *Craniophora Ligustri*,

but the fore-wings are broader, and the fringes darker; the markings are nearly obliterated by the uniform leaden-grey colouring.)

20. *D. Dovrensis* (Wocke.).—Fore-wings blackish, varied with white, with four black dentated lines; the stigmata white, the reniform stigma filled up with blackish, and the claviform stigma bordered with black, or absent; fringes spotted with black and white; hind-wings blackish, varied with greyish in the middle, with a darker central spot and line; fringes yellowish. Size of *Filigramma*. It is found in the mountains of Norway in July, sitting on the rocks in rainy weather, or flying over the flowers of *Phaca oroboides* in the sunshine. (*D. Colletti*, Schneid., also found in the Dovre Alps in June, is intermediate between *Dovrensis* and *Cæsia*; fore-wings violet-grey, with four whitish transverse lines bordered with black, the subterminal line with two teeth in the middle, the reniform stigma brown, the orbicular whitish, with a small black dot in the middle, and the claviform stigma large and black. There is a white bifid spot below the orbicular stigma, and a round white spot at the tip. Hind-wings grey, paler in the middle; the fringes pale yellow, divided by a brown line. Wings beneath with a brown line and central spot, indistinct on the fore-wings, and on the upper side of the hind-wings.)

GENUS XXIII.—MAMESTRA (OCHS.).

Characters of *Dianthœcia*, but the moths are generally larger and darker, and have no projecting ovipositor in the female; the hind-wings have no white spot. The larvæ generally feed on low plants and shrubs during the day.

*1. *M. Saponariæ* (Borkh.).—Fore-wings violet-brown, with whitish nervures, and double brown transverse lines, filled up with paler and not dentated; subterminal line whitish, with a sharply-formed W, and long black arrow-heads, between which the nervures are narrowly black; hind-wings grey, with the hind margins darker. Expands from 1½ to 1¾ inches. Common in Northern and Central Europe and in the Altai in June and July, flying over viper's bugloss and other flowers. The larva is pale green or brownish-green, with a fine dark double line on the back, and a white stripe on the sides. It feeds on the seeds of *Silene*, yarrow, &c., in July and August.

2. *M.* (?) *Siccanorum* (Staud.).—Resembles a *Dianthœcia*, but there is a projection on the forehead, and the female has no ovipositor. Fore-wings dark grey, sometimes with a slight yellowish shade; the reniform stigma large and quite white, the orbicular stigma small and white, sometimes with a grey centre, and the claviform stigma reduced to a sharp black line; behind it is a lighter space. All the transverse lines are light, bordered on both sides with dark; and the white submarginal line, bordered inside with small arrow-heads, and forming an acute angle inwards, near the tip, is very conspicuous. Nervule 1 is white, and the marginal nervures are narrowly black, or alternately black and white. Hind-wings white, dusted with blackish on the nervures. Occurs at Sarepta.

3. *M. Cappa* (Hübn.).—Fore-wings white, varied with grey in the central area, and spotted with blackish on the costa, with slender dark brown dentated transverse lines and central shade; the stigmata pure white, the claviform stigma broadly surrounded with black, which is produced into a black streak behind; the subterminal line slightly zigzag, with small black arrow-heads in front; hind-wings white, greyish towards the hind margin. Expands from 1¼ to 1½ inches. Inhabits South Europe and the Altai in May and August. The larva is light brownish-grey, and feeds on larkspur in June and autumn.

* 4. *M. Serena* (W. V.).—Fore-wings bluish-white, brownish-grey in the central area, with

double dentated transverse lines sharply bordered with black on the opposite sides, the elbowed line forming one curve in cell 1*b*, the stigmata whitish, with dark centres, the subterminal line indistinct; hind-wings grey, with the hind margin darker. The variety *Obscura* (Staud.), from the Alps, is very dark, and nearly unicolorous; and variety *Corsica* (Ramb.) is more suffused. Expands about 1¼ inches. It is common in Central and Southern Europe and Western Asia in May and August. The larva is green, with a row of connected dark green lozenge-shaped spots on the back, and a dark green stripe on the sides bordered with paler. It feeds on the flowers of hawkweed, &c., in July and August.

5. *M. Caduca* (Herr.-Schäff.).—Fore-wings grey, slightly varied with ochreous; the transverse lines whitish, bordered with black, with an intermediate line; stigmata bordered with black and white; hind-wings whitish, broadly bordered with grey. Inhabits France, Spain, and Crete.

* 6. *M. Dysodea* (W. V.).—Fore-wings pale grey, darker in the central area, and varied with orange, with dark dentated transverse lines bordered with paler, and scarcely double, the elbowed line forming two curves in cell 1*b*, the stigmata surrounded with black, and the subterminal line indicated by orange spots, which are bordered in front with small black angular dashes; hind-wings pale grey, with the hind margin darker. A nearly white variety (*Innocens*, Staud.) occurs in Greece Size of *Serena*. Common in Central and Southern Europe and Western Asia in May and June. The larva is dull greenish-grey, with the belly yellowish-green; a slender dark double line on the back, and waved lines below it. It feeds on the unripe seeds of the lettuce in August. The moth and larva are figured at Pl. 37, Fig. 7, *a*, *b*. (*M. Cavernosa*, Eversm., from South Russia and the Altai, is violet-grey, fore-wings with a waved yellowish line towards the base, marked with black spots; the three stigmata black, and the inner margin yellow.)

* 7. *M. Chenopodii* (W. V.).—Fore-wings uniform brownish-grey, with the markings indistinct, the transverse lines double and dentated, the reniform stigma filled up beneath with dark grey, the subterminal line whitish, with a sharply-formed W, and small black arrow-spots; hind-wings dirty white, with the hind margin brownish-grey. Expands about 1½ inches. Common in Europe and Northern Asia from May to September. Larva green, with a dark line on the back, and a red stripe on the sides. It feeds on *Chenopodium* and *Atriplex* from July to October.

8. *M. Sodæ* (Ramb.).—Very close to *Chenopodii*, but ashy-grey, with no yellowish tint, shaded with darker towards the hind margin, especially near the costa; the lines as in *Chenopodii*, the W of the subterminal line more obtuse; the orbicular stigma is often smaller, the reniform stigma is more filled up with blackish, and the claviform stigma is blackish and very distinct; hind-wings grey, with a brown central lunule, and the hind margin broadly washed with brown. The larva feeds on different species of *Chenopodiaceæ* growing on the borders of the sea. The moth is common on the shores of the Mediterranean.

9. *M. Sociabilis* (Grasl.).—Closely allied to *Sodæ;* fore-wings yellowish-grey, shaded with ashy-grey around the stigmata, on the middle of the wing beyond the reniform stigma, and longitudinally a little above the inner margin; the transverse lines are lost in the ground-colour, but the subterminal line is more distinct, and forms a W in the middle; stigmata distinct, and bordered with black, the claviform stigma marked with dark grey, the others concolorous; hind-wings white, with the nervures, a dash in the cell, and a border interrupted at the anal angle blackish. It is found in the Pyrenees in July and August, and the larva feeds on wormwood in June.

10. *M. Treitschkei* (Boisd.).—Fore wings ochre-yellow, slightly shaded with reddish, with all the lines paler, and bordered with black on both sides, but especially within; the inner line is much festooned, and the elbowed line is dentated; the subterminal line is angular, but little, if at all, bordered with black; it forms a W in the middle, and is marked with small black arrow-headed spots; the orbicular stigma is well marked and pale yellow, slightly centred and bordered with black, the reniform stigma is blackish, and a little lighter in the middle, and the claviform stigma is well marked, brown, and bordered with black. The brown central shade runs between the two upper stigmata, and its lower portion is parallel to the elbowed line. Fringes brown, interrupted with yellowish-grey. Hind-wings of a slightly yellowish grey, with a broad blackish marginal band, and a curved line above it. Inhabits South France in May and August, and the larva lives on *Hippocrepis comosa*, *Lotus corniculatus*, &c., in June.

11. *M. Marmorosa* (Borkh.).—Fore-wings brown, varied with pale brownish-grey, with double slightly-dentated transverse lines, and a pale double dentated spot between the three stigmata, the orbicular stigma small and whitish, the others filled up with dusky; the subterminal line white, with a sharply-formed W and long black arrow-heads; hind-wings dirty white, with the hind margin brownish-grey. Expands from 1¼ to 1½ inches. It is found in the mountains of the south of Central Europe in May. The larva is dark blue, with two yellow stripes on each side. It lives on *Hippocrepis comosa* and *Coronilla minima* in July. (*M. Digramma*, Fisch., from South Russia, has brown fore-wings, with two white streaks, the outermost three-branched, and forked in the middle. *M. Prædita*, Hübn., from Sarepta and Armenia, is brown, clouded with blackish on the fore-wings; the subterminal line forms a W, and there are two light lines within it; the usual inner line is wanting; all the stigmata are well marked, and edged with paler; hind-wings brown, paler towards the base. *M. Dianthi*, Tausch., also from South Russia, has greyish-brown fore-wings, with the disc and hind margin varied with blackish, the three stigmata bordered with whitish, and a whitish mark behind; hind-wings grey, with a paler stripe.)

* 12. *M. Peregrina* (Tr.).—Fore-wings of a reddish or rusty-yellow, with the transverse lines rather indistinct, brown, dentated, interrupted, and bordered with pale yellow; subterminal line pale and well marked, forming a strongly-marked W in the middle, and bordered within by reddish arrow-heads. The upper stigmata are whitish, partly bordered by black dashes; the orbicular stigma is placed on an oblique whitish band, which traverses the middle of the wing, and often extends to the inner margin. The claviform stigma is rust-coloured, also partly bordered with black. Fringes spotted. Hind-wings dirty white, with the hind margin washed with reddish. Expands about 1¼ inches. Common in May on the shores of the Mediterranean, and has once been taken in England. The larva lives on low plants in June.

* 13. *M. Dentina* (W. V.).—Fore-wings paler or darker brownish-grey, varied with pale grey, with slightly-dentated transverse lines filled up with paler, a pale double dentated spot between the three stigmata, and a slight yellowish dash at the base of the inner margin; the subterminal line whitish, with an obtuse W; hind-wings brownish-grey, lighter towards the base in the male. Expands from 1¼ to 1½ inches. Common in Europe and the Altai from May to August. The larva is dark brown, with paler waved subdorsal lines bordered with black spots, and a black line on the sides. It feeds on dandelion, &c., in June and autumn, preferring the roots. The moth is figured at Pl. 37, Fig. 8.

* 14. *M. Glauca* (Hübn.).—Fore-wings varied with dark grey and bluish ashy-grey, with double slightly-dentated transverse lines; the orbicular and reniform stigmata bluish-white, the

former rather large; the claviform stigma and the subterminal line (which forms a rather obtuse W, and is marked with black arrow-heads) white or yellowish; hind-wings grey, lighter towards the base in the male. Expands from 1¼ to 1½ inches. It is met with in Central and Northern Europe, except Holland, Belgium, and North France, in May and June. The larva is brownish-red, with a pale line on the back, dark angular stripes, and a broad yellowish-white stripe on the sides. It feeds on bilberry, &c., in August.

*15. *M. Contigua* (W. V.).—Fore-wings brownish-grey, varied with reddish and whitish, with a black basal streak bordered with whitish in front, and dentated and rather indistinct transverse lines; the orbicular stigma is whitish, and forms part of a streak running to the hinder angle; the subterminal line is white, with a sharply-formed W, and black arrow-heads before it; hind-wings light grey, with the hind margin brownish. Expands about 1½ inches. Inhabits Northern and Central Europe and the Altai in June and July. The larva is yellowish-green, with a red line on the back, oblique red streaks below it, and a pale stripe on the sides. It feeds on broom, bilberry, &c., in autumn.

16. *M. Alpigena* (Boisd.).—Fore-wings brownish-grey, varied with whitish, with the central area darker; the lines all black; the subterminal line very indistinct, and crossed by thick black streaks running to the hind margin; the two upper stigmata of nearly equal size, bordered with black; the orbicular stigma oval and oblique, the reniform stigma touching the elbowed line, which forms a small dark triangle behind it, with the outer angle very acute; the claviform stigma is slightly pointed. Two black basal streaks, the second close to the inner margin. Hind-wings yellowish-white, with the nervures and a marginal line brown. Expands 1½ inches. Alps of Dauphiné. Only one specimen known.

* 17. *M. Genistæ* (Borkh.), *W.-Latinum* (Borkh.).—Fore-wings pale reddish-grey, reddish-brown in the central area as far as nervule 1, and along the hind margin, with a black streak at the base, and at the extremity of the claviform stigma, and dentated dark transverse lines, bordered with paler, and indistinct towards the inner margin; the subterminal line with a strongly-marked W extending to the hind margin; the orbicular stigma round and reddish-white; hind-wings brownish-grey, dirty white towards the base in the male. Common in Central Europe and Northern Asia in May and June. The larva is brownish-grey, greenish, or yellow, with a dark line, and dark, connected, oblique dashes on the back, between which stand dark angles, open behind; and there is a pale green stripe on the sides. It lives at the same time and on the same plants as *M. Contigua*.

* 18. *M. Thalassina* (Hufn.).—Very like *Genistæ*, but the fore-wings are of a more coppery brown, less varied with grey, and not paler on the inner margin; the transverse lines are distinct to the inner margin, and the tips of the W do not extend to the hind margin. Expands from 1½ to 1¾ inches. Common in Central Europe and Northern Asia in June and July. The larva is yellowish-violet-grey, with blackish, or green and red oblique stripes on the back, which expand into arrow-headed spots on the last two segments; and with a pale grey stripe on the sides, bordered with rust-colour. It feeds on bramble and other low plants in autumn.

* 19. *M. Suasa* (W. V.).—Fore-wings pale brown or violet-brown, varied with dark grey, with a black streak running from the middle of the base, but with none behind the claviform stigma; the transverse lines are indistinct, and the subterminal line is narrowly white, with a sharp-pointed W extending to the hind margin, and bordered with dark grey behind; the fringes slightly waved, and the hind-wings brownish-grey. Expands from 1½ to 1¾ inches. Common in Central and Northern Europe and Northern Asia in May, June, and August. The larva is yellowish-red or flesh-colour, with three steel-blue lines on the back, and

a white stripe on the sides, bordered with black. It feeds on low plants from July to October.

20. *M. Aliena* (Hübn.).—Very like *Suasa*, but the fore-wings are of a more unicolorous brownish-grey, the transverse lines are more distinct, double and dentated, and the tips of the W in the subterminal line do not quite extend to the hind margin; fringes much waved. Expands about 1¾ inches. A rather scarce species, found in South-Central and Eastern Europe, and Northern and Western Asia in May and June. The larva is brownish-grey, marbled, with the belly greenish-yellow, and three light lines on the back. It feeds on *Trifolium montanum*, *Cytisus nigricans*, and *Anthyllis vulneraria*, &c., from July to September.

*21. *M. Oleracea* (Linn.).—Fore-wings reddish-brown, with no basal streak, the reniform stigma orange, and the orbicular stigma whitish; the subterminal line white, with a small but sharply-pointed W; the other markings quite indistinct. Hind-wings yellowish-white, with the hind margin grey. Expands about 1½ inches. Common in Europe in May, June, and August. The larva is green, grey, or flesh-coloured, with three dull dark lines on the back, and a yellow or white stripe on the sides. It feeds on cabbage, nettle, *Reseda*, &c., from July to September. The moth is figured at Pl. 37, Fig. 9.

22. *M. Splendens* (Hübn.).—Very like *Oleracea*, but the fore-wings lighter and more varied; violet-brown, with the markings more distinct, the transverse lines double, and scarcely dentated; the orbicular and reniform stigmata pale grey, and bordered with white; the subterminal line with a very short W, and suffused with darker in front. A rare species, inhabiting parts of Germany, Hungary, and Northern Asia in June.

*23. *M. Pisi* (Linn.).—Fore-wings brownish-red, varied with violet-grey, with double slightly-dentated transverse lines, and a pale yellow subterminal line, expanding into a spot above the hinder angle; hind-wings brownish-grey, lighter towards the base. Expands about 1½ inches. Common in Northern and Central Europe in May and June. Larva reddish-brown or dark green, with two broad yellow stripes on the back, and one on the sides. It lives on broom and various low plants from July to September. The moth and larva are figured at Pl. 37, Fig. 10, *a*, *b*.

24. *M. Leineri* (Freyer).—Fore-wings yellowish-brown, with the two stigmata bordered with white, and a white zigzag subterminal line; hind-wings of the male brownish-grey. Expands about 1½ inches. Inhabits Austro-Hungary. The variety *Cervina* (Eversm.), from South Russia and Armenia, has dull reddish fore-wings, with a white line in the middle; and the variety *Pomerana* (Schulz), from Stettin, has yellowish-brown fore-wings, with broad white nervures, white spots on the costa, and a white zigzag subterminal line, but no other markings; the hind-wings are thinly dusted with grey, with the hind margin darker.

*25. *M. Persicariæ* (Linn.).—Fore-wings violet-black, with double dentated transverse lines; the subterminal line consists of yellowish spots, spotted with black in front; the stigmata are surrounded with black, and the reniform stigma is white, with a rusty-yellow centre; hind-wings dirty white, with the hind margin brownish-grey. The reniform stigma is brownish-grey in variety *Unicolor* (Staud.). Expands from 1½ to 1¾ inches. Larva dirty green or greyish-brown, with a paler line on the back, large dark spots on segments 5, 6, and 12, and light angular spots, open in front, on the other segments. It feeds on low plants in autumn. The moth and larva are figured at Pl. 36, Fig. 8, *a*, *b*.

*26. *M. Brassicæ* (Linn.), (*Cabbage Moth*).—Fore-wings brownish-grey, varied with reddish, with dark double dentated transverse lines, the orbicular stigma bordered with black, and the

reniform stigma partially bordered with white; the subterminal line whitish, with a distinct W spotted with dusky behind; hind-wings brownish-grey; the front tibiæ with a strong horny claw at the end. Expands about 1¾ inches. Abundant in Europe and Northern and Western Asia in May and June. Larva green or brownish, with three lighter lines on the back, and oblique black dashes between. On the 12th segment is a black horseshoe-shaped spot; and there is a light stripe on the sides. It feeds on cabbages and low plants in summer and autumn, and is often very destructive, eating into the heart of the cabbage. The moth and larva are figured at Pl. 36, Fig. 9, *a*, *b*.

* 27. *M. Albicolon* (Hübn.).—Resembles *Brassicæ*, but altogether paler; fore-wings uniform brownish-grey, with indistinct markings; the subterminal line broken into yellowish spots; hind-wings lighter towards the base; the crest on the abdomen slighter, and the front tibiæ with no claw. Expands about 1½ inches. Inhabits Central Europe and the Altai in May and June. The larva also resembles that of *Brassicæ;* it is dark green, with three light lines on the back, and oblique black dashes between, and a waved reddish stripe on the sides. It feeds on low plants in July and August. (*M. Subcontigua*, Eversm., from the Ural, has dark grey fore-wings, with the stigmata paler; the submarginal line is white, and forms two obtuse teeth in the middle; hind-wings grey, with the hind margin blackish.)

28. *M. Serratilinea* (Ochs.).—Fore-wings rather long; pale grey, with dark transverse lines, which are scarcely double; the elbowed line is sharply dentated, and there is a row of white dots behind the teeth; the stigmata are indistinct, and there are two white dots behind the reniform stigma at its lower end; the subterminal line is whitish, and zigzag, with dark spots in front above the middle, and at the hinder angle; hind-wings dirty white, with the hind margin grey. Expands about 2 inches. It occurs in Austria, Switzerland, the Ural and Altai, and Armenia in July and August. The larva is grey, with a dark head. It feeds on low plants in spring.

* 29. *M. Nebulosa* (Hufn.).—The fore-wings are pale grey, varied with darker, with double dentated black transverse lines, filled up with paler; the stigmata large, narrowly surrounded with black; and a light zigzag subterminal line, which is marked in front with large black arrow-heads above the hinder angle, and in the middle with smaller ones; hind-wings pale grey, darker towards the hind margin. Expands from 2 to 2½ inches. Common in Central Europe and Northern and Western Asia from May to July. The larva is dirty white or pale brownish-grey, with dark brown lozenge-shaped spots on the back, and dark brown oblique stripes and a longitudinal line on the sides. It feeds on low plants from autumn to May. The moth is figured at Pl. 36, Fig. 10.

* 30. *M. Tincta* (Borkh.).—Fore-wings pale greenish-grey, varied with brown, especially in the central area, with double transverse lines filled up with paler; the elbowed line dentated, with black and white dots beyond the teeth; the stigmata large, the subterminal line slightly zigzag, with black spots in front above the middle and above the hinder angle; hind-wings grey. Expands about 2 inches. Common in Northern and Central Europe and the Altai in June and July. The larva is ochre-yellow, or reddish-brown, marbled with darker, with dark connected lozenge-shaped spots on the back, and dark brown oblique dashes on the sides. It feeds on grass, bilberry, birch, &c., from autumn to May. The moth is figured at Pl. 36, Fig. 11.

* 31. *M. Advena* (W. V.).—Resembles *Tincta*, but the fore-wings are narrower; violet-grey, varied with rusty-red; the subterminal line scarcely dentated, and bordered in front with brownish-red, which is broadest and darkest above the hinder angle; hind-wings of a more yellowish grey. Expands from 1¾ to 2 inches. Common in Northern and Central Europe and Northern Asia in June and July. The larva is brownish-grey, with dull dark lozenge-shaped

spots on the back, and a stripe on the sides powdered with pale grey. After the last moult these markings disappear almost entirely. It feeds on *Ononis spinosa*, bilberry, birch, &c., from autumn to May.

* 32. *M. Leucophæa* (W. V.).—Fore-wings pale grey, varied with brownish, with double slightly-dentated transverse lines, the stigmata large, the two upper ones with a brownish centre surrounded with whitish, and the claviform stigma dark; the subterminal line forms a distinct W, and is marked with dark arrow-heads; and the fringes are broadly intersected with brown at the ends of the nervules; the hind-wings are pale grey, and the antennæ of the male are strongly pectinated. Expands from 1½ to 1¾ inches. Common in Central Europe and the Altai in May and June, but rare in England. The larva is pale brown, with two dark bands on the back separated by a pale line, and another on the sides; and with two black dots on each segment close to the dorsal line. It feeds on grass and other low plants till April. The moth and larva are figured at Pl. 36, Fig. 12, *a*, *b*.

GENUS XXIV.—HADENA (TR.).

Small or moderate-sized moths, the fore-wings with the hind margin evenly curved or truncated, and oblique above the hinder angle; brown or grey, and occasionally green; the *Noctua*-pattern generally distinct, the subterminal line arched, or forming a W; the fringes more or less waved, the hind-wings slightly contracted below the tip, generally pale grey or dirty white, with a broad brownish-grey border; the antennæ of the male dentated and ciliated, or simple, and the abdomen extending beyond the anal angle of the hind-wings. In the first two species the tips of the fore-wings are rather pointed, and in the others they are truncated. The larvæ resemble those of *Mamestra*, and mostly feed on grasses. Some prefer the roots, and others the stalks, leaves, or seeds; and they hide themselves during the day. Many larvæ hybernate; and the moths appear in summer, and may be found at rest on tree-trunks or palings, or may be captured at sugar.

* 1. *H. Leucostigma* (Hübn.).—Fore-wings yellowish-brown or coppery-brown, lighter in the suffused submarginal band, and darker beyond, with rather indistinct transverse lines; the subterminal line simple and not dentated; the orbicular and often the reniform stigma also finely surrounded with white, and the former filled up with white or yellow behind; the subterminal line is paler brown, curved, but not dentated, and bordered with dark grey behind; and nervules 3 and 4 are often dusted with white at their base. In the variety *Fibrosa* (Hübn.) the fore-wings are more unicolorous brown, with the suffused submarginal band yellowish-grey, and no distinct markings, except the yellow-spotted reniform stigma. Expands about 1½ inches. Inhabits Central Europe and Northern Asia in July and August. The larva is white, brownish above, with black warts and a brown head. It feeds in the lower part of the stems of *Iris pseudacorus* in May and June.

* 2. *H. Satura* (W. V.).—Fore-wings dark brown, varied with dark violet-red, lighter in the suffused submarginal band, with a black basal streak in the middle, another towards the base above the inner margin, and a broader one across the lower part of the central area; the transverse lines are black, double, and strongly dentated, and the stigmata are rather large, and a little lighter than the ground-colour; the subterminal line is pale and interrupted, but forms a distinct W, and is spotted with black behind; the fringes are strongly waved, and the hind-wings are dark brownish-grey. Expands from 1¾ to 2 inches. Occurs in Northern and Central Europe (except Holland and Belgium) and in the Altai in July and

August, but is not common. The larva is reddish-brown, marbled with darker; and yellowish-grey below. There are three pale lines on the back and another on the sides, the latter bordered above with dusky. It feeds on honeysuckle in shady woods till June. (*H. Arnica*, Tr., from Russia and Siberia, has the fore-wings varied with red and brown, with the transverse lines white and rather broad, the subterminal line suffused, rising from a white spot at the tip, forming a distinct W in the middle, and marked with black arrow-heads. The stigmata are brown, bordered with white; the orbicular stigma is oval and oblique, and the reniform stigma is large, with a white spot above it, bordered within with black; the suffused submarginal band is brownish-violet, very pale inside; and the hind-wings are greyish-white in the male, and nearly copper-coloured in the female.)

* 3. *H. Adusta* (Esp.).—Fore-wings dark reddish-brown, lighter in the suffused submarginal band, with a narrow black basal streak, and a broader one below the claviform stigma, and with black double transverse lines, slightly dentated; the subterminal line yellowish-white, with a distinct W, and dark arrow-heads; the reniform stigma yellowish-white behind, and the hind-wings whitish, with the hind margin grey. Expands from 1½ to 1¾ inches. Found throughout Europe and the Altai from May to July. (The variety *Baltica*, Hering, from North Germany and Livonia, has the fore-wings varied with violet-red and iron-grey, and the variety *Pavida*, Boisd., from South Russia, is much darker, and nearly unicolorous.) Larva pale rusty-brown, marbled with darker, and green below. Feeds on heath, golden rod, &c., in autumn, and hybernates in its cocoon, when full-grown. (*H. Sommeri*, Lef., from Iceland, Greenland, and Labrador, has fore-wings marbled with brown and grey, with black dentated transverse lines, bordered with white, and grey stigmata; hind-wings orange-grey. Figured at Pl. 56, Fig. 4.

4. *H. Solieri* (Boisd.).—Fore-wings uniform brown, with the hind margin darker; the subterminal line indistinct, not forming a W, and intersecting a row of long black or brown dashes, placed between the nervules; the transverse lines are angulated, bordered with brown, and close together towards the hind margin, sometimes touching each other so as to form an X; the stigmata are more or less distinct, the reniform stigma bordered with white dots outside, and the orbicular stigma ringed with black. Hind-wings dull white, with an interrupted brown border; in the female they are wholly washed with brown. Size of *Adusta*. Common in South Europe in September. The larva hybernates, and is full-grown in January. It lives on low plants, and is very injurious in kitchen gardens; it buries itself deeply in the earth when about to become a pupa, and constructs a firm cocoon formed of silk and grains of sand.

* 5. *H. Atriplicis* (Linn.).—Fore-wings varied with paler and darker moss-green, violet on the nervures and hind margin, with the transverse lines black, dentated, and broadly bordered with violet; the three stigmata are large, with a large dentated white spot placed obliquely below the orbicular stigma; the subterminal line is whitish, and strongly curved. Expands from 1¾ to 2 inches. Common throughout the greater part of Europe and Asia in June and July. The larva is reddish-brown, mottled with darker, with a dark line on the back, a faint grey double stripe on the sides, and two yellow spots on the last segment. It feeds on *Polygonum persicaria*, *Atriplex*, &c., from July to October. The moth is figured at Pl. 56, Fig. 11.

6. *H. Gemmea* (Tr.).—Fore-wings olive-brown, varied with violet, with double black dentated transverse lines, and a narrow black zigzag central shade; the three stigmata are large and white, with the centres slightly dusky; the subterminal line is narrow, white, zigzag, and marked with small black arrow-heads in front; hind-wings grey, with two narrow stripes, and the hind margin brownish. Expands about 1¾ inches. It is found in Northern and Alpine Europe in September. (*H. Sylvatica*, Chav., from Corsica, is greyish-brown fore-wings with two black lines; stigmata

greyish-white, hind-wings with a darker line and central spot; abdomen crested. Wings with a central spot, and broad brown lines beneath. Expands 1½ inches. It occurs in July.

7. *H. Anilis* (Boisd.), *Albescens* (Guén.).—Fore-wings rather long, pale grey, with a sharply-defined black central shade, and an ill-defined subterminal line, slightly zigzag, and bordered with dusky in front; the transverse lines are distinctly black, the inner line double, and filled up with black; the stigmata large, the orbicular stigma with no dark centre, and the hind-wings whitish, brownish towards the hind margin. Expands about 1¾ inches. Described from a single specimen taken in the Valais in July.

8. *H. Platinea* (Tr.).—Fore-wings rather long, pale ashy-grey, shading into yellow in some places; all the markings indistinct, the intermediate spaces of the transverse lines, and the spaces usually filled by the stigmata, whitish; the subterminal line is shortly dentated, but without forming a W; hind-wings pale grey, darker towards the hind margin. Expands from 1¾ to 2 inches. Inhabits the mountains of South-Central Europe in July.

9. *H. Pernix* (Geyer).—Resembles *Platinea;* the fore-wings are broader behind, dark bluish-grey, sometimes varied with yellowish, and the pattern is often as indistinct as in *Platinea;* the reniform stigma is slightly bordered with paler behind, the transverse lines are simple and dentated; the subterminal line forms a short W, and the hind-wings are brownish-grey. The variety *Zeta* (Tr.) is pale grey, with no yellowish shading. Expands about 2 inches. A rare species, found under stones by day in June and July in the Alps, Pyrenees, &c.

10. *H. Maillardi* (Boisd.). — Fore-wings dark greyish-brown, with double dark dentated transverse lines, bordered with black, the reniform stigma yellowish behind, and with two white dots below; the subterminal line pale yellow, irregular, and forming a short W; hind-wings brownish-grey. Expands from 2 to 2½ inches. Found in the Alps and Pyrenees, and in Norway. It is doubtful whether this and the last species are truly distinct from the next, which is one of the most variable of all known *Noctuæ*, scarcely two specimens being alike.

*11. *H. Exulis* (Lef.), *Assimilis* (Doubl.).—Fore-wings varied with grey and black, and sometimes with reddish, the transverse lines dentated or waved, black, or whitish, bordered with black; the nervures often whitish; the stigmata grey or whitish, sometimes partly bordered with black; the subterminal line sometimes yellowish, and the fringes spotted with brown; hind-wings yellowish-grey, with brown hind margins and ochreous fringes. Expands from 1½ to 1¾ inches. The numberless varieties of this species have received many names, which it is not worth while to enumerate here. It abounds in Iceland, and is also found in Greenland and Labrador; it is a great rarity in Scotland, though widely distributed; it appears in July. The typical *H. Exulis* and its larva (Figs. 10, *a*, *b*) and the variety *H. Assimilis* (Fig. 2) are figured on Pl 56.

12. *H. Rubrirena* (Tr.).—Fore-wings dark brown, varied with rusty-yellowish in the central area, with simple black transverse lines, strongly dentated, and bordered with yellowish; the orbicular and reniform stigmata are reddish, the latter bordered with pale yellow behind; the subterminal line is pale yellow, and forms a short W; hind-wings dusted with brownish-grey, darker towards the hind margin; the crest at the back of the thorax brick-red. Expands about 2 inches. Inhabits the Swiss and German mountains in July and August. The variety *Hereyniæ* (Staud.), from the Harz, is a quarter of an inch smaller; the fore-wings are black, scarcely varied with rust-colour, with the transverse lines bordered with white, and a white subterminal line; the stigmata are ochreous and white. (*H. Sylvicola*, Eversm., from South Russia, has dark grey fore-wings, shaded with black; the stigmata and transverse lines whitish, bordered with black, and the reniform stigma very broad; hind-wings dark grey, with a central lunule, a curved stripe, and the hind margin blackish.)

*13. *H. Furva* (W. V.).—Fore-wings varied with dark grey and brown, the transverse lines double, slightly dentated, and filled up with pale grey; the subterminal line whitish, forming a short W, and marked with black arrow-heads; the reniform stigma pale yellow behind, sometimes with two whitish dots below; hind-wings greyish-white, darker towards the hind margin. Expands from 1¼ to 1¾ inches. Widely distributed in Central Europe and Northern and Western Asia in July and August, but local. The larva is violet-brown, with raised black spots, and a dark brown head, and plates on the 2nd and last segments. It lives on grass till June.

*14. *H. Abjecta* (Hübn.).—Fore-wings blackish, with the markings very indistinct; the transverse lines are scarcely double, and slightly bordered with lighter, and the elbowed line is spotted with black and white at the ends of the teeth; the subterminal line is narrowly whitish, with a short W, and suffused black arrow-heads, and there are two whitish dots below and behind the reniform stigma; hind-wings dark grey, with the base lighter. Expands about 1¾ inches. Widely distributed in Central Europe and Northern and Western Asia in June and July, but rather scarce. The larva lives on grass, &c., and hides itself during the day under stones, and at the roots of plants.

15. *H. Lateritia* (Hufn.).—Fore-wings reddish or yellowish-brown, with black and white dots beyond the single dentated elbowed line; the two stigmata are grey, the orbicular stigma oblique, and the reniform stigma bordered with white behind; the subterminal line and generally all the other markings are more or less indistinct. Expands from 1¾ to 2 inches. Common throughout the greater part of Europe (except Britain) and Northern Asia, from June to August. The larva is dark grey, with a black plate on the 2nd and last segments, and a brown head. It feeds on grass till May.

* 16. *H. Monoglypha* (Hufn.), *Polyodon* (Linn.), (*Dark Arches*).—Fore-wings greyish-brown, varied with darker brown, and in the suffused submarginal band with whitish, with a black basal streak, and another in the central area in cell 1 *b*; the transverse lines indistinctly double, and bordered with lighter; the inner line projects strongly below the middle, and the elbowed line is dentated, and interrupted in cell 1 *b*; the subterminal line forms a very distinct W, and is marked with sharply-defined dark arrow-heads; the orbicular and reniform stigmata are large, and the former oblique; hind-wings grey. It varies considerably in colour, and Scotch and Irish specimens are unusually dark. Expands from 1¾ to 2 inches. Abundant throughout Europe and Northern and Western Asia in June and July, flying in gardens or into lighted rooms in the evening. The larva is brownish-grey, and very shining, with dark brown warts, head, and plates. It feeds on the roots of grass till May. The moth is figured at Pl. 37, Fig. 11.

* 17. *H. Lithoxylea* (W. V.).—Fore-wings pale ochre-yellow, varied with brownish; the only visible markings are a row of small black and pale dots in the suffused submarginal band; the commencement of the transverse lines on the costa; the suffused central shade; a dark lunule of the elbowed line above the fold, which is bordered with white; and two long teeth of the subterminal line in the middle, above and below which the hind margin is broadly reddish-brown; hind-wings dirty white, with the hind margin grey. Expands from 1¾ to 2 inches. Common in Central Europe and Western Asia in June and July. The larva is bluish-green, with a black head, and a plate behind. It feeds on the roots of grass till May. (**H. Sublustris*, Esp., which some consider a variety, is rather smaller and scarcer, with yellowish fore-wings, varied with rusty-red and yellowish-white, and with the elbowed line more or less distinctly marked; hind-wings shaded with darker before the hind margin.)

* 18. *H. Sordida* (Borkh.), *Infesta* (Tr.), *Anceps* (Hübn.).—Resembles unicolorous specimens of *Gemina*, but the fore-wings are pale yellowish-grey, varied with pale brown, and with a black basal streak; the reniform stigma is grey within, bordered with whitish behind, and marked with two white dots below; hind-wings whitish, with a curved line, and the hind margin grey; the thorax unicolorous yellowish-grey. Expands from 1½ to 1¾ inches. Common in Central Europe in May and June. The larva is pale brown, with light longitudinal lines, and dark warts. It feeds on grass, and hybernates when full-grown. (*H. Leucodon*, Eversm., from South Russia and Siberia, is greyish-brown, the thorax varied with black and white, the fore-wings with white lines bordered with black, and with submarginal black dashes; the orbicular stigma white, narrow, and oblique, the reniform stigma bordered with white, and the subterminal line much angulated in the middle; hind-wings with white fringes.)

* 19. *H. Gemina* (Hübn.).—Fore-wings brownish-grey, with indistinct double transverse lines bordered with paler, the elbowed line slightly dentated, with white and dark dots at the ends of the teeth, the subterminal line pale, with a distinct W and black arrow-heads before it, and shaded with dark grey behind; the stigmata inconspicuous, and the reniform stigma not bordered with white behind; hind-wings brownish-grey; the thorax reddish-grey in the middle, with the collar and scapulæ blackish. The variety *Remissa* (Tr.) has brighter coloured and browner fore-wings, pale grey in the suffused submarginal band, and on the inner margin, with black basal streaks, and the extremity of the claviform stigma black. Expands about 1½ inches. Common in Central Europe and Northern Asia from May to July. The larva is brownish-grey, with three pale lines on the back, and a black line on the sides bordered below with paler. It feeds on grass and low plants till May.

* 20. *H. Unanimis* (Hübn.).—Fore-wings reddish-brown, blackish on the hind margin, with two black basal streaks, and double transverse lines a little lighter on the inside; the elbowed line is slightly dentated, and curved inwards behind the reniform stigma, which is partly bordered with white; the subterminal line is yellowish, with a slight W; hind-wings grey, lighter towards the base, with a conspicuous dark central lunule. Expands about 1¼ inches. Occurs throughout Central Europe from May to August. The larva is brownish-yellow, with three paler lines on the back, and a pale-coloured head. It feeds on grass in June and autumn, and hybernates when full-grown. (*H. Illyria*, Freyer, found in the Alps, has more pointed fore-wings, with the markings more sharply defined, and the marginal area light brown.)

* 21. *H. Basilinea* (W. V.).—Fore-wings ochreous or greyish, varied with brownish-red on the costa in the central area, and in the suffused submarginal band; hind margin grey; a very distinct black basal streak, the transverse lines a little darker than the ground-colour, and slightly dentated; the subterminal line is suffused, with an obtuse W; the orbicular stigma is small and round, and there are two white dots below the reniform stigma; hind-wings pale grey. Expands from 1¼ to 1½ inches. Common in Europe and the Altai in May and June. Larva pale brownish-grey, with three white lines on the back; the belly greenish, and the head pale brown. It feeds on soft grasses, hidden between the leaves, and also lives in the ears of wheat, feeding on the grains; it hybernates when full-grown.

* 22. *H. Hepatica* (Hübn.).—Fore-wings reddish-grey, varied with darker brown, with a thick black basal streak, and dark transverse lines bordered with paler; the elbowed line dentated, with black and pale dots at the ends of the teeth; the subterminal line curved, with no W, but with blackish spots on both sides above the hinder angle, and above the middle; the orbicular stigma oblique, and entirely surrounded with black; the reniform stigma thickly bordered with black in front only, and not sharply bounded behind; hind-wings blackish, with

yellowish fringes. Expands from 1½ to 1¾ inches. Occurs in Central Europe and Northern Asia in June and July. The larva is shining grey, with three yellow lines on the back, and the head, and plates on the 2nd and last segments brown. It feeds on grass till April.

23. *H. Funerea* (V. Hein.).—Fore-wings varied with dark coppery-brown and blackish, with two black basal streaks, and fine black inconspicuous markings; the transverse lines double, and slightly dentated; the nervures narrowly black; the orbicular stigma very long and oblique, narrowly bordered with black; the reniform stigma grey, narrowly edged with white above and below, and bordered behind with yellowish; the subterminal line suffused, reddish, with a slight W, and with long blackish arrow-heads in front; hind-wings dark grey. Expands about 1½ inches. A rare species, found near Hanover in June. The larva, which resembles that of *Rurea*, feeds on grass till spring.

* 24. *H. Rurea* (Fabr.).—Fore-wings light yellowish-grey, whitish on the inner margin, reddish-brown at the base of the inner margin, on the costa to beyond the middle, and on the hind margin, so that the colour of the inner margin projects strongly and sharply towards the base and hinder angle, and in the middle, and the paler ground-colour between is rounded towards the hind margin; the two stigmata are brown, surrounded with whitish; the orbicular stigma is long and oblique, and the nervures in the marginal area are marked with brown and white dots; otherwise all the markings are very indistinct; hind-wings dark grey, with ochreous fringes. The variety *Alopecurus* (Esp.) has dark reddish-brown or blackish-brown fore-wings, upon which only the two yellowish-bordered stigmata are visible. Expands about 1½ inches. Common in Central and Northern Europe and Northern Asia in June and July. The larva is shining brown, with raised black spots, a whitish line on the back, and two reddish lines below it; on the sides is a pale brown stripe. It feeds on grass till May.

* 25. *H. Scolopacina* (Esp.).—Fore-wings dull olive-grey, varied with brown below the costa to beyond the middle, with a blackish spot at the base of the inner margin, the transverse lines single, the elbowed line dentated, with black dots at the ends of the teeth, the reniform stigma more or less white, especially on the hinder edge; the subterminal line indistinct, curved, and broadly bordered with rusty-brown on both sides; hind-wings yellowish-grey, with paler fringes. Expands from 1¼ to 1½ inches. Occurs in Central Europe and the Altai in July and August, but is rarer than most of the foregoing species. The larva is brownish-grey, with three yellowish lines on the back, and the belly yellowish; head brownish-yellow. It feeds on grass in May and June. (*H. Icterias*, Eversm., from the South Ural, has ochreous fore-wings, varied with brown on the costa, with a brown mark on the hind margin below the tip, the reniform stigma white, marked with brown inside, and surrounded with brown outside, and the subterminal line spotted with brown; hind-wings yellowish.)

* 26. *H. Pabulatricula* (Brahm), *Connexa* (Borkh.).—Fore-wings greyish-white, the central area broadly brown between the transverse lines on the inner margin, and on the costa, between the stigmata; two black longitudinal streaks in the basal area, the inner line double, and strongly curved above the inner margin; the elbowed line single and dentated; the subterminal line indistinct, with a sharply-formed W, the two stigmata whitish, and the reniform stigma not distinctly bounded; hind-wings greyish-brown, with whitish fringes. Expands about 1½ inches. A rather scarce species, found in the northern half of Central Europe in June and July. The larva is blackish, lighter above, with a pale line on the back; it feeds on grass in April.

* 27. *H. Ochroleuca* (W. V.).—Fore-wings yellowish-brown, clouded with darker in the central area, with white dentated transverse lines which touch below the middle, and a pale submarginal line, suffused towards the hind margin; the two stigmata indistinct, the reniform

stigma pale, and suffused behind ; hind-wings pale grey, slightly dusted with brownish, with a slender dark curved line, and the hind margin broadly brown. Expands from 1¼ to 1½ inches. Widely distributed in Central Europe in July and August. The larva is green, with two dull grey lines on the back, and a white stripe on the sides, bordered with black above. It feeds on grass, and on wheat and rye, preferring the ears, in May and June.

* 28. *H. Haworthii* (Curt.).—Fore-wings dark purplish-brown, dusted with whitish in the suffused submarginal band, with narrow double transverse lines, filled up with whitish, but not dentated ; the two small stigmata white, slightly marked with brownish in the centre ; the subterminal line, and nervures 3 and 4 as far as the elbowed line, white, the former slightly zigzag in the middle, and bordered with blackish in front. Hind-wings smoky-grey, with a darker central lunule. Expands about 1 inch. Inhabits heaths and swampy places in Northern and North-Central Europe from July to September. The larva is green, with a black head, and lives on cotton-grass in May and June.

* 29. *H. Didyma* (Esp.), *Oculea* (Guén.).—Very variable ; fore-wings unicolorous dark rusty-brown ; or else more or less varied with brownish-yellow, especially on the inner margin, and in the suffused submarginal band ; the transverse lines indistinct, the elbowed line scarcely dentated, the subterminal line light brown, and strongly curved, but not zigzag, and bordered with dark grey behind as far as the hind margin ; the orbicular stigma more or less white, or with white dots on its edge ; hind-wings greyish-brown. Expands from 1 to 1¼ inches. Abundant throughout Europe and Western Asia from May to August. The larva is green, with two reddish lines on the back, and a yellowish one on the sides. It lives in the stems and among the roots of grasses till May. The moth is figured at Pl. 38, Fig. 3.

* 30. *H. Ophiogramma* (Esp.).—Fore-wings violet-grey, dark brown on the costa in the basal area, and in the central area as far as the fold, the colours separated by a white and much waved line ; the transverse lines scarcely dentated, and whitish on the inside, the subterminal line arched, not dentated, with a bluish spot behind above the middle, and above the hinder angle ; the reniform stigma pale brown behind. Sometimes the reniform stigma and the marginal area are suffused with rusty-red. Hind-wings reddish-grey, with a blackish central lunule and curved line ; fringes pinkish-white. Expands about 1¼ inches. Occurs in marshy places among willows throughout Central Europe and the Altai in June and July, but not generally common. The larva is dirty flesh-colour, with the belly whitish, and feeds in the stems of *Iris Pseudacorus*, *Glyceria spectabilis*, &c., till May.

* 31. *H. Strigilis* (Linn.).—Fore-wings brown, whitish in the submarginal area and at the tips ; the stigmata a little lighter, the inner line double, the elbowed line single, regularly curved, and bordered with whitish, particularly pale in cell 1 *b*, where it forms an upright white lunule, which stands below and not in front of the reniform stigma ; there is a black dash running from the extremity of the claviform stigma, and the subterminal line is curved and zigzag, and bordered behind with dark grey above the middle and the hinder angle ; hind-wings dark brownish-grey. In the variety *Latruncula* (Hübn.) the suffused submarginal band is reddish, and the lunule formed by the elbowed line is flatter, and not so pale ; in the variety *Æthiops* (Haw.) the fore-wings are nearly unicolorous black, with a faint reddish shade, and the markings very indistinct. Expands about 1 inch. Common in Europe and Western Asia in June and July. The larva is pale brownish-yellow, reddish on the back, and with pale lines on the back and sides. It feeds in the stems of grasses, especially of *Dactylis glomerata*, till May. The moth is figured at Pl. 38, Fig. 4. (* *M. Fasciuncula*, Haw., which some consider another variety of *Strigilis*, is rather smaller, the fore-wings are reddish-ochreous, with no black dash. and the

lower part of the elbowed line is distinctly white. It is confined to Western Europe in June and July.)

* 32. *H. Furuncula* (W. V.).—Fore-wings brown as far as the middle, and paler behind, the two colours separated by a fine black vertical and nearly straight line, consisting of the front border of the white reniform stigma, and the lower half of the elbowed line, while the upper half of the latter makes a large curve round the reniform stigma; the subterminal line as in *Strigilis*, and the hind-wings light grey. The fore-wings vary very much in colour; the hinder half is sometimes of a paler or darker brownish-yellow, or the whole fore-wing is of a tolerably unicolorous light brown, the marginal half and the reniform stigma hardly paler. Expands from three-quarters of an inch to an inch. Common throughout Europe and Northern and Western Asia in June and July. The larva is pale yellow, with the back reddish, and feeds in the stems of grasses till May. (*H. Bipartita*, Herr.-Schäff., from Sicily, has brown fore-wings, with waved fasciæ, and the stigmata fawn-colour; a waved white transverse line runs outside the elbowed line; hind-wings grey, with the base and fringes paler. *H.* (?) *Microglossa*, Ramb., from Andalusia, is exceedingly variable; the fore-wings may be whitish, ochreous, or even reddish; the stigmata, central shade, and suffused submarginal band are brown, the transverse lines pale, sometimes white, edged with black on the sides opposite to each other; the inner line nearly straight, and the upper part of the elbowed line forms a large curve round the reniform stigma; hind-wings whitish; brownish or ochreous towards the hind margin. Expands nearly 1 inch.)

* 33. *H. Literosa* (Haw.).—Fore-wings varied with violet-grey and purplish-red as far as the middle, bounded by an interrupted black line as in *Furuncula;* beyond the middle, pale grey, as is also the reniform stigma; broadly purplish-red before the hind margin; the edge of the orbicular stigma, and a dash in the position of the claviform stigma finely and sharply black; the subterminal line is less strongly arched, and not bordered behind with grey; hind-wings darker grey, with grey fringes. The variety *Onychina* (Herr.-Schäff.), from Norderney and Heligoland, has unicolorous pale brownish-grey fore-wings, dusted with ashy along the nervures; and only the two pale-bordered stigmata and the lower halves of the two transverse lines very faintly marked. Expands about 1 inch. Widely distributed in Central Europe and Northern and Western Asia from June to August; but not generally common, and scarcely known in France. The larva is found in the stalks of grass in April.

GENUS XXV.—HYPPA (DUP.).

Fore-wings with an oblique and moderately curved hind margin, the hinder angle distinct, and the fringes slightly waved, the *Noctua*-pattern rather irregular, and the claviform stigma absent, the antennæ shortly and thickly pectinated, and ciliated, the thorax crested behind, and the scapulæ rather projecting, and there is a very strong crest, truncated above, on the 3rd segment of the abdomen, and smaller crests on the following segments; hind-wings rounded, scarcely contracted below the tip. The only species, **H. Rectilinea* (Esp.), has brown fore-wings, clouded with blackish in the lower half of the central area, and varied with ashy-grey in the basal and marginal areas; there is a long and thick black basal streak; the transverse lines are whitish on the inside, the inner line with long teeth, and the elbowed line arched, and not dentated, but expanded into a spot above the inner margin; and the subterminal line is narrowly white, and forms a white W, extending to the hind margin; it is indistinct above the middle, and marked with black streaks extending to the hind margin; hind-wings brownish-grey. Expands about 1½ inches. It is found throughout Northern and Central

Europe (except Holland and Belgium) and Northern Asia in June and July, but is not common; it may be attracted by sugar. The larva is yellowish-brown, bluish on the sides, with dark oblique dashes on the back, a dark stripe on the sides, and two yellow spots on the sides of the 12th segment. It feeds on bilberry from autumn to April.

GENUS XXVI.—DIPTERYGIA (STEPH.).

Fore-wings considerably broader behind, with a curved oblique hind margin, a distinct hinder angle, and long and much waved fringes; the crest of the thorax is higher and straighter in front, and projects into a point above the 1st segment of the abdomen, which is strongly crested on the 3rd and 4th segments. The subterminal line is absent; but in other characters the genus resembles *Hadena*. The only species, **D. Pinastri* (Linn.), has dark brown fore-wings; the transverse lines are single and black, the inner line with long teeth, and the elbowed line not dentated, but projecting considerably in the middle, and beyond it the pale brown colour of the lower half of the suffused submarginal band forms a pattern resembling the outspread wing of a bird; the three stigmata are narrowly surrounded with black, and the hind-wings are brownish-grey. Expands from 1¼ to 1½ inches. It occurs in most parts of Europe and Western Asia in June. The larva is chestnut-brown, marbled with darker, with a white line on the back, and a dark brown stripe on the sides, whitish below, and with oblique brown dashes above. It feeds on low plants from July to September. The moth is figured at Pl. 38, Fig. 5.

GENUS XXVII.—PRODENIA (GUÉN.).

Allied to *Hadena*, but the thorax clothed with raised scales, and not crested in front; the abdomen covered with very long silky hair, which projects beyond the ends of the segments, and forms a rather long tuft at the extremity in both sexes; the antennæ of the male are ciliated. The only European species, *P. Littoralis* (Boisd.), from South-Eastern Europe, Southern Asia, and Madagascar, has brown fore-wings, with violet-opalescent spaces in the basal and marginal areas; the markings nearly as in *Hadena Atriplicis*, but the oblique spot not so pale; hind-wings shining opalescent white in both sexes. Expands about 1½ inches. The larva feeds on low plants from November to February, and hides itself under stones; and the moth appears in March and April. It is figured at Pl. 55, Fig. 10.

GENUS XXVIII.—EUPLEXIA (STEPH.).

Fore-wings with the hinder angle and the *Noctua*-pattern distinct; the fringes almost jagged; hind-wings short and somewhat projecting in the middle, the 3rd segment of the abdomen very strongly crested, and the tongue thick. The only species, **E. Lucipara* (Linn.), has violet-brown fore-wings, darker in the central area, and on the upper part of the hind margin, with indistinct double transverse lines, which are nearly straight and not dentated, and converge towards the inner margin; the orbicular stigma is large, dark bluish-grey, and concave above; the reniform stigma is straw-coloured, and the subterminal line is slender, straw-coloured, slightly dentated, and spotted with blackish on both sides above the middle; hind-wings yellowish-white, brownish-grey towards the hind margin. Expands about 1¼ inches. Common in Northern and Central Europe, and in Northern and Western Asia, in June and July. The larva is green, with dark angular spots on the back, and a white stripe on the

sides, suffused above; and there is a slight prominence on the 12th segment. It feeds on low plants, such as bramble, raspberry, and foxglove, in August and September. The moth is figured at Pl. 38, Fig. 6.

GENUS XXIX.—TRIGONOPHORA (HÜBN.).

Allied to *Hadena*, but the thorax is not crested, and the hind margin of the fore-wings is dentated; the antennæ of the male are dentated and ciliated. The commonest species, **T. Flammea*, Esp. (*Empyrea*, Hübn.), has rather long dark violet-brown fore-wings, with a purplish reflection, and the inner margin yellowish-white. The transverse lines are rather lighter than the ground-colour, the inner line is nearly straight, the elbowed line a little dentated, with a very acute angle at the upper portion, and the subterminal line is waved, and followed by a blackish shade. There is a large velvety black spot in the central area, in the angle formed by the elbowed line, on which stands the whitish reniform stigma, which sends off an angular projection from its lower end towards the base; the orbicular stigma is concolorous and indistinct, and the claviform stigma is large and black, and touches another black spot which extends to the elbowed line. There is a large black dash at the base, above the yellowish inner marginal stripe, and the hind-wings are uniform dark grey. Expands from $1\frac{3}{4}$ to 2 inches. It inhabits Southern and Western Europe as far north as Sussex, in September and October, and is taken at sugar. The larva is greenish or brownish, with three pale lines, and a row of dark lozenge-shaped spots on the back. It feeds on low plants in early spring. *T. Jodea* (Guén.), which inhabits France in August and September, is closely alied to *Flammea*, but is rather smaller and paler; fore-wings with the inner margin concolorous, and the stigmata only a little paler than the ground-colour; the orbicular stigma is large and well marked, and the reniform stigma is oblong and a little constricted; hind-wings rosy white, with traces of a blackish lunule, and two transverse lines. The larva feeds on broom and sloe in spring.

GENUS XXX.—HABRYNTIS (LED.).

Contains species rather above the middle size, the fore-wings narrow at the base, with the hind margin more or less oblique and sinuated, with the inner margin distinct; the *Noctua*-pattern somewhat irregular, and the claviform stigma absent. The abdomen is strongly crested on the three first segments in *Meticulosa*, which differs from *Scita* in the shape of the fore-wings, and is the type of the genus *Brotolomia* (Led.). In repose the wings are folded lengthwise around the body.

1. *H. Scita* (Hübn.).—Fore-wings light apple-green, varied with whitish in the basal and marginal areas, with the central area narrow, forming a dark green triangle, truncated on the inner margin; the transverse lines are single, white, nearly straight, and not dentated; the elbowed line is indistinct, and projects a little outwards beyond the middle; the two stigmata are large and connected below; the orbicular stigma is white and oblique, and the reniform stigma is white above and in front, and bordered with black behind; the subterminal line is indistinct, and finely zigzag, with a dark green dot below the costa; hind-wings whitish, suffused with yellow, with greenish fringes. Expands from $1\frac{1}{2}$ to $1\frac{3}{4}$ inches. Inhabits rocky woods in Central Europe, except the north-west, in June and July, but not common. The larva is green, with dark angular spots on the back, and a dull pale stripe on the sides. It feeds on fern (*Pteris aquiliva*) and *Ficaria ranunculoides* from autumn to May, and may be obtained by sweeping. The moth and larva are figured at Pl. 38, Fig. 7, *a*, *b*.


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3.
7a.
12a.
1b.
1a.
7b.
A.
B.
C.
D.

* 2. *H. Meticulosa* (Linn.), (*Angle-shades Moth*).—Fore-wings olive-brown, pale ochreous suffused with pink in the front half of the basal area, and in the suffused submarginal band; the central area broadly triangular, bordered by the pale transverse lines, which are slightly interrupted; the stigmata large, and united below, bordered with whitish; the orbicular stigma grey, and the reniform stigma filled up with pink in front; the subterminal line is indistinct, and marked with a black dot below the costa; hind-wings yellowish-white, with a dark curved line, and dusted with brownish before the hind margin. Expands about 2 inches. Abundant in Southern and Central Europe in May and June, and again from August to October. The larva has a slight projection on the 12th segment; it is green or brown, with dark oblique streaks on the back, and a white stripe on the sides. It feeds on low plants from autumn to May, and in July and August. The moth is figured at Pl. 38, Fig. 8.

GENUS XXXI.—MORMO (STEPH.).

Fore-wings very broad, with the hind margin long, a little oblique, slightly arched, and dentated, the tip obtusely pointed, and the hinder angle distinct; hind-wings broad and rounded, extending as far as the abdomen, which is crested above on the four first segments. The only species, **M. Maura*, Linn. (the *Old Lady*), has dark brown fore-wings, with a slight purplish shade, blackish in the outer half of the central area, with double black transverse lines, bordered with lighter on the inside, and not dentated, which are arched, and nearly parallel; the median nervure, the borders of the two black stigmata, a spot at the tip, and the subterminal line pale grey; the latter is zigzag, broadly shaded with darker in front; hind-wings dark grey, with two yellowish-grey transverse stripes in the middle and before the hind margin. Expands about 2½ inches. Common in Southern and Central Europe in July and August. It may be found in the day-time resting on dark walls, especially under bridges or may be seen flying in gardens, or into houses at dusk. The larva is yellowish-grey, with three light lines, and dark connected lozenge-shaped spots on the back, oblique transverse dashes bordered with light in front, and a light longitudinal line on the sides. It feeds on alder, willow, and low plants from April to June, and conceals itself very carefully during the day. The moth is figured at Pl. 41, Fig. 1.

GENUS XXXII.—NÆNIA (STEPH.).

Fore-wings rather convex behind, with the hind margin long and not dentated; the *Noctua*-pattern distinct; hind-wings broad, and extending nearly as far as the tip of the abdomen; rounded and slightly contracted below the tip. The only species, **N. Typica* (Linn.), has brown fore-wings with pale nervures, the transverse lines double, slightly dentated, and bordered inside with pale grey; the subterminal line pale grey, scarcely zigzag, and spotted with black in front; the two stigmata are bordered with white, and the orbicular stigma is rather long; hind-wings brownish-grey. Expands from 1½ to 1¾ inches. Common in Europe and Northern Asia in June and July. The larva is brownish-grey, with a reddish-grey stripe on the sides, bordered above with darker, above which are dark oblique dashes, bordered with pale; and those on the hinder segments are thicker. It feeds on low plants till May.

GENUS XXXIII.—JASPIDEA (BOISD.).

Fore-wings pointed at the tip, with the hind margin dentated, and with a wholly irregular pattern; hind-wings broad, and without markings. The only species, *J. Celsia* (Linn.), has

apple-green fore-wings, with a brown central transverse band, with a branch projecting on each side in the middle, a small brown dot beyond, and the hind margin irregularly brown; fringes brown; hind-wings brownish-grey. Expands from 1½ to 1¾ inches. A rare species, inhabiting the east and north of Europe, in August and September, as far west as Sweden and Eastern Germany; also found in Northern Asia. It is figured at Pl. 54, Fig. 5.

GENUS XXXIV.—RHIZOGRAMMA (LED.).

Fore-wings with an oblique moderately curved hind margin, and the hinder angle distinct; the *Noctua*-pattern is scarcely indicated, and the hind-wings are small, and do not extend so far as the middle of the abdomen. The only species, *R. Detersa*, Esp. (*Petroriza*, Borkh.), has pale grey fore-wings, with a black basal streak, and black longitudinal dashes before the hind margin, especially above the middle, and the anal angle; the two stigmata connected below, a little lighter, and narrowly surrounded with black; all the transverse lines quite indistinct. Hind-wings bluish-white, with the nervures and hind margin brown. Expands from 1¾ to 2 inches. Common in Southern and South-Central Europe in July and August. The larva is clay-colour, streaked with darker, with three dull lines on the back, and a dark brown stripe on the sides. It feeds on barberry in May. The moth is figured at Pl. 38, Fig. 9.

GENUS XXXV.—CLOANTHA (BOISD.).

Rather small moths; the fore-wings short, with the hinder angle distinct; the transverse lines absent, and the subterminal line faintly indicated or incomplete; the orbicular stigma is absent in the two first species. The larvæ are thick, and feed on St. John's wort in July and August; and the moths, which appear in May and June, are found flying over flowers in the day-time.

* 1. *C. Polyodon* (Clerck), *Perspicillaris* (Linn.).—Fore-wings olive-brown, varied with pale ochreous and reddish-violet, with a slender black basal streak, and a large crescent-shaped reniform stigma, surrounded with paler; the marginal area with long sharp whitish teeth below the tip, and two similar ones below the middle, intersecting the strongly waved fringes; and with black triangular spots between; hind-wings dirty white, with a broad dark marginal band. Expands from 1¼ to 1½ inches. Widely distributed in Europe and Northern Asia, but a great rarity in England. The larva is cherry-colour, with three light lines on the back, and small blackish oblique streaks between; and a broad yellow stripe on the sides.

2. *C. Radiosa* (Esp.).—Fore-wings olive-green, varied with whitish in the marginal area, where there are two long and sharp teeth projecting into the slightly waved fringes. There are black triangles on the hind margin, and the fringes are sharply intersected with white. Hind-wings whitish, with a large black central lunule, and a black marginal band, broader than in *Polyodon*. Expands about 1 inch. Inhabits the southern half of Central Europe, but much scarcer than the last species. The larva is reddish-brown, with three dull dark lines on the back, and a pale yellow stripe on the sides, suffused with reddish, and spotted with black above.

3. *C. Hyperici* (W. V.).—Fore-wings pale grey, varied with brown, with a long black basal streak edged above with a yellowish one; the subterminal line faintly indicated, bordered with brownish behind, and crossed by longitudinal black streaks; the two stigmata are bordered with black; the fringes are slightly waved, and spotted with dusky, and the

hind-wings are dusted with grey. Expands about 1 inch. Inhabits Southern and South-Central Europe and Western Asia. The larva is reddish-grey or brown, with dark spots on the back, three whitish lines on the back, and a white stripe on the sides.

GENUS XXXVI.—ERIOPUS (TR.).

Small moths, the fore-wings with the *Noctua*-pattern, but the claviform stigma absent and the subterminal line indistinct; the fringes slightly waved, and spotted with paler and darker behind; hind-wings broad, extending nearly as far as the abdomen, strongly contracted below the tips, and dusted with brownish-grey. The larvæ are slender, thickened behind, and with a slight prominence on the 12th segment.

1. *E. Purpureofasciata* (Pill.), *Pteridis* (Fabr.).—Fore-wings with an angular projection in the middle of the hind margin, olive-brown, whitish before the tip, with pale yellow nervures, and single black transverse lines, which are not dentated, but broadly bordered with purplish-red behind; the marginal area is rusty-brown behind, with an oblique white streak above the middle, and a pink spot at the hinder angle; the two stigmata are bordered with white, and the orbicular stigma is very narrow and oblique; hind-wings brown, whitish towards the base. Expands from 1¼ to 1½ inches. Inhabits Southern and Central Europe, except the north-west, in June, but not very common. The larva is green, with red or white crescents on the back, bordered with white, and hollow behind; or reddish, with pale yellow crescents. It feeds by day on the under surface of the fronds of the fern (*Pteris aquilina*) in August and September, and passes the winter full-grown in a thick cocoon, in which it becomes a pupa in spring. The moth is figured at Pl. 38, Fig. 10.

2. *E. Latreillii* (Dup.).—Fore-wings with the hind margin regularly curved, dark grey, varied with paler grey, and suffused with reddish on the nervures, with the transverse lines dark, double, slightly dentated, and bordered with white inside, and a slender white subterminal line, more distinct above the middle; the two stigmata bordered with paler, and the orbicular stigma round and very small; hind-wings yellowish-white, washed with grey towards the hind margin. Expands about 1 inch. Inhabits South Europe, as far north as the South-Eastern Alps; and likewise occurs in North Africa. The larva is rusty-red, with many indistinct pale longitudinal lines; and yellow stigmata. It feeds on *Ceterach officinarum*, &c., only eating the reddish scales which cover the capsules below the leaves; and there is a succession of broods throughout the year.

FAMILY VI.—XYLINIDÆ.

Middle-sized or rather large moths; the fore-wings a little broader behind, with the tip obtuse, and the hinder angle distinct; the hind margin not longer than half the length of the inner margin. The colour of the fore-wings is brown or grey, often resembling that of rocks or petrified wood, with the *Noctua*-pattern more or less distinct; hind-wings small, with a short hind margin, and strongly contracted below the tips. The legs are short; the antennæ of the males are densely ciliated, and the palpi are small, porrected, and hairy. The larvæ are naked and cylindrical, with sixteen legs, and undergo their transformations in the ground. The moths fly at night, and may be taken at sugar; or may be found at rest during the day on palings, trunks of trees, &c.

GENUS I.—XYLINA (TR.).

Middle-sized moths; the fore-wings with the hind margin strongly rounded in the middle, and consequently more oblique above the hinder angle, a black basal streak bordered in front with pale as far as the hind margin, and a pale subterminal line, strongly zigzag, especially in the middle; the orbicular and reniform stigmata are large and broad, or indistinct, and the transverse lines are often undistinguishable. The hind-wings are brownish-grey, generally lighter towards the base; the palpi are almost drooping; and the abdomen is strongly crested, with a particularly prominent crest, truncated above, on the 4th segment; or is not crested, with loose erect hair in front only. The larvæ feed on trees from May to the beginning of July, and are mostly active in the day-time. The moths appear from August to October, and slope their wings slightly when at rest. The females hybernate, and do not lay their eggs till spring.

* 1. *X. Socia* (Hufn.), *Petrificata* (W. V.).—Fore-wings pale yellowish-brown along the costa and inner margin, shading slightly into grey, or dark grey between, with indistinct dentated transverse lines, and a more suffused subterminal line, with long teeth, and spotted with rusty-brown in front; the orbicular and reniform stigmata are pale yellowish, not distinctly bordered; the first oblique, and the latter with a dark brown streak below; the abdomen with two narrow crests on segments 3 and 4. Expands from 1½ to 1¾ inches. The larva is green, marbled with whitish, with a very distinct white stripe on the sides. It feeds on lime, elm, &c.

* 2. *X. Semibrunnea* (Haw.).—Resembles *Socia*, but the fore-wings are narrower, brownish-yellow on the costa, and dark reddish-brown on the entire inner marginal half; above the outer portion of the inner margin is an eye-like blackish shade, bordered with paler; all the transverse lines are indistinct, and the stigmata are only indicated by light spaces; the abdomen has prominent black crests on the 4th and following segments, which diminish in size behind. Expands from 1½ to 1¾ inches. Inhabits Southern and Western Europe. The larva feeds on oak, and forms a solid cocoon in the ground, composed of grains of earth, and brown silk.

* 3. *X. Furcifera* (Hufn.), *Conformis* (W. V.).—Fore-wings dark violet-grey, varied with brownish, with indistinct double transverse lines, which are slightly dentated, and a suffused subterminal line, shortly zigzag, and bordered in front with rusty-brown; the three stigmata distinct, the reniform stigma very large and broad, and constricted in the middle, varied with rusty-red inside, and broadly bordered with black below; the claviform stigma with a deep black streak behind; the abdomen with a strong crest on the 4th segment, and the under side suffused with reddish. Expands from 1¾ to 2 inches. Inhabits Northern and Central Europe and the Altai; a great rarity in England. The larva is grey, varied with brownish, with three light lines on the back, and a grey stripe on the sides, spotted with black above. It feeds on oak and alder, hiding itself in the crevices of the bark during the day.

4. *X. Ingrica* (Herr.-Schäff.).—Resembles *Furcifera*, but the fore-wings are narrower, pale grey, the basal area darker, all the transverse lines more distinct, the reniform stigma smaller and rounder, with the centre brownish, the streak running from the claviform stigma shorter, and the under side not suffused with reddish. Expands about 1¾ inches. Inhabits Northern and Eastern Europe and the Alps, but is a scarce insect.

* 5. *X. Zinckenii* (Tr.).—Fore-wings light bluish-grey, varied with darker, a black basal streak filled up with whitish, and curved forwards towards its extremity, a black streak shaded with dusky above in the position of the claviform stigma, and extending to the elbowed line; and the two upper stigmata bordered below with deep black, the transverse lines indistinct, and the subterminal

line indicated by its being shaded behind, dark and irregularly zigzag; abdomen not crested. The variety *Somniculosa*, Herr.-Schäff. (*Lambda*, Fabr.), has wholly unicolorous bluish-grey fore-wings with scarcely any markings, only the two black streaks being distinct. Expands from 1½ to 1¾ inches. Inhabits Northern and Central Europe, but scarce and local; *Somniculosa* appears to be almost confined to the neighbourhood of Berlin. The larva is bluish-green, dotted with whitish, with three whitish lines on the back, and a yellow stripe on the sides. It is said to feed on *Myrica Gale*, and probably on alder also.

*6. *X. Ornithopus* (Hufn.), *Rhizolitha* (Fabr.).—Fore-wings pale grey, slightly varied with brownish, with all the transverse lines indistinct; a black branching basal streak, shaped like a stag's horn; the claviform stigma distinct, and bordered by a black streak; the reniform stigma constricted in the middle, and bordered with black below, and the abdomen not crested. Expands about 1½ inches. Common in many parts of Europe. The larva is verdigris-green, reticulated with white, with three white lines on the back, and one on the sides. It feeds on oak and sloe. The moth is figured at Pl. 38, Fig. 11.

7. *X. Lapidea* (Hübn.).—Fore-wings pale bluish-grey, slightly varied with brownish, with no basal streak; all the transverse lines quite indistinct; the only indication of the stigmata is a black streak representing the lower border of the reniform stigma; and there are also a few fine black longitudinal streaks below the middle and on the hind margin; abdomen not crested. Expands about 1½ inches. A rare species, inhabiting South Europe and the Valais. The larva lives on cypress and juniper, and constructs a very fine cocoon of strong silk on the surface of the ground, under moss.

8. *X. Merckii* (Hübn.).—Fore-wings ashy-grey, with a slight bluish tint; most of the nervures black; the stigmata and transverse lines obsolete, but the latter indicated by very deep zigzags. A slight brown shade runs from the tip, and is lost before reaching the inner margin. Expands about 2 inches. A scarce species, inhabiting Southern Europe. The larva feeds on alder.

GENUS II.—CALOCAMPA (STEPH.).

Rather large moths, expanding from 2 to 2¼ inches, the fore-wings long and narrow, with slightly-curved and much-waved fringes; brown or grey, with darker longitudinal dashes; the orbicular and reniform stigmata visible, and the subterminal line indicated by a long pale W in the middle; and there are dark dots separated by white ones on the nervures in the position of the suffused submarginal band; the other markings are indistinct; the hind-wings are triangular, brownish-grey, with a slightly-curved hind margin. The larvæ feed on low plants in June and July, during the day. The moths appear in September and October, and hybernate, re-appearing in March and April. They fold their wings longitudinally round their bodies. Both species are common in Europe and Siberia.

*1. *C. Vetusta* (Hübn.).—Fore-wings pale brownish-grey on the costal half, whiter towards the base, and dark brown on the inner marginal half, with a long black streak in the middle of the subterminal line, which extends to the reniform stigma; the orbicular stigma is absent or indistinct. The larva is green, with three light lines on the back, three white dots between, on each segment, and a yellow stripe on the sides, bordered above with brown.

*2. *C. Exoleta* (Linn.), (*Sword-grass Moth*).—Fore-wings light violet-grey, with the costa brown; the orbicular stigma distinct and rather long, and small black arrow-heads before the middle of the subterminal line; the reniform stigma bordered behind with a black dentated spot. The larva is green, with two yellow subdorsal stripes (sometimes absent), above which are two

white spots in black rings, and connected by a black line on each segment; a red stripe on the sides, bordered with white. It prefers cypress spurge to other food. The moth and larva are figured at Pl. 38, Figs. 12, *a*, *b*.

GENUS III.—EGIRA (DUP.).

Fore-wings rather pointed at the tips, and the fringes much waved; the *Noctua*-pattern complete, except that the claviform stigma is absent; hind-wings much contracted above the middle; position of the wings at rest the same as in *Calocampa*. The only species, **E. Solidaginis* (Hübn.), has grey fore-wings, varied with brownish, and (especially in the marginal area) with whitish, with dark dentated transverse lines bordered with paler, a small round orbicular stigma, and a large reniform stigma with a white centre; the subterminal line whitish, with a distinct W, and deep black arrow-heads in front; hind-wings dirty white, with a grey curved stripe and hind margin. Expands from 1½ to 1¾ inches. Inhabits Northern and Central Europe and the Altai in August and September, chiefly in hilly districts. The larva is reddish-brown, with three light lines on the back, dark angular shades between, and a broad pale yellow stripe on the sides, bordered above with brownish-red. It feeds on bilberry in June.

GENUS IV.—XYLOMYGES (GUÉN.).

Wings shaped as in *Egira*, but the hind-wings are less contracted. On the fore-wings the transverse lines are absent, but the subterminal line is indicated by a pale space, which has two long teeth in the middle, separated and bordered by narrow black triangles. The only species, **X. Conspicillaris* (Linn.), has pale yellowish-brown fore-wings, pale grey in the suffused submarginal band, and often more or less varied with dark brown (sometimes so much so that in variety *Melaleuca*, View., only the inner margin and a stripe in the position of the subterminal line remain pale); the three stigmata are narrowly bordered with black, the reniform stigma is open behind, and the hind-wings are white. Expands about 1¾ inches. Inhabits Central Europe and the Altai from April to June, but not generally common. The larva is green or brown, with dark suffused lozenge-shaped spots on the back, and a yellowish-white stripe on the sides. It feeds on various low plants in July. The moth is figured at Pl. 38, Fig. 13.

GENUS V.—SCOTOCHROSTA (LED.).

Fore-wings sloping off obliquely behind beyond the middle, with the *Noctua*-pattern quite indistinct, but with longitudinal stripes; hind-wings short and rounded, and the abdomen extending much beyond them. The only species, *S. Pulla* (W. V.), has slaty-grey fore-wings, varied with darker, with slender black nervures and black longitudinal streaks, especially between and below the stigmata and beyond the subterminal line; the orbicular and reniform stigmata are indicated by their yellowish colouring, and the subterminal line by the rather lighter suffused submarginal band, which is zigzag behind; hind-wings white Expands from 1¾ to 2 inches. Inhabits Southern Europe in September. The larva is green, marbled with white, and with a white stripe on the sides. It feeds on low plants in April and May.

FAMILY VII.—CLEOPHANIDÆ.

Rather small moths; the fore-wings short and broad, with a long and rather oblique hind margin, slightly and regularly curved, and the *Noctua*-pattern irregular, though occasionally more

distinct; hind-wings round, scarcely contracted below the tips; the palpi small, and hairy below, the collar seldom so much developed as in *Cucullia*, the abdomen convex, and not extending much beyond the anal angle. When at rest, the wings are generally sloping. The larvæ are naked, with sixteen legs.

GENUS I.—XYLOCAMPA (GUÉN.).

Fore-wings narrow towards the base, coarsely scaled, with long fringes; the claviform stigma absent, but the other stigmata of equal size; the transverse lines are indistinct, and the head has a hairy crest in front. The moth flies late in the evening. The only species, **X. Arcola*, Esp. (*Lithorhiza*, Borkh.), has grey fore-wings, dusted with brown, and varied with brown in the central area, with a black basal streak; the two stigmata large, united, and edged below by two black curves; the subterminal space suffused in front, and spotted with dark brown behind, and sometimes in front also; hind-wings dusted with grey. Expands from 1¼ to 1½ inches. Inhabits Western Europe in March and April. The larva is grey, with a whitish line on the back, below which are black spots on the 8th and 9th segments, and a dark stripe on the sides. It feeds on honeysuckle in June and July, hides itself during the day, and undergoes its transformations in the ground.

GENUS II.—LITHOCAMPA (GUÉN.).

Fore-wings narrow at the base, with smooth scales and short fringes; the elbowed line is visible below the costa, and the subterminal line at the hinder angle, the other lines being obliterated; the hind-wings are broad, and the palpi thinly clothed with hair. The moths fly at night. The larvæ have two small pointed projections on the 12th segment, and the two first pairs of prolegs are shorter than the others. They change to pupæ in a loose cocoon. The commonest species, *L. Ramosa* (Esp.), has pale ashy-grey fore-wings, broadly brown on the inner margin, with a light brown transverse shade running towards the tip in the suffused submarginal band, and black longitudinal streaks on the hind margin; the orbicular and reniform stigmata are connected below, and form a strong rounded projection; hind-wings white, with the hind margin brownish. Expands from 1¼ to 1½ inches. Inhabits the south of Central Europe in May and June. The larva is brownish-yellow, varied with whitish on the back, and with blackish oblique dashes; on the sides is a dark longitudinal stripe. It feeds on honeysuckle in July and August. The other species, *L. Millierei* (Staud.), from Catalonia, has silver-grey fore-wings, with a dark longitudinal shade running nearly to the hind margin, where it divides into four short streaks running to the tip. The two upper stigmata are broadly bordered with white, especially the lower end of the reniform stigma, and the orbicular stigma forms a long narrow segment of a circle, running obliquely outwards, and nearly touching the reniform stigma; a small portion of it even extends beyond the discoidal cell. Otherwise, the species resembles *Ramosa;* and the larva likewise feeds on honeysuckle, and is double-brooded.

GENUS III.—EPIMECIA (GUÉN.).

Fore-wings long and narrow, broader behind, with the tip rounded and the hind margin rather oblique; the *Noctua*-pattern very indistinct. Hind-wings and fringes broad and rounded; larva long and slender, spindle-shaped. The only species, *E. Ustula* (Freyer), has slaty-grey fore-wings, with the hind margin and a longitudinal shade in the middle of the wing rusty-

red; the stigmata are replaced by two small whitish dots, and the transverse lines are barely indicated by some small black dots. Hind-wings whitish, with the nervures and hind margin dark grey. Expands about 1¼ inches. Found throughout South Europe and Northern and Western Asia. It is double-brooded, and is met with from May to August, flying over flowers in the evening. The larva is green, with yellowish-white stripes on the back and sides. It feeds on *Scabiosa leucantha* in May and June, and again in August, hiding itself at the roots of the plants during the day. It constructs a thick egg-shaped parchment-like cocoon, in which it changes to a rather long and slender pupa.

GENUS IV.—CALOPHASIA (STEPH.).

Rather small moths; the antennæ of the male densely ciliated, the fore-wings grey or white, with the stigmata small or absent, and the other markings mostly indistinct; hind-wings small. The larvæ are marked with yellow lines and many dark spots, and live on toadflax and larkspur; they undergo their transformations in a firm cocoon. The moths fly over flowers in the day-time.

1. *C. Casta* (Borkh.), *Opalina* (Esp.).—Fore-wings milk-white, varied with violet-grey in the central and marginal areas; the hind margin edged with reddish-brown, the subterminal line white, interrupted, shortly zigzag in the middle, and spotted with black behind. The fringes are spotted with black and white; hind-wings white, with the hind margin reddish-grey. Expands about 1 inch. Common in the south of Europe in May and June, in August and September. The larva is yellowish-white, with three yellow lines on the back, and dark brown spots.

2. *C. Platyptera* (Esp.).—Fore-wings ashy-grey, with a brownish shade running from the middle of the inner margin to the tip, and slender black nervures and intermediate black streaks in the marginal area, which are intersected by the pale suffused submarginal line. The transverse lines and stigmata are absent; hind-wings brownish, paler towards the base. Expands from 1 to 1¼ inches. It inhabits Southern Europe in June, and the larva resembles that of *Lunula*. A very dark variety, *Olbiena* (Dup.), was once taken at Hyères in April. (*C. Hamifera*, Staud., from Castile, differs from *Platyptera* in having three black and three ashy-grey rings on the prothorax, and a black hook-shaped mark at the hinder angle of the fore-wings. It flies over flowers in the evening in June, and the larva feeds on *Linaria nivea*. *C. Almoravida*, Grasl., from Andalusia, is a little smaller, with nearly unicolorous wings. There is a pinkish-grey basal stripe, bordered by slender black lines, and there are longer uninterrupted black lines towards the extremities of the wings. The larva feeds in spring, and the moth appears in the summer of the following year. *C. Freyeri*, Friv., from Turkey and Armenia, has bluish-grey fore-wings, with the base, transverse lines, and central shade white, and marginal black spots; hind-wings blackish, with the hind margin and a central stripe paler.)

3. *C. Lunula* (Hufn.), *Linariæ* (W. V.).—Fore-wings rusty-brown, varied with pale grey in the basal and marginal areas; the inner line double, the lower part of the elbowed line forming a large arch as far as the middle, from whence it is continued in a series of black dashes to the tip; the two stigmata distinctly white, and the fringes broadly intersected with white. Hind-wings brown; dirty white towards the base, with brown nervures. Expands from 1 to 1¼ inches. Inhabits many parts of Central Europe in May and July, but doubtfully British. The larva is pearly-white, with yellow longitudinal lines, black transverse spots

on the back, and black spots on the sides; it feeds in June and August. The moth is figured at Pl. 39, Fig. 2.

GENUS V.—CLEOPHANA (BOISD.).

Fore-wings pointed at the tips, with double but indistinct transverse lines; the subterminal line absent, and the reniform stigma indistinct; hind-wings small. The larvæ undergo their transformations in a strong cocoon, and the moths, which fly by day, are all inhabitants of Southern Europe.

1. *C. Antirrhini* (Hübn.).—Fore-wings pale ashy, varied with greyish-brown, and the costa slightly reddish, the two stigmata small, with dark centres, and bordered with pale, the transverse lines indistinct and double, black and white streaks in the marginal area, and the fringes spotted with white; hind-wings whitish, with a broad brown marginal band. Expands from 1 to 1¼ inches. Inhabits South Europe, parts of Austria, and Western Asia in June. The larva is green, with black spots and white longitudinal lines. It feeds on toadflax and *Scabiosa ochroleuca* in June.

2. *C. Serrata* (Tr.).—Fore-wings varied with silvery-white and brown, the central area darker, edged by the white transverse lines, which are bordered with blackish within and brown outside; the hind margin white, intersected with long brown dashes; hind-wings yellowish-brown, with a broad dark brown border; fringes white. It inhabits Sicily and Andalusia. Larva reddish-brown, with narrow black undulating subdorsal and lateral lines.

3. *C. Olivina* (Herr.-Schäff.).—Fore-wings olive-green, nervures blackish, fringes spotted with brown and white, a white longitudinal streak in the middle of the wings, and paler dashes towards the costa, and in nervures 1, 2, and 5; hind-wings dark grey. Inhabits Piedmont and Turkey.

4. *C. Anarrhini* (Dup.).—Fore-wings straw-colour at the base and hind margin, intersected with brown rays; the transverse lines black, bordered with yellow, and much dentated; the central area reddish-brown, the colour extending beyond the lines, and a row of black radiating lines running from the elbowed line towards the hind margin; hind-wings blackish, lighter at the base, with the fringes pale yellow. Expands about 1 inch. A rather scarce species, inhabiting South France in May. It is figured at Pl. 55, Fig. 3.

5. *C. Dejeanii* (Dup.).—Fore-wings ashy-grey, with the transverse lines slender, black, bordered with white, and connected in the middle by a black streak; the inner line strongly angulated towards the base, the elbowed line forming two teeth below the discoidal cell, and arched above, and the space outside the central area bordered with dark brown. The reniform stigma brown and triangular, bordered with white, and touching the elbowed line; the orbicular stigma wanting. The marginal area is intersected with black rays, surrounded with white. Hind-wings dark grey, paler at the base; fringes white, intersected with grey. Size of *Anarrhini*. Inhabits South Europe in May. The larva is pale yellow, with red subdorsal lines spotted with white, and red spiracles. (*C. Bætica*, Ramb., from South-Western Europe, has grey fore-wings, varied with brown, the transverse lines white, and sharply bordered on both sides with black.)

6. *C. Yvanii* (Dup.).—Fore-wings ashy, varied with reddish-brown, especially in the central and marginal areas. The transverse lines are black and slender, and the inner line forms several angles, that in the middle projecting so as to touch an angle formed by the elbowed line, and thus dividing the central area into two portions, of which the uppermost is the largest. The reniform stigma is represented by a small white spot on a dark ground, and the orbicular stigma is absent,

or represented by some small white dots. The fringes are slightly interrupted with grey. Hind-wings grey, with the hind margin darker. Size of *Dejeanii*. Inhabits South France and Spain in May. The variety *Diffluens* (Staud.), from Cadiz, is dark grey, with a blackish central shade, and the two lines nearly parallel and not united; the elbowed line dentated; the reniform stigma bordered with white below and on the outside, and the orbicular stigma more distinct than in the type. The larva is yellowish-white, with four red longitudinal lines on each side. It feeds on the seeds of a species of *Helianthemum* with a yellow flower. (*C. Opposita*, Led., from Turkey and Armenia, has ashy fore-wings, darker at the base, with a brownish fascia in the middle, touching the whitish reniform stigma; subterminal line whitish, continuous, and dentated; fringes spotted with black and white; hind-wings pale grey, with very broad brownish hind margins, and a brown stripe in the middle. Expands nearly 1 inch.)

7. *C. Pectinicornis* (Staud.).—Fore-wings grey, darker in the inner half of the central area, and with a dark grey triangular spot on the costa, near the tip; the transverse lines black and dentated, the inner line bordered within with paler, and the elbowed line standing on the paler grey ground-colour of the wing; a white suffused subterminal line, and a black and white line at the root of the fringes, which are spotted with black and grey; hind-wings white, with the hind margin broadly brown. Antennæ distinctly pectinated in the male. Expands a little more than 1 inch. Inhabits Andalusia.

FAMILY VIII.—CUCULLIIDÆ.

Middle-sized moths, with long and narrow lanceolate fore-wings, with the tip pointed and the hind margin short and oblique; brownish-yellow, grey, silvery-white, or green, sometimes with silvery spots, and generally with longitudinal markings; the transverse lines and spots rarely distinct, but the inner line, when present, is long and sharply indented, and the elbowed line is sometimes indicated by light crescents on the inner margin. The hind-wings are small, with the tip rather produced and the inner margin very short; and they scarcely extend as far as the middle of the abdomen. The middle and hind tibiæ are provided with woolly flag-like processes. The antennæ of the males are very shortly ciliated, and the collar is raised in the form of a hood, whence the moths have derived their popular German name of "Monks." In England they are generally called "Sharks," from their shape when at rest. The larvæ have sixteen legs, and are naked, smooth, and shining, and generally spotted or streaked with bright colours, and some are provided with short fleshy protuberances. They generally rest on their food-plants during the day, leaping from them among the herbage below if disturbed. They generally prefer the flowers and seeds to the leaves, and feed in summer and autumn, grow very rapidly, and undergo their transformations in the ground. The moths appear next spring, fly over flowers in the evening, and rest during the day on palings, &c., with their wings sloping very obliquely. The species are most numerous in Eastern Europe. There is only one genus.

GENUS CUCULLIA (SCHRANK),

which it is therefore unnecessary to characterise, but it may be divided into two sections. In the first, including species 1—6 inclusive, the fringes of the fore-wings are denticulated and those of the hind-wings strongly waved; and in the second, including the remaining species, the fringes are rounded or but slightly waved.

*1. *C. Verbasci* (Linn.).—Fore-wings brownish-yellow, chestnut-brown along the costa and


11.
9.
10.
8.
1.
7.
3c.
4
5a.
5b.
3a.
6a.
6c.
2.
3b.
6b.
A.
B.
C.

inner margin, with a whitish longitudinal streak in the marginal half, and two pale lunules above the inner margin beyond the middle; the fringes very strongly dentated, being indented to the middle; hind-wings of the male whitish, with the hind margin brownish, and those of the female brown. Expands from 1¾ to 2 inches. Inhabits Central and Southern Europe and Western Asia in April and May. The larva is greenish-white, with slender bluish-grey transverse lines and spots in the incisions; on each segment there are three yellow spots on the back and sides, which are sometimes connected, and those on the back have two black dots in front and two long hatchet-shaped spots behind; belly spotted with black, and prolegs black. It feeds on the leaves of the mullein in June and July. The transformations are figured at Pl. 39, Fig. 3, *a—c*. (*C. Scrophulariphila*, Staud., from Andalusia, has brownish-grey fore-wings; costa and inner margin dark brown, two whitish spots in the middle, and a twice-curved line on the inner margin. Hind-wings whitish, narrowly bordered with brown in the male, and broadly in the female. The larva resembles that of *Verbasci*, but has a broader head, and the spots are more confluent. It feeds from March to May on *Scrophularia sambucifolia*, and the moth appears in spring.)

* 2. *C. Scrophulariæ* (W. V.).—Resembles *Verbasci*, but the fore-wings are dusted with grey on the brown costal area, the brown inner marginal area is narrower and paler, with more distinct black longitudinal lines, and the inner margin is more varied with lighter; there are also two rows of small black dots in the position of the stigmata, the white streak in the marginal area is absent, and the fringes are less strongly denticulated, being only indented to one-third of their length. Size of *Verbasci*. Inhabits Central Europe in May and June. The larva differs from that of *Verbasci* in wanting the transverse lines and spots in the incisions, and the black spots on the belly. There is a black curved line instead of the hinder spots on each segment, and the prolegs are not black, but only spotted with black. It feeds on *Scrophularia* and *Verbascum* from June to August, preferring the flowers and seeds.

* 3. *C. Lychnitis* (Ramb.).—Resembles *Scrophulariæ*, though more uniform and paler ochreous, but likewise suffused with violet-grey on the costa; the dots in the position of the stigmata are smaller, the fringes indented to two-thirds of their length; hind-wings whitish in both sexes, with the hind margin brownish, especially in the female. Expands about 1½ inches. Inhabits Central Europe from May to July, but local. The larva resembles that of *Scrophulariæ*, but the prolegs are not marked with black. It lives on different species of mullein in August and September, feeding on the seeds and fruits, and is always to be found at the top of the plants, often in considerable clusters.

4. *C. Thapsiphaga* (Tr.).—Fore-wings pale ochreous, varied with whitish below the middle, and iron-grey on the costa; brown on the inner margin, with black longitudinal streaks, and two light lunules beyond the middle; the two stigmata indicated by large black dots; fringes as in *Scrophulariæ;* hind-wings whitish, with the hind margin narrowly brownish in the male and broadly brownish in the female. Expands about 1¾ inches. Inhabits Central and Southern Europe from May to July. The larva is bluish-white, with a broad pale yellow stripe on the back and sides, and generally with small bluish spots between. It feeds on the leaves and flowers of the mullein between June and September, and is much commoner than the perfect insect. (*C. Scrophulariphaga*, Ramb., from Corsica, resembles *Thapsiphaga*, but the shading on the costa and inner margin is finer and softer, more as in *Prenanthis;* the hind-wings are decidedly grey in both sexes and on both surfaces, and there is a dark curved line beyond the central spot. The larva has four black spots on the back of each segment, arranged in a St. Andrew's cross, the outer ones touching a yellow longitudinal line.)

5. *C. Blattariæ* (Esp.).—Allied to *Thapsiphaga*, but the fore-wings more iron-grey, only varied with pale ochreous below the tips; above the brownish inner margin runs a purer white colouring from one-third of the length of the wing to the hind margin, and the dots in the position of the stigmata are smaller and more indistinct. Size of *Thapsiphaga*. Inhabits the south of Central Europe and Western Asia in May, but rather scarce. The larva is citron-yellow above, with black spots, often united into the shape of a cross; the sides grey, dotted with black, and the head brown or red. It lives on the flowers and seeds of different species of *Scrophularia* in June and July.

6. *C. Prenanthis* (Boisd.).—Fore-wings dark brown on the costa, broadly ashy-grey below the middle, so that the two colours run together; the inner margin narrowly dark brown as far as the middle, with two pale lunules, that nearest to the inner margin very long and oblique, and with dark brown longitudinal stripes behind in cells 1 *a* and 1 *b*; hind-wings uniform brownish-grey. Expands from 1¾ to 2 inches. Inhabits Eastern Germany and Russia in April and May. The larva is green, with three yellowish lines on the back, and a white line on the sides. It feeds on the seeds of *Scrophularia vernalis* in June.

* 7. *C. Asteris* (W. V.).—Fore-wings violet-grey, the costa broadly reddish-brown, and the orbicular and reniform stigmata narrowly surrounded with dusky; the inner margin narrowly edged with dark brown, with a pale lunule beyond the middle, from the middle of which a dark brown stripe runs to the hind margin; hind-wings brownish-grey, lighter towards the base. Expands about 1¾ inches. Inhabits Central Europe and the Altai from May to July. The larva is green, with yellow stripes on the back and sides, pale subdorsal lines, and black longitudinal lines below. It feeds on golden rod and asters, preferring the flowers, from July to September. (*C. Celsiæ*, Herr.-Schäff., from Salonica, has dark brown fore-wings, with the outer third obliquely pale ochreous; hind-wings brown, with the base and fringes paler. *C. Virgaureæ*, Boisd., from the Ural and Altai, resembles *Asteris*, but the fore-wings are more pointed at the tip; the costa and inner margin are darker, with scarcely any whitish space, and the stigmata are indistinct. *C. Dracunculi*, Hübn., from South Russia and the Altai, has pale grey fore-wings, with darker nervures, and the costa brownish; the stigmata are pale, surrounded with brown; hind-wings grey, with brownish hind margins. *C. Mixta*, Freyer, from Hungary and Sarepta, is closely allied to *Dracunculi*; the fore-wings are dull grey, varied with reddish, and the basal area is banded with pale. *C. Lactea*, Fabr., from South Russia, Armenia, and the Altai, is almost uniform white; the fore-wings and the hind margin of the hind-wings are slightly dusted with brown. *C. Biornata*, Fisch., also from South Russia and the Altai, has pale grey fore-wings, with dark nervures and intermediate white lines, and two longitudinal ochre-yellow bands, the first traversing the cell, and extending nearly to the hind margin; the second, which extends to the hind margin, is in the middle of the wing, and is intersected by a black basal streak; the stigmata are absent. Hind-wings whitish, with the hind margin broadly grey and the fringes white. *C. Balsamitæ*, Boisd., from Hungary and Sarepta, resembles *Dracunculi*; the fore-wings are pale grey, whitish ochreous at the end of the cell, with a slender black longitudinal line bordered with ochreous running from the base through the middle of the wing; hind-wings grey, with the hind margin darker, and the fringes white.)

* 8. *C. Umbratica* (Linn.).—Fore-wings narrow, with the hind margin straight, and half as long as the inner margin; ashy-grey, with a pale ochreous streak above the position of the reniform stigma, and small black dots in the position of the orbicular stigma; narrow black nervures in the marginal area, and black rays, bordered with whitish, between. There is also

a curved black streak beneath the hinder edge of the discoidal cell; and the hind-wings are whitish in the male, and brownish-grey, paler towards the base, in the female. Expands about 2 inches. One of the commonest species of the genus throughout Europe and Western Asia from May to July. The larva is mottled with black and pale brown, and is leaden grey below; the anal fold is bordered with pale grey, and there is a pale grey stripe in the middle. It feeds on sow-thistle from July to September. The moth is figured at Pl. 39, Fig. 4.

9. *C. Campanulæ* (Freyer).—Fore-wings broader than in *Umbratica*, with a slightly-curved hind margin three-fifths of the length of the inner margin; light bluish-grey, with oblique dark shades on the costa, and tolerably distinct and sharply-dentated transverse lines; the dark rays and curved stripe as in *Umbratica*, the former suffused and bordered with pale grey, and that above the hinder angle thicker and more oblique; the orbicular stigma sometimes indicated by its narrow border; hind-wings evenly dusted with brownish-grey, and their tips distinctly angulated. Size of *Umbratica*. Inhabits Southern and South-Central Europe in June. The larva is pearly white, with small white spots and dots, a yellow macular stripe on the back, and a narrower one on the sides. It lives on different species of *Campanula* in August.

10. *C. Lucifuga* (W. V.).—Fore-wings as in *Campanulæ*, with the hind margin rather more curved and the tips not so pointed; dull bluish-grey, varied with brownish; the markings as in *Campanulæ*, but with no trace of the orbicular stigma; the black nervures slightly thickened towards the hind margin, and the black rays before the hind margin sometimes indistinct, and sometimes expanded into triangular spots; hind-wings with the tips rounded, brownish-grey, lighter towards the base in the male. Expands from 2 to 2¼ inches. Inhabits Central Europe in May and June. The larva is black, with a row of broad orange-red spots on the back, and a row of smaller red spots on the sides. It feeds on sow-thistle and wild carrot in July and August.

11. *C. Lactucæ* (W. V.).—Fore-wings rather broad, with the hind margin three-quarters as long as the inner margin, and distinctly curved; dark bluish-grey, paler below the costa and in the broad rays on the hind margin; the markings as in *Campanulæ* and *Lucifuga*, but the curved black stripe is wanting, and the dark rays are replaced by dark longitudinal shades; hind-wings with rounded tips, dirty white in both sexes, with the hind margin broadly brownish-grey. Size of *Lucifuga*. Inhabits Central Europe and Northern Asia in May and June. The larva is pearly white, with a yellow stripe on the back and one on the sides composed of connected spots; between these is a row of alternately oval and oblong large transverse spots. It feeds on sow-thistle and lettuce, preferring the flowers, in July and August. The moth and larva are figured at Pl. 39, Fig. 5, *a*, *b*.

12. *C. Santolinæ* (Ramb.).—Fore-wings slightly dentated and rather broad at the tips; ashy-grey, more or less shaded with brown and whitish, with blackish lines and nervures; the transverse lines are black and dentated, and the elbowed line rests on a whitish spot towards the costa, which is followed by a thick black streak extending to the hind margin. The stigmata are absent. Hind-wings reddish-brown, with brown nervures, darker towards the hind margin and anal angle; fringes spotted with brown and whitish. Expands about 1¾ inches. Inhabits South-Western Europe in April and May. The larva lives on different species of *Artemisia* in April and July.

* 13. *C. Chamomillæ* (W. V.).—Fore-wings narrow, brownish-grey, varied with pale grey, with whitish rays in the marginal area. It may be known by the black lines on the nervures being strongly thickened on the hind margin, and produced beyond to the middle of the

fringes, which are slightly but distinctly waved; hind-wings brownish-grey, with the base lighter. Expands about 1¾ inches. Inhabits Central and Southern Europe and Western Asia from April to June. The larva is greyish-green, with dark green connected markings, and a yellow stripe on the sides. It feeds on wild chamomile from June to August. (*C. Inderiensis*, Herr.-Schäff., from South Russia, is apparently a smaller and paler variety. *C. Rimula*, Freyer, from Sarepta, has ashy-grey fore-wings, with whitish radiating lines, black dots on the disc and hind margin, and the stigmata indistinct; hind-wings white, with the hind margin narrowly grey. *C. Achilleæ*, Guén., from Andalusia, has greyish-white fore-wings, with no transverse lines or stigmata; slightly tinged with ochreous in the cell and towards the hinder angle; a long black basal streak extending to the hind margin, and four black rays towards the hind margin; hind-wings white, slightly clouded with blackish in the female, and with some marginal black dots.)

14. *C. Anthemidis* (Guén.).—Fore-wings pale ashy in the male and greyish in the female, the base and the inside of the discoidal cell tinged with pale reddish; the stigmata scarcely indicated by a few black dots. The inner line is distinct and strongly dentated, and crossed by a long and slender black basal streak; the lower part of the elbowed line is also visible, and double, forming two teeth, from the second of which runs a slender black streak to the hind margin, and there are also some black streaks towards the tip. Hind-wings dark grey, with the base silvery-white, with darker nervures. Expands about 1½ inches. The moth is found flying over flowers at dusk in July and August, at Bordeaux.

15. *C. Tanaceti* (W. V.).—Fore-wings narrow, pale grey, with sharply-defined black longitudinal lines running from the base and beyond the middle, and sometimes with similar short rays between them, and in cell 4, but no other distinct markings; hind-wings white, with the costa narrowly bordered with light brown. Expands about 1¾ inches. Inhabits Southern and Central Europe, except the north-west, in June. The larva is pale pearly grey, with yellow stripes on the back and sides, and many small black dots and spots. It feeds on *Tanacetum vulgare* and *Artemisia vulgaris* in July and August.

16. *C. Santonici* (Hübn.).—Fore-wings narrow, with a thick black truncated stripe above the hinder angle, and slight black streaks before the hind margin towards the tips; the orbicular and reniform stigmata finely surrounded with black, and the hind-wings white. Expands 1¾ inches. Inhabits South Switzerland, South Russia, and perhaps South France, in June. The larva is white, with dirty green angles on the back, open above, and faint red spots adjoining, and with a dirty green stripe on the sides. It feeds on chamomile in July. (*C. Præcana*, Eversm., from the Ural and the shores of the Baltic, has pale grey fore-wings, clouded with whitish, with black dots on the disc and hind margins, and black longitudinal lines towards the hind margin; hind-wings brownish, with the hind margin darker, and white fringes. *C. Cineracea*, Freyer, from the Ural, has ashy-grey fore-wings, with grey radiating lines and marginal spots, the orbicular and reniform stigmata well marked and nearly square; hind-wings pale, with the hind margin grey, and the fringes white.)

17. *C. Xeranthemi* (Boisd.).—Intermediate between *Guaphalii* and *Artemisiæ;* fore-wings bluish-ashy, washed with blackish, with two indistinct stigmata, slightly washed with pale reddish, and with a double blackish centre. Transverse lines indistinct, the angles of the inner line rounded off; hind margins with small black dashes; the subterminal line replaced by faint longitudinal shaded dashes. Hind-wings as in *Artemisiæ*, but less reddish, with the fringes divided by an interrupted blackish line. Expands about 1½ inches. Inhabits South France, South-Eastern Europe, and the Altai in June. The larva is green, with longitudinal pink lines; but its food is unknown.

18. *C. Fraudatrix* (Eversm.).—Fore-wings brownish-grey, with pale grey spots, not sharply bounded, instead of, and below the position of the two stigmata; the transverse lines indicated, especially the inner line, and a rather broad and suffused pale grey subterminal line, intersected by three thick black longitudinal dashes. Hind-wings ashy grey, with the hind margin brown, and the fringes whitish. Expands about 1½ inches. Inhabits Eastern Europe and the Altai. The larva is greyish-white, suffused with flesh-colour and dusted with greenish, with a pale line on the back, and oblique greenish oblong spots. It feeds on wormwood in September.

*19. *C. Gnaphalii* (Hübn.).—Fore-wings rather broad, reddish-grey, varied with light violet-grey in the basal and marginal areas, and narrowly black on the inner margin, with yellowish-brown stigmata surrounded with lighter, two deep black rays before the hind margin, and a light obtusely interrupted transverse line above the inner margin in the position of the elbowed line; hind-wings brownish-grey, paler towards the base. Expands about 1½ inches. Found throughout Central Europe and the Altai in June, but not very common. Larva green, with a row of large connected pale violet lozenge-shaped spots on the back, and a row of smaller spots on the sides. It feeds on golden rod in July and August, preferring the leaves. (*C. Fuchsiana*, Eversm., from the Ural and Altai, has ashy-grey fore-wings, varied with reddish, with lanceolate lines and marginal spots, alternately whitish and black; hind-wings grey, with the hind margin very broadly darker, and the fringes white. *C. Propinqua*, Eversm., from the same localities, has ashy-grey fore-wings, varied with black and fawn-colour, with paler lanceolate lines and marginal spots, and a white streak on the hinder part of the disc; hind-wings ashy-grey, with the hind margin broadly blackish, and white fringes.)

20. *C. Artemisiæ* (Hufn.), *Abrotani* (W. V.).—Fore-wings narrow, varied with paler and darker grey, the inner margin not black, the transverse lines tolerably distinct, the inner line with long teeth, and the elbowed line sharply interrupted above the inner margin; the two stigmata pale, with dark centres and black borders; hind-wings brownish-white, with the hind margin brownish-grey. Expands about 1¾ inches. Inhabits Central Europe (except Britain) and the Altai in May and June. The larva is green, with a white line on the back, and protuberances tipped with brownish-red. It feeds on the flowers of the wormwood in July and August.

21. *C. Scopariæ* (Dorfm.).—Resembles *Artemisiæ*, but smaller, the fore-wings browner, the inner line with much shorter and more obtuse teeth, and the elbowed line obtusely interrupted above the inner margin. It occurs in Austria in July. The larva is reddish-brown or brownish-green, with a pale line on the back, and oblique pale red streaks below, and a broad white stripe on the sides. It feeds on *Artemisia scoparia* in September.

*22. *C. Absinthii* (Linn.).—Fore-wings varied with brown and ashy-grey, with two longitudinal rows of black spots instead of stigmata, the transverse lines double, thick, and black, but the elbowed line only visible above the inner margin; hind-wings as in *Artemisiæ*. Expands about 1½ inches. Found throughout Central Europe and the Altai from May to July; rare in England. The larva is green, humped, marked with white lines on the back and sides, and with reddish-brown crescents. It feeds on wormwood in August and September.

23. *C. Formosa* (Rogenh.).—Fore-wings pearly grey; the central area is nearly black, and intersected by a straight yellowish band, on which stands the small ochreous orbicular stigma, which is surrounded with white; the reniform stigma, which bounds the central area outside, is large, chamois-colour, and shaded with brown behind. The base and inner line are tinged with yellowish, and the nervures are blackish. The fringes are brown, preceded by small blackish lunules on the nervures. Hind-wings hyaline-white, a little clouded towards the hind margins,

and with white fringes. Expands about 1¾ inches. It inhabits South France and Hungary, and the larva, which resembles that of *Absinthii*, feeds on *Artemisia camphorata*.

24. *C. Spectabilis* (Hübn.).—Fore-wings bluish-grey, with angulated orange transverse lines, bordered with black; the orbicular stigma yellowish-brown, bordered with white, and with a white spot behind; the reniform stigma blackish, bordered with orange; a white submarginal line and black marginal spots; hind-wings pale, with a grey curved line, and the hind margins very broadly grey; the fringes white. Inhabits Russia and the Altai.

25. *C. Scopula* (Fisch.), *Magnifica* (Freyer).—Fore-wings silvery-white, the borders and transverse lines yellowish-grey, and the latter bordered with dark green on both sides; hind-wings white. Expands about 1½ inches. Very rare in Austria; commoner in South Russia.

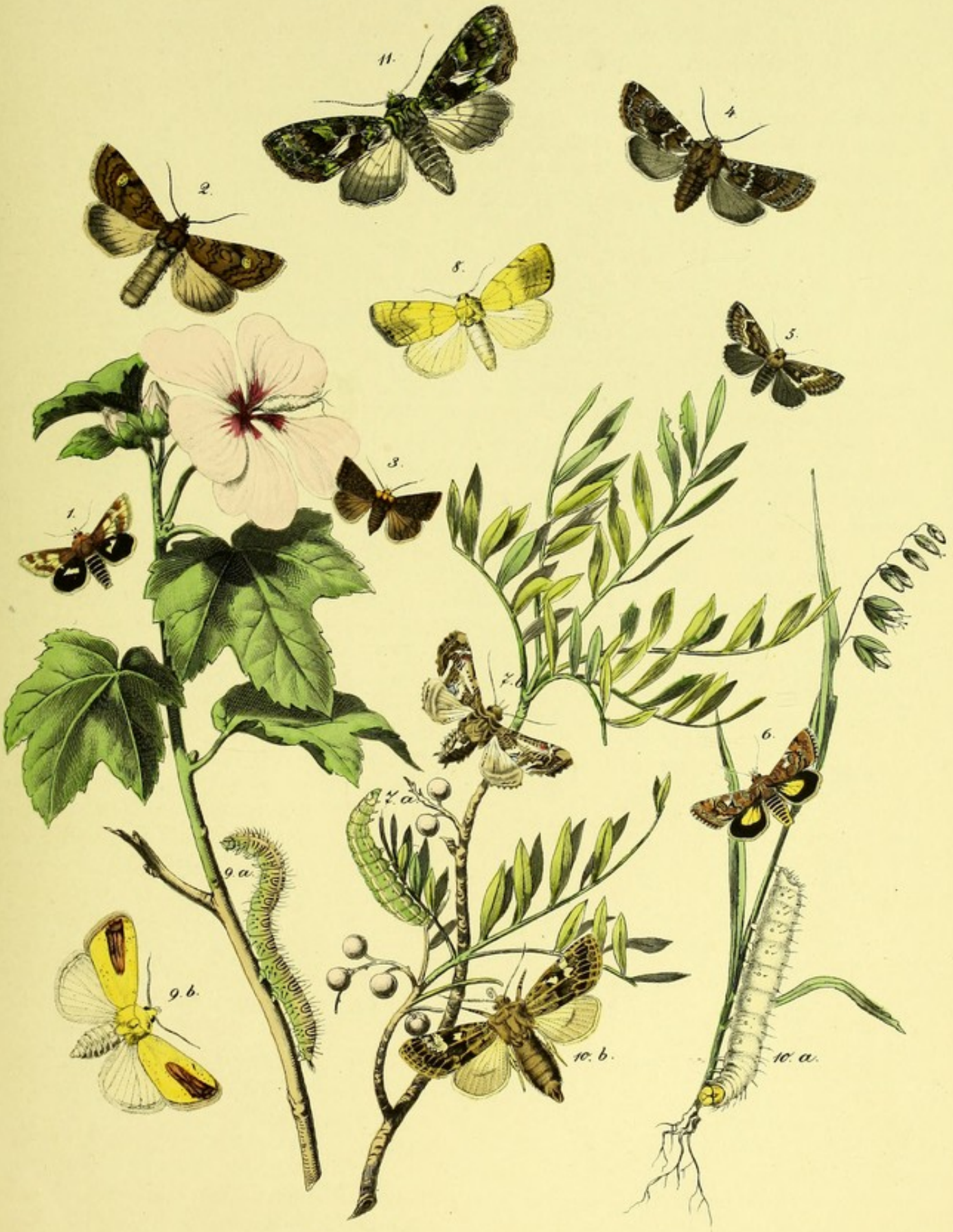
26. *C. Argentea* (Hufn.), *Artemisiæ* (W. V.).—Fore-wings green, with large silvery spots; hind-wings white, greyish towards the hind margin. Expands about 1¼ inches. Inhabits the greater part of Central Europe (except the west) and the Altai in May and June, and erroneously reputed British. The larva is green, with a white line on the back, and brownish-red prominences. It lives on wormwood from July to September. The transformations are figured at Pl. 39, Fig. 6, *a—c*. (*C. Splendida*, Stoll, from South Russia and the Altai, has brilliant silvery-white wings, and the hind-wings broadly bordered with grey. *C. Argentina*, Fabr., has olive-brown and rather pointed fore-wings, with a broad longitudinal brilliant silvery stripe, truncated and slightly concave at the end of the cell; hind-wings white. It likewise inhabits South Russia and the Altai, and remarkably resembles a huge *Crambus*, both in shape and colour.)

FAMILY IX.—EURHIPIIDÆ.

Rather small moths; the fore-wings marbled and finely scaled, slightly projecting below the tips, which are truncated, and then sloping off obliquely; hind-wings very slightly contracted below the tips, scarcely extending beyond the middle of the abdomen; the antennæ of the male dentated and ciliated, and the tongue horny; the femora and tibiæ densely woolly. The larvæ are naked, with sixteen legs, and undergo their transformations in a cocoon in the ground. The moths curve up their abdomen when at rest, and spread their wings out flat like *Geometræ*, so that the hind-wings are not quite covered by the fore-wings. There is but one European genus and species, *Eurhipia Adulatrix* (Boisd.), which has the fore-wings varied with light brown and rosy, with a whitish and strongly interrupted transverse stripe before the middle, the reniform stigma whitish, and the central area varied with whitish, and bordered on both sides with fine dark and light transverse lines, the elbowed line bordered with blood-red in the middle and below the costa, and expanded into a greenish-silvery spot on the inner margin; hind-wings white, with the hind margin brownish. Expands from 1 to 1¼ inches. Inhabits Europe, south of the Alps. The larva is light green, with a darker line on the back, yellowish lines below, and a yellow or crimson stripe on the sides. It feeds on *Rhus cotinus* and on several species of *Pistacia*, and there is a succession of broods throughout the year. The moth and larva are figured at Pl. 56, Fig. 7, *a*, *b*.

FAMILY X.—HELIOTHIDÆ.

Small or middle-sized moths, with rather stout bodies; the fore-wings rarely with the complete *Noctua*-pattern; in most cases only the reniform stigma and traces of the undentated transverse lines are visible; hind-wings pale, with a darker marginal band and central spot, which



B. A. C.

is sometimes extended so as to cover the whole basal portion of the wing; hind-legs clothed with long hair. The larvæ have sixteen legs, with fine scattered hairs placed on raised spots; they feed on the flowers and seeds of low plants, and undergo their transformations in the ground. The moths fly over flowers in the day-time.

GENUS 1.—HELIOTHIS (OCHS.).

Fore-wings varied with pale yellowish-grey or olive-grey, the tips rather obtuse, and the fringes sometimes slightly waved; hind-wings with a dark central lunule and a pale spot in the dark border; the abdomen extends a little beyond the anal angle, and is not provided with an ovipositor in the female; the front tibiæ are spined.

* 1. *H. Scutosa* (W. V.).—Fore-wings dark olive-grey, varied with white in the central area, and with whitish nervures; the three stigmata very large, dark brown, the subterminal line whitish; hind-wings dirty white, with a large brown central spot and border, the latter intersected by a pale line near the inside, in addition to the pale spot towards the anal angle. Expands from 1¼ to 1½ inches. Common throughout Central Europe and the Altai, but very rare in the north of England. It is double-brooded, appearing in spring and autumn. The larva is green, with a black line on the back, and below it a black finely zigzag line on each side, shaded beneath with grey. It feeds on wormwood in May, June, August, and September.

* 2. *H. Armigera* (Hübn.).—Fore-wings brownish-ochreous, varied with darker in the suffused submarginal band, with indistinct dark transverse lines, central shade, subterminal line, and a small darker reniform stigma; hind-wings whitish, with a narrow dark central lunule, and a black border, containing a small pale spot, towards the anal angle. Expands about 1½ inches. Common over the greater part of the world, except the north, from May to October, but very rare in Britain. The larva is brownish-red, with three greenish-grey lines on the back, and a yellow stripe on the sides. It feeds on wild mignonette and other low plants, and, like most other larvæ of the genus, is a cannibal. It is one of the most destructive insects to the cotton crops in the Southern States of America. (*H. Incarnata*, Freyer, from South Europe and Western Asia, is greenish-yellow, with the costa and hind margin rosy, the stigmata brown, and the reniform stigma slightly marked with white; hind-wings pale grey, with the hind margin black; fringes red; head and thorax purple. The larva feeds on different species of *Silene*.)

* 3. *H. Peltigera* (W. V.).—Fore-wings greyish-ochreous, brownish in the suffused submarginal band, with a small black spot above the inner margin, the reniform stigma dark grey, connected with the costa by a brown spot; hind-wings as in *Armigera*. Expands from 1¼ to 1½ inches. Abundant throughout the south of Europe, Asia, and Africa, but scarce in Central Europe, from May to September, flying over the flowers of thistles in the day-time. The larva is greenish-yellow, suffused with red above, with three grey longitudinal stripes on the back, and a whitish stripe on the sides. It feeds on *Hyoscyamus niger* from June to August. (*H. Nubigera*, Herr.-Schäff., from Andalusia, South Russia, and Syria, closely resembles *Peltigera*, but the male has the femora and upper part of the tibiæ of the hind-legs furnished with a tuft of very long hair, which is wanting in the other species.)

* 4. *H. Dipsacea* (Linn.).—Fore-wings pale olive-green, with a broad brownish central shade, which covers the large brown reniform stigma, and is expanded on the inner margin to the subterminal line, which is indicated by the dark shading in front; hind-wings dirty white,

with a large black central lunule and border, the latter with a large pale spot in the middle. Expands about 1¼ inches. Common throughout the greater part of Europe, Northern and Western Asia, and North Africa from May to autumn, especially frequenting clover-fields. The larva is green or rust-colour, with white lines on the back and sides. It feeds on chicory larkspur, &c., in July and August. The moth is figured at Pl. 39, Fig. 7. (*H. Maritima*, Grasl., found in La Vendée in June, is perhaps a variety of this; the fore-wings are generally darker and tinged with reddish, more uniform, and the central band better marked and more distinctly bounded. The larva feeds on the seeds of *Spargularia* in July and August.)

5. *H. Ononis* (W. V.).—Fore-wings ashy-grey, suffused with reddish at the base; the marginal area and the broad central shade, on which the reniform stigma stands, and which is expanded on the inner marginal half as far as the elbowed line, are dark olive-grey; the elbowed and subterminal lines are light and not dentated; hind-wings whitish, with a large black central spot extending to the hind margin. Expands about 1 inch. Widely distributed in the south of Central Europe, but always scarce. The larva is green or reddish-brown, with a dark double line on the back, and two whitish lines on the sides, the uppermost bordered with dusky below It feeds on toad-flax, rest-harrow, &c., in August and September.

GENUS II.—ANTHÆCIA (BOISD.).

Allied to *Heliothis*, but the front tibiæ are furnished with a horny claw instead of spines; the fore-wings are pointed, and the hind-wings are black, with a whitish band before the middle; and the female is provided with an ovipositor.

1. *A. Cardui* (Hübn.).—Fore-wings olive-green, brownish-white in the central area and on the hind margin, with a dark green reniform stigma, but with no distinct transverse lines; and the pale band of the hind-wings does not extend to the inner margin. Expands about 1 inch. Inhabits the southern half of Central Europe in July. The larva is greyish-brown, with a connected stripe of whitish spots on the back. It feeds on *Picris hieracioides* in August. The moth is figured at Pl. 56, Fig. 1.

2. *A. Cognatus* (Hübn.).—Fore-wings olive-brown, varied with pale grey in the central area, with all the lines pale and not dentated; and the pale band of the hind-wings extends to the inner margin. Expands about three-quarters of an inch. It inhabits South-Eastern Europe in June. The larva is brownish-grey or greenish-grey, with a dark double line on the back, and a white line on the sides, bordered with brown. It feeds on *Prenanthes purpurea* and *Chondrilla juncea* in August and September. (*A. Purpurascens*, Tausch., from South Russia and Turkey has purple fore-wings, with a purplish central and marginal band, the latter bordered with whitish; hind-wings coppery-black, with two white spots in the middle, and white fringes. *A. Imperialis*, Staud., from the Caucasus and Armenia, differs from this in having the pale markings of the fore-wings greenish-grey, and a white dot in the middle; the hind-wings are black, with an angulated white band in the middle. *A. Cora*, Eversm., from South-Eastern Europe and Northern Asia, has coppery-brown fore-wings, with two darker suffused bands, the two transverse lines whitish and much waved, and a black spot on the costa near the tip; hind-wings orange, with the base and hind margin broadly brown, and pale fringes.)

GENUS III.—ÆDOPHRON (LED.).

The only European species of this genus, *Æ. Rhodites* (Eversm.), from South-Eastern Europe and Western Asia, much resembles *Chariclea Delphinii* in size, colour, and outline, but differs

from it in the character of its markings. The fore-wings are purplish-rosy, with three longitudinal pale yellow streaks, and the hind-wings are grey, suffused with rosy.

GENUS IV.—CHARICLEA (STEPH.).

Fore-wings rather pointed, without stigmata, with two double transverse lines, the inner line composed of three curves, and the elbowed line curved and not dentated; hind-wings small, extending as far as the middle of the abdomen.

*1. *C. Delphinii* (Linn.).—Fore-wings varied with paler and darker purplish-red, with dark transverse lines bordered within with light, and a light subterminal line, which is not dentated; hind-wings whitish, with a grey central lunule and marginal band. Expands about 1¼ inches. It is found throughout Central and Eastern Europe in May and June, though rather local. In England it is very rare. The larva is violet-grey, dotted with black, with yellow lines on the back and sides. It feeds on larkspur and monkshood in July and August, but must be reared alone, as it is a cannibal, like others of the *Heliothidæ*. The moth is figured at Pl. 39, Fig. 8. (*C. Victorina*, Sodoffsky, from the Caucasus and Armenia, has straw-coloured fore-wings, with two oblique rosy stripes, the inner one suffused and the outer one double; hind-wings greyish, with the base and fringes whitish.)

2. *C. Treitschkei* (Friv.).—Fore-wings straw-colour, with the base and fringes rosy, the latter spotted with red, and a large red spot on the costa, from which run the dark olive-yellow transverse lines, which are near together; hind-wings ashy-grey, with the base paler, and rosy fringes. Inhabits Turkey and South Russia.

GENUS V.—XANTHODES (GUÉN.).

Middle-sized moths, with broad yellow fore-wings; the pattern generally irregular, the tip slightly produced, but hardly pointed, and the hind margin slightly curved. Hind-wings white, not shorter than the abdomen.

1. *X. Malvæ* (Esp.).—Fore-wings yellow, clouded with brown, with three darker angulated transverse lines, and black marginal dots; hind-wings whitish, with hind margin broadly fawn-colour. Expands about 1¼ inches. Inhabits Spain and Sicily. Figured at Pl. 56, Fig. 8.

2. *X. Graëllsii* (Feisth.).—Fore-wings rich yellow, with a broad reddish-brown longitudinal stripe on the outer part of the disc, and three spots of the same colour below the costa; hind margin and fringes dark grey; hind-wings white, bordered with fawn-colour. Expands about 1¾ inches. The larva is long and cylindrical; light yellowish-green, dotted with black; and reddish on the back. It feeds on *Lavatera Olbia* in summer. Inhabits Spain, Nubia, the East Indies, and the Mauritius. The moth and larva are figured at Pl. 56, Fig. 9, *a*, *b*.

FAMILY XI.—ANARTIDÆ.

Small moths, either with bright colours and markings, or unicolorous dark grey, the *Noctua*-pattern more or less distinct, and sometimes wholly absent; hind-wings little or not at all contracted below the tips; antennæ simple, and the legs short and woolly. The larvæ are naked, with sixteen legs. The moths fly over flowers in the day-time, and rest with their wings sloping.

GENUS I.—EUTERPIA (GUÉN.).

Fore-wings moderately broad, with the hind margin oblique and curved; hind-wings triangular, and the abdomen extending for one-third of its length beyond the anal angle.

The only species, *E. Laudeti* (Boisd.), has white fore-wings, varied with purplish-brown between the thick half-line and the inner line, and on both sides of the elbowed line, which is composed of double black lunules, increasing in size towards the inner margin; the stigmata are narrowly surrounded with dusky, and the reniform stigma is filled up with dark grey; hind-wings white, with a zigzag curved grey stripe. Expands a little more than 1 inch. Inhabits the Valais, South-Eastern Europe, and Western Asia in June.

GENUS II.—HELIACA (HERR.-SCHÄFF.).

Fore-wings dark-coloured, almost without markings, and the fringes unspotted; hind-wings broad and rounded, extending as far as the abdomen, and yellow in the middle. The only European species, **H. Tenebrata*, Scop. (*Arbuti*, Fabr.; *Small Yellow Underwing*), has olive-brown fore-wings, with a dark and strongly zigzag central shade; hind-wings yellow, with the base and hind margin broadly black. Expands about three-quarters of an inch. Common in meadows in the greater part of Europe from April to June. The larva is pale green, with a dark line on the back and pale lines beneath it, and a white line on the sides. It feeds on *Cerastium arvense* in June. The moth is figured at Pl. 39, Fig. 9.

GENUS III.—HELIODES (GUÉN.).

Closely allied to *Heliaca*, but the wings dark, with pale fringes, and the fore-wings with whitish markings. *H. Rupicola* (W. V.) has the head and thorax rusty-yellow, the fore-wings shining yellowish-brown, marked nearly as in *Heliaca Tenebrata*, but the two stigmata more or less marked in white; hind-wings unicolorous golden-brown. All the fringes pale yellow, spotted with black. Expands about three-quarters of an inch. Inhabits South-Eastern Europe in June, when it is found sucking honey from the flowers of the Alpine medlar on hot afternoons. (*H. Theophila*, Staud., from Greece and Asia Minor, is rather darker, and the fringes are only interrupted by a broad black spot above the hinder angle of the fore-wings; it occurs in May. It is figured at Pl. 56, Fig. 3.)

GENUS IV.—ANARTA (TR.).

Fore-wings generally with the *Noctua*-pattern, but the reniform stigma very small above, and the fringes sometimes spotted with paler; hind-wings rounded, extending nearly as far as the tip of the abdomen, white or yellow, with a black border, or else wholly black. Nearly all the species of this genus are either Alpine or Polar.

* 1. *A. Myrtilli* (Linn.), (*Beautiful Yellow Underwing*).—Fore-wings varied with dull red and olive-green, with unicolorous stigmata; double scarcely-dentated black transverse lines; a white spot below the orbicular stigma, edged outside with paler, and a white subterminal line; hind-wings yellow, broadly brownish-black at the base and hind margin. Expands about 1 inch. Common on heaths throughout the greater part of Europe in summer and autumn; it flies very rapidly, and is not easily caught. The larva is green, with three rows of yellow spots on the back, and oblique white spots on the sides; it feeds on heath. The moth is figured at Pl. 56, Fig. 6. (*A. Bohemani*, Staud., from Lapland, resembles *A. Cordigera*, but the reniform stigma, though sometimes pale, is never white; the fore-wings resemble those of an *Acronycta*.)

* 2. *A. Cordigera* (Thunb.).—Fore-wings black, dusted with grey in the basal and marginal areas, with a large whitish reniform stigma; hind-wings yellow, with a black border. Size of

Myrtilli. It inhabits moors and mountains in Northern and Central Europe (France excepted?), and, according to Stainton, is sometimes found at rest on rocks at Rannoch. It appears from May to July. The larva feeds on *Vaccinium uliginosum.*

3. *A. Melaleuca* (Thunb.).—Fore-wings black, with the transverse lines and stigmata white, the reniform stigma containing a black spot; fringes spotted with black; hind-wings white, with a black central spot, and a broad black border; fringes white. Inhabits Lapland, Norway, and Labrador, and perhaps Scotland.

* 4. *A. Melanopa* (Thunb.).—Fore-wings dark grey, sometimes dusted with yellow, with unicolorous stigmata, and double black dentated transverse lines; hind-wings dirty white, dusted with black at the base and inner margin, with a black spot in the middle, and a broad black border. In the variety *Rupestralis* (Hübn.) the hind-wings are wholly clouded. Expands from 1 to 1¼ inches. Inhabits Lapland, Labrador, and the Alps from June to August; it is also found at Rannoch. (*A. Nigrita,* Boisd., from the Alps, has black wings, with white fringes; on the fore-wings the reniform stigma is absent, and there is a broad ashy-grey submarginal stripe.)

5. *A. Funebris* (Hübn.).—Fore-wings dark grey, blackish in the central area, with two single thick black waved transverse lines; hind-wings dark grey, with a white spot in the middle. Expands about 1 inch. A rare species, inhabiting the Alps, Lapland, and Labrador in July. (*A. Richardsoni,* Curt., has the fore-wings varied with grey and white, the transverse lines black, dentated, and broadly bordered with grey; stigmata partly bordered with grey and black; fringes spotted with black and white; hind-wings grey or whitish, with a black border and central spot, and white fringes. Inhabits Lapland, Greenland, and Labrador. *A. Schœnherri,* Zett., also circumpolar, has black fore-wings, varied with grey, the transverse lines black, zigzag, and partly bordered with paler. The three stigmata are white, bordered with black, but the reniform stigma is more or less filled up with dusky; otherwise this species seems to resemble the last.)

6. *A. Lapponica* (Thunb.).—Male with black fore-wings, varied with grey and white, and fringes spotted with black and white; hind-wings blackish, with white fringes; female with smoky-brown fore-wings, with a black central band, and the fringes blackish, spotted with grey; hind-wings black, with white fringes. Inhabits Lapland, Labrador, and Greenland. (*A. Zetterstedtii,* Staud., is blackish, with obscure yellowish-grey markings round the black stigmata and beyond the elbowed line; hind margin with a stripe of the same colour, spotted outside with black; fringes broad and unicolorous; hind-wings blackish, with broad white fringes. Inhabits Lapland, and mountains of Norway. *A. Quieta,* Hübn., from Lapland; dark grey fore-wings, angulated transverse lines, whitish stigmata bordered with black; fringes spotted with whitish; hind-wings ashy-grey, with two whitish stripes, one bordered, the second spotted with black; fringes whitish.

GENUS V.—OMIA (GUÉN.).

Fore-wings without the *Noctua*-pattern, the fringes spotted with black and white, and the hind-wings unicolorous.

1. *O. Cymbalariæ* (Hübn.).—Fore-wings olive-brown, with a pale grey suffused central band, and the nervures in the marginal area black; hind-wings blackish, with white fringes. Expands about 1 inch. Inhabits the Southern Alps, and the mountains of South France and Spain. It flies rapidly by day, often resting on flowers in the heat of the sun. Figured at Pl. 56, Fig. 5.

2. *O. Cyclopea* (Grasl.).—Fore-wings brownish-grey, darker at the base and paler in the middle, with the transverse lines waved, whitish, and narrowly bordered with black; the reniform stigma large, nearly triangular, and bordered with black; hind-wings dark brown, paler towards the base. Inhabits the mountains of Corsica, Spain, and Piedmont.

FAMILY XII.—PLUSIIDÆ.

Middle-sized moths, the fore-wings brown, grey, yellowish, or greenish, rarely with the ordinary *Noctua*-pattern, and often with metallic markings; hind-wings broad, rounded, and slightly contracted below the tips; the antennæ simple, and the palpi nearly always strongly developed, the collar round, and not concave, and the abdomen convex. The larvæ are naked, or furnished with scattered hairs, and have twelve or sixteen legs. The moths slope their wings when at rest, and many fly by day, while others fly at dusk, or later.

GENUS I.—TELESILLA (HERR.-SCHÄFF.).

Fore-wings with the hind margin nearly straight below the tips, with no metallic markings, the fringes not longer at the hinder angle, the stigmata distinctly dark, surrounded with paler; the abdomen extending nearly to the anal angle of the hind-wings, and the antennæ scarcely half the length of the costa. The larvæ are slender, tapering gradually in front, with sixteen fully-developed legs; and they undergo their transformations in the ground.

1. *T. Amethystina* (Hübn.).—Fore-wings olive-brown, with the outside of the half-line, the spaces between the double transverse lines, the suffused submarginal band, the stigmata, which are partly bordered with white, and a triangular spot connecting them below, all dusted with reddish-violet. Hind-wings pale grey, with an indistinct central lunule, the nervures darker, and the fringes rosy. Expands from 1¼ to 1½ inches. A scarce insect, inhabiting some parts of Central Europe from May to July. The larva is green, with three white lines on the back, and one on the sides; the latter shades into red at both ends. It may be found early in the morning in July and August among the umbels of the wild carrot, and of *Peucedanum palustre*. The moth is figured at Pl. 57, Fig. 4.

2. *T. Virgo* (Tr.).—Fore-wings coffee-brown, everywhere more or less suffused with rose-colour, except round the two stigmata, which are placed obliquely together in the form of a V; the transverse lines are white, and converge on the inner margin, and there are traces of a whitish submarginal band, which is suffused, double, and dentated. Hind-wings unicolorous shining yellowish-grey. Rather larger than *Amethystina*. It inhabits Hungary and the Ural, and flies by day.

GENUS II.—ABROSTOLA (HÜBN.).

Includes three very similar species. Fore-wings dark grey, with a short curved hind margin and waved fringes, the transverse lines widely apart and not dentated, the inner line slightly arched, and the elbowed line rather curved. Both lines are single, narrow, black, and bordered with rust-colour. The orbicular and reniform stigmata are indicated by a narrow black outline, and there is generally another slender black ring beneath the former. The stigmata and transverse lines are covered with raised scales. The subterminal line is finely zigzag, and marked with narrow deep black arrow-heads below the costa. Hind-wings brownish-grey, paler towards the base; palpi rather large and ascending, with the last joint linear; abdomen extending considerably beyond the anal angle of the hind-wings. The larvæ are attenuated in front, and have sixteen legs, but the first two pairs of legs are rudimentary, so that they walk like Loopers. They feed chiefly by day from July to September, and undergo their transformations in a soft cocoon

composed of silk and moss. The moths appear from May to July, and fly at dusk, resting on tree-trunks, &c., during the day. They expand from 1¼ to 1½ inches.

* 1. *A. Triplasia* (Linn.).—Fore-wings dark grey, varied with brownish-yellow in the basal and marginal areas, the subterminal line marked with black arrow-heads in front below the tip. Common in Europe and Northern and Central Asia. The larva is green or flesh-colour, with a white line on the sides, with white oblique dashes above it on the segments after the 7th, a pale longitudinal line above on segments 2—4, and on segments 5 and 6 a black raised triangular spot, bordered with paler. It feeds on nettle. The moth is figured at Pl. 39, Fig. 10.

2. *A. Asclepiadis* (W. V.).—Fore-wings dark grey, varied with rosy-grey in the basal and marginal areas, with a fine black line at the base of the fringes, bordered outside with pale pink, and with fine black nervures behind it; and the fringes are also spotted with pale pinkish-grey. Inhabits many parts of Central Europe. The larva is bluish-white, with many black dots, and a broad yellow stripe on the sides. It feeds on *Cynanchum vincetoxicum*, and hides itself carefully during the day.

* 3. *A. Tripartita* (Hufn.), *Urticæ* (Hübn.), (*Spectacle Moth*).—Fore-wings dark grey, varied with greenish-white in the basal and marginal areas; the subterminal line is marked below the costa with black arrow-heads in front, and is bordered with deep black behind; there is a black line at the base of the unicolorous fringes. Common in the greater part of Europe and Northern Asia. The larva resembles that of *Triplasia*, and has two white lines on the back of segments 2 and 4, and slender white and green lines above the feet; it feeds on nettle.

GENUS III.—PLUSIA (OCHS.).

Fore-wings with a long curved or arched hind margin, contracted towards the hinder angle; the fringes are entire, seldom slightly waved, and generally form a slight pointed projection at the hinder angle. The fore-wings are often metallic, or marked with shining metallic spots resembling a letter; hind-wings brownish-grey, often lighter towards the base, and occasionally yellow, with a black border. The palpi are strongly developed and erected, and the hair in front of the thorax forms a collar which covers the base of the scapulæ, and is distinctly separated from them at its edges. The abdomen extends considerably beyond the hind-wings. The larvæ have twelve legs, and are very slender in front and thicker behind, with a few fine hairs. They feed by day, often between leaves spun together, and undergo their transformations in a loose cocoon. The moths fly over flowers, some in the hot sun, and others at dusk or at night. In the first four species the scapulæ project behind, and in the others they are depressed; the palpi in the first two species are sickle-shaped, and the last joint is very long and pointed; in the rest of the genus they are shorter, with the last joint rounded. The genus *Plusia* is very extensive, and has numerous representatives all over the world, all of which have a strong family likeness.

1. *P. Moneta* (Fabr.).—Fore-wings pale golden-grey, varied with whitish-violet on the hind margin, with dark double slightly-dentated transverse lines, and a brown central shade. The broad border of the orbicular stigma and a curve below it, yellowish silvery; hind-wings thinly dusted with grey. Expands from 1½ to 1¾ inches. Inhabits the greater part of Europe, except the north-west, and Northern Asia in June and July, and again in September, chiefly in mountainous districts. The larva is grass-green, with white dots, a dark line on the back, and a white one on the sides. It lives on monkshood from autumn to June.

2. *P. C. aureum* (Knoch), *Concha* (Fabr.).—Fore-wings violet-brown, with the transverse lines

double, not dentated, and widely apart, the elbowed line broadly bordered with golden-yellow in front on the inner margin, and behind from the tip as far as nervule 2; the stigmata indistinct, and the hind-wings brownish-grey. Expands from 1¼ to 1½ inches. Widely distributed in Central Europe, except the west, and in Northern and Western Asia, but scarce and local. It appears in July. The larva is humped, green, with three white longitudinal lines on segments 2—4, and oblique dark green stripes broadly bordered with white, which run forward from the back to the sides of the preceding segments; the three last segments quite white. It feeds on *Thalictrum* from September to May.

3. *P. Deaurata* (Esp.).—Fore-wings golden-yellow, suffused with violet-red in the basal and marginal areas, the inner line forming an acute angle, the elbowed line double, curved, running towards the tip, and then turning towards the base below it; hind-wings yellowish-grey. Expands from 1½ to 1¾ inches. Inhabits the mountains of Southern and South-Central Europe in July and August. The larva is green, with a dark green stripe on the sides bordered with white, five white lines on segments 2 and 5, and dark green lunules bordered with white on the others. It feeds on rue in May and June.

4. *P. V. argenteum* (Esp.), *Mya* (Hübn.).—Fore-wings olive-brown, varied with rosy; the transverse lines double, blackish, bordered, and filled up with rosy, the inner line strongly interrupted, and the elbowed line not dentated, but strongly curved towards the base below the costa, the subterminal line yellowish and bordered with black in front; the lower edge of the orbicular stigma, an angular mark, and a spot behind the latter, as well as some dots on the lower edge of the reniform stigma, silvery; hind-wings brownish-grey. Expands about 1½ inches. A rare species, inhabiting the Southern Alps in July; it flies at twilight. The larva feeds on *Isopyrum thalictroides*.

5. *P. Cheiranthi* (Tausch.).—Fore-wings dull flesh-colour, tinged with olive-green behind the stigmata and in the suffused submarginal band, cinnamon-brown in the basal area and at the tip; the transverse lines slender, double, and bordered with flesh-colour, the inner line slightly curved, and the elbowed line not dentated, but sharply angulated behind, below the costa; the stigmata are small and sharply defined, and the hind-wings are yellowish-grey. Expands about 1½ inches. Inhabits Eastern Europe and Northern and Western Asia in June. The larva is humped, green, with white lines on the sides, and three white lines on the back of the first segments, and oblique white streaks on the others. It feeds on *Thalictrum* and *Aquilegia vulgaris* in May.

6. *P. Consona* (Fabr.).—Fore-wings greenish-grey, olive-brown in the central area and in the suffused submarginal band, with all the lines whitish, double, and not dentated or zigzag, and with large golden-brown spots at the hinder angle and in the middle of the hind margin; the border of the orbicular stigma and a curve below it silvery; hind-wings light grey, with the hind margin darker. Expands from 1¼ to 1½ inches. Inhabits Central Europe (except the west) in July and September, but very local. The larva is green, whitish on the sides of the back, with a white stripe on the sides, and a brown head. It feeds on *Lycopsis pulla* in May, July, and August. (*P. Beckeri*, Staud., from Sarepta, resembles *Consona*, but the fore-wings are narrower and more pointed, though less falcate; rusty-yellowish, with pale markings as in *Consona*, but the ring round the orbicular stigma is dull white instead of silvery, and nearly touches the elbowed line, which is more curved, and visible throughout its whole length.)

7. *P. Modesta* (Hübn.).—Fore-wings olive-brown, with double whitish transverse lines, which are not dentated, the inner line acutely angulated outwards above the middle, and the elbowed line nearly straight, uniting with the undentated subterminal line on the costa; there are two

golden-brown spots at the hinder angle and in the middle of the hind margin ; the hind-wings are brownish-grey. Expands about 1½ inches. Inhabits Central Europe, except the north-west, in June and July. The larva is pale bluish-grey, dotted with black and white. It feeds on *Pulmonaria officinalis* in May and June.

8. *P. Illustris* (Fabr.).—Allied to *Modesta ;* the fore-wings varied with rosy in the basal area and beyond the cell, and the transverse lines bordered with rosy ; the elbowed line rather more curved, and further from the subterminal line on the costa. Expands from 1½ to 1¾ inches. Inhabits the Alpine ranges in June and July, and has been reputed British. The larva is green, with a broad dark stripe on the back, and a yellow one on the sides. It feeds on monkshood from May to July.

9. *P. Uralensis* (Eversm.).—Closely resembles *Illustris*, but a little smaller. Inner line less oblique, more broken, and better marked ; orbicular stigma double, more distinct, rounder, and enclosed by a fine brilliant yellow ring ; the central area darker, the elbowed line not so straight, not angulated towards the costa, and strongly shaded with brown inside ; and the hind margin bright rosy, intersected by the well-marked bright yellow subterminal line. The Department of Basses-Alpes, the Ural, and the Amoor are the only localities recorded for this rare species, which appears in July. The larva lives gregariously on *Aconitum anthora*, and is full-grown at the end of June.

* 10. *P. Chrysitis* (Linn.), (*Burnished Brass Moth*).—Fore-wings violet-brown, with two broad shining transverse brassy-green bands, often connected below the middle, and covering a great part of the wing ; hind-wings brownish-grey. Expands from 1¼ to 1½ inches. Common in Europe and Northern and Western Asia from May to September, flying over flowers at dusk. The larva is pale green, with fine white lines on the back, and a white stripe on the sides. It feeds on nettles and other low plants from autumn to May, and in July. (*P. Zosimi*, Hübn., from Piedmont, the Ural, and Northern Asia, has gilded fore-wings, with the costa brownish, and a stripe near the stigmata coppery ; the borders of the stigmata and two spots behind reddish ; hind-wings grey.)

* 11. *P. Chryson* (Esp.), *Orichalcea* (Hübn.).—Fore-wings violet-brown, slightly dusted with golden, and the hind margin purplish-grey, a very large greenish-golden spot beyond the middle, extending from nervule 3 almost to the costa ; hind-wings pale yellowish, with the hind margin grey. Expands about 1¾ inches. Widely distributed in Central and Southern Europe and Northern and Western Asia in July and August, but local ; in England it occurs at Deal. The larva is green, with a dark line bordered with white on the back, and with waved white lines and a white stripe, bordered with black above, on the sides. It feeds on *Eupatorium Cannabinum* and *Salbia glutinosa* from autumn to May. (*P. Orichalcea*, Fabr., for which many writers have mistaken this insect, is an Indian species closely allied to *Chrysitis*.)

* 12. *P. Bractea* (W. V.).—Fore-wings violet-brown, shading into rusty-yellow in the larger lower half of the central area, with a large greenish-silvery spot below the median nervure, which is truncated above, obliquely lengthened behind, and rounded at the extremity ; hind-wings as in *Chryson*. Expands from 1½ to 1¾ inches. Occurs throughout Central Europe and Northern Asia in July, chiefly in mountainous districts. It flies in the evening, and sometimes during the day. The larva resembles that of *Iota*, and feeds on hawkweed and dandelion in May and June. The moth is figured at Pl. 40, Fig. 1. (*P. Excelsa*, Kretschm., is very like *Bractea ;* fore-wings purplish-brown, with the marginal area shining, the metallic spot golden, narrower and more curved than in *Bractea ;* the outer line is waved, and the pale band between this and the shade at the tip of the wing is very distinct, and is continued equally broadly as far as the lowest branch of the median

nervure; hind-wings brown, with the base and a narrow transverse fascia paler. On the under side the fore-wings are smoky-brown from the base to two-thirds of their length. Inhabits Russia and the Altai.)

13. *P. Æmula* (W. V.).—Fore-wings violet-grey, dark brown in the larger inner marginal half of the central area and before the tips, and with a large diamond-shaped silvery spot before the middle; the transverse lines slender, double, and not dentated; hind-wings pale grey. Expands about 1½ inches. A rare species, found in the Alps of Styria in July and August.

*14. *P. Festucæ* (Linn.).—Fore-wings violet-brown, with golden spots dusted with rusty-yellow on the inner margin, at the base of the costa, and before the tips, and with two pear-shaped silvery spots in the middle; hind-wings brownish-grey. Expands from 1¼ to 1½ inches. Found throughout the greater part of Europe and Northern Asia from July to September. The larva is green, with slender yellowish lines, and a white stripe on the sides. It feeds on soft grasses from September to May.

15. *P. Chalcites* (Esp.).—Fore-wings reddish-violet, golden in the central area below the median nervure, except above the silvery spots, and also at the hinder angle and before the upper part of the hind margin, and with two small roundish silvery spots in the middle; hind-wings yellowish-grey. Expands about 1½ inches. Inhabits South Europe and North Africa. The larva resembles that of *Gamma*, and feeds on various low plants; it constructs a very delicate cocoon of white silk between leaves. (*P. Mandarina*, Freyer, from the Ural and Siberia, has reddish fore-wings varied with black fasciæ, with the transverse lines and the borders of the reniform stigma greenish, and with a forked silvery mark in the middle; hind-wings yellowish-brown, with a grey central stripe, and the hind margin broadly grey.)

16. *P. Gutta* (Guén.).—Fore-wings reddish-violet-grey, brown varied with rusty-yellow in the larger inner marginal half of the central area, and with a rather long silvery spot in the middle, concave above. The inner line is narrowly silvery, and curves round as far as the spot; hind-wings yellowish-grey. Expands rather over 1½ inches. Inhabits Southern and South-Central Europe and Northern and Western Asia in August. The larva is green or brownish, with three dark stripes on the back, bordered with white, the outer ones waved beyond the third segment, and with a white stripe on the sides. It feeds on yarrow in May and June. (*P. Accentifera*, Lef., from Spain, Sicily, and Crete, is of the size of *Consona;* the fore-wings are rosy, varied with shining reddish, with a golden lustre, a golden mark in the middle, and a golden line behind it, shaped like an accent; hind-wings brown. *P. Circumscripta*, Freyer, from Sicily and Crete, has reddish-brown fore-wings, varied with coppery and golden, with a basal mark, some spots in the middle, and two transverse lines beyond them silvery; hind-wings pale grey, broadly bordered with brown.)

*17. *P. Iota* (Linn.), (*Golden Y Moth*).—Fore-wings violet-red, varied with olive-brown, especially in the central area, at the extremity of which stands a rusty-yellow spot in cell 1 *b;* the transverse lines are dark, double, and not dentated, and there is a yellowish-silvery V-shaped spot in the middle and a silvery spot behind (connected with it in variety *Percontationis*, Tr., and absent in variety *Inscripta*, Esp.); the subterminal line is indicated below the middle by a shaded stripe, which is twice indented; hind-wings yellowish-grey, with a dark central stripe and hind margin, and with two dark stripes on the under side. Expands from 1¼ to 1½ inches. Common in Northern and Central Europe from May to August, flying by day. The larva is green, with slender yellowish-white longitudinal lines, which are waved on the sides. It feeds on dead-nettle, honeysuckle, &c., in April and June. The moth is figured at Pl. 40, Fig. 2.

*18. *P. Pulchrina* (Haw.), *V. aureum* (Guén.).—Very like *Iota*, but the fore-wings more varied and more purplish, the silvery markings more sharply defined and always separated, and the stigmata usually slightly edged with silvery; hind-wings with three dark transverse stripes on the under side. Size of *Iota*. Inhabits Central Europe and the Altai in June and July, but less common than *Iota*. The larva is green, with a yellow stripe on the sides; it feeds on nettle, &c., till May. (*P. Macrogamma*, Eversm., from the north of Europe and Asia, has pale reddish fore-wings, with double black transverse lines, the basal and marginal areas washed with metallic greenish-grey, the reniform stigma bordered with black, and a very large and brilliant pale golden γ, placed horizontally; the fringes marked with black dots; hind-wings nearly as in *Iota*.)

*19. *P. Gamma* (Linn.), (*Gamma Moth*, or *Silver Y Moth*).—Fore-wings varied with violet-grey and brownish-grey, with a rust-coloured spot at the extremity of the central area in cell 1*b*, slender white transverse lines, and a silvery spot, shaped like the Greek letter γ, before the middle, the subterminal line indicated by a shaded stripe, which is zigzag behind; hind-wings pale grey, with the hind margin broadly brownish. Expands from 1½ to 1¾ inches. Abundant during all the fine season throughout Europe, Asia to the Himalayas, North Africa, and Western North America, flying both in the day-time and at dusk. The larva is green, with fine waved longitudinal lines on the sides, and a narrow yellowish stripe below. It feeds on low plants. The moth and larva are figured at Pl. 40, Fig. 3, *a*, *b*. (*P. Circumflexa*, Linn., from South-Eastern Europe, Northern and Western Asia, and North Africa, has ashy-grey fore-wings, varied with dark bronzy, with all the lines distinct and double, and a very pale oblique golden mark in the middle, shaped like an oblong r; the stigmata are also visible, and the hind-wings are black, paler at the base.)

*20. *P. Ni* (Hübn.).—Fore-wings varied with ashy-grey and brownish-grey, with dark double zigzag transverse lines, and a slender white V, with a slight silvery lustre, and a white spot behind it; the subterminal line whitish, twice dentated below the middle, and with fine black arrow-heads above; hind-wings pale grey, with the hind margin darker. Expands from 1¼ to 1½ inches. Inhabits South Europe, and has once been taken at Exeter. The moth flies at twilight from May to August, and the larva feeds on various low plants. (*P. Daubei*, Boisd., from South-Western Europe, India, and Senegal, is a little smaller than *Ni*, with shining greyish-brown wings, a silvery mark in the middle resembling a Y, and a very narrow silvery curve in the position of the reniform stigma; the nervures whitish, the subterminal line, fringes, and some tortuous markings near the discoidal cell pale pink; hind-wings pale grey, darker towards the hind margin. The larva feeds on *Sonchus maritimus*, and probably on a variety of other low plants, like its allies.)

*21. *P. Interrogationis* (Linn.).—Fore-wings dark violet-grey, varied with blackish, with double dark waved transverse lines, and a silvery mark before the middle, generally resembling a V, and a kidney-shaped spot adjoining it, but often quite irregular; the subterminal line is black, bidentate in the middle, and widened above in front; hind-wings pale grey, with the hind margin darker. Expands from 1¼ to 1½ inches. Common in a great portion of Northern and Central Europe and Northern Asia, especially in mountainous districts. The larva is green, paler above, with waved yellowish longitudinal lines. It feeds on nettle, *Vaccinium uliginosum*, &c., till May. (*P. Parilis*, Hübn., from Lapland, Labrador, and Greenland, has dark grey fore-wings, with the transverse lines only visible below the cell, and bounding a square dark brown spot, on which stands a white spot, resembling a horizontal γ; hind-wings white, with the base and hind margin blackish.)

22. *P. Ain* (Hübn.).—Fore-wings varied with bluish-grey and blackish, with dark double slightly-curved transverse lines, and a white, slightly shining and slender-armed γ before the middle; the subterminal line bidentate below the middle, and the hind-wings yellow, with a broad black border. Expands about 1½ inches. Inhabits the Alps, and the mountains of Germany and Siberia, in July and August. (*P. Diasema*, Boisd., found in Lapland and Greenland in August, is of the size of *Ain*, but more closely allied to *Microgramma;* the fore-wings are dull grey, with the central area dark blackish-brown, and with silvery marks, as in *P. Interrogationis;* hind-wings smoky yellow, with a broad black border, and the base and nervures washed with the same colour.)

23. *P. Microgamma* (Hübn.).—Fore-wings varied with brown and reddish-grey, with dark double transverse lines, which are not dentated, and a silvery γ before the middle, the arms of which are slender and wide apart; the subterminal line moderately waved, and the hind-wings yellow, with a black border. Expands about 1¼ inches. Inhabits Eastern Germany and Russia in July.

24. *P. Hochenwarthi* (Hochenw.), *Divergens* (Tr.).—Fore-wings reddish-grey, dark brown in the lower half of the central area, with slender double transverse lines, and a silvery γ before the middle, the arms of which diverge only slightly; the subterminal line not zigzag; hind-wings as in *Microgamma*. Expands from 1 to 1¼ inches. Inhabits the Alps, North Europe, and Labrador in July, flying by day. The larva is reddish-brown, with yellowish lines on the back and sides, and with indistinct waved lines between. It feeds on low plants till June. The moth is figured at Pl. 40, Fig. 4.

25. *P. Devergens* (Hübn.).—Allied to *Hochenwarthi;* fore-wings varied with ashy-grey and brownish-grey, the silvery mark broader, the subterminal line strongly zigzag, bordered with dark grey in front and pale grey behind. Inhabits the high mountains of Switzerland in July and August. The larva is very dark violet, with pale grey longitudinal lines; it is rather short, and tapering in front. It hides itself under stones by day near the snow-fields, and probably feeds on a variety of low plants.

FAMILY XIII.—CALPIDÆ.

Fore-wings broad, with the tips pointed and projecting, and the hind margin strongly curved outwards. There are two projections on the inner margin, one acutely projecting just within the hinder angle, and the other, which is large and rounded, near the base; the *Noctua*-pattern is absent. The hind-wings are broad and slightly contracted below the tips; the antennæ are short, with long pectinations in the male, and short ones in the female; the palpi are large, with a dense velvety covering of hair, which is compressed above, and expanded and flattened below; the last joint is concealed by the hair. The body is moderately slender, and the abdomen extends a little beyond the anal angle of the hind-wings. The larvæ are naked, with sixteen legs, and undergo their transformations in a silken cocoon. There is but one European genus, *Calpe*, Boisd., and one European species, *C. Capucina*, Esp. (*Thalictri*, Borkh.), which has rosy-grey fore-wings, slightly varied with olive-green, and finely striated with pale grey. There are some oblique dark lines before the middle, and an oblique rusty-yellow line bordered with pale behind, running from the tip to the inner margin; hind-wings yellowish-grey, darker towards the hind margin. It inhabits Europe south of the Alps, and Northern and Western Asia, in June and July, and was formerly taken at Magdeburg. The larva is yellowish-green, with three rows of blackish spots above; head yellow. It feeds on *Thalictrum flavum* from autumn to May.


5.
4.
6.
1.
2.
3b.
7.
3a.
10.
9a.
9b.
8a.
8c.
A
B.
C.
8b.

FAMILY XIV.—ACONTIDÆ.

Fore-wings blackish, with double undentated transverse lines, a zigzag subterminal line, and a white spot on the costa; the stigmata indistinct; the hind-wings blackish, with a white interrupted central band, and extending nearly to the tip of the abdomen; the antennæ simple, and the femora thinly clothed with hair. The larvæ are smooth and moderately stout, with sixteen legs, in *Luctuosa*, and long and slender, with only twelve legs, in the other species. The species are double-brooded, and may be found throughout a great part of the year, both as moths and larvæ. The former fly by day, and rest with their wings sloping. The European species are comprised in the single genus

ACONTIA (OCHS.).

* 1 *A. Luctuosa* (W. V.).—Fore-wings blackish, with a large white or slightly rosy costal spot extending to the middle, and white fringes, clouded in the middle of the hind margin; hind-wings black, with a white transverse band, varying in width, a white dot towards the hind margin, and white fringes, slightly clouded in the middle. Expands about 1 inch. Common in Central and Southern Europe and Northern and Western Asia. The larva is yellowish-grey, dusted with darker, with two pale lines on the back, and a white stripe on the sides. It feeds on *Convolvulus* and mallow. The moth is figured at Pl. 39, Fig. 11. (*A. Moldavica*, Herr.-Schäff., from Dalmatia and Greece, resembles *Luctuosa*, but expands only three-quarters of an inch; the white spot of the fore-wings is absent, and there are two black transverse lines, bordered with red on the sides opposite to each other; subterminal line whitish. Fringes whitish, with blackish spots on the ends of the nervures. Hind-wings dark brown, with yellowish fringes chequered with brown.

2. *A. Viridisquama* (Guén.).—Fore-wings dark brown, with the basal and median areas covered with large green scales, the lines only indicated by three white streaks on the costa. The reniform stigma is indistinct and a little paler, with a black dash in the centre. The subterminal line is indistinct, and composed of green scales; the fringes are concolorous, but interrupted by two greenish-white spaces; hind-wings rounded, black, with greenish-white fringes. Inhabits Spain and the Pyrenees in June; and the larva feeds on a kind of mallow in July.

* 3. *A. Lucida* (Hübn.), *Solaris* (W. V.).—Fore-wings dark grey, suffused with violet-grey, and more or less whitish in the basal area (especially in the variety *Albicollis*, Fabr., which the French entomologists consider a distinct species), and with a small white costal spot; fringes above the middle grey, and below white. Hind-wings white at the base, with three or four blackish rays, and a broad black border (narrower and more regular in *Albicollis*, which also wants the black rays). Expands from 1 to 1¼ inches. Inhabits Central and Southern Europe and Northern and Western Asia; *Albicollis* is rare in England. Larva green or brownish-grey, with three dark double lines on the thoracic segments; tufted, and with a white line on the back on segments 5 to 7, and with a dark stripe on the back, and a whitish line on the sides of the remaining segments. It feeds on *Convolvulus*. (*A. Titania*, Esp., has white fore-wings, with the base ashy, and a large brown spot dotted with blue towards the tip, having a white spot on its front edge; submarginal line whitish, and a row of marginal black dots; fringes intersected with brown; the stigmata and a large spot on the costa olive; the reniform stigma with a black dot in the middle; hind-wings white, with two broad brown stripes. *A. Urania*, Friv., has yellowish-white fore-wings, with the hind margin

rose-colour, washed with reddish-brown, and marked with scattered metallic blue spots. Towards the base are a few reddish hairs; the orbicular stigma is angular, and the hind margin is varied with blue and black; hind-wings white, with the hind margin and a central spot brown. Both these species are found in South-Eastern Europe and Western Asia.)

FAMILY XV.—OPHIUSIDÆ.

Middle-sized or large moths; the body moderately slender, fore-wings broad, rarely with the *Noctua*-pattern distinct; hind-wings frequently banded, or with a dark marginal band, and rarely shorter than the abdomen; the antennæ simple. The larvæ have the two first pairs of prolegs more or less rudimentary, and undergo their transformations in a slight cocoon.

GENUS I.—ANOPHIA (GUÉN.).

Middle-sized moths; fore-wings dark brown, with black dentated transverse lines, the inner line single, and the elbowed line double; the subterminal line suffused and zigzag, and the stigmata indistinct; hind-wings white, with a broad blackish border, the fringes broadly white below the tips and towards the anal angle; and the abdomen extends considerably beyond the latter. The larvæ are naked, and the front prolegs are slightly rudimentary; they feed on *Convolvulus*. The moths fly at twilight, and rest with their wings sloping.

1. *A. Funesta* (Esp.), *Lencomelas* (Hübn.).—Fore-wings dark brown, with a large pinkish-white spot beyond the middle of the costa; hind-wings white, with a broad regular border. Expands from 1¼ to 1½ inches. Inhabits Southern and South-Central Europe and Western Asia in June. The larva is brownish-grey, dotted with orange, with yellow chain-like spots on the back, and a pale line on the sides. It is found in July and August, especially in vineyards, and hides itself during the day.

2. *A. Lencomelas* (Linn.), *Ramburii* (Tr.).—Fore-wings dark brown, with the reniform stigma partially bordered with paler, and with a pale spot below; hind-wings white, with a narrower black border than in *Funesta*. Expands about 1½ inches. Inhabits South Europe and North Africa in July. The larva is brownish, with three orange lines on the back, and a white waved stripe on the sides.

GENUS II.—CATEPHIA (OCHS.).

Fore-wings dark, with rather indistinct markings; hind-wings short, the abdomen extending for one-third of its length beyond the anal angle; the antennæ of the male strongly ciliated. The larvæ with very rudimentary prolegs, and with warts and fleshy prominences on the 5th and 12th segments. The moths fly at night, and rest with their wings sloping. There is only one European species, **C. Alchymista* (W. V.), which has black fore-wings, with single zigzag deep black transverse lines and central shade, and the stigmata surrounded with black; the subterminal line is brownish, zigzag, and widened on the inner margin; hind-wings white, with a broad black border at the tip and anal angle. Expands from 1½ to 1¾ inches. It inhabits Central and Southern Europe in June, and has once been taken in the Isle of Wight. The larva is mottled with brownish-grey and pale grey. It feeds on oak from July to September. The moth is figured at Pl. 41, Fig. 2.

GENUS III.—CATOCALA (SCHRANK).

Fore-wings broad, with the hind margin long and a little oblique; brown or grey, and resembling bark, with strong nervures and with single or double dark transverse lines, which



A. B.

project a strong tooth towards the base above the inner margin, and generally two more behind the reniform stigma also; the orbicular and claviform stigmata absent, the reniform stigma distinct, generally with a pale spot, bordered with black, below it; the subterminal line sometimes strongly zigzag, and sometimes indistinct; hind-wings broad, extending about as far as the abdomen; red or yellow, with black central or marginal bands, or black, with a bluish band beyond the middle; antennæ ciliated. The larvæ have the front prolegs rudimentary; the belly is smooth, and there are fleshy filaments, and often fleshy prominences on the sides. They are brown or green, resembling bark, and are pale below, with dark spots. They live on trees in May and June, hiding themselves in the crevices of the bark during the day, but may be beaten from the trees early in the morning and in the evening. The moths fly late in the evening in August and September, and may be taken at sugar; but some species may also be found resting on tree-trunks during the day, with their wings slightly sloping. This genus is very numerous in species throughout the whole northern hemisphere, especially in North America, where, in addition to numerous representatives of the various European groups, there is a large group with black hind-wings with pale fringes, only showing the characteristic markings of the genus in black and white on the under surface of the wings.

* 1. *C. Fraxini* (Linn.), (*Clifden Nonpareil*).—Fore-wings bluish-grey, dusted with darker, with dark double transverse lines, and a pale spot below the reniform stigma; hind-wings black, with a pale blue band. Expands from 3½ to 4 inches. Inhabits Central Europe and Northern Asia, but a great rarity in Britain. The larva is ashy-grey, with a dark brown protuberance, yellowish above, on the 9th segment. It feeds on poplar. The moth and larva are figured at Pl. 41, Fig. 3, *a*, *b*.

* 2. *C. Nupta* (Linn.), (*Red Underwing*).—Fore-wings varied with brown and grey, and dusted with blackish, with the elbowed line strongly and irregularly dentated; hind-wings red, with a regular black border and a black central band, which is narrowed before the middle, and forms a truncated rectangle in the middle. Expands about 3 inches. Common throughout Central Europe and the Altai. The larva is varied with paler and darker grey, with a yellowish prominence bordered with darker behind, on the 9th segment; the belly is blue, spotted with black. It feeds on poplars and willows. The moth is figured at Pl. 41, Fig. 4.

3. *C. Elocata* (Esp.).—Allied to *Nupta;* the markings of the fore-wings indistinct, the elbowed line more evenly zigzag, and the central band of the hind-wings gradually curved, and of equal breadth to beyond the middle. Size of *Nupta.* Inhabits the shores of the Mediterranean, part of Central Europe, and the Altai. The larva is pale grey, mottled and shaded with darker, with a flesh-coloured projection on the 9th segment, and a dark spot behind; belly flesh-coloured, with brown spots. It feeds on poplars and willows. (*C. Deducta*, Eversm., from the Ural and Altai, has pale grey fore-wings, with the transverse lines very well marked; hind-wings rosy, with a black border and central band. *C. Adultera*, Mén., from North Russia and the Amoor, has the fore-wings marked as in *Elocata*, but coloured as in *Fraxini*, and the hind-wings nearly as in *Nupta*.)

* 4. *C. Sponsa* (Linn.), (*Crimson Underwing*).—Fore-wings brown, varied with rust-colour and grey, with an unevenly zigzag elbowed line, and whitish or yellowish spots before and below the light-bordered reniform stigma; hind-wings crimson, with the hind margin black and not dentated, and a black central band, which is very strongly waved, and forms nearly a rectangle above the central band, and ends before the hind margin. Expands from 2¼ to 2½ inches. Common in Central Europe and Northern Asia. The larva is

brown or ashy-grey, resembling bark, with a yellowish prominence on segment 8, and two points on the last segment but one, and with brownish-red spots beneath on segments 7 to 11. It feeds on oak. The moth and larva are figured at Pl. 41, Fig. 5, *a*, *b*.

5. *C. Dilecta* (Hübn.).—Resembles *Sponsa*, but larger. Expands from 2½ to 3 inches; fore-wings darker, and more uniformly greyish-brown, not conspicuously varied with yellow or white; the reniform stigma dusted with pale grey, with no pale spot before it, and the central band of the hind-wings continued to the inner margin. Inhabits South Europe and North Africa. The larva is grey, varied with greenish, with a dark double line on the back, and a yellowish prominence broadly shaded with dusky on both sides on segment 9. It feeds on oak.

*6. *C. Promissa* (W. V.).—Fore-wings ashy-grey, varied with brown, with the elbowed line irregularly zigzag; hind-wings crimson, with a black unspotted border and a black slightly waved central band. Expands from 2 to 2¼ inches. Inhabits Central and Southern Europe. The larva differs from that of *Sponsa* by having a dark spot on the lower part of each segment. It feeds on oak.

7. *C. Conjuncta* (W. V.).—Fore-wings dark brown, with the transverse lines black and well marked, the inner line followed by a greyish band, more or less dark and suffused externally, the elbowed line forming a W beyond the cell, and ending on the costa in an indistinct white subterminal spot; it is dentated, and the angles are pale grey inside, thus forming a row of triangular spots, whiter towards the costa. The reniform stigma is bordered with black, and there is another round spot below. At the base is a short thick black dash. Hind-wings dark rosy or crimson, with the central band narrow, curved, and only slightly waved, and extending nearly to the inner margin; the black border is broad on the costa and narrow at the anal angle. Fringes of the hind-wings white at the tip; otherwise greyish, and divided by a blackish line. Inhabits the shores of the Mediterranean. The larva feeds on oak.

8. *C. Electa* (Borkh.).—Fore-wings ashy-grey, slightly varied with brownish, with the elbowed line single, sharply defined, and strongly zigzag; it projects two long pointed teeth above the middle towards the hind margin, and is connected below the middle with the extremity of the spot below the reniform stigma; hind-wings crimson, but banded as in *Nupta*. Expands from 2¾ to 3¼ inches. Inhabits South-Central Europe and Northern and Western Asia. The larva is pale ochre-yellow, with a dark brown projection on the 9th segment and a bifid projection on the last but one; it feeds on willow. The moth is figured at Pl. 40, Fig. 6. (*C. Optata*, Godt., from South France and Spain, and *C. Lupina*, Herr.-Schäff., from South Russia, Armenia, and the Altai, much resemble *Electa*, but have a thick black basal streak on the fore-wings, and the border of the hind-wings is continuous in *Optata*, but interrupted in *Lupina*. The larva of *Optata* feeds on willow.)

9. *C. Pacta* (Linn.).—Fore-wings ashy-grey, with the elbowed line slightly and moderately dentated; hind-wings pale crimson, with the border not spotted and the central band slightly curved; abdomen crimson. Inhabits Eastern Europe and North Germany, and also occurs in the Altai. The larva is reddish-grey, marbled with darker, with K-shaped spots on the back, a blackish projection on the 9th segment, and two contiguous points on the last segment but one. It feeds on willow.

10. *C. Puerpera* (Giorna).—Fore-wings grey, dusted with brown, with the elbowed line nearly evenly zigzag; hind-wings pale crimson, with a black central and incomplete marginal band, and red at the tip. Expands from 2¼ to 2½ inches. Inhabits South Europe and Northern and Western Asia. The larva feeds on willows growing by the side of streams,


1
3b
4
3a
2
7b
7a
5a
6
5
A
B
C

and lives exposed till the third moult, but afterwards it hides itself during the day under stones and rubbish near the tree on which it feeds.

11. *C. Neonympha* (Hübn.).—Fore-wings grey, with brown angulated fasciæ bordered with black; hind-wings and abdomen yellow, the former with a short black central band, and the border interrupted, and with an oblong yellow spot at the tip. Inhabits South Russia, Armenia, and the Altai. (*C. Nymphæa*, Esp., from South Europe, has fore-wings like *Conversa*, brown, with the elbowed line evenly dentated, and hind-wings like those of *Neonympha*, but with the waved central band longer; the larva feeds on oak.)

12. *C. Paranympha* (Linn.).—Fore-wings reddish-grey, varied with brown, reddish-white below the costa before the middle, with the elbowed line strongly and unevenly dentated; hind-wings yellow, with a curved black central band, connected with another running parallel to the inner margin, and with the black border interrupted; tip yellow. Expands from 2 to 2¼ inches. The larva is grey or brown, with a long pointed tubercle on the 9th segment, and with two brown points on the last segment but one. It feeds on sloe, especially on old bushes. The moth and larva are figured at Pl. 41, Fig. 7, *a*, *b*.

13. *C. Hymenæa* (W. V.).—Fore-wings dark grey, with the elbowed line slightly zigzag in the middle; hind-wings yellow, with the central black band slightly curved and not extending to the inner margin, the black border interrupted, and the tip yellow. Expands from 1¾ to 2 inches. The larva is ashy-grey, with raised dots, a double spot on the 9th segment, and points on the last segment but one, all brownish-red. It feeds on sloe. Inhabits South-Eastern Europe and Western Asia. (*C. Protonympha*, Boisd., only known by a single specimen taken near Paris in August, is supposed by Staudinger to be a specimen of *Eutychea*, with the hind-wings of *Hymenæa*.)

14. *C. Conversa* (Esp.).—Fore-wings varied with ashy-grey and brownish-grey, with the elbowed line nearly evenly dentated; hind-wings dull ochre-yellow, with a curved black central stripe, and the black border broad and unspotted. The variety *Carbonaria* (Staud.) has nearly black fore-wings, and the variety *Agamos* (Hübn.) is also very dark, especially on the hind-wings. Expands from 2 to 2¼ inches. The larva is blackish, with two yellow spots on the lower part of the back of each of segments 4 and 5, and with large greyish-yellow spots on the sides of segments 7 to 10. It feeds on sloe.

15. *C. Eutychea* (Tr.).—Fore-wings greyish-brown, with black angulated transverse lines; the reniform stigma and a semi-oval spot below whitish, and surrounded with black; hind-wings yellow, with a short angulated central band, and a black border. Expands about 1¾ inches. Common in Greece and Asia Minor. The Spanish variety *Dotata* (Herr.-Schäff.) has the band curved instead of angulated. (*C. Diversa*, Geyer, from South Europe, is of the size of *Conjuncta*; fore-wings clouded with grey, and with black transverse lines, as in *Conversa*; hind-wings yellow, with the black border broad, and decreasing to the anal angle, and a black crescent-shaped central band, not extending to the inner margin. The larva feeds on oak.)

16. *C. Nymphagoga* (Esp.).—Fore-wings varied with grey and brown, with slightly dentated black transverse lines; hind-wings yellow, with the base dusky, a broad black border, narrower and almost interrupted, in the middle, and a narrow central stripe forming a right angle at its lower extremity, and extending nearly to the hind margin. Expands from 1¼ to 1½ inches. It inhabits South Europe and Western Asia, and the larva feeds on oak. (*C. Disjuncta*, Geyer, from Greece, Asia Minor, and perhaps Italy, is of the size of *Nymphagoga*; fore-wings brown, with a black trifid basal streak, the elbowed line bluish,

angulated, and bordered with white on the outside; the reniform stigma is white and clouded in the middle, the hind margins are marked with black lunules, and the hind-wings and abdomen are yellow, the former with a black border and central band.)

GENUS IV.—EUCLIDIA (OCHS.).

Rather small moths, expanding from 1¼ to 1½ inches; the fore-wings with the tips obtuse, and the hind margin long and straight; grey or brown, with light transverse lines, which are not dentated; stigmata indistinct; hind-wings round, and as long as the abdomen, white or yellow, banded with dusky; the antennæ of the male ciliated. The larvæ are slender and naked, with three pairs of prolegs, the front pair rudimentary; or with only two pairs. They feed on grass and clover, and are double-brooded. Both the moths and larvæ may be found throughout the fine season. The moths fly in meadows in the sunshine, and rest with their wings sloping.

*1. *E. Mi* (Linn.).—Fore-wings varied with grey and brownish, with the orbicular and reniform stigmata blackish, the transverse lines all whitish (pure white in variety *Litterata*, Cyr.); above the inner margin the elbowed line forms a deep bend, extending to the reniform stigma; hind-wings black, spotted with white before the middle, and with two rows of white spots beyond. Common in Europe and Northern and Western Asia. The larva has twelve legs, and is yellowish-brown or straw-colour, with fine darker and paler longitudinal lines, and a white stripe on the sides. The moth is figured at Pl. 40, Fig. 6.

*2. *E. Glyphica* (Linn.).—Fore-wings violet-brown, with paler transverse lines, which are slightly curved, and broadly bordered with olive-brown on the inside; a triangular brown spot on the costa, near the tip; hind-wings greyish-brown, with two yellow bands, broader and generally united in front. It is as common and as widely distributed as *Mi*, and the larva resembles that of *Mi*, but has fourteen legs, and is rather darker, with a white triangle above the mouth, and a black spot on the belly just before the first pair of prolegs. The moth is figured at Pl. 40, Fig. 5. (*E. Munita*, Hübn., from Sarepta, has reddish-ochre fore-wings washed with blackish towards the hind margin, with two large angular brownish-black blotches, the first triangular, with two very sharp angles touching the costa and inner margin, and the second forming a band bounded by the elbowed line, which is deeply excavated in the middle; beyond the elbowed line is a dusky spot on the costa; hind-wings paler, with a narrow blackish subterminal band.)

3. *E. Triquetra* (W. V.).—Fore-wings reddish-grey, with two large triangular dark brown spots on the inner margin, and another, connected with the outermost, behind the reniform stigma; hind-wings yellow, with a curved blackish submarginal stripe. Inhabits South-Eastern Europe and Northern and Western Asia. (*E. Fortalitium*, Tausch., from the Ural and Altai, has greyish-brown fore-wings, with a basal streak and all the lines whitish; the inner and elbowed lines bordered with black, the former excavated on the inside and the latter waved; hind-wings greyish-brown, with a very angulated brown stripe across the middle, and a broad border, which is marked with a pale stripe.)

GENUS V.—CEROCALA (BOISD.).

Allied to *Euclidia*, but the antennæ and palpi are longer, and the former are pectinated in the male. The only species, *C. Scapulosa* (Boisd.), has the fore-wings varied with paler

and darker grey, dusted with bluish-grey on the costa, hind margin, and suffused submarginal band, and along a black line running obliquely from the extremity of the bluish portion of the costa to the middle of the subterminal line, and then turning at right angles towards the base as far as the inner line. The transverse lines are yellowish-grey, the inner line curved, the elbowed line indistinct, and the subterminal line very distinct, yellow, bordered outside with red, and projecting a sharp angle towards the base in the middle and above the inner margin. Hind-wings dull ochreous, with the nervures, a central lunule, an outer continuous band, and an interrupted border not extending to the anal angle, brown. Expands about 1½ inches. Inhabits South Spain, Algeria, and Syria in March and April, and again in July and August, flying in dry woods by day. The larva is long, slender, and cylindrical; it is naked, and has only twelve legs, and is of a livid-grey colour, with a yellow head. It feeds on *Helianthemum halimifolium*, &c., in spring and autumn. The moth and larva are figured at Pl. 57, Fig. 11, *a*, *b*.

GENUS VI.—PERICYMA (HERR.-SCHÄFF.).

Allied to *Cerocala*, but with shorter fore-wings, the hind margin obtusely angulated in the middle, and the hind-wings with waved fringes. The antennæ are ciliated in the male. The only species, *P. Albidentaria* (Freyer), resembles a *Geometra* in appearance; the fore-wings are yellowish-grey, with the half-line indicated on the costa, and all the transverse lines black, bordered with whitish. The elbowed line is irregularly waved, but forms no distinct teeth; and the subterminal line is placed close to the fringes, from which it is only separated by a whitish stripe, and it is continued on the hind-wings, which are paler than the fore-wings and dusted with whitish; the central area of the fore-wings, and the hind-wings, are indistinctly striated with brown. Expands about 1 inch. Inhabits Sarepta; and a larger and paler variety, *Squalida* (Led.), found in Asia Minor. The moths are readily disturbed from plants in day-time. The larva is pale greenish-yellow, very long and slender, with fourteen legs, but the first pair of prolegs are quite rudimentary. The moth and larva are figured at Pl. 58, Fig. 13, *a*, *b*.

GENUS VII.—ZETHES (RAMB.).

Wings narrow at the base, much widened towards the extremity, each with a projecting angle in the middle; antennæ slender, ciliated in the male; palpi very long. The only European species, *Z. Insularis* (Ramb.), is dull ashy-grey, the transverse lines white, broadly bordered with dark brown within, which shades gradually into the ground-colour; the inner line is curved, and the elbowed line forms two sharp teeth outside; in the marginal area is a large triangular brown costal spot; the markings of the fore-wings are continued on the hind-wings, but less distinctly. Expands nearly 1½ inches. It inhabits Corsica, South-Eastern Europe, and Asia Minor, and is easily disturbed by day in dry weedy places during the summer months. It is figured at Pl. 57, Fig. 1.

GENUS VIII.—ACANTHOLIPES (LED.).

The only species, *A. Regularis* (Hübn.), resembles *Euclidia Triquetra* in size, shape, and outline, but is more like an *Ophiusa* in colour and pattern. The wings are violet-grey or brownish-grey, and the fringes are broad, unicolorous, and entire. The fore-wings are marked with a black streak bordered with yellow on the disco-cellular nervule, the central shade is blackish, very broad on the inner margin, and suffused on the costa, and there is a yellowish transverse line, starting at two-thirds of the length of the costa, nearly

straight, but curved a little outwards towards the hinder angle, and slightly shaded outside with darker. Hind-wings with the continuation of the central shade and transverse line, the latter broader than on the fore-wings. It is found in South Russia and Armenia, and resembles *Zethes Insularis* in its habits.

GENUS IX.—OPHIUSA (OCHS.).

Middle-sized moths, with rather slender bodies; fore-wings strong, with hind margin long and a little oblique; brown or violet-grey, often without stigmata, the subterminal line sharply zigzag, but indistinct or incomplete; hind-wings rounded and as long as the abdomen; legs woolly in the two last species. The larvæ resemble those of *Catocala* in shape, and the moths fly by day, and do not slope their wings much when at rest.

1. *O. Cailino* (Lef.).—Fore-wings with the basal area bluish-black, the central area reddish-yellow, and the marginal area dark grey as far as the subterminal line, and bluish-grey beyond. These shades are all bounded by the transverse lines; the inner line is black, double, oblique, and waved; the elbowed line is much angulated, and the subterminal line is double, brown, and waved. The central shade is composed of two straight reddish lines. The reniform stigma is small and narrow, brown bordered with black, and the fringes are reddish-brown, preceded by a row of small black and white dots. Hind-wings white, with a broad black border, waved in the middle, and with a large white spot in the middle outside; fringes white, a little blackish in the middle. Expands nearly 1½ inches. It is common in South Europe and Western Asia in May and August, and may be taken on the flowers of the lavender with the aid of a lantern. The larva feeds on *Salix viminalis*. The moth is figured at Pl. 57, Fig. 6. (*O. Stupida*, Herr.-Schäff., from Turkey, has brown fore-wings, with black transverse lines, the inner line nearly straight and the elbowed and subterminal lines waved, the former bordered with white inside, and with a broad reddish stripe outside; hind-wings greyish-brown, with a whitish central stripe, and the fringes white, interrupted with blackish. *O. Panaceorum*, Ménétr., from South Russia, is yellowish-grey, varied with brown, and with black transverse lines, the inner line acutely bifid, the elbowed line strongly curved inwards, and the submarginal line marked towards the tip with five arrow-headed spots; hind-wings white, with a square black spot in the middle, and a black submarginal band. *O. Flexuosa*, Ménétr., from South Russia and Western Asia, has yellowish-grey fore-wings, dusted with brown, and black transverse lines; the inner line oblique, the elbowed line curved strongly inwards below and bordered by a brown fascia, broadly forked outwards in the middle, and the submarginal line dentated; hind-wings white, brown towards the base, and with a broad black submarginal band.)

2. *O. Stolida* (Fabr.).—Fore-wings dark olive-brown, dark violet-grey on the costa and hind margin, with two pale yellow transverse lines hardly extending to the costa, the inner line straight, broad, and perpendicular, the elbowed line consisting of two curves; hind-wings dark brown, with a white central stripe and a white spot near the anal angle; fringes white, spotted with brown in the middle and at the anal angle. Expands about 1½ inches. Inhabits South Europe, North Africa, and Western Asia in July, and the larva feeds on bramble.

3. *O. Bifasciata* (Petagna), *Geometrica* (Rossi).—Fore-wings broadly violet-grey on the costa and hind margin, with a large dark olive-grey triangle on the inner margin, intersected by a broad, straight, rather oblique, and yellowish-white transverse line, and bordered behind by a similar, but rather narrower one; hind-wings dark grey, with a straight white suffused


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central band, and the fringes interrupted by two white spaces. Expands nearly 1¾ inches. Inhabits the south of Europe and Asia, and North Africa, from May to November, hiding itself among the tufts of its food-plant during the day. The larva is bluish-grey, with slender yellowish lines, two ochre-yellow stripes on the back, and a pale yellow one, shaded with dusky, on the sides. It feeds on *Polygonum Persicaria* in damp places, and constructs a strong white waterproof cocoon. The moth and larva are figured at Pl. 58, Fig. 5, *a*, *b*.

4. *O. Algira* (Linn.).—Fore-wings brown, the tip marked with two triangular black spots, the marginal area and a transverse central band slightly narrower in the middle, violet-grey, the elbowed line whitish, with a broad projection above the middle; hind-wings dark grey, with a central band and the fringes paler. Expands about 1¾ inches. Its range is similar to that of *Bifasciata*, and it appears in May, July, and August. The larva is yellowish-grey, with slender blackish lines. It feeds on bramble, sloe, &c., in summer and late in autumn. The moth is figured at Pl. 57, Fig. 3.

GENUS X.—PSEUDOPHIA (LED.).

Large moths; the fore-wings rather long, with a dark reniform stigma more or less distinct; transverse lines, which are not dentated, and a zigzag submarginal line; hind-wings as long as the abdomen, and legs strong. The larvæ resemble those of *Catocala*, and hide themselves in the crevices of the bark of trees during the day. They feed from July to September, and the moths appear in May and June. They fly at night, and rest with their wings sloping.

1. *P. Illunaris* (Hübn.).—Fore-wings dull ochreous-grey, more or less dusted with darker, the transverse lines blackish, the two central ones indistinct and often interrupted, the submarginal line better marked, dentated, with acute angles, indistinctly bordered with pale outside, and terminated by a black dot before reaching the costa; reniform stigma formed of two whitish dots, one above another, and often indistinct, orbicular stigma absent; fringes preceded by a black festooned line; hind-wings pale yellowish-grey, with a broad blackish submarginal band, suffused on the inside. Expands about 1¾ inches. Inhabits South France and Italy, and the larva feeds on tamarisk. The moth is figured at Pl. 57, Fig. 9. (*P. Syriaca*, Bugn., from Syria and Andalusia, appears to be a variety with the dark band on the hind-wings less distinct, or wholly absent.)

*2. *P. Lunaris* (W. V.).—Fore-wings pale grey, varied with rusty-brown, with light transverse lines, a dark subterminal line, a black dot in the place of the orbicular stigma, and the reniform stigma blackish; hind-wings reddish-grey, with the hind margin brown Expands from 2 to 2¼ inches. Inhabits Central and Southern Europe and North Africa; in England it is extremely rare. The larva is of a grey colour, resembling bark, with two yellowish spots on the back of the 5th segment, and a reddish stripe on the sides. It feeds on oak. The transformations are figured at Pl. 40, Fig. 8, *a—c*. (*P. Profana*, Eversm., from the Caucasus, is darker than *P. Lunaris*, with the reniform stigma small and white; hind-wings pale yellowish-grey, with a well-defined black central lunule.)

3. *P. Tirrhæa* (Cram.).—Fore-wings green, with the reniform stigma and hind margin reddish-brown; hind-wings pale yellow, generally with a short broad black band beyond the middle. Expands from 2½ to 2¾ inches. Inhabits the south of Europe and Asia, and North Africa. The larva is grey, with a pale grey stripe on the sides, and black spots on the lower surface between the prolegs. It feeds on *Pistacia Lentiscus*. The moth is figured at Pl. 40, Fig. 7.

FAMILY XVI.—TOXOCAMPIDÆ.

Fore-wings paler or darker grey; hind-wings unicolorous brownish-grey, a little paler at the base, and not quite as long as the abdomen; antennæ simple. The larvæ are naked and slender, with sixteen legs, generally with the front pairs of prolegs rudimentary; and they undergo their transformations in a cocoon on the surface of the ground. The moths fly at night, and sit during the day with their wings flatly sloping and a little overlapping.

GENUS I.—SPINTHEROPS (BOISD.).

Large or middle-sized moths; the fore-wings with the hind margin moderately curved, dark dentated transverse lines, broader on the costa, and a pale zigzag subterminal line; the orbicular stigma reduced to a dot, and the reniform stigma often indistinct; hind-wings obtusely rounded. The larvæ have the legs fully developed, and feed by day, and the moths may be attracted by light.

1. *S. Spectrum* (Fabr.).—Fore-wings greyish-brown, with black transverse lines and a white macular subterminal line shaded with dusky in front; the orbicular stigma represented by a white dot, and the reniform stigma concolorous, bordered with black and white; hind-wings unicolorous brownish-grey, and the last joint of the palpi very long. Expands from $2\frac{3}{4}$ to $3\frac{1}{4}$ inches. Inhabits South Europe and North Africa in May and June. The larva is yellow, with four black stripes on the back, and black dots on the sides. It feeds on broom in July. The moth is figured at Pl. 58, Fig. 1.

2. *S. Cataphanes* (Hübn.).—Fore-wings shining yellowish-grey, with brown transverse lines, and a whitish subterminal line spotted with darker in front; the orbicular stigma reduced to a white dot, and the reniform stigma indistinct; hind-wings grey, with a central streak, and the fringes pale yellowish; the last joint of the palpi longer than the others. Expands nearly $1\frac{3}{4}$ inches. A rare species, found in South Europe in July and August; the larva feeds on furze.

3. *S. Dilucida* (Hübn.).—Fore-wings greyish-yellow, with brown transverse lines and a pale subterminal line broadly shaded with brownish on both sides; the orbicular stigma is a black dot, and the reniform stigma a dark lunule; hind-wings grey, with a central streak and the fringes paler; the last joint of the palpi very short. Expands from $1\frac{3}{4}$ to 2 inches. Inhabits Europe, south of the Alps, North Africa, and Western Asia in June and July, and the larva feeds on *Onobrychis sativa*.

4. *T. Hirsuta* (Staud.).—Fore-wings yellowish-grey, with very indistinct transverse lines and reniform stigma; hind-wings dirty yellowish-grey; the head and thorax clothed with very long hair, and even the fore-wings covered with long fine hairs. Expands about $1\frac{3}{4}$ inches. Only one specimen known, which flew into a house in the Valais on a mild February evening.

GENUS II.—EXOPHILA (GUÉN.).

Fore-wings narrow, truncated behind, rounded at the hinder angle, and without markings; hind-wings rounded. Larvæ with the front prolegs rudimentary. The only species, *E. Rectangularis* (Hübn.), has yellowish-grey fore-wings, finely and sparingly dusted with blackish, with pale slender transverse dashes, and the hind-wings light grey. Expands about $1\frac{1}{2}$ inches. Inhabits South-Eastern Europe as far as the Tyrol, and Armenia, in July and August. Larva green, with pale slender longitudinal lines, and light angular interlacing oblique dashes between. It feeds on *Celtis australis* in May and June.

GENUS III.—ECCRITA (LED.).

Fore-wings truncated behind and rounded at the hinder angle, with no distinct transverse lines or orbicular stigma; hind-wings very broad and rounded. Larvæ as in *Toxocampa*. The only species, *E. Ludicra* (Hübn.), has violet-grey fore-wings, transversely speckled with brown, brownish in the marginal area, and the reniform stigma black, broader below, and divided by the pale nervures; head and collar brownish-black. Expands from $1\frac{3}{4}$ to 2 inches. Inhabits Eastern Europe and Northern Asia in June and July. The larva is violet-grey, with a broad brown stripe on the back, divided by a pale line and bordered with black, and with a brown stripe on the sides, and a white one below it. It feeds on vetches in May. (*Dichagyris Melanura*, Herr.-Schäff., is a genus and species closely allied to *Exophila* and *Eccrita*; the fore-wings and the under surface of all the wings are white, with a broad black border and concolorous fringes; the hind-wings are grey above. The only known specimen is supposed to have been taken in Dalmatia.)

GENUS IV.—TOXOCAMPA (GUÉN.).

Middle-sized moths; the fore-wings as in *Eccrita*, but much broader behind, violet-grey or brownish-yellow, transversely speckled with darker; all the transverse lines absent or suffused, the orbicular stigma reduced to a black dot, or absent, and the reniform stigma, as well as the head and collar, dark brown; hind-wings very broad, truncated below the tips, and brownish-grey. The larvæ are slender, with the front prolegs rudimentary. They feed on vetches, and hide themselves during the day.

1. *T. Lusoria* (W. V.).—Fore-wings of a yellowish violet-grey; the orbicular stigma is a black dot, and the reniform stigma is much widened below, and not divided with paler; the subterminal line is indicated by the darker shading in front. Expands from $1\frac{3}{4}$ to 2 inches. Inhabits South-Eastern Europe and Northern and Western Asia in July and August. The larva is ashy-grey, with a double red line on the back, a black one below, and two more red ones lower down on each side. It is met with in May and June, and is figured, with the moth, at Pl. 40, Fig. 9, *a*, *b*.

* 2. *T. Pastinum* (Tr.).—Fore-wings of a bluish violet-grey, brownish in the marginal area. The stigmata as in *Lusoria*, but the reniform stigma is only a little broader below, and there are one or two black dots outside its lower end. Expands from $1\frac{1}{2}$ to $1\frac{3}{4}$ inches. Common in Central Europe and Northern Asia in June. The larva is ashy-grey, with three rows of small yellow spots on the back, and a broad white stripe on the sides, dotted with white, and orange-yellow below. It lives till May. (*T. Glycyrrhizæ*, Ramb., from Andalusia, has grey fore-wings, finely striated with brown, with the suffused submarginal band and hind-wings rusty-yellow. The reniform stigma is black, a little widened below, and the head and collar are brownish-red. Expands about 2 inches.)

* 3. *T. Craccæ* (W. V.).—Fore-wings reddish ashy-grey, with narrow pale nervures; brownish in the marginal area, with several dark spots on the costa, and a blacker reniform stigma divided by the nervures, but with no transverse lines; the suffused submarginal band is reddish-brown. Expands from $1\frac{1}{2}$ to $1\frac{3}{4}$ inches. Local in Central and Southern Europe, and in Northern and Western Asia, in May and June; rare in England. Larva light grey, with a dark double line on the back, and a greyish-brown streak and dark oblique dashes on the sides. It feeds in summer and autumn. The moth is figured at Pl. 40, Fig. 10.

4. *T. Viciæ* (Hübn.).—Resembles *Craccæ*, but smaller (expands $1\frac{1}{2}$ inches or less); the costal spots are not so dark, and there are two suffused brown transverse lines, and a pale subterminal

line. Inhabits many parts of Central Europe and Northern Asia in July. The larva is clay-coloured, with a broad brown stripe on the back, divided by a darker line edged with paler; and a whitish spot on the last segment. It feeds in May and June.

5. *T. Limosa* (Tr.).—Fore-wings reddish-grey, dark grey on the costa and in the marginal area, almost without markings, only the small black-edged reniform stigma being visible. Expands about 1½ inches. It inhabits Hungary and Dalmatia in April and July. The larva is pale bluish-grey, with black and yellow longitudinal lines on the back. It feeds on *Coronilla varia* in spring and autumn. (*T. Ephialtes*, Hübn., from Andalusia, is uniform brown, with the three outer lines black and very slightly curved, and the reniform stigma small, black, and nearly square.)

FAMILY XVII.—NOCTUOPHALÆNIDÆ.

Small moths; the fore-wings generally brightly coloured and marked, seldom with the *Noctua*-pattern distinct, and often quite irregular; the antennæ simple, and the thighs only occasionally clothed with thin hair. The larvæ have twelve or fourteen legs, and are naked, or covered with short soft hair, and the moths rest with their wings sloping.

GENUS I.—ERASTRIA (TR.).

Rather slender moths, with delicate wings; the fore-wings brown or grey, varied with whitish, or without markings. Larvæ with fourteen legs, those on the 8th segment rudimentary. They are naked, live in summer, and undergo their transformations on or in the ground. The moths fly at twilight in open woods from May to August. The abdomen is strongly crested in the two last species, and only slightly or not at all in the others.

* 1. *E. Argentula* (Hübn.), *Bankiana* (Fabr.).—Fore-wings olive-grey, with two broad straight and oblique silvery-white transverse lines, the first continued along the costa to the base; hind-wings grey, dusted with brownish. Expands from three-quarters of an inch to an inch. Inhabits Central Europe and Northern and Western Asia; very local in England and Ireland. The larva is green, darker above, with two white lines on the back, and a yellowish stripe on the sides. It feeds on grass in August and September.

* 2. *E. Uncula* (Clerck), *Uncana* (Linn.).—Fore-wings brown, with the costa broadly white, edged above with brownish; below this are the two stigmata, which are bordered with silvery-white; the reniform stigma is inconspicuous. There is a white line parallel to the hind margin, and the hind-wings are brownish-grey. It expands 1 inch or less. Common in damp meadows in Northern and Central Europe, and Northern Asia. The larva is green, with a dark line on the back, and feeds on grass.

3. *E. Obliterata* (Ramb.), *Wimmeri* (Tr.).—Fore-wings varied with ashy-grey and brownish-grey, with indistinct finely waved transverse lines, bordered with paler; the elbowed line is curved round the light space in the middle of the wing representing the reniform stigma; and the hind-wings are reddish-grey. Expands about 1 inch. Inhabits South-Eastern Europe, westwards to North Italy; and Northern and Western Asia.

* 4. *E. Venustula* (Hübn.).—Fore-wings varied with violet-grey and brown, rosy-grey towards the base and in the position of the orbicular stigma, with whitish transverse and subterminal lines, which are not dentated, and a black spot before the reniform stigma; the hind-wings are pale grey. Expands about three-quarters of an inch. Scarce and local, occurring among fern in Central Europe and Northern and Western Asia. The larva is dark reddish-brown, with

two orange-yellow stripes on the back, divided by a dark line, and bordered below by black arches, and there are white spots on the sides of the 4th segment.

5. *E. Candidula* (W. V.).—Fore-wings white, clouded with grey, with fine dark double transverse lines, a rather large reniform stigma, bordered below with black dots, and a large triangular costal spot; hind-wings pale grey. Expands about 1 inch. Scarce and local in many parts of Central Europe and Northern and Western Asia. The larva is green, with three dark lines on the back, and two whitish lines on the sides. It feeds on grass and other low plants.

6. *E. Scitula* (Ramb.).—Fore-wings much rounded, grey, with the basal area white, and a blackish central shade. The elbowed and subterminal lines are white, curved, and sinuated, and the latter expands into a white space below the tip; and beyond this is a reddish-brown spot marked with a greyish-white zigzag line and some black dots. The upper half of the fringes is brownish, and the stigmata are indicated by some black scales. Hind-wings grey, paler at the base, and the fringes white. Expands about half an inch. A rarity in South Europe. (*E. Numerica*, Boisd., has the fore-wings brown, with all the lines white and zigzag, and a festooned marginal line; the stigmata bordered with white, and resembling a figure of 80, as the reniform stigma is long and constricted; hind-wings yellowish-grey, with the fringes spotted with white. Expands about 1 inch. Inhabits Corsica, Andalusia, and perhaps South France.)

7. *E. Deceptoria* (Scop.), *Atratula* (Borkh.).—Fore-wings dark brown, white in the basal area and in the suffused submarginal area, with small orbicular and reniform stigmata bordered with paler; hind-wings grey, with an indistinct light curved stripe. Expands from 1 to 1¼ inches. Inhabits Central Europe, except the north-west, and Northern Asia. The larva is green, paler above, with a dark line on the back, a white line below, and a yellowish line on the sides. It feeds on grass. The moth is figured at Pl. 42, Fig. 1.

* 8. *E. Fasciana* (Linn.), *Fuscula* (Borkh.).—Fore-wings brown, broadly whitish above the hinder angle (except in variety *Guénèi*, Fallou), with black transverse lines, a white subterminal line, and small stigmata; hind-wings brownish-grey. Size of *Deceptoria*. Common in Central and Southern Europe and Northern and Western Asia. The larva is yellow, with three brownish-red longitudinal stripes. It feeds on brambles. The moth is figured at Pl. 42, Fig. 2.

GENUS II.—EMMELIA (HÜBN.).

Fore-wings rather narrow, without the *Noctua*-pattern. The only species, **E. Trabealis* Scop. (*Sulphuralis*, Linn.), has sulphur-yellow fore-wings, with two black longitudinal stripes on the inner margin and below the middle, two black transverse lines before the hind margin, the outermost somewhat macular, and black spots towards the costa; hind-wings brownish-grey. Expands rather less than 1 inch. Common in Central Europe and in Northern and Western Asia in May, June, and August; rare in England. It flies by day along the edges of cornfields and in similar localities, generally settling on the stems of plants. The larva has twelve legs; it is green or brown, with a yellow stripe on the sides, and feeds on *Convolvulus* in July and in autumn. The moth and larva are figured at Pl. 42, Fig. 3, *a*, *b*.

GENUS III.—PHOTHEDES (LED.).

Small and delicate moths; the fore-wings with powdery scales and the *Noctua*-pattern; the thighs thinly clothed with hair. The only species, *P. Captiuncula* (Tr.), has dark yellowish-brown fore-wings, varied with reddish-yellow in the suffused submarginal band, with whitish transverse and subterminal lines, and the two stigmata olive-green; hind-wings dark grey. Expands

three-quarters of an inch or less. It is local in the mountains of Central and Eastern Europe and in the Altai, flying about sunset in July and August. The British variety, **P. Expolita* (Stainton), which is common at Darlington and Galway, is thus described by him:—"Fore-wings shining greyish-brown, with more or less of a reddish tinge, with a darker central band; the whitish lower half of the elbowed line forming the inner edge of a pale, not sharply defined, band before the hind margin; hind-wings dark grey, with whitish fringes." This species is sometimes placed in the genus *Miana*.

GENUS IV.—MESOTROSTA (LED.).

The male is slender, and the female rather stout; fore-wings short, with powdery scales, and with no distinct transverse lines. The only species, *M. Signalis* (Tr.), has clay-coloured fore-wings, with a leaden lustre; a yellow dot instead of the orbicular stigma, and a whitish eye-spot instead of the reniform stigma; the elbowed and subterminal lines indistinctly light, and the hind-wings brownish-grey. Expands about three-quarters of an inch. It inhabits South-Eastern Europe in May, flying by day.

GENUS V.—PROTHYMIA (HÜBN.).

Fore-wings with no stigmata or transverse lines, but with an indistinct subterminal line. The moths fly during the day. The commonest species, **P. Viridaria*, Clerck (*Laccata*, Scop.; *Ænea*, W. V.), has dark olive-grey fore-wings, with a straight purplish-red central band and hind margin; hind-wings brownish-grey, with purplish fringes. Expands about three-quarters of an inch. It is common in Europe and Northern and Western Asia from May to August. The larva is green, with several very pale longitudinal lines. It feeds on *Polygala vulgaris* in August and September. The moth is figured at Pl. 57, Fig. 5. (*P. Sanctiflorentis*, Boisd., is olive-grey, with the hind margin and central band brownish-red; the fore-wings with the reniform stigma composed of two dark dots; fringes rosy at the tips. Expands about 1 inch. It inhabits Spain. *P. Baueri*, Staud., supposed to be from Andalusia, has greenish-grey fore-wings, with a black spot in the middle of the costa, and two oblique darker transverse lines in the middle; hind-wings dirty white, very strongly dusted with black atoms. *P. Conicephala*, Staud., from the extreme south of Europe, and Western Asia, has straw-coloured fore-wings, with a small black dot at lower end of discoidal cell, and two transverse dark bands beyond, more or less indistinct; hind-wings pale yellow.

GENUS VI.—TROTHISA (HÜBN.).

Comprises a number of small moths, the largest not expanding more than 1¼ inches; the fore-wings are short and broad, with a very long and gradually curved, or shorter and somewhat arched hind margin, and long fringes, covered with powdery scales, with the pattern irregular and the colour variable, generally with a dark transverse stripe in the middle, bordered with paler, and often divided into two halves of different colours. The larvæ are short and thick, with twelve legs and short fine hairs. They often feed on the seeds of plants, and undergo their transformations in a cocoon or in the ground. The moths fly in the sunshine in dry sandy or chalky places, and are chiefly met with in the south of Europe. The smaller species are liable to be mistaken for *Tortrices* or other *Microlepidoptera*, and thus overlooked.

1. *T. Arcuinna* (Hübn.).—The colour varies from pale grey to dark brownish; fore-wings with a dark central stripe composed of three rather flattened curves, bordered with white behind, and a pale subterminal line, strongly zigzag in the middle; hind-wings with two whitish and widely-separated curved stripes. Expands about 1¼ inches. Inhabits Andalusia and South-Eastern Europe in July.

2. *T. Suava* (Hübn.).—The fore-wings vary from brownish-grey to cinnamon-red, with an obtusely angulated blackish central stripe, bordered with white, and a whitish and much waved subterminal line; hind-wings dark grey, with two whitish waved stripes near together. Expands 1 inch or over. It is found in South Europe in July.

3. *T. Jucunda* (Hübn.).—Fore-wings varied with reddish-grey and brown, with the dark brown central stripe quite straight, suffused in front, and bordered with white behind, the subterminal line spotted with white on the costa, and projecting strongly in the middle; hind-wings blackish, with a straight whitish central stripe divided with darker, and a white macular streak before the hind margin. Expands about 1 inch. Inhabits South France, Spain, and Carinthia from May to July.

4. *T. Velox* (Hübn.).—Fore-wings pale grey, varied with yellowish and bluish, with four fine waved parallel black transverse lines, well marked on the costa by triangular spots. Stigmata blackish; the orbicular stigma is a dot, and the reniform stigma is irregular, and traversed by the central shade. Hind-wings grey, with the hind margin tinged with slate-colour, dentated, and varied with reddish; inner margin dusted with blackish. Expands about three-quarters of an inch. Common in South Europe and Western Asia in July and August, resting on walls, bridges, &c.

5. *T. Dardouini* (Boisd.).—Wings brownish-grey, fore-wings with three dark waved transverse lines, narrowly bordered with pale grey, the middle one strongly curved round the small reniform stigma, and the subterminal line finely whitish; hind-wings grey, with an indistinct light waved line. Size of *Velox*. Inhabits South Europe in May and June. The larva is dull yellow, with brownish-red transverse spots, divided with paler. It feeds on the seeds of *Anthericum ramosum* in August and September.

6. *T. Lacernaria* (Hübn.), *Glarea* (Tr.).—Fore-wings yellowish-white, with several olive-grey waved parallel lines; fringes long, and paler; hind-wings similar, but paler, darker towards the hind margin. In the variety *Phlomidis* (Guén.) the fore-wings are olive-grey, unmixed with yellowish, with darker bands. Expands a little more than half an inch. It inhabits South Europe in July, and its larva feeds on different species of *Phlomis*, rolling up the leaves like that of a *Tortrix*.

7. *T. Respersa* (Hübn.), *Amœna* (Hübn.).—Fore-wings varied with pale grey and brownish-grey, with a brown transverse shade before the middle, curving towards the base, a brown spot before the tip, a light interrupted elbowed line, and a whitish subterminal line; hind-wings grey, with a light suffused curved stripe. Expands about 1 inch. Inhabits South Europe and Western Asia in June and August. The larva is pale grey, with a light line on the back. It feeds on *Onopordum acanthium* in May. The moth is figured at Pl. 42, Fig. 4.

8. *T. Albicans* (Ramb.).—Greyish-white, with brown spots on the costa, a nearly straight subterminal brown line, and two transverse lines parallel to each other, the outermost curving round the small reniform stigma; hind-wings more or less brownish or reddish towards the hind margin. The female is much darker, especially towards the hind margins and between the transverse lines. Expands about 1¼ inches. It inhabits Andalusia. (*T. Parallela*, Freyer, from South Russia and Armenia, is grey, with two transverse lines as in *Albicans*, the inner line broadest, and with two outer greenish-grey stripes, and a white spot on the costa before the tip; hind-wings grey, with the tips of the fringes white. *T. Concinnula*, Boisd., from South Russia and the Altai, is a little larger than *Paula;* fore-wings bluish-white, with white transverse and subterminal lines, the former double; hind-wings white, slightly dusted with brownish. *T. Ragusana*, Freyer, from Dalmatia and Syria, resembles *Polygramma*, but is as large as *Lacernaria;* the wings are of a chalky-white, without lustre, with three fine olive-brown lines bordered with paler, directed obliquely outwards and then angulated inwards, the first indistinct; fore-wings with two dots, as in *Polygramma*.)

9. *T. Polygramma* (Dup.).—All the wings violet-grey, with three fine yellow transverse lines bordered with rust-colour, the fore-wings with two black dots in the place of the stigmata. Expands about three-quarters of an inch. Inhabits South Europe and Armenia in July. (*T. Cinerina*, Ghil., from Sardinia, is yellowish-grey, slightly tinged with rosy-white on the fore-wings, which are marked with three very short and narrow lines towards the extremity of the costa, followed by three brown dots. The tip is divided by a diagonal dark brown dash, from which several narrow and rather indistinct diverging brown lines, bordered with lighter on both sides, run obliquely to the inner margin; the subterminal line is yellowish and more distinct, ending in a white spot below the apical dash. Within this is a row of five black dots, two on the apical blotch and three below, and there are two very small ones towards the middle of the costa. Hind-wings with three brown transverse lines towards the inner margin; all the fringes preceded by a very narrow black line.)

10. *T. Communimacula* (W. V.).—Fore-wings flesh-colour, with a large rust-coloured spot bordered with white, and of the shape of half an egg, on the middle of the inner margin; hind-wings reddish-white. Expands about 1 inch. Inhabits South-Eastern Europe in August; the short cylindrical yellowish-white larva feeds on sloe and peach-trees. (*T. Pannonica*, Freyer, from South-Eastern Europe and Armenia, is of the size of *Purpurina;* the fore-wings are broadly shining yellow at the base, marked with three black dots, and greyish-brown beyond, with an indistinct whitish line; hind-wings brown. *T. Amasina*, Eversm., from South Russia and Asia Minor, has yellow fore-wings, with the outer half rosy; a subterminal line and submarginal dots whitish, bordered with black, and the hind margin paler; hind-wings grey, with the base and fringes whitish.)

11. *T. Purpurina* (W. V.).—Fore-wings with an interrupted oblique greenish-yellow central shade before the middle, pale yellow before it, and rosy, with darker streaks, behind; the elbowed line dark red, strongly interrupted in the middle and below the costa, and running very obliquely from thence to the borders; the subterminal line indicated by the red shading in front, which is bordered with whitish, and projects strongly towards the hind margin in the middle; hind-wings brownish-grey. Expands 1 inch or a little over. Inhabits South Europe in May, June, August, and September. The larva is greyish-green, with two dark stripes on the back, and two duller ones on the sides. It feeds on *Cirsium arvense* in July and in autumn. The moth is figured at Pl. 42, Fig. 6.

12. *T. Rosea* (Hübn.), *Rosina* (Hübn.).—Fore-wings violet-red, paler at the base, with an olive-green central shade before the middle, projecting in front, and slightly bordered with white behind, and three dark red undentated transverse lines in the marginal area; hind-wings brownish-grey. Expands about 1 inch. Inhabits South-Eastern Europe and Western Asia in June and July. The larva is rosy, dusted with darker, with two whitish lines on the back, and a whitish stripe on the sides. It feeds on *Jurinea mollis*, under a web, in May. The moth is figured at Pl. 42, Fig. 5.

*13. *T. Ostrina* (Hübn.).—Fore-wings pale yellow, with an oblique brown central shade, slightly shaded with pinkish beyond, on which stands a very small black dot, representing the reniform stigma, and a fine whitish subterminal line, composed of three curves; hind-wings grey. Expands about three-quarters of an inch. Inhabits Southern and Western Europe in June, as far as the south coast of England, where it is rare; it also occurs in North Africa and in Northern and Western Asia. The larva is said to live in the shoots of thistles.

*14. *T. Parva* (Hübn.).—Fore-wings pale rusty-yellow, with a fine white oblique transverse line in the middle, shaded with dusky in front, and a whitish elbowed line, strongly curved round


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10c.
A.
B.
C.

a black dot, which represents the reniform stigma ; hind-wings pale grey. Expands about half an inch. It inhabits South Europe and Western Asia in June, and specimens were taken by Dr. Battersby at Torquay in 1859, in company with *Ostrina*. Some doubt having been expressed as to the British specimens being really *Parva*, I may add that having had an opportunity of comparing Dr. Battersby's original specimens with Continental specimens and descriptions, I have come to the conclusion that they really belong to that species. The larva lives in the seed-capsules of *Inula montana*, and becomes a pupa there.

15. *T. Paula* (Hübn.).—Fore-wings olive-grey, whitish at the base, with a dark oblique band in the middle, and a whitish transverse stripe in the marginal area, projecting in an obtuse angle ; hind-wings pale grey, edged with darker. Size of *Ostrina*. Common in the southern half of Central Europe from June to August. The larva is pale green, with a dark double line on the back. It feeds on *Gnapbalium arenarium* in June.

16. *T. Viridula* (Guén.).—Fore-wings yellowish olive-green, with an oblique brownish stripe before the middle ; hind margin grey, with rusty-brown spots at the tip and on the inner margin, between which projects a tooth of the white ground-colour ; hind-wings whitish at the base. Size of *Ostrina*. The variety *Elychrysi*, from Corsica, Sardinia, and Sicily, may be distinguished by its dark greyish-green colour ; the true *Viridula* is common in South Europe and Western Asia.

17. *T. Candidana* (Fabr.).—Fore-wings white, with an oblique central band and the hind margin rusty-red ; the latter is varied with white towards the extremity, and the intermediate white band projects a tooth outwards in the middle ; hind-wings grey, whitish at the base. Expands nearly three-quarters of an inch. Common in South Europe and Armenia in June and July. The variety *Impura* (Staud.), from the south-west of France, is smaller and darker, and varied with brownish instead of rust-colour. (*T. Himmighoffeni*, Mill., has yellow, rather pointed fore-wings ; the subterminal band is blackish, broad in the centre, and narrower at the extremities ; the costa and a broad transverse central band are satiny white ; fringes dark grey ; hind-wings white, with yellow fringes. *T. Barcinonensis*, Mill., has moderately pointed fore-wings; the costa is very little arched, and the hind margin quite straight, pale straw-colour, with a slightly indicated brown subterminal band, and a very small black central dot ; between these is a small oblong blackish spot. Hind-wings very pale straw-colour, almost white. Both these species are about the size of *Ostrina*, and are found at Barcelona in June.)

18. *T. Pura* (Hübn.).—Fore-wings shining white, slightly washed with yellowish, with a central curved band, and the hind margin yellowish-red. Stigmata replaced by two small black dots ; fringes very long, and tinged with reddish at the extremities, as are also the white hind-wings. Expands about three-quarters of an inch. Common in summer in South France and Spain.

GENUS VII.—HÆMEROSIA (BOISD.).

Antennæ pectinated in both sexes ; wings shaped nearly as in *Trothisa*, but with an accessory cellule on the fore-wings, which is wanting in that genus. The only species, *H. Renalis* (Hübn.), has flesh-coloured wings, the fore-wings with a white reniform stigma, placed on the brownish elbowed line, which is bordered with whitish on the outside, and consists of slender lunules ; the inner line is often indistinct ; the hind margin and fringes are suffused with brown, and the hind-wings are without markings. Expands about 1 inch. It inhabits South France in spring and autumn, and the larva feeds on the flowers of different species of *Lactuca* and *Chondrilla*. The moth is figured at Pl. 57, Fig. 7.

GENUS VIII.—METOPONIA (DUP.).

Fore-wings with the hind margin almost perpendicular, slightly oblique below, or with the hind margin oblique and nearly straight ; uniform yellow, with a black dot in the middle. The larvæ are naked, with sixteen legs. The moths appear in June, and expand about 1¼ inches.

1. *M. Vespertalis* (Hübn.).—Pale ochre-yellow, slightly varied with brownish, with violet-grey fringes, and a black dot in the middle of the fore-wings. Inhabits South Europe in dry sunny places. It rests with its wings sloping, and is easily disturbed during the day. (*M. Agatha*, Staud., from Greece, has straw-coloured fore-wings, with a curved ochre-yellow stripe, a spot of the same colour in the middle, with a black dot on each side ; border, ochre-yellow ; hind-wings smoky-brown. It is figured at Pl. 58, Fig. 7.)

2. *M. Koekeritziana* (Hübn.), *Flava* (Hübn.).—Fore-wings pale sulphur-yellow, with a black dot in the middle ; all the fringes yellowish-grey ; hind-wings dark grey. Inhabits South-Eastern Europe, and the yellow larva feeds on larkspur.

GENUS IX.—MEGALODES (GUÉN.).

Resembles *Metoponia*, but twice as large and rather stouter ; the antennæ are rather thick, and ciliated in the male. The only species, *M. Eximia* (Freyer), from Turkey and Asia Minor, has greenish-grey fore-wings, interrupted with dirty white on the nervures and fringes ; the two stigmata indistinct, the transverse lines dirty white, the inner and subterminal lines straight, and the elbowed line projecting round the reniform stigma, and then curving inwards, thus making the narrow central area triangular. Hind-wings light ashy-grey, rather darker in the female than in the male, and with paler fringes. It sits on mallows, with its wings sloping, and its larva, which resembles that of a *Plusia*, feeds on the same plants.

GENUS X.—METOPTRIA (GUÉN.).

Resembles the last genus in size and structure, but the body and antennæ are more slender. The only species, *M. Monogramma* (Hübn.), has the fore-wings pale yellowish-green as far as the central shade, and olive-brown beyond. The subterminal line is very distinct, pale, and slightly undulated, and the reniform stigma is whitish and constricted, which gives it the form of an 8. Hind-wings orange-yellow, with a broad blackish border, rather ill-defined in the middle. The female is browner, with the lines lost in the ground-colour. Expands about 1¼ inches. Inhabits South-Western Europe in May and June, flying in the sunshine in grassy places, and often settling on the ground. The larva feeds on the flowers of *Psoralea bituminosa*. The moth is figured at Pl. 58, Fig. 2.

FAMILY XVIII.—DELTOIDÆ.

Fore-wings more or less broadly triangular, with rectangular or pointed tips, rarely rounded ; grey, brown, or yellowish, seldom with the usual *Noctua*-pattern ; the stigmata are generally absent or only slightly marked, but from one to three pale or dark transverse lines are generally present. The hind-wings extend nearly as far as the tip of the abdomen, and the lines of the fore-wings are frequently continued across them. The abdomen is occasionally slightly crested, and the antennæ and legs are frequently provided with appendages. The

palpi are generally very strongly developed, and ascending. The larvæ have sixteen, fourteen, or twelve legs. The moths fly by night or in the twilight. They are called *Deltoidæ* because the triangular fore-wings are placed flatly together over the hind-wings when at rest, so as to resemble the Greek letter Δ. The position of this and the three following families is somewhat uncertain; *Aventia* and *Boletobia* are placed by Guénée among the *Geometræ*, and the remaining *Deltoidæ* as a family next to the *Pyralidæ*.

GENUS I.—AVENTIA (DUP.).

Fore-wings broad, with the tip and middle of the hind margin strongly projecting; hind-wings rather prominent, with a long inner margin and a short slightly curved hind margin; nervule 5 rather slighter than the rest, and arising at two-thirds of the length of the disco-cellular nervule. The larva has twelve legs, and is naked, with fleshy filaments on the sides, and undergoes its transformations in a soft cocoon. The moth sits with the wings flatly sloping. The only species, **A. Flexula*, W. V. (the *Beautiful Hook-tip*), has reddish-grey fore-wings, brownish towards the hind margin and dusted with greyish at the tips, with two light transverse lines, not dentated, but angulated below the costa, and bordered with brown; an indistinct subterminal line, and two black dots instead of the reniform stigma; hind-wings paler, with the elbowed line continued across them. Expands from 1 to 1¼ inches. Inhabits Central Europe in July and August. Larva grey, varied with green and blackish; feeds on lichens growing on firs from autumn to June. The moth is figured at Pl. 58, Fig. 3.

GENUS II.—BOLETOBIA (BOISD.).

Wings broad, with the hind margin of the fore-wings dentated; hind-wings rounded; all similarly coloured and marked. Larva with twelve legs, and with fine bristles on raised warts; it undergoes its transformations in the ground. The moth rests with the wings flatly sloping. The only species, **B. Fuliginaria* (Linn.), has brownish-black fore-wings, with a black central lunule, and two brownish-yellow dentated transverse lines beyond the middle. Expands 1 inch, or a little over. Inhabits Europe and Siberia in June and July, but very rare in England. The larva is bluish-black, with raised orange spots, and it feeds on fungi growing on rotten wood, from autumn to June. The moth is figured at Pl. 58, Fig. 4.

GENUS III.—HELIA (GUÉN.).

Fore-wings with the *Noctua*-pattern tolerably complete; hind-wings rounded, and less distinctly marked. The larva has fourteen legs, with raised dots, on which are scattered hairs, and it undergoes its transformations in a cocoon on the surface of the ground. The moth sits with the wings flat on the trunks of trees. The only species, *H. Calvaria* (W. V.), has greyish-brown fore-wings, dusted with whitish in the central area, with whitish transverse and subterminal lines; the stigmata ochre-yellow, the orbicular stigma small, and the reniform stigma very large and crescent-shaped; hind-wings brown, with two pale suffused transverse lines. Expands from 1¼ to 1½ inches. Inhabits Southern and South-Central Europe and Northern and Western Asia in August. The larva is rusty-brown, with black dots, and feeds on *Rumex*, &c., in May and June.

GENUS IV.—SOPHRONIA (GUÉN.).

All the wings coloured alike, and the border interrupted in the middle. The larvæ have fourteen legs and raised spots, and undergo their transformations in a soft cocoon. The wings of the moth are flat in repose. The only species, **S. Emortualis* (W. V.), has greyish wings, the fore-wings with two straight white transverse lines, the outermost continued on the hind-wings; and a white central lunule. Expands from 1 to 1¼ inches. Inhabits Central Europe in May; rare in England. The larva is brownish-yellow, with a dark line on the back, and blackish spots on the upper part of the sides. It feeds on oak in September.

GENUS V.—SIMPLICIA (GUÉN.).

Allied to *Zanclognatha*, but the fore-wings are narrower, and the hind-wings paler. The only species, *S. Rectalis* (Eversm.), has fawn-coloured fore-wings, with two indistinct dark transverse lines, a dark central lunule, and a straight sharply-defined pale yellow subterminal line. Expands from 1¼ to 1½ inches. Inhabits South-Central Europe, and Northern and Western Asia in July.

GENUS VI.—NODARIA (GUÉN.).

Differs from *Simplicia* and *Zanclognatha* in its much more obtuse fore-wings; from the former in the presence of an accessory cell on the fore-wings; and from the latter in nervules 4 and 5 of the hind-wings rising close together. The only species, *M. Nodosalis* (Herr.-Schäff.), is very variable; it is reddish, yellowish, or iron-grey, with three more or less distinct darker lines, the inner line arched and denticulated, and the elbowed line irregular, the latter marked with yellowish-white dots, shaded or dotted with black within; and a black line before the fringes; the reniform stigma is black, slightly oval, and well marked. The hind-wings are paler, and sometimes yellowish. Expands about 1 inch. Inhabits Spain and Sicily in June and autumn.

GENUS VII.—ZANCLOGNATHA (LED.).

Fore-wings moderately broad, with the tips rectangular and rather prominent, and the hind margin slightly rounded; yellowish or brownish-grey, with a dark central lunule, two dark transverse lines, the elbowed line curved round the central lunule, and a straight or slightly arched white or somewhat dusky subterminal line; hind-wings with the hind margin rather convex; paler, with traces of a dark curved stripe, and the commencement of a light stripe at the anal angle, which diverges from the hind margin in front. The antennæ of the male are pubescent or ciliated, and their front coxæ and femora are very long and slender; the latter, as well as the very thickly scaled front tibiæ, are provided with a long tuft of hair, which can be spread out like a fan, whence the name of "fan-foot," given to some of these moths. The larvæ have sixteen legs, and are naked, and slenderer towards each end. They feed from autumn to May, and undergo their transformations in a slight cocoon. The moths appear in June and July, and rest with their wings flat. This genus may be divided into two sections:—

A. *The males with no front tarsi, or knot-like thickenings on the antennæ; the marginal line of the fore-wings sharply black, and not interrupted.*

*1. *Z. Nemoralis* (Fabr.), *Grisealis* (Hübn.).—Fore-wings yellowish-grey, with a fine dark central lunule, and three transverse lines, the first quite straight, the second slightly indented in the middle of the projection, and the last running to the tip; hind-wings pale grey. Expands about 1 inch. Common in Central Europe and Northern Asia. The larva is dark grey, with black triangles on the back, bordered with pale grey. It feeds on *Chrysosplenium.*

2. *Z. Tarsicrinalis* (Knoch.).—Fore-wings yellowish-grey, dusted with darker, with a fine dark central lunule and three brown transverse lines, the inner line interrupted below the costa; the elbowed line begins straight above the lunule, forms a small angle outwards on the projection, and is nearly twice as far from the inner as from the subterminal line on the inner margin; the subterminal line is narrowly bordered with lighter, and runs into the costa before the tip; hind-wings pale grey, with an obtusely angulated whitish stripe before the hind margin, which does not extend to the costa. Expands from 1¼ to 1½ inches. It is met with throughout Central Europe and Siberia; but although very likely to occur in England, has not yet been observed here. The larva is reddish-yellow, waved with greenish-grey, and with black triangles on the back. It feeds on *Clematis vitalba.*

B. *The males with front tarsi, and with a knot-like thickening on the antennæ; the hind margin of the fore-wings with dark separated dashes or lunules.*

*3. *Z. Tarsipennalis* (Tr.).—Fore-wings dusted with yellowish-grey, and marked as in *Tarsicrinalis*, but the elbowed line is slightly waved, and commences on the costa distinctly behind the central lunule, and is not much further from the inner than from the subterminal line on the inner margin; and the light stripe on the hind-wings is very strongly interrupted. The antennæ of the male have a slight tooth on the thickening, adjoining a strong bristle. Size of *Tarsicrinalis.* The variety *Bidentalis* (Hein.) has dark, nearly fawn-coloured fore-wings, and the light stripe on the hind-wings is less strongly interrupted. Common in Central Europe and Northern Asia; *Bidentalis* is met with in Brunswick. The larva is dull black, with the belly reddish, and feeds on grass. The moth is figured at Pl. 58, Fig. 11.

4. *Z. Tarsiplumalis* (Hübn.).—Fore-wings violet-brown, with a dark central lunule, two dark finely-dentated transverse lines, and a pale subterminal line, shaded with reddish-brown on both sides, which is curved towards the tip below the costa; hind-wings brownish-grey, with a strongly interrupted whitish stripe before the hind margin. The antennæ of the male are strongly thickened, and there are two slender teeth on them. Expands nearly 1½ inches. Rather scarce and local in Central Europe (except the west) and in the Altai.

5. *Z. Tarsicristalis* (Hübn.).—Allied to *Tarsiplumalis*, with which it agrees in size, and in the structure of the male antennæ; fore-wings brown, the transverse lines much more sharply zigzag; the subterminal line interrupted below the costa, and the central lunule replaced by a hollow stigma. It inhabits Dalmatia, Croatia, and Bithynia; and, like many other southern insects, has also been taken at Botzen, in the Tyrol.

6. *Z. Zelleralis* (Wocke.).—Fore-wings yellowish-brown, with the transverse lines as in *Tarsiplumalis;* a dark ring instead of the central lunule; the antennæ of the male with no teeth on the knots, and the tibiæ with only a slight tuft of hairs. Expands about 1¼ inches, or more. A scarce species, found in Silesia, and on the Rhine.

GENUS VIII.—HERMINIA (TR.).

Fore-wings with two or three transverse lines, which are sometimes broken into spots, and a dark central lunule; hind-wings broad, rather flattened below the tips; nervules 4 and 5

usually wide apart, but rising close together in *H. Derivalis*. In the three first species the antennæ of the males are thickened and strongly pectinated, and the front tibiæ are provided with a tuft of hairs; other peculiarities will be noticed in their places. The larvæ resemble those of *Zanclognatha*, and feed from autumn to spring; and the moths appear in June and July, and rest with their wings flat.

1. *H. Crinalis* (Tr.).—Fore-wings reddish-brown, with a dark central spot, two fine, dentated, dark transverse lines, and a white subterminal line, which is not dentated; hind-wings brown, with a white, obtusely interrupted line before the hind margin. Expands about 1½ inches. Inhabits South Europe, Belgium, and Northern and Western Asia. The larva is brown or yellowish, and feeds on *Rubia peregrina*. (*H. Gryphalis*, Herr.-Schäff., from Hungary and the Amoor, is gilded ochreous, with the transverse lines on the fore-wings more dentated than in *Crinalis*.)

*2. *H. Cribralis* (Hübn.).—Fore-wings whitish-grey, with a black dot in the middle, and two transverse rows of black dots beyond; hind-wings paler. Expands about 1 inch. Inhabits marshy places in Central Europe and Northern Asia, and its larva feeds on grass.

*3. *H. Barbalis* (Linn.).—Fore-wings pale grey, finely dusted with brown, with two brownish rust-coloured transverse lines, and a light submarginal line bordered with brownish; hind-wings whitish in front, and grey, with a white stripe, behind. The antennæ of the male are shortly pectinated, but without knots, and the front tibiæ are provided with a tuft of hair. Expands from 1 to 1¼ inches. Common in most parts of Europe. The larva is brownish-grey, with a dark stripe on the back, and dark oblique dashes on the sides. It feeds on birch and oak in autumn, and on low plants in spring.

4. *H. Tentacularia* (Linn.).—Fore-wings pale yellow, dusted with brown, with three rusty-brown transverse lines, which are not dentated, and a brown central lunule; hind-wings paler, with two brown transverse lines. The antennæ of the male are strongly pectinated, but not thickened, and the tibiæ are not tufted. Expands from 1 to nearly 1½ inches. Common in Europe, except the north-west, and in the Altai. The larva is rather rough, brownish-grey, with a dark line on the back, and feeds on grass. The moth is figured at Pl. 42, Fig. 7. (*H. Modestalis*, Heyd., found in the Upper Engadine in August, is perhaps a variety of this. The wings are rather narrower, and the antennæ and their pectinations rather shorter. Palpi shorter, compressed, dark grey; the second joint strongly tufted below, and the last half as long, narrow, pointed, and a little raised. Wings uniform ashy-grey, varied with very small darker scales, which darken the costa of the fore-wings, and sometimes almost form waved lines; fringes unicolorous, preceded by a fine blackish line. Head and body dark grey; legs paler.)

*5. *H. Derivalis* (Hübn.).—Wings ochre-yellow, dotted with brown, the fore-wings with a dark central lunule, and with two dark transverse lines, which are not dentated; the outermost is continued across the hind-wings. The antennæ of the male are neither dentated nor knotted, and the front tibiæ are not tufted. Size of *Barbalis*. Inhabits Central Europe and Northern and Western Asia, but not very common. The moth is figured at Pl. 42, Fig. 8.

GENUS IX.—MADOPA (STEPH.).

The antennæ and legs are without appendages, the fore-wings have no central spot, and the hind-wings are narrow, with a short hind margin. The only European species, **M. Salicalis* (W. V.), has bluish-grey fore-wings, with three rusty-brown transverse lines, bordered with pale

yellow and not dentated; the subterminal line strongly curved outwards, and running to the tip; hind-wings pale grey, with a light curved stripe. Expands about 1¼ inches. Inhabits Central Europe in May and June; rare in England. The larva has fourteen legs; it is green and slender, with yellowish incisions, and feeds on *Salix caprea* in June and August. The moth is figured at Pl. 58, Fig. 12.

GENUS X.—BOMOLOCHA (HÜBN.).

Fore-wings with pointed tips, a rather short and slightly-curved hind margin, and no distinct transverse lines; hind-wings broad and rounded, without markings, and the forehead with a loose horizontal crest; the palpi as long as the thorax, the eyes hairy behind, and the antennæ not dentated. The larva has fourteen legs, and raised dots, and the moth rests with sloping wings. The only species, **B. Fontis*, Thunb. (*Crassalis*, Fabr.; *Beautiful Snout*), has brown fore-wings, varied with pale yellow and bluish-grey on the inner margin, and in the marginal area; the central area is sharply bounded behind, and projecting in the middle; the marginal area is marked with a row of indistinctly darker round dots, bordered behind with whitish; the tip is intersected and more or less shaded with brown; and the hind-wings are grey. The variety *Torricularis* (Hübn.) has nearly black wings, with white dashes towards the hind margins. Expands from 1¼ to 1½ inches. Common in Northern and Central Europe from May to July. The larva is green, with five dark lines on the back. It lives on heath and bilberry from July to September. We have figured the moth at Pl. 58, Fig. 8.

GENUS XI.—HYPENA (TR.).

Fore-wings with the hind margin curved and more or less convex; brown or grey, with transverse lines; hind-wings very broad, flatly contracted below the tips as far as the middle, unicolorous brownish-grey; the forehead with a tuft of hair, the palpi as long as the head and thorax together, and the antennæ simple. The larvæ have fourteen legs, and raised spots, bearing a few hairs. The moths slope their wings when at rest, and all the species which follow *Proboscidalis* have raised, and often black, scales on the stigmata.

1. *H. Lividalis* (Hübn.).—Fore-wings olive-brown, with a green lustre, and violet-grey in the marginal area, the two colours separated by an oblique white line, which runs from the middle of the inner margin to the costa near the tip. Inhabits South Europe, North Africa, and Western Asia. (*H. Ravalis*, Herr.-Schäff., from Sarepta and Amasia, is bluish-grey, with indistinctly dentated transverse lines, the subterminal line reddish and suffused, and an oblique black streak on the disc.)

2. *H. Antiqualis* (Hübn.).—Fore-wings varied with brownish-grey and pale grey, with a dark transverse line bordered with white on both sides, running from the middle of the inner margin, and acutely angulated below the costa. Expands about 1 inch. Inhabits South-Eastern Europe and Asia Minor in June, and the larva feeds on sage in May.

*3. *H. Proboscidalis* (Linn.), (*Snout*).—Fore-wings broad, pale brownish-yellow, transversely speckled with darker, with two rusty-brown transverse lines, and the subterminal line replaced by a row of black dots, marked with white. Expands about 1½ inches. Abundant throughout Europe and Northern Asia in June, July, and September, among nettles, on which its green larva, with a dark stripe on the back, and a yellowish one on the sides, feeds in May, July, and August.

*4. *H. Rostralis* (Linn.).—Fore-wings narrow, varied with brown and grey, with a black transverse line, bordered with paler, straight above and zigzag below, beyond the middle; a

strongly-curved and finely-zigzag subterminal line, and small orbicular and reniform stigmata. The variety *Radiatalis* (Hübn.) has dark brown fore-wings, with the costa yellowish. Expands from 1 to 1¼ inches. Common in Europe and Northern Asia throughout most of the year. The larva is yellow, with a dark line on the back, and two upper and two lower white lines on each side. It feeds on nettle. The moth is figured at Pl. 58, Fig. 10.

5. *H.(?) Munitalis* (Mann.).—Fore-wings dusted with brownish-grey, the inner and subterminal lines rather indistinct, and the elbowed line pale yellowish-grey, and forming two curves; the marginal line consists of dull dark dashes; hind-wings pale yellow, with a narrow blackish-grey border. Expands about 1¼ inches. Inhabits Turkey and Asia Minor.

6. *H. Palpalis* (Hübn.).—Fore-wings broad, varied with brown and yellowish, with a darker transverse central line, which forms a rectangle in the middle; a dark reniform stigma, and the subterminal line composed of dark spots, marked with light ones. Expands about 1½ inches. Inhabits South Europe and the Altai in June. The larva feeds on *Parietaria officinalis* in May.

*7. *H. Obsitalis* (Hübn.).—Rather smaller than *Palpalis*, the fore-wings broad, brown, varied with pale yellow, with a black transverse line as in *Palpalis*, and indistinct stigmata; the subterminal line is very indistinct. Inhabits South Europe, North Africa, and Western Asia in June. Larva green, with dark green line on back, and white stripe on sides; to be looked for in May. I have lately seen a British specimen of this moth.

8. *H. Obesalis* (Tr.).—Fore-wings dark brown on the costa, and more or less varied with brownish-yellow on the inner margin and in the marginal area, with the subterminal line replaced by brown spots, marked with pale ones; the stigmata and the zigzag transverse lines are indistinct. Expands about 1½ inches. Widely distributed in Central Europe and the Altai in August, but rather scarce. The larva feeds on nettle in June.

GENUS XII.—ORECTIS (LED.).

Fore-wings with the hind margin curved and rather convex, finely scaled, with the *Noctua*-pattern tolerably complete; hind-wings unicolorous, with the transverse lines continued across them. The only species, *O. Proboscidata* (Herr.-Schäff), has light ashy-grey wings, with two brownish-grey transverse lines, expanded into spots on the costa of the fore-wings; a lighter subterminal line, bordered with darker, especially in front, and a small obscure reniform stigma. Expands about 1 inch. It inhabits Hungary, Dalmatia, and Carniola.

GENUS XIII.—HYPENODES (GUÉN.).

Fore-wings narrow, with a short straight hind margin, and the *Noctua*-pattern tolerably complete; hind-wings unicolorous, broad, and contracted above the middle; the antennæ of the male long, and finely ciliated. The moths appear in June and July, and may be taken at sugar. They expand about three-quarters of an inch.

*1. *H. Albistrigatus* (Haw.).—Fore-wings yellowish-brown, lighter in the suffused submarginal band, with two fine black transverse lines, the inner line zigzag, and the elbowed line parallel to the hind margin, nearly straight, and bordered behind by a distinct white line; the subterminal line is obscurely pale, and the reniform stigma is represented by a dark brown spot, which is sometimes indistinct; hind-wings grey. Inhabits England, France, and Germany, but not generally common.

*2. *H. Costæstrigalis* (Steph.).—Fore-wings ochreous-brown, paler on the inner margin and in the marginal area, with two dark transverse lines, the inner line zigzag, and the elbowed line very oblique and curved, and only bordered with light below the costa; beyond it is a light dash at the tip, running towards the middle of the inner margin, where it becomes indistinct, and there is a longitudinal dash, dusted with black, in the place of the reniform stigma; hind-wings whitish. Inhabits Central Europe, but scarce in many places. (*H. Kalchbergi*, Staud., which inhabits Sicily and Macedonia in June, has dark grey fore-wings, with a very indistinct light inner line, and a rather more distinct line just beyond the discoidal cell, where it is arched outwards, and there is a whitish lunule at the end of the cell; both lines are bordered inside by a black line, and there is a very indistinct light subterminal line just before the hind margin; there are four light dots close to the costa beyond the second line, and others at the base of the fringes; hind-wings and under side greyish-black.)

GENUS XIV.—THOLOMIGES (LED.).

Fore-wings with the tip rectangular, with transverse lines and a central lunule; hind-wings triangular, and slightly contracted just below the tip; the antennæ of the male dentated. The only species, **T. Turfosalis* (Wocke), has reddish-grey fore-wings, with the inner line indistinct, and the elbowed line dark brown, bordered with light, very oblique, and very indistinct in the middle, but running to the middle of the inner margin; the subterminal line is lighter, and shaded with dusky in front, and there is a black central spot. Expands about half an inch. It is found in marshy places in June and July throughout the north of Central Europe, but is very local.

GENUS XV.—RIVULA (GUÉN.).

Fore-wings broad, with transverse lines, and the reniform stigma; hind-wings rather short, and without markings; antennæ of the male slightly ciliated. The larva has sixteen legs, and is clothed with fine short hair. The moth rests with sloping wings. The only species, **R. Sericealis* (Scop.), has ochre-yellow fore-wings, brownish on the hind margin, with two indistinct double dentated dark transverse lines, and white marginal dots; the reniform stigma is violet-grey, and marked with two black dots, and the hind-wings are dusted with brown. Expands nearly 1 inch. Common in Europe and Northern and Western Asia from June to September. The larva is green, with two whitish stripes on the back. It feeds on grass in May and June.

NYCTEOLIDÆ.

Small and slender-bodied moths, the thorax rounded in front, and clothed with flattened hair; neither the thorax nor the abdomen crested; legs slender, with smooth scales; fore-wings brownish-grey or whitish, with more or less distinct transverse and subterminal lines; hind-wings without markings, and not quite extending to the tip of the abdomen. The larvæ have fourteen or sixteen legs, and are clothed with fine hair; they undergo their transformations in a firm boat-shaped cocoon. The moths fly at night. The position of the few genera placed in this group is quite uncertain; many authors regard them as *Bombyces*, placing *Nola* and *Paidia* among the *Lithosiidæ*, to which they are closely related; while

others class them with the *Pyralidæ;* and *Sarrothripus*, which was long considered to be a *Tortrix*, is now placed by Staudinger with *Nycteola* and the *Chloephoridæ*, as a small family preceding the *Lithosiidæ;* while Herrich-Schäffer places the *Chloephoridæ* (inclusive of *Sarrothripus* and *Nycteola*) nearly in the position which they occupy in the present work, towards the end of the *Noctuæ*.

GENUS I.—NYCTEOLA (HERR.-SCHÄFF.).

Fore-wings with pointed tips and an oblique curved hind margin; hind-wings smoothly rounded, and contracted below the tips; antennæ of the male scarcely ciliated; nervures 3 and 4 and 6 and 7 of the hind-wings not stalked. The only species, *N. Falsalis* (Herr.-Schäff.), has ashy-grey fore-wings, with the tip divided; whiter in front, and dark grey on the hind margin, and a black spot bordered with pale before the middle in cell 1 *b*, from which a whitish and a black line run to the costa, between which the ground-colour is pale yellow; hind-wings pale grey. Expands about three-quarters of an inch. Inhabits South Europe and Syria.

GENUS II.—NOLA (LEACH).

Fore-wings short, much widened behind, with moderately pointed tips, and a slightly-curved hind margin, with more or less distinct patches of raised scales below the costa, towards the base, as well as before and beyond the middle; grey or whitish, with two dark or pale transverse stripes, and a subterminal line; the elbowed line curved, forming one arch below the costa; hind-wings short, rounded, and without markings; nervules 3 and 4, as well as 6 and 7, rise on long stalks, or nervule 4 is wanting. The antennæ of the males are strongly ciliated, and sometimes pectinated. The larvæ, which have fourteen legs, are broad and flat, with hairy warts; and the moths rest on the trunks of trees, with their wings slightly sloping.

1. *N. Togatulalis* (Hübn.).—Fore-wings pale grey, darker in the central area, with transverse lines, the inner line forming long teeth, and the elbowed line finely dentated above; and there is a thick black transverse line between them. Expands from 1 to 1¼ inches. Inhabits Southern and South-Central Europe in June and July. Larva dirty white, with two blackish stripes on the sides; it feeds on lichens growing on trees and rocks, in May. The moth is figured at Pl. 58, Fig. 6. (*N. (?) Dardouinula*, Mill., found at Marseilles in September, resembles *Togatulalis*, but expands less than 1 inch; fore-wings broad at the tip, and the costal nervure is straighter than in any *Nola;* thus it probably connects this genus with *Nycteola*.)

*2. *N. Cucullatella* (Linn.).—Fore-wings reddish-grey, with the basal area dark brown, and bordered by a thick black curved line; the elbowed line is slender and dentated. Expands about three-quarters of an inch. Common throughout Europe in June and July. The larva is yellowish-grey, with a white line on the back, and deep incisions. It feeds on sloe, apple, &c., in May.

*3. *N. Strigula* (W. V.).—Fore-wings pale grey, slightly suffused with brownish in the marginal area, and with two black transverse lines, the inner line slightly waved, and the elbowed line finely zigzag; the subterminal line white, crossed by black nervures; hind-wings dark grey, with nervules 3 and 4 on a long stalk. Expands nearly 1 inch. Widely distributed in Southern and Central Europe in June and July, but not very common. The larva is yellowish or flesh-coloured, with a black transverse spot on the 8th segment. It feeds on oak in May.

*4. *N. Confusalis* (Herr.-Schäff.), *Cristulalis* (Dup.).—Fore-wings pale grey, darker behind, with two dark brown transverse lines, the inner line scarcely waved, but sharply angulated below the costa; the elbowed line forms a rounded and slightly dentated curve, with black dots on the nervures, just before which is a grey transverse line forming long zigzags; hind-wings greyish-white, with nervule 4 absent. Size of *Cucullatella*. Common in Western Europe in May and June. The larva is pale reddish-brown, with an uneven dark line on the back. It feeds on oak in July.

5. *N. Cicatricalis* (Tr.).—Very like *Confusalis*, but the fore-wings more pointed, with a much more oblique, longer, and straighter hind margin; more uniform and darker grey; the elbowed line with a truncated curve, and rather more strongly dentated; hind-wings not so pale. Size of *Cucullatella*. Inhabits South Europe.

6. *N. Thymula* (Mill.).—Fore-wings bluish-grey when fresh, but fading to clay-colour after some time. The transverse lines are black, slender, well-marked, and interrupted; the elbowed line forms a large angle, and is edged within by another indistinct parallel line; the subterminal line is pale, waved, and slightly shaded on the inside. There are three patches of raised scales —two in the middle of the central area, and one at the base; hind-wings paler and without markings. Size of *Strigula*. It is found in April, resting on stones or on the stalks of thyme, in South France and Spain. The larva is flesh-coloured, with a whitish line, accompanied with purplish and yellowish warts, on the back. It feeds on thyme, and is full-grown at the end of May, but remains in the pupa till the following spring. (*N. Ancipitalis*, Herr.-Schäff., from Croatia, is grey, slightly blackish towards the base; the elbowed line is waved, forming three curves, but is not dentated.)

7. *N. Chlamydulalis* (Hübn.).—Fore-wings reddish-white, dotted with blackish; hind margin with a broad dark brown band, intersected by three white waves, and on its inner side is a double grey line. Fringes grey; under side reddish-grey. Hind-wings white, washed with reddish towards the hind margin, both above and below. Head, body, and antennæ white. Expands about three-quarters of an inch. Inhabits South Europe in June and July, sitting on rocks during the day, and the larva is yellowish-green, with darker dashes. It feeds on the flowers of *Scabiosa Columbaria* in June and July. (*N. Subchlamydula*, Staud., from Spain and Greece, is darker than *Chlamydulalis*, and the hind-wings are unicolorous grey, very seldom lighter towards the base. The larva, which is violet with greenish markings, feeds on the flowers of *Salvia Hispanorum* in July, and the moth appears in April.)

8. *N. Cristatula* (Hübn.), *Cristulalis* (Hübn.).—Fore-wings whitish, reddish-grey on the hind margin, with a slender dark transverse line, which is not dentated, but slightly arched below the costa, and preceded by a reddish-grey parallel shade; subterminal line white, consisting of three shallow curves; hind-wings grey. Expands nearly three-quarters of an inch. Inhabits South Europe in June and July. The larva is brownish-yellow, with a few long hairs mixed with the shorter ones; on the back is a dark line marked with black arrow-heads. It feeds on *Mentha aquatica* in May.

*9. *N. Centonalis* (Hübn.).—Fore-wings white, dusted with golden-brown, with golden-brown transverse and subterminal lines, the elbowed line running nearly straight to the costa, hardly projecting in the middle, and the hind-wings pale grey. Size of *Cucullatella*. Inhabits many parts of Europe and Northern Asia in June and July, but local and rare in England.

*10. *N. Albula* (W. V.).—Fore-wings varied with white and golden-brown, with the elbowed line white and nearly straight, the subterminal line forming three arches, and the central shade dark brown; hind-wings pale grey. Size of *Cucullatella*. Found throughout the greater

part of Europe, but scarce. Its larva is said to feed on water-mint. (*N. Squalida*, Staud., which occurs at Malaga at the end of February, is the smallest known species, and may be distinguished from any other by its narrow, dirty greyish-brown fore-wings, with indistinct markings, and its nearly pure white hind-wings.)

GENUS III.—PAIDIA (GEYER).

May be distinguished from *Nola* by the simple antennæ, and by wanting nervule 5 on hind-wings; markings much less varied. *P. Mesogona* (Godt.), from South France, is grey, with two black curved transverse lines on fore-wings, and a black dot between them; it expands nearly 1 inch. The moth is figured at Pl. 58, Fig. 9. *P. Rufeola* (Ramb.), from Italy and Corsica, is reddish-grey, with blackish dots on fore-wings; and *P. Obtusa* (Herr.-Schäff.), from Italy and the Amoor, resembles *Mesogona*, but fore-wings are shaped more as in a *Lithosia*, being of uniform breadth, with a much shorter and almost vertical hind margin.

GENUS IV.—SARROTHRIPA (CURT.).

Fore-wings strongly arched at the base, and scarcely broader behind, with the tips rectangular, and a very short curved hind margin; the *Noctua*-pattern indicated; the hind-wings contracted above the middle; the palpi very long, with equally broad pointed scaling to the tips; and the antennæ simple. The larva has sixteen legs, and is slender, with a few long hairs. The only species, * *S. Revayana* (W. V.), has two double slightly-dentated transverse lines, a light arched subterminal line, and a dark spot in the position of the central area. It varies much in colour and in the distinctness of the markings, and many of the varieties have received separate names. The fore-wings are usually pale grey, but often greenish; sometimes the basal, and sometimes the central area, especially towards the costa, and sometimes the fore-wings, are wholly dark brown, with the markings quite indistinct, and only a black basal streak visible. Expands about 1 inch. Common throughout Central and Southern Europe, and Northern and Western Asia from July to October. The larva is green, with yellowish incisions, and a yellowish line on the sides. It is found in June between the leaves of willows and oaks, which it spins together.

CHLOEPHORIDÆ.

Body stout, with flattened hairs and scales, and not crested; the head is small and retracted; the palpi and legs are slender, and the palpi horizontal; the fore-wings are pointed at the tips, and are green; the hind-wings are white or yellow. The larvæ have sixteen legs and are convex, and flattened off behind, with long claspers. They feed on trees, and undergo their transformations in a boat-shaped cocoon. The position of these insects is rather uncertain, and they have been referred by different authors to the *Tortrices*, the *Noctuæ*, and the *Bombyces*.

GENUS I.—HALIAS (TR.).

Fore-wings moderately broad, a little wider behind, with an oblique curved hind margin; hind-wings short and narrow, extending to two-thirds of the length of the abdomen; the palpi thinly clothed with hair, with the last joint long and cylindrical. The only species,

**H. Prasinana*, Linn. (the *Green Silver-lines*), has green fore-wings, with three suffused oblique whitish transverse lines; the fringes, costa, and hind margin are purplish-red in the male, and yellow in the female; and the hind-wings and abdomen are yellow in the male, and white in the female; the antennæ are purplish-red. Expands from 1¼ to 1½ inches. Common in May in Europe and Siberia. The larva is yellowish-green, mottled with yellow, with three yellowish lines on the back, and red dashes on the claspers. It feeds exposed on oak, beech, and other trees, from July to October. The transformations are figured at Pl. 42, Fig. 9, *a—d*.

GENUS II.—CHLOEPHORA (STEPH.).

Fore-wings broad, even at the base, and a little broader behind, with the hind margin oblique, and rather convex in the middle; hind-wings rather long and broad, extending to three-quarters of the length of the abdomen; the last joint of the palpi short. The larva has a slight protuberance on the 3rd segment. The only species, **C. Bicolorana*, Fuessly, (*Quercana*, W. V.; the *Scarce Green Silver-lines*), has green fore-wings, with two parallel pale yellow straight and oblique lines; abdomen and hind-wings white. Expands about 1¾ inches. It inhabits Central and Southern Europe and Asia Minor in July. The larva is yellowish-green, with two yellow lines on the back after the 4th segment. It feeds on oak from autumn to June. The transformations are figured at Pl. 42, Fig. 10, *a—d*.

GENUS III.—EARIAS (HÜBN.).

Rather small moths, the fore-wings broadly triangular, with the costa strongly arched, and the hind margin straight and a little oblique; hind-wings rounded, extending nearly to the tip of the abdomen; the palpi clothed with smooth scales. The larvæ are thickened in the middle, and clothed with short hair.

1. *E. Vernana* (Hübn.).—Fore-wings pale green, with two dark transverse lines, converging on the costa and hind margin; hind wings and abdomen white. Expands about 1 inch. It inhabits Austro-Hungary, Piedmont, and Pomerania in May; and the larva feeds on silver poplar in September.

2. *E. Insulana* (Boisd.).—A variable species; fore-wings bright grass-green, sometimes with white stripes on the costa and inner margin; hind-wings iridescent white, with a suffused brown border. Expands about three-quarters of an inch. Common in the extreme south of Europe, Africa, Australia, and Southern and Western Asia. Its larva is often very destructive to the cotton crop.

*3. *E. Chlorana* (Linn.).—Fore-wings green, with the costa whitish; hind-wings and abdomen white. Expands from three-quarters of an inch to an inch. Common in Europe and Siberia from April to June. The larva is grey, with a light stripe on the back, divided with dusky. It feeds on willow in June and autumn.

BREPHIDÆ.

Fore-wings rather broader behind, with the tip rounded and the hind margin regularly curved; clouded with brown and grey, with indistinct transverse and subterminal lines; hind-wings long, extending as far as the tip of the abdomen; black, with a broad yellow band before the hind margin, and a broad yellow longitudinal stripe beyond the middle, only

separated from the band by the dark central lunule; body slender, thinly clothed with raised hair; head downy; antennæ of the male shortly pectinated or serrated; palpi small, and concealed by the hair; legs short and downy. Larvæ are short and slender, with short hairs and raised spots; they have sixteen legs, but the three first pairs of prolegs are quite rudimentary. They feed from May to July, and change to pupæ among soft wood, or moss. The moths fly in the sunshine in March and April, and rest with their wings slightly sloping. They are insects of somewhat uncertain position, and are sometimes placed after the *Noctuo-phalænidæ*. The three European species are all very similar, and are included in the single genus *Brephos* (Ochs.). They expand from 1¼ to 1½ inches.

*1. *B. Parthenias* (Linn.).—Fore-wings brown, dusted with whitish in the central and marginal areas, with an indistinct dark reniform stigma, and the fringes chequered with whitish at the ends; hind-wings orange from the middle to the costa, and with a broad orange submarginal band; the antennæ of the male are serrated. Common in Europe, Siberia, and Labrador. The larva is green, with three dark lines on the back, finely bordered with yellow, and a yellow stripe on the sides. It feeds on birch. The moth is figured at Pl. 41, Fig. 8.

*2. *B. Notha* (Esp.).—Very like *Parthenias*, but the fore-wings are darker grey, dusted with whitish at the base and beyond the middle, so that the basal half is obliquely bounded; the fringes are unspotted, and the antennæ of the male are pectinated. Inhabits Central Europe. The larva is green, with very fine and indistinct longitudinal lines, and a white line on the sides, which is generally broadly bordered with black. It feeds on aspen.

3. *N. Puella* (Esp.).—Fore-wings longer and narrower, with the hind margin longer and more oblique; dark greyish-brown, finely dusted with pale grey, the fringes not spotted; hind-wings with a narrower and strongly curved ochre-yellow band, and the discoidal cell of the same colour; the antennæ of the male are pectinated. Inhabits the south of Central Europe. The larva is violet or rosy, with two white lines on the back, and a white stripe on the sides; it feeds on aspen.

GEOMETRIDÆ.

Body slender; the wings large, broad, and delicate; the fore-wings triangular, and the hind-wings rounded, often with projecting angles, and extending as far or further than the abdomen; sometimes with nervule 5 much slenderer than the others; the thorax rounded in front, with the short collar and the scapulæ adherent. The thorax and abdomen are not crested, and the legs are short and slender; the femora are seldom hairy. Some species, however, resemble *Notodontidæ* by their stout bodies and longer and stouter fore-wings; but they have no tuft of hair at the base of the antennæ, and their tarsi are much longer than those of *Notodonta*. The larvæ have generally only one pair of prolegs on the 10th segment, and seldom a pair on the 9th, or on the 8th also. They move very rapidly by fixing their claspers close to their prolegs and strongly arching their bodies, which they then extend in front and fix by their true legs, then draw up the claspers again, and proceed as before; whence they derive their names of Geometers, or Looper Caterpillars. When at rest, they fix themselves by the claspers and prolegs only, and stretch their bodies stiffly out, or curved in front, and in this position they greatly resemble twigs or leaf-stalks; and as these larvæ are much relished by birds, their safety is believed to depend mainly on this resemblance. The moths mostly fly at night, and generally expand their wings flat when at rest, though some species hold them sloping, or erect them in the manner of a butterfly. They also resemble butterflies by their broad and often brightly-coloured wings and slender bodies, and are easily dislodged from their retreats during the day by beating hedges and bushes; or they may be found at rest on walls, tree-trunks, &c. This large group is divided either into a number of subordinate families, or into two main sections, and in the present work we have followed the latter arrangement.

FAMILY I.—DENDROMETRIDÆ.

The costal nervure of the hind-wings rises from the base, and is not united with the subcostal nervure, or only for a short distance, and diverges from it much before the end of the discoidal cell. In some species nervule 5 of the hind-wings is slenderer than the other branches, and in others just as thick. The pattern generally consists of two transverse lines and a central spot on the fore-wings, and a transverse line on the hind-wings. The lines are counted from the base outwards, as first line, second line, &c., though they are sometimes called inner, elbowed, and subterminal lines, as in the *Noctuæ*.

GENUS I.—ELLOPIA (TR.).

Wings moderately broad; the hind margin of the fore-wings nearly as long as the inner margin, and both margins of the hind-wings of equal length; the antennæ of the male are pectinated, and the femora are naked. The larvæ have twelve legs, a round head, and two points on the 12th segment. They undergo their transformations in a slight cocoon.

*1. *E. Prosapiaria* (Linn.), *Fasciaria* (W. V.).—Fore-wings flesh-colour, darker in the central area (leaf-green in the rare Southern variety *Prasinaria*, Hübn.), which is bounded by two white parallel transverse lines, the outermost continued on the hind-wings. Expands about

1½ inches. Common in most parts of Europe from May to September, according to the locality. The larva is reddish-brown, varied with whitish, and may be found on fir from September to April, and again in June and July.

2. *E. Pinicolaria* (Bell.).—Glaucous-green, fore-wings more pointed than in *Prosapiaria*, with two pure white stripes bordered with reddish-brown, running from the inner margin two-thirds of the distance to the costa, the innermost very oblique. Hind-wings with one line. Expands about 1¾ inches. Inhabits larch forests in Corsica.

GENUS II.—METROCAMPA (LATR.).

Body moderately stout, fore-wings broad, with the hind margin convex, and as long as the inner margin, with two dark transverse lines bordered with white, the second continued on the hind-wings; antennæ of the male pectinated. The larvæ have twelve legs, with fleshy filaments on the sides, and a round head. They feed on trees from September to May, and again in July, and the pupa is constructed on or in the ground. The moths are double-brooded, appearing from April to July, and expand from 1½ to 2 inches.

*1. *M. Margaritaria* (Linn.), (*Light Emerald*).—Wings very light green, the fore-wings not dentated, with two white transverse lines, bordered with darker green, and converging a little on the inner margin; hind-wings slightly dentated, with a white line across the middle. A reddish variety of this species has been met with, but very rarely. The type is common in Central and Southern Europe. The larva is dark green or brown, with darker lines on the back and sides. It feeds on oak, beech, &c. The moth and larva are figured at Pl. 43, Fig. 1, *a*, *b*.

2. *M. Honoraria* (W. V.).—Wings dentated, dark flesh-colour in the male, paler in the female, and dusted with darker, and with a brown spot in the middle; fore-wings with two brown transverse lines, bordered with white, and diverging in front; hind-wings with one line. Inhabits Southern and South-Central Europe, but not very common. The larva is ashy-grey or reddish above, and bluish below, with a row of paler lozenge-shaped spots on the back. It feeds on oak.

GENUS III.—ODONTOPERA (STEPH.).

Rather stout, the hind margin of the fore-wings as long as the inner margin, and dentated, with two indentations above the middle; hind-wings rather long, with the costa long; the antennæ of the male very shortly pectinated; femora hairy. The larvæ have fourteen legs, and a hump on the 12th segment, and change to pupæ in moss. The only European species, **O. Bidentata* (Clerck.), has greyish-brown or yellowish-brown fore-wings, with two dark brown transverse lines, the second dentated, and bordered with whitish behind; hind-wings paler, with a dark transverse line beyond the middle. There is also a dark brown ring in the middle of all the wings. Expands from 1½ to 1¾ inches. Common in the greater part of Europe and Siberia in May and June. The larva is paler or darker green, with irregular dark markings. It feeds on sloe, poplar, &c., from August to October. The moth is figured at Pl. 50, Fig 1.

GENUS IV.—EUGONIA (HÜBN.).

Middle-sized moths; the body stout, the wings strong, yellow, and often dusted with darker; the fore-wings excavated below the tips, and curved below the succeeding prominence, and

with two dark transverse lines; hind-wings with costa and inner margin of equal length, and a projection in the middle of the hind margin; antennæ of the male pectinated; the thorax and femora downy. The larvæ have ten legs, and are narrower behind the head, and are frequently provided with humps. They feed on trees in summer, undergo their transformations in a thin cocoon, and the moths appear from July to October. The hind tibiæ are furnished in the first two species with four spurs, and in the others with terminal spurs only.

*1. *E. Autumnaria* (Werneb.), *Alniaria* (W. V.).—Wings ochre-yellow, darker towards the hind margins, and speckled with violet-brown; fore-wings with two transverse lines, composed of agglomerations of dark specks. The wings are more evenly dentated than in the other species of the genus. Expands from 1¾ to 2 inches. Inhabits Central and Northern Europe; rare in England. The larva is grey or brown, with small warty prominences on the 6th, 7th, and 10th segments, and with a bifid prominence on the 12th segment. It feeds on alder, aspen, apple, &c. The transformations are figured at Pl. 43, Fig. 2, *a—c.*

*2. *E. Quercinaria* (Hufn.), *Angularia* (W. V.).—All the wings paler or brighter ochre-yellow, with the fringes chequered with white and brown, the fore-wings often finely speckled with violet-brown, with two well-marked brown transverse lines, the outermost continued across the hind-wings; paler on the under surface, with the tips broadly violet-brown; and the hind-wings are also violet-brown beneath. In the variety *Carpinaria* (Hübn.) the basal and marginal areas are clouded with violet-brown. Expands from 1½ to 1¾ inches. Common in Central Europe. The larva is reddish-brown, with smaller or larger warts on segments 6, 7, 10, and 12. It feeds on oak and lime.

*3. *E. Erosaria* (Borkh.).—Fore-wings ochre-yellow, often speckled with brownish, with two distinct brown transverse lines, the tips not darker beneath; hind-wings brownish, violet-brown beneath, especially towards the hind margin; fringes pale yellow, spotted with brown. Size of *Quercinaria.* The variety *Ochraria,* Steph. (*Tiliaria,* Hübn.; *Quercinaria,* Borkh.), is paler, and not speckled with brown. Common in Central and Southern Europe. The larva is pale grey or pale brown, with the 7th segment thickened, and humps on several of the other segments, especially on the 10th and 12th. It lives on oak.

4. *E. Quercaria* (Hübn.).—Very like *Erosaria,* but smaller (expands about 1½ inches); the wings are sulphur-yellow, the fore-wings with two brown transverse lines bordered with lighter, and pale yellow on the under side. It is found in Austro-Hungary, Spain, and perhaps also on the Rhine.

*5. *E. Fuscantaria* (Haw.).—Wings ochre-yellow, speckled with violet-grey, and violet-brown towards the hind margins; the fore-wings with two dark brown transverse lines, strongly converging on the inner margin. On the under side the hind-wings and the tips of the fore-wings are violet-brown. Expands about 1½ inches, or a little more. Inhabits England, Holland, North France, and Silesia, but always rare. The larva is green, with no humps, but with brown bands on the 7th, 10th, and 12th segments. It feeds on ash. (*E. Effractaria,* Freyer, from Sarepta, is allied to the last, but yellower; the transverse lines of the fore-wings are blackish, and there is an irregular rust-coloured spot between them; the hind margin of the hind-wings is broadly reddish.)

*6. *E. Alniaria* (Linn.), *Tiliaria* (Borkh.), *Canaria* (Hübn.), (*Canary-shouldered Thorn*).—Wings ochre-yellow, sprinkled with brown, the fore-wings with two brown parallel and slightly curved transverse lines, the under side of the hind-wings speckled with brown, and with a large dark brown central spot; head and thorax sulphur-yellow. Expands from 1½ to 1¾ inches.

Common throughout Central Europe. The larva is brown, marbled with darker, with humps on the 6th, 7th, 9th, and 10th segments, and a bifid elevation on the 12th segment. It feeds on lime and birch in May and June.

GENUS V.—SELENIA (HÜBN.).

Middle-sized moths, with moderately stout bodies, the fore-wings projecting above the middle of the hind margin; hind-wings more or less deeply excavated between nervures 4 and 6. All the wings are yellow or brownish, finely dusted with darker; the fore-wings whitish on the costa, with two dark transverse lines, which are not dentated, but expanded into spots on the costa, and a dark central shade; the outermost line is continued on the hind-wings, and there is also a large dark lunule extending to nervure 5; the under side is marbled with bright colours, and there is generally a whitish semi-transparent lunule on all the wings. The antennæ of the male are pectinated, and those of the female are serrated. The larvæ are stout, with the front segments much more slender. The third pair of true legs are much larger than the others, and the 8th and 9th segments are much thickened. There are two or three broods, which feed from June to September, and undergo their transformations in a slight cocoon; and the moths of the summer broods are much smaller than those of the spring or autumn broods.

*1. *S. Tetralunaria* (Hufn.), *Illustraria* (Hübn.).—Wings reddish-brown, violet-grey in the marginal area, and with white central lunules; the outermost transverse line of the fore-wings curved, and the hind-wings considerably dentated. Expands from $1\frac{1}{4}$ to $1\frac{3}{4}$ inches. Inhabits Central Europe from May to September. The larva is of a bark-like grey, with paler and darker spots, and a prominence on the 6th segment. It feeds on sloe, rose, &c. The transformations are figured at Pl. 43, Fig. 3, *a—c.*

*2. *S. Lunaria* (W. V.).—Wings ochreous-yellow, dusted with brown, with whitish central lunules, which are bordered with black on the hind-wings; the outermost transverse line of the fore-wings is straight, and the hind-wings are very strongly dentated. Expands about $1\frac{3}{4}$ inches. The summer brood, *Delunaria* (Hübn.), is considerably smaller, the wings very slightly dentated, the central lunule of the fore-wings less distinct, and that of the hind-wings only slightly surrounded with darker, but much more distinct than in the following species, from which it may also be distinguished by its different colour, and by the central shade being close to the second line on the costa. Inhabits the greater part of Europe from May to September. The larva is reddish-brown, with darker prominences, and feeds on sloe, lime, &c.

*3. *S. Bilunaria* (Esp.), *Illunaria* (Hübn.), (*Early Thorn*).—Wings pale ochreous-grey, slightly shading into violet-grey, and not much dentated, with no distinct central lunules; and the central shade of the fore-wings is some distance from the second line on the costa. Expands from $1\frac{1}{4}$ to $1\frac{3}{4}$ inches. Common in Northern and Central Europe and Northern Asia from March to September. The larva is of a bark-like grey or brown, with bifid prominences on the 9th and 10th segments. It feeds on alder, willow, &c. The moth and larva are figured at Pl. 44, Fig. 1, *a, b.*

GENUS VI.—THERAPIS (HÜBN.).

Body slender; the fore-wings with a rounded projection on the hind margin; the costa of the hind-wings rather long; the antennæ of the male pectinated. The larva is thick, without protuberances, and undergoes its transformations in the ground. The only species,


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7a
4c
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2a
4b
B
3b
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D
A.
2b
C

T. Evonymaria (W. V.), has pale ochre-yellow fore-wings, finely speckled with black, and darker on the hind margin; the fore-wings are marked with black costal spots, and the second line is represented by a row of black dots placed on a pale line; on the hind-wings is a curved blackish line. Expands from 1½ to 1¾ inches. Local in various parts of Germany and Hungary in July and August. The larva is slate-colour, transversely mottled with brown, with black spots on the back, and yellow subdorsal and lateral stripes spotted with red. It feeds on spindle-tree in May. The moth and larva are figured at Pl. 49, Fig. 1, *a*, *b*.

GENUS VII.—PERICALLIA (STEPH.).

Body rather stout; fore-wings slightly and regularly rounded from the inner margin to below the tip; hind-wings truncated from the anal angle to the middle; antennæ pectinated, with shorter teeth in the female. The larva is thick, with short double points on the 6th and 7th segments, and with two long fleshy projections, which are curved backwards, on the 9th segment. It undergoes its transformations in a loose cocoon, which is suspended to a twig. The only species, **P. Syringaria* (Linn.), has olive-grey fore-wings, varied with pale violet-white, the fore-wings shaded with rusty-yellow before the hind margin, and with large whitish spots on the costa, from which the reddish-white transverse lines arise; the second is narrowly black above; the narrow and very oblique central shade is continued on the hind-wings. Expands from 1½ to 1¾ inches. Occurs throughout Northern and Central Europe and Northern Asia in May, July, and August. The larva is varied with brown and yellow, and feeds on privet, lilac, and bird-cherry from April to June and in August and September. The moth and larva are figured at Pl. 49, Fig. 2, *a*, *b*.

GENUS VIII.—HIMERA (DUP.).

Rather stout; fore-wings with the hind margin oblique, and a little projecting above the middle; hind-wings obtusely rounded, and with the costa considerably longer than the inner margin; antennæ of the male with long pectinations; thorax very downy. The larva has two points on the 12th segment, and undergoes its transformations in the ground. The only species, **H. Pennaria* (Linn.), has reddish-grey wings, with brown central dots, the fore-wings with two nearly straight reddish-brown transverse lines, the second rather oblique, and a blackish spot before the tips; the hind-wings with a slender dark central line. Expands from 1¾ to 2 inches. It is found in the greater part of Europe and Northern and Western Asia from September to November. The larva is of a bark-like grey, with red or yellow spots on the sides. It feeds on oak, birch, willow, fruit-trees, &c., in May and June. The transformations are figured at Pl. 43, Fig. 4, *a—c*.

GENUS IX.—CROCALLIS (TR.).

Body thick, rather stout, thorax downy, wings strong; fore-wings with the hind margin evenly and gradually curved outwards, yellow, with the central area dark, broader on the costa, and with a small blackish spot in the middle; and bounded by two darker transverse lines, edged with paler; hind-wings rounded, a little longer on the costa, and paler than the fore-wings; antennæ of the male pectinated. The larvæ are rather slender, with a flat bifid head and two rows of pointed warts, which are largest on the 12th segment; they undergo their transformations in a slight cocoon.

*1. *C. Elinguaria* (Linn.).—Fore-wings pale ochre-yellow, a little darker in the central area, with two slightly curved brown transverse lines, bordered with lighter; hind-wings a little paler, with a very indistinct central line. Expands from 1½ to 1¾ inches. Common in the greater part of Europe and Northern and Western Asia in July and August. The larva is brownish-grey, with brown spots and dashes. It feeds on oak, willow, &c., from autumn to May, and must be avoided as a cannibal. The moth and larva are figured at Pl. 49, Fig. 3, *a*, *b*.

2. *C. Tusciaria* (Borkh.).—Fore-wings pale ochreous in the male, and reddish ochre-yellow in the female, brownish in the central area, with two strongly curved dark brown transverse lines, the second forming an obtuse angle above the middle, and continued on the hind-wings. Expands about 1¾ inches. Inhabits South-Central and Southern Europe in July. The larva is yellowish-brown, with dark lozenge-shaped spots on the back, and feeds on sloe in May and June. (*C. Dardoinaria*, Donz., from France and Spain, may be distinguished from *Elinguaria* by its reddish colour, and from *Tusciaria* by its trapeze shaped central area, which is not suddenly contracted in the middle. It appears from June to August, and the larva, which is clay-colour, washed with reddish, on the back, and bluish below, lives on *Ulex nanus* during the winter, preferring the flowers.)

GENUS X.—EURYMENE (DUP.).

Slender; the hind margin of the fore-wings perpendicular as far as the middle, then curved towards the base, and running to the hinder angle in a shallow concavity; the costa of the hind-wings is rounded at the tip, and a little longer than the inner margin, but does not extend beyond the hinder angle of the fore-wings. The antennæ of the male are pectinated, and serrated at the tips. The larva has ten legs and two rows of raised spots, and the head is obtusely bifid. The only species, **E. Dolabraria*, Linn. (the *Scorch-wing*), is pale yellow, finely and transversely striated with brown, with one or two irregular violet-brown markings towards the hinder angle of all the wings. Expands about 1¼ inches. It inhabits the greater part of Europe from April to August, and is generally found resting on the trunks of trees. The larva is yellowish-grey, with the 3rd segment brown and rather thickened, and a hump on the 9th segment. It feeds on oak, beech, lime, &c., in May and June, and from August to October. The moth and larva are figured at Pl. 49, Fig. 4, *a*, *b*.

GENUS XI—EPIONE (DUP.).

Rather small, slender, and delicate moths; the fore-wings pointed at the tips, and the hind margin curved outwards in the middle, and retracted towards the hinder angle; the costa of the hind-wings is scarcely longer than the inner margin. In the first species, which forms the genus *Caustoloma* (Led.), the fore-wings are distinctly excavated below the tips, but are only slightly so in the other species. They all expand from 1 to 1¼ inches. The larvæ are slender, rather thicker behind, with a round head, and a few fine hairs.

1. *E. Flavicaria* (Hübn.).—Wings golden-yellow, with indistinct brown spots in the middle of the marginal area, and the fore-wings also with five brown costal spots; the inner margin brown, and brown fringes on the concavity. Inhabits Galicia, South-Eastern Europe generally, and Armenia.

*2. *E. Advenaria* (Hübn.).—Wings whitish or very pale yellowish, dusted with yellow and brown, with suffused dark transverse lines, and a black central spot on the hind-wings


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Inhabits Central Europe and Northern and Western Asia from May to July. The larva is greenish-grey, with two pointed elevations on the 12th segment, and a pale yellow wavy line on the sides. It feeds on bilberry in July and August. The moth is figured at Pl. 49, Fig. 5.

*3. *E. Parallellaria* (W. V.), *Vespertaria* (Steph.).—Wings golden-yellow, transversely speckled with orange, and clouded with violet-grey in the marginal area; a black dot in the centre of each; fore-wings with two transverse lines, the first arched, and the second running to the costa in the male, and to the tip in the female; the second line is continued on the hind-wings, where it is excavated in the middle. Inhabits Central and Northern Europe and Northern Asia in July and August. The larva is brown, with a double white line on the back and one on the sides, indistinct behind; a square pale yellow spot on the back of the 7th segment, and oblique square reddish spots on the following ones. It feeds on aspen, nut, and birch in May and June.

*4. *E. Apiciaria* (W. V.).—Very like *Parallellaria*, but the first line of the fore-wings is acutely angulated and narrower, and the second runs to the tip in both sexes, and on the hind-wings it is nearly straight. Its range resembles that of *Parallellaria*, but it is the commonest species of the genus. The larva is greyish-brown, thickened on the 6th segment, with slender dark longitudinal lines, and a light stripe on the sides. It feeds on willow, poplar, and alder from May to August. The moth is figured at Pl. 49, Fig. 6.

GENUS XII.—VENILIA (DUP.).

Slender; all the wings coloured and marked alike, hind-wings with the costa rather long, and extending beyond the hinder angle of the fore-wings. The larva has a round head, and changes to a pupa among moss. The only European species, **V. Macularia* (Linn.), is golden-yellow, with irregular black spots, dusted with yellow; it varies considerably. The variety *Quadrimaculata* (Hatchett) is wholly yellow, with only four spots on the costa of the fore-wings; and the variety *Fuscaria* (Staud.) is entirely dark brown. Expands about 1 inch. It is common in bushy places throughout the greater part of Europe in May and June. The larva is green, with a dark line and several slender white longitudinal lines on the back, and a broader one on the sides. It feeds on dead-nettle and other low plants in August and September. The moth is figured at Pl. 45, Fig. 1.

GENUS XIII.—EILICRINIA (HÜBN.).

Wings strong and rather long; hind-wings rounded; fore-wings with the tip pointed, and a deep concavity between this and a projecting angle just above the middle of the hind margin.

1. *E. Cordiaria* (Hübn.).—Wings yellowish or greyish-white, dusted with blackish, especially on the inner margin, with a fine zigzag transverse line beyond the middle; fore-wings dark brown on the upper half of the hind margin, and with a dark brown heart-shaped spot in the middle. Expands about 1¼ inches. Inhabits Austria and Hungary in July. The moth is figured at Pl. 60, Fig. 9. (*E. Cauteriata*, Staud., from Andalusia, has orange-brown fore-wings, speckled with brown, with two transverse black lines, the second curved inwards above the middle, and almost touching the black central spot; hind-wings yellowish-white, shading into yellowish-brown on the hind margin, and with a slender brown line across the middle. There are two transverse rows of brown dots towards the hind margin on the fore-wings, and one on the hind-wings.)

2. *E. Subcordaria* (Herr.-Schäff.).—Fore-wings pale ochreous, with two blackish dentated lines, and an oval blackish ring in the middle; hind-wings paler, with one line. The variety *Anicularia* (Eversm.) has greyish fore-wings and whitish hind-wings, clouded towards the hind margin. Inhabits South Russia.

3. *E. Trinotata* (Metzn.).—Greyish or whitish-ochreous, speckled with black, with the second line, a marginal line, and a black dot on all the wings; fore-wings with the first line, and with two black spots on the costa in addition. Inhabits Turkey, Greece, and Asia Minor.

GENUS XIV.—DIASTICTIS (HÜBN.).

Slender; the hind-wings rather paler than the fore-wings, and slightly projecting in the middle; the larva smooth and slender. It transforms itself between leaves which it has spun together. The only species, *D. Artesiaria* (Fabr.), is violet-grey, finely dusted with darker, with light nervures, rusty-yellow in cell 3 as far as the suffused subterminal line, with a black central spot, a dark transverse line before the middle, and a whitish one behind, parallel to the hind margin. Expands from 1¼ to 1½ inches. Inhabits Central Europe, except the north-west, from June to August. The larva is yellowish-green, with white lines on the back and sides. It feeds on willow in May and June. The moth is figured at Pl. 49, Fig. 7.

GENUS XV.—MACARIA (CURT.).

Slender, with delicate wings, pale grey, dusted with darker; the fore-wings with three suffused lines, sometimes very indistinct, which rise from dark costal spots, and the two outermost of which are continued on the hind-wings, and a large costal spot in front placed on the wholly suffused submarginal line; hind-wings equally broad on the costa and inner margin, and often with a projecting angle in the middle of the hind margin. The larvæ are slender, with a heart-shaped head, and feed in August and September; and the moths, which expand about 1¼ inches, appear from May to July.

* 1. *M. Alternata* (W. V.).—Greyish-white, speckled with grey, with rusty-brown costal spots, a large black spot beyond the middle intersected by light nervures, and a deep excavation below the tip, where the fringes are black; the angle of the hind-wings is very prominent. Inhabits the greater part of Europe, and Northern and Western Asia. The larva is reddish-brown, with a dark brown stripe on the sides. It feeds on fir.

* 2. *M. Notata* (Linn.), (*Small Peacock Moth*).—Very near *Alternata*, but of a more yellowish-white, the concavity on the hind margin of the fore-wings shallower, and the fringes grey, spotted with whitish. As widely distributed as *Alternata*. The larva is green, with reddish-brown heart-shaped spots on the back, and a stripe of the same colour on the sides. It feeds on birch and willow. The moth is figured at Pl. 43, Fig. 5.

3. *M. Signaria* (Hübn.).—Wings greyish-white, dusted with brown; the fore-wings with grey transverse lines and a dark grey spot on the costa before the tip, and another behind the middle; hind margin dotted with black, and the concavity very shallow; the tips of the hind-wings slightly prominent. Inhabits Central Europe, except the west, and the Altai. The larva is green, with two white lines on the back, and a yellowish stripe on the sides. It feeds on fir.

* 4. *M. Liturata* (Linn.).—Wings violet-grey, with the subterminal line suffused, and broadly bordered in front with rusty-brown; fore-wings with black costal spots; the concavity of the fore-wings and the projecting angle of the hind-wings are very slight. Its range is as extensive

as that of *M. Notata.* The larva is yellowish-green, with a darker line on the back, bordered with yellow, and with yellowish lines on the sides. It lives on fir.

5. *M. Æstimaria* (Hübn.).—Wings varied with brown and grey, and finely dusted with darker; fore-wings with blackish transverse lines, the outermost acutely angulated below the costa, and broadly bordered with whitish; the concavity of the fore-wings and the angle of the hind-wings very slight indeed; hind margin dotted with black on the fore-wings, and edged with a black line on the hind-wings. Inhabits South Europe, and Northern and Western Asia. The larva is dull pale green, with white lines on the back and sides. It feeds on tamarisk.

GENUS XVI.—URAPTERYX (LEACH).

Body slender; fore-wings with the borders straight and the hind margin nearly rectangular; hind-wings with the inner margin longer than the costa, and a long pointed projection in the middle of the hind margin. The larva is slender, with bud-like elevations on the sides of the 8th and on the back of the 11th segments. It constructs a cocoon of loose threads, interwoven with leaves, and attached to a branch. The only European species, * *U. Sambucaria*, Linn. (the *Swallow-tailed Moth*), is pale citron-yellow; the fore-wings with two pale olive-brown transverse lines, the hind-wings with one line, which runs towards the anal angle, and with two small yellowish-brown spots at the root of the tail. Expands from $1\frac{3}{4}$ to $2\frac{1}{4}$ inches. Common in Central Europe, and Northern and Western Asia in June and July. The larva is brown, with paler and darker stripes, and feeds on elder, honeysuckle, lime, &c., from autumn to May. The moth is figured at Pl. 43, Fig. 6.

GENUS XVII.—RUMIA (DUP.).

Slender; fore-wings rather long, with the inner margin long; hind-wings rounded, longer on the costa than on the inner margin. The larva is thick, with fourteen legs, the two first pairs of prolegs rudimentary, with humps on the 7th segment, and with slight projections on the sides of the four last segments; it undergoes its transformations in a cocoon. The only species, * *R. Luteolata*, Linn. (*Cratægata*, Linn.; the *Brimstone Moth*), has sulphur-yellow wings with transverse rows of suffused lunules, the fore-wings with rusty-red spots at the base and middle of the costa and before the tips, and with a white central lunule, bordered with brown. Expands from $1\frac{1}{4}$ to $1\frac{1}{2}$ inches. Common throughout Europe, Northern and Western Asia, and North Africa. There is a succession of broods throughout the year, and the larva, which is brown or green, with pale spots on the sides of the 3rd, 11th, and 12th segments, feeds on sloe and hawthorn. The moth and larvæ are figured at Pl. 44, Fig. 2, *a*, *b*.

GENUS XVIII.—ANGERONA (DUP.).

Body slender, wings broad, hind margin of the fore-wings a little oblique, and the tip rectangular; the costa and inner margin of the hind-wings of equal length. The larva resembles a twig, and has pointed protuberances on the 9th, and smaller ones on the 5th, 10th, and 13th segments, and the head is smooth and round. It undergoes its transformations between leaves spun together. The only European species, **A. Prunaria*, Linn. (the *Orange Moth*), is orange in the male and pale yellow in the female, with fine violet-grey transverse dashes, and oblong central spots. In the variety *Sordiata* (Fuessly) the dashes are fused into broad basal and marginal bands, leaving only the central area orange. Expands from

1¾ to 2 inches. Common in most parts of Europe, and in Northern and Western Asia in June and July. The larva is greyish-brown, shaded with darker; it feeds on sloe and other trees from autumn to May. The variations and the larva are figured at Pl. 44, Fig. 3, *a—d.*

GENUS XIX.—PLOSERIA (BOISD.).

Fore-wings broad, rounded, and projecting behind; hind-wings with the costa longer than the hind margin, and projecting considerably beyond the hinder angle of the fore-wings. The larva is cylindrical and without humps, and undergoes its transformations in a cocoon. The only species, *P. Diversata* (W. V.), has reddish-brown fore-wings, suffused with violet-grey, with two black transverse lines, sometimes broken into dots, and bordered with pale grey; hind-wings orange, with a black spot in the middle; all the wings speckled with dusky. Expands from 1¾ to 2 inches. Inhabits Europe, except the south and west, and Northern Asia in March and April. The larva is grey, with dark lozenge-shaped spots on the back, divided by two pale lines. It feeds on aspen in May and June. The moth is figured at Pl. 49, Fig. 8.

GENUS XX.—HYPOPLECTIS (HÜBN.).

Rather stout, the wings moderately broad, and the antennæ of the male pectinated. The larva is slender, without protuberances, with a flat round head, and it constructs a cocoon. The only species, *H. Adspersaria* (Fabr.), has pale yellow wings, speckled with brown, and two rows of larger brown dots on the fore-wings. Expands about 1½ inches. It inhabits a great part of Central Europe, except the north-west, and Northern Asia in May. The larva is brown, varied with yellowish, with brown longitudinal stripes on the back, and a whitish one on the sides. It feeds on broom, *Genista*, &c., from August to October. The moth and larva are figured at Pl. 50, Fig. 2, *a*, *b*.

GENUS XXI.—SCORIA (STEPH.).

Rather stout, wings moderately broad, hind-wings with the hind margin entire, and contracted above the middle. The larva is thicker behind, with a small projection on the last segment; it constructs a cocoon somewhat resembling that of a *Zygæna*. The only species, **S. Lineata*, Scop. (*Dealbata*, Linn.; *Black-veined Moth*), is white, with the nervures black on the under side, and shining through above. Expands from 1½ to 1¾ inches. Inhabits many parts of Europe, and Northern and Western Asia in June and July. The larva is grey, with a dark line on the back and a white stripe on the sides. It feeds on broom and St. John's wort in May and June. The moth is figured at Pl. 49, Fig. 9.

GENUS XXII.—ASPILATES (TR.).

Rather stout, wings white or yellow, with one or more transverse lines composed of dark specks; all the wings, or at least the fore-wings, speckled with dusky; hind-wings entire or slightly waved, and sometimes a little contracted above the middle, and the costa considerably longer than the inner margin. The larvæ are soft and cylindrical, with two anal points, and they undergo their transformations in a loose cocoon.

1. *A. Mundataria* (Stoll).—Silvery-white, with the costa, hind margin, and two oblique stripes converging in front, fawn-colour. Expands from 1½ to 1¾ inches. Inhabits South Russia, and Northern and Western Asia.

2. *A. Formosaria* (Eversm.).—Fore-wings ochre-yellow, speckled with rusty-brown, and with a central spot and two transverse lines of the same colour, the second stripe running to the tip, bordered with white in front, and with rosy-grey behind as far as the hind margin; hind-wings whitish. Expands about 1½ inches. It is found in the west of France in marshy places, and also near Vienna, Stettin, and in the Ural, in June and July, but is always rare. (*A. Rectaria*, Freyer, said to have been taken in Styria, is of a pale dirty yellow colour, with a black dot in the middle of each wing, and an oblique rusty-brown line running from the tip of the fore-wings to the middle of the inner margin of the hind-wings.)

*3. *A. Gilvaria* (W. V.).—Fore-wings straw-colour, indistinctly dusted with darker, with a straight, oblique, suffused, reddish-grey stripe running into the costa near the tip; hind-wings paler, with an indistinct stripe and central spot. Expands from 1¼ to 1½ inches. Inhabits Central Europe and Northern and Western Asia in July and August. The larva is reddish-grey, varied with yellow, with dark lozenge-shaped spots on the back, and two brown lines on the sides. It feeds on yarrow, broom, &c., in May and June. The moth is figured at Pl. 50, Fig. 3.

*4. *A. Ochrearia* (Rossi), *Citraria* (Hübn.).—Very like *Gilvaria*, but yellower, and with two dark stripes on the fore-wings. Expands from 1 to 1¼ inches. Inhabits Southern and Western Europe, North Africa, and Western Asia in May, August, and September. The larva is clay-coloured, washed with reddish, with slender brown lines on the back, and a whitish stripe on the sides. It feeds on scabious, lotus, broom, &c., in April and May.

*5. *A. Strigillaria* (Hübn.).—Pale grey, thickly speckled with yellowish-brown, the fore-wings with three or four, and the hind-wings with two or three brown transverse lines, the hindermost finely zigzag; hind-wings with the hind margin waved, and more strongly contracted above the middle. Expands from 1¼ to 1½ inches. Common in Central Europe and the Altai from May to July. The larva is silvery-grey, with a whitish stripe on the back, divided and bordered with black, and a dirty yellow stripe on the sides. It feeds on broom from August to May. (*A. Bæticaria*, Ramb., from Spain, resembles this, but is very strongly dusted with ochreous-brown, especially towards the hind margins, and there is a darker basal streak above the whole inner margin of the fore-wings.)

GENUS XXIII.—EUSARCA (HERR.-SCHÄFF.).

Slender; wings grey, with transverse lines, but not speckled; fore-wings rather long and obtuse at the tip, hind margin straight and oblique; hind-wings rounded, and not contracted; antennæ pectinated in the male and simple in the female.

1. *E. Interpunctaria* (Herr.-Schäff.).—Wings grey, with a black dot in the middle, and a row of black dots and short white dashes on the hind margin; fore-wings with the first line brownish and dentated, and the second line black and arched; hind-wings with the outer line indistinct. Inhabits Sicily.

2. *E. Jacularia* (Hübn.).—Pale yellowish-grey, with a brownish dot in the middle of each wing; fore-wings with the inner line straight, and a waved brown stripe, bordered with white, beyond it; the latter is continued on the hind-wings, and denticulated. From Sarepta. (*E. Badiaria*, Freyer, from South Russia and Turkey, is yellowish-grey, with a brownish dot in the middle of each wing, and slightly waved brownish lines beyond; the fore-wings have also a brownish line nearer the base.)

GENUS XXIV.—LIGIA (BOISD.).

Body stout, fore-wings narrow and very pointed at the tips, covering the hind-wings when at rest; the latter are broad, but truncated on the hind margin; the antennæ are broadly pectinated in the male, and simple in the female. The larvæ are long and slender, without protuberances. They feed on shrubs, and construct an oval cocoon.

1. *L. Opacaria* (Hübn.).—Fore-wings grey, more or less tinted with reddish (brick-red in variety *Rubra*, Staud.), with a straight oblique white line, shaded with reddish-brown on the inside, running from the tip to the middle of the inner margin; and with a small dark dot in the middle; hind-wings pale shining grey. Expands from 1¼ to 1½ inches. Inhabits South-Western Europe in September and October. The larva is greyish-white, with two brown festooned lines on the back, and two small black dots at the back of each of the middle segments. It feeds on *Genista* and on *Dorycnium suffructicosum*, and is full-grown in April and May.

2. *L. Jourdanaria* (Vill.).—Fore-wings blackish, with silvery-white longitudinal lines on the nervures, connected by a row of white lunules running from the tip to the middle of the inner margin; fringes spotted with brown and white; hind-wings pearly white, with the hind margin greyish-brown, and the fringes white. Size of *Opacaria*. Common in South France and Spain in September, hiding itself under plants during the heat of the day. The larva is ashy-grey, with longitudinal brown lines, the two on the back festooned. It lives on thyme in March and April, but falls from the plant at the slightest touch. (*L. Argentaria*, Herr.-Schäff., from Sicily, is rosy-white; fore-wings with a black mark in the middle, a waved submarginal brown shade, and the costa and hind margin yellowish; hind-wings with the hind margin brownish.)

GENUS XXV.—HELIOTHEA (BOISD.).

Contains but one Spanish species, *H. Discoidaria* (Boisd.). The body is stout, the palpi very short and hairy, the tongue very small, and the antennæ are rather short and thick, and pectinated in the male. The wings are rather narrow, robust, and entire, uniform yellow, with a black spot in the middle, and all the margins black, especially the hind margin of the hind-wings in the male. Expands about 1 inch. It flies by day.

GENUS XXVI.—SCODIONA (BOISD.).

Rather stout, wings pale grey, dusted with darker, and with a dark central spot; fore-wings with the tip obtuse, and with two dark transverse lines, often indicated by dots only; the first line is frequently absent, but the second is continued on the hind-wings. The hind-wings only extend a little beyond the hinder angle of the fore-wings, and the costa and hind margin of the former are of equal length. In the female the wings are smaller and narrower than in the male. The larva has a conical elevation on the last segment but one, and two anal points; it undergoes its transformations in a cocoon.

1. *S. Emucidaria* (Dup.).—Fore-wings light brown, dusted with black (occasionally pure white), with a small central dash, and the two central lines represented by indistinct brownish spots; beyond the second line are two blackish spots, one towards the tip and the other towards the hinder angle; hind-wings whitish, with the fringes and hind margin washed with fulvous; the blackish central dot is sometimes absent. Size of *Belgaria*. A rare species, found in South France in June and July. The larva is yellowish clay-colour, with the incisions bluish, and the belly reddish; on the back and sides are some whitish lines. It feeds on wormwood from July to May.


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*2. *S. Belgaria* (Hübn.).—Wings pale grey, speckled with rusty-brown, with black central and smaller marginal dots; fore-wings with two blackish transverse stripes converging on the inner margin, and often broken into spots, the first finely zigzag and the second curved; the latter more narrowly continued on the hind-wings. Expands from 1¼ to 1½ inches. Inhabits Central Europe, especially the west, in June. The larva is ashy-grey, with two brown lines on the back, and a dark green stripe on the sides. It feeds on heath from autumn to May. (*S. Penulataria,* Hübn., from Spain, is yellowish-ashy or dull brown, speckled with black, and with a black central spot on each wing; fore-wings with two transverse black lines, the second thickened behind, denticulated, and continued on the hind-wings.)

3. *S. Conspersaria* (W. V.).—Usually paler than *Belgaria*, with rows of dark dots, the first generally indistinct and the second parallel to the hind margin, but with no black marginal dots. Expands about 1⅛ inches. Inhabits South Europe and Western Asia in July. It varies considerably in colour, like all the species of this genus. The larva is grey, with a white stripe broken into spots on the back, and a brown stripe on the sides. It feeds on *Salvia officinalis* in June. (*S. Raunaria,* Freyer, found in Carniola in August, is much smaller than *Conspersaria;* the male expands about three-quarters of an inch, and the female a little more. The wings are more rounded than in *Conspersaria,* and the hind-wings are shorter on the costa, and there is a less prominent tooth on the middle of their inner margin in the male. The male is dull yellowish-white, with no rows of spots, and the female is chalky-white, speckled with dark atoms, and with rows of dots, the second row on the fore-wings further from the hind margin than in *Conspersaria.*)

4. *S. Lentiscaria* (Donz.).—Fore-wings reddish-brown (rarely white), more or less speckled with brown, with a spot in the middle and two transverse curved rows of brown dots; hind-wings grey, also speckled with brown, with a central spot, and one row of brown dots. Expands about 1½ inches. Inhabits South France and Spain in May. The larva is grey, varied with reddish, and with a reddish stripe on the back. It feeds on *Helianthemum* from April to November.

GENUS XXVII.—PHASIANE (DUP.).

Slender; the hind-wings extend a little beyond the inner margin of the fore-wings, and the costa of the former is a little longer than the inner margin. The larvæ are cylindrical, with deep incisions, and form their pupæ in the ground.

*1. *P. Petraria* (Hübn.).—Fore-wings greyish-white, dusted with rusty-brown, with a dark brown central spot, two straight and rather oblique whitish transverse lines, shaded with brown in front, and a light subterminal line; hind-wings paler, with the commencement of the second line on the inner margin. Expands about 1¼ inches. Common in Central and Southern Europe, and Northern and Western Asia in May and June. The larva is dark green above, with a slender dark double line on the back, many indistinct suffused parallel lines, and a pale yellowish stripe on the sides. It feeds on fern in summer. The moth is figured at Pl. 49, Fig. 10.

2. *P. Partetaria* (Hübn.).—Fore-wings pale yellow, more or less strongly suffused with reddish-brown, with two yellow transverse lines, the first straight, and the second angulated towards the base; hind-wings paler and less irrorated, with an indistinct brown central dot and curved line. Expands from 1 to 1¼ inches. Inhabits South France and Spain from March to May and from August to September. The larva is grey, with a broad whitish stripe on the sides; it feeds on *Teucrium* in October.

3. *P. Scutularia* (Dup.).—Wings whitish-grey, dusted all over with brown, with two broad yellow transverse lines on the fore-wings only, bordered with brown, and frequently absent in the female; the first is nearly straight and the second curved, and the space between them is paler. Expands about 1 inch. It inhabits South-Western Europe in September and October. The larva is grey, with numerous indistinct brown lines, and a whitish line on the sides. It feeds on flowers of rosemary and thyme in April.

4. *P. Rippertaria* (Dup.).—Pale ashy-grey; fore-wings generally with two thick black transverse lines, not extending to the costa or to the hind-wings, and bordered outside with white, the first nearly straight, and the second sinuated, and bordered with whitish inside also; beyond the second line is a blackish shade, which is continued on the hind-wings; fringes whitish, spotted with grey. Expands about 1 inch. Inhabits South France in April and July, but rare. The larva is bluish-green, with a dark green line on the back, below which is a double whitish one, and a broad white line on the sides. It feeds on willow in May and September.

GENUS XXVIII.—EUBOLIA (BOISD.).

Rather stout, wings darkest in the marginal area, with dark transverse dashes and central spots; fore-wings with the costa straight and rather long, and the hind margin a little oblique and very slightly arched; two dark and nearly straight transverse lines run near the base and hind margin, and the second is continued on the hind-wings, which are nearly triangular, with the inner margin rather shorter than the costa; their rounded tips extend beyond the hinder angle of the fore-wings. The antennæ of the male are serrated at the tips. The larvæ are smooth and slender, with a flat triangular head, and feed in July and August. The moths appear in May and June. They expand from 1 to 1½ inches.

1. *E. Arenacearia* (Hübn.).—Wings pale ochre-yellow, finely speckled with rusty-brown, and with a small brown central spot; fore-wings with the marginal area violet-grey, and with two brown transverse lines, the second straight, and bordered with light in front. Inhabits South-Eastern Europe. The larva feeds on *Coronilla varia.*

2. *E. Murinaria* (W. V.).—Wings reddish ashy grey, speckled with brown, and with a brown central spot; fore-wings darker in the marginal area, with two brown and slightly curved transverse lines. It varies considerably in colour and markings. The variety *Cineraria* (Dup.) is light yellowish-grey, much speckled, and the lines indistinct. It is common in a great part of Central and Southern Europe and Northern and Western Asia, flying in lucerne fields during the day, in May, July, and August. The larva is green, with three white lines on the back, and a yellowish-white stripe on the sides; the belly is spotted with rusty-brown. It feeds on vetch, clover, lucerne, &c., in spring and autumn.

3. *E. Catalaunaria* (Guén.).—Dirty white, speckled with brownish-grey; fore-wings with three lines, the first straight and oblique, the second arched, and the third broadly clouded; hind-wings with two parallel lines in the middle, the second slightly denticulated. Inhabits Catalonia.

4. *E. Pumicaria* (Led.).—Wings ashy-grey, speckled with black; fore-wings with three black lines, the two innermost incomplete, and the third waved and slightly dentated; a black central spot in the middle of the fore-wings, and a row of black spots before all the fringes; hind-wings with two parallel lines. The female is yellowish-grey, irrorated with brown, with a black spot in the middle of each wing, and marginal spots, but with no lines. Inhabits Andalusia, Syria, and Abyssinia.

5. *E. Assimilaria* (Ramb.).—Grey, irrorated with reddish, with a black spot in the middle of each wing, and a black line, broken into spots, before the fringes; the three lines are black, and are sometimes only indicated on the costa of the fore-wings; sometimes the first and third are double, filled up with reddish-grey, and continued as two reddish-grey stripes, the outermost angulated on the hind-wings. Inhabits waste rocky places in Corsica and Sardinia, among *Genista corsica*, on which the larva feeds. The latter is yellowish-green, with a dark green line on the back and a yellow line on the sides. (*E. Sparsaria*, Hübn., reputed European, is pale ochreous, speckled with blackish, and with marginal black dots; the fore-wings have no central spot; the first line is arched, and the second is suffused with reddish on the outside, and continued on the hind-wings. *E. Griseolaria*, Eversm., from the steppes of South Russia, resembles *Murinaria*, but is more speckled, the lines are broken into dots, and there is no central shade; hind-wings with few or no markings.)

GENUS XXIX.—NUMERIA (DUP.).

Rather slender, the wings speckled with dusky, and darker in the central area; the fore-wings with two dark transverse lines, bordered with light, the second projecting outwards above the middle, and visible on the hind-wings, at least at the inner margin; the hind-wings only extend a little beyond the hinder angle of the fore-wings, and their costa is a little longer than the inner margin. The larvæ are slender and rigid, with a conical projection on the 10th segment, and a heart-shaped head.

*1. *N. Pulveraria* (Linn.).—Fore-wings ochreous-brown, the central area olive-brown, and strongly widened behind above the middle; it is bordered by two suffused darker lines, and the hind-wings are more yellowish. Expands from 1¼ to 1½ inches. Common in Northern and Central Europe, and Northern Asia in May and June. The larva is brown, with a double wavy brown line on the sides; it feeds on willow in July and August. The moth is figured at Pl. 50, Fig. 4.

2. *N. Capreolaria* (W. V.).—Wings pale yellow, suffused with rosy, and speckled with brown; fore-wings with the tip divided with black, a black spot in the centre, and two black transverse lines, the second waved, dentated, and broadly suffused with grey in front; hind-wings paler. Expands about 1½ inches. Inhabits the south of Central Europe, and Greece in June and July. The variety *Donzellaria* (Dup.), from Auvergne, has whitish wings, with the apical dash, central spot, and transverse lines all black. The larva is yellowish-brown, with two dark stripes on the back, spotted with black, and a yellowish stripe on the sides. It feeds on *Pinus picea* and *abies* in May.

GENUS XXX.—CABERA (TR.).

Wings delicate, whitish, speckled with brown, the tip of the fore-wings slightly pointed, and the inner margin rounded; fore-wings with three transverse lines, and hind-wings with two; the costa and inner margin of the latter are of equal length. The larvæ are cylindrical, with a round head, and feed on birch, elder, hazel, &c., from July to September. The moths appear from May to August, and expand from 1 to 1¼ inches.

*1. *C. Pusaria* (Linn.).—Wings white, slightly speckled with grey, the lines brownish-grey; face white. The variety *Heyeraria* (Herr.-Schäff.) is brown, and the variety *Rotundaria* (Haw.) has the two inner lines nearer together, owing to the first line being angulated; on the hind-wings, which are more rounded than in the type, the outer line is indistinct.

Abundant in the greater part of Europe and Siberia. The larva is green, with rusty-brown spots on the back, bordered with white.

*2. *C. Exanthemata* (Scop.).—Wings white, thickly speckled with brown, the lines rusty-brown and suffused, rarely with a black dot in the middle (variety *Pellagraria*, Guén.); face brown. Common in Europe, and Western and Northern Asia. The larva is green or brown, with yellowish incisions, small yellowish spots on the back dotted with white, and a yellow stripe on the sides. The moth is figured at Pl. 46, Fig. 1.

GENUS XXXI.—BAPTA (STEPH.).

Wings white, not speckled with darker; the fore-wings less pointed at the tips, and with the hinder angle more distinct than in *Cabera*. The larvæ are smooth and cylindrical, with flat heads, and feed on trees from June to September, and the moths appear in May and June. They expand from 1 to 1¼ inches.

*1. *B. Temerata* (W. V.).—Wings white, with black marginal lunules and central dots; the marginal area dusted with brown, and divided by a broad stripe in the middle, which is not dusted. Inhabits Central Europe and Northern Asia. The larva is green, with a reddish-brown stripe on the back, often broken into spots. It feeds on birch, willow, &c.

*2. *B. Bimaculata* (Fabr.), *Taminata* (W. V.).—Wings white, with a single dark marginal line, and fine black central spots; fore-wings with two dark brown spots on the costa; from the second runs an indistinct finely dentated brown line across all the wings. The larva is supposed to feed on sallow. The moth is figured at Pl. 45, Fig. 2.

GENUS XXXII.—ALEUCIS (GUÉN.).

Fore-wings broader and more pointed than in *Bapta*, and darker than the hind-wings. The only species, **A. Pictaria* (Curt.), has the fore-wings dusted with brownish-grey, with a dark spot in the middle, and two suffused dark transverse lines, the second zigzag, bordered with whitish, and indistinctly continued on the hind-wings; the hind margin is dotted with black, and the hind-wings are pale grey. Expands about 1 inch. A rather scarce and local insect, found resting on palings, or at sallow or sloe-blossoms at dusk, in March and April, chiefly in Western Europe. The larva is greenish-grey, with dark longitudinal lines and round spots. It feeds on oak and sloe in June.

GENUS XXXIII.—ORTHOSTIXIS (HÜBN.).

The only European species, *O. Cribraria* (Hübn.), from South-Eastern Europe and Western Asia, has the wings entire; fore-wings rather pointed, and the hind margin curved and slightly oblique; white, with a central black dot, beyond which are two rows of black dots, and a third on the hind margin; hind-wings similar, but without the first row of dots.

GENUS XXXIV.—TERPNOMICTA (LED.).

Small moths; wings yellow, speckled with brown, with brown transverse lines and a brown marginal line; fore-wings moderately broad, the costa slightly curved, and the hind margin rather oblique; hind-wings short, with the costa and inner margin of equal length. The antennæ of the male are pectinated in the first two species, and strongly ciliated in the others.

1. *T. Trimaculata* (Vill.), *Permutaria* (Hübn.).—Wings straw-colour, with a slight greenish shade, and finely dusted with darker; fore-wings with three rusty-brown costal spots, from the two first of which run fine brown transverse lines; hind-wings with one line. Expands about 1 inch. Inhabits South Europe and the Amoor from April to August. The larva is green, shading into violet below, with an irregular red stripe on the back. It feeds on the white poplar in June and September, forming its pupa between a rolled-up leaf, or in the crevices of the bark. The moth is figured at Pl. 59, Fig. 9.

2. *T. Dilectaria* (Borkh.).—Wings pale yellow, transversely speckled with brown; the nervures and two transverse lines (one only of which is continued on the hind-wings) rusty-brown; the second line is arched and angulated below the costa; beyond it runs another leaden-grey stripe, which is widened into spots, extending to the hind margin at the hinder angle, and above the middle. Expands about 1¼ inches. It is found in Austria and Hungary in June.

3. *T. Cararia* (Hübn.).—Wings pale yellow, thickly speckled with rusty-brown, with brown central lunules, a row of dots beyond the middle, and beyond this a brown transverse line, consisting of two large curves, which sends off a longitudinal line to the hind margin above the middle, and above the hinder angle of the fore-wings. Expands about 1 inch. Local in Central Europe in July. (*T. Dalmataria*, Guén., from South Russia, resembles *Trimaculata*; it is very pale ochreous, with ashy-grey markings, the marginal line slightly interrupted, and the second forming ill-defined angles; fore-wings longer than in *Trimaculata*, with a grey sub-marginal line.)

GENUS XXXV.—ZERENE (TR.).

Distinguished from *Abraxas* by the thicker tongue, the larger and ascending palpi, and by the difference in pattern. The larva is slender, with a smooth head. The only species, **Z. Adustata* (W. V.), has white wings, the base of the fore-wings brown, varied with violet-black, and a broad dark brown band behind the middle, varied with rusty-yellow and violet-grey, which projects in four sharply rounded curves in the middle; hind-wings with indistinct pale brownish transverse lines. Expands 1 inch or more. Common in Europe and Western Asia from May to July. The larva is green, with small brown spots on the back ringed with white, and flesh-coloured spots edged with brown on the 6th and 7th segments. It feeds on spindle-tree in August and September.

GENUS XXXVI.—ABRAXAS (LEACH).

Wings white, with transverse rows of round dark spots, sometimes coalescing into a broad band on the costa and hind margin; the costa of the fore-wings slightly arched, the hind margin rather oblique, and the costa of the hind-wings a little longer than the inner margin; the hind margin is more or less brown, especially on the fore-wings. The larvæ are slender and cylindrical, with a smooth round head; they feed on trees.

*1. *A. Sylvata* (Scop.), *Ulmata* (Fabr.).—All the wings white, with round violet-grey spots arranged in rows, and a large rusty-brown blotch marked with silvery-blue beyond the middle of the inner margins. Expands about 1¾ inches. Common in Central Europe, and Northern and Western Asia, in June and July, though rather local. The larva is bluish-white, yellowish on the back, and marked with a black line and rows of black dots. It feeds on elm and bird-cherry in August and September. The moth is figured at Pl. 45, Fig. 3.

2. *A. Pantaria* (Linn.).—Resembles *Sylvata*, but the spots are fewer and smaller, only

those in the inner margins being more distinct, rusty-brown, and less mixed with bluish; the fringes are pure white. Expands from 1½ to 1¾ inches. Inhabits Southern and Western Europe from May to July; its reputed occurrence in England seems to require confirmation. The larva is greyish-blue, with a bluish-black line on the back, and some blackish lines on the sides; belly greenish-yellow. It feeds on ash from autumn to June, and frequently strips the trees of their leaves when it is abundant. The moth is figured at Pl. 45, Fig. 4.

*3. *A. Grossulariata* (Linn.), (*Magpie Moth*).—Fore-wings white, with transverse rows of large round partly-connected black spots, between which stand two orange bands, one near the base, and another beyond the middle; hind-wings white, with a row of black spots on the hind margin, another (sometimes double) across the middle, and one or more detached spots nearer the base, but with no orange ones. This species varies very much in the size and number of the spots, but is generally recognisable at once. Size of *Pantaria*. Abundant in Europe and Northern and Western Asia, in gardens, bushy places, &c., in July and August. The larva is white, with black transverse spots on the back, and an orange-yellow stripe on the sides, spotted with black above and below. It feeds on gooseberry, currant, sloe, &c., in May and June. The transformations are figured at Pl. 45, Fig. 5, *a—d*.

*4. *A. Marginata* (Linn.).—Wings white, with a broad irregular black marginal band; the fore-wings with two very large black costal blotches, and sometimes a smaller one on the inner margin; and the hind-wings with the black border generally interrupted. The variety *Pollutaria* (Hübn.) is almost white, with a few black spots. Expands about 1 inch. Common in most parts of Europe and Northern Asia from May to August. The larva is green, with three dark lines on the back, and a white stripe on the sides. It feeds on poplar, willow, hazel, sallow, &c., in June and September. The transformations are figured at Pl. 45, Fig. 6, *a—c*.

GENUS XXXVII.—CLEOGENE (DUP.).

Wings without markings, the fore-wings moderately broad, and the hind-wings rather long, the costa being rather longer than the inner margin. The female is smaller, with slender wings. Antennæ pectinated in the male, and simple in the female. The species are found in the Alps, as high and higher than the rhododendrons, in June and July. They expand from 1¼ to 1½ inches. The males fly by day, and the females conceal themselves in the grass. *C. Lutearia*, Fabr. (*Tinctaria*, Hübn.), has ochre-yellow wings in the male, and the female is paler. It is common in the Alps, Galicia, and Ural. The larva is short, tapering at both ends, and covered with short hair; it is reddish-ochreous, with some longitudinal grey lines, and feeds on low plants. *C. Niveata*, Scop. (*Illibata*, W. V.), from the Eastern Alps, is milk-white in both sexes; and *C. Peletieraria*, Dup., from the Pyrenees, has smoky-black wings in the male, while the female is pale yellowish-ashy. The male of *C. Peletieraria* is figured at Pl. 60, Fig. 1.

GENUS XXXVIII.—CHEMERINA (BOISD.).

Antennæ lamellated in the male, and setaceous in the female; proboscis distinct; wings entire, broad, slender, and silky, the fore-wings triangular, and the hind-wings slightly truncated below the tip; abdomen long and slender. The only species, *C. Caliginearia* (Ramb.), has pale ashy fore-wings, finely dusted with black, with the lines rather indistinct, and tinged with reddish-brown, the first line arched, the second obliquely sloping to the costa, where it is rounded, and the subterminal line composed of white triangular spots, often separated; the



A. B.

discoidal spot is small; hind-wings paler, without markings above, but with an indistinct line below. Expands about 1½ inches. Inhabits South Europe and North Africa from January to March. The larva is cylindrical and rigid, without prominences, and a little narrower in front; it is of a dull green on the back and sides, and flesh-colour below. It feeds on the buds of *Cistus incanus* and *Helianthemum polyfolium* in April and May. The moth and larva are figured at Pl. 60, Fig. 11, *a*, *b*.

GENUS XXXIX.—LIGNYOPTERA (LED.).

Slender; fore-wings almost without markings in the male, and moderately broad, with the tips rather rounded, and the hind margin oblique and nearly straight in front, but strongly curved towards the hinder angle; hind-wings large, convex in the middle of the hind margin, and the costa considerably longer than the inner margin, and extending considerably beyond the hinder angle of the fore-wings. The only species, *L. Fumidaria* (Hübn.), has reddish-grey fore-wings, indistinctly speckled with grey, and with a large and dark, but very indistinct, half-circle on the costa; hind-wings clearer grey. Expands from 1¼ to 1½ inches. It is found in Hungary and South Russia in October and November.

GENUS XL.—HIBERNIA (LATR.).

Slender; fore-wings yellow or grey, dusted with darker, and with darker transverse lines; hind-wings broad, rounded, or somewhat truncated behind, with the inner margin shorter than the costa, and paler than the fore-wings; the hind margin is entire, except in the last species, in which it is dentated. The wings of the females are rudimentary, and the larvæ are slender, with raised spots on the back, and a heart-shaped head. They feed on various forest-trees in May and June, and are not particular about their food. The moths appear in October and November, or in early spring.

*1. *H. Defoliaria* (Linn.).—Fore-wings with the hind margin very oblique below the middle, yellow, coarsely dusted with rusty-brown, and often marked with one or two black undentated, but strongly curved transverse lines, broadly bordered with rusty-brown, and a black central spot; sometimes unicolorous brownish-red, dusted with darker; hind-wings pale grey, speckled with brownish. Expands about 1¾ inches. The female is wholly wingless, yellow, spotted with black. Common in Central Europe late in autumn. The larva is brown, with a dark double line on the back, and a broad yellow stripe on the sides. The male moth is figured at Pl. 44, Fig. 4.

*2. *H. Aurantiaria* (Esp.).—Fore-wings with the hind margin slightly curved, golden-yellow, indistinctly dusted with violet-brown, with two violet-brown undentated transverse lines, the second line slightly curved inwards about the middle; hind-wings paler, with an indistinctly darker line in the middle. Expands from 1½ to 1¾ inches. The female is brownish-grey, with the feet and antennæ ringed with paler; the wings one-fourth as long as the body, with black transverse lines and long hair-like fringes. Common in Central Europe late in autumn. The larva is grey or brown, with dark lines on the back and sides, the latter bordered with white above. The male moth is figured at Pl. 44, Fig. 5.

*3. *H. Progemmaria* (Hübn.).—Fore-wings with the hind margin straight; pale reddish-grey, finely dusted with black, and with black marginal dots; the transverse lines as in *Aurantiaria*, brown, the second slightly edged with darker behind; hind-wings whitish and truncated. Expands from 1¼ to 1½ inches. The fore-wings of the female are two-thirds

and the hind-wings three-fourths as long as the body, and varied with grey and brown, the former with two black transverse lines and the latter with one. Common in Central Europe from February to April. The larva is brownish-yellow, with brown longitudinal stripes in front, bordered with paler, and with X-shaped spots behind. (*H. Ankeraria*, Staud., from Hungary, is of the size of *Progemmaria;* wings broad, slender, and thinly scaled, light brown, with the two transverse lines brown, narrow, and continuous, the first nearly straight, and the second angularly curved round the large oval brown central spot; hind-wings white, very slightly dusted with greyish-brown towards the hind margin. The female and larva are unknown.)

*4. *H. Leucophæaria* (W. V.).—Fore-wings with the hind margin rather oblique, grey, varied with whitish, and dusted with darker, with two blackish transverse lines, the first arched, and the second forming three curves; hind-wings whitish, speckled with grey. In the variety *Marmorinaria* (Esp.) the basal and marginal areas of the fore-wings are dark grey. Size of *Progemmaria*. Common in Central Europe from February to April. The larva is dirty green, with two whitish lines on the back, and a double brown line on the sides. It feeds chiefly on oak. The female is grey, with very short rudiments of wings, edged with long hair-like fringes. The male moth is figured at Pl. 44, Fig. 6.

*5. *H. Rupicapraria* (W. V.), (*Early Moth*).—Fore-wings with the hind margin slightly oblique, brownish-grey, with a blackish central spot, two indistinct blackish and slightly dentated transverse lines bordered with paler, and small black marginal dots; hind-wings pale grey. Expands about 1¼ inches. The female is grey, the wings half as long as the body, and the fore-wings broadly dusky before the hind margin. Common in Central Europe and Armenia from January to April. The larva is green, with a darker line on the back, and several whitish lines on the sides.

6. *H. Bajaria* (W. V.).—Fore-wings of the male varied with dark grey and rusty-brown, with a whiter zigzag subterminal line; hind-wings pale grey, dusted with darker. Size of *Rupicapraria*. The female is grey, with very short fringes, which do not resemble hairs. It is common late in autumn throughout the south of Central Europe. The larva is grey, with a darker longitudinal line in front, and with pale spots on the back behind, bordered with black.

GENUS XLI.—RHYPARIA (LED.).

Slender; wings tolerably stout, fore-wings moderately broad, with the costa and hind margin slightly curved, and the latter oblique; hind-wings rounded behind, with the costa longer than the inner margin, and extending beyond the hinder angle of the fore-wings. On the under side of the base of the fore-wings in the male are two scaleless depressions in cells 1*a* and 1*b*. Antennæ strongly pectinated in the male, and simple in the female. The larva is smooth and cylindrical. The only species, *R. Melanaria* (Linn.), has whitish fore-wings and yellow hind-wings, covered with transverse rows of large and small black spots. Expands from 1¾ to 2 inches. Local in Northern and Central Europe, except the north-west, and in Northern Asia, in June and July, occurring in waste places. The larva is dark green on the back, with a dark blue central line and white subdorsal lines, spotted with black; it is yellow, with two blue lines on the upper part of the sides, and below this it is blue, with two yellow lines. It feeds on *Vaccinium uliginosum* in May and June. The moth is figured at Pl. 45, Fig. 7.


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GENUS XLII.—SELIDOSEMA (HÜBN.).

Antennæ pectinated nearly to the tips in the male, and simple in the female; palpi straight, tongue short and slender, abdomen slender; wings dull grey or brown, finely dusted or striated with darker; fore-wings rather long, but obtuse at the tips; hind-wings rounded, and often a little dentated, and more or less excavated opposite the cell. The larvæ are smooth and cylindrical, with a round head, and feed on low plants or shrubs. The moths expand about 1½ inches.

1. *S. Miniosaria* (Dup.).—Wings entire, thick, of a yellowish or whitish-grey, striated with brown, and with a blackish dot in the middle of each wing; fore-wings with four transverse lines, indicated by rather darker spots; hind-wings paler, striated with brown, and bluish at the base, but with no lines. It is very variable; sometimes the ground-colour is dark brown, speckled with black, with reddish costa and nervures. Inhabits South France and Spain in September. The larva is bluish-violet, or green, with a brown stripe on the back, finely bordered with yellow, and with a broad whitish stripe on the sides, marked with a yellow spot before and behind each of the black stigmata. It feeds on the flowers of *Genista* and *Ulex* in March and April.

2. *S. Agaritharia* (Dard.).—Fore-wings with the tip rather long, but obtuse; dull brownish-grey, with a dark central band, broad above, narrower from the middle of the inner margin, and bordered with whitish on both sides. The subterminal line is waved, of a lighter grey, and bordered with dark grey on both sides. The markings vary much in intensity, and are sometimes lost in the ground-colour. Hind-wings whitish-grey, with the hind margin dull ashy, and an indistinct central dot. Inhabits South France and Spain. The larva is reddish-grey, with a broad whitish stripe on the sides, and feeds on *Genista* and *Ulex*. (*S. Unicoloraria*, Ramb., supposed to occur in Andalusia, is greyish-white, thickly speckled with yellowish-brown, the nervures yellowish-brown, and a stripe of the same colour across the centre of all the wings, which is obtusely angulated outwards, just below the cell of the fore-wings.)

*3. *S. Plumaria* (W. V.).—Wings light violet-grey, finely speckled with brown, darker on the hind margin, with a brown central spot, and a suffused subterminal line, bordered with dark brown in front; and the fore-wings with three dark brown shaded stripes, often only distinct on the costa. It is found throughout a great part of Europe and Western Asia, in rocky places, in July and August, but is seldom very common. The larva is brownish-red, with a black line on the back, expanded into spots at the back of the segments, and with blackish dashes on the sides. It feeds on *Lotus corniculatus* in May. The moth is figured at Pl. 59, Fig. 3. (*S. Granataria*, Ramb., from Andalusia, is yellowish-grey, transversely striated with brown, the half-line marked, and the two transverse lines indicated by brown spots; the inner line consists of three large spots, and is not continued on the hind-wings; the subterminal line is broad, pale, and much dentated, especially on the fore-wings, and is broadly bordered on both sides with yellowish-brown.)

4. *S. Tæniolaria* (Hübn.).—Wings reddish-testaceous, dusted with black, with three blackish lines, the first angulated, and the second and subterminal lines dentated, and bordered outside with reddish and with white respectively; hind-wings dentated, with only the two outer lines marked. Inhabits South France and Spain from June to September. The larva is yellowish-grey, shading into bluish-grey and dull red, with a grey line on the back and a red one on the sides. It lives on sloe, bramble, &c., in summer and autumn, and forms its pupa on the ground, without constructing a cocoon.

5. *S. Ambustaria* (Hübn.).—Yellowish-grey, speckled with black, and with a black central dot; fore-wings with a waved black stripe, and hind-wings with a reddish black one. The female is yellowish-red, and the stripe on the fore-wings is not so dark. Inhabits Sicily.

GENUS XLIII.—THAMNONOMA (LED.).

Antennæ of the males, and of the female of *Vinculuria*, shortly pectinated, and serrated at the extremity; in the females of the other species they are serrated throughout. The body is slender, the palpi straight, and the tongue spiral. The wings are rather short and broad, the fore-wings with the tips obtuse, and the hind margins rounded and convex; hind-wings rounded. The fore-wings are of a dirty grey or brownish, with more or less distinct traces of four transverse lines, and the hind-wings have at least one line. The moths fly in open places among grass or bushes.

1. *T. Vinculuria* (Hübn.).—Fore-wings bluish-grey, with four black costal spots, the outermost followed by an oblong black blotch at the end of the cell; beyond this is a slightly curved reddish transverse band, brown on the costa, and finely bordered with whitish on each side; hind-wings paler, with an indistinct line; all the fringes dotted with black. Expands about 1¼ inches. It inhabits South France and Spain in early spring, and again in August. The larva is purplish-brown, with small tubercles on the 4th, 5th, and 11th segments. It feeds on *Rhamnus infectorius* in June and September. The moth is figured at Pl. 59, Fig. 1.

2. *T. Semicanaria* (Freyer).—Fore-wings pale brownish-grey, with two dark brown transverse lines, and an oblong central spot between; between the second line and the hind margin runs a broad brownish band, shading into reddish in fresh specimens; hind-wings reddish-grey, with a small dot in the middle. Expands from ¾ inch to 1¾ inches. It inhabits South Europe and North Africa.

3. *T. Contaminaria* (Hübn.).—Wings pale ochreous-yellow, dusted with brownish, with two well-marked reddish-brown lines, the second waved, and approaching the first on the lower part of the fore-wings, where they are crossed by a reddish-brown blotch; towards the base of the fore-wings is another line. Expands about 1¼ inches. Local in France and Italy from June to September. The larva is pale yellowish-green, and feeds on oak in May, June, September, and October. (*T. Gesticularia*, Hübn., from Spain, differs from *Contaminaria* in wanting the reddish blotch on the fore-wings, and in the lines being quite parallel. *T. Acquiaria*, Mill., which occurs in Italy in June, is allied to *Gesticularia*, but is white, finely dusted with brown, with red lines.)

4. *T. Loricaria* (Eversm.).—Violet-grey, with black central and marginal dots on all the wings; fore-wings with three waved blackish lines and an irregular submarginal reddish band; hind-wings paler, with one line. The wings of the female are rudimentary. Widely distributed in Russia.

*5. *T. Wavaria* (Linn.).—Fore-wings ashy-grey, with four rusty-brown costal spots, the second of which is connected with an angular mark at the end of the cell, below which often runs a curved line to the inner margin; hind-wings paler, indistinctly speckled with grey. Expands about 1¼ inches. Common throughout Europe in June and July. The larva is bluish-green, bluish-white, grey, or blackish, with a few hairs on raised black spots, and a bright yellow stripe on the sides. It feeds on gooseberry and currant in spring and autumn. The moth is figured at Pl. 45, Fig. 10. (*T. Fuscaria*, Hübn., supposed to occur in Lapland, is brownish, with pale fringes dotted with black; the fore-wings are bordered with grey, with a yellowish spot on the costa before the tip, bordered with black outside; hind-wings grey, with the base paler.)


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GENUS XLIV.—FIDONIA (TR.).

Antennæ of the male more or less pectinated, and those of the female dentated. Body rather stout, the palpi drooping and slightly developed, or absent. The wings are yellow, rarely whitish; the fore-wings generally with three or four, and the hind-wings with two broad dark transverse lines. The fore-wings are moderately broad, with the costa nearly straight, and the hinder angle rounded; hind-wings with the costa scarcely longer than the inner margin. The larvæ are slender, with a round head, and undergo their transformations in the ground.

* 1. *F. Piniaria* (Linn.).—The male is whitish, or pale ochreous, with the tip, nervures, and inner margin of the fore-wings, and the costa, hind margin, and two transverse lines on the hind-wings, dark olive-brown; the female is dull orange, with the hind margins, and frequently a transverse band in the middle of the wings, reddish-brown. Expands about 1¼ inches. It is common in fir-woods from May to July throughout Europe and Northern Asia. The larva is green, with three white lines on the back, and a yellow stripe on the sides. It feeds on fir from August to October. The sexes of the moth are figured at Pl. 45, Fig. 8, *a*, *b*.

* 2. *F. Atomaria* (Linn.).—The wings of the male are ochre-yellow, and those of the female whitish, transversely speckled with brown; the fore-wings with four and the hind-wings with two broad brown stripes, the two middle ones converging on the inner margin of the fore-wings. Expands about 1 inch. Common on heaths, from May to September, throughout the greater part of Europe, and Northern and Western Asia. The larva is varied with lighter and darker brown, with a waved yellow stripe on the sides. It feeds on heath, birch, &c., in June and September. The moth is figured at Pl. 45, Fig. 9.

3. *F. Plumistaria* (Vill.). — Antennæ very strongly pectinated in the male; fore-wings yellowish-white, slightly speckled with brown, with four very broad brown transverse stripes, the outermost only separated from the brown hind margin by a row of pale spots, the innermost bifurcating towards the inner margin, and the third strongly curved inwards towards the inner margin, and angulated so as to touch the second stripe; hind-wings yellow, with some scattered brown dots, an inner brown transverse stripe, and an outer row of brown spots. Expands nearly 1¾ inches. Inhabits Southern Europe in March and September, flying rapidly in the forenoon. The larva is clay-colour, spotted with brown, and with a yellow stripe on the sides. It feeds on *Dorycnium suffruticosum*. The moth is figured at Pl. 59, Fig. 11.

4. *F. Pennigeraria* (Hübn.).—Fore-wings dark brown, with three broad, irregular, and dentated white transverse stripes; hind-wings yellow, with a moderately broad brown border; all the fringes spotted with brown and white. Expands rather more than 1½ inches. Inhabits South-Western Europe in May and June. The larva is purplish-brown, with a white stripe, spotted with orange on the sides. It feeds on lavender, and probably also on *Santolina chamæcyparissus*, in April. (*F. Chrysitaria*, Geyer, from South Europe and North Africa, resembles this, but has only two angulated white lines on the fore-wings, and there is a yellow spot at the tip of the hind-wings.)

* 5. *F. Limbaria* (Fabr.).—Wings ochre-yellow, the fore-wings with a broad black border, and the hind-wings dusted with blackish, more densely towards the hind margin; under side thickly and transversely striated with dusky, and marked with whitish longitudinal rays. Expands about 1 inch. Widely distributed in Central Europe from May to July. The larva is reddish-brown, with a yellow stripe on the sides, and feeds on broom in June and July, and in September and October.

6. *F. Roraria* (Fabr.). — Fore-wings ochre-yellow, transversely speckled with brown, most

thickly and darkly towards the hind margins; the hind-wings beneath not darker than the fore-wings, and with no white longitudinal rays. Expands about 1¼ inches. Inhabits many parts of Central Europe, except the north-west, in May and June. The larva is green, with white lines on the back and sides, and feeds on broom in August and September.

*7. *F. Brunneata* (Thunb.).—Wings reddish ochre-yellow, dusted with brownish-red, with unicolorous fringes; the fore-wings with four and the hind-wings with two indistinct brown transverse lines. Expands about 1 inch. In this and the following species the females are rather smaller than the males. Widely distributed in Central Europe and Northern Asia, from May to July; in Britain it occurs at Rannoch. The larva is violet-red, with white lines on the back, and a yellow stripe on the sides. It feeds on bilberry from May to July, according to the locality.

8. *F. Fasciolaria* (Hübn.).—Wings pale yellow, suffused with brownish in the male, and with spotted fringes; the fore-wings with four and the hind-wings with three broad olive-brown transverse lines, which are often partially connected; hind-wings rather long. Expands about 1 inch. Widely distributed in Eastern Europe and the Altai in May, July, and August. The larva feeds on *Artemisia campestris* from June to September.

*9. *F. Carbonaria* (Clerck).—Wings white, speckled with blackish, and with chequered fringes; the fore-wings with four and the hind-wings with three black parallel stripes. Expands from ¾ of an inch to 1 inch. Inhabits the mountains of Northern and Central Europe (including those of Scotland) in April and May.

10. *F. Famula* (Esp.), *Concordaria* (Hübn.).—Fore-wings yellowish-white, often entirely suffused with brown, with four brown transverse stripes, the two last close together; hind-wings orange, with two stripes above, and with white longitudinal rays beneath. Expands about 1¼ inches. Occurs in many parts of Central Europe, especially the south-west, from April to June; and there is a second brood in August in the south. The larva is greenish-yellow, with a darker line on the back, and paler lines, and a row of black spots on the sides. It feeds on different species of *Genista* in spring and October, and constructs its pupa in moss.

11. *F. Glarearia* (W. V.).—Wings pale ochreous, speckled with brown, with chequered fringes; the fore-wings with three and the hind-wings with two ill-defined olive-brown transverse stripes. Expands about 1 inch. Local, but widely distributed in Central and Southern Europe and Western Asia in April, May, and July, frequenting meadows, and openings in dry woods. The larva feeds on *Lathyrus pratensis* in June, August, and September.

*12. *F. Clathrata* (Linn.).—Wings white, more or less suffused with yellow, with dark brown nervures and chequered fringes; the fore-wings with four and the hind-wings with three dark brown transverse stripes. Expands 1 inch or over. Common on heaths in Europe, and Northern and Western Asia, from May to August. The larva is bluish-green, with a slender darker line on the back, and a white stripe on the sides. It feeds on different kinds of clover in May, June, August, and September. The moth is figured at Pl. 45, Fig. 11.

GENUS XLV.—GNOPHOS (TR.).

Slender, the wings broad, of a paler or darker unicolorous grey, occasionally shading into green, and dusted with darker, with dark central rings, and dentated transverse lines, generally rather indistinct, or broken into dots. There are two on the fore-wings, and one on the hind-wings, as well as a zigzag, but almost always wholly suffused subterminal line.

The costa of the fore-wings is slightly curved, and the hind margin is generally as long as the inner margin; hind-wings broad, with the costa as long or longer than the inner margin. The antennæ of the males are pectinated, or evenly ciliated, and their hind tibiæ are often thickened. The larvæ are cylindrical, generally with small warts or points, especially on the last segment but one, and with two points on the last segment. Most of them may be fed on lettuce in confinement. The moths are met with chiefly in the mountainous districts, from May to July. They sit on rocks and the trunks of trees, and are very easily disturbed. They may be divided into several sections.

A.—*Antennæ of the males ciliated (pectinated in Stevenaria) and their hind tibiæ thickened; the wings strongly waved or zigzag, and the tips of the fore-wings pointed.*

1. *G. Stevenaria* (Boisd.).—Wings shining grey, with two common angulated brown lines, one near the base, and the other beyond the middle; fore-wings with three dark brown costal spots, and the hind-wings angulated. Expands about 1½ inches. Inhabits Andalusia, South-Eastern Europe, and Western Asia.

2. *G. Dumetata* (Tr.).—Wings strongly dentated, violet-grey, with the hind margins brownish; fore-wings with three dark costal spots, the transverse lines indicated by black dots, the under side with no curved line, the forehead not darker, and the hind tibiæ of the male slightly thickened. Expands from 2 to 2¼ inches. Inhabits South France and South-Eastern Europe in autumn. The larva is flesh-coloured, with a yellow stripe on the sides. It feeds on *Phillyrea latifolia.*

3. *G. Furvata* (W. V.).—Wings strongly dentated, violet-grey or greenish, finely dusted with darker, brownish-grey in the central area, with small dark central rings, the second line strongly dentated, and the subterminal line suffused, the under side with no curved line, and the hind tibiæ of the male long and slightly thickened. Expands from 2 to 2½ inches. It is found in the mountains of South-Central Europe in July. The larva is yellowish or brown with a darker line on the back, reddish subdorsal stripes, and a suffused grey stripe on the sides. It feeds on plantain in May and June.

*4. *G. Obscurata* (W. V.).—Hind margin of the fore-wings lobed, and of the hind-wings strongly dentated; wings grey, thickly speckled with dusky, with dark central lunules; the second line black, strongly dentated, and visible on the underside also; the forehead dark brown, and the hind tibiæ of the male short and strongly thickened. It differs considerably in colour; the varieties *Argillacearia* and *Calceata* of Staudinger are clay-coloured and whitish respectively; the latter is a rarity. Expands from 1¼ to 1½ inches. Common in the greater part of Europe in June and July. The larva is brownish, with oblique yellowish dashes, and a brown line on the sides. It feeds on bramble and wormwood in April and May.

5. *G. Respersaria* (Hübn.).—Wings dusted with brownish-grey, and slightly dentated; fore-wings reticulated with pale yellow on the costa, and marked with three or four dark brown spots from which run transverse lines; hind-wings transversely striated with brown, yellowish on the hind margin and near the lines; all the wings below finely dusted with brown, and with dark central spots; the forehead dark brown, and the hind tibiæ of the male long and slightly thickened. Expands about 1¼ inches. It inhabits Spain, Dalmatia, and perhaps the Alps, in July. The larva feeds on *Rhamnus alaternus*, according to Millière; but I do not describe it because his description does not seem to agree with his figure; other authors say it feeds on birch.

6. *G. Sartata* (Tr.).—Fore-wings waved, and hind-wings strongly dentated; pale grey dusted with brownish-grey, with a brown central shade, a black dentated transverse line formed of black

dots on the nervures, and a lighter subterminal line widened into spots in the middle; the under side is marked with a dark central spot and curved stripe, and with whitish marginal spots in the middle and at the tips; the forehead is dark brown. Expands about 1¾ inches. Inhabits South-Eastern Europe and Western Asia.

B.—*Antennæ of the males serrated or shortly pectinated beneath; hind tibiæ short and strongly thickened; fore-wings with the tips more rounded, and the hind margin entire, and hind-wings with the hind margin strongly dentated; the forehead is not dusky.*

7. *G. Glaucinaria* (Hübn.).—Wings dusted with bluish-ashy-grey, with dark central rings, the second line dentated, and darker on the nervures, and a suffused subterminal line; on the under side the middle is whitish and the hind margin grey spotted with white; the antennæ of the male are serrated beneath. The variety *Plumbearia* (Staud.), from the Rhine, is smaller, darker, dusted with yellowish-grey, and almost without lines. Expands about 1½ inches. Common in the mountains of Central and South-Western Europe in July. The larva is yellowish-grey, with brown angular spots on the back, and a white stripe on the sides. It feeds on *Polygonum bistorta* and dandelion, and that of *Plumbearia* feeds on *Sedum album.*

8. *G. Variegata* (Dup.).—Wings finely and transversely speckled with brown; pale grey varied with bluish-grey with a silken lustre, small dark central rings, a dentated transverse line, and a suffused subterminal line; central area and hind margin dusted with ochre-yellow; wings white beneath, spotted with grey before the hind margin; the antennæ of the male are serrated beneath. The variety *Cymbalariata* (Mill.) is bluish and more unicolorous. Expands about 1¼ inches. Common in South-Central and Southern Europe and Western Asia in May, June, August, and September. The larva is wrinkled, with three pointed prominences; it is fulvous, with a duller double line on the back, and a paler stripe on the sides. It feeds on *Asplenium Ruta-muraria* from spring to autumn.

9. *G. Mucidata* (Hübn.).—Very like *Variegata*, but the fore-wings are narrower, with the tips more prominent, the hind margin more oblique and the inner margin shorter, the speckling is coarser and more irregular, and the antennæ of the male are pectinated; it is very variable in size and colour. Common in France, Spain, and Corsica in March, April, August, and September. The larva differs from that of *Variegata* chiefly by its bifid prominences. It feeds on a great variety of low plants, and constructs its pupa in the crevices of walls.

C.—*Resembles Section B, but the hind margin of the hind-wings is smoothly waved, and rather more strongly excavated above the middle, and the forehead is brown.*

10. *G. Pullata* (W. V.).—Wing bluish or yellowish-grey, dusted with darker, occasionally blackish (variety *Confertata*, Guén.) or very pale and almost whitish (variety *Impectinata*, Guén.) with small brown central rings; the fore-wings slightly waved, with two dentated blackish transverse lines, and the hind-wings with one. The subterminal line is zigzag and suffused, and the under side is ashy-grey, with a strongly-marked pure white curved line; the forehead is dark brown. Expands about 1¾ inches. Common in Central Europe in July. It is reputed British; but it is uncertain whether the British *Pullata* is anything more than a dark variety of *Obscurata.* The larva is greyish-yellow with a lighter line on the back, below which are broad blackish curved dashes. It feeds on lettuce till June. (*G. Dolosaria*, Herr.-Schaff., from Greece and Crete, is dark ashy-grey with central black dots; the fore-wings have the first, second, and subterminal lines either complete or reduced to dots, the second line, which is whitish bordered with blackish, is continued on the hind-wings.)

11. *G. Asperaria* (Hübn.).—Greyish-brown, with two slender black transverse lines, the first not extending to the costa nor to the hind-wings, the second is straight and oblique, and there

is a dark and often macular central shade between them; the subterminal line is straight and edged outside with white; the fringes are grey spotted with blackish, and the under side is washed with black and crossed by a slender central line and marked with black central dots. Expands a little more than 1 inch. Inhabits South Europe from April to June. The larva is ochreous-grey or dull reddish, with an indistinct brown line on the back edged with whitish, and a brick-red line on the sides. It lives on *Cistus Monspeliensis* in December.

12. *G. Tibiaria* (Ramb.).—Fore-wings shining greyish-brown and slightly striated, the second line only is marked on the fore-wings by a pale streak which is twice arched, and by a row of white dots on the nervures touching black dots; hind-wings paler and without markings; the under surface is marked with black discoidal dots and a row of black dots across the centre. Expands nearly 1¼ inches. It is found in August and September in open places in woods in the centre of France. (*G. Benesignata*, Chav., found in the mountains of Corsica in August, is dark yellowish-brown; fore-wings with black streaks on the nervures in the medial area, and the elbowed line represented by a row of very fine whitish dots; hind-wings paler, and marked with a central row of black dots. *G. Gruneraria*, Staud., which occurs in Greece in June, has ashy-grey wings irrorated with brown, with central dots, which are less conspicuous on the hind-wings, and a chocolate-brown submarginal band beyond the middle; the hind-wings are slightly waved, and the under side of all the wings is yellowish.)

D.—*The antennæ of the male ciliated, the hind tibiæ long, and not thickened; the hind margins slightly waved, and the tips of the fore-wings rather rounded.*

*13. *G. Obfuscata* (W. V.).—The male is dark grey, and the female pale grey, dusted with darker, with an indistinct central spot and subterminal line; the fore-wings with two blackish dentated transverse lines, and the hind-wings with one; the forehead of the male is dark brown, and that of the female is grey, and the body of the latter is rather thick. Expands from 1¾ to 2 inches. It inhabits the mountains of Northern and Central Europe and the Altai in July. The larva is grey, or pale ochreous, with dark angulated streaks, it feeds on vetches, *Genista*, &c., in May.

E.—*The antennæ of the male are pectinated, the hind tibiæ long and thickened; the fore-wings entire, or very slightly waved, and the hind-wings waved, and strongly contracted above the middle.*

14. *G. Dilucidaria* (W. V.).—Wings pale grey, finely dusted with darker, with brown central rings, the second line dentated, and darker brown on the nervures, and the subterminal line suffused; the first line only represented on the fore-wings, and the forehead whitish. Expands about 1½ inches. Widely distributed in the mountains of Northern and Central Europe in July and August. The larva is rusty-brown, with a dark line on the back, and a sulphur-yellow stripe on the sides. It feeds on low plants till May. The moth is figured at Pl. 50, Fig. 5. (*G. Canitiaria*, Guén., from the Maritime Alps, is whitish, much resembling the pale variety of *Pullata*, except in its pectinated antennæ. The lines are indistinct, the second line bordered with white, and the rings are large. It differs from *Dilucidaria* by its colour, its more dentated fore-wings, and its yellow forehead and antennæ.)

15. *G. Serotinaria* (Hübn.).—Resembles *Dilucidaria*, but pale ochreous-yellow, more coarsely and transversely speckled with brown; and the forehead is brown above. Expands about 1¾ inches. It inhabits the Alps in July. The larva feeds on a variety of plants.

F.—*Resembles Section E, but the hind tibiæ of the male are not thickened, and the hind margin of the hind-wings is only slightly waved, and a little contracted above the middle.*

16. *G. Sordaria* (Thunb.).—Wings pale grey, dusted with rusty-brown, with small brown central rings, the second line brown, dentated, and darker on the nervures, and with black

marginal dots; the first line on the fore-wings is often indistinct, and the forehead is dark brown. Expands about 1¾ inches. Inhabits the mountains of Norway, Silesia, the Alps, and the Altai in July.

17. *G. Andereggiaria* (Lah.).—Wings smooth and shining, grey, with a greenish lustre, a small dark central spot, two whitish costal spots, and the second line very slightly dentated, and narrowly bordered with whitish behind; the fringes unspotted, and the forehead scarcely darker. Expands about 2 inches. Inhabits the Alps of the Valais and Piedmont.

G.—*The antennæ of the male pectinated, the hind tibiæ not thickened, the hind margins of all the wings entire, and the wings of the female rudimentary.*

18. *G. Zelleraria* (Freyer).—Wings pale ashy-grey, with the transverse lines wholly suffused, and only indicated on the costa by some rather darker spots, and with dull central spots; the under side is whitish, with a grey border; the wings of the female are rather longer than the body, and the fore-wings are rounded. The male expands about 2 inches, and the female a little more than 1 inch. It inhabits the Alps in June and July.

19. *G. Cælibaria* (Herr.-Schäff.).—Wings ashy-grey or bluish-grey, dusted with darker; yellowish on the costa and on the nervures, with large blackish central spots, and a dark grey dentated second line, bordered behind with lighter; both the transverse lines rise from large dark costal spots, and the hind margin is not dotted. The wings of the female are half as long as the body, and the fore-wings are pointed, with two dark grey transverse lines; the second continues on the hind-wings. The male expands about 1½ inches, and the female about half an inch. Inhabits the Southern Alps in July.

20. *G. Operaria* (Hübn.).—Wings pale ashy-grey, finely dusted with darker, with a grey central spot, a suffused subterminal line, and black marginal dots, the fore-wings with two grey dentated transverse lines, which are darker on the nervures, and the hind-wings with one; the female has very short rudiments of wings. The male expands about 1½ inches. Inhabits the mountains of Austria and Silesia in July, and the larva feeds on *Campanula*.

GENUS XLVI.—HEMEROPHILA (STEPH.).

Rather stout, the wings ochreous, with two nearly straight oblique and slightly-waved lines; the first runs from the costa near the base to beyond the middle of the wings, and the second runs parallel to it, from or before the middle of the inner margin to the hind margin below the tip, accompanied by a more or less distinct oblique brown shade; the hind-wings transversely striated, and with a black line which runs transversely through the wing beyond the middle; the subterminal line is only indicated by some light zigzags below the tip of the fore-wings, and the costa of the hind-wings is rather longer than the inner margin.

1. *H. Nyctemeraria* (Geyer).—Fore-wings ochreous, with the costa broadly paler, and a broad dark brown oblique band running from the inner margin before the middle to the hind margin below the tip; hind-wings pale ochreous, with a black transverse line, which is not dentated. Expands about 1¾ inches. Inhabits South France and the Valais in May and August; the larva is clay-coloured or brownish, washed with bluish beneath. It feeds on broom, juniper, &c., in March and April. (*H. Barcinonaria*, Chav., found at Barcelona in May, is uniform brown, with two slender black lines and a small central dot on the fore-wings, and one line on the hind-wings.)

*2. *H. Abruptaria* (Thunb.).—Ochreous, varied with brown, the front half of the oblique second line on the fore-wings, and the black dentated transverse line on the hind-wings, bordered outside with dark brown bands. Expands about 1½ inches. Common in many parts of Western Europe from April to September; in the North it appears to be single-brooded. The larva is yellowish-grey, sometimes washed with flesh-colour and bluish. It feeds on broom, jasmine, &c. (*H. Fractaria*, Staud., from Andalusia, is white, dusted with grey, with two thick black transverse lines which approach each other in the middle, and enclose a large black spot in front. The basal area, the front of the medial area, and a broad black shade on the outside of the second line are dark, the latter shade running into the hind margin before the tip. Hind-wings much less dentated than in *H. Abruptaria*, also with a black line near the hind margin, broadly shaded on the outside.)

GENUS XLVII.—NYCHIODES (LED.).

Antennæ of the male strongly pectinated to the tips, and those of the female shortly but distinctly pectinated; body stout, and obtuse at the extremity. The wings are broad, thick, and regularly dentated, with long fringes. The larva is short, thick, and without protuberances, and forms its pupa in the ground. The commonest species, *N. Lividaria* (Hübn.), has iron-grey wings, washed with pale flesh-colour on the disc; the two central lines black and slender, the first line arched and waved, and the second curved round the discoidal cell of the fore-wings, and continued across the hind-wings; beyond it is a band formed of whitish atoms. The fringes are concolorous, preceded by a festooned black line. Expands nearly 2 inches. Inhabits South-Western Europe, Turkey, and Western Asia in July. A whitish variety, *Andalusiaria* (Mill.), has been taken in the mountains of Spain. The larva is grey, varied with blackish and reddish, with the back ashy, and a pale line on the sides, crossed by oblique black streaks, on which stand the stigmata; the head is small, black, and quadrangular, and the collar is orange. It lives on sloe in France, and on *Erica arborescens* in Spain. It hybernates, and feeds till May or June, but cannot be reared successfully in-doors. *N. Amygdalaria* (Herr.-Schäff.) is greyish-white, partly clouded with dark grey, with two slightly-waved blackish lines, the second line partly double on the fore-wings, and forming an acute angle, and the costa of the fore-wings with some black marks. It inhabits Turkey and Asia Minor.

GENUS XLVIII.—SYNOPSIA (HÜBN.).

Resembles *Boarmia;* the fore-wings are moderately broad, with the tips rounded, and the hind margin long and waved; the hind-wings are dentated, with a rather larger excavation above the middle, and the costa and inner margin are of nearly equal length. The larvæ are slender, with pointed elevations on the back, and two anal points.

1. *S. Sociaria* (Hübn.).—Wings pale grey, varied and speckled with brown; the fore-wings with two transverse lines, between which the ground-colour is rather paler; the second line projects considerably before the tips in a double angle; and the transverse line on the hind-wings also projects considerably outwards on the costa. Expands nearly 2 inches. Common in Southern and South-Central Europe, and in Northern and Western Asia, in August and September. It is a rather variable species. The larva is grey, with a black stripe on the sides bordered below with white, and is chequered with brown and whitish on the last segments. It feeds on broom, sea-buckthorn, &c., in May and June. (*S. Phæoleucaria*, Led., from Sarepta, Turkey, and the Altai, has white fore-wings, varied with blackish, with two black dentated lines,

rather widely separated, and two olive-grey transverse bands; hind-wings white, with an indistinct and partly double grey line. Expands about 1¼ inches. This species is much more slender than *Sociaria*, and has more resemblance to a small *Boarmia*.)

GENUS XLIX.—BOARMIA (TR.).

Large moths, rarely below the middle size, and moderately slender; the wings dusted with grey, with a more or less distinct pale submarginal line, which is generally zigzag; and the fore-wings with two dark transverse lines, the second running from or beyond the middle of the inner margin nearly to the tip, and then turning again towards the base; it is often dentated, and is continued on the hind-wings as well as the central shade, and the line on the hind-wings either meets the second line of the fore-wings on the costa, or is set considerably further back. The hind-wings are rounded, and the costa is only slightly, if at all, longer than the inner margin; the first joint of the front tarsi is very long. The larvæ are slender, and are generally furnished with protuberances of various kinds. The moths rest on tree-trunks, with their wings extended flat. They may be divided into several sections.

A.—*The antennæ of the males pectinated to the tips.*

*1. *B. Lichenaria* (Hübn.).—Wings varied with pale grey and greenish, the fore-wings with two black transverse lines bordered with white, the second sharply dentated and continued on the hind-wings. Expands from 1 to 1¼ inches. Common in Central and Southern Europe in July and August. The larva is humped, and is varied with white and green, like the lichens on which it feeds. It may be found in May and June.

B.—*The antennæ of the males pectinated, but simple or serrated towards the tips.*

*2. *B. Viduata* (W. V.).—Wings white, finely speckled with black, the fore-wings varied with brownish, with the central shade broad and black, and with two black transverse lines, the second slightly dentated, and thickened on the nervures. Expands about 1½ inches. Common in Central Europe in May and June. The larva has a double hump on the 6th segment, and is varied with paler and darker brown, like bark. It feeds on lichens growing on trees, in autumn.

*3. *B. Glabraria* (W. V.).—Wings white, thinly and finely dusted with black, the fore-wings with four blackish spots on the costa, a large black central spot, and two black transverse lines, which are not dentated, and are often indistinct. Expands from 1 to 1¼ inches. Common in Central Europe in June and July. The larva is verdigris-green, with three black lines on the back, and black spots on the sides. It feeds on lichens in May.

*4. *B. Cinctaria* (W. V.).—Wings with the hind margin slightly waved, pale grey, thickly dusted with brown; the fore-wings varied with brownish, with rather long black central rings, two black scarcely dentated transverse lines, and a light subterminal line, shortly and evenly dentated; the first segment of the abdomen white. Expands from 1¼ to 1½ inches. Common in Northern and Central Europe and Northern Asia from April to June. The larva is green, with many white longitudinal lines, of which those on the back are most distinct. The larva feeds on St. John's wort and wormwood in June and July. The moth is figured at Pl. 46, Fig. 2.

*5. *B. Repandata* (Linn.).—Wings with the hind margin strongly waved, ashy-grey, varied with brownish and rusty-yellow, and dusted with darker, with a light, irregularly-dentated subterminal line; the fore-wings with two black transverse lines; the second strongly and irregularly curved, and connected with the subterminal line by a dark grey spot above the

middle. In the variety *Conversaria* (Hübn.) there is a broad black band across the middle of all the wings. Expands from 1½ to 1¾ inches. Common throughout Europe and Northern and Western Asia in June and July. The larva is grey, varied with darker on the back, and marked with paler stripes on the back and sides. It feeds on various trees from April to June.

6. *B. Umbraria* (Hübn.).—Reddish-white, transversely speckled with brownish. The lines are black, the first line curved, and the second rises in a spot on the costa and is zigzag, and very thick on the inner margin. The subterminal line also rises from a black spot near the tip, and is angular and thickened in the middle, where it approaches the second line; the central shade is curved, absorbing the discoidal streak, and is widened at the base, where it unites with the second line; and there are several marginal spots placed between the nervures towards the tip. The hind-wings have three black lines, the first rather large and slightly curved, the second and third waved and angulated; and there is a well-marked discoidal dash between the first and second. Expands about 1¾ inches. Inhabits South Europe in April and September. The brown larva feeds on olive and oak.

*7. *B. Abietaria* (W. V.).—Wings varied with brownish-grey and greenish, speckled with dusky, the fore-wings with narrow black dentated transverse lines and central shade, and a light subterminal line composed of small arches filled up with blackish towards the hind margin; hind-wings lighter, with a black dentated central line. Expands from 1½ to 2 inches. It inhabits Central Europe in June and July. The larva is brownish, with dark oblique dashes, and a yellowish stripe on the sides. It feeds on fir and larch, and sometimes on oak, birch, and willow, in April and May.

8. *B. Secundaria* (Hübn.).—Wings moderately thick, with the hind margins waved; dirty white, varied with brownish and dusted with darker, with a dark brown central shade and a sharply-dentated second line, which runs to the inner margin of the fore-wings close to the central shade, and on the hind-wings is placed rather back in front towards the hind margin; and there is a strongly-curved light subterminal line on the fore-wings, which is widened into spots in the middle. Expands about 1½ inches. It occurs in Germany, Switzerland, and Greece from June to August. The larva is brownish-grey, with brown lozenge-shaped spots on the back, spotted with white in front, and a yellow lobate stripe on the sides. It feeds on fir till June. The moth is figured at Pl. 46, Fig. 3.

9. *B. Ilicaria* (Geyer).—Resembles *Secundaria*, but the fore-wings are varied with greenish, the central shade is broader, and expanded on its hinder half into a band as far as the second line, which is less strongly dentated, and projects in a round curve below the costa; the subterminal line is more sharply dentated, and the central line of the hind-wings begins where the subterminal line of the fore-wings ends. Expands about 1½ inches. It is found in South Europe and near Hanover in July and August. The larva is dark grey, varied with greenish, with a fine white line on the sides. It feeds on oak in May and June.

10. *B. Solieraria* (Ramb.).—Resembles a small *Hemerophila Abruptaria* in pattern. Wings pale grey, with transverse and oblique black and brown lines. The central lines on the fore-wings are black, the first is interrupted before reaching the costa, and the second runs from the inner margin to the tip, dividing the wing into two nearly equal parts; the brown central shade only extends to the discoidal dot, and the marginal area is traversed by two brown lines united at the tip; the hind-wings are also traversed by two black and two brown lines. It inhabits South France and Spain, and the larva is believed to feed on juniper. (*B. Atlanticaria*, Staud., from Andalusia, is clearly allied to this, but the central area of the fore-wings is darker

instead of paler, and the second line is sharply zigzag; on the hind-wings there is only one regularly zigzag black line besides the slender subterminal line, which is often broken into spots on all the wings; the female is paler than the male, with more brown lines on the hind-wings. Expands about 1 inch.)

11. *B. Occitanaria* (Dup.).—Wings reddish-white, more or less shaded with brown; the fore-wings have two black irregular transverse lines, the first forms a 7 on the costa and is then arched, the second is tridentate at the top and then slightly concave; there are four other indistinct brownish lines, and the pale subterminal line runs between the two last; hind-wings with two brown lines, only well marked on the inner margin; a central dot on all the wings, most distinct below. Expands nearly 1½ inches. Inhabits South France and Spain in August and September. The larva varies from clay-colour to dark brown, with a dark line on the back and a whitish one on the sides. It feeds on oak and thyme till March or April. (*B. Bastelicaria*, Chav., found in Corsica in July, is dull grey; fore-wings with three brown lines, the first double, as far as the discoidal spot, and the subterminal line thick, but often interrupted. Hind-wings dentated, with a large central spot, and a dentated curved brown line, bordered inside with black.)

12. *B. Perversaria* (Boisd.).—Resembles *Rhomboidaria* in pattern, but the wings are much paler, reddish-ashy-grey, darker on the subterminal line, very slightly and sparingly dusted with darker, the transverse lines bordered with light, the first interrupted in front and the second running from the middle of the inner margin almost to the costa in a nearly straight line, but less set back at this point, and like the light subterminal line, scarcely dentated. Expands about 1½ inches. It inhabits South-Eastern Europe in June, and the larva feeds on juniper.

13. *B. Buxicolaria* (Mab.).—Wings yellowish-grey, velvety, the first line is red and oblique, and rises from a spot on the costa, the central shade is reddish but scarcely marked, the second line is very oblique, black, macular, accompanied by a dark reddish shade, and curved outwards at the top towards the subterminal line, as in *Rhomboidaria*. The subterminal line is whitish, bordered by a dark red shade on both sides; under side shining yellowish-grey, with black central spots but no lines; there is a dark reddish border, with two paler spaces on the fore-wings, and one on the hind-wings. Expands nearly 1½ inches. It inhabits the slopes of Mount Alaric in the Department of Aude in July and August, and the pale yellow larva feeds on *Buxus sempervirens* in February and March.

* 14. *B. Rhomboidaria* (W. V.).—Wings varied with whitish and brownish-grey, dusted with darker, with a blackish central shade, and the second line black, slightly dentated, and thickened on the nervures; it runs to the middle of the inner margin on the fore-wings, where it closely approaches the central shade, and is placed further outwards on the hind-wings; the subterminal line is whitish and strongly dentated, and there is a large black spot in the middle of the fore-wings before the central shade. Expands from 1½ to 1¾ inches. Common in Central Europe and Northern and Western Asia from May to August. The larva is greyish-brown, with dusky lozenge-shaped spots on the back, striped with yellow and black, and a darker waved line on the sides. It feeds on oak, sloe, and fruit trees from September to May.

* 15. *B. Consortaria* (Fabr.).—Wings ashy-grey, dusted with darker, with a dark central ring, and a light subterminal line strongly zigzag, and shaded with dusky on both sides; the second line is black, sharply dentated, and bordered with brownish on the outside. It runs to the middle of the inner margin on the fore-wings, and begins further back on the hind-wings, which are strongly waved. There is no mark at the tip of the fore-wings on


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C.

the under side. Expands from 1¾ to 2 inches. Inhabits Central Europe from May to August. The larva is grey, with brown spots and warts, and a darker line on the back. It feeds on oak and other trees in May, and from July to September. The moth is figured at Pl. 46, Fig. 4.

*16. *B. Roboraria* (W. V.).—Larger than *Consortaria* (expands from 2 to 2½ inches), and more uniformly coloured, sometimes wholly dark grey, with the transverse lines and central spot, the former generally indicated only by black dots on the nervures; the subterminal line whitish and much less zigzag, especially on the hind-wings, and more composed of shallow curves; hind-wings only slightly waved. The tip of the fore-wings is white on a dark ground on the under side, or is bordered towards the base by a blackish spot. Common in Europe and Northern Asia in June and July. The larva is marbled with brownish grey and white, with a dark projection on the 4th segment, and two points on the 12th. It feeds on oak till May. The transformations are figured at Pl. 46, Fig. 5, *a—c*.

C.—*The antennæ of the male simply ciliated.*

*17. *B. Crepuscularia* (W. V.).—Wings pale grey, dusted with brown, the second line brown, dentated, and sharply black on the nervures. Behind it is a second broader and browner stripe, streaked with dusky on the nervures. The principal transverse line on the hind-wings commences where the subterminal line on the fore-wings ends. The latter is waved, and shaded with brownish in front. Expands from 1½ to 1¾ inches. Inhabits Europe and Northern Asia in April, May, July, and August. The larva is pale grey, with dark spots and streaks; it feeds on willow and various other forest and fruit trees in June and August. The moth is figured at Pl. 46, Fig. 6.

*18. *B. Binndularia* (Borkh.), *Laricaria* (Doubl.).—Size of *Crepuscularia*, ground-colour white, slightly tinged with yellow, and much less speckled with brown; the lines shaded with pale ochreous. All the lines are better marked, darker, and often continuous; and the marginal dots are deep black. Inhabits Central Europe, especially England, from March to May, and the larva feeds on larch.

*19. *B. Consonaria* (Hübn.).—Resembles *Crepuscularia*, but the second line is not dentated, and not so distinctly dotted on the nervures; it begins on the hind-wings where it ends on the fore-wings, and the subterminal line is shaded with dusky on both sides above the middle. Expands about 1½ inches. Inhabits Central Europe and the Amoor from April to June. The larva is brown, with three yellow lines on the back, and two brownish red lines on the sides. It feeds on birch, lime, and beech in August and September.

*20. *B. Extersaria* (Hübn.).—Fore-wings violet-grey, clouded with large transverse specks, with blackish central shade and transverse lines, the second broken into small spots, and with a zigzag whitish subterminal line, expanded into spots in the middle; hind-wings paler, less speckled, and scarcely waved. Expands from 1¼ to 1½ inches. Inhabits Central Europe in May and June. The larva is varied with brown and grey, and feeds on birch, alder, and hazel in August and September.

*21. *B. Punctularia* (Hübn.).—Wings rounded, pale grey, dusted with darker, the fore-wings with three more or less distinct brown transverse lines, which expand into spots on the costa, and are not dentated; the first and third are continued on the hind-wings. The subterminal line is suffused and is bordered with a brown spot in front on the costa of the fore-wings. Expands about 1¼ inches. Common in Europe and Siberia in May and June. The larva is brown, with darker and paler longitudinal lines, and feeds on alder and birch from June to September.

D.—*The antennæ of the male serrated and strongly ciliated.*

22. *B. Selenaria* (W. V.).—Wings whitish, varied with pale rusty-brown, finely and thinly dusted with black, with a large white central lunule surrounded with black, and the second line slender, black, and strongly dentated. Expands about 2 inches. Inhabits Southern and South-Central Europe, and Northern and Western Asia, in July. The larva is dark brown, spotted with black on the back, with reddish and yellow longitudinal lines. It feeds on wormwood and other low plants.

GENUS L.—TEPHRONIA (HÜBN.).

Small moths, the fore-wings narrow, pale grey, and dusted with darker, with two waved and sharply-defined black transverse lines, sometimes broken into spots; the hind-wings are paler, and the antennæ of the male are pectinated. The larvæ are short, soft, and rather flattened before and behind. They feed on lichens in June, undergo their transformations in a cocoon, and the moths appear in July and August.

*1. *T. Sepiaria* (Hufn.), *Cineraria* (W. V.).—Wings ashy-grey, the fore-wings finely dusted with darker, with two slender black slightly dentated transverse lines, and a suffused dark central shade; the hind margin is marked with black streaks between the nervures. Expands about 1 inch. Inhabits Central and Southern Europe; very rare in Britain. The larva is brownish ashy-grey, with a paler line, and two rows of pale spots on the back. The moth is figured at Pl. 50, Fig. 6.

2. *T. Cremiaria* (Freyer).—Resembles *Sepiaria*, but the hind margin is without markings, the fore-wings are whiter, with a more distinct central shade, and the hind-wings are slightly dusted with darker. Inhabits France and the Tyrol. The larva is greenish, with two blue lines on the back, and yellowish raised spots. (*T. Fingalata*, Mill., found in South France in July, is deep rust-colour in the male, and dark grey in the female; fore-wings with three black lines, the middle one obsolete in the male, except towards the costa; central spot large, black, and extending to the costa. Hind-wings with one blackish transverse line, bordered with whitish on the outside.)

GENUS LI.—PACHYCNEMIA (STEPH.).

The only species, **P. Hippocastanaria* (Hübn.), has greyish fore-wings varied with reddish-brown, with two blackish transverse lines bordered with lighter, the first sharply angulated, and the second dentated, and a black central spot; the hind-wings are pale grey. The antennæ of the male are not dentated. Expands from 1 to 1¼ inches. Inhabits Western and Central Europe in April and May, but local. The larva is slender and attenuated in front; it is brown or grey, chequered with white, producing dusky lozenge-shaped spots on the back. It feeds on heath from July to September, and undergoes its transformations in the ground. The moth is figured at Pl. 50, Fig. 7.

GENUS LII.—BISTON (LEACH).

Thick-bodied moths, large or small, the fore-wings with the hind margin long and oblique; white or grey, dusted with darker, with two dark transverse lines, which are broken or waved; hind-wings slenderer, paler, and more unicolorous; the antennæ of the male pectinated and ciliated. The larvæ are rather long, with hard skins and warts; the head is heart-shaped; and they undergo their transformations in the ground. The moths appear in spring, and rest with sloping wings. The hind tibiæ have only terminal spurs, except in *Pilosaria*, in which


6.
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2a.
12b.
15b.
2b.
12a.
1.
3.
B.
A.
C.

there are two pair of spurs; and the wings of the female are rudimentary, except in the two first species.

*1. *B. Strataria* (Hufn.), *Prodromaria* (W. V.).—Fore-wings greenish-white, the central area bounded by two black transverse lines, strongly and irregularly dentated, and followed by irregular rusty-brown bands; hind-wings paler, with brown transverse lines before and beyond the middle. Expands from $1\frac{3}{4}$ to 2 inches. Common in Central Europe in March and April. The larva is greyish-brown, with small protuberances; it feeds on oak and other trees in summer and autumn. The moth is figured at Pl. 46, Fig. 7.

*2. *B. Hirtaria* (Clerck).—Wings greyish-brown (more thinly scaled in the female, becoming pale grey dusted with darker); the fore-wings with dark waved and often indistinct transverse lines and central shade; the fringes spotted with dusky; antennæ dark brown, with very long pectinations in the male. Expands from $1\frac{3}{4}$ to 2 inches. Common in Central and Southern Europe from March to May. The larva is brown, with yellow warts and a yellow collar. It feeds on various trees from June to September. The transformations are figured at Pl. 46, Fig. 8, *a—c*.

*3. *B. Pilosaria* (W. V.).—Fore-wings of the male broad, greenish-grey dusted with darker, with more or less distinct suffused transverse lines; the hind-wings paler and less dusted; the fringes unspotted, the abdomen slender and reddish above; the shaft of the antennæ whitish, and the pectinations brown and moderately long. Expands from $1\frac{1}{2}$ to 2 inches. The female has very small rudiments of wings, and is clothed with flattened scales, shining grey varied with reddish, the abdomen with two black stripes; the antennæ and legs quite naked, and spotted with paler. Common in Central Europe and Siberia from January to April. The larva is greenish or yellowish-brown, with black streaks and spots. It feeds on various trees from May to July, and is figured, with the male moth, at Pl. 46, Fig. 9, *a*, *b*.

*4. *B. Hispidaria* (W. V.).—Fore-wings of the male narrow, brownish-grey, with the hind margin pale grey, and with distinct black transverse lines; hind-wings white dusted with brown; the antennæ rusty-yellow, with short strong pectinations; the abdomen thick, with diverging spines on the upper side of the front segments. Expands about $1\frac{1}{4}$ inches. The female is finely hairy on the antennæ, legs, and abdomen, and has slender bristles on the latter; it is dark grey, with two rows of black spots on the back, and unicolorous legs. Local in Central Europe from February to April. The larva is brownish-grey, with orange spots and warts. It feeds on oak and birch in June and July.

5. *B. Pomonaria* (Hübn.).—Wings pale grey, semi-transparent, the nervures dusted with blackish and yellow, and the fringes spotted with dusky; the fore-wings are also spotted with blackish and yellow on the costa and inner margin, and marked with suffused dusted transverse lines, the body with grey hairs, the upper side of the abdomen with a longitudinal stripe scaled with orange, and the antennæ blackish. Expands from $1\frac{1}{4}$ to $1\frac{1}{2}$ inches. The female is black, varied with orange scales and slender white and grey diverging hairs, and the wings are rather longer than the body. Inhabits Northern and Central Europe in April and May, but local. The larva is pale grey, with brown pointed elevations placed on yellow spots, and with a yellow collar. It feeds on oak, &c., in June and July. The male moth is figured at Pl. 46, Fig. 10. (*B. Lapponœria*, Boisd., from Lapland and the Upper Engadine, resembles this, but the body is clothed with black hair, the wings are shorter and broader and more finely scaled, the nervures are more broadly brown, and the fringes are brown and unspotted.)

6. *B. Alpina* (Sulz.).—Wings of the male whitish, and not semi-transparent, often with a hollow blackish central spot, the fore-wings with two brown transverse lines, the second marked

with black dashes on the nervures; the subterminal line is shaded with brownish in front, and there is often a central shade passing over the central spot; the hind-wings have a dark shade before the middle, and two transverse shaded lines beyond; the fringes are pale grey, unspotted; and the body is black, with white hairs. Expands about 1½ inches. The female is black, with diverging white hairs; the wings are twice as long as the thorax, and pale grey. Inhabits the Valais and the Grisons in March and April. The larva is dirty yellow with black dots and dashes, and a yellow stripe on the sides. It feeds on yarrow and other low plants in June and July. (*B. Græcaria*, Staud., found in Carniola, the Balkans, and Greece in February and March, is smaller and darker. It is grey generally, with darker bands, but is sometimes almost unicolorous.)

* 7. *B. Zonaria* (W. V.).—Fore-wings of the male greyish-brown, whitish in front in the basal half, with two whitish curved transverse lines beyond the middle, and brownish unspotted fringes; hind-wings whitish, with two greyish-brown shaded stripes, and the segments of the abdomen narrowly bordered with whitish. Expands from 1 to 1¼ inches. The female is black, with white hairs, and the segments of the abdomen are bordered with white; the rudiments of wings are very short. Inhabits South-Central and Western Europe, and Armenia, in April; it is a coast insect in Britain, occurring on the sand-hills. The larva is green, dotted with blackish, and with a broad yellow stripe on the sides. It feeds on yarrow in May and June. The male moth is figured at Pl. 46, Fig. 11. (*B.* (?) *Fiduciaria*, Anker, from Hungary, is dark grey; the thorax whitish, and the abdomen blackish; the wings are semi-transparent, with a white border, and the fore-wings have a large white central spot, and a transverse white line beyond it.)

GENUS LIII.—APOCHIMA (HERR.-SCHÄFF.).

Body very stout and woolly; all the wings entire, straight, long, and pointed at the tips. The hind tibiæ have only one pair of spurs. The antennæ of the male are very large, fan-like, and pectinated; in the female they are pubescent. The abdomen is very short and conical in the male, and does not extend beyond the hind-wings; in the female it extends for half its length beyond them. The only species, *A. Flabellaria* (Heeger), is grey, with marginal black dots; the fore-wings with four oblique and slightly angulated blackish lines, and the hind-wings with two. It inhabits Sicily, Sardinia, Turkey, and Algeria in spring.

GENUS LIV.—AMPHIDASIS (TR.).

Resembles *Biston*, but the female has perfectly developed wings, and the hind tibiæ have two pairs of spurs. The single European species, **A. Betularia*, Linn. (the *Pepper and Salt Moth*), has chalky-white wings speckled with black, the fore-wings with four black costal spots, and two (sometimes indistinct) black and strongly-interrupted transverse lines, the second continued on the hind-wings. An almost black variety (*Doubledayaria*, Mill.) is not very uncommon in England. Expands from 1½ to 2¼ inches. Common in Northern and Central Europe, and in Siberia, in May and June. The larva is grey or brown, with blackish warts; it feeds on various trees from July to October. The transformations are figured at Pl. 43, Fig. 7, *a*—*c*.

GENUS LV.—DASYDIA (GUÉN.).

Blackish moths, with large dark wings with a light transverse line, all coloured alike; the fore-wings are triangular in the male, and the hind margin is two-thirds of the length of the

costa; in the female the wings are short and rounded. The antennæ of the male are pectinated, and the abdomen is slender, especially in the male. There appears to be only one variable species, which flies in barren rocky places in the French and Swiss Alps; its supposed occurrence in Ireland is more than doubtful. *D. Tenebraria* (Esp.) is dark shining brown, with a rather indistinct central spot; without lines, or, in variety *Torvaria* (Hübn.), with a light, dentated, and generally suffused, transverse stripe beyond the middle; on the under side there is a whitish stripe just before the hind margin, which is somewhat widened on the costa of the fore-wings. The hind-wings are strongly contracted longitudinally, and extend far beyond the inner margin of the fore-wings. The variety *Innuptaria* (Herr.-Schäff.), from Carinthia, has the markings obsolete, and shorter wings, and the variety *Wockearia* (Staud.), from Trafoi in the Tyrol, has on the under surface a very distinct white submarginal stripe, and a white apical streak at the tip of the fore-wings. Expands from 1 to 1½ inches; it appears in July and August.

GENUS LVI.—PSODOS (TR.).

Small moths, with dark-coloured wings, either without markings; with two dentated transverse lines; or with a broad yellow transverse band; the female with fully-developed wings. They fly by day, from June to August, in the mountains of Europe, and expand about 1 inch, or a little more or less.

1. *P. Alpinata* (Scop.), *Horridaria* (W. V.).—Wings dark brown, with a yellowish lustre, the transverse lines very indistinct, or quite invisible. Inhabits the Alps, Pyrenees, and the mountains of Silesia.

* 2. *P. Coracina* (Esp.).—Wings brownish-black, dusted with whitish, with a black central spot, sharply-dentated black transverse lines bordered with whitish, black marginal dots, and the subterminal line indistinct; the under side is iron-grey, with the hind margin a little lighter. Inhabits the mountains of Northern and Central Europe, including those of Scotland. (*P. Trepidaria*, Hübn., from the higher Alps, is greenish, varied with rusty-yellow.)

3. *P. Alticolaria* (Mann).—Resembles *Coracina* above, but greenish, and with a more connected marginal line; on the under side there are two silvery-white subterminal lines, partly bordered with black. Inhabits the Southern Alps.

4. *P. Quadrifaria* (Sulz.), *Alpinata* (W. V.), *Equestrata* (Borkh.).—Wings black, with a broad orange-yellow transverse band before the hind margin. Larva pale dull yellow, slightly tinged with yellow at the extremities, and with a white stripe on the sides. It feeds on low plants, especially dandelion, in spring and autumn, and constructs a soft cocoon of grains of earth, and vegetable refuse. Common in the Alps, &c., in summer. The moth is figured at Pl. 47, Fig. 1.

GENUS LVII.—PYGMÆNA (BOISD.).

Antennæ of the male thick and pectinated, body slender, wings delicate. The only species, *P. Fusca* (Thunb.), has brownish-grey wings, paler and narrower in the female; the fore-wings with a dark central spot, and two scarcely-dentated transverse lines. The female expands one-half and the male three-quarters of an inch. Inhabits the high Alps and Scandinavia, flying by day, in July and August. The female is much rarer than the male. The larva is short, very slender, shagreened, and covered with short fine hair. It is reddish-brown, with a broad paler band on the sides. It passes the winter under the snow, feeds till summer on various low plants, and forms its cocoon in moss or dry leaves.

GENUS LVIII.—ANTHOMETRA (BOISD.).

Small moths, with the wings oblong, concolorous, and entire. The antennæ of the males are strongly pectinated, the palpi are short and slender, and the hind tibiæ are furnished with one pair of spurs.

1. *A. Plumularia* (Boisd.).—Fore-wings with the tip produced, but not pointed; hind-wings narrow and rounded; all the wings reddish cinnamon-brown, sometimes nearly black, with the fringes blackish, and two waved parallel lines (often obliterated) a little darker than the ground-colour, the second bordered with lighter behind; tip of the abdomen fulvous. The female is smaller and paler, with the lines very indistinct; the abdomen is thicker, and wholly yellowish fulvous. Expands about three-quarters of an inch. It is found in Spain and the Pyrenees, flying over a thorny species of *Genista*, on which the larva is supposed to feed.

2. *A.* (?) *Homochromata* (Mab.).—Fore-wings dark shining brown, with the hind margin grey, and covered with many shining yellowish scales. Hind-wings paler, silky, with the hind margins paler. Under side similar, suffused with fulvous on the costa. Expands nearly 1 inch. Inhabits Corsica in May, and the larva probably feeds on *Genista Corsica*.

GENUS LIX.—EGEA (DUP.).

The male is of the size and shape of *Pygmæna Fusca*, but the fore-wings are rather longer and more pointed. The antennæ are shortly ciliated, and the hind tibiæ have two pairs of spurs. The female is apterous. The only European species, *E. Pravata* (Hübn.), is dirty white, with central spots; a dark brown curved line runs from the tip to the base of the fore-wings, behind which the ground-colour is dirty brown, intersected by the white nervures; the hind-wings have a curved line beyond the middle. The moth flies over grassy hills in early spring, in Lapland, the Ural, and Northern Asia.

GENUS LX.—EREMIA (HERR.-SCHAFF.).

Resembles *Egea*, but the hind margin of the fore-wings is more convex, the antennæ of the male have long slender pectinations, and the female is winged, but heavy and inactive.

1. *E. Culminaria* (Eversm.).—Fore-wings white, with two transverse lines, the second nearly straight, with a narrow stripe of the ground-colour behind, followed by a brownish shaded band, in which the nervures are scaled with black, and behind it they are brown; the fringes are broad and white, and spotted with brown on the nervures. The hind-wings are grey, with a paler transverse stripe beyond the middle. Inhabits South-Eastern Russia and Asia Minor.

2. *E. Cacuminaria* (Ramb.).—Wings greyish-brown slightly dusted with black, the second line formed of black oblong spots, followed with paler; a black line broken into spots precedes the fringes. The inner line is represented on the fore-wings by three obscure spots; and there are two smaller ones at the end of the cell. Expands nearly 1 inch. Inhabits Spain.

GENUS LXI.—PSEUDOTERPNA (HÜBN.).

Rather stout, fore-wings moderately broad, with the hind margin nearly straight; hind-wings narrow, truncated behind, with the costa and inner margin of equal length; the antennæ of the male shortly pectinated, and the hind tibiæ with two pairs of spurs. The larvæ are slender, with ten legs, a bifid head, and two anal points; they undergo their transformations in a slight cocoon.

* 1. *P. Pruinata* (Hufn.), *Cytisaria* (W. V.), (*Grass Emerald*).—Wings dusted with green and white, the fore-wings with two dark zigzag transverse lines, and the hind-wings with one; the subterminal line is suffused, and whitish. Expands about 1¼ inches. Common in Central and Southern Europe in grassy and bushy places from May to August. The variety *Agrestaria* (Dup.), from South France, is smaller, with no markings except the white subterminal line. The larva is green, with yellow lines on the back, and a whitish stripe on the sides. It feeds on broom and *Genista* in May and June. The moth and larva are figured at Pl. 47, Fig. 2, *a*, *b*.

2. *P. Coronillaria* (Hübn.).—Wings satiny ashy-grey, marked as in *Pruinata*, but the transverse lines are better marked, blacker, and more dentated, and the under side of the fore-wings is tinged with blackish, with the second line blackish and bordered with white. Size of *Pruinata*. Inhabits South-Western Europe and Western Asia in June and July. The larva feeds on *Cytisus*, *Ulex*, *Genista*, &c., in April and May.

3. *P. Corsicaria* (Herr.-Schäff.).—Ashy-grey, the second line blackish, denticulated, and bordered with whitish outside; the subterminal fascia whitish; fore-wings with two dark dentated lines nearer the base, and a blackish central spot. Inhabits Corsica.

GENUS LXII.—GEOMETRA (LINN.).

Wings broad and rather delicate, the hind margins slightly waved; that of the fore-wings long, curved, and oblique, and that of the hind-wings rounded; the antennæ of the male pectinated, and the hind tibiæ with two pairs of spurs. The only European species, * *G. Papilionaria*, Linn. (the *Large Emerald Moth*), has bright green wings, with whitish spots before the hind margin, and two more or less dentated transverse lines. Expands from 2 to 2½ inches. Widely distributed in Europe and Northern Asia from June to August, but not very abundant. The larva is green, with a yellowish line on the sides, and two humps tipped with red on segments 3, 6, and 9. The head is small, yellow, and partly hidden under the second segment. It feeds on birch, and other trees in autumn and spring, and constructs a loose cocoon. The moth is figured at Pl. 47, Fig. 3.

GENUS LXIII.—PHORODESMA (BOISD.).

Wings broad, the fore-wings with the hind margin entire, and obliquely curved, and the hind-wings rounded and slightly waved. Colour green; the antennæ of the male pectinated, and the hind tibiæ with two pairs of spurs. The larvæ are warty, with ten legs, and live in a case formed of fragments of plants, in which they afterwards undergo their transformations.

* 1. *P. Smaragdaria* (Fabr.), (*Essex Emerald*).—Wings green, fore-wings with the costa and central spot yellowish-white, and two yellowish-white dentated transverse lines; hind-wings broadly whitish on the costa, and with a fine white line before the hind margin; fringes conspicuously white. Expands about 1¼ inches. Inhabits Southern and Western Europe, and Northern and Western Asia, in July and August; rare in England, occurring on the coast of Essex. The larva is greyish-brown, with a black line on the back, and black warts. It feeds on yarrow from May to July. The transformations are figured at Pl. 47, Figs. 4, *a—e*.

* 2. *P. Pustulata* (Hübn.), *Bajularia* (W. V.).—Wings green, with a white spot varied with rusty-brownish at the hinder angles, and the hind-wings bordered with connected whitish semicircular spots, on which stand brownish spots. Fore-wings with two rather indistinct white lines, and the hind-wings with one. Expands about 1¼ inches. Inhabits Central and Western Europe in June and July, flying in woods at dusk, about ten feet from the ground. The larva is greyish-

brown, with a pale line on the back, and white warts. It feeds on oak in May. (*P. Neriaria*, Herr.-Schäff., from Greece and Asia Minor, appears to be a variety with a better-marked central spot on the fore-wings, and the blotch at the hinder angle small, and composed of two white spots bordered with red; the white lines are also less dentated. *P.* (?) *Plusiaria*, Ramb., from Andalusia and Algeria, is light green, with the nervures, the broad dentated transverse lines, the subterminal arrow-headed spots, and hind-wings all silvery-white; the central spot of the fore-wings is green, broadly surrounded with white, and there is a long white spot below it, towards the inner margin. Expands about 1¼ inches.)

GENUS LXIV.—EUCROSTIS (HÜBN.).

Antennæ short, pectinated in the male, and dentated in the female. The only European species, *E. Indigenata* (Vill.), has uniform dark velvety-green wings, without lines, but with a small dull reddish dot in the centre of each wing. The fringes are broad, dull purplish-red, edged inside with a darker line, preceded by a yellow stripe. The costa and inner margin of the fore-wings are also yellowish. Expands about three-quarters of an inch. Inhabits South Europe and Western Asia in spring and autumn. The larva is green, yellowish below, with yellow incisions, and the first and last segments slightly washed with reddish. It feeds on different species of *Euphorbia*.

GENUS LXV.—NEMORIA (HÜBN.).

Wings green, with white transverse lines; broad, and entire or waved; hind-wings with the inner margin generally longer than the costa. The larvæ are slender and rigid, with a bifid head, and two anal points. They undergo their transformations in a slight cocoon. Several species which otherwise closely resemble each other differ considerably in structure. In some the antennæ are pectinated, and in others they are simple; and the hind tibiæ have two spurs in some species, and four in others.

1. *N. Fimbrialis* (Scop.), *Thymiaria* (Linn.), *Bupleuraria* (W. V.).—Wings leaf-green, with pale fringes spotted with brownish-red, the fore-wings with two narrow white and slightly waved transverse lines, the second continued on the hind-wings. The hind margin of the hind-wings is dentated, with a large excavation above the middle projection; and the palpi are extremely short. Expands nearly 1½ inches. Inhabits Central and Southern Europe, and Western Asia, in July and August. The larva is green, with a rose-red line on the back, and red points behind the head, and on the last segment. It feeds on thyme, yarrow, &c., in May and June. The moth is figured at Pl. 50, Fig. 8.

*2. *N. Strigata* (Müll.), *Æstivaria* (Hübn.), *Thymiaria* (Guén.).—Very like *Fimbrialis*, but the hind-wings are scarcely dentated, and their hind margin forms almost a right angle, with a projecting point in the middle; the costa of the fore-wings is finely speckled with brown, and the palpi are not remarkably small. Expands from 1 to 1¼ inches. Common throughout Central and Southern Europe from June to August. The larva is greyish-green, with a dark line on the back, and dark angular marks. It feeds on oak and hazel in May and June.

3. *N. Faustinata* (Mill.).—Wings green, covered with very fine and ill-defined whitish striæ, the transverse lines dark green, and nearly straight, forming small angles on each side, two of which, on the second line, are larger than the others; on the hind-wings the second line is complete, but the inner line is only indicated on the inner margin. There

is a large central spot on the fore-wings, touching the inner line; and the costa is slightly tinted with yellowish. Expands about 1 inch. It inhabits Spain and South France in May. The larva is dull pale green, with an interrupted reddish-brown stripe on the back. It feeds on rosemary.

4. *N. Pulmentaria* (Guén.).—Wings glaucous white, slightly bluish, with numerous small paler striæ, covering all the surface of the wings. The transverse lines are white and well marked, the second line straight, slightly waved, and continued on the hind-wings. Size of *Faustinata*. Inhabits South Europe and Western Asia; and there is a succession of broods throughout the year. The larva is pale green, with a dull red stripe on the back; sometimes bright yellow, or even white, according to the colour of the flowers of the various *Umbelliferæ* on which it feeds. (*N. Melinaria*, Herr.-Schäff., from the Ural, is bright green; the second line is oblique, white and denticulated, and the first line is incomplete on the fore-wings.)

*5. *N. Viridata* (Linn.).—Wings yellowish-green, fore-wings with the costa narrowly edged with yellowish-white, and two white and slightly-waved transverse lines, the second continued on the hind-wings, which are slightly angulated; the fringes are unspotted, and the forehead cinnamon-brown. Expands from three-quarters of an inch to an inch. Common in Europe, and Northern and Western Asia, in May and June. The larva is green, varied with brownish-red, and with white markings. It feeds on hawthorn in August and September.

6. *N. Porrinata* (Zell.).—Closely resembles *Viridata*, but the costa of the fore-wings is speckled with brown, and is sometimes wholly rusty-brown; the forehead is greyish-brown, and the abdomen is tipped with yellow. It is scarce in Central Europe in May, July, and August. The larva is flesh-coloured, with a dark line on the back. It feeds on bramble, hazel, &c., in June and September. The moth is figured at Pl. 50, Fig. 9.

7. *N. Beryllaria* (Mann), *Aureliaria* (Mill.).—Wings velvety bluish-green, with only one whitish transverse line, which is straight and oblique, and rather indistinct on the fore-wings, and slender and angulated on the hind-wings. Size of *Viridata*. Inhabits South Europe and Western Asia in April and May. The larva is dark green, with a yellow line on the back, and feeds on *Phillyrea angustifolia* during the winter, until the end of March.

8. *N. Herbaria* (Hübn.).—Apple-green, with the central lines white, the inner line fine, and badly defined; the second line oblique, waved, and continued on the hind-wings, where it is nearly straight, slightly waved, slender, and sharply defined. The costa of the fore-wings is reddish-fulvous, and the abdomen is greenish, ringed with white above, and pure white below. Size of *Viridata*. Inhabits South Europe in September.

*9. *N. Vernaria* (Hübn.).—Wings bluish-green, fore-wings with two white oblique transverse lines which are not dentated, the first curved, and the second nearly straight; hind-wings with a white slightly-curved central line, a slightly-projecting angle in the middle of the hind margin, and unspotted fringes; the forehead cinnamon-red. Expands from 1¼ to 1½ inches. Inhabits Europe and Northern Asia from May to July. The larva is pale green, with two white lines on the back and on each side. It feeds on *Clematis* from July to September. The moth is figured at Pl. 47, Fig. 5. (*N. Impararia*, Guén., from South Russia, resembles a small *Vernaria*, but the hind-wings are whiter, and without markings; the lines on the fore-wings are indistinct, except as white dots on the nervures; the basal half of all the fringes is darker grey, and the terminal half is conspicuously white.)

*10. *N. Lactearia* (Linn.).—Wings whitish-green, with two white and scarcely waved transverse lines, the second acutely angulated on the hind-wings, which form a very prominent angle, and the forehead is greyish-yellow. Expands about 1 inch. Common in Central Europe and

Northern Asia from May to July. The larva is green, with yellow spots on the back divided with dusky; it feeds on bilberry and alder in August and September. (*N. Putata*, Linn., which is common in many parts of Northern and Central Europe, differs from *Lactcaria* by the distinctly dentated transverse lines, and the ochre-yellow forehead. The larva is pale grey, with small red spots, and feeds on bilberry. In size and times of appearance it resembles *Lactearia.*)

GENUS LXVI.—APLASTA (HÜBN.).

Fore-wings broad and entire, with the tips rounded, and the hind margin a little oblique; hind-wings rounded and concolorous, and the antennæ of the male ciliated. The larva is spindle-shaped, with raised spots and fine hairs, and it constructs a cocoon. The only species, **A. Ononaria* (Fuessly), has ochreous-grey wings, thickly dusted with brick-red, often with one or two dark shaded bands formed of an agglomeration of these atoms. The small Southern variety *Fæcataria* (Hübn.) is whitish, dusted with red. Expands about 1 inch. Inhabits Central and Southern Europe and Western Asia in June and August; in Britain it has occurred at Folkestone. The larva is green, with small black waved spots on the back, and a yellow line on the sides. It feeds on rest-harrow in May and July. The moth is figured at Pl. 59, Fig. 4.

GENUS LXVII.—GYPSOCHROA (HÜBN.).

Antennæ long and slender, pubescent in the male, and finely ciliated in the female. The wings are narrow, slender, entire, and unicolorous, and the abdomen is long and slender, with a projecting ovipositor in the female. The only species, *G. Renitidata* (Hübn.), is uniform silvery-white above; the fore-wings and the costa of the hind-wings are smoky-grey beneath. Expands about 1¼ inches. Inhabits South France, Sarepta, and Bithynia in June.

GENUS LXVIII.—ACIDALIA (TR.).

Small and delicate moths, the wings generally entire; white, grey, yellow, or brownish, generally dusted with darker, and usually with two dark transverse lines before and behind the middle, and with a dark central shade between them; the subterminal line indicated by dark streaky dusting. The antennæ of the males are rarely pectinated, but the males have often peculiarly formed hind-legs, the tibiæ being compressed, and the tarsi rudimentary; and the number of spurs is not constant in the different groups, and sometimes not even in the same species. The larvæ are slender, with transverse folds, and are mostly polyphagous. They hybernate, and live on low plants in spring, but generally eat only withered leaves; and most of them may be fed on lettuce in confinement. They remain on the surface of the ground in moss, &c., and change to pupæ in a slight cocoon. The moths, which are generally called "Waves" by English collectors, may be divided into several groups.

A.—*The antennæ of the male are pectinated, and nervures 6 and 7 of the hind-wings are stalked.* (The hind tibiæ have terminal spurs in both sexes in *Pygmæaria*, and middle spurs also in *Humifusaria;* in the other species the males are without spurs, and the females have terminal spurs only.)

1. *A. Humifusaria* (Eversm.).—White, wings with a brown waved central line, a brown submarginal fascia streaked with white, and brown nervures. A black central spot, and an outer waved line; the fringes are spotted with brown. Inhabits Sarepta and Armenia, and perhaps Andalusia and Algeria.

2. *A. Pygmæaria* (Hübn.).—Wings pale olive-colour, olive-brown at the base and in the marginal area, with a broad dark central shade, a fine central point, and a light wavy subterminal line, the fore-wings with two fine transverse lines, and the hind-wings with one; fringes with no dark dots. Expands about half an inch. Inhabits South Switzerland, Italy, and South-Eastern Europe, in June and July.

3. *A. Perpusillaria* (Eversm.).—All the wings luteous, with the fringes concolorous, and a brown central fascia spotted with luteous; fore-wings with brown streaks at the base and middle; hind-wings with a brown inner line and central spot. Inhabits Sarepta.

4. *A. Vittaria* (Hübn.).—Brown, wings with a submarginal line composed of luteous spots, fore-wings with a very broad luteous fascia, interlined and bordered with luteous, and the hind-wings with a narrow waved luteous fascia. Inhabits Andalusia, North Africa, and perhaps Dalmatia.

5. *A. Filacearia* (Herr.-Schäff.).—Wings lemon-yellow, with two dark brown transverse lines, the second placed half-way between the first and the hind margin; and with a black marginal line and pale grey fringes. Expands about three-quarters of an inch. Inhabits the Alps, and the mountains of South Europe and Western Asia.

B.—*Antennæ of the male ciliated; branches 6 and 7 of the hind-wings stalked; and the hind tibiæ with terminal spurs in both sexes, or occasionally without spurs, or with only one in the male.*

*6. *A. Rusticata* (W. V.).—Wings whitish, with a black central spot, the fore-wings with two black angulated transverse lines, the space between, and the base of the costa, dark brown or rusty-brown (variety *Vulpinaria*, Herr.-Schäff.) varied with bluish; the lines and dark shade are much less strongly marked on the hind-wings; hind tibiæ of the male sometimes with only one spur, or spurless. Expands two-thirds of an inch. Inhabits Southern and Western Europe, as far as the south coast of England, in July. The larva is wood-coloured, with a dark line, and often with lozenge-shaped spots on the back, and a black head. It feeds on moss and lettuce in spring.

7. *A. Sericeata* (Hübn.).—Fore-wings with a silky lustre, dull greyish-brown, with three or four waved silvery transverse and subterminal lines; hind-wings white, with three pale brown transverse lines. Expands about 1 inch. Found in warm meadows in South Europe and Western Asia.

8. *A. Mediaria* (Hübn.).—Fore-wings narrow, with the tip rather long; hind-wings rounded on the hind margin, with the inner margin straight. Pale yellow, dusted with blackish, especially on the nervures, with the lines brown, diagonal, straight, and not extending to the costa; the central shade thicker and darker. Expands about 1 inch. Inhabits South-Western Europe in July. The larva is dull grey, with a broad brown line on the back. It feeds on *Euphorbia* and *Ulex* till June.

9. *A. Litigiosaria* (Boisd.).—Yellowish-white, dusted here and there with fine black atoms, and with several olive-grey waved longitudinal shades or lines. A distinct black central dot on each wing, beyond which are three brown transverse lines, and a row of black dots at the ends of the nervures before the fringes; no central shade. Expands about 1 inch. Inhabits South Europe and Algeria from June to August.

10. *A. Moniliata* (W. V.).—Wings whitish, with faint brownish nervures, and finely and sparingly dusted with black, with a black central streak, a row of white spots surrounded with brown in the marginal area, a black marginal line, and the fringes dotted with black; the fore-wings with three waved brown transverse lines, and the hind-wings with two. Expands

about three-quarters of an inch. Inhabits Southern and South-Central Europe and Western Asia in July. The larva is transversely wrinkled, with rows of fine brown or blackish raised warts, and four white lozenge-shaped spots in the middle, bordered with dusky, adjoining smaller white spots; and the belly with a white lyre-shaped mark on each segment.

11. *A. Mutillata* (Staud.).—Size of *Litigiosaria*, wings light grey, with a very slight yellowish tinge. The dark central dots are equally distinct above, but much fainter below, and the black dots or dashes of the marginal line are much more strongly marked. The first transverse line projects much more sharply than the others behind the discoidal cell, and is strongly and irregularly zigzag on the hind-wings. There is also a tolerably distinct transverse basal line before the central dot of the fore-wings; and beyond the strongly zigzag line are two more faint transverse lines. It occurs in Sicily in October.

12. *A. Determinata* (Staud.).—Dirty yellow, thinly speckled with large black scales, and with a very slight reddish shade. Central dots large and black. At two-thirds of the length of the fore-wings is a very oblique black transverse line, strongly angulated outwards, and beyond the discoidal cell are two sharply-defined black transverse stripes close together; the innermost does not extend to the costa. There is a third dark transverse band considerably beyond these, and another before the fringes. The marginal line is light, very strongly dotted with black on the nervures. Size of the last species. It inhabits Sicily in September and October.

13. *A. Macilentaria* (Herr.-Schäff.).—Wings straw-colour, greyish-green, or ochre-yellow, thinly dusted with black, with a broad waved subterminal line bordered with brownish, and a brownish central shade; the fore-wings with two dark transverse lines, the hind-wings with one, and with a black dot before the middle; the base of the fringes finely dotted with black. Expands about 1 inch. Inhabits South-Central and South-Western Europe in June. The larva is greenish-ochreous, with a paler line on the back bordered by dark streaks; it feeds on yarrow.

14. *A. Rufaria* (Hübn.).—Wings reddish-ochreous, with dark brown central dots, a slender dark marginal line, and a light subterminal line, indistinctly bordered with reddish; two transverse lines on the fore-wings, and one on the hind-wings, as well as the central shade, are brick-red, and the fringes are not dotted. Expands 1 inch or over. Inhabits South Europe, Silesia, and Western Asia in July and August. The larva is yellowish-grey, with a sharply-defined double pale line on the back bordered with dark lines, and adjoining blackish trapeze-shaped spots; and a whitish spot on the 10th segment. (*A. Consanguinaria*, Led., from South-Eastern Europe, is paler and more shining, with paler lines, black central dots, the fringes dotted with black, and the submarginal line of the fore-wings more recurved behind.)

*15. *A. Ochrata* (Scop.).—Closely allied to *Rufaria*, but the brown central dots are absent, and the roots of the fringes are marked with fine dark dots. The transverse lines and central shade are brown rather than red. Expands about three-quarters of an inch. Inhabits Central and Southern Europe in July and August. The larva is rather smooth, greenish grey, with slender double lines on the back, and the belly marked with two black dots at the end of each segment. It feeds on chickweed till May.

16. *A. Trilineata* (Scop.), *Aureolaria* (W. V.).—Wings pale golden-yellow, with two black parallel transverse lines on the under surface beyond the middle; on the upper side the fore-wings are marked with three and the hind-wings with two nearly straight dark grey transverse lines; the fringes are dark grey, and paler at the ends. Expands about three-quarters of an inch.

Inhabits Southern and Central Europe and Siberia in July and August. The larva is slender, with transverse folds, and sharp angles at the sides; it is reddish ashy grey, with a white line on the back, bordered with black. It feeds on lettuce and *Rumex*. (*A. Luteolaria*, Const., is of a smoky ochre-yellow, marked as in *Trilinearia*, but the lines on the upper side are brown, waved, and rather indistinct, and there are sometimes traces of a much waved subterminal shade. It inhabits Spain and the Pyrenees, flying in dry, stony mountain meadows in July.)

C.—*Antennæ of the males ciliated, nervures 6 and 7 of the hind-wings stalked, hind tibiæ of the males without spurs, and those of the females with terminal spurs, and occasionally with middle spurs also; in the males the hind-legs are often rudimentary; the tibiæ are sometimes broadly compressed, and furnished with a tuft of hair at the base, and frequently expanded into a sheath covering the short foot.*

17. *A. Flaveolaria* (Hübn.).—Wings bright ochre-yellow, very slightly and finely dusted with black, somewhat more thickly under the costa; the fore-wings with three and the hind-wings with two dark transverse lines, which are often very indistinct; and another very slight waved line before the hind margin; fringes black. There is a black central stripe on all the wings below. Expands about two-thirds of an inch. It inhabits Saxony and the Alps in July.

*18. *A. Perochraria* (Rössl.).—Wings dull ochreous-yellow, with the subterminal line shaded with brownish on both sides, and brown unspotted fringes; the fore-wings with three and the hind-wings with two somewhat waved ochre-yellow transverse lines, and the hind-wings sometimes with a small central dot. Expands about three-quarters of an inch. Inhabits the greater part of Europe and Northern Asia in July and August. The larva is moderately slender, and is grey, with three rows of longitudinal streaks, pointed in front. (*A. Exilaria*, Guén., from South France, is smaller, and of a fulvous clay-colour. The fore-wings have three brick-red waved parallel lines on the disc, the last followed by an irregular blackish subterminal band. The hind-wings are marked with two indistinct lines, and those on the fore-wings are also indistinct in the female, and the subterminal band is absent.)

19. *A. Pallidata* (W. V.).—Wings pale ochre-yellow in the male, and white in the female, finely and thinly dusted with black, with no central spots; the fore-wings with three and the hind-wings with two dull brownish-yellow transverse lines, and with the subterminal line bordered with brownish; the marginal line and fringes are unmarked. Expands about three-quarters of an inch. Inhabits the greater part of Europe, and the Altai, in May and June.

*20. *A. Subsericeata* (Haw.).—Very like the female of *A. Pallidata;* white, very finely dusted with black; the transverse lines narrower and better defined; olive-grey, the second particularly fine and somewhat zigzag; the hind margin unmarked, except that there are sometimes a few very small black dots at the root of the fringes; the under side is also white and less dusted, and the costa of the fore-wings is yellowish, especially beneath. Size of *Pallidata*. Inhabits Southern and Western Europe in June. The larva is clay-coloured, with a paler line on the back, and a yellowish one on the sides. It feeds on grass, &c., till April.

*21. *A. Holosericeata* (Dup.).—Resembles *Sericeata*, but shining straw-colour in both sexes, only dusted with darker on the costa of the fore-wings; the transverse lines are narrower and better defined than in *Pallidata*, olive-brown, and rather waved; and the subterminal line is composed of light curves. Expands about three-quarters of an inch. Local in Central and Southern Europe, and Western Asia, in July. The larva is short and broad, dark reddish brown in front, and of a more yellowish white behind. There is a dark double line on the back, and clubbed hairs on the sides. (*A. Præustaria*, Mann, from Croatia and Dalmatia, differs from *Holosericeata* in the more pointed fore-wings, and the three transverse lines are more curved towards the base at

the costa ; towards the hind margins of all the wings the ground-colour shades into lead-colour, and the subterminal line is much more indistinct. *A. Nitidata*, Herr.-Schäff., from Hungary, is larger than *Pallidata ;* straw-coloured and shining, the lines grey; the second line forms on nervure 3, and the third forms on nervures 3, 4, and 6, sharp angles outwards ; the first and third are a little more distinct than the others, and the central shade, and the dark edging on each side of the light subterminal line, are very broad.)

* 22. *A. Circellata* (Guén.).—Wings rounded, silky, of a rather smoky white, but with hardly any black atoms; the central and marginal black dots very distinct ; the lines are also very distinct, especially the elbowed line, which is waved and denticulated. The central shade is close to this, well marked, and nearly straight on the fore-wings. It passes over the central dot on the fore-wings, and below it on the hind-wings. There are two smoky-brown subterminal shades, quite disconnected from the elbowed line or the hind margin ; and the under side of the wings is uniform smoky-brown. Expands three-quarters of an inch. It occurs near Manchester in June. (*A. Diffluata*, Herr.-Schäff., from Hungary, is one-third larger than *Bisetata*, with which Herrich-Schäffer compares it, though Staudinger places it here. Lines 1 and 2 are very indistinct, and the subterminal line is not indented towards the base in cell 4, but the dark space in cell 3 is sharply bounded by the second transverse line, without its encroaching upon it, as is generally the case in *Bisetata*. On the under side the dark band on the inner side of the subterminal line is much narrower.)

23. *A. Dilutaria* (Hübn.).—Wings shining straw-colour, with a black central dot, the transverse and subterminal lines as in *Holosericeata*, and the costa of the fore-wings dusted with brown as far as the middle, and strongly arched before the tips ; the hind margin marked with black dots or streaks between the nervures, and the fringes often with a few black dots on the ends of the nervures. Expands about three-quarters of an inch. Inhabits Europe, except the west, and the Amoor, in June and July. The larva is dark ochreous, broad, narrower at each end, and transversely wrinkled ; the 10th segment is pale yellow ; it feeds on moss.

* 24. *A. Humiliata* (Hufn.), *Osseata* (W. V.).—Wings yellowish, with fine black central dots, a dark shaded subterminal line, a fine darker marginal line, and unspotted fringes ; the fore-wings reddish-purple along the almost straight costa, with three rather waved olive-grey transverse lines, and the hind-wings with two. Expands about three-quarters of an inch. Inhabits Europe and North Africa from June to August. The larva is transversely wrinkled, attenuated in front, and with dark spots on the back. The moth is figured at Pl. 47, Fig. 6. (*A. Robiginata*, Staud., from Castile, is deep ochre-yellow, the fore-wings with three stripes, and the hind-wings with two, the fringes preceded by blackish dashes almost forming a line, and marked with a row of black dots at the base ; the under side is very distinctly marked, except that the first line on the fore-wing is absent.)

25. *A. Obsoletaria* (Ramb.).—Wings pale reddish-grey, not dusted with black, with a fine black central dot, and a suffused subterminal line ; the fore-wings with three brownish lines, curved on the costa, and the hind-wings with two, the hind margin unmarked, but the base of the fringes marked with fine, and mostly indistinct, black dots. Expands about two-thirds of an inch. Inhabits South Europe and some parts of Eastern Germany.

26. *A. Helianthemata* (Mill.).—Wings of a fine uniform ochreous brick-red, including the rather long fringes, and dusted with well-defined black atoms. The central area, bounded by a slender black streak, is marked on the first half by a broad black band, formed of accumulated black dots, which is rather narrower on the hind-wings. The central black dots are visible on the hind-wings, but covered by the black band on the fore-wings. The fringes are marked with rather

large black dots. Under and upper sides of the female paler. Expands about three-quarters of an inch. Found at Cannes in July. The larva is greyish-ochreous, with indistinct markings, and feeds on various low plants till June.

*27. *A. Straminata* (Tr.).—Wings pale straw-colour, shading into greyish-green, and dusted with black, with a black central dot; the fore-wings with three brownish-grey, but ill-defined transverse lines, and the hind-wings with two; the second and third are not curved at the costa of the fore-wings. The subterminal line is suffused, and slightly shaded with dusky, and the hind margin is unmarked, except by black dots at the base of the fringes. The variety *Fologneuria* (Staud.) is greenish-yellow, more strongly dusted with black, and the second and third transverse lines are better defined. Expands about three-quarters of an inch. Inhabits Central Europe in June and July. The larva is slender, pale yellow, with fine dark double lines on the back, and dark lozenge-shaped spots. It feeds on thyme and *Chenopodium* till May. (*A. Graciliata*, Mann., from Botzen, is allied to *Straminata*, but may be distinguished by its silky lustre, paler and less dusted colouring, and the finer black dots on the nervures. It flies in July.)

28. *A. Mancipiata* (Staud.).—Yellowish-grey, with black central dots, the hind-wings clouded, and three darker lines on the fore-wings and two on the hind-wings; the first indistinct on the fore-wings and broader on the hind-wings, the second broader and dentated on the hind-wings, and the third line of the fore-wings distinctly dentated. Size of *Straminata*. Inhabits Andalusia from June to September. (*A. Longaria*, Herr.-Schäff., from Andalusia, Sardinia, and Syria, resembles *Virgularia*, but the wings are much longer. It appears in June.)

29. *A. Sodaliaria* (Herr.-Schäff.).—Wings white, scarcely dusted with darker, with black central dots; the fore-wings with three finely-dentated blackish transverse lines, thickened on the costa, and the hind-wings with two; the subterminal line is indicated by the brownish shading, broken into spots, in front; the hind margin with black dashes between the nervures, and the fringes with black dots at the ends of the nervures. Inhabits Corsica, Carniola, and South-Eastern Europe.

30. *A. Nexata* (Hübn.).—Wings white, with black central dots, and dusted with brown; fore-wings with the inner line arched, a central shade, an outer slightly waved oblique line, and a white macular submarginal line; hind-wings with the hind margin brownish, and an indistinct submarginal line. Inhabits Andalusia.

* 31. *A. Virgularia* (Hübn.).—Wings straw-colour, slightly reddish, and finely dusted with brown, with black central dots, a violet-grey central shade, and the curved subterminal line shaded with violet-grey; the fore-wings with two fine transverse lines, and the hind-wings with one, dotted with black on the nervures; the marginal line marked with black dashes, and the fringes dotted with black at the ends of the nervures. Expands about three-quarters of an inch. Common in Central and Southern Europe, and Western Asia, from May to August. The larva is yellowish-red or dark brown, with blackish lozenge-shaped spots on the back, bordered behind with oblique lines. It feeds on various plants till April, and again in June. The moth and larva are figured at Pl. 47, Fig. 7, *a*, *b*. (*A. Bischoffaria*, Geyer, from Switzerland, has very dark iron-grey fore-wings, the indentations of the transverse line being obliterated. The fringes, and pale markings of the wings, are very conspicuously white. The under side is much lighter than in dark varieties of *Virgularia*. The marginal dots between the nervures are well marked, and the base of the fringes is interrupted with large black dots.)

32. *A. Cervantaria* (Mill.).—Warm clay yellow, dusted with brown; fore-wings with four nearly straight lines, the first and the central shade brown, the second black, festooned, and dentated on the outside, and the subterminal line pale, concolorous, with two inner angles,

obtuse, and shaded with brown on the inside; all the lines, except the inner line, are continued on the hind-wings. Fringes long, concolorous, and preceded by a row of square black dots. Expands about three-quarters of an inch. Inhabits South France and Spain in May and July. The larva is long, rigid, clay-coloured, with indistinct markings, and feeds on low plants till April. Appears to differ from *Transmutata* (No. 54) by the marginal dots. (*A. Asellaria*, Herr.-Schäff., from the South Tyrol and Corsica, is reddish-grey, with three waved blackish lines, the third shaded outside, and with black central dots. *A. Colonaria*, Herr.-Schäff., resembles *Straminata*, but is redder, with a black marginal line, and unspotted fringes. Its locality is uncertain.)

*33. *A. Contiguaria* (Hübn.).—Wings violet-grey, yellowish in front, the costa itself narrowly bordered with coal-black; coarsely dusted with brown and with black central dots, two dentated dark brown transverse lines, thickened towards the costa of the fore-wings, and the subterminal line irregularly zigzag, and spotted with dusky in front; the hind margin and fringes as in *Virgularia*, and the hind tibiæ of the female with four spurs. A very pale brownish-grey variety (*Typicata*, Guén.) is found in South France. Expands about three-quarters of an inch. Local in Central Europe in July. The larva is flattened, and pointed in front, with fine transverse wrinkles, the back greyish-yellow, and the belly dark brown; a dark green line on the back, broad double greyish yellow angles on the sides, and a double dark brown central line on the belly. It feeds on *Sedum album* in autumn and spring.

*34. *A. Herbariata* (Fabr.).—Wings ochreous, dusted with brown, with an indistinct brown central spot, and a broad subterminal line, projecting in two rounded curves in the middle, and broad and macular in front; fore-wings with three brown transverse lines, not dotted with black, and darkened between the two first lines; hind-wings with two transverse lines, the marginal line indistinctly dark between the nervures, and the base of the fringes spotted with dark brown at the ends of the nervures. Expands about two-thirds of an inch. Inhabits Central and Southern Europe in July. The larva feeds on dry plants till June. (*A. Subsaturata*, Guén., from South France, is larger and darker than *Herbariata*, speckled with greyish-brown, the outer line nearly black, and almost straight at the costa, and the marginal black dots very distinct; the central dot of the hind-wings only distinctly visible below. *A. Incomptaria*, Boisd., from South France, is whitish fulvous, slightly speckled with darker, with four much waved parallel brown lines, and a brown dash at the tip of the fore-wings; the under side is without markings. Smaller than *Moniliata*. It appears in June. *A. Calunetaria*, Staud., found in pine forests in Spain in May, is pale grey, with a central black dot, and two dark lines, nearly parallel to the hind margin, on the hind-wings; on the fore-wings, the first line forms a sharp angle outwards on the costa, and the second line forms an M outwards in the middle.)

35. *A. Consolidata* (Led.).—Shape and size of *Contiguaria*, but the pattern resembles that of *Immutata*; the collar is not darkened, and the fringes are marked beyond the marginal line with a row of coarse black dots. In the male, the antennæ are dentated and very shortly ciliated, and there is a tuft of long hair on the hind tibiæ, and the tarsi are extremely short. It occurs at Naxos and Brussa. (*A. Pecharia*, Staud., from Hungary and Sarepta, is dull grey, with the central dots and transverse lines almost obliterated, but with marginal black dots.)

36. *A. Elongaria* (Ramb.).—Fore-wings long and narrow; hind-wings rounded. Wings pale grey, slightly tinged with reddish, irregularly dusted with a few black atoms; a black dot in the middle of each wing. Between this point and the hind margin there are four reddish-brown rays on the fore-wings, and three on the hind-wings, and one or two extend

from the central dot to the base. The fringes are reddish, and marked with a row of oblong black dots within the brown marginal line. Expands about three-quarters of an inch. Inhabits South Europe and Western Asia in May.

37. *A. Circuitaria* (Hübn.).—Fore-wings pointed at the tip, and the hind margin of the hind-wings slightly sinuated. Wings reddish-yellow, fore-wings with two brown lines slightly curved and sinuated, between which is a darker red central shade, and the marginal area is darker red, traversed by a pale and slightly sinuated subterminal line. Hind-wings with the same markings, except the inner line. Fringes concolorous, preceded by a continuous brown line. The front legs of the male are very long, the hind legs have indistinct joints, and the tibiæ are unspurred. Expands three-quarters of an inch. Inhabits South Europe in July, and flies at twilight. The larva is slender, with brown lines, and feeds on various plants till the end of June, preferring withered leaves.

38. *A. Ostrinaria* (Hübn.).—Pale yellow, the costa and hind-wings tinged with red; the fore-wings traversed by three waved purple lines, the middle line often indistinct; the marginal area purple, with a triangular yellow spot at its upper part, and a smaller one at its base. Hind-wings with two purple lines nearer together than those of the fore-wings, and the hind margin purple. The central dots are only visible on the fore-wings, and the fringes are yellow, preceded by a series of small yellow dashes. Expands nearly 1 inch. Inhabits South Europe and Western Asia in June, and perhaps also in August. The larva is short, very rough, and reddish-brown, with a paler line on the sides, and a large oblong white dot, surrounded with black, on the back of the incisions of segments 7 to 10; the last dot is heart-shaped, with a brown centre. It feeds on the flowers of various plants, especially the bramble and heliotrope, till the end of May, when it forms its pupa in moss.

39. *A. Lævigaria* (Hübn.).—Wings reddish ashy-grey, with fine black central dots, a dark grey transverse shade widened into a band on the inner margin of the fore-wings, extending above the central dot, and the fore-wings with two blackish transverse lines, rather darker on the nervures; the second line is acutely angulated below the costa towards the base, and continued on the hind-wings; the marginal line is dark and interrupted, and the fringes are dotted with black on the ends of the nervures. Expands about two-thirds of an inch. It inhabits Southern and South-Central Europe in June and August. The larva is light yellowish-grey, with fine pale oblique lines, and two fine dark longitudinal dashes on the 9th segment, bordered in front by triangular spots. (*A. Extarsaria*, Herr.-Schäff., is allied to *Virgularia*. The antennæ are slender and less pubescent; the wings are paler, yellower, and less dusted; the lines very slender, wide apart, and hardly continuous; central shade wanting, but the central spots distinct; the marginal line scarcely divided into spots, and the hind-wings rather short. Inhabits South Europe.)

40. *A. Eriopodata* (Grasl.).—Allied to *Bisetata*, but smaller, with the fore-wings narrower and less rounded, and the hind-wings longer. Very pale yellowish-grey, a little darker at the base; the costa washed with reddish flesh-colour towards the base, and with dark brown towards the hind margin. Fore-wings with two curved rows of small blackish dots, and hind-wings with one. Marginal area greyish-brown, with a slight violet shade, except at the tip of the fore-wings, which is of the ground-colour; the two colours are separated by a dark brown and rather oblique dash. Central dots well marked; a dentated subterminal line of the ground-colour on the hind-wings. Fringes violet-grey, slightly interrupted with paler, and preceded by a black interrupted line. Expands about two-thirds of an inch. Inhabits South France in June. (*A. Inesata*, Mill., from Barcelona, is allied to *Scutulata*, but smaller, with

the wings longer and more pointed; the transverse lines are well-defined and continuous, and the small terminal spots are placed before the fringes instead of upon them. *A. Atromarginata*, Mab., from Corsica, has reddish-grey fore-wings, with a broad dull purplish-black border, divided by the subterminal line, and interrupted at the tip. Fringes reddish. Tip blackish, and preceded by two small black costal dots. Hind-wings with the band paler. All the central dots very small; under side paler. Expands three-quarters of an inch. It occurs among bushes in May.)

41. *A. Attenuaria* (Ramb.), from Corsica and Sardinia, is yellowish-grey, with long and pointed wings, distinct black central dots, and broad black borders, intersected by a white terminal line (which stops obliquely before reaching the tip, as in *Eriopodata*), and on the fore-wings by two straight white subterminal lines. There is a black curved inner line on the fore-wings, and three parallel ones on the hind-wings—one within and two outside the central dot. Expands nearly three-quarters of an inch. (*A. Disjunctaria*, Staud., from Catalonia, has the fore-wings less pointed, and the subterminal line rather zigzag and very slightly marked; the hind legs of the male are fully developed, though the tibiæ are without spurs. *A. Infirmaria*, Ramb., from South Europe, closely resembles *Extarsoria*, but is rather smaller, and the second line on the fore-wings is parallel to the hind margin, and curved inwards above the inner margin, but is not curved on the costa. The front legs of the male are rudimentary.)

42. *A. Ledererata* (Guén.), *Aquitanaria* (Const.).—Wings rather narrow, the fore-wings pointed at the tips; purplish-grey, dusted with black, and with black central dots; two dark transverse lines, and an intermediate central shade passing over the dots; the second line is rather suffused, but strongly dusted with black on the nervures, and the fringes are dark lead-colour, dotted with black at the base. Expands nearly three-quarters of an inch. Inhabits South France, Corsica, and Bithynia.

*43. *A. Dimidiata* (Hufn.), *Scutulata* (W. V.).—Wings ochreous, with black central dots and a slight central shade; the fore-wings with two transverse rows of fine black dots, and the hind-wings with one; the subterminal line composed of light crescents, broadly shaded with brownish-grey on the basal side at the hinder angle of the fore-wings, and sometimes also on the outside; there is no marginal line, but the base of the fringes is marked with a row of black dots. Expands about three-quarters of an inch. Common in Europe and Western Asia in June and July. The larva is transversely wrinkled, greenish-grey or brown, with dark double lines on the back, and dark oblique dashes. It feeds in May. (*A. Miserata*, Staud., from Granada, differs from *Bisetata* by its luteous colour.)

*44. *A. Trigeminata* (Haw.).—Wings yellowish-white, finely dusted with dark grey, with a dark dentated central shade, and black central spots beyond; the fore-wings with two sharply dentated dark transverse lines, widened on the costa, and the hind-wings with one; the second line is followed on the fore-wings by large round dark grey spots arranged in pairs below the costa, in the middle, and at the hinder angle; the inner line is indistinct; the hind margin is dotted between the nervures, and at the end of the nervures before the fringes. Expands about three-quarters of an inch. Common in Southern and Western Europe and in Northern and Western Asia in June and July. (*E. Belemiata*, Mill., which occurs in Barcelona in June and July, has rounded wings of a dark clay-colour, dotted with black atoms, with two much angulated transverse lines on the fore-wings; the second is continued on the hind-wings, and is bordered outside by a large square blackish blotch on all the wings at two-thirds the length of the inner margin. Fringes preceded by a row of black dots. Expands scarcely more than

half an inch. The larva is flesh-coloured, with fine longitudinal lines, and feeds on the flowers of various plants from July to April, but grows very slowly.)

45. *A. Politata* (Hübn.).—Wings shining straw-colour, with a broad and continuous violet-grey submarginal band both above and below, and with distinct black central dots. Fore-wings with three fine waved lines, the outermost bordering the inside of the band; hind-wings with two lines. Expands about two-thirds of an inch. Inhabits South Europe and Western Asia in June and July. The larva is short, attenuated in front, and rough; it is of a glaucous green, with a broad pale line on the sides. It feeds on low plants till May.

*46. *A. Bisetata* (Hufn.).—Wings straw-colour, brownish-grey on the marginal area, with black central dots, and a light dentated subterminal line; fore-wings with two dark transverse lines, and hind-wings with one; the hind margin unmarked, and the fringes finely dotted with black. Expands from three-quarters of an inch to an inch. Common in Europe, and in Northern and Western Asia, in June and July. The slender greyish-brown larva feeds on withered plants till April.

47. *A. Filicata* (Hübn.).—Wings yellowish-white, with black central dots, and a grey shaded subterminal line; fore-wings dark grey as far as the middle, with a double transverse line, light inside, and dark in front; hind-wings with dark suffused transverse lines; hind margin and fringes without markings. Expands about three-quarters of an inch. Inhabits South Europe and Western Asia in June and July.

*48. *A. Degeneraria* (Hübn.).—Wings greyish-yellow, often suffused with reddish, and brighter red on the costa, with black central dots, and two dark transverse lines, the second angulated below the costa of the fore-wings. The fore-wings have a broad dark central shade often extending to the first line; there is a slender dark marginal line, but the fringes are unspotted. The variety *Rubraria* (Staud.) is red, with blackish lines and dots. Expands 1 inch or over. Inhabits Southern and Western Europe, and Western Asia, in May, July, and August. The larva is yellowish-grey, with oblique black crosses on the back, and the 10th segment lighter, with an angular mark. It feeds on low plants.

49. *A. Agrostemmata* (Guén.).—Size and appearance of *Degeneraria*. Wings delicate, very pale uniform bone-colour, without dark atoms, terminal line, or marginal dots, but with very small central dots. There are only two parallel, scarcely waved, and very indistinct lines towards the hind margin, and the under surface is unicolorous. Inhabits Central France in June and July. The larva feeds in the capsules of *Agrostemma dioica*. (*A. Incarnaria*, Herr.-Schäff., is allied to the last two species; it is rose-coloured, with the costa of a yellowish clay-colour. The lines are better marked than in *Agrostemmata*, but less so than in *Degeneraria*, and the second line is not angulated on the costa. The terminal line is well marked only below; and the fore-wings are smoky beneath. Inhabits South Europe in June.)

*50. *A. Inornata* (Haw.).—Wings dirty straw-colour, very slightly dusted with darker, with fine black central dots, the fore-wings with three dull dark transverse lines, and the hind-wings with two; the second line is not interrupted on the fore-wings; the marginal line is finely dusky, and the fringes are without markings. Expands from 1 to 1¼ inches. Inhabits Europe in June and July. The larva is reddish-brown, with dark lozenge-shaped spots on the back. It feeds on low plants till May.

51. *A. Deversaria* (Herr.-Schäff.).—Differs from *Inornata* in the fringes being dotted with black at their base, and from *Aversata* by its purer straw-coloured and more shining fore-wings; the last transverse line on the fore-wings is only slightly angulated below the costa, and the subterminal line is generally more distinct, and more strongly shaded; the

central shade passes over the central dot on the fore-wings, or close behind it, whereas it runs distinctly behind it in *Aversata.* Size of *Inornata.* Inhabits Southern Europe and Western Asia in June and July. The larva is light ochreous, darker on the belly, with a lighter line on the back, and a fine dark cross on the four middle segments. It feeds on low plants till May.

*52. *A. Aversata* (Linn.).—Wings straw-colour, finely dusted with black, with black central dots, an interrupted marginal line, and the fringes dotted with dusky at the base; fore-wings with three brown transverse lines, the last strongly interrupted below the costa; the two outer lines are continued on the hind-wings, and the space between them is filled up with dark grey in the type, but not in the commoner form (*Spoliata*, Staud.). Expands about $1\frac{1}{4}$ inches. Common in the greater part of Europe from May to August. The larva is brown, with dark lozenge-shaped spots on the back of the middle segments; beyond the 9th segment it is light, with a broad dark stripe on the back. It feeds on withered leaves from April to June. The moth is figured at Pl. 47, Fig. 8.

*53. *A. Muricata* (Hufn.), *Auroraria* (Borkh.).—Wings golden-yellow, thickly covered with purplish-red, so that only the lower half of the base of the fore-wings, and two round spots on the fore-wings (which are sometimes united), and one on the hind-wings remain pure yellow. There is a blackish line before the hind margin, and the fringes are golden-yellow, and without markings. Expands about two-thirds of an inch. Common in many parts of Europe and Northern Asia from June to August. The larva is cinnamon-red, with dark lozenge-shaped spots on the back, divided by a double line. It feeds on plantain and lettuce in June.

54. *A. Inclinata* (Led.).—Shape of *Auroraria*, but rather smaller; wings dirty brownish-yellow, with the costa red; the markings resemble those of *Osseata*, but are less defined and more suffused; the marginal area of the fore-wings is darker, and intersected by the light subterminal line. The fore-wings have also two central lines, and a small space at the base darker; and sometimes a blackish central spot, over which runs the broad brownish central shade; between this and the second line the colour is paler. The pattern from the central shade to the hind margin is continued on the hind-wings, but is only distinct on the inner margin; the fringes are unspotted, and the marginal line is but little darker. Inhabits Andalusia and Syria. (*A. Manicaria*, Herr.-Schäff., from Andalusia, is smaller than *Ochrata*, but the ground-colour is the same; there are no central dots, the second line is further from the hind margin, and the space between this and the subterminal line is reddish-violet; marginal line sharply defined; fringes unspotted, but divided by a broad dusky line. *A. Fractilineata*, Zell., from Sicily, resembles *Obsoletaria*; the central dots and those on the fringes are more distinct, the lines straighter, the first interrupted before the costa; the middle stripe passes over the dot on the fore-wings, and within that on the hind-wings; the hinder stripe forms a rectangle on the hind-wings, and the subterminal line is more curved, and more distinctly edged with darker on the inside).

55. *A. Transmutata* (Ramb.).—Reddish-ochreous, dusted with brown, very variable, with from two to four broad transverse brown lines on the fore-wings, and from one to three on the hind-wings. The first is curved on the fore-wings, but is sometimes wanting, and is not continued on the hind-wings; the second is generally present on the fore-wings, and projects two angles outwards above the middle; it is always present on the hind-wings, where it forms a slight angle in the middle, and is indented below; it is generally clouded with brown on the inside. The other line or lines on the hind-wings are parallel to this; the 3rd and 4th lines of the fore-wings are sometimes nearly straight, and sometimes form angular projections inwards,


1.
2.a
2.b
3
4.a
4.b
4.c
5.
6.
7.a
7.b
8.
9.
10.
11.
12.
13.
14.
15.
16.
A
B
C

and the space between them is always filled up with reddish or brown, but when the 4th line is absent, the 3rd is but slightly clouded with brown on the outside. There are no central dots; the fringes are uniform yellow, edged with a narrow black line. Expands from two-thirds to over three-quarters of an inch. Inhabits South France and Spain. (*A. Inustata*, Herr.-Schäff., from Austria, is reddish straw-colour, with three darker dentated lines, and black central and marginal dots, the fringes dusted with black. *A. Accessaria*, Herr.-Schäff., probably from South Europe, resembles *Incanata*, except in structure; the wings are redder, with round suffused dots between the terminal and subterminal lines.)

*56. *A. Emarginata* (Linn.).—Differs from all the preceding species in having a projection in the middle of the hind margin of each wing, above which it is deeply excavated, and behind more slightly. The wings are pale ochreous or rusty-brown, with the central dots placed on a broad brownish but often indistinct central shade; there is a slender brown marginal line, and the fringes are chequered with brown. There are two reddish-brown transverse lines on the fore-wings, and one on the hind-wings. Expands from three-quarters of an inch to an inch. Common throughout Europe and Northern Asia from June to August. The larva is ochre-yellow, with a brown line on the back. It feeds on low plants till June. The moth is figured at Pl. 47, Fig. 9.

D.—*Antennæ of the male ciliated, nervures 6 and 7 of the hind-wings separated, the hind tibiæ without spurs in the male, but with two pairs of spurs in the female; occasionally both sexes have terminal spurs, or the female has middle spurs also; the hind margin is waved, or entire, and the hind-wings are sometimes excavated above the middle.*

57. *A. Immorata* (Linn.).—Wings white, everywhere finely and evenly dusted with black; the marginal area yellowish-brown, with a slender white zigzag subterminal line; fore-wings with three broad yellowish-brown transverse lines, and the hind-wings with two, nearly covering the light ground-colour; central dots absent; the hind margin scarcely waved, and bounded by a black line, the fringes whitish, spotted with dusky, and divided by a dark line. Expands from 1 to 1¼ inches. Common in many parts of Europe and Northern and Western Asia in June and July. The larva is brownish-grey, with several dark longitudinal lines on the back. It feeds on low plants till May.

58. *A. Tessellaria* (Boisd.).—Allied to *Immorata*, but the hind margin of the wings distinctly dentated, especially that of the hind-wings, which is excavated above the middle. The surface is only dusted with black at the base, on the transverse lines, and in the marginal area, and is elsewhere pure white; the nervures are dusky, the two outer transverse lines more sharply defined, and distinctly dentated; the subterminal line is broad, and divided into spots by the nervures; and the fringes are not divided by a dark line, but there is a central black spot on the hind-wings. Expands about 1¼ inches. A rather scarce species, found in the south and east of Central Europe in June and July. It frequents dry rocky places.

*59. *A. Rubiginata* (Hufn.), *Rubricata* (W. V.).—Wings greyish-brown, more or less varied with purplish-red, with the subterminal line a little paler, and slightly curved; the fore-wings with three dark transverse lines which are not dentated; and the hind-wings with two. Expands nearly 1 inch. Common in Europe, and in Northern and Western Asia, from June to August. The larva is greenish, with an indistinct brown line on the back. It feeds on thyme till June.

60. *A. Turbidaria* (Herr.-Schäff.).—Size and shape of *Rubiginata;* ochreous-grey, slightly dusted with black, with all the markings blackish, and common, except the inner line, which

is wanting on the hind-wings; the second line fine, sharply defined, waved and followed by a broad central shade, on which the waved subterminal line is very distinctly marked. The fore-wings are marked with three nearly straight oblique lines, at equal distances, and a distinct central dot; on the hind-wings the central shade passes over the dot. Inhabits Central Europe and Western Asia in July. (*A. Albiceraria*, Herr.-Schäff., is dull waxen-yellow, with black central and marginal dots; the inner line is absent; the others are double, reddish, and scarcely dentated. It is said to occur in South Europe. *A. Sulphuraria*, Freyer, from Sarepta and Armenia, is allied to this, but the fore-wings are longer and more pointed, the colour is pale sulphur-yellow, the lines are straighter, and the inner line is well marked.)

61. *A. Adjunctaria* (Boisd.).—Resembles *Strigaria;* wings dirty white, dusted with black, with three parallel and scarcely waved lines between the middle and the tip; the inner line is nearly straight. On the under side the wings are more shining, with two lines on the fore-wings, and three on the hind-wings. It is found in the mountains of Lombardy in August.

*62. *A. Marginepunctata* (Goeze), *Promulata* (Guén.).—Resembles *Incanata*, but smaller, and more coarsely dusted, the first line of the fore-wings expanded into dots on the nervures, and the second interrupted below the costa; beyond the middle the subterminal line forms two curves filled up with dusky, and the fringes are uniformly dusted with dashes. Expands about three-quarters of an inch. Widely distributed in Central and Southern Europe, and in Northern and Western Asia, in May and June. The larva is moderately slender, pale brownish, with a dark line and dark dots on the back. It feeds on *Sedum* and chickweed till May. (*A. Beckeraria*, Led., from Sarepta and Armenia, resembles this, but is of a uniform dirty chamois colour, and the space between the second line and the hind margins of all the wings is almost without markings, the pale subterminal line being scarcely indicated.)

63. *A. Luridata* (Zell.).—Resembles *Marginepunctata* in the shape of the second and subterminal lines, but the transverse lines and central shade are expanded into distinct spots on the costa of the fore-wings, the first line is not thickened on the nervures, and the marginal line is narrowly black; hind-wings with one pair of spurs in both sexes. The ground-colour varies considerably; it may be whitish, ashy, or tinged with rosy. Expands nearly 1¼ inches. Inhabits South Europe and Western Asia in June. The larva is bluish-grey, with two blue lines on the back, and a white stripe on the sides. It feeds on lichens till May. (*A. Cœnosaria*, Led., from Greece and Western Asia, is closely allied to this, but is dull ochre-yellow, dusted with black, and the hind tibiæ are unspurred in the male, but provided with both middle and terminal spurs in the female. *A. Rufomixtata*, Ramb., from France and Spain, is also closely allied to *Luridata;* it is greyish-white, washed with black, with a narrow marginal line; fore-wings with three or four equidistant waved and dentated lines, placed on a dark ochreous-yellow shading; hind-wings with three suffused and denticulated shaded lines; fringes tinged with ochreous. The larva is long, and grey, with a darker line on the back. It feeds on *Silene inflata* in May, and the moth appears in June and July.)

64. *A. Submutata* (Tr.).—Wings white, or reddish-white, dusted with blackish; bluish-grey in the marginal area, with black central dots, and a light subterminal line projecting into large curves below the costa and in the middle; the fore-wings with three rusty-brown transverse lines expanded into spots on the costa, and the hind-wings with two; the hind-wings excavated above the middle; the marginal line narrowly black, and the fringes spotted with dusky. Expands about 1¼ inches. Inhabits South Europe and Western Asia in May and September. The larva is long, glaucous-green, with a fine white line on the back, and a broad one on the sides. It feeds on thyme in April and July.

*65. *A. Incanata* (Linn.).—Wings pale bluish-grey, rather thickly but finely dusted with dark grey, with black central dots, a broad suffused central shade, and a light, evenly-suffused subterminal line shaded with dusky; the fore-wings with two dark grey zigzag transverse lines, and the hind-wings with one; the hind margin dotted with black, and the fringes spotted with dusky; hind-wings rounded. Expands about 1 inch. Common in Europe and in Northern and Western Asia from June to August. The larva is pale grey or yellowish-brown, with angular dashes spotted with darker yellow, and a pale line on the sides. It feeds on low plants till May.

66. *A. Vesubiata* (Mill.).—Resembles *Incanata*, but darker; yellowish-white or reddish-brown, with three black curved and much-dentated lines, which are not dotted, but continuous; and the fringes, instead of being dotted with black, are preceded by a row of small rectangular black dashes. Expands about 1 inch. Found resting on rocks on river banks in the south-east of France in June.

*67. *A. Fumata* (Steph.).—Wings straw-colour, finely dusted with brown, with no central dots; the fore-wings with three and the hind-wings with two yellowish-grey transverse lines, more or less suffused, but not dentated; the hind margin unmarked, or with a dark marginal line; the fringes without dark dots, and the hind-wings rounded; the hind tibiæ with two spurs in the male and four in the female. Expands about 1 inch. Common in hilly districts in Central Europe and Northern Asia in June and July. The larva is reddish-grey, with whitish angular marks on the sides, and an interrupted dark line on the back. It feeds on bilberry till May.

*68. *A. Remutaria* (Hübn.).—Wings whitish straw-colour, very finely and sparingly dusted with brown; the fore-wings with three brownish-grey transverse lines, and the hind-wings with two, the second line more sharply defined and zigzag; the subterminal line indicated by narrow yellowish dusting on the sides, and not interrupted in front; the hind-wings scarcely angulated; the central and marginal dots are generally absent, or the latter are only visible below the tips. Expands about 1¼ inches. Common in most parts of Europe in May and June. The larva is yellowish-grey or brown, with a whitish stripe on the sides. It feeds on low plants till April.

69. *A. Nemoraria* (Hübn.).—Wings snow-white, the fore-wings dusted with black on the costa, with black marginal dots below the tips, and three suffused brownish-yellow transverse lines, the third zigzag, and interrupted below the costa; hind-wings rounded, with two lines. The central dots are only visible on the under side. Expands about 1¼ inches. Inhabits the south of Central Europe in July.

70. *A. Punctata* (Tr.).—Wings white, the fore-wings with five and the hind-wings with four brownish-yellow transverse lines, of which the middle one is the broadest and most zigzag, and forms a right angle below the costa of the fore-wings; the hind-wings dotted with black below the tips in the male; hind-wings rounded. Fore-wings with a central black dot in the male only. Expands about 1 inch. Inhabits South Europe in July. The larva is long and slender, yellowish-white, washed with flesh-colour on the front segments, and with a brown line on the back and a whitish one on the sides. It feeds on low plants till May. The moth frequents damp woods, but is not common.

71. *A. Caricaria* (Reutti).—Resembles the female of *Immutata;* wings snow-white, only dusted with black towards the hind margins and on the costa of the pointed fore-wings; the third transverse line is further from the hind margin, straighter, and less zigzag; the marginal line is finely and sharply brown, with no black dots; central dots indicated on the rounded hind-wings only. Inhabits damp mountain meadows in the south of Central Europe in May, June, and August. The larva is long and slender, clay-coloured, with a whitish line on the sides. It feeds on low plants. (*A. Anseraria*, Herr.-Schäff., which Staudinger thinks may be the same as

Caricaria, is snow-white, with no trace of darker dusting, but with black central and marginal dots; the fore-wings with five and the rounded hind-wings with three interrupted yellow transverse lines. Expands about three-quarters of an inch. It inhabits Thuringia.)

*72. *A. Immutata* (Linn.).—Wings yellowish-white in the male and white in the female, thinly and finely dusted with blackish, with black central dots; the fore-wings with five and the hind-wings with four brownish-yellow transverse lines, the third and fourth zigzag; hind margin unspotted, or with fine black dots; hind-wings rounded. Expands about 1 inch. Common in Europe and Northern Asia in June and July. The larva is transversely wrinkled, yellowish-grey, with two dark lines on the back and a sulphur-yellow stripe on the sides. It feeds on yarrow, plantain, &c., till May. The moth is figured at Pl. 47, Fig. 10.

73. *A. Corrivalaria* (Kretschm.).—Wings bone-colour, thinly dusted with black, with black central dots and a light subterminal line, bordered with suffused reddish-grey; the fore-wings with three and the hind-wings with two parallel reddish-grey transverse lines, the outermost dentated; hind margin dotted with black, and hind-wings angulated. Expands nearly 1 inch. It is found on damp moors in Eastern Germany and Poland in June and July, sitting on the upper side of the marsh plants.

74. *A. Strigaria* (Hübn.).—Wings dirty bone-colour, thickly dusted with darker, with yellowish-grey and nearly straight transverse lines which are not dentated, and an indistinct subterminal line; a slender dark marginal line, and unspotted fringes; black central spots on the slightly angulated hind-wings only. Expands about 1 inch. Inhabits Central and Southern Europe in May and June. The larva is green, with a darker line on the back, and a double yellow line on the sides. It feeds on birch (?) in autumn.

*75. *A. Strigillaria* (Hübn.).—Wings pale olive-grey, thickly dusted with darker, with black central dots, and a light suffused submarginal line; the fore-wings with three and the hind-wings with two grey transverse lines, the second dentated and more sharply defined; the marginal line finely black, and slightly thickened between the nervures; the fringes rarely with a few black dots, and the hind-wings angulated. Expands from 1 to 1¼ inches. Widely distributed in Europe and Northern Asia in June and July. The larva is yellowish-grey, with a dark line on the back, and a white stripe on the sides. It feeds on plantain and *Stachys* till May.

76. *A. Umbellaria* (Hübn.).—Very like *Strigillaria*, but larger, purer white, and less thickly dusted; the male with no central dot on the fore-wings; the transverse lines yellowish-grey, the subterminal line more broken into spots, and the fringes marked with fine black dots. Expands about 1½ inches. Inhabits the south of Central Europe and Northern Asia in June and July. The larva is pale brown, with dark dashes, and a light stripe on the sides. It feeds on vetch, &c., till May.

*77. *A. Emutaria* (Hübn.).—Wings whitish, finely dusted with black, with fine black central dots, a grey central shade running towards the tips of the wings, and a row of fine black dots before the narrow grey-shaded subterminal line; hind-wings angulated. Expands about 1 inch. Inhabits Southern and Western Europe in June. (*A. Flaccidaria*, Zell., from South-Eastern Europe and Western Asia, appears to differ from this chiefly in the central dots on the hind-wings being much larger than those on the fore-wings.)

*78. *A. Imitaria* (Hübn.).—Wings reddish-ochreous, with fine black central dots, the fore-wings with three brown transverse lines, the two last converging on the costa, strongly waved, and continued in the hind-wings; the second line often shaded with rusty-brown outside, the marginal line finely dusky, and the hind-wings strongly angulated. Expands about 1 inch.

Common in Southern and Western Europe, and in Northern and Western Asia, in July and August. The larva is long and slender, yellowish, greenish, or bluish-grey, with large brown spots on the back and sides. It feeds on various shrubs, and often remains motionless for several hours together, curved into a semicircle.

79. *A. Eugeniata* (Mill.).—Wings flesh-colour, dusted with dark atoms, and with black central dots; the second line is ill-defined, though rather broad and continuous; the third line is marked with a row of small dots on the nervures, and there is a row of similar dots at the base of the pink fringes, beyond the black marginal line. The under side is paler, with the second line and dots well marked. Expands rather more than 1 inch. It is found at Marseilles in July.

80. *A. Decorata* (W. V.).—Wings white, not dusted with darker, bluish in the marginal area, with a white dentated subterminal line, black central dots, often indistinct on the fore-wings, and a grey central shade; the fore-wings with two fine black lines, the second curved and slightly dentated, and the hind-wings with one line; the hind margin waved, dotted with black above the middle, and excavated on the hind-wings above the middle; the fringes intersected with dusky, and marked with two rows of dark lunules; collar dark brown. Expands about 1 inch. Common in many parts of Europe, except the north and north-west, in Western Asia, and in North Africa, from May to August. A yellowish variety (*Honestata*, Mab.) is found in Corsica and Sardinia. The larva is long and cylindrical; yellowish, with several dark lines on the back, and a broad white stripe on the sides. It feeds on thyme in April, May, and July. (*A. Subtilata*, Christoph, from Sarepta, is allied to *Decorata;* whitish, with all the lines well marked, the second broad and enclosing a black dot; hind margin bluish-grey, with three brown spots, and the adjacent space varied with bluish-grey on the costa, and towards the third line. The subterminal line is broad and white, and the hind margin is spotted with black and whitish, with a terminal brown and white line, and the fringes brown. Hind-wings pure white, with the markings less distinct. It flies in May, June, August, and September.

*81. *A. Ornata* (Scop.).—Differs from *Decorata* by the marginal area, which is varied with golden-brown and pale grey; the second line projects more forward below the costa, and the collar is rusty-brown. Size of *Decorata*. Common in many parts of Europe, North Africa, and Western Asia, from May to August. The larva is grey, with several dark longitudinal lines; it feeds on thyme in June and September. (*A. Congruata*, Zell., from Sicily, is rather smaller; the lines are more conspicuous, and the submarginal shades are bluish-grey, and divided into spots; the brown marginal dots are very small on the fore-wings, and are absent on the hind-wings.)

82. *A. Concinnaria* (Dup.).—White or yellowish-white, marked nearly as in *Ornata*, but the hind margin less denticulated; the first and second lines are rusty-brown, the first angulated, often slightly marked, and not continued on the hind-wings; the second much dentated; the third black, also dentated, and followed by a bluish-grey submarginal shade, divided by the white subterminal line, which is sometimes partly broken into spots; the fringes are yellowish, preceded by a black line, broken into long spots, but with no dark markings on the fringes themselves. Expands about 1¼ inches. Inhabits Andalusia.

GENUS LXIX.—PROBLEPSIS (LED.).

Body rather stout in both sexes, wings broad, stout and entire, the hind margin of the fore-wings slightly curved. The antennæ are pubescent in the male; the hind tibiæ are silky,

and without spurs; and the hind tarsi are short. In the female the antennæ are simple, and the hind tibiæ have four spurs. The only European species, *P. Ocellata* (Friv.), found in Greece and Western and Southern Asia in June and July, is white, with three rows of yellow dots on the abdomen. In the centre of each wing is a large saffron-yellow spot with a black pupil, and bordered with silvery, yellow, and black. There is also a curved black submarginal line, and two rows of submarginal dots. The fore-wings are marked with a black inner line, and a stripe behind it in addition.

GENUS LXX.—PELLONIA (DUP.).

Middle-sized moths; the wings rounded, yellow, with red transverse lines; the antennæ of the males pectinated. The larvæ are slender, rigid, and the head with truncated angles; they undergo their transformations in a cocoon.

1. *P. Vibicaria* (Clerck).—Wings ochre-yellow, with the central dots and fringes rosy; the fore-wings with three rose-red transverse lines, equally far apart, and not dentated; hind-wings with two. The second line is broadly bordered with rosy behind, except in the Southern variety *Strigata* (Staud.); hind-wings slightly angulated. Expands about 1¼ inches. Inhabits the greater part of Central and Southern Europe in May and July. The larva is yellowish, varied with brown, and with a light line on the back. It feeds on broom, sloe, *Tanacetum*, &c., in June and September. The moth is figured at Pl. 47, Fig. 11.

2. *P. Calabraria* (Zell.).—Resembles *Vibicaria*, but the two last transverse lines are very near together, the space between is filled up with rosy, and the hind-wings are perfectly rounded. The variety *Tabidaria* (Zell.) has large purplish-red central spots on the wings. *P. Sicanaria* (Zell.), in which the inner line is absent, and the hind tibiæ have generally four instead of three spurs in the male, is probably also a variety. Varieties occur both in this and the preceding species, in which the wings are nearly unicolorous, the red lines being nearly obliterated. Expands from 1¼ to 1½ inches. Inhabits Europe, south of the Alps, and Western Asia, in June and July. The larva is yellowish-grey, with dark longitudinal lines. It feeds on *Asperula calabrica* till May. (*P. Perizaria*, Oberth., from Spain, is yellow, finely and thickly dusted with rosy, especially on the outer half of the hind-wings; fringes rosy; fore-wings yellow beneath, with the tip and costa dusted with reddish; hind-wings reddish beneath, with the inner margin yellow. Expands about 1¼ inches.)

GENUS LXXI.—TIMANDRA (DUP.).

Small or middle-sized moths, the fore-wings with the tips pointed, and the hind margin projecting angularly on either the fore or the hind wings; the antennæ of the males pectinated, but the tips bare. The larvæ and transformations as in *Pellonia*.

*1. *T. Amataria* (Linn), (*Blood-Vein*).—Wings pale ochreous, dusted with brownish, with rosy fringes and a cinnamon-brown or dull red stripe running obliquely from the tip of the fore-wings to the inner margin of the hind-wings, outside which is a brown terminal line; the fore-wings with the hind margin curved, and a rosy central dot; the hind-wings rectangular, with no central dot. Expands about 1¼ inches. Common in Europe and in Northern and Western Asia from May to September. The larva is strongly thickened between segments 4 and 7; pale brown, varied with grey, and with dark longitudinal lines on the back and sides. It feeds on *Rumex*, *Atriplex*, &c., in June and autumn. The moth is figured at Pl. 44, Fig. 7.

2. *T. Adustaria* (Waldh.).—Fore-wings ochreous-yellow, brownish on the costa, and speckled with rosy elsewhere, with a dark straight transverse line before the middle, and four slender dark

parallel lines beyond; there is an angular projection in the middle of the hind margin. Hind-wings paler, with the lines less distinct, and the greater part of the fringes reddish-brown. Expands about 1 inch. It is found at Sarepta and in Armenia.

GENUS LXXII.—ZONOSOMA (LED.).

Small moths, the fore-wings with the tips pointed, and the hind margin entire and curved; whitish or yellowish, dusted with darker, with two dark transverse lines often broken into dots, a more distinct central shade, and generally a white central spot, surrounded with dusky; the antennæ of the males strongly pectinated, and the tips bare. The larvæ are slender and twig-like, with a triangular head. They feed on trees in June and July, and again in autumn, and the moths appear in May, July, and August. The pupæ are attached by the tail and by a thread round the body, much like those of the *Papilionidæ*. The moths expand a little more or less than 1 inch.

*1. *Z. Pendularia* (Linn.).—Wings white, finely and sparingly dusted with grey, with two transverse rows of long black dots; the central rings are of equal size; reddish-brown on the fore-wings and black on the hind-wings; fringes very distinctly dotted with black. Common in Central Europe and Siberia. The larva is green or yellow, with yellow longitudinal lines, a brown head, and a rusty-brown oval fold. It feeds on oak, alder, &c.

*2. *Z. Orbicularia* (Hübn.).—Wings pale grey, thickly dusted with brown, with a suffused dentated central shade, followed by a transverse row of black dots. The central rings are filled up with white; on the fore-wings they are smaller and brownish-red, and on the hind-wings dark brown; the fringes are dotted with black. Inhabits Central Europe, but not very common. The larva is yellowish-green, with three yellowish lines on the back, and a yellow dotted stripe on the sides; head reddish. It feeds on willow and alder.

*3. *Z. Annulata* (Schulze), *Omicronaria* (W. V.).—Wings straw-colour, with large dark brown central rings, two adjacent dark brown and strongly dentated transverse lines beyond the middle, and another before the middle; fringes dotted with black. Common in Central Europe. The larva is green, with three yellow lines on the back and a duller line on the sides, and a white head. It feeds on birch, maple, &c.

4. *Z. Albiocellaria* (Hübn.).—Resembles *Annulata*, but a little larger; the wings bright yellow, clouded with brown on the central area; the rings larger and paler, white within; the second line more broken into dots, and the hind margin not dotted. Inhabits South Europe and Siberia The larva is supposed to feed on maple.

5. *Z. Pupillaria* (Hübn.).—Wings greyish-yellow or ochreous-yellow, very finely and indistinctly transversely speckled with purplish or brown, with a small brownish central spot, scarcely, if at all, centred with white in the type, a row of black dots beyond the middle, and often with a zigzag dull red central shade also; fringes bright yellow or reddish; the fore-wings with the tips pointed, and almost hooked. A variable species; varieties with the central spots distinctly centred with white are not uncommon. Inhabits South Europe, Western Asia, and North Africa. The larva is very variable; apple-green, citron-yellow, dull green, brown, or reddish. It feeds on cistus, arbutus, myrtle, &c.

*6. *Z. Porata* (Fabr.).—Wings ochreous, speckled with brick-red and brown, and more or less blotched with grey in the marginal area, with black central rings with white pupils on the hind-wings, and black or red rings on the fore-wings; beyond them is a row of black dots, and the hind margins are dotted with black. The brown central shade passes over the ring on the

hind-wings, but behind it on the fore-wings. Common in Central and Southern Europe, and Western Asia. The larva is green, with dark longitudinal lines in front, and dark angular spots behind. It feeds on oak and birch.

*7. *Z. Punctaria* (Linn.).—Wings ochreous, dusted with blackish and brick-red, with no central rings, but with a broad nearly straight brick-red or brown transverse line across the middle, and a row of black dots behind, and sometimes also before it; the fore-wings often clouded with grey and reddish in the marginal area, the hind-wings angulated in the middle; fringes with an interrupted black line. The variety *Suppunctaria* (Zell.) is smaller and paler, and the dots are absent or indistinct. Common in Central and Southern Europe, and Western Asia. The larva is brown or green, with a dark line on the back and a yellow stripe on the sides of the first and last segments; the middle segments are marked with dark angles on the back and yellow spots on the sides. It feeds on oak, birch, &c.

*8. *Z. Trilinearia* (Borkh.).—Bright ochreous-yellow, generally dusted with brown, with a brown and nearly straight central shade, two brown transverse lines, the outermost often broken into dots, and rather indistinct whitish central spots, often surrounded with dusky, which are smaller on the fore-wings, and stand distinctly before the central shade on the hind-wings; fringes unicolorous, with an interrupted black line at their base. Common in Central Europe. The larva is green, dotted with white, belly reddish, head brown. It feeds on oak, &c. The moth is figured at Pl. 47, Fig. 12.

*9. *Z. Strabonaria* (Zell.).—A variety of the last, according to Staudinger; smaller, with the tips of the fore-wings more pointed; reddish-ochreous, finely dusted with reddish; the central shade reddish-grey; the transverse lines continuous, with dark dots, the whitish central dots not bordered with dusky, and placed close to the central shade on the hind-wings; marginal line reddish and continuous. Inhabits Silesia, Nassau, &c. (This description agrees fairly with some of the British specimens of *Trilinearia* before me.)

10. *Z. Ruficiliaria* (Herr.-Schäff.).—Resembles the preceding species; hind-wings rounder, distinctly and coarsely speckled with dusky, with a brown central shade, and rows of brown dots; fringes red. Inhabits South-Central Europe. Staudinger considers it to be a variety of *Punctaria*.

FAMILY II.—PHYTOMETRIDÆ.

The costal nervure of the hind-wings rises from the median nervure a little before the angle of the latter, or close to it. The fore-wings have always twelve nervures, and (except in *Anisopteryx*) an accessory cellule, which is often divided by an oblique nervure running from the subcostal nervure. On the hind-wings, nervure 5 is as thick as the other nervures; and there is very rarely more than one internal nervure, which is sometimes absent; in some genera the neuration is different in the sexes, and in others the females have rudimentary wings. The body is never stout, and the body and legs are clothed with flattened scales; the palpi and femora are not hairy, except in *Lythria*. All the *Phytometridæ* sit with their wings flat, and in some genera the hind-wings are not covered by the fore-wings when at rest.

GENUS I.—ANISOPTERYX (STEPH.).

Middle-sized moths, with small bodies and broad, delicate, thinly-scaled wings, the fore-wings with the tips rounded, and the hind margin long and entire; pale, with two dark dentated transverse lines; hind-wings rounded, paler, and without markings; antennæ of the males ciliated.

The female is apterous, and provided with an anal tuft. The larvæ are smooth and cylindrical, with longitudinal lines, and a round head. They feed on trees, and undergo their transformations on or in the ground.

*1. *A. Æscularia* (W. V.).—Wings of the male yellowish-grey, brownish on the costa, with a few dark brown scales, and two dark dentated transverse lines; hind-wings whitish; all the wings with dark brown central dots, and the hind margins dotted with brown; female reddish-grey. The male expands from 1¼ to 1½ inches. Common in Central Europe in March and April. The larva is pale green, with whitish lines on the back, and a less distinct line on the sides. It may be looked for in May and June. The male is figured at Pl. 47, Fig. 13.

2. *A. Aceraria* (W. V.).—May be distinguished from *Æscularia* by the pale yellow fore-wings, not dusted with darker, and the undotted hind margin; female pale-grey. Size of *Æscularia.* Inhabits Western Europe (except Britain) in November. The larva is dull green, with whitish lines on the back, and a yellow stripe on the sides; it may be looked for in June and July.

GENUS II.—ODEZIA (BOISD.).

Small and slender moths, the wings entire, black, the fringes partly white; hind-wings rounded, with nervure 8 running from the base, close to the subcostal nervure to beyond the front angle of the discoidal cell; antennæ simple. The larvæ are slender, resembling a leaf-stalk, and undergo their transformations in a cocoon.

*1. *O. Atrata* (Linn.), *Chærophyllata* (Linn.), (*Chimney Sweep*).—Wings black without markings; the fringes white at the tip of the fore-wings. Expands from 1 to 1¼ inches. Common in most parts of Europe and Western Asia in June and July. The larva is unicolorous green, and feeds on *Chærophyllum* in May. The moth is figured at Pl. 50, Fig. 10.

2. *O. Tibiale* (Esp.).—Wings black, the fore-wings with a white stocking-shaped transverse band; the fringes white at the tip and hinder angle of the fore-wings, and on the hind-wings. Size of *Atrata.* Inhabits the south of Central Europe, and some portions of North Germany, in June and July.

GENUS III.—MINOA (BOISD.).

Fore-wings long and triangular; all the wings entire; the antennæ of the male shortly ciliated. The larva is short and thick, finely hairy, and undergoes its transformations in a loose cocoon. The only species, **M. Murinata*, Scop. (*Euphorbiata*, W. V.), is pale unicolorous yellowish-brown, and expands about three-quarters of an inch. It is common in a great part of Europe, and in Northern and Central Asia, in May and June, and again in August and September. The larva is dirty green, dotted with black and white, with a brown head. It feeds on spurge in summer and autumn. The moth is figured at Pl. 47, Fig. 14.

GENUS IV.—STERRHA (HERR.-SCHÄFF.).

Rather small moths, the wings delicate and entire, the fore-wings broad and triangular, and the hind-wings broad, pale, and without markings; the antennæ of the male pectinated.

*1. *S. Sacraria* (Linn.).—Fore-wings sulphur-yellow, with an oblique purplish stripe running from the tip to the middle of the inner margin; hind-wings pale yellow or whitish. It varies considerably, and has sometimes ochreous-yellow fore-wings, strongly dusted with brown, and a central dot; sometimes the fore-wings and fringes are more or less tinged with red, and the hind-wings are marked with a central greyish band (variety *Sanguinaria*, Esp.). Expands about

1 inch. Inhabits Southern and Western Europe, Africa, and Southern and Western Asia, from July to October. The larva is green, with a paler line on the back, and a yellowish line on the sides; spiracles reddish. It feeds on chamomile and other low plants in September.

2. *S. Anthophilaria* (Hübn.).—Very variable; fore-wings yellow or reddish, with a reddish and less oblique stripe running from the costa before the tip; hind-wings blackish, with a more or less distinct yellow central stripe; sometimes whitish, with darker markings (variety *Subsacraria*, Staud.). Inhabits South Russia and Greece. (*S. Consecraria*, Ramb., from Andalusia, is probably another variety, with reddish fore-wings with a white central spot, broadly yellow at the base, and with the slightly oblique red stripe bordered outside with yellow; fringes yellowish in the male, hind-wings whitish.)

GENUS V.—LYTHRIA (HÜBN.).

Small and rather stout moths, the fore-wings narrow, with the hind margin short and entire; yellow, with red or brown bands; hind-wings bright yellow, and the antennæ of the males with long pectinations. The larvæ are long and cylindrical, with a flat head, and undergo their transformations in a slight cocoon.

*1. *L. Purpuraria* (Linn.).—Fore-wings greenish ochre-yellow, rarely uniform olive-green, or quite red (variety *Sanguinaria*, Dup.); the fore-wings with two purplish-red transverse stripes, which are often incomplete, the second broader or divided on the costa; hind-wings orange, slightly dusted with black at the base. Expands about 1 inch. Common in most parts of Europe and Western Asia from May to August; rare in England. The larva is reddish-brown, with two dark lines on the back, and a white one on the sides. It feeds on dock, &c., from May to autumn. The moth is figured at Pl. 47, Fig. 15. (*L. Porphyraria*, Herr.-Schäff., from South Russia, is probably another variety; the fore-wings are purple, with the inner margin and under surface yellow, and the hind-wings are yellow above and rosy below.)

2. *L. Plumularia* (Freyer).—May be distinguished from *Purpuraria* by the pale yellow fore-wings, the purplish-brown bands, of which the second is narrower in front, and by the base of the hind-wings being thickly dusted with black. There is also a blackish line before the hind margin of the latter. Expands about three-quarters of an inch. It is found in the Upper Engadine from June to August.

GENUS VI.—SIONA (DUP.).

All the wings are long and entire, the hind margin of the fore-wings long and curved, and nervure 8 of the hind-wings runs close to the subcostal nervure, without being completely united with it; the antennæ are not dentated. The commonest species, *L. Decussata* (W. V.), has whitish, or (in variety *Fortificata*, Tr.) smoky-brown wings, with the nervures brownish-grey, two strongly-curved brownish or reddish-grey transverse lines, and the fringes spotted with dusky. Expands about 1½ inches It is found throughout Austria in June. (*A. Nubilaria*, Hübn., from South Russia, the Altai, and Armenia, has whitish wings thickly dusted with fawn-colour, and a brownish marginal line; the fore-wings have also a blackish central spot, and a waved white line beyond it.)

GENUS VII.—ANAITIS (BOISD.)

Size variable, all the wings entire and rather long; the fore-wings with the hind margin long, grey, with two or three double brown transverse lines; hind-wings narrow, without

markings, and extending far beyond the hinder angle of the fore-wings; the antennæ of the male very shortly ciliated. The larvæ are rather flattened, and wrinkled on the sides. They construct a loose cocoon on the ground.

1. *A. Lithoxylata* (Hübn.).—Fore-wings with the tip pointed and nearly hooked, and the hind margin curved; of a lighter or darker ochre-yellow, with seven well-marked slender brown lines, the four first nearly parallel, the fifth straighter and thicker, the sixth more waved, and the seventh double and connected with a brown subapical streak. The hind margin and fringes washed with dark brown. Central dots often visible only on the fore-wings. The hind-wings are narrow and rounded, of the colour of the fore-wings, but without markings, or with one indistinct transverse line. Expands a little more than 1 inch. Inhabits the mountains of South France and Asia Minor in August. (*A. Columbata*, Metzn., from Turkey and Asia Minor, is of the size and shape of *Plagiata*, but the fore-wings are rather longer, ochreous-grey, and the hind-wings are brownish. They are traversed by two brown bands, the first nearly straight, and the second composed of three obsolete and slightly-arched lines.)

2. *A. Boisduvaliata* (Dup.).—Bluish-grey, fore-wings with four oblique and nearly straight blackish lines, bordered with whitish; a whitish and scarcely waved submarginal line, and an oblique whitish stripe at the tip; hind-wings grey. Inhabits South Russia and Asia Minor.

*3. *A. Plagiata* (Linn.).—Fore-wings ashy-grey, with the tip divided by a rusty-brown dash, from which a brown line, edged outside with white, often runs to the hinder angle; and with waved brown lines coalescing into two bands, the first of nearly uniform width, and a little darker in the costal half, the second projecting furthest towards the hind margin below the costa; nearer the base is a single line, rising from a square black spot on the costa; hind-wings pale grey. Expands about 1¼ inches. Common in Europe and Western Asia from June to September. The larva is coppery-brown, with a darker line on the back, and a pale yellow stripe on the sides. It feeds on St. John's wort from May to July. The moth is figured at Pl. 50, Fig. 11.

4. *A. Præformata* (Hübn.).—Resembles the last species, but larger (expands about 2 inches), the fore-wings are bluer, the first band dark brown as far as the middle, and strongly contracted below the costa. Inhabits Central Europe in June and July. The larva is yellowish-grey, with a dark line on the back, and a white stripe on the sides. It feeds on St. John's wort from August to May.

5. *A. Fraudulentata* (Herr.-Schäff.).—Resembles *Plagiata;* but the fore-wings are broader, and of a more bluish-grey, with no violet lustre; below the tip runs a short oblique black dash, instead of a rusty-brown one. All the lines, except the apical dash, rise from three large black spots on the costa. Expands about 1¾ inches. Inhabits Bulgaria and Brussa.

6. *A. Simpliciata* (Tr.).—Size and shape of *Plagiata.* Fore-wings bluish ashy grey, with five narrow waved darker grey bands. The two middle ones are always better marked than the others, which are often only indicated by dark dots and marks on the nervures. Hind-wings light yellowish grey. Fringes light grey, chequered with dark grey, and preceded by small brown marks on the nervures on the fore-wings, and by a brown line on the hind-wings. Inhabits the mountains of South France, Dalmatia, Greece, and Asia Minor, in July and August; and the larva feeds on *Hypericum montanum.*

*7. *A. Paludata* (Thunb.), *Imbutata* (Hübn.).—Fore-wings ashy-grey, varied with rosy in the marginal area above the middle, with two brown transverse stripes, bordered with white

lines on the outside, and sometimes connected; the second projects furthest towards the hind margin in the middle; nearer the base are one or two slender brown lines; hind-wings dark grey. Expands from ¾ to 1¼ inches. It is found on moors in Northern and Alpine Europe, and in Siberia and Labrador, in July; the northern specimens are paler ashy, and more unicolorous. The larva is yellowish, with fine dark lines on the back, and a yellowish-white stripe on the sides. It feeds on the flowers of *Vaccinium oxycoccus* in June.

GENUS VIII.—CHESIAS (TR.).

Fore-wings without markings, or with transverse or longitudinal streaks; otherwise as in *Anaitis*. The larvæ are slender, and undergo their transformations on or in the ground.

*1. *C. Spartiata* (Fuessly).—Fore-wings grey, brown on the hind margin, and with a light streak, white and broader behind, which runs below the costa from the base to the tip, and two large spots, surrounded with rusty-brown, on the inner margin and in the middle. Expands from 1¼ to 1½ inches. Inhabits South-Central and Western Europe in September and October. The larva is dark green, with a darker line on the back, bordered with light, and whiter subdorsal and lateral lines. It feeds on broom in May and June. The moth and larva are figured at Pl. 50, Fig. 12, *a*, *b*.

*2. *C. Oblata* (Fabr.), *Obliquaria* (W. V.).—Fore-wings pale grey, with a band varied with rusty-brown and finely bordered with black before the middle, and a rusty-brown band beyond, blackish towards the base, and bordered with black and white dots towards the hind margin; and from the latter band runs a rusty-brown dash to the tip, below which runs the whitish and nearly straight subterminal line. Expands about 1¼ inches. Inhabits Central and Southern Europe in April, May, and August. The larva is green, with a light yellow stripe on the sides. It feeds on broom and *Genista* in July and August.

3. *C. Griseata* (W. V.).—Wings whitish-grey, darkened with dull grey dusting (or unicolorous yellowish-grey, in the variety *Infuscata*, Eversm.), the fore-wings with a dark shade which divides the tip, and is often continued, though less distinctly, to the hinder angle. Size of *Oblata*. Inhabits Southern and Central Europe and Western Asia in May. The larva is green or reddish, with a darker line on the back, and a dark line on the sides, bordered with light above. It feeds on *Sisymbrium Sophia* in June and July. (*C. Castiliaria*, Staud., from Spain, has mouse-coloured fore-wings, shading into olive, with a broad sharply-defined yellowish-grey band towards the hind margin; hind-wings light grey, with a very suffused light transverse band beyond the middle. Size of a small *Griseata*.)

4. *C. Asinata* (Freyer).—Very like *Griseata*, fore-wings with indistinct straight oblique denticulated lines, the outer shade better defined, and marked with a white submarginal line, with rounded indentations, and the fringes dotted with grey. Inhabits South Russia. (*C. Duplicata*, Hübn., from South Russia and Armenia, of which *Asinata* is perhaps a variety, is whitish, the fore-wings with a slight bluish shade, and with two oblique and nearly straight blackish lines, the first line bordered with white, and placed on a slight fawn-coloured shade; and an oblique black dash at the tip. *C. Bosporaria*, Herr.-Schäff., from South Russia, Turkey and Armenia, is dusted with pale ashy, the fore-wings with three oblique darker stripes, of which the first is waved and very narrow; and the hind-wings white.)

*5. *C. Farinata* (Hübn.), *Nivearia* (W. V.).—Wings white, without markings, the fore-wings slightly shading into grey. Expands about 1¼ inches. Inhabits Central Europe and Western Asia from May to July, but scarce and local. The moth is figured at Pl. 50, Fig. 13.

GENUS IX.—LOBOPHORA (CURT.).

Small or middle-sized moths, the fore-wings broad or rather long, rounded, with dark transverse lines, forming a double transverse stripe filled up with lighter, before and behind the middle, and with a light subterminal line, the hind margin marked with a double row of dark dots; hind-wings narrow, lighter, almost without markings, but with a fringed lobe in the males; the antennæ of the males shortly ciliated. The larvæ are cylindrical, with the belly flat, and with two anal points; they undergo their transformations amongst moss or leaves.

A.—*The hind tibiæ with terminal spurs only; and the appendages of the wings very small.*

* 1. *L. Polycommata* (W. V.).—All the wings rather long, the fore-wings pale rusty-brown varied with grey, with darker nervures and a lighter subterminal line, the central area bounded by suffused darker double lines, and projecting behind into an acute angle below the costa; hind-wings pale grey; palpi very short. Expands from 1¼ to 1½ inches. Inhabits Central Europe and the Altai in April. The larva is dark green, with a dull yellow stripe on the sides, and two anal points of the same colour. It feeds on honeysuckle in May and June.

2. *L. Externata* (Herr.-Schäff.).—Brownish-grey, fore-wings with the first line white, a central dark brown band, which is broader and paler in front, and the marginal area partly tinged with flesh-colour, and traversed by a white denticulated subterminal line, obsolete behind; hind-wings grey, with a black macular central line, black submarginal lunules, and two inner white lines. Inhabits Bulgaria and Asia Minor.

3. *L. Sabinata* (Geyer).—Fore-wings brownish-grey, with black nervures in the central area, which is darker, and forms a strong rounded projection below the costa; hind-wings short and greyish-brown; palpi longer than the head. Expands about 1¼ inches. Inhabits the Southern Alps and Asia Minor.

*4. *L. Viretata* (Hübn.).—Fore-wings dull olive-green, varied with dark grey on the sides of the central area, with dull dark and light transverse lines, and the nervures dotted with black and whitish; hind-wings light brownish-grey, and the palpi longer than the head. Expands about 1 inch. Inhabits Central Europe from April to June, and again in autumn. The larva is dull yellow, with a reddish-brown stripe on the back, and reddish-brown spots on the three last segments. It feeds on privet and *Actæa spicata* in July. (*L. Appensata*, Eversm., from Bavaria, the Ural, and Siberia, differs from *Viretata* in its more uniform green colour, which is rather darker on the sides of the central area only; its larva also feeds on *Actæa spicata*.)

5. *L. Sertata* (Hübn.).—Fore-wings broad, pale grey, with dark transverse lines, the central area with brownish bands on the sides, and intersected with black nervures behind; beyond this is a broad whitish and slightly curved transverse band, which is continued across the pale grey hind-wings, though less distinctly. Expands about 1¼ inches. Inhabits the mountains of South-Central Europe and Eastern Germany in April, May, and October.

*6. *L. Carpinata* (Borkh.), *Lobulata* (Hübn.).—All the wings rather long, the fore-wings pale grey, with waved double brownish transverse lines, the central area bounded by two bands which are only a little darker, but more distinct on the costa; the central mark forms a streak, and the hind-wings are pale grey; palpi short. Expands from 1 to 1¼ inches. Common in Northern and Central Europe, and in Northern Asia, in April and May. The larva is dark green, with a broad yellowish stripe on the sides. It feeds on willow, poplar, &c., in July and August.

B.—*The hind tibiæ with two pairs of spurs, the lobes of the hind-wings extending nearly to the middle, and the palpi very short.* The large lobes of the males of this division give them the appearance of having six wings, from which they have derived their English name of "Seraphims."

*7. *L. Halterata* (Hufn.), *Hexapterata* (W. V.).—Fore-wings grey, dusted with black, with darker waved lines; in the basal area is a dark grey transverse band, and there is a light one beyond the middle which forms a pointed projection below the costa, and two rounded ones below the middle, and the space beyond is clouded with darker grey, but all the markings are frequently indistinct; the hind-wings are whitish, with the hind margin narrowly grey. The variety *Zonata* (Thunb.) is pale yellowish, with the base and outer band blackish. Expands from 1 to 1¼ inches. Common in Northern and Central Europe from April to June. The larva is green, with a yellow stripe on the sides, and yellow anal points. It feeds on willow and aspen in August and September.

*8. *L. Sexalisata* (Hübn.).—Fore-wings brownish-grey, with two whitish transverse bands divided by a rusty-yellow line, between which the central area is darkened on the costal half; the subterminal line is white and evenly dentated, and the hind-wings are whitish in the male, and grey in the female. Expands from ¾ to 1 inch. Inhabits Northern and Central Europe in June. The larva is pale green, with three white lines on the back, and a white stripe on the sides. It feeds on willows in August and September. The moth is figured at Pl. 50, Fig. 14.

GENUS X.—ORTHOLITHA (HÜBN.).

Rather large moths, fore-wings with the costa straight; grey or brown, with the central area distinct, and bounded by transverse lines; the basal area divided by a transverse line, the subterminal line more or less distinct and regular, and the rest of the wings traversed by dark and pale and often very suffused transverse lines. The tip is divided by a dark dash extending to the subterminal line, and the hind-wings are paler, either without or with much less distinct markings; and their inner margin extends far beyond the hinder angle of the fore-wings. The antennæ of the males are shortly pectinated, and occasionally furnished with short thick truncated and ciliated processes; the palpi usually extend considerably beyond the head. The hind margins are entire in the first three species, and waved in the others. The larvæ are smooth and slender, and undergo their transformations on or in the ground.

1. *O. Coarctaria* (W. V.).—Fore-wings pale bluish-grey, dusted with brown, with straight brown transverse lines, a narrow light band beyond the central area, a whitish scarcely dentated subterminal line, and black central and marginal dots. The variety *Infuscata* (Staud.) is brown, with grey lines; and the variety *Tenebraria* (Hübn.) is unicolorous brown. Expands about 1½ inches. Inhabits Southern and Central Europe, except the north-west, in July.

*2. *O. Palumbaria* (W. V.).—Fore-wings ashy-grey or violet-grey, dusted with brown, with a black central dot, the subterminal line strongly zigzag, but suffused, and the tip divided by a rusty-brown streak; the central area a little darker, broader in front, and edged by two rusty-brown lines. Expands from 1¼ to 1½ inches. Common in Central and Southern Europe, and Western Asia, in June and July. The larva is pale grey, with three dark grey lines on each side. It feeds on heath and clover till April. The moth is figured at Pl. 48, Fig. 1.

*3. *O. Limitata* (Scop.), *Mensuraria* (W. V.).—Fore-wings dull yellowish-brown, shading into olive-colour, with dull dark transverse lines, and the tip divided by a slight blackish streak; the central area darker, and bordered by pale waved rusty-brown bands; hind-wings pale grey, with two parallel curved brown transverse lines beyond the middle, enclosing a paler space. Size of *Palumbaria*. Common in Europe and Northern and Western Asia from June to August. The larva is yellowish-grey, and feeds on grass till May or June.

*4. *O. Mœniata* (Scop.).—Fore-wings violet-grey, with a small black central spot, and the

tip divided by a black dash; the central area darker, broadly olive-brown on the sides, and bordered by two white lines. In the middle it projects strongly and acutely outwards. Hind-wings grey, with a strongly angulated light line beyond the middle. Size of *Palumbaria*. Inhabits Central Europe from June to August, but not very common. The larva is ashy-grey, with dark longitudinal lines, and is spotted with blackish on the sides. It feeds on broom till June.

*5. *O. Cervinata* (W. V.).—Fore-wings fawn-colour, lighter at the beginning of the marginal area, with the tip divided by a slight black dash; subterminal line whitish, and regularly zigzag; the base and central area are darker on the sides, and bordered by fine white lines, and the central area is rather broader towards the costa; hind-wings reddish-grey, with a dark curved central line, and the hind margin fawn-colour. Expands from 1½ to 1¾ inches. Inhabits Central Europe and Western Asia from July to October. The larva is green, with fine hairs; pale grey on the under surface and in the incisions. It feeds on mallow in June and July.

6. *O. Peribolata* (Hübn.).—Wings entire, fore-wings with the tip pointed; bluish-grey, dusted with brown, and traversed by a large central band of a darker brown, and bounded inside by several lines strongly shaded with dark brown; the inner line is nearly straight, and the second line is expanded in the middle into a more or less prominent curve; between the lines is a small dot. There are several other brown lines parallel to the two central lines on both the basal and marginal areas. The tip is divided by an oblique brown dash; hind-wings grey, traversed by two paler lines, of which one is angulated in the middle. Fringes concolorous, preceded by a white line. Expands about 1½ inches. Inhabits South France and Spain in August and September. The larva is yellowish, shading into greenish, and is marked with square black spots on segments 5 and 10, and with indistinct brown and whitish lines on the back.

7. *O. Cælinaria* (Grasl.).—Very like *Bipunctaria;* the basal area flesh-colour, traversed by grey lines, angulated towards the costa; central band broad, greyish-brown, darker and almost black in the middle of the wings, and paler and slightly suffused with flesh-colour towards the costa. There are two small black dots in a light space on the band as in *Bipunctaria*, and it is also traversed by four rather waved black lines, rounded outside in the middle, and most distinct towards the costa and inner margin. The second line is black, sharply defined and waved, forms a prominent tooth in the middle, and is followed by a fulvous band which follows its outline exactly, and is bordered by a black line and divided by a grey one. The marginal area is grey, traversed by the waved whitish subterminal line, which is united to an oblique subapical dash. Fringes ashy-grey, spotted with brownish-grey, and preceded by a black festooned line. Hind-wings uniform reddish-grey, darker towards the hind margin, and with three indistinct pale transverse lines. It is found in the Pyrenees in July; and the Spanish variety *Jugicola* (Staud.) is larger and paler. (*E. Proximaria*, Ramb., from Corsica, has pale grey fore-wings, with a black central dot and transverse lines, and a black central waved band strongly projecting outwards. The larva is darker than that of *Peribolata*, and the markings are lighter. *O. Obvallaria*, Mab., found in Corsica in July and August, resembles *O. Mæniata;* it is dark grey, with the central area and hind margin varied with whitish, the former with two black dots in the middle. The line separating the basal and central areas is black, bidentate, and bordered within with yellowish, and the black elbowed line is bordered outside with yellowish. The latter projects strongly outwards, and is bidentate, forming a shallow W. The apical dash and subterminal line are indistinct; hind-wings dark grey.

*8. *O. Bipunctaria* (W. V.).—Fore-wings ashy-grey, sometimes with a dark dash at the tip, with dull dark transverse lines clouded inside with grey, and intersected by a paler space, on which stand two black central dots; hind margin dotted with black; central area bounded by two waved whitish lines. Expands about 1¼ inches. Inhabits Southern and Western Europe in July and August. The larva is brownish-grey and finely hairy, with three dark lines on the back. It feeds on grass and clover till June. The moth is figured at Pl. 48, Fig. 2.

9. *O. Vicinaria* (Dup.).—Very near *Bipunctaria*, but much smaller (expands about 1 inch) and more delicate. The fore-wings are of a bluish satiny-grey, with the central area slightly angulated outwards, and reddish-brown, bordered inside by two waved blackish lines, and marked with two small dots in the centre, placed on a whitish space, as in *Bipunctaria;* and the band is also bordered outside and at both extremities by a double whitish line. Nearer the base are two dark grey curved lines. The subterminal line is whitish and suffused, and followed by a double row of black marginal dots. The fringes are concolorous, and spotted with darker grey. Hind-wings pale grey, with the first half rather darker grey, and the rest traversed by several lines of the same colour. It is found among rocks in the Pyrenees, Valais, and Armenia in June, but is a rarity. (*O. Burgaria*, Eversm., from the Ural, resembles this. The antennæ of the male are very shortly pectinated, and the fore-wings are greyish-white, the central area dark grey, with no central dot, and bordered with white lines; hind-wings with a very indistinct line.)

*10. *O. Badiata* (W. V.).—Fore-wings purplish-brown, with the tip divided by a black line; the subterminal line whitish, finely zigzag, and expanded into spots in the middle, and with a fine dark marginal line; the central area is greyish-ochreous, bordered on the sides by brown bands divided with dusky, edged by a black and white line, and making two projections outwards in the middle; the antennæ of the male are shortly pectinated. Expands about 1¼ inches. Common in Central Europe and the Altai from March to May. The larva is green or brown, with white dots, and a darker line on the sides; head yellow. It feeds on dog-rose in June and July.

*11. *O. Comitata* (Linn.), *Chenopodiata* (Linn.).—Wings convex behind, ochre-yellow, with dull dark transverse lines, black central dots, and a slightly dentated but indistinct subterminal line; the tip divided by a dark dash; the base and the central area brownish, the latter very broad, bounded by two whitish lines, and with a broad rectangular projection in the middle; the hind margin marked with dark dots; hind-wings yellowish-white, with the hind margin darker. Expands from 1¼ to 1½ inches. Common in a great part of Europe and Siberia from June to August. The larva is yellowish-green, chequered with black, and with a yellowish-grey stripe on the sides. It feeds on *Chenopodium* in September.

GENUS XI.—MESOTYPE (HÜBN.).

The only species, **M. Virgata*, Hübn. (*Lineolata*, W. V.), is rather stout, with the wings shaped as in *Ortholitha*, and entire; the fore-wings are pale grey, dusted with darker, with a black central spot, and the tip divided by a dusky dash, passing into the slightly-indicated subterminal line; the central area bordered by two straight parallel brownish-grey bands, the first edged with whitish on the inside only, and the second on both sides; hind-wings paler, with dull dark lines before the hind margin. Expands from ¾ to 1 inch. Widely

distributed in Europe and Northern and Western Asia in spring and autumn, but local. The larva is reddish-brown, with dark lines on the back and sides, the latter bordered with pale yellow beneath; head flat. It is slender and twig-like, and feeds on *Vaccinium Oxycoccus* in June and autumn.

GENUS XII.—PHIBALAPTERYX (STEPH.).

Moderately stout, fore-wings with the costa rather long, and the tip divided by a dark dash; all the wings coloured and marked nearly alike, and intersected by dark transverse lines, which are seldom dentated; two dark divided bands on the central area, and the subterminal line generally lighter; the hind margin rounded or slightly waved. The larvæ are without prominences.

*1. *P. Fluviata* (Hübn.), *Gemmata* (Hübn.).—The male is ochre-yellow, and the female reddish-grey, with dark wavy transverse lines, a white undulating line beyond the middle, bordered with dusky, and a white dentated subterminal line; the basal half of the fore-wings suffused with reddish-grey, and bordered behind by a narrow darker band, on which stands the small black central dot; the tip of the fore-wings is divided by a dark shade. Expands from ¾ to 1 inch. Widely distributed in Southern and Western Europe, and Western Asia, occurring almost throughout the year. The larva is very variable in colour: greenish, yellowish-brown, brown, or nearly black, with indistinct lines. It feeds on various low plants.

*2. *P. Vittata* (Borkh.), *Lignaria* (Hübn.).—Pale ochreous, with paler and darker brown transverse lines, of which three or four before the subterminal line are more clearly defined, and with well-marked black marginal dots; fore-wings with a grey transverse band, broader above, on which the black central dot stands, and the tip divided by a dark grey shade. Expands about 1 inch. It is found in damp places in Northern and Central Europe from May to August; and the larva feeds on *Galium.*

*3. *P. Lapidata* (Hübn.).—Wings reddish-ochreous, dusted with brown; fore-wings with the tip slightly divided with brown, a slender marginal line, and rusty-brown transverse lines, those nearest the base curved; a double line in the middle, strongly arched, and two double lines beyond, slightly curved; hind-wings marked with brown lines beyond the middle. Expands from 1 to 1¼ inches. Inhabits Northern and Western Europe, and Northern Asia, from September to December, but always scarce and local. The larva feeds on evergreen oak in the south of France.

*4. *P. Polygrammata* (Borkh.).—Wings pale ochreous, with many brown and nearly straight transverse lines; hind margin grey, with the subterminal line whitish and scarcely dentated, and a fine dark marginal line; fore-wings marked with a brown transverse band before the middle, running from the inner margin to the black central dot, the tip divided by a pale dash, and the two lines beyond the middle often filled up with darker before the costa. The variety *Conjunctaria* (Led.) is paler, with the brown transverse band absent. Expands from ¾ to 1 inch. Inhabits Central and Southern Europe from April to August, but not generally common. The larva is reddish-grey, with a darker line on the back, and a blackish line on the sides. It feeds on bedstraw from June to September.

5. *P. Corticata* (Freyer).—Yellowish-grey, with many brown transverse lines, and a fine black marginal line, the fore-wings with the tip divided with black, and two more distinct double lines becoming suffused before the costa, one running obliquely from the middle of the inner margin, and the other nearer the base. These lines are thicker and blacker on the opposite sides, and

are bordered behind with a light band; hind-wings with the continuation of the double line, but it projects much further towards the hind margin on the costa than it does on the inner margin of the fore-wings. Expands about 1¼ inches. Inhabits Austria, Hungary, &c.

6. *P. Aquata* (Hübn.).—Wings white, hind margin and fringes grey, with brownish-yellow and brown transverse lines, a scarcely-dentated white subterminal line, and fine black marginal dots; fore-wings with the tip divided with black, and a reddish-brown shaded streak running from thence to the middle of the inner margin, the hindermost double stripe curved, and running into the inner margin beyond the middle. Expands about 1¼ inches. A local species, found in Central Europe from May to July. The larva is green, suffused with violet-grey; or brownish, with a dark macular line on the back, and a dark line on the sides above the flesh-coloured angular marks. It feeds on *Clematis* in summer and autumn.

*7. *P. Vitalbata* (W. V.).—Wings light brown, broadly pale ochreous on the costa, with many rusty-brown transverse lines, which are dark brown in the central area, and suffused towards the costa, and indistinct black central and marginal dots; beyond the central dot runs a blackish oblique band from near the base of the inner margin to the tip, and below this is the whitish subterminal line. Expands from 1 to 1¼ inches. Inhabits many parts of Europe and Western Asia in June and July. The larva is bluish-green, with a darker streak on the back, expanded into an oval spot, paler in the centre, and on the middle segments; and with a yellowish stripe on the sides. It feeds on *Clematis* in August and September.

*8. *P. Tersata* (W. V.).—Wings dust-colour, with many brown transverse lines, dotted with black on the nervures beyond the middle; a whitish and strongly zigzag subterminal line, and fine black marginal dots; the central area of the fore-wings projects in an angle in the middle and below the costa, and the tip is divided with black. Expands about 1¼ inches. Inhabits Central and Southern Europe, and Northern and Western Asia, in June and July. The larva is greenish-grey or brown, spotted with darker, with a brown line on the back bordered with white, pale and dark longitudinal lines, and a grey line on the sides. It feeds on *Clematis* in September and October. (*P. Testaceata*, Hübn., from South Germany, has shorter wings, the subterminal line bordered with darker on the inside, and the hind margin without black dots.)

9. *P. Exoletaria* (Herr.-Schäff.).—Greyish fawn-colour, all the wings with black central and marginal dots, and a pale denticulated submarginal line; fore-wings with some slightly dentated blackish lines, with three black spots in front, a black angulated streak behind, and a whitish spot on the inner margin. From Sicily.

10. *P. Radicaria* (Lah.).—Rather larger than *Tersata* (expands about 1½ inches); wings grey, varied with yellowish, with no transverse lines in the basal area, the dots on the nervures less conspicuous, the subterminal line less dentated, and the tip of the fore-wings divided by a sharply-defined black dash, beneath which the ground-colour is pure yellow. Occurs at Lausanne. Staudinger refers both this species and *Testaceata* to *Testata*, but with doubt.

11. *P. Æmulata* (Hübn.).—Brownish-grey, the costa mottled, with dark transverse lines and black marginal dots, the central area of the fore-wings only projecting into an angle below the costa, and bordered behind by a light band divided by dusky, in which the nervures are strongly dotted with black and white; the subterminal line zigzag, and expanded into a blotch on the inner margin. Expands about 1¼ inches. It is found in the Alps of South Bavaria, Austria, and Carinthia in June. Larva greyish-green, with a black line on the back, expanded into spots on the middle segments. It feeds on *Clematis* in September.

12. *P. Calligrapharia* (Herr.-Schäff.).—Wings pale bluish-grey, dusted with brown, with numerous indistinct brownish transverse lines and black marginal dots, the central area of the

fore-wings only distinctly bounded behind, and with small sharply-defined zigzags on the nervures; the tip indistinctly divided. Expands about 1¼ inches. Inhabits the mountains of South-Eastern Europe and Armenia.

GENUS XIII.—SCOTOSIA (STEPH.).

Wings broad, all coloured and marked alike; grey or brownish, with many dark waved lines. The larvæ thick and cylindrical, and without appendages; they undergo their transformations in the ground.

A.—*Triphosa* (Steph.).—*Hind margin of the hind-wings very strongly dentated, the inner margin with no appendage in the male.*

1. *S. Sabaudiata* (Dup.).—Wings pale grey, with a yellowish lustre; fore-wings dusted with grey, and with darker grey transverse lines, dentated on the inside, and only distinct on the costa; hind-wings paler, with very indistinct transverse lines; the fringes without markings. Size of *Dubitata.* Inhabits the mountains of South-Central Europe in August. The larva is black, with many waved and interlacing yellow longitudinal lines, orange-yellow spots on the sides, and scattered bristles placed on white raised warts. Head black, marbled with yellow. The young larva is green, with four yellowish longitudinal lines, and a yellowish-green head. It feeds on *Rhamnus alpinus* in June and July.

*2. *S. Dubitata* (Linn.).—Fore-wings shining brownish-grey, varied with reddish (except in the smaller and paler variety *Cinereata*, Steph., which only occurs in the male), with the nervures dotted with dark and light; dark dentated transverse lines towards the base, and a whitish zigzag subterminal line, expanded above the inner margin; the central area bordered by dark bands, with one angle below the costa, and two rounded projections in the middle; hind-wings pale grey, darker on the hind margin, and with a fine black marginal line. Expands about 1¾ inches. Common in the greater part of Europe and Western Asia in April and May, and from July to September. The larva is pale green, with four pale yellow lines on the back, and a broad yellow stripe on the sides. It feeds on sloe and buckthorn in May and June, and again in autumn.

B.—*Eucosmia* (Steph.).—*Hind margin of the hind-wings less strongly dentated, and the middle of their inner margin furnished with a strong tuft of hair in the male.*

*3. *S. Certata* (Hübn.).—Fore-wings varied with brownish-grey and rusty-brownish, with indistinct dots on the nervures, the central area with two angles on the outside in the middle and below the costa; hind-wings with more distinct transverse lines nearly to the base, and the hind margin obtusely angulated inwards and outwards; otherwise as in *Dubitata.* Expands from 1½ to 1¾ inches. Common in Central and South-Eastern Europe and Western Asia in May. The larva is bluish-grey, with dark lines on the back and orange spots on the sides. It feeds on barberry in June and July. The transformations are figured at Pl. 48, Fig. 3, *a—c.*

4. *S. Montivagata* (Dup.).—Closely allied to *Certata.* Wings ashy-grey, with no reddish shade; fore-wings with many waved lines of a rather darker grey, the middle ones forming a central band which is waved rather than angulated on the outside, and is followed by a greyish stripe divided by a grey thread. The subterminal line is whitish, much dentated, continued on the hind-wings, and generally better marked than any of the other lines, which are often scarcely visible at the base. The marginal line is brown rather than black, and the hind-legs of the male are densely hairy. Expands nearly 2 inches. Inhabits the mountains of South France, Spain, Piedmont, and Asia Minor in July; and the larva probably feeds on barberry.

*5. *S. Undulata* (Linn.).—Yellowish-white, light brown on the hind margin, and on the fore-

wings in the central area also, with many parallel and strongly-waved brown transverse lines, and a white regularly-dentated subterminal line; hind margin unmarked. Expands from 1¼ to 1½ inches. Common in Europe and Northern Asia in June, resting on the trunks of trees in woods. The larva is dark grey, with a double white line on the back, duller-coloured subdorsal lines, and a broad dirty white stripe on the sides. It feeds on sallow in September and October. The moth is figured at Pl. 48, Fig. 4.

C.—*Scotosia* (Steph.).—*Hind-wings moderately zigzag or dentated, and with no appendage on the inner margin in the male.*

*6. *S. Rhamnata* (W. V.).—Wings rusty-brown, with many greyish-brown and scarcely-dentated transverse lines, a suffused whitish subterminal line, and a black marginal line; fore-wings with the tip divided with black, and the dark brown central area bordered by two light lines, the last of which runs from the inner margin almost to the tip, before which it is acutely angulated. Size of *Undulata*. Common in a great part of Europe in June and July. The larva is dark brown, chequered with yellow and white on the sides, and with oblique reddish dashes; or green, with a white stripe on the sides, bordered below with dark reddish-brown. It feeds on sloe and buckthorn in May.

*7. *S. Vetulata* (W. V.).—Wings brownish-grey, with suffused darker and paler transverse lines, which are more distinct and more strongly waved on the costa, and light nervures dotted with dusky; the central area of the fore-wings is bordered by a light waved line behind, which projects only slightly outwards below the costa; the marginal line is narrowly black, and interrupted. Expands from 1 to 1¼ inches. Common in Central Europe and Siberia in June and July. The larva is bluish-grey, with two white lines on the back, and a pale yellow stripe on the sides, spotted with black. It feeds on buckthorn, between leaves spun into a cone, in May and June.

GENUS XIV.—COLLIX (GUÉN.).

The only species, **C. Sparsaria* (Hübn.), resembles a *Eupithecia*, but may be distinguished by the dentated hind-wings, which are more deeply excavated below the tips. The wings are grey, with many dark wavy transverse lines, a white zigzag subterminal line, and the nervures dotted with black and white; the fore-wings have a black central dot, and are spotted with black on the costa. Expands about 1 inch. Common in a great part of Europe in June and July. The larva is pale green, with five white lines on the back, and a broad yellow stripe on the sides. It feeds on *Lysimachia vulgaris* in August and September.

GENUS XV.—LARENTIA (TR.).

Small or moderate-sized moths, the fore-wings varying in shape, colour, and markings. The central area is often dark, and is generally bordered by two lighter bands, usually divided with dusky; and the basal and central areas are traversed by darker transverse lines; the subterminal line is generally distinct, and composed of connected lunules concave on the inside. The hind-wings are rounded, marked and coloured like the fore-wings, or paler, and with fewer markings. The larvæ are without prominences, and undergo their transformations on or in the ground, or in a cocoon. This large genus contains most of the species known as "Carpets." By many authors it is divided into numerous small genera; in the present work it is only divided into sections.

A.—*Fore-wings of the male with a strong tuft of hair projecting forwards on the inner margin beneath; the tip divided by a distinct white line, and nervule* 5 *of the hind-wings rising from the front half of the discocellular nervule.*

* 1. *L. Reticulata* (W. V.).—Fore-wings dark grey, with white nervures, the basal and central areas bounded by white lines, and separated by an oblique transverse band dusted with whitish, and sharply interrupted above the hinder angle. There are also two white transverse lines in the central area, and a white dentated subterminal line, before which the ground-colour is also dusted with whitish; hind-wings grey, with two white transverse lines. Expands about 1¼ inches. Inhabits Central Europe and Siberia in June and July, but not common. The larva is green, with a red line on the back, and two adjoining white lines; head green. It feeds on *Impatiens noli-me-tangere* in October. When reared in confinement the food-plant must be kept in water.

B.—*Fore-wings of the male with no tuft of hair beneath, and the tip divided by a distinct white line; hind-wings pale grey, with one or two whitish curved lines before the hind margin; nervule* 5 *as in section A.*

* 2. *L. Silaceata* (W. V.).—Fore-wings dark brown, the basal area bordered by one and the central area by two whitish lines, and a band, angular behind, between them. The marginal area is paler and marked with pointed black cones, bordered with white in front, and a black spot on the hind margin below the tip; the nervures in the marginal area (except in variety *Deflavata*, Staud.), and frequently some of those in the central area also, are yellowish; head dark brown. Expands from 1 to 1¼ inches. Common in Northern and Central Europe, and Northern Asia, from May to July. The larva is green, with paler lines on the back and belly, edged with dusky, or suffused with reddish-brown, with brown longitudinal lines, and a darker line on the back, which divides into three forks above the tail; head green, brown in front. It feeds on aspen, willow-herb, &c., in June and September.

3. *L. Capitata* (Herr.-Schäff.).—Resembles *Silaceata*, but the head, the middle of the back, and the abdomen are ochre-yellow, and the nervures in the central area are always unicolorous. Expands about 1¼ inches. Local in various parts of Central Europe in May, June, and August. The larva also resembles that of *Silaceata*, but is green, with no line on the belly, and with dark lines only on the head. It feeds on *Impatiens* in July and September.

*4. *L. Suffumata* (W. V.).—Fore-wings brown, with a light strongly-dentated band before the middle, the central area edged with white lines, with a black central spot in the middle, and a double rounded projection, bordered with light brown, behind; the subterminal line white, and strongly dentated, and the hind margin dotted with black. Expands from 1¼ to 1½ inches. Common in many parts of Northern and Central Europe, and the Altai, in April and May. The larva is yellowish-brown, with a pale interrupted line on the sides, and angular marks, open behind, on the middle segments. It feeds on bedstraw in July.

C.—*Fore-wings with the tip pointed, and with a tuft of hair beneath in the male, as in section A; there are two transverse lines before the middle, enclosing a band-like space; the central area projects behind, the tip is divided, and there is a dark semi-oval spot on the hind margin below; hind-wings paler, with nervule* 5 *rising from the hinder half of the discocellular nervule.*

* 5. *L. Prunata* (Linn.).—Fore-wings brown, with a zigzag band before the middle, and the marginal area paler, the central area with two broad rounded projections behind, and bordered with a white line; the subterminal line is indicated by white lunules filled up with blackish, and the hind-wings are grey, with three light zigzag lines. Expands from 1¼ to 1½ inches. Common

in a great part of Europe and Siberia in July and August. The larva is green or brown, with the 3rd segment thickened, reddish-brown, and spotted with white, and segments 5 to 11 with white triangular spots bordered with red. It feeds on gooseberry, currant, sloe, &c., in May and June.

6. *L. Pyropata* (Hübn.).—Fore-wings greyish fawn-colour, with two dentated ochre-yellow bands bordered with white, the second narrow, but broader in front; and the marginal area grey; hind-wings pale grey, with a grey marginal fascia traversed by two whitish angulated lines, and the space at the anal angle ochreous. Expands about 1¼ inches. Not uncommon in Russia.

*7. *L. Testata* (Linn.).—Fore-wings yellow, dusted with rusty-red, varied with violet-grey beyond the middle, and with a transverse band before the middle bordered with rusty-red, the central area with shallow projections, and bordered behind by a white line; the tip divided with white, and the hind margin brownish-red below, the subterminal line indistinct, and the hind-wings greyish-white, darker on the hind margin, and with a light curved line. Expands about 1¼ inches. Common in Northern and Central Europe, and Northern Asia, from July to September. The larva is straw-coloured, with a dark line on the back, and a whitish line on the sides, bordered above with grey. It feeds on willow and aspen in May and June.

*8. *L. Populata* (W. V.).—Fore-wings ochre-yellow, the basal and central areas bounded by brown zigzag lines, and varied with violet-brown, the latter with two rounded projections below the middle; the subterminal line yellow, dentated, filled up with darker in front, and the space behind also darker; hind-wings pale yellow, with the hind margin darker; all the fringes spotted with brown. In the variety *Musanaria* (Freyer) the fore-wings are rusty-brown, almost without markings, with the central area dark violet. Expands about 1¼ inches. Common in Central and Northern Europe, Northern Asia, and Labrador, in July and August. The larva is pale green, with a reddish-brown line, widened into spots on each segment, on the back. It feeds on sallow and bilberry in May and June.

*9. *L. Associata* (Borkh.), *Marmorata* (Hübn.), *Dotata* (Guén.).—Fore-wings pale ochre-yellow, with two rusty-brown zigzag transverse lines before, and one behind the middle, the second forming an acute angle; the subterminal line suffused and filled up with brownish in front; the tip divided with brownish, and the hind-wings yellowish; fringes spotted with brown. Expands from 1¼ to 1½ inches. Common in Central Europe and Northern Asia in July. The larva is green, with a light stripe on the sides. It feeds on currant in April and May.

D.—*Fore-wings with the tip pointed; no tuft of hair beneath in the male; the central area generally bordered by two simple white lines, but without the double light band of the following sections; the subterminal line whitish, dentated, and not filled up with dusky in cells* 4 *and* 5 *as is the case in the other cells, but frequently absent; hind-wings pale, almost without markings, and nervule* 5 *rising either from the middle or the hinder half of the discocellular nervule.*

*10. *L. Dotata* (Linn.), *Pyraliata* (W. V.).—Fore-wings ochre-yellow, with three rusty-brown transverse lines, one close to the base, and the other two bounding the narrow central area, which is a little darker, and projects slightly above the middle; the subterminal line is absent, the fringes are brownish, and the hind-wings are pale yellow. Expands from 1¼ to 1½ inches. Inhabits Europe and Northern Asia in June and July. The larva is pale green, with a dark line on the back, whitish subdorsal lines, and a yellow stripe on the sides. It feeds on hawthorn in May.

*11. *L. Fulvata* (Forst.).—Fore-wings yellow, the central area varied with rusty-brown and dark grey, zigzag in front, and strongly projecting in the middle behind; the tip divided

with brown; costa pale yellow; hind-wings yellowish. Expands about 1 inch. Common in Central Europe, and in Northern and Western Asia, in July and August. The larva is pale green above, and dark green on the sides, with a whitish lateral stripe. It feeds on rose in May. The moth is figured at Pl. 48, Fig. 11.

*12. *L. Firmata* (Hübn.).—Fore-wings light violet-grey, pale rusty-brown in the basal and central areas, the latter with a pointed excavation in front, and bordered by a darker line; the tip, hind margin, and paler hind-wings without markings, and the antennæ of the male pectinated. The variety *Ulicata* (Ramb.) is violet-grey, with a brown central band. Expands from 1 to 1¼ inches. Inhabits Central and Western Europe from May to September. The larva is grass-green, with a yellow line on the sides, and small reddish-brown spots on the front segments. It feeds on fir in April, June, and July. (*L. Serraria*, Zell., from Northern Europe, has fawn-coloured fore-wings, with the outer fascia and angulated lines white, and an oblique black central spot; hind-wings bordered with grey.)

*13. *L. Variata* (W. V.).—Very variable in colour and markings; fore-wings whitish (variety *Stragulata*, Hübn.), brownish-grey, or yellowish-brown, with the basal and central areas dark greyish-brown, or fawn-colour (variety *Obeliscata*, Hübn.); the central area bordered by dark lines edged with whitish, and with a slight rounded projection behind, projecting furthest in cell 6, and much narrowed towards the inner margin; the tip divided by a short dark dash, and the hind margin dotted with black; hind-wings with a darker curved line, bordered with pale, and curved rectangularly in the middle. Expands from 1 to 1¼ inches. Inhabits Europe and Siberia from June to August. The larva is green, with white lines on the back and sides; it feeds on fir in April and May.

*14. *L. Juniperata* (Linn.).—Very like grey specimens of *Variata*, but smaller (expands about 1 inch); fore-wings narrower and of a purer ashy-grey, and rather darker brownish-grey at the base and in the central area; no subterminal line, and the marginal spots finer and more like an interrupted line; the hind-wings are considerably longer on the costa than on the inner margin, and are pale grey, with a darker curved line, forming a rectangle in the middle. Common in Central Europe in October and November. The larva is green, with a double yellow line on the back and a red stripe on the sides, bordered with white below. It feeds on juniper in July and August.

*15. *L. Simulata* (Hübn.).—Much like the last two species, the wings shaped as in *Juniperata*. Fore-wings are brownish-grey, with the basal and central areas darker, and bordered by dark brown lines edged with whitish; the central area not much broader on the costa, and with the edges scarcely dentated, only projecting into an acute angle beyond the central spot, and intersected by two dark lines; the pale subterminal line is interrupted, the hind margin dotted with black, and the hind-wings marked with an obtusely angulated central line beneath. Expands about 1 inch. Inhabits Northern and Alpine Europe in July. The larva is green, with three whitish lines on the back, and a white line on the sides, bordered with red above. It feeds on juniper in June.

16. *L. Cupressata* (Geyer).—Resembles *Variata*; fore-wings reddish-grey, with the basal and central areas darker grey, the latter only distinctly bounded on the costa, and with rather slight projections, and very narrow at the inner margin; subterminal line indistinct, and with three black dashes behind below the tip. Expands a little more than 1 inch. Inhabits South France and Bithynia in October and November. The larva is green, paler below, with a dark green line on the back, and a zigzag white line below. It feeds on juniper from May to October.

*17. *L. Corylata* (Thunb.).—Fore-wings whitish, varied with olive-grey, and finely dusted with

brown; the basal and marginal areas dark brown, and bounded by dentated white lines, the latter with strong double projections below the costa and in the middle, which are constricted or interrupted above the inner margin; tip divided. Expands about 1 or 1¼ inches. Inhabits Northern and Central Europe in June. The larva is yellowish-grey, or reddish, with a red line on the back before and behind, and a whitish line on the sides. It feeds on lime and sloe in September.

*18. *L. Truncata* (Hufn.), *Russata* (W. V.).—Very variable, fore-wings generally dark grey, the central area broad, dusted with pale grey, intersected by two dark dentated lines, and bounded in front by a reddish-brown band, and behind by a white line, and bordered with brownish-red as far as the subterminal line, with strong narrow projections in the middle, and with shorter ones below; hind margin with distinct black dots; hind-wings brownish-grey. Sometimes the central area is pale ochre-yellow as far as the subterminal line, or the whole surface is dark grey, with suffused white transverse lines. Expands from 1¼ to 1½ inches. Common in Northern and Central Europe, and Siberia, from May to August. The larva is green, with dark lines on the back and sides, and rose-red anal points. It feeds on low plants in April, May, July, and August.

*19. *L. Immanata* (Haw.).—Another very variable species, closely allied to *Truncata*, but the fore-wings are more pointed at the tips; grey, fulvous, or even whitish, with the basal and central areas black or brown, the latter more sharply angulated. Size and times of appearance of *Truncata*. The larva is dull pale yellowish or whitish-green, with a dark green line on the back, bordered with paler dirty whitish subdorsal lines, and some oblique green streaks on the sides; spiracular line green, intersected by a yellowish thread; anal points pink or green. It feeds on sallow.

*20. *L. Sagittata* (Fabr.).—Fore-wings fawn-colour, with a white spot before the middle of the hind margin; basal and marginal areas narrow, blackish, and bordered with white, the latter with a concave excavation in front, and projecting into a long tooth behind opposite the white spot. Expands from 1 to 1¼ inches. It inhabits North-Central Europe in June and July. The larva is yellowish-green, with dark green and reddish markings. It feeds on *Thalictrum flavum* in August.

*21. *L. Viridaria* (Fabr.), *Miaria* (W. V.).—Fore-wings pale green, the basal and marginal areas bordered by dark lines, which are expanded into large triangular spots on the costa, and are there edged by white lines; the central area varied with dusky, and with two rounded projections in the middle, and smaller ones below; antennæ of the male pectinated. Expands from 1 to 1¼ inches. Common in Europe and the Altai in June and July. The larva is humped, reddish-yellow, with double black lines on the back, and a black stripe on the sides. It feeds on bedstraw in May. The moth is figured at Pl. 48, Fig. 12.

E.—*Fore-wings of the male not tufted beneath, their tips not divided, or with a suffused light dash; the central area not darker on the costa than on the inner margin, intersected by darker lines, projecting outwards in the middle, and bordered behind, and frequently also in front, by a light and generally double transverse stripe; the subterminal line is whitish, regularly dentated towards the base, and the hind margin is dotted with black; hind-wings paler, with the continuation of the double stripe and the subterminal line; nervule* 5 *rises from the front half of the discocellular nervule; all the wings with a dark central dot.*

*22. *L. Picata* (Hübn.).—Fore-wings paler or darker brown, often varied with greenish, the central area darker, with two strong pointed projections in the middle, and bordered behind by a broad white indistinctly-divided band, on which is a dusky transverse line, followed by a white

dentated one ; the subterminal line is strongly dentated, and filled up with blackish in cells 4 and 5 ; the space behind is greenish or yellowish. Expands from 1 to 1¼ inches. Common in Central Europe in June and July. The larva is stone-colour, reddish in the incisions, with a darker line on the sides, and dark spots on the back. It feeds on low plants in spring.

23. *L. Malvata* (Ramb.).—Fore-wings reddish-brown, with the central area brown, more or less waved inside, and with a very prominent angle outside ; it is bordered with white on both sides, and traversed by several blackish waved parallel lines. The base is also dark brown, and the rest of the surface of the wings is traversed by waved brown lines. The subterminal line is festooned, white, and more or less distinct ; fringes concolorous, and preceded by a row of black dots ; hind-wings shining reddish-grey, with traces of two waved blackish lines. Expands about 1¼ inches. Inhabits South France, Spain, and Algeria in September. It is a very variable species, being sometimes white, brown, or fulvous. The larva is green when young, and pale or dark brown when older, with a small bifid prominence on the 11th and 12th segments. It feeds on different species of lavender and mallow.

24. *L. Basochesiata* (Dup.).—Fore-wings reddish-brown, with three well-marked black transverse lines, the two nearest the base curved, and separated by a paler space ; the 3rd line is much waved, and bordered on the inside by a black spot at the end of the cell ; on the outside it is finely bounded with whitish, and followed by two double brown streaks. The subterminal line is fine, white, dentated, and ill-defined, with two bluish-black spots on the inside, opposite the black spot of the 2nd line. The central and basal areas are traversed by several other lines, and there is a small black discoidal spot on the former. Fringes brown, preceded by a black festooned line ; hind-wings brownish-grey, traversed by five or six clouded lines. Expands about 1 inch. Common in South France and Spain. The larva is light brown, shaded with brownish on the sides, and with a slender brown line on the back, and flesh-coloured subdorsal lines washed with yellowish. It feeds on the young stalks of *Rubia peregrina ;* and there is a succession of broods throughout the year. (*L. Corollaria*, Herr.-Schäff., from South-Eastern Europe and Western Asia, is grey, with a broad brown central area bordered and intersected with black, on which stands a dark oblong discal dash, and with a pale grey or reddish-brown shade, and a white dentated submarginal line, spotted outside with blackish in front ; basal area blackish.)

25. *L. Permixtaria* (Herr.-Schäff.).—Wings white, fringes slightly spotted, fore-wings with the tip rather long, and the hind margin nearly straight, with a broad basal area varied with black, brown, and bluish-grey, extending above as far as the central dot, but narrower towards the inner margin. The white dentated subterminal line intersects the dark border (which is brown before it, and bluish-grey behind), and is interrupted between nervures 2 and 3. Between the two brown spaces runs a slender double black dentated line, spotted on the nervures. Hind-wings with several fine black incomplete lines, a double light brown line, and a rather ill-defined bluish-grey border, interrupted between nervures 2 and 3. Inhabits Andalusia, South-Eastern Europe, and Western Asia.

* 26. *L. Galiata* (W. V.).—Fore-wings whitish at the base, and waved with pale brown, the central area iron-grey on the inside, and brownish on the outside, with double projections ; the hinder double band white and unequally divided, so that the hinder half is broader, the marginal area varied with bluish-grey and pale brown, and rusty-brown in cells 4 and 5. Hind-wings whitish, with rather indistinct grey lines. Expands from 1 to 1¼ inches. Common in a great part of Europe, North Africa, and Northern and Western Asia, from June to August. The larva is pale yellowish-grey, with three dark lines on the back, and a flesh-coloured stripe on

the sides, bordered with greenish-brown above. It feeds on bedstraw from May to July. (*L. Oxybiata*, Mill., is allied to *Galiata*, but smaller; the central area of the fore-wings, and the hind-wings, are darker; the former is broader, wholly brownish-black, nearly straight on both sides, and followed outside by a broad parallel, continuous, and perfectly white band; antennæ simple. It occurs at Cannes in October.)

*27. *L. Rivata* (Hübn.).—Fore-wings grey, the central area dark grey on the inside, and brownish on the sides; it projects slightly in the middle, and on the costa and inner margin, and forms small angles on nervules 2, 3, and 4; the two double bands are white, with an indistinct line in the middle; and the second is broad. The marginal area is grey on all the wings, rusty-brown in cells 4 and 5, and interrupted with whitish beneath, the subterminal line is white and dentated; hind-wings white, with three dark central lines. Expands from 1 to 1¼ inches. Inhabits Europe and Northern Asia in June and July. The larva is yellowish-brown, with a dark stripe on the back of the first and last segments, between which are angular marks, open behind; and a whitish stripe on the sides. It feeds on bedstraw in autumn.

*28. *L. Unangulata* (Haw.).—Differs from *Rivata* in the first double band, of which only the hinder half is visible as a narrow strongly-curved white stripe, and the central area forms only one angle behind above the middle, and curves gradually to the margins both above and below. Expands about 1 inch. It inhabits Central Europe from May to August.

*29. *L. Sociata* (Borkh.).—Fore-wings grey, the central area brown, with an almost rectangular projection above the middle, the two double bands white, with a distinct dark line in the middle, the second broad, but less so than in *Rivata*, the subterminal line filled up with blackish in cells 4 and 5, and the marginal area not interrupted with blackish below; hind-wings grey, with a double whitish stripe and subterminal line. Expands 1 inch or over. Common in the greater part of Europe and Northern Asia from May to July. The larva is brownish-grey, with blackish longitudinal lines in front, and with blackish angles filled up with white after the 3rd segment. It feeds on bedstraw in July and August.

*30. *L. Montanata* (W. V.).—Wings white, fore-wings with the central area rusty-brown, intersected by brown lines, projecting in the middle and constricted or interrupted below, the subterminal line shaded with grey in front, the transverse bands ill-defined, broadly white, and scarcely divided with dusky; hind-wings with indistinct transverse lines. The variety *Fuscomarginata* (Staud.) has broad brown hind margins, and the variety *Lapponica* (Staud.) is smaller, paler, and with the central band almost obsolete. Expands from 1 to 1¼ inches. Common in Europe and Northern Asia from May to August. The larva is pale yellowish-grey, with a darker line on the back, and a white one on the sides. It feeds on low plants from autumn to May.

31. *L. Incursata* (Hübn.).—Fore-wings pale grey, suffused with yellowish, and finely dusted with blackish, the central area bounded by two broad blackish transverse stripes, expanded on the costa, and with a double projection; the double bands a little lighter than the ground-colour, and the second unequally divided by a dull line; the subterminal line shaded with grey, and widened below the middle; hind-wings whitish, with three darker transverse lines, and the antennæ of the male pectinated. Expands about 1¼ inches. Inhabits Northern and Alpine Europe in May and June; it also occurs in Labrador.

*32. *L. Ferrugata* (Clerck).—Very variable; fore-wings ashy-grey, yellowish-grey, or yellowish, the base and the central area (which varies in breadth) dark grey or brownish-red, and often intersected with lines (variety *Spadicearia*, W. V.); the central area has a double projection, and is bordered with a white line on each side, consisting of the narrow lighter half of the

double band, and the subterminal line is filled up with blackish in cells 4 and 5, forming two black spots on the upper part of the hind margin. The hind-wings are brown, and waved with dusky, and the antennæ of the male are pectinated. Expands from ¾ to 1 inch. Common in a great part of Europe and Northern and Western Asia from May to August. The larva is yellowish-grey, with dark longitudinal lines in front and behind, and dark crosses on the middle segments. It feeds on low plants in June and autumn.

*33. *L. Unidentaria* (Haw.).—Ochreous-grey, the base and central area greyish-black, with no reddish or yellowish shade, the central area always broader above than below. This is followed by a fine dentated reddish line, rising from a brown spot on the costa, and the two black spots rest on a pale space. There are some red lines between the base and the central area. Size of *Ferrugata*. Inhabits the north of Central Europe in May and June, and the larva feeds on ground ivy.

F.—*The base and central area of the fore-wings darker, with a lighter band between them, which is broader than the dark part of the base; the central area with rounded projections in the middle, bordered behind by a light, unequally divided, and sometimes indistinct band, the front half of which is narrower and paler; the subterminal line is dentated, and filled up with dusky in cells* 4 *and* 5; *the hind margin is dotted with black, and the hind-wings are pale, almost without markings, with nervule* 5 *rising from the lower half of the discocellular nervule; the antennæ of the male are pectinated, except in Ocellata and Tæniata.*

34. *L. Aptata* (Hübn.).—Fore-wings pale grey, shading into green, the base and central area blackish-grey, the latter narrow, with a slight projection in the middle, and the hinder double band broad and white; hind-wings pale grey. Expands about 1 inch. Inhabits Northern and Alpine Europe in June and July.

*35. *L. Ocellata* (Linn.).—Fore-wings white, the base and central area bluish ashy-grey, the latter slightly projecting, and intersected by darker lines, with a large black central spot, the subterminal line indistinct, spotted with black in front in cells 4 and 5; hind-wings white. Expands from 1 to 1¼ inches. Common in Europe and in Northern and Western Asia from June to August. The larva is brown, with black angular spots on the back, bordered with white, and a black stripe on the sides. It feeds on bedstraw in May, June, and September.

36. *L. Confixaria* (Herr.-Schäff.).—Fore-wings rather narrow, white, varied with rusty-yellowish, the base and marginal area dull cherry-colour, the latter bordered by black lines, and with a slight projection behind; the subterminal line is distinct, filled up with grey in cells 4 and 5, and broadly interrupted with white above; hind-wings grey, with three darker curved lines. Expands about 1 inch. Described from a single specimen of uncertain locality.

*37. *L. Olivata* (W. V.).—Fore-wings dull olive-green, the base and the broad central area varied with brownish, and intersected with dark lines, the marginal area with long black dashes, bordered with white on the nervures, the double stripes narrow and whitish, and the hind-wings dark grey. Expands from 1 to 1¼ inches. Inhabits Central Europe and the Altai in July and August. The larva is dirty brown, and feeds on bedstraw till May.

38. *L. Kollariaria* (Herr.-Schäff.).—Resembles *Olivata*, but larger (expands about 1½ inches), the base and central area of the fore-wings purer brown, the latter with strong rounded projections at and below the middle, and with small pointed projections below the costa; the double stripes broader, white in the narrower half and green in the broader half; hind-wings paler grey. The variety *Lætaria* (Lah.) is bright pale green, with the central band darker. It inhabits the Alps and Siberia in June and July.

39. *L. Turbata* (Hübn.).—Fore-wings blackish-grey, with a brownish band before the middle,

and with pale grey double bands and subterminal line; hind-wings pure white, with a dark grey border. Expands from 1¼ to 1½ inches. Inhabits the Alps, Finland, and the Altai in June and July.

*40. *L. Tæniata* (Steph.).—Fore-wings blackish at the base and in the central area, and with a broad rust-coloured band between, narrowly bordered with white; the central area with tolerably uniform projections behind, and the marginal area reddish-brown towards the costa; hind-wings pale grey. Expands from ¾ to 1 inch. Inhabits Northern and Central Europe in July, chiefly in the mountains.

G.—*As in section E, but the marginal line is interrupted with lighter only on the nervures, and forms small distinct dots; nervule 5 of the hind-wings rises from the front half of the discocellular nervule, except in Berberata, in which it rises from the hinder half.*

*41. *L. Munitata* (Hübn.).—Fore-wings ashy-grey, with the tip divided with dusky, the base and central area reddish-grey, and bordered with black lines; the central area narrower towards the inner margin, and making a round projection in the middle; two blackish spots on the costa near the tip, and the subterminal line suffused; hind-wings grey, and the antennæ of the male pectinated. Expands about 1 inch. Inhabits Northern and Alpine Europe in June and July. The larva is dull green or brown, speckled with black, and blotched with pink on the 6th and 7th segments. It feeds on groundsel.

*42. *L. Designata* (Hufn.), *Propugnata* (W. V.).—Fore-wings ashy-grey, indistinctly waved with darker, the tip not divided, the base and central area reddish-grey, and bordered with whitish lines; the central area projects below the costa and in the middle, and its inner side, as well as the outer side from the costa to the middle, forms a dark brown band; hind-wings pale grey. Expands about 1 inch. Common in Europe and Siberia in May and June. The larva is reddish-grey, with triangular orange spots on the back, and a pale yellowish-grey line on the sides. It feeds on cabbage in September. (*L. Abrasaria*, Herr.-Schäff., from Lapland, has the wings rounded; pale grey, slightly tinged with yellowish-brown, with dark grey waved lines forming bands; the last forms the border, and is traversed by the light denticulated subterminal line on all the wings. The central area of the fore-wings is bounded by two stripes formed of double lines, and the intermediate space is of the ground-colour, and without markings, except the very small central dot. The elbowed line is simply waved, with no angles or prominent curves. Palpi longer than the head. It agrees with *Biriviata* in form, and with *Molluginata* in colour.)

43. *L. Biriviata* (Borkh.).—Fore-wings with the base rust-colour, the central area with an angular projection in the middle, banded with brown on the sides, and edged in front by a white line, and behind by a broad white unevenly divided band; the marginal area is varied with brown and grey, and the subterminal line is filled up with dark brown in cells 4 and 5, and below the costa; hind-wings waved with grey and whitish. Expands about 1 inch. Common in many parts of Europe and in the Altai from April to July. The larva is green or brown, with a whitish stripe on the sides, and triangular black spots on the back. It feeds on *Impatiens noli-me-tangere* in August.

* 44. *L. Berberata* (W. V.).—Fore-wings pale reddish-grey, with two dark brown transverse bands near the base and in the front of the central area, and the commencement of another band at the end of the central area below the costa, which forms sharp projecting angles behind, and is continued in an irregular line to the inner margin; tip divided with black; hind-wings grey, with indistinct darker lines. Expands about 1¼ inches. Inhabits Europe and Northern and Western Asia in May and August. Larva rather thick, yellowish-brown or grey, with dark spots

on the back, and a dark line on the sides. It feeds on barberry in June and autumn. The moth is figured at Pl. 48, Fig 10.

*45. *L. Rubidata* (W. V.).—Fore-wings reddish-grey, the base and central area dark grey, the latter pale grey behind below the middle, and with four rounded projections, and bordered on both sides by two fine white lines; hind-wings pale grey. Expands from 1 to 1¼ inches. Common in Central Europe and Northern Asia from May to July. The larva is grey, with a blackish line on the back before and behind, and with blackish angular dashes between. It feeds on bedstraw in August and September.

*46. *L. Cucullata* (Hufn.), *Sinuata* (W. V.).—Fore-wings with the basal third dark brown, divided by a reddish-brown band bordered with whitish lines; beyond this they are white, varied with grey and rusty-brown in the marginal area; the central area forms two rounded projections below the middle, and is bordered behind by a white line edged with dusky, before which there is a dark brown band on the costa; hind-wings whitish, with the hind margin grey. Expands from 1 to 1¼ inches. Inhabits Central Europe and the Altai in June. The larva is greenish-brown, with a broad yellow stripe on the back, and a yellowish line on the sides. It feeds on bedstraw in July and August.

*47. *L. Quadrifasciaria* (Cl.).—Fore-wings grey, slightly tinged with rusty-brown, and obscurely waved with dusky; the central area blackish, bordered behind with a whitish line, and with a rounded projection above the middle; the subterminal line suffused; hind-wings brownish-grey, with an indistinct light transverse line; the antennæ of the male pectinated. Expands from 1 to 1¼ inches. The larva is pale grey, with a darker line on the back adjoining black zigzag streaks, and a blackish stripe on the sides, bordered with whitish below. It feeds on low plants in spring and autumn. (*L. Conspectaria*, Mann, from Sicily and Madeira, closely resembles this, but the hind-wings are less rounded at the anal angle, and the antennæ of the male are much more strongly pectinated. The fore-wings are of a dull smoky coppery-brown, marked as in *Quadrifasciaria*, but the central band is paler in the middle, and the subterminal line is white, shaded with dusky on the inside, and better defined; fringes slightly chequered; hind-wings paler and duller than the fore-wings, with faint traces of a darker subterminal line on the inner margin.)

48. *L. Scripturaria* (W. V.).—Wings pale grey, with many waved brownish lines, the central area of the fore-wings not darker, and with a double projection in the middle; the double stripes scarcely lighter, and divided with grey. Expands about 1¼ inches. It is found in the Alps in July. (*L. Kalischata*, Staud., from Malaga and Algeria, is allied to this, but with fewer lines, especially on the hind-wings, and the marginal line is composed of disconnected lunules, concave on the inside. The male is pale grey, and the white portions of the female are suffused with rosy; the antennæ of the former are shortly ciliated, but very thick.)

49. *L. Molluginata* (Hübn.).—Wings grey, the fore-wings with dark waved transverse lines, and the central area brownish on the sides, slightly projecting in the middle, and bordered by two whitish equally divided double streaks; the subterminal line is bordered with darker in front, and there is a whitish dash at the tip. Expands about 1¼ inches. Common in Central Europe, except the north-west, in May, June, and August. The larva is clay-coloured, with a black line on the back, below which are whitish dashes, and a greyish-brown stripe on the sides. It feeds on bedstraw in June and September.

H.—*The costal half of the central area of the fore-wings wholly or partly darker, and thus forming a large costal spot; the subterminal line whitish, and dentated towards the base; nervule 5 of the hind-wings rising from the front half of the discocellular nervule.*

*50. *L. Fluctuata* (Linn.).—Fore-wings pale grey, waved with darker, with a black central spot; the base and the costal half of the central area dark grey, the latter bordered by two unequally divided double bands, which converge on the inner margin, and are scarcely lighter than the ground-colour; hind-wings pale grey; hind margins dotted with black. Expands from 1 to 1¼ inches. Common in Europe and Northern and Western Asia from April to August. The larva is brown, with dark X-shaped marks on the back, and a blacker line on the sides. It feeds on cabbage, &c., from June to September. The moth is figured at Pl. 48, Fig. 5.

51. *L. Alpicolaria* (Herr.-Schäff.) resembles *Fluctuata*, fore-wings with the tip more pointed; bluish-grey, with the end of the basal area, the hinder part of the central area both on the costa and inner margin, and the marginal area greyish-black; the central area with stronger projections in the middle and below the costa, the double stripes reddish-grey; the second whitish in the costal half; the subterminal line milk-white, zigzag, and with black longitudinal streaks on both sides below the tip; expands about 1¼ inches. It inhabits the Austrian Alps in July. The larva is grub-like, whitish or yellowish, with a dark brown head, and very small black warts on the back. It lives in the seed-capsules of various species of Gentian. (*L. Gentianata*, Mill., from the Engadine, is larger, with longer wings; fore-wings pale grey, slightly washed with red, and with four or five pale dentated lines, which are often dotted on the nervures. The two lines nearest the base are brown; the elbowed line is the palest; it runs from the costa to the inner margin, where a large blackish spot stands before it. The tip is marked with a large dark spot, continued on the fringes (which are preceded on all the wings by a row of brown dots) as far as the hinder angle. The hind-wings are whitish; greyish towards the hind margin. The central dot is small and indistinct; the body is rather stout, and the antennæ are simple and rather slender. It appears in May, and the larva feeds on the seeds of *Gentiana punctata* till September.)

*52. *L. Procellata* (W. V.).—Wings white, with slender brown waved transverse lines; the fore-wings with the base, the costal half of the central area, and the marginal area rusty-brown, the latter marked with a large white spot in the middle on the black-dotted border. Expands about 1¼ inches. Inhabits Central Europe and the Altai from May to July. Larva ochreous-brown, the dorsal line expanding into dark spots on segments 6 to 9, before and after which it is reddish and then black; segments 10 to 13 are paler. The larva feeds on Clematis and spindle-tree in August and September.

53. *L. Alaudaria* (Freyer).—Wings white, narrowly blackish towards the hind margin, near which is a white and irregularly interrupted subterminal line; the fore-wings with a small black basal area and a large costal spot. Expands nearly 1¼ inches. Inhabits the Austrian Alps.

*54. *L. Bicolorata* (Hufn.), *Rubiginata* (W. V.).—Wings white, without transverse lines, the base and a large spot in the middle of the costa varied with brown and rusty-yellow; the marginal area suffused with grey, and darker below the tip, with a white subterminal line; the hind margin concolorous. A blackish variety (*Plumbata*, Curt.) occurs in Britain. Expands about 1 inch. Inhabits Northern and Central Europe, and Northern Asia, in July and August. The larva is green, with a darker line on the back, and yellowish subdorsal lines. It feeds on alder in May and June.

I.—*Fore-wings green waved with dusky, with a broad and rather paler zigzag band between the base and the central area, and the hinder edge of the latter is strongly curved; hind-wings grey; nervule* 5 *rising from the front half of the discocellular nervule; all the wings with a dark central spot.*

*55. *L. Siterata* (Hufn.), *Psittacata* (W. V.).—Fore-wings greyish-green, the band before the middle and the marginal area sometimes varied with rusty-red; the hinder edge of the central area slightly and evenly dentated, and bordered behind by a whitish and equally-divided double stripe on the costa and hind margin; the subterminal line continuous and scarcely dentated; hind-wings brownish-grey. Expands about 1¼ inches. Inhabits Europe and Armenia from September to May. The larva is green, with a darker line on the back, a dull yellowish line on the sides, and red anal points; it is often marked with red spots on the back also. It feeds on lime, rose, &c., in May.

*56. *L. Miata* (Linn.).—Very like *Siterata*, the fore-wings lighter green, and unmixed with rust-colour; the hinder edge of the central area more distinctly dentated, with a stronger tooth below the costa, projecting inwards; the subterminal line consists of whitish spots, bordered behind with dusky; and the hind-wings are pale grey. Expands about 1¼ inches. Inhabits Northern and Central Europe from September to May. The larva is green, with two projecting points, and feeds on birch, alder, and oak in August.

K.—*All the wings uniformly and regularly coloured, with dark waved transverse lines, and a light, slightly zigzag subterminal line, the central area of the fore-wings bordered with white lines on both sides, the outermost of which is continued on the hind-wings; the hind margin is edged by a fine dark line, and nervule* 5 *of the hind-wings rises from the front half of the discocellular nervule.*

*57. *L. Bilineata* (Linn.), (*Yellow Shell*).—Wings pale golden-yellow, waved with brown; the central area of the fore-wings edged by two white transverse lines, and projecting in the middle. Expands from 1 to 1¼ inches. Abundant in Europe and Northern and Western Asia from June to August. The larva is greenish, with a darker line on the back, and white subdorsal and lateral lines. It feeds on grass and other low plants in April and May. The moth is figured at Pl. 48, Fig. 6. (*L. Bistrigata*, Tr., from Sardinia, Greece, and Asia Minor, is grey, more or less varied with yellow in Sardinian specimens, and the outer transverse line of the central area of the fore-wings is much more curved and dentated. *L. Confusaria*, Staud., from Sicily, is of the size of *Quadrifasciaria*, ochreous-yellow, with the central area tinged with violet below, and bordered with black; the subterminal line scarcely dentated, very pale, and preceded by two well-marked black dots in the usual place.)

58. *L. Riguata* (Hübn.).—Wings greyish-brown, finely dusted with whitish, and indistinctly waved with darker; the central area bordered by two white lines, and scarcely projecting behind. Expands about 1¼ inches. Inhabits South Europe and Armenia in spring and autumn. The larva is long, cylindrical, violet-grey, partially washed with pale rose-colour, with a fine brown line on the back, below which is an obscure flesh-coloured line and a whitish one. It feeds on various *Rubiaceæ* in August and September.

L.—*Fore-wings black, or dark grey, all the areas coloured alike; the central area bordered behind by a broad white band, indistinctly divided or dotted with black on the nervures, which is continued on the hind-wings. The latter are broadly black on the hind margin, which is intersected by a black line; fringes chequered with black and white; nervule* 5 *of the hind-wings rises from the front half of the discocellular nervule in the three first species, and from the hinder half in the others.*

59. *L. Lugubrata* (Staud.).—Fore-wings dark grey, with a dark transverse line before, and a broader white, indistinctly divided, transverse band beyond the middle, and a well-marked evenly zigzag whitish subterminal line; hind-wings grey at the base, and the white band much broader than on the fore-wings, especially towards the costa. Expands about 1¼ inches. Inhabits a great part of Europe and Northern and Western Asia in May, June, and August.

The larva is green, with three dark lines on the back, and a whitish line on the sides, or brownish, with dark oblique dashes crossing on the back. It feeds on willow-herb in July and autumn.

*60. *L. Tristata* (Linn.).—Wings brownish-black, with a black central spot, and a white band towards the base and beyond the middle, dotted with black on the nervures; the white zigzag subterminal line stands on the dark border, and the central area of the fore-wings is dusted with grey, and intersected by black lines, and projects in the middle; hind-wings whitish at the base, with blackish transverse stripes, and the hind margin distinctly waved. Expands about 1 inch. Common in Europe and Armenia from April to July. The larva is yellow, with several reddish-brown longitudinal lines. It feeds on bedstraw in June, August, and September. The moth is figured at Pl. 48, Fig. 7.

61. *L. Luctuata* (Hübn.).—Wings black, with a white band beyond the middle, dotted with black on the nervures, and white dots instead of the subterminal line, the fore-wings with a similar but narrower band before the middle, the central area intersected by a white line, projecting in the middle, and marked with a white central lunule on the fore-wings; hind-wings entire. Expands about 1 inch. Inhabits some parts of Central Europe in May and June. The larva is yellowish-brown, with three light lines on the back and a black line on the sides. It feeds on bedstraw from July to September.

62. *L. Funerata* (Hübn.).—Smaller than *Tristata;* wings snow-white, with greyish-black markings, unmixed with brown or yellowish above; the white bands divided by a line instead of by dots. Border never interrupted, the subterminal line regular, continuous, and dentated on all the wings. Base tinged with ochreous below; fringes pure white, chequered with black, and the tip divided by an oblique dash, below which is a whitish spot. Inhabits the French Alps and Northern and Western Asia in July. (I suspect that this species is the same as *Subtristata*, Haw., in which case it is British.)

*63. *L. Hastata* (Linn.).—Wings black, with slightly interrupted white transverse lines, and a white band beyond the middle, the middle of which touches an oblique square spot formed by the irregular and macular subterminal line, and the black dots upon it are very indistinct; the base of the hind-wings is marked with only one white line. Expands from 1¼ to 1½ inches. Inhabits Northern and Central Europe, and Northern Asia and America, from May to July. The larva is brown, with a darker line on the back, and frequently with a row of yellow horseshoe-shaped spots on the sides. It feeds on birch in August. The moth is figured at Pl. 48, Fig. 8. (*L. Thulearia*, Herr.-Schäff., from Iceland, is of the size of *Hastata*, but the pattern is nearly that of *Subhastata;* the subterminal line is continuous, and forms no square white spot in the middle, as in *Hastata;* the pale central area is much narrower, waved, and intersected by a row of spots on the nervures, which are often connected. The linear markings are much more regular, and all the white portion is replaced by smoky-grey or violet. Head, palpi, and antennæ blackish, unmixed with white. The larva is uniform black, with the head and plate behind shining black, and the ends of the legs light brown.)

64. *L. Subhastata* (Nick.).—Generally rather smaller than *Hastata*, the black spaces of the wings with more distinct and connected white lines: that is, there is another white dentated line in the marginal area close behind the band, and there are two white lines on the basal half of the hind-wings, and also round white spots on the inside of the central area; the pattern, however, is very variable. It occurs in the mountains of North Europe and Silesia from May to July, and the larva feeds on *Vaccinium uliginosum.*


1.
2.
3a
3b
3c
4.
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6.
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8.
9a
9b
9c
10.
11.
12.
13a
13b
14a
14b
A.
B.
C.

M.—*Central area of the fore-wings very broad, and pure white; nervule* 5 *of the hind-wings rising from the hinder half of the discocellular nervule.*

*65. *L. Albicillata* (Linn.).—Wings white, varied with grey on the hind margin, with an indistinct white subterminal line, the base of the fore-wings and a large costal spot before the tip dark brown, and waved with violet-blue; the central area bordered behind by a scarcely double, dark brown, and slightly dentated line, dotted on the nervures. Expands about 1¼ inches. Inhabits Europe and Northern Asia from May to July. The larva is green, with triangular red spots on the back and a yellow stripe on the sides. It feeds on bramble in August and September. The moth and larva are figured at Pl. 50, Fig. 15, *a*, *b*.

N.—*Fore-wings with no central spot, the central area not darker than the rest of the wing, or only on the front edge and on the front half of the hinder edge; the subterminal line indistinct; hind-wings grey, with faint curved lines; nervule* 5 *rising from the hinder half of the discocellular nervule.*

*66. *L. Derivata* (W. V.).—Fore-wings pale grey, tinged with purplish; whitish in the central area, with a darker angulated transverse band, blackish in front, before the middle; the central area with a brown costal spot behind, from which a curved blackish stripe runs obliquely outwards nearly to the hind margin in nervule 4, and then turns inwards to the indistinct line bounding the central area; tip not divided. Expands from 1 to 1¼ inches. Inhabits Europe and the Altai in April and May. The larva is pale green, with a red stripe on the back of the first segments, and a reddish head. It feeds on rose in July. The transformations are figured at Pl. 48, Fig. 9, *a—c*. (*L. Alhambrata*, Staud., from Granada, has pale grey fore-wings, with a broad band near the base, convex and dark brown outside, and shaded with light grey inside; central area with no markings except a dark dot at the end of the cell; tip divided by a small black dash; hind-wings reddish-grey, with a fine black line parallel to the hind margin.)

*67. *L. Impluviata* (W. V.).—Fore-wings brownish-grey, the base and the inside of the central area ashy-grey, the base bounded by an oblique black line, and the pale part of the central area bordered on both sides by double dentated black lines, and with two rounded projections in the middle; the marginal area with dark dentated lines, and with black dashes below the tip. Expands from 1 to 1¼ inches. Inhabits Northern and Central Europe and Siberia in May. The larva is yellowish-grey, with bluish-green lines on the back and sides. It feeds on alder in September.

*68. *L. Literata* (Don.).—Fore-wings brownish-grey, with dark transverse lines in the basal area, and with a darker band before the subterminal line, with a black central spot, and the two double bands, the latter not paler, bordered by black lines, and divided by a broad brick-red line; there are also red transverse lines in the basal area and beyond the subterminal line; hind margin dotted with black, and the tip divided with dusky. Expands from 1¼ to 1½ inches. Inhabits Northern and Alpine Europe in May and June. The larva is dirty white or greyish, and rather hairy, and the pupa is shining black, and concealed under the bark of trees. The larva feeds on willow and sallow.

*69. *L. Sordidata* (Fabr.), *Elutata* (Hübn.).—Fore-wings dingy green, more or less varied with rusty-red, with several dark grey irregularly dentated or macular transverse stripes, the two last of which are more or less spotted with whitish; the subterminal line is black and zigzag, and the tip divided with black. Varieties occur in which the fore-wings are almost wholly dark grey, with pale costal spots. Expands about 1¼ inches. Common in Northern and Central Europe, and Northern Asia, in July and August. The larva is yellowish-grey, with three paler

lines on the back and a pale stripe on the sides, spotted with yellowish-red. It feeds on willow, alder, and bilberry, in May and June.

O.—*Fore-wings generally with dull markings; the central area not darker, or only slightly so, generally intersected with darker, and often indistinct, lines, and with rounded projections behind, unicolorous with the basal area, and bounded by two light and evenly-divided transverse bands, but the first is often very suffused and scarcely paler; the subterminal line consists of evenly-rounded curves, open towards the base, and often indistinct, not darkened in cells* 4 *and* 5, *or only slightly so; hind-wings pale grey, generally with the indistinct continuation of the second double band and the subterminal line, and the hind margin almost always marked with dark double dots. The antennæ of the males are simply ciliated, or shortly pectinated. The structure of the hind-wings differs in different species. In L. Adumbraria and Frustata the discocellular nervule is simply arched, and nervule* 5 *rises from its upper half. In most of the other species the discocellular is curved into an S-shape, and nervule* 5 *rises from the lower projecting part, nearer nervule* 4 *than nervule* 6, *and rarely in the middle between them.*

*70. *L. Didymata* (Linn.).—Fore-wings brownish-grey in the male, and pale grey in the female, varied with brownish, the central area bordered by distinct pale double stripes, with slight projections below the middle, and the subterminal line filled up with dark grey in cells 4 and 5; hind-wings pale grey, darker on the hind margin, with a double light suffused central band, and the antennæ of the male pectinated. Expands about 1 inch. Common in Northern and Central Europe in June and July. The larva is grey, with white lines on the back and sides; it feeds on bilberry and chervil in May and June.

*71. *L. Multistrigaria* (Haw.).—Fore-wings yellowish-grey, with light nervures dotted with black; the subterminal line scarcely filled up with darker in cells 4 and 5; hind-wings pale grey, and the antennæ of the male pectinated. Expands from 1 to 1¼ inches. Inhabits Western Europe in March and April. The larva is yellowish-white, with double lines on the back, and a black head. It feeds on bedstraw in May and June.

72. *L. Aquæata* (Hübn.).—Fore-wings smooth, shining, pale yellowish or yellowish-green, the double stripes whitish, the first indistinct, and the central area with two strong projections in the middle and one below the costa; hind-wings rather dark grey, and the antennæ of the male pectinated. Expands about 1¼ inches. It is found in the Alps and the mountains of Southern Germany in July and September.

73. *L. Nobiliaria* (Herr.-Schäff.).—Fore-wings smooth, shining, bluish-grey, the double stripes paler grey and very broad, the first often indistinct, the central area paler on the costa in the middle, and with no central dot; slightly curved, and regularly dentated behind, with no stronger projections; the subterminal line shaded with darker in front, and the hind margin without markings; hind-wings equally long on the costa and inner margin, with a light and simply-curved transverse stripe; the antennæ of the male simple. Expands about 1½ inches. Inhabits the Alps and the German and Norwegian mountains in July. (*L. Vallesiaria*, Lah., from Switzerland, is smaller than *Cæsiata;* the ground-colour is greyish-fulvous, and the central band and hind margin are dull brownish-red; the subterminal line is very indistinct, but the marginal row of double dashes forms a slender waved brown line; antennæ simple.)

74. *L. Austriacaria* (Herr.-Schäff.).—Fore-wings faintly shining, brownish-grey, the double stripes paler grey, broad and distinct; the central area paler on the costa in the middle, banded with darker on the sides, and intersected by one dull dark line in front, and behind by two; a black central dot and a triple projection in the middle; the subterminal line shaded with darker in front, and the hind margin long, and marked with double black dots;

hind-wings rather long, the costa longer than the inner margin, and the basal half almost rectangular; antennæ of the male pectinated. Expands about 1½ inches. It occurs in the Austrian Alps in June.

75. *L. Adumbraria* (Herr.-Schäff.).—Fore-wings pale grey, dusted with brown, the second double stripe whitish towards the costa, the central area with a dusky band behind, intersected by two darker lines, and projecting more strongly in the middle; the subterminal line suffused, and the hind margin marked with a row of double black dots; hind-wings with the costa and inner margin of equal length, with a light, simply curved transverse band; antennæ of the male not pectinated. Expands about 1½ inches. Inhabits Dalmatia and Armenia. The larva is believed to feed on *Pinus abies*.

76. *L. Incultaria* (Herr.-Schäff.).—Fore-wings with the tips pointed, uniform pale shining grey, with two broad whitish double stripes, the second with slight projections in the middle, the central area twice as broad on the costa as on the inner margin, and with large brownish-grey spots on both sides towards the costa; the subterminal line and the hind-wings whitish, the latter almost without markings, and the antennæ of the male not dentated. Expands about 1 inch. Inhabits the Alps and Galicia in July. The larva is green, and mines in the leaves of *Primula Auricula* among the rocks. (*L. Senectaria*, Herr.-Schäff., from Croatia, has yellowish-grey fore-wings, darker on the hind margin, with dark transverse stripes, the double stripes not lighter, and indistinct; hind-wings whitish. Expands about 1¼ inches. *L. Sandosaria*, Herr.-Schäff., from Andalusia, has the wings very slightly festooned, and bordered by double black oblong dots; fore-wings pale rose-colour, with the base and central area browner, the latter traversed by three lines, in addition to those bounding it, all of which are waved and dentated, and the space between the two first and the three last is dusted with grey, and marked with a central spot. The subterminal line is slender, pale, and dentated, and there are some traces of other lines. The hind-wings are rather greyer than the fore-wings, and marked with many parallel lines. It occurs in April.)

77. *L. Nebulata* (Tr.).—Fore-wings pale grey, the base and central area darker, the latter intersected by two darker lines; its hinder edge is marked with small dark spots on the nervures, and forms a triple pointed projection in the middle, and a bi-lobed projection between this and the costa; the double bands are whitish, the second suffused outside; hind-wings with the costa and inner margin of equal length, with the basal half darker, and forming almost a rectangle in the middle; nervule 5 rises from the hinder half of the discocellular nervule, and the antennæ of the male are not pectinated. Expands from 1¼ to 1½ inches. It is found in the Alps in July. (*L. Ibericata*, Staud., from Spain, is pale grey, dusted with brown, with the commencement of several pale brown lines on the costa of the fore-wings, only the intermediate ones extending to the inner margin; hind-wings with the nervures brown, and an angulated pale brown central shade. Expands about 1 inch.)

78. *L. Achromaria* (Lah.), *Saxicolata* (Led.).—Resembles *Nebulata*, but smaller; the projections of the central area are rather more pointed, and the dark dots on its hinder margin are less distinct; the discocellular nervule of the hind-wings is very slightly curved, and nervule 5 rises from the middle. Inhabits the Alps. (*L. Polata*, Hübn., from Lapland, Labrador, and Greenland, is intermediate between *Cæsiata* and *Austriacaria*, and may be recognised by its silky appearance, its dark shade, and the regularity of the pale band beyond the central area, which is darker, and very neatly intersected by transverse lines.)

*79. *L. Cæsiata* (W. V.).—Fore-wings bluish-ashy, sometimes slightly dusted with yellowish, with darker transverse lines; the central area brownish-grey, lighter on the costa in the

middle, and with nearly uniform rounded projections on each side, nowhere remarkably prominent; the double stripes distinct and pale grey, the subterminal line filled up with darker in cells 3 to 6; hind-wings with the costa considerably longer than the inner margin, pale grey, with the light band simply curved, and nervule 5 rising from the hinder half of the discocellular nervule; antennæ of the male not pectinated. Expands from 1¼ to 1½ inches. Inhabits the mountains of Northern and Central Europe, the Altai, and Labrador, from May to August. The larva is greyish-green, with triangular reddish spots on the back, bordered with black. It feeds on bilberry and heath in May and June.

*80. *L. Flavicinctata* (Hübn.).—Resembles *Cæsiata*, but the wings are more strongly dusted with golden-yellow, and the central area is of a more decided bluish-grey colour; the hind-wings are rounder, with the costa and inner margin of equal length, and nervule 5 rises more in the middle between nervules 4 and 6. Size of *Cæsiata*. It is found in the mountains of Northern and Central Europe in July. The larva closely resembles that of *Cæsiata*, but is of a duller green; it feeds on saxifrage in May.

81. *L. Infidaria* (Lah.).—Resembles the last two species, but more strongly dusted with golden-yellow, especially at the base, on the sides of the central area, and on the nervures in the marginal area; the projections of the central area are longer and more pointed, and the hind-wings resemble those of *Flavicinctata;* nervule 5 rises from the hinder half of the discocellular nervule. Size of *Cæsiata*. Inhabits the mountains of Central Europe in July.

82. *L. Cyanata* (Hübn.).—A narrow band at the base, and the central area of the fore-wings bluish-grey, a broad band before the middle, and the marginal area whitish, or more or less dusted with golden-yellow, the central area not sharply defined, with regular projections, and with no central spot; the double stripes and the subterminal line wholly suffused, and the marginal dots only distinct on the hind-wings, which are equally long on the costa and on the inner margin; nervule 5 rises from the hinder half of the discocellular nervule; antennæ of the male not pectinated. Expands about 1½ inches. Inhabits the Alps and the Riesengebirge in July. A scarce and rather variable species, but not difficult to recognise.

83. *L. Tophaceata* (W. V.).—Fore-wings ashy-grey, with the central area darker, especially on its hinder edge, where it is intersected by dark lines, and somewhat suffused with yellowish; there are two strong projections in the middle, above which it is more retracted than in the other species, and there are one or two slighter projections below the costa; the first double stripe is only distinct in front, and the second is whitish; the nervures in the marginal area are yellow, and the subterminal line is shaded with dusky on both sides above the middle and on the costa; hind-wings with the costa and inner margin of equal length, grey, with a light double stripe and subterminal line, the former forming a rectangle; the antennæ of the male are not pectinated. Expands from 1¼ to 1½ inches. Inhabits the mountains of South-Central Europe in July and August.

*84. *L. Salicata* (Hübn.).—Fore-wings dusted with bluish-grey, the base and sides of the central area darker, and varied with yellow, as are also the nervures in the marginal area; the central area is shaped as in *Nebulata*, but has no dark spots on the border; the double stripes and subterminal line are indistinct and a little lighter than the ground-colour; the hind-wings are of equal length on the costa and inner margin, grey, with the double stripe beyond the middle rectangular, but indistinct; the antennæ of the male are pectinated. (A variable species; variety *Podevinaria*, Herr.-Schäff., is not dusted with yellow.) Expands from 1 to 1¼ inches. Inhabits the mountains of Southern and Central Europe and Syria in May and June. The larva is flesh-coloured, with the lines edged with reddish, and a row of brown or rosy spots

on the back. It feeds on bedstraw, and forms its pupa on the surface of the ground, in a firm cocoon.

85. *L. Disjunctaria* (Lah.), from Sicily and South Spain, differs from *Rivata* by its pectinated antennæ; the central band is larger and darker than in *Fluctuata;* entire, and very little suffused behind, where it forms two distinct angles, and two excavations.

86. *L. Frigidaria* (Guén.).—Wings narrow and rather silky, smoky-brown, fringes unicolorous and scarcely spotted; fore-wings with the tip rather long, and obliquely contracted at the hind margin, dusted with yellowish-grey atoms, covering the base and disc, leaving only the central area brown, which is rather narrow, and composed of four contiguous annular spots; the first is largest, having all the costa and the discoidal spot dark; it is followed by a short dentated line. Hind-wings narrow and rather lighter, with the central line dentated, but not angulated, close to the discoidal spot below. Inhabits Lapland.

87. *L. Alfacaria* (Staud.) has dirty grey fore-wings, with paler waved bands, central area scarcely darker, hind-wings unicolorous, with a brown dot at the end of the cell, indistinct above; antennæ pectinated in the male. It occurs in the mountains of Andalusia in July and August.

88. *L. Tempestaria* (Herr.-Schäff.).—Fore-wings brownish-grey, with two broad ill-defined pale grey double stripes, which are not divided, and another towards the base, the central area paler in the middle below the costa, and the subterminal line only visible before the tip; hind-wings a little lighter, with a broad pale curved stripe, and the hind margin without markings. Expands about 1¾ inches. From the Tyrolese Alps.

89. *L. Frustata* (Tr.).—Fore-wings pale grey, varied with yellowish-green, especially on the sides of the central area, and dusted with blackish; the central area with a tri-lobed projection in the middle, and a bi-lobed one beneath it, the double stripes a little lighter, the subterminal line filled up with dark grey above the middle, and broken into spots below; hind-wings rounded, dusted with grey, with the double stripe simply curved, and nervules 5 and 6 rising near together; antennæ of the male not pectinated. Expands about 1¼ inches. Inhabits South-Central and Southern Europe and Western Asia from May to July, but not very common. Its green colour is very liable to fade to yellowish. (*L. Cuprearia*, Herr.-Schäff., from Sicily, is smaller than *Badiaria;* the fore-wings are of a nearly uniform ferruginous, the tip is divided by a dark dash, and the hind-wings are paler. *L. Ludificata*, Staud., from Greece, is greyish, varied with yellow, with many dark waved lines and black marginal dots; hind-wings whiter at the base, and the antennæ simple. *L. Uniformata*, Chav., from Catalonia, much resembles this, but has a black marginal line formed of connected lunules, within which is a zigzag whitish line, which is represented by a row of spots in *Ludificata.*)

P.—*Fore-wings with a very long oblique hind margin, the central area not darker, and both edges almost straight, the subterminal line only indicated by dark shading, the tip divided with dusky, and the hind margin marked with black double dots; nervule* 5 *on the hind-wings rising from the hinder half of the discocellular nervule.*

90. *L. Verberata* (Scop.), *Rupestrata* (Hübn.).—Fore-wings whitish, finely dusted with brown, with very slightly waved, rusty-brown transverse lines, most numerous at the base and before the subterminal line; hind-wings dirty white, with a darker curved line before the hind margin. Expands about 1¼ inches. Inhabits the mountains of South-Central Europe in July. The larva is dark green, with yellow lines on the back and sides. It feeds on fir in May and June.

91. *L. Vespertaria* (W. V.).—Fore-wings whitish, thinly dusted with brown; darker before

the hind margin, with two straight dark brown stripes bordered behind with rusty-brown, and indistinct dark transverse lines; hind-wings pale grey, dusted with darker on the hind margin. Expands about 1¼ inches. Widely distributed in Northern and Central Europe from July to September.

Q.—*Fore-wings broad, brown or grey, indistinctly waved with darker; the central area bordered behind only by a white and evenly-divided band, which is irregular and strongly dentated towards the base, with a strong projection in cells* 2 *or* 3 *and below the costa; the front transverse stripe scarcely indicated, the subterminal line pure white and strongly zigzag on the costa, beneath which it is duller and dentated; the tip indistinctly, if at all, divided; the marginal line interrupted on and often between the nervures; hind-wings paler, with a light double stripe, and nervule* 5 *rising from the hinder half of the discocellular nervule.*

*92. *L. Fumosata* (Hein.), *Turbaria* (Steph.).—Fore-wings dark rusty-brown, the double band broad, more or less suffused with brownish in the hinder half, especially in the male, the central area with a strong and sometimes divided projection in cell 2; hind-wings broadly whitish in the middle, and brownish at the base and hind margin, the two shades not sharply separated. Expands from 1 to 1¼ inches. Inhabits Northern and North-Central Europe in June and July.

*93. *L. Affinitata* (Steph.).—Resembles *Fumosata*, but the double white band of the fore-wings is narrower, and pure white only in the basal half; hind-wings darker brownish-grey, with a rather lighter and distinctly defined double band beyond the middle. Size of *Fumosata*. Inhabits Northern and Central Europe from May to July. The larva is dirty white, with a black head and plate behind. It feeds in the seed-capsules of *Lychnis* from July to September.

*94. *L. Alchemillata* (Linn.).—Fore-wings pale rusty-brown, with two white divided spots on the inner margin, at the base and before the middle, the double band narrow, pure white, and sharply divided, the central area with narrow projections in cells 2 and 3, which form a stronger and often separated spot in cell 3, the subterminal line with blackish streaks behind, between the nervures; hind-wings as in *Affinitata*, but with a narrower double band. Expands about three-quarters of an inch. Common in Europe and Northern and Western Asia in June and July. The larva is yellowish-green, with two reddish lines on the back, and a dark brown head and anal fold; it feeds on the flowers and seeds of *Galeopsis tetrahit*, dead-nettle, &c., in August and September.

95. *L. Hydrata* (Tr.).—Fore-wings brownish-grey, indistinctly waved with darker, the central area projecting in cell 2, the double band whitish on the front half only, the tip divided by a rather conspicuous dash; and the hind-wings pale grey, with the transverse band entirely suffused. Expands about three-quarters of an inch. Inhabits the south of Central Europe in May and June. The larva is thick and worm-like, pale reddish-yellow, with a slight line on the back, brick-red subdorsal stripes, and a reddish stripe on the sides; the head, a plate behind, and the anal fold brown. It feeds in the capsules of *Silene nutans* in July. (*L. Lugdunaria*, Herr.-Schäff., from France and Hungary, has greenish-brown fore-wings, with white dots on the nervures, a white subapical spot, and the upper half of the second line edged outside with white. There are two black transverse lines nearer the base, and many short black dashes on the costa. Hind-wings dark brown, with a pale central line.)

R.—*Small and delicate moths; fore-wings with the central area a little darker, and edged on both sides by a light band divided with dusky, and more or less projecting in the middle behind; the subterminal line dentated, equally light everywhere, and scarcely or not at all filled up with darker in cells* 4 *and* 5, *and the tip not divided with dusky, or only slightly so; hind-wings paler, with*

a light suffused double band, and with nervule 5 *rising from the hinder half of the discocellular nervule.*

*96. *L. Decolorata* (Hübn.).—Fore-wings pale brownish-yellow, waved with rusty-brown, the central area with two large rusty-brown projections in cells 2 and 3, the second double stripe white in its broad front half, almost interrupted, and with the narrower hinder half yellowish; the subterminal line shaded with rusty-brown in front, and the hind-wings whitish, and suffused with yellowish towards the hind margin. Expands from 1 to 1¼ inches. Common in Europe and the Altai in June and July. The larva feeds in the seed-capsules of the red campion from July to September.

*97. *L. Albulata* (Steph.).—Fore-wings pale greyish-yellow (grey in variety *Griseata*, Staud.), waved with dusky, the double stripes white and equally divided, the central area with a slight double projection in the middle, and with no central dot; the subterminal line white and shortly dentated; hind-wings whitish, with the hind margin grey. Expands about three-quarters of an inch. Common in Europe in June. The larva is thick, whitish-green, with dark green stripes on the back and sides. It feeds in the seed-capsules of *Rhinanthus* from July to September.

*98. *L. Blandiata* (W. V.).—Fore-wings grey, the central area blackish, at least on the costa, with a black central dot, and a slight double projection in the middle, bounded by two broad and equally divided white bands; the subterminal line white, dentated, and spotted with blackish behind in cells 5 and 6; hind-wings clouded with grey, and with the hind margin darker. Expands about three-quarters of an inch. Common in Northern and Central Europe in May and June. The larva is thick, green, with dark red triangular spots on the back, and a yellowish-green stripe on the sides. It feeds on *Euphrasia officinalis* in September.

*99. *L. Minorata* (Tr.).—Resembles *Blandiata*, but the double stripes are not so broad, and the front half of the second stripe is narrower and pure white, and the hinder half is somewhat clouded; the central and marginal areas are varied with dark grey, the central dot is surrounded with whitish, and the hind-wings are pale grey. Expands from one-half to three-quarters of an inch. Inhabits mountainous districts in Northern and Central Europe in June and July, flying by day.

*100. *L. Unifasciata* (Haw.).—Fore-wings fawn-coloured in the basal area and before the subterminal line; brownish-grey before the hind margin, and the central area dark greyish-brown, with a moderate projection in the middle; the two double bands unequally divided, and always composed of a white line in the central area, and a broader pale reddish-grey stripe; the subterminal line spotted with white behind below the costa, and the hind-wings grey. Expands about three-quarters of an inch. Local in Central Europe from June to August. The larva is short, clay-coloured, with interrupted brown lines on the back, and a continuous whitish line on the sides. It feeds on *Odontites lutea* in October, and constructs a small solid cocoon, in which it is said to remain for two years before the moth emerges.

GENUS XVI.—OPORABIA (STEPH.).

Wings delicate, fore-wings broad, with the hind margin long, shorter in the female, pale, with dark waved transverse lines, hind-wings paler, and with fewer markings, antennæ of the male ciliated.

*1. *O. Dilutata* (W. V.).—Fore-wings pale grey, more or less dusted with darker, and occasionally dark brown (variety *Obscurata*, Staud.), with dark and much-waved transverse lines;

the central area with brownish bands on the sides, and bordered on both sides by a light and equally-divided band; the median nervure and nervules 3 and 4 blackish on the sides of the central area; hind-wings whitish, with two dark waved lines beyond the middle. Pale and indistinctly-marked specimens belong to the variety *Autumnata* (Guén.). Expands from 1¼ to 1½ inches. Inhabits Northern and Central Europe from August to April. The larva is grass-green, yellowish in the incisions, with extremely fine whitish longitudinal lines, and often with a reddish line on the back. It feeds on trees in May. The moth and larva are figured at Pl. 48, Fig. 13, *a*, *b*. *(*O. Filigrammaria*, Herr.-Schäff., from the north of England and Scotland, is a species with narrower and more pointed wings, and with rather more distinct markings. It is much smaller than *O. Dilutata*, expanding from 1 to 1¼ inches, and is found among heath, on which the larva feeds, in August and September.)

GENUS XVII.—CHEIMATOBIA (STEPH.).

Allied to *Oporobia*, but the female has rudimentary wings. The larvæ are without protuberances, and are marked with pale longitudinal lines.

*1. *C. Brumata* (Linn.), (*Winter Moth*).—Fore-wings of the male reddish-grey, with indistinct dark wavy lines; hind-wings paler, with an indistinct central stripe passing across the end of the discoidal cell. Expands from 1 to 1¼ inches. The fore-wings of the female are one-quarter as long as the body, brownish-grey, with two dark transverse stripes. Common on hedges and bushes in Central Europe from October to December. The larva is green, with three white longitudinal lines on each side. It feeds on trees in May, and is often sufficiently abundant to be very injurious in orchards. The sexes are figured at Pl. 48, Fig. 14, *a*, *b*.

*2. *C. Boreata* (Hübn.).—Very like *Brumata*, but the fore-wings are pale grey, tinged with brownish-yellow, and the hind-wings are whitish, with the central stripe running beyond the discoidal cell; in the female the fore-wings are a little longer than the thorax, yellowish-grey, with a dark transverse stripe. Common in woods in Central Europe in October and November. The larva may be known from that of *Brumata* by its black head. It feeds on various trees, especially birch, sallow, and larch, in May and June. (*Thysanodes Phryganea*, Ramb., described from a single male from Touraine, resembles *Cheimatobia Brumata*, but the wings, especially the hind-wings, are much narrower, and uniform reddish-brown, paler on the disc and at the base of the hind-wings, with a slight golden reflection; the body is slender, and the abdomen is yellowish at the tip. Expands about 1¼ inches. *Malacodea Regelaria*, Tengstr., is another little-known genus and species from Lapland, which differs from *Cheimatobia* by the very large median cell of all the wings; the accessory cell on nervure 11 is long, and divided in the middle; the moth is grey, and resembles *Lobophora Carpinata*, Borkh., but is darker and more slender.)

GENUS XVIII.—SPARTA (STAUD.).

Antennæ strongly pectinated in the male and simple in the female; fore-wings triangular and very broad; hind-wings very narrow, and not much more than half the length of the fore-wings, with no frenulum in either sex, and with a horny semi-circular appendage at the base of the inner margin in the male. The only species, *S. Paradoxaria* (Staud.), is coppery-green, with costa of fore-wings, and hind-wings, yellowish, and the latter whitish towards the base. Inhabits Greece and Sicily in June and July. It is figured at Pl. 59, Fig. 6.

GENUS XIX.—HYDRELIA (HÜBN.).

Small moths, with white or yellowish wings, with dark transverse lines, which are generally dentated; hind-wings like the fore-wings in colour and markings, but with fewer transverse lines. The antennæ are pectinated in the male of *Cambrica*, and simple in the other species, and the larvæ are without protuberances.

*1. *H. Cambrica* (Curt.).—Fore-wings pale grey, with waved brownish transverse lines, and the last but one in the central area conspicuously dark brown; nervures 3, 4, and 6 are likewise dark brown in the central area, and intersect the following broader stripe; the subterminal line is bordered by two waved brownish stripes, and the light band before it is not divided by a dark line; hind-wings rounded, whitish, with a darker and more simple central line, and the continuation of the subterminal line close to the hind margin; the latter is marked with dark lunules. Expands from 1 to 1¼ inches. Inhabits Northern and Alpine Europe and the Altai in June and July.

*2. *H. Blomeri* (Curt.).—Fore-wings bluish-grey, with a broad rusty-brown band below the costa beyond the middle, extending half across the wings, and with a dark central lunule and dark waved transverse lines, the central area lighter, and with fewer markings, and with two sharp teeth projecting below the middle; hind-wings waved with dusky. Expands about three-quarters of an inch. Inhabits the north of Central Europe in June and July, but is very scarce, except in England. The larva is light greenish-yellow, with a brown band on the back of segments 2—4, a reddish-brown band on the sides of segments 7 and 8, and a red mark on the back of segment 12. It feeds on elm in September.

*3. *H. Sylvata* (W. V.).—Fore-wings whitish, with transverse lines dusted with grey, and two rusty-yellow suffused transverse stripes on the sides of the central area, and the light band beyond the last transverse stripe unequally divided, the subterminal line bordered by two dark waved lines; hind-wings slightly angulated, also with dark transverse lines; hind margin with dark lunules. Expands from ¾ to 1 inch. Inhabits Central Europe from May to July. The larva is lilac, green on the sides of the first and last segments, the other segments marked with white spots dotted inside with black, and with white oblique dashes. It feeds on alder in August.

*4. *H. Candidata* (W. V.), (*Small White Wave*).—White, with many waved brownish-yellow transverse lines and a blackish central dot, which is inconspicuous on the hind-wings; hind margin finely dotted with black. Expands about three-quarters of an inch. Common in Europe and Armenia in May and June. The larva is pale green, with a red line on the back of the first and last segments, and red spots on the sides of the middle ones. It feeds on beech and hornbeam in August and September. (*H. Nymphulata*, Guén., from Andalusia, is much larger (expands over 1 inch), with six very pale brown lines on the fore-wings and five on the hind-wings, which are parallel and but slightly waved.)

*5. *H. Luteata* (W. V.), (*Small Yellow Wave*).—Wings ochre-yellow, with dark brown central dots, the fore-wings with six waved ochreous-brown transverse lines, some of which are double, and the hind-wings with three; all the fringes with a dark spot in the middle, extending to the outermost line. Size of *Candidata*. Common in Europe and Northern Asia in May and June. The larva is pale yellowish-brown, with five darker brown longitudinal lines.

*6. *H. Obliterata* (Hufn.), *Heparata* (W. V.).—Wings thickly dusted with ochreous-brown, the fore-wings pale ochreous-yellow on the costa, with three straight and often indistinct

transverse lines dusted with darker; fringes pale ochre-yellow, spotted with dark brown. Expands from ¾ to 1 inch. Common in Europe from May to July. The larva is green, with a yellow line on the back and a yellow stripe on the sides. It feeds on birch and alder in August and September.

GENUS XX.—EUPITHECIA (CURT.).

Small and delicate moths; fore-wings with the costa rather long, and the hind and inner margins of equal length. They are generally grey or brownish, and occasionally white, with dark waved transverse lines, of which three double bands or double stripes generally enclose and intersect a light band before and behind the central area, and two or three more placed close together intersect the central area itself. The subterminal line is generally light, often dentated, and thicker below the costa; in many species it is expanded into a spot above the hinder angle. The hind-wings are generally lighter than the fore-wings, with the outer double band and the subterminal line more or less distinct. The antennæ are only distinctly ciliated in the males of a few species. The larvæ are usually slender, though sometimes thick, with raised angles on the sides. Most of them feed on flowers and seeds, especially on *Compositæ*, in autumn, though some feed in spring. They construct their pupæ in or on the ground in a cocoon. The species are generally called "Pugs" by British collectors. They are small and inconspicuous insects, and many of them are very difficult to determine. Several entomologists have lately paid special attention to this group, both in England, France, and Germany, and new species are being described every year, though it is doubtful whether all the reputed species are truly distinct; for while many of the moths are wonderfully similar, the larvæ of the same species often differ very much in colour and markings, and feed on a great variety of plants.

1. *E. Magnata* (Mill.).—Wings very long, pointed at the tips, clouded with grey, finely speckled with black, very slightly washed with orange, and traversed by several whitish and strongly-dentated lines. Fore-wings with the costa nearly straight; the central spot black, oval, and very large, and surrounded by four white dots; on the hind-wings it is very small. Fringes preceded by blackish lunules, and marked with black dots between the nervures. On the under side the markings are less distinct. Expands nearly 1½ inches. Occurs at Celerina, in Switzerland, in July. (*E. Fenestrata*, Mill., is nearly white, the transverse lines very fine, interrupted, reddish-grey, and a little more distinct on the fore-wings than on the hind-wings. The second line is rounded on all the wings. Fringes very long and satiny-white. Under side pale grey, with the dark grey lines more distinct than above, and the central dots, which are invisible above, just perceptible. Expands about 1¼ inches. It is found on the Italian frontier of France in August.)

* 2. *E. Centaureata* (W. V.).—Fore-wings white, suffused with brownish in the marginal area, with a large black central lunule, and a dark grey costal spot beyond it; the central area bounded on each side by a finely-dentated black line; the subterminal line white and zigzag, and the hind-wings whitish. The costa of the fore-wings and all the inner margins are spotted with dusky. Expands nearly 1 inch. Common in Europe and Northern and Western Asia in June and July. The larva is white or yellowish, with a blood-red stripe on the back, connected with red curves, open in front. It feeds on the flowers of various *Compositæ* in September.

3. *E. Gratiosata* (Herr.-Schäff.).—Larger than *Centaureata;* snow-white, the fringes darker on the nervures, the subterminal line narrowly bordered with dusky outside, and broadly inside, and expanded into a white spot at the tip. The basal and central areas are cherry-coloured towards

the costa, and the latter is leaden-grey towards the inner margin. The first double line forms sharp angles outwards on nervule 1, in cell 1*b*, and in the discoidal cell, and the second is angulated inwards on nervule 1, and on the median nervure, and is marked with black dots on the nervures towards the base, and two parallel dark lines. The hind-wings are banded with grey towards the inner margin, and the first four bands are equally distant from each other. Inhabits Sardinia and Western Asia.

4. *E. Gueneata* (Mill.).—Shape of *Centaureata;* fore-wings rather more pointed, brick-red, and traversed by a broad brown band, edged with lighter outside. The second line always forms a very acute angle outwards. Hind margin slightly smoky on the third nervure and on the whole inner margin. There is a large black central spot, and the black dashes before the fringes are preceded by four or five black dots, placed between the middle nervures of the wing; hind-wings short and grey, slightly tinged with flesh-colour on the hind margin, and traversed by several waved and slightly marked lines; central dot very small, head and thorax flesh-coloured. Abdomen brown in front and flesh-coloured behind. Rather larger than *Centaureata.* Inhabits Ardèche in August.

5. *E. Breviculata* (Donz.).—Wings rounded, rather broad, and white; fore-wings with a rusty-yellow spot at the base, expanded on the costa, traversed by two whitish lines, and marked with some black dots; a large square brown spot at the tip, traversed by the white dentated subterminal line. The second line is double, grey, much waved, and runs to the hinder angle, near a small brown spot. The central dot is small, black, and placed near the basal spot. Fringes brown along the apical spot, and white elsewhere; hind-wings with several interrupted grey lines. It inhabits South Europe and Western Asia, and the larva is supposed to feed on *Clematis.*

6. *E. Extremata* (Fabr.).—Fore-wings yellowish-white, grey at the base of the costa, with a small black central dash and a grey band before the middle, varied with rusty-brown behind, and intersected by a whitish and strongly-dentated double stripe; the second double stripe pure white, distinctly double on the costa, and bordered outside with dark grey; below this it is single, and is connected in the middle with the fine zigzag subterminal line; hind-wings whitish, with the hind margin grey. Expands nearly 1 inch. A very rare species, inhabiting South Germany and Austria. (*E. Glaucomictata,* Mab. (*Extremata,* Guén.), from Corsica and Western Asia, is shaped like *Venosata,* but is smaller, expanding only three-quarters of an inch. The wings are white, more or less washed with pale flesh-colour; the fringes chequered and clouded with darker brown. Fore-wings with the basal area edged by an oblique, waved, well-marked line, connected with a black triangular spot on the costa by an oblique clay-coloured streak, and the middle of the wing varied with white and bluish. The central streak is narrow, but well marked; the elbowed line is fine, marked with dots on the nervures, and followed by a large greyish-blue spot on the costa. There is a subterminal clay-coloured band, not extending to the hind margin. Hind-wings with a greyish-blue basal spot, a small central dot, and the extremity washed with grey; divided by white lines, which are most distinct at the anal angle. Abdomen dark greyish-blue, with the tip white. *E. Pantellaria,* Mill., is of the size and shape of *Glaucomictata,* but the fore-wings are nearly black, traversed by three broad, white, continuous waved lines. There is a large whitish spot bordered with black on the inside of the second line, representing the central spot. Hind-wings blackish, with a central white line; fringes concolorous, preceded by some pale arrow-headed spots. Inhabits the island of Pantellaria in May.)

* 7. *E. Irriguata* (Hübn.).—Fore-wings long and pointed, dirty white, brownish-grey at

the base and on the costa; central dot black and rather long, nervures yellowish, the transverse lines generally quite indistinct, the subterminal line white, zigzag, and spotted with brownish-grey on both sides above the hinder angle; hind-wings whitish. Expands about three-quarters of an inch. Inhabits Central and Southern Europe in April and May. The larva is very slender, cylindrical, and yellowish-green or bluish-green, with a double row of red triangular spots on the back. It feeds on oak, and more rarely on beech, in May and June.

* 8. *E. Insigniata* (Hübn.).—Fore-wings pale ashy-grey, with a large black central streak, and four large dark brown costal spots, the first of which is continued in a band nearly as far as the inner margin; and with three transverse bands, which are a little lighter, and finely edged with dusky. The first and third band are also finely divided with dusky, and the subterminal line is absent. Hind-wings paler grey, traversed by two double waved reddish lines. Expands nearly 1 inch. Inhabits Central and Southern Europe in April and May. The larva is green, with red spots on the back and a yellow stripe on the sides. It lives on fruit-trees, such as sloe, cherry, and apple, in June. (*E. Carpophagata*, Ramb., from Andalusia, is grey, fore-wings with six black spots on the costa; from the four inner ones run black lines, the third and fourth curved outwards, spotted on the nervures and continued on the hind-wings; the two basal ones are not continued. Hind-wings with two slender basal lines, continued on the inner margin of the fore-wings between the two basal lines; a dash at the end of the cell, and a slender line between the two outer lines; all the fringes spotted with black.)

* 9. *E. Venosata* (Fabr.).—Fore-wings reddish ashy-grey, with two waved whitish transverse bands, bordered by black transverse lines, and intersected by a fine black line, and also with two black transverse lines, one near the base and the other in the middle; the subterminal line is absent, but the nervures on the hind margin are black; hind-wings paler, with the markings less distinct. Palpi only half as long as the head. Expands from ¾ to 1 inch. Common in a great part of Europe and Western Asia in May and June. The larva is greenish, with a brown stripe on the back, and a black head. It feeds in the seed-capsules of *Silene* and *Lychnis* in July.

10. *E. Silenicolata* (Mab.).—Smaller than *Venosata;* iron-grey, with the markings much less distinct; the submarginal band is scarcely dentated on the upper part, and has only one long tooth on the lower part, on the branches of the submedian nervure. Palpi black, very pointed, and as long as the head. It occurs in Corsica in May and June. Larva white or greenish, with five reddish lines. The larva feeds on *Silene paradoxa* in June and July.

11. *E. Alliaria* (Staud.).—Rather dark grey, sometimes with a very slight violet shade; fore-wings with many fine black transverse lines, and sometimes with a black central dot; the subterminal line white, zigzag, and more distinct; hind-wings grey, with darker lines towards the inner and hind margins. Inhabits Hungary in June and July. The larva is whitish, with a yellow head, and feeds on the seeds of *Allium flavum* in August and September. (Quoted by Steudel as the same as *Egenaria*, No. 52.)

* 12. *E. Subnotata* (Hübn.). — Fore-wings broad, pale greyish ochre-yellow, indistinctly waved with dusky, and with a dull brown central spot, the double bands indistinct, and whitish on the costa, the first strongly angulated and the second nearly straight; the subterminal line uniformly pale, bordered with grey behind, and slightly so in front, rather strongly angulated below the middle, and angulated above the hinder angle; hind-wings pale grey, darker on the hind margin. Expands nearly 1 inch. Inhabits Central Europe in June and July. The larva is green, with dark lozenge-shaped spots on the back, and a dark green line on the sides. It feeds on the seeds of *Chenopodium* from August to November.

*13. *E. Linariata* (W. V.).—Fore-wings ochreous, varied with rusty-brown bands in the basal area and in the front half of the marginal area; the central area, which is bordered by two single lines, and the space beyond the subterminal line, are dark grey; the subterminal line is whitish and slightly zigzag, shaded with blackish above the hinder angle and on both sides in the middle; hind-wings grey. Expands about three-quarters of an inch. Common in Central and Southern Europe in June and July. The larva is green, frequently marked with brown zigzag oblique dashes. It feeds on the flowers and seeds of the toadflax in September and October. (A larger and darker variety, *Digitaliaria*, Dietze, proceeds from a pale yellowish or bluish-green larva almost without markings, which feeds on the flowers of *Digitalis ambigua* in June and July. The moth appears in the Odenwald in May. It is, perhaps, identical with the following.)

14. *E. Pyreneata* (Mab.).—Intermediate between *Linariata* and *Pulchellata*, but darker; the terminal shade not interrupted, the brownish band more distinct and better marked, the central band broader, bluish-black, and traversed by a waved black shade; hind-wings smoky-black, with black fringes, never white. Found in the Pyrenees in June. The larva is slender, dirty green, with a dark green line on the back, black subdorsal lines, shaded below with pure green, and a white line on the sides, edged with black above; head paler green. It feeds on *Digitalis lutea* in July.

*15. *E. Pulchellata* (Steph.).—Very like *Linariata*, but rather larger; the colours paler, the basal area and the front of the marginal area pale yellow, and the bands dirty brown, those in the basal area blackish on the costa; the central area with a more distinct white line beyond the central spot, and its hinder edge more strongly curved below the costa. Inhabits Central and Western Europe in May and June. The larva is dull or bright yellowish-green, pale primrose, or red, sometimes with darker lines on the back. It feeds on *Digitalis purpurea* in September.

16. *E. Laquæaria* (Herr.-Schäff.).—Fore-wings short, brownish-grey, slightly varied with yellowish, with a small black central spot; the double stripes indistinct, the first curved, and bordered with darker grey bands on each side, the second broader on the costa, and edged by dark spots; the subterminal line suffused, and shaded with dusky above the hinder angle, and above the middle on both sides; hind-wings narrow, truncated, and pale grey; the antennæ of the male distinctly ciliated. Expands about three-quarters of an inch. Inhabits Central and South-Western Europe in July and August. The larva is green or yellowish-green, with a dark green line on the back. It feeds on the flowers of *Odontites lutea* in August and September. (*E. Luteostrigata*, Staud., is whitish, with ochre-yellow transverse lines or bands on all the wings, and a large black central lunule on the fore-wings. The broad yellow basal and marginal bands are most distinct; the two central lines, between which the lunule stands, are much less so. The latter are blackish close to the costa, and there is also a black dash on the costa close to the base. Hind-wings with the basal band absent and the central lunule much fainter. Under side unicolorous dirty white, with the central spots and the outer band showing very faintly through. Expands about half an inch. Inhabits Sicily in May.)

*17. *E. Pusillata* (W. V.).—Fore-wings rather pointed, bone-coloured, dusted with grey; brownish-grey in the marginal area, with a black central spot and dark costal spots, the double stripes narrow, the first slightly curved below the costa, and the space between it and the middle stripe forming a grey band; the subterminal line whitish, paler in the middle; and the hind-wings truncated, whitish, with the hind margin grey. Expands about three-quarters of an inch. Common in many parts of Europe in May. The larva is green, with dark longitudinal lines. It feeds on fir in July.

18. *E. Abietaria* (Goeze), *Strobilata* (Borkh.).—Fore-wings with the tips rounded, pale

grey, a dull rust-coloured band at the end of the basal area and before the subterminal line; a very large black central spot, and two rather indistinct double stripes, the second obtusely angulated in the middle and below the costa, and marked with black spots in front; the subterminal line zigzag, and bordered behind with grey; hind-wings similar to the fore-wings, but less distinctly marked, and slightly angulated in the middle of the hind margin; palpi very long, extending beyond the head for more than its length. Expands about three-quarters of an inch. Inhabits Northern and Central Europe (except Britain) in May and June. The larva is reddish-brown, dotted with darker, and pale green on the belly. It has fully-developed prolegs, and creeps instead of looping. It feeds on fir-cones in July and August.

*19. *E. Togata* (Hübn.).—Very like the last species, but larger (expands about 1 inch); the tips of the fore-wings more pointed, the central spot still larger, and the red bands brighter coloured; hind-wings more distinctly marked. Most readily distinguished by its much shorter palpi, which are only a little longer than the head. A scarce species, found in fir-woods in Northern and Central Europe. It appears at the same season as *Strobilata*, which its larva also resembles in appearance and habits.

*20. *E. Coronata* (Hübn.).—Fore-wings dull yellowish-green, with no central spot; the central area blackish, varied with grey, especially on the sides, below the costa, where it projects outwards in a conspicuous angle; only one-half of the two double stripes is visible as a white line, and the subterminal line is entirely suffused. Expands three-quarters of an inch, or under. Local and rather scarce in Central and Southern Europe in May and June. The larva is green, with triangular reddish-brown spots on the back and a yellowish stripe on the sides. It feeds on *Clematis*, *Lythrum salicaria*, *Eupatorium cannabinum*, &c., in August and September.

*21. *E. Rectangulata* (Linn.).—Wings broad, rounded, green, with dark transverse lines, the fore-wings varied with grey in the central area, with a black central spot, the second double stripe and the subterminal line pale green, the former angulated in the middle of all the wings, and the latter dentated and shaded with grey. It is very variable, and is sometimes almost entirely grey (variety *Subærata*, Hübn.), brownish-grey, with a darker central band (variety *Cydoniata*, Borkh.), or blackish, with the subterminal line green and dentated (variety *Nigrosericeata*, Haw.). Expands three-quarters of an inch or more. Common in Europe in June and July. The larva is green, with a red stripe on the back and a yellowish line on the sides. It feeds on apple-blossom in May, and is often very destructive. The moth is figured at Pl. 47, Fig. 16.

22. *E. Chloerata* (Mab.).—Wings rounded, smoky-brown, with all the markings bluish-green; central area blackish, often darker than the ground-colour, and the band beyond it very distinct on all the wings, broader, and never obliterated below the middle of the fore-wings, and preceded by black arrow-headed spots; central dot of the fore-wings large, oblong, black, and connected with a square black spot on the costa. Size and shape of *Coronata*. Inhabits France and Germany in June and July. The larva is pale yellow or greenish, with a rosy line on the back, a rosy spot on the side of each segment, and the front segments entirely rosy. Head pale brown. It feeds on sloe in May.

23. *E. Debiliata* (Hübn.).—Allied to *Rectangulata*, paler green, and less grey in the central area, the double stripes less distinct, and the second less angulated on the fore-wings; the central area bordered by black spots on the nervures instead of by a dark line, and the subterminal line more strongly zigzag. Expands about three-quarters of an inch. Rather scarce and local in Northern and Central Europe in June. The larva is green, with a dark stripe on the back finely bordered with white, and a white stripe on the sides. It lives between united leaves of bilberry in May.

*24. *E. Scabiosata* (Borkh.), *Piperata* (Steph.).—Fore-wings moderately broad, with the tips rounded; whitish, dark grey on the costa and in the marginal area, with yellowish nervures, and a small and indistinct central dot, the double stripes bordered and intersected by sharply defined grey lines, the second forming an angle inside, below the costa, the subterminal line finely white, evenly and strongly dentated; hind-wings white, waved with grey. Expands a little over three-quarters of an inch. Local in Central Europe and the Altai in May and June. The larva is green, varied with reddish, with an indistinctly darker line on the back, and fine subdorsal lines. It feeds on the petals and stamens of a great variety of wild flowers, in August and September.

25. *E. Denticulata* (Freyer).—Fore-wings broad and pointed, yellowish-white, with the basal area, the costa, and the narrow marginal area bluish-grey; a black central dot; the tip divided by a whitish dash, and the double stripes (except the middle one) intersected by brownish-yellow and sometimes very dull lines, the second interrupted below the costa, and with a small black tooth in front; the subterminal line obtusely zigzag, and the hind-wings whitish, with grey transverse lines. Expands nearly 1 inch. Inhabits South-West Germany, and Austria, in May and June. Larva brownish-yellow, with three darker lines on the back and the intermediate space clouded, and with a fine dark longitudinal line on the sides, marked with a conspicuous black dot in the middle of each segment. It feeds on the flowers of *Ononis repens*, and in the seed-capsules of *Campanula rotundifolia*, in August and September.

26. *E. Millefoliata* (Rössl.).—Fore-wings pointed in the male, pale grey, speckled with brownish-yellow, especially on the nervures; in the female they are rounder and dark bluish-grey; the markings are the same as in *Scabiosata*, but unmixed with white. Expands about 1 inch. It inhabits France, Germany, and Corsica from May to July. The larva is rather stout, dull yellowish-white suffused with brown, with a dark curve on the sides of the middle segments. It feeds on yarrow in September. (*E. Biornata*, Christoph, from Sarepta, has pale grey fore-wings, dull grey at the base and in the middle, dusted with dark atoms, and marked with a central black dot, and four transverse lines; hind-wings pale grey. Expands nearly 1 inch. It appears in July, and the larva is supposed to feed on a species of *Artemisia*.)

27. *E. Santolinata* (Mab.).—Uniform yellowish-grey, with the lines black and strongly marked, the second line much angulated and strongly shaded, and the subterminal line interrupted and very thick. The central spot is very large, and stands between two central angulated lines, strongly marked on the costa. Hind-wings nearly uniform, but with a paler band in the middle, and the inner margin with traces of lines. Size of *Succenturiata*. Inhabits South France in May. The larva resembles that of *Millefoliata*, but is blacker and longer. It feeds on santoline from June to October.

*28. *E. Succenturiata* (Linn.).—Fore-wings white, bluish-grey on the costa, inner margin, and in the marginal area, with rusty-brown nervures, the double stripes white, the first strongly interrupted below the costa, and the second with a sharp point projecting inwards, the central dot large and black, the subterminal line white and zigzag, and a little expanded above the hinder angle; hind-wings grey, and the abdomen brownish-grey, with the tip white. In some varieties the ground-colour is brownish-grey, with a rusty-yellow dash below the central dot, extending beyond the second double stripe. Expands from ¾ to 1 inch. Inhabits Europe and Northern Asia from May to August. The larva is paler or darker clay-colour, with black lozenge-shaped markings on the back, which are connected by short dark longitudinal dashes; and with a pale grey line on the sides. It feeds on the flowers of the wormwood from August to October.

*29. *E. Subfulvata* (Haw.).—Fore-wings rusty-brown, dark grey on the costa and hind margin, with a distinct black central spot, the transverse stripes very indistinct, and the subterminal line uniformly white and zigzag; hind-wings dark grey, and the abdomen brownish-grey. Inhabits Central Europe and the Altai. The larva is chocolate-brown, with dark brown lozenge-shaped spots on the back. It feeds on the flowers of the yarrow and of other plants in August and September. (*E. Lentiscata*, Mab., from Corsica, is pale reddish, with most of the markings inconspicuous or absent; there are two more distinct lines; the first before the central spot is waved, and thicker on the costa; beyond this is a row of short marks on the nervures. The second line runs from the costa through the oblong black central spot, and is waved; there are two darker spots, marked with whitish outside, towards the hinder angle, representing the subterminal line. Hind-wings reddish, with a small central dot; greyish-brown towards the costa.)

30. *E. Scopariata* (Ramb.).—Wings narrow, the fore-wings lanceolate, dusted with grey, and with all the nervures spotted with black and grey, especially on the last band, where they appear like rows of black spots. Lines and bands indistinct, waved, and not always extending to the costa. There is also a small black central spot, placed above an irregular white space, which sometimes forms a band, and descends to the last third of the wing; and a second white space before the second line, extending to the dark shade, on which the subterminal line stands, which is white and dentated but straight and rather enlarged at the inner margin, though seldom well defined. Hind-wings ashy-grey, with some black dashes on the inner margin only. Fringes grey, spotted with brown, and preceded by a black thread interrupted by the nervures. Expands from ¾ to 1 inch. Inhabits South-Western Europe in April, May, July, and August. The larva is rather long, brownish-green, with white stripes on the back and sides, the dorsal stripe intersected by a broad scarlet streak. It feeds on *Erica scoparia* and *arborea* from October to February, and again in June.

*31. *E. Nanata* (Hübn.).—Fore-wings narrow and pointed, greyish-brown varied with whitish, and less frequently uniform green, with a blackish central dot placed behind a white spot, and the tip divided by a whitish dash, the three double stripes whitish, and strongly angulated below the costa, the subterminal line white, dentated, and widened into a spot above the hinder angle, the nervures yellowish in the marginal area, and the hind-wings grey, with a white double stripe and subterminal line. Expands about three-quarters of an inch. Common on heaths in Central Europe in May. The larva is rosy, with a dark stripe on the back, and dark transverse and oblique stripes. It feeds on heath from July to September. (*E. Hyperboreata*, Staud., from Lapland, is ashy-grey, with much less distinct greyish-white transverse lines than in *Nanata;* the wings are generally shorter, and the nervures are scarcely tinged with rust-colour.)

32. *E. Innotata* (Hufn.).—Fore-wings narrow and pointed, brownish-grey, with a black central dot, and small dark spots on the costa, the double stripes indistinct and a little lighter, the second twice angulated below the costa, the subterminal line whitish and slightly dentated, with a white W below the costa, purer white above the inner margin, but not thickened, the nervures partially dotted with black, and the median nervure yellowish at the end, as well as nervules 3 and 4; hind-wings pale grey, darker on the hind margin, and with a whitish subterminal line. Expands about three-quarters of an inch. Common in Central and Southern Europe, and in Northern and Western Asia, in May and July. Its occurrence in Britain is doubtful, as the *Innotata* of British authors is *Fraxinata*. The larva is green, with white

oblique lines, and purple or violet-brown spots on the middle segments, and white lines, often spotted with purplish-brown, on the other segments. It feeds on wormwood in June and October. (*E. Tamarisciata*, Freyer, from the south of Central Europe, differs from *Innotata* by its very dark colour, which shades into leaden-grey. The larva feeds on *Myricaria germanica*.)

*33. *E. Fraxinata* (Crewe).—Very like *Innotata*, the fore-wings more uniform brownish-grey, the double stripes and costal spots still less distinct; the white W on the fore-wings, and the whole subterminal line on the hind-wings, very indistinct. Inhabits Central Europe in June and July. The larva is dark green, yellowish in the incisions, with an indistinct dark green or purplish line on the back, which expands into a broad dark purplish spot before the tail. It feeds on ash, sloe, and hawthorn in August and September. (*E. Tribunaria*, Herr.-Schäff., from the Caucasus and Armenia, is pale grey; the fore-wings rather long, and the costa straight; there are three waved lines, and a short one between the second and third, but no central dot, and the hind margin is broadly grey; hind-wings more brownish. *E. Extensaria*, Freyer, from Russia and Northern and Western Asia, is yellowish-grey, the fore-wings long and pointed, with three nearly straight whitish bands, the first and second angulated, and the third bifurcated, and connected with the submarginal line.)

34. *E. Impurata* (Hübn.).—Wings whitish-grey, fore-wings broad, with the tip rather long, and traversed by many angulated and dentated grey lines; the first pale band and the lines nearer the base are rather confused, and the space following is filled up with grey, and forms a projecting angle in the cell; the large black oblong central dot stands upon it. The second and third pale bands are more distinct than the first, and are separated by the second line, which is much angulated, and ends in a square black spot on the costa; and they are also bisected by a fine grey line. The marginal area, on which the indistinct subterminal line stands, is filled up with grey. The hind-wings are broad and rounded, and are covered with grey lines; the central dot is small. Fringes whitish, slightly spotted with grey. Expands about three-quarters of an inch. Inhabits the south of Central Europe from June to August; it is generally met with resting on rocks. The larva feeds on some Caryophyllaceous plant.

35. *E. Modicaria* (Hübn.).—Fore-wings moderately broad and pointed, everywhere light bluish-grey, with a black central spot, and the nervures slightly yellowish, the three double stripes sharply defined, whitish, and divided with dusky, the last near the hind margin, marked with dark dots in front, and obtusely angulated below the costa, where it is bordered with dark on both sides; the subterminal line very indistinct. Hind-wings bluish-grey, with a double whitish band. Expands nearly 1 inch. Inhabits the south of France and Germany in July. The larva is pale brownish-yellow, with a darker line on the back, widened in the middle of the segments, and a black dot near it. It feeds on *Campanula* in August. (*E. Nepetata*, Mab., is probably a dark variety from Corsica; the larva feeds on the flowers of *Calamentha nepeta*. *E. Cossurata*, Mill., which inhabits the island of Pantellaria in May, resembles the last two species, but instead of five or six transverse lines, there is one broad continuous and much waved line, a little paler than the ground-colour, and edged within by round black dots on the nervures. Central dots scarcely visible; the subterminal line very slender, white, and zigzag.)

36. *E. Mayeri* (Mann.).—Fore-wings rather narrow and pointed, dark grey, with no central dot, the nervures broadly suffused with yellowish, the double stripes unequally divided; in the two first only the front half, and in the third the broader hinder half, is whitish; the third is distinctly zigzag, and curved outwards below the costa; the subterminal line is indistinct, finely whitish, and sharply zigzag only beneath the costa, and slightly bordered with

darker in cells 1*b* and 5; hind-wings whitish, waved with grey. Expands about three-quarters of an inch. Inhabits Austria. The larva is slender, pale greyish-green, with blackish lines on the back and sides; head pale red.

37. *E. Graphata* (Tr.).—Allied to *Mayeri*, fore-wings paler, greyish-white, with a small dark central spot, the nervures not suffused with yellowish, the double stripes with both halves whitish, and equally divided by distinct dark lines, the last very strongly dentated, and very obtusely angulated below the costa, the space between the second and third rather darker; the subterminal line thicker, whitish, zigzag, and filled up with darker in front in cells 1*b*, 4, and 5; the hind-wings whitish, waved with grey. Expands nearly 1 inch. Inhabits Austria and Hungary.

38. *E. Scriptaria* (Hübn.).—Fore-wings narrow and pointed, dark grey, with a small dark central dot, and three whitish double bands distinctly divided, the last zigzag, with stronger angles above the inner margin, and obtusely angulated below the costa, the subterminal line sharply whitish and uniformly zigzag; hind-wings grey, with a whitish double band and subterminal line. Size of *Mayeri*. Inhabits the Alps in July. (*E. Riparia*, Herr.-Schäff., from Dalmatia and Spain, is a small greyish-white species; the fore-wings with five pale grey parallel and slightly dentated lines, and a narrow pale grey marginal line; hind-wings with two lines, and a central dot. *E. Spissilineata*, Metzn., is yellowish-grey, covered with white stripes interrupted by the nervures, and with the fringes spotted with grey and white. *E. Multilineata*, Mann, which is probably a variety of this, is a little larger (expands fully three-quarters of an inch), and entirely yellowish. Both forms are met with in South-Eastern Europe and Western Asia in April and May.)

*39. *E. Pygmæata* (Hübn.).—Fore-wings pointed, with the costa straight; dark greyish-brown, with a coppery lustre, and no central spot; the double bands and lines very indistinct, the subterminal line zigzag and interrupted, with a sharply-defined white spot above the hinder angle, the fringes chequered with whitish; hind-wings unicolorous, with no markings except a white spot at the anal angle. Expands from one-half to three-quarters of an inch. Inhabits Northern and North-Western Europe in June. The larva is short and thick, tapering towards the head, and rather densely hairy; finely and transversely reticulated with pale ochre-yellow on the back; more rarely green, with a dirty brown line, widened into spots on each segment, on the back, and a narrower one on the sides. It feeds in the seed-capsules of *Cerastium triviale* in marshy places.

40. *E. Ultimaria* (Boisd.).—Wings narrow and obtuse, ashy-grey, darker towards the hind margin, and traversed by several waved rays, lighter than the ground-colour, and finely bordered with blackish. The central dots, and the pale band beyond the second line, are equally distinct on all the wings. The fringes are grey, chequered with darker. Under side shining white, with the central dots and lines of the upper side well marked. Expands about half an inch. It inhabits South France, Italy, and Bithynia; and the larva, which is long, light green, and spotted with white and carmine, feeds on *Tamarix gallica*.

41. *E. Massiliata* (Mill.).—Wings rounded, fore-wings dark grey, with many fine brown lines; the elbowed line is double, with two teeth pointing inwards above the inner margin, and the subterminal line light and denticulated. The central black dot is oval and well marked. The fringes are concolorous, chequered with brown, and preceded by small black dashes, well marked, and separated by a light space. Hind-wings paler at the base, with many lines, only well marked on the inner margin. Central dot round and brown; fringes long and concolorous. Larger than *Ultimaria*. Inhabits South France and Spain in March and April. The larva

resembles that of *Cocciferata*, but is smaller, with reddish tridentate spots on the back. It feeds on evergreen oak in May and June.

*42. *E. Tenuiata* (Hübn.).—Fore-wings short, with the tips rounded, pale ashy-grey, with a greenish shade, and varied with dark grey on the costa, with a black central dot, and the nervures more or less yellowish; the double stripes not paler, and only indicated by the dark lines which border and divide them; the last is broad, and rather acutely angulated below the costa; the subterminal line not lighter, indistinct, and scarcely zigzag; hind-wings nearly similar. Expands nearly three-quarters of an inch. Inhabits Central Europe in June and July. The larva is either uniform dull greenish-white, or marked with brown longitudinal lines; the head and a plate behind it black. It is found in sallow catkins in early spring.

*43. *E. Subciliata* (Guén.).—Allied to *Tenuiata*, wings longer, and the antennæ of the male slightly ciliated; fore-wings very pale grey, with a slight reddish shade, the markings indistinct, the hind margin blackish, interrupted, and intersected by the dentated submarginal line, the central dot indistinct, and the fringes chequered. Expands about three-quarters of an inch. Inhabits England in July; the larva is said to feed on oak and maple.

*44. *E. Plumbeolata* (Haw.).—Fore-wings moderately broad; paler or darker grey, with slender dark transverse lines bordering and intersecting the three rather lighter double stripes, the last stripe slightly curved below the costa; the subterminal line uniformly light, slightly zigzag, and often preceded by another white line; the central dot slightly marked or absent, and the hind-wings pale grey, thickly waved with darker. The variety *Singularia* (Herr.-Schäff.) has more pointed fore-wings, the costa spotted with darker, and the central dot more distinct. Expands rather less than three-quarters of an inch. Inhabits Central Europe in May and June. The larva is yellowish, greenish, or lilac, with three reddish-brown lines on the back. It feeds on the flowers of *Melampyrum* in July and August.

*45. *E. Valerianata* (Hübn.), *Viminata* (Doubl.).—Fore-wings rather narrow, brownish-grey, with no central spot; with suffused dark transverse lines, by which the double bands are only slightly indicated; the last band is more strongly curved below the costa than in *Plumbeolata*, and the subterminal line is fine, slightly zigzag, whitish, and expanded into a small white spot above the hinder angle; hind-wings grey, with suffused light lines, and often with a white dot at the anal angle. Expands rather less than three-quarters of an inch. Inhabits Central Europe in June, but not very common. The larva is green, with three dark lines on the back, and a yellowish line on the sides. It feeds on the flowers and seeds of *Valeriana officinalis* in August.

46. *E. Immundata* (Zell.).—Fore-wings broad, with the tips rounded, and the hind margin convex; brownish-grey, slightly tinged with yellowish, especially behind, with no central dot; the markings very suffused, in consequence of which the double bands, which are a little lighter, are only slightly marked; the last is strongly curved inwards above the middle, and the subterminal line is very indistinct; hind-wings with the hind margin slightly angulated, grey, with a light double stripe only slightly marked. Expands about three-quarters of an inch. Inhabits Central Europe, except the west. The larva feeds on the seeds of *Actæa spicata* in June and July.

*47. *E. Isogrammata* (Tr.), *Haworthiata* (Crewe).—Very like *Immundata*, but smaller (expands two-thirds of an inch), of a darker and purer grey, the last double stripe not so strongly angulated, though more so than in *Plumbeolata;* hind margin of the hind-wings not angulated, and the middle of the thorax and abdomen tinged with orange above. Inhabits Central Europe in June and July. The larva is thick; pale lilac or green, with three darker

lines on the back, the middle one broadest. It feeds in the buds of *Clematis vitalba* in August.

*48. *E. Satyrata* (Hübn.).—Wings uniform reddish-grey, the fore-wings narrow, with a small blackish central dot, and the nervures dotted with blackish and white, the double bands and transverse lines rather indistinct; the last band curved inwards below the costa, and the subterminal line whitish and zigzag; above the costa it is purer white and rather broader. Expands about three-quarters of an inch. Inhabits Northern and Central Europe from April to July. The larva is apple-green or whitish, with large blood-red spots on the back, which are rounded behind and angular in front; and there is often a waved blood-red line on the sides also. It feeds on many low plants, such as bedstraw, scabious, gentian, &c., in July and August. (*E. Offirmata*, Spey., from Dantzic, is allied to *Satyrata;* the body is rather stout, the antennæ are longer, with tufted ciliations, and the under side is differently marked. The larva was found feeding on golden rod in September, and the moth appeared at the end of February.)

49. *E. Veratraria* (Herr.-Schäff.).—Larger than *Satyrata* (expands 1 inch or over), the fore-wings much broader, paler, uniform light reddish-grey, with a more distinct black central spot, and the nervures dotted with black and white, the transverse lines and double bands very indistinct, and the subterminal line white and rather broader above the hinder angle; the hind-wings scarcely paler. Inhabits the Alps in July. The larva feeds in the capsules of *Veratrum nigrum* in August. (*E. Eynensata*, Grasl., from the Pyrenees, expands nearly 1¼ inches; it is pale grey, darker on the costa and at the tip, but with no reddish shade; fore-wings with a large oblong black oblique discoidal spot; first double line pale; central area dark, with two pale double waved lines, bordered with small black acute angles; hind-wings paler in the middle, with many transverse lines marked with small brown acute angles.)

50. *E. Cauchyata* (Dup.).—Allied to *Satyrata*, the wings much paler; pale yellowish-grey (almost white in the Russian *E. Aggregata*, Guén., which is probably a variety of this), brownish in the marginal area; the fore-wings narrower, and only the last double band marked with black dots. Expands about 1 inch. Local in Central Europe in June. The larva is long and slender, pale green, with a brown head. It feeds on the leaves of the golden rod.

*51. *E. Pernotata* (Guén.).—Size of *Cauchyata*, wings narrower, fore-wings yellowish-grey, with the nervures spotted with dull grey and white; and with pale, waved, and dentated lines, the marginal area rather darker, and including two pale lines; a black central mark bordered with paler; hind-wings with confused markings; paler below, with a blackish sub-marginal line; and the abdomen varied with dark grey and whitish. Expands nearly 1 inch. A very scarce species, inhabiting England and Piedmont in July; the larva feeds on golden rod.

52. *E. Italicata* (Guén.).—Resembles *Cauchyata* and *Pernotata;* fore-wings white, lanceolate, with a black central dot, narrow grey lines, the two outermost parallel, near together, and not dentated; the hind margin darker, enclosing the denticulated submarginal line. Hind-wings paler; abdomen pale grey. Described from a single male taken at Domo d'Ossola.

*53. *E. Helveticaria* (Boisd.).—Fore-wings rather broad, the tips pointed; brownish-grey, with an oval black central dot, and the nervures dotted with black and pale; the double bands pale grey, and rather indistinct, the last slightly curved below the costa; and with two or three more dark transverse lines between them; the subterminal line indistinct; hind-wings brownish-grey, almost without markings, and the abdomen slightly crested. Expands about

three-quarters of an inch. Inhabits Northern and Central Europe in April and May. The variety *Arceuthata* (Freyer) is of a lighter grey, with better defined markings, and the subterminal line more distinct. The larva is thick, pale green, with a darker line in the back, and paler subdorsal and lateral lines; head green (purple in *Arceuthata*). It feeds on juniper in September and October.

* 54. *E. Egenaria* (Herr.-Schäff.), (compare *E. Alliaria*, Staud., No. 11).—Fore-wings rather pointed; reddish-grey or pale brown, with three double transverse lines, and another (incomplete) at the base. The subterminal line white, zigzag, and rather broader towards the inner margin; hind-wings grey, with the commencement of four or five blackish bands on the inner margin. Expands about two-thirds of an inch. Occurs in the Hartz Mountains and in Hungary. (*E. Undata*, Freyer, from Carniola, resembles *Pimpinellata* and *Castigata;* it is grey, with the pale and dark waved bands more distinct, and more zigzag. *E. Schmidii*, Dietze, from the Tyrol, resembles *Arceuthata* in colour and markings, but is smaller and greyer, with the fore-wings much more pointed; it appears in July, and the larva probably feeds on *Tunica saxifraga*.)

55. *E. Primulata* (Mill.).—Allied to *Helveticaria*, but the fore-wings are more pointed; dull lead-colour, with only the fine whitish festooned subterminal line distinct; the elbowed line is strongly angulated, broad, and grey, but suffused and ill-defined on the outside. The central dot is well marked on the fore-wings, but scarcely visible on the hind-wings. Inhabits Celerina in Switzerland in May. The larva is clay-coloured, with brown longitudinal lines, and feeds on the seeds of *Primula latifolia* in autumn.

* 56. *E. Castigata* (Hübn.).—Fore-wings rather slender and pointed; brownish ashy-grey, rather darker before the middle, and in the marginal area, with a small black central dot, and three distinct pale grey double stripes, the two first forming several sharp angles, and the last angulated inwards below the costa; the subterminal line whitish and slightly zigzag, with more prominent teeth below the costa and below the middle; hind-wings grey, lighter on the costa, with a distinct double band and subterminal line. Expands about three-quarters of an inch. Common in Europe and the Altai in May and June. The larva is clay-coloured, with dark or reddish-brown spots on the back, and longitudinal and oblique streaks on the sides. It feeds on the flowers of bedstraw, gentian, and many other low plants. (**E. Jasioneata*, Crewe, from North Devon, is paler ashy-grey, with the dark central lunule of the fore-wing round instead of narrowed, and with a conspicuous angulated whitish sub-marginal line. The larva, which feeds in the seed-heads of *Jasione montana* in September, resembles that of *E. Campanulata*, but is shorter and stouter).

* 57. *E. Lariciata* (Freyer).—Smaller than *Castigata*, the fore-wings purer slate-colour, with a small black central dot, the double stripes a little lighter than the ground-colour, as in *Castigata*, but the last is narrower, and narrowly bordered with dusky in front; the subterminal line is pale grey, slightly zigzag only below the costa and below the middle; nervules 3 and 4 generally yellowish at their base; hind-wings smaller, and unicolorous grey, almost without markings. Inhabits Central Europe and Northern and Western Asia in May and June. The larva is green or brown, with a dark stripe on the back, and a white one on the sides. It feeds on larch in August and September.

* 58. *E. Trisignaria* (Herr.-Schäff.).—Fore-wings reddish ashy-grey, or dark slaty-grey, with a large black central spot, and two large dark grey costal spots before and behind it, the first standing nearer to the central spot than the last; the double stripes and subterminal line are very indistinct, and scarcely paler than the ground-colour; the subterminal

line is very slightly zigzag, the middle stripe passes over the central spot, and the hinder stripe is slightly curved below the costa; the hind-wings are a little lighter and unicolorous, with faint traces of the last double stripe. Expands about three-quarters of an inch. Inhabits Central Europe in May and June, but scarce. The larva is green, with a darker line on the back; it feeds on the buds and seeds of *Heracleum*, *Sphondylium*, *Peucedanum*, &c.

*59. *E. Virgaureata* (Crewe), *Pimpinellata* (Guén.).—Fore-wings broader and more pointed than in *Satyrata*, uniform reddish slaty-grey, waved with darker, with a strongly-marked black central lunule, and the nervures dotted with black and white; the costa spotted with light and dark, the double bands indistinct, the second sharply angulated inwards below the costa, the subterminal line whitish, and slightly zigzag, with sharper teeth towards the costa, and expanded into a small white spot above the hinder angle; hind-wings a little paler. Expands from ¾ to 1 inch. Inhabits Central Europe in April, and from June to August; but scarce and local. The larva is slender, orange, with a row of black triangular spots on the back, and oblique yellowish or whitish streaks on the sides. It feeds on the flowers of golden rod, ragweed, &c., in July and September.

*60. *E. Vulgata* (Haw.).—Fore-wings narrow, rust-coloured, varied with dark grey on the costa, with a small black central dot, the nervures dotted with black, and yellowish in the marginal area, the double bands whitish, often not much lighter than the ground-colour, and the last angulated below the costa, the subterminal line finely white, zigzag, and expanded into a spot above the hinder angle; the hind-wings rust-coloured, waved with dusky. Expands about three-quarters of an inch. Common in Central Europe in May and June. The larva is reddish or yellowish-brown, with sharply-defined lozenge-shaped spots on the back surrounded with dusky, and waved dark subdorsal lines. It feeds on golden rod, willow, and many other plants in August and September.

*61. *E. Denotata* (Hübn.), *Campanulata* (Herr.-Schäff.).—Fore-wings broad, with the tips rounded, uniform reddish slaty-grey, or rusty yellowish-grey, with a large black central spot, the subterminal line dull whitish, not paler and scarcely thicker on the inner margin, the double bands very indistinct, and slightly bordered with dusky on the costa; the last is angulated inwards below the costa, and marked with dull dark spots on the nervures on the basal side; hind-wings short, truncated in the middle, grey, with the costa whitish. Expands about three-quarters of an inch. Inhabits Central Europe from May to August. The larva is pale ochreous brown, with two dark triangular spots on the middle segments, between which is an oval spot of the ground-colour; these spots diminish gradually before and behind into a dorsal stripe. It feeds in the capsules of *Campanula trachelium* in September and October.

62. *E. Selinata* (Herr.-Schäff.).—Very like *Denotata*, the fore-wings more yellowish-brown, only slightly shading into grey; the double bands tolerably distinct, especially on the costa, the subterminal line more distinctly whitish, and pure white above the hinder angle, but not widened; the nervures dotted with brown, especially before the last double band; hind-wings rather long, with the hind margin obliquely truncated. Expands nearly 1 inch. It occurs at Frankfort-on-the-Maine, and the larva feeds on *Peucedanum oreoselinum* at the end of June. (Staudinger places this species, with doubt, as a variety of *Trisignaria*.)

*63. *E. Albipunctata* (Haw.), *Tripunctaria* (Herr.-Schäff.).—Fore-wings uniform slate-colour, with or without a central black spot, the nervures thickly dotted with black and white, and the double bands generally indistinct. The subterminal line is expanded on all the wings into a large pure white spot above the hinder angle, and a small one above the middle; there is often

another below the costa. Expands about three-quarters of an inch. Inhabits the west of Central Europe in May and June. The larva is green, with a row of red or dark green heart-shaped spots on the back, the narrow end pointing forwards. It feeds in the heads of *Angelica sylvestris* in August.

64. *E. Actæata* (Waldersdorff).—Resembles *Trisignaria,* but larger (expands about 1 inch), the fore-wings are broader, reddish slate-colour, the double stripes are very faint, and are indicated by fine black dots on the nervures; the costal spots are not so large and conspicuous, and both stand at an equal distance from the central spot; when the subterminal line is distinct, it is whitish, and strongly zigzag, with a small white spot above the hinder angle; hind-wings a little paler and indistinctly waved, with a white dot before the anal angle. Local in Germany; the larva feeds on the leaves of *Actæa spicata.*

*65. *E. Absynthiata* (Clerck).—Fore-wings light violet-brown, with a long black central spot, and three blackish costal spots near the base and before and behind the middle; between the two last are two oblique dashes; the double bands are very indistinct, and the subterminal line is suffused, and broken into whitish dots, with a more distinct white spot at the hinder angle; hind-wings reddish-grey. Expands nearly 1 inch. Common in Northern and Central Europe in June and July. The larva is dirty flesh-colour, with triangular clay-coloured spots on the back, finely divided with paler, and suffused oblique whitish lines on the sides. It feeds on the flowers of wormwood, yarrow, &c., in September and October.

*66. *E. Assimilata* (Doubl.).—Closely resembles *Absynthiata,* the fore-wings are broader, shorter, and rounder; the central streak is very long and black, and is sometimes followed by traces of fine grey lines. The subterminal line is tolerably well defined, white and macular, with the spot at the hinder angle large and well marked. Fringes slightly chequered. Expands about three-quarters of an inch. Inhabits the west of Central Europe from May to July. There are two varieties of the larva—one is delicate green, granulated, and finely striated with white; the dorsal line is darker green, and the incisions are pale yellow. Head and legs red. The other variety is yellowish-green, washed with brown and rosy, with the dorsal line very fine, blackish, interrupted on each segment, and bounded above by two oblique brown V-shaped streaks. It feeds on hop and black currant in September and October.

*67. *E. Minutata* (Guén.).—Very like *Absynthiata,* fore-wings narrower, pale chocolate-brown, shading into ashy-grey, the costa whitish near the spots, which, as well as the intermediate streaks and the central spot, are larger, and black; the subterminal line is more continuous, with small suffused dark spots in front; hind-wings pale grey. Size of *Assimilata.* Inhabits the west of Central Europe in June. The larva, which resembles that of *Absynthiata,* feeds on the flowers of heath and *Eupatorium cannabinum* in September.

68. *E. Goossensiata* (Mab.).—Also closely allied to *Absynthiata,* the fore-wings are more oblong, liver-coloured, with the nervures dotted with black and white; the markings more sharply defined, thicker, and varied with white; the subterminal line tolerably well marked, and nearly continuous, forming a rounded curve in the middle. Common near Paris in May and August. Larva short, very pale rosy grey, with small brown triangles, rounded at the base, and bisected by the fine dorsal line on the intermediate segments. An indistinct brown line on the sides, sometimes rosy white, and bordered below by a brown shade; belly pale rosy. It feeds on *Calluna vulgaris* in June and October.

*69. *E. Expallidata* (Guén.).—Allied to *Absynthiata,* the fore-wings very long, pale brownish-grey, suffused with darker in the marginal area, with fine black dots on the nervures before and behind the middle, the costal spots small and blackish, the central spot long and thick,

and the subterminal line quite suffused; hind-wings pale reddish-grey. Size of *Minutata*. Inhabits the west of Central Europe in June and August, but scarce and local. The larva feeds on the flowers of the golden rod in August and September.

*70. *E. Pimpinellata* (Hübn.).—Fore-wings moderately broad, light reddish-grey, ashy-grey on the costa, with a thick black central dash, and the nervures somewhat yellowish, the double stripes generally well marked, and narrowly spotted with black on the sides at the costa; the last is broad, ashy-grey, unequally divided, marked with black dots in front on the nervures, and curved below the costa; the subterminal line is whitish, paler above the hinder angle, distinctly zigzag, and shaded with darker in front; hind-wings pale grey, waved with darker, and whitish on the costa. Expands nearly 1 inch. Inhabits Central Europe in April, July, and August, but not common. The larva is green, suffused with reddish, with a dark green stripe on the back. It feeds on pimpernel and other low plants in September and October.

*71. *E. Constrictata* (Guén.).—Fore-wings moderately broad, pale ashy-grey, with a greenish shade, and the marginal area grey; central streak thick, and deep black; the double stripes and subterminal line not lighter, the former indicated by brownish-grey transverse lines, which are thicker and darker on the costa, the last double stripe narrow, curved, and broader on the costa, the subterminal line uniform, and strongly zigzag; hind-wings pale grey, waved with dusky; the under side with suffused markings. Expands three-quarters of an inch. Inhabits England and some parts of Germany in July and August, but scarce and local. The larva feeds on thyme.

72. *E. Euphrasiata* (Herr.-Schäff.).—Fore-wings narrow and pointed, pale ashy-grey, with a narrow black central dot, and fine suffused dark transverse lines bordering and traversing the double stripes, which are scarcely paler; the lines expand on the costa into small and sharply defined blackish spots; the last double stripe is nearly straight, and very little curved inwards below the costa; the subterminal line is fine, straight in the middle, and not dentated; hind-wings pale grey, with a whitish double stripe, and the subterminal line slightly dentated. Expands about three-quarters of an inch. A little-known species which has been confounded with the last. It occurs at Mayence, Lyons, and in Corsica in July and August. The larva is green, or yellowish clay-colour, with dark subdorsal lines, which become thicker behind, and enclose light spots on the back. It feeds in the seed-capsules of *Euphrasia lutea* in September.

73. *E. Gemellata* (Herr.-Schäff.).—Fore-wings moderately broad and whitish, with the hind margin grey, a small black central dot, and the nervures narrowly yellowish, the lines of the three double stripes slender and sharply defined, grey; the space between the two first stripes rather clouded, the last stripe curved below the costa, not dentated, and narrowly bordered with grey in front; the subterminal line whitish and finely zigzag; hind-wings whitish, waved with grey. Expands rather less than three-quarters of an inch. Inhabits Southern Europe, as far north as the Southern Alps.

74. *E. Albifrontata* (Grasl.).—Fore-wings triangular and very pointed, ashy-grey, with a slight reddish shade, and traversed by several dark grey lines; the first line a little arched; the central spot is a large black lunule, bifurcated on the costa, and connected with the inner margin by a fine waved line; the elbowed line is double, slightly dentated, and forms an obtuse angle opposite the cell. The marginal area is a little darker, and intersected by the subterminal line, which is formed of small pale, interrupted dashes on the nervures. Hind-wings rather paler, rounded, with a whitish central band, angulated externally, and rounded opposite the small blackish central dot. Fringes slightly chequered; thorax and abdomen darker grey, the latter slightly crested; vertex and forehead white. Inhabits the Pyrenees

in July. The larva is green, with a yellowish-white stripe on the back. It feeds on a species of *Polygonum* in June.

75. *E. Distinctaria* (Herr.-Schäff.), *Extraversaria* (Herr.-Schäff.).—Fore-wings bluish-grey, the double stripes not much curved, the transverse lines slender and sharply defined; the central spot resembling a streak. Expands three-quarters of an inch. Very local in France and Germany from June to August. The larva is green, with blood-red transverse streaks, or large blood-red spots. It feeds on the flowers of *Peucedanum oreoselinum* in August and September.

76. *E. Libanotidata* (Guén.).—Probably a variety of the last. The fore-wings are broader and rather pointed; brownish ashy-grey; the double stripes and subterminal line not paler than the ground-colour, the former only indicated by dark transverse lines expanded into spots on the costa, of which the first line of the last stripe is blackish and more distinct; the last stripe is strongly arched, and broader on the costa; the subterminal line is slightly zigzag, and the central spot consists of a thick black and uniformly broad streak, broader than in the other species; hind-wings unicolorous, and indistinctly waved with darker; the under side with rather sharply-defined markings. It occurs at Jena, and the larva feeds on *Athamantha libanotis.*

77. *E. Heydenaria* (Staud.).—Rather larger than *Virgaureata;* the black central spot well marked; the dark costal spots are better defined than in *Virgaureata*, and arranged as in *Pimpinellata*, and distinct blackish lines run from the spots at the base and beyond the central spot to the inner margin, and, in the female, across the intermediate space also. This gives it some resemblance to *Distinctaria* and *Libanotidata*, but it is not nearly so distinctly marked. The light subterminal line is much suffused. Hind-wings with a very indistinct central spot or streak, and scarcely waved. Under side with two complete transverse lines beyond the central dot, which only extend distinctly to the fore-wings in the male; the costal spots are also tolerably distinct below. Inhabits Switzerland. (*E. Undosata*, Dietze, is a brownish-green species from Livonia; the male resembles *Virgaureata* or *Altenaria*, and the female resembles *Heydenaria* or *Castigata*, but it may be distinguished from any other species by the central area of the fore-wings being bordered on each side by two parallel dark lines.)

78. *E. Sextiata* (Mill.).—Fore-wings long and broad, dull grey, traversed by three oblique and continuous lines, which are not festooned. A fourth line traverses the central spot, is angulated above, and extends to the inner margin. All these lines are well marked on the costa. The subterminal line is light, waved, and continuous, and the central spot is rather large, square, and black. Hind-wings grey, with a broad continuous band hardly paler than the ground-colour. Fringes chequered with grey, and preceded by a row of small black marks, separated by pale dots. Expands about three-quarters of an inch. Inhabits South France and Spain in April. The larva is greenish, or dark purple, with a dark red stripe on the back. It feeds on the seeds of the thyme, and is full-grown in May.

*79. *E. Indigata* (Hübn.).—Fore-wings narrow and pointed, pale reddish-grey, with a large black central spot, and suffused grey transverse stripes, expanded into darker spots on the costa; the double stripes very indistinct, and not lighter than the ground-colour, the last curved, and the subterminal line also indistinct; hind-wings paler, and nearly unicolorous. Expands about three-quarters of an inch. Common in most parts of Europe in May, June, and August. The larva is pale greenish-yellow or yellowish-red, with a reddish-brown line on the back, and pale yellow subdorsal and lateral lines. It feeds on fir, juniper, cypress, &c., in July. (*E. Altenaria*, Staud., found in Lapland and Norway in July, is allied to *Castigata* and *Trisignaria;* it is grey, with more or less distinct whitish transverse lines, which are acutely

angulated on the costa; the central black dots are more or less distinct on the fore-wings, and are generally absent on the hind-wings.)

80. *E. Conterminata* (Zell.).—Resembles *Indigata*, but smaller, the fore-wings purer grey, with more distinct and larger costal spots, and an unusually large black oval central spot, the double stripes very indistinct; the middle one less curved, and the last set slightly back below the costa; the subterminal line suffused. Inhabits Eastern Europe.

81. *E. Silenata* (Staud.).—Fore-wings broad, rounded at the tips, greyish-brown with a black central spot, the two first double stripes indistinct, the last more distinct, angulated below the costa, and unequally divided, its hinder half being broader and whiter; the subterminal line is thick, dentated, and nearly pure white, especially above the hinder angle; hind-wings a little paler, with a distinct double stripe and subterminal line. Expands about three-quarters of an inch. Inhabits Silesia and Galicia in May and June. The larva is green, or brownish-yellow, with a darker line on the back. It feeds in the seed-capsules of *Silene inflata* in July.

*82. *E. Dodoneata* (Guén.).—Fore-wings rather short, pale grey, slightly varied with yellowish, with a small black central spot placed on a distinctly lighter ground, the first double band strongly angulated below the costa, and bordered behind by a dark grey band, which projects a prominent angle towards the central spot; the last double band curved, the nervures before it marked with short black dashes, and partially suffused with flesh-colour; the subterminal line whitish and slightly zigzag, and the fringes whitish at the base, with grey spots; hind-wings truncated, grey, with a dull double stripe and a zigzag subterminal line. Expands three-quarters of an inch. Inhabits Western Europe in March, April, and August. The larva is pale yellow, with a triangular dark brown spot on the back of the five middle segments. It feeds on oak in June.

*83. *E. Abbreviata* (Steph.).—Very like *Dodoneata*, but larger, and with the fore-wings longer and yellower; cells 2 and 3 are pale brownish-yellow, brighter on the nervures, nearly to the hind margin, and nervures 3 and 4 are not marked with black dashes; the central spot consists of a fine black streak on a whitish ground, and the last double stripe is more distinctly angulated inwards below the costa; the fringes are unicolorous grey, and slightly spotted with dusky. Inhabits Western Europe in April. The larva is greenish-yellow, with a greenish-brown line on the back, expanded into narrow triangular spots. It feeds on oak in June.

84. *E. Cocciferata* (Mill.).—Wings broad, thick, entire, and covered with dusky velvety scales; brownish, with the lines and markings darker, and rather shining; sometimes greenish. The second line is dentated on the outside, and finely bordered with black; the other lines are more indistinct, but the black central dot is well marked. Hind-wings less speckled with black atoms, and with rudiments of lines on the inner margin; the central dot is long, ill-defined, and often absent. The fringes are chequered with brown, and preceded by a row of small black marks between the nervures. Expands nearly 1 inch. Inhabits South France, Spain, and Corsica in March. The larva is greenish-yellow, with reddish-brown lines. It feeds on the flowers of various species of oak in May.

*85. *E. Exiguata* (Hübn.).—Fore-wings moderately broad and pointed, pale grey, with an oval black central spot, the three double stripes distinct and rather lighter, the first obtusely angulated below the costa, and with a darker shaded band on each side; the last nearly straight, angulated inwards below the costa, and with black dashes on the nervures in front; the space between these and the whitish and slightly zigzag subterminal line is darker, interrupted with light below the costa and in the middle; hind-wings truncated; pale grey, waved with dusky. Expands from ¾ to 1 inch. Common in Central Europe in May and June. The

larva is dark green, with a brick-red stripe on the back expanded into spots on the middle segments, and a brick-red stripe on the sides. It feeds on hawthorn, barberry, &c., in August and September.

86. *E. Inturbata* (Hübn.).—Resembles *Exiguata*, but the fore-wings are not so pointed; yellowish-grey, with a small black central spot, and the nervures in the marginal area yellowish, the last double stripe sinuated, wider in the middle, and slightly curved below the costa, and with small even teeth in front, which are equally distinct on the hind-wings. Expands rather less than three-quarters of an inch. It inhabits Bavaria and Austria; and is doubtfully referred by Staudinger to *Tenuiata*.

87. *E. Lanceata* (Hübn.).—Fore-wings narrow and pointed, of a pale rusty brownish-grey, with a pale grey and acutely angulated double stripe before the middle, extending to the black central streak, the central area darker grey, contracted above the middle, and bordered behind by a simple curved light line; the subterminal line shaded with grey in front, and the hind-wings whitish, waved with grey. Expands nearly three-quarters of an inch. Inhabits various parts of Central Europe from March to May. The larva feeds on the young shoots of the red fir in May and June.

88. *E. Phœniceata* (Ramb.).—Fore-wings rather long, ashy or smoky grey, traversed by many fine black lines; that which borders the basal area forms a very acute angle on the subcostal nervure, and the three others are slightly arched and parallel; the last band is edged within with black, and marked with black on the nervures, as in the allied species. Hind-wings paler, with traces of lines on the inner angle. Fringes unicolorous, preceded by a row of small black dashes; and the abdomen with two rows of little black dots on the back. Expands nearly 1 inch. Inhabits South France and Spain in September. The larva is dull green, reddish, or brown, with indistinct whitish lines on the back. It feeds on *Juniperus phœnica* from December to February. (*E. Provinciata*, Mill., is allied to *Phœniceata* and *Oxycedrata*, but larger, and always with a reddish shade. It occurs at Cannes in April, and the larva feeds on *Juniperus oxycedrus* in November. *E. Mnemosynata*, Mill., is of a pinkish-grey, the transverse lines are well marked, especially the first on the central area, which is deep black, continuous, and very sharply angulated to the large black central spot, which seems to be buried in it. The elbowed line is broad, a little paler than the ground-colour, strongly angulated, and bordered with black on each side. On the median area, opposite the central spot, is a square deep black spot, bidentate on the outside. Hind-wings with three lines running from the inner margin to a level with the small black central dot. It occurs at Cannes in September and October. The larva is dull white when young, and afterwards shining clay colour, with brown crosses on the back of the middle segments, and whitish spots on the sides. It feeds on juniper or cypress.)

*89. *E. Sobrinata* (Hübn.).—Fore-wings with the tips rounded, varied with pale brown and ashy-grey, with a black central streak surrounded with white, the double stripes dull, the first acutely angulated below the costa, and bordered behind with a darker band, the last set back below the costa, and marked with black dashes in front, especially on nervures 2, 5, and 6, and in the fold; the subterminal line whitish, and finely zigzag; hind-wings rather oval, and waved with grey. Expands nearly 1 inch. Common in Europe in August and September. (*E. Scoriata*, Staud., found in Iceland in August, is of a dark leaden black, with paler transverse lines. The larva, which is brassy-green or reddish-brown, with pale yellowish lines, feeds on *Juniperus nanus* in June.)

90. *E. Oxycedrata* (Ramb.).—Very like *Sobrinata*; fore-wings dark grey or blackish, but with no red shade. The subterminal line is suddenly angulated towards the costa, and there

are several small black dashes behind it; towards the middle of the wing it is crossed by one or two black streaks extending to the hind margin; and the subterminal line is suddenly angulated before reaching the inner margin. In *Sobrinata*, this line is much straighter, curved in front, regularly dentated, and not obliquely angulated above the inner margin. The central band runs from the extremity of the central spot, is confused with it, and is continued to the costa. In *Sobrinata*, the band runs from the inner edge of the spot, and leaves the rest of it isolated. Inhabits France, Corsica, and Bithynia. The larva is green, with the back, belly, and a line on the sides, paler. It feeds on *Juniperus oxycedrus*, and there is a succession of broods throughout the year.

91. *E. Unedonata* (Mab.).—Wings thick, opaque, rather dark ashy-grey, and of a scaly or velvety appearance. The lines are parallel to the hind margin, and are angulated towards the costa before the discoidal spot, and form a well-marked angle before this point, corresponding to that at the tip. These lines are waved and well marked, as well as the subterminal line, which forms a very large curve at the hinder angle, and a rather indistinct M towards the tip. The discoidal spot is isolated, and quite separate from any of the lines. Hind-wings rather dark, with a grey border, and the inner margin with traces of interrupted lines. Inhabits South Europe in March. The larva is very variable; sometimes uniform red, with an indistinct darker line on the back, the legs and belly rosy-white, and the head reddish, dotted with black; sometimes yellowish-white, washed with yellowish, or pale green. It feeds on the flowers of the arbutus in October and November.

92. *E. Rosmarinata* (Mill.).—Wings greyish-brown, washed with reddish; fore-wings broad and rather long, with many fine lines, and the double bands indistinct. The central area ill-defined, bounded by the inner and elbowed lines, and much angulated, as well as the lines and streaks which follow it; the subterminal line is simple, straight, and a little paler than the ground-colour. The central spot is black, oval, well marked, and traversed by a well-marked black streak. There are two other brown streaks, rather wide apart, and of unequal length, below the tip. Hind-wings rounded, with the transverse lines well marked on the inner margin, and the central dot small. The female has shorter wings, and is paler, with the markings less distinct. Expands nearly 1 inch. It inhabits South France from November to January. The larva is dull greyish or bluish-green, with glaucous green lines. It feeds on the flowers of the rosemary from January to April.

93. *E. Pauxillata* (Boisd.), *Millierata* (Staud.).—Allied to *Sobrinata;* wings dusted with dull dark grey, the fore-wings with two very well-marked oblique lines, parallel to the hind margin; the central spot is often confounded with the second of these, which is the elbowed line; the subterminal line is rounded in the middle, and indicated by a very fine and continuous inner shade, which is never interrupted; the rest of the wing is concolorous. Hind-wings paler, with a single indistinct central line, and the hind margin a little darker. Under side paler, unicolorous, with only the central dots visible; abdomen grey, with a very narrow black ring on the second segment. Expands nearly three-quarters of an inch. It inhabits South France, and the larva feeds on juniper.

94. *E. Ericeata* (Ramb.).—Fore-wings oblong and rather long, dusty-grey, with small black dashes on the nervures; the four most distinct are placed before the last band, two below the costa, and two before the inner margin. The thread which forms the last line of the basal area is oblique, and forms with the first line, which passes over the central spot, a band broader below. Beyond this, we find only the last band parallel to the hind margin, which is nearly straight, and composed of three black threads, and its summit is angulated to receive two

little black marks close together, beyond which is a black apical streak. Hind-wings with a central dot, and the commencement of waved black lines on the inner margin; abdomen with a row of black dots on each side. Expands about three-quarters of an inch. Inhabits South France, Piedmont, and Corsica in September and October. Larva yellowish-green, with a dark green line on the back, pale subdorsal lines, and a whitish stripe on the sides; head reddish. It feeds on the flowers of *Erica arborea* in March and April.

*95. *E. Pumilata* (Hübn.).—Fore-wings pointed, reddish-white, with no distinct central spot, the first double stripe arched, and bordered behind by a brownish-red band; the last double stripe is replaced by a narrow white and slightly interrupted line, edged in front by a more distinct black line, and behind by a fine grey one, and distinctly continued on the hind-wings; the subterminal line is finely zigzag, and bordered with rusty-brown on the fore-wings on the costa above the middle, and above the hinder angle. Expands about three-quarters of an inch, but varies considerably in size and markings. The variety *Tempestivata*, Zell. (*Globulariata*, Mill.), is smaller, uniform reddish grey, with the lines straighter, not dentated on the disc, and well marked on all the wings; in the variety *Parvulata*, Hübn., the lines are straight, form only one angle, and do not coalesce opposite the cell. Widely distributed in Central and Southern Europe and Western Asia in April and July. The larva is pale yellowish-green or whitish, with dark green or reddish-violet lines on the back, and a paler line on the sides. It feeds on the flowers of a great variety of plants, such as *Clematis*, broom, convolvulus, *Globularia*, &c. (*E. Incertata*, Mill., which occurs at Cannes in June, is probably another variety. It is clay-coloured, with three dark brown lines on the fore-wings, and two on the hind-wings; the central dot is brown and very small, and the elbowed line is marked with horizontal black arrow-headed spots.)

MICRO-LEPIDOPTERA.

THE smaller *Lepidoptera*, including the moths belonging to the five groups *Pyrales*, *Tortrices*, *Tineæ*, *Pterophori*, and *Alucitæ*, are almost as numerous as the larger species, which have already been discussed in this work. Although fully as beautiful, and in many respects at least as interesting as the *Macro-Lepidoptera*, yet their small size and the consequent difficulty of collecting and preparing them cause them to be regarded with much less interest, even by collectors, than the larger species. It therefore becomes impracticable to describe the species in detail in a popular work like the present; but not wishing to omit the *Micro-Lepidoptera* altogether, we have figured a number of the more interesting species belonging to various families on our two concluding Plates. A considerable amount of information respecting the *Micro-Lepidoptera* has already been given in our Introduction; and we will now proceed to give some further account of the various groups which fall under this general term.

PYRALES.

THE insects included in this division may generally be recognised by their long slender bodies and legs, and frequently by their long narrow fore-wings. The hind-wings are always ample. The antennæ are not pectinated, though those of the males are frequently provided with a tuft of hair at the base or elsewhere; and the palpi are sometimes very long, projecting from the head in the form of a beak, as in the genus *Libythea*, among the butterflies. Their larvæ have always sixteen legs. The *Pyrales* are divided into the following six families—viz., *Pyralidæ*, *Botydæ*, *Chilonidæ*, *Crambidæ*, *Phycidæ*, and *Galleriidæ*.

The *Pyralidæ* and *Botydæ* average about 1 inch in expanse, though some of the smallest species do not measure more than half an inch across the wings, while the largest expand nearly 1½ inches. But their broad wings, and their habit of resting on leaves or trunks of trees either with all the wings expanded, or with the fore-wings lying flat over the hind-wings, sometimes make them appear larger than they really are. They generally fly at dusk, though some species fly by day, and most of the others may readily be disturbed from their hiding-places during the day-time.

We have figured two representatives of the *Pyralidæ*. One is **Pyralis Farinalis*, Linn. (Pl. 61, Fig. 15), a prettily-marked and widely-distributed insect, found throughout the Palæarctic Region, as well as in North America. It is known as the Meal-Moth, for its whitish larva feeds on flour, corn, and straw. The moth is double-brooded, and is found in summer. The Tabby Moth (**Aglossa Pinguinalis*, Linn.), figured on Pl. 61, Fig. 14, is dull-coloured; the male is smaller than the female. The larva is brown, smooth, and shining; it was long believed to feed on greasy substances, but recent observations of the late Mr. Buckler appear to show that its real food is hay, straw, and chaff.

The *Botydæ* differ very much in size and appearance, and many of the smaller species, belonging to the genera *Pyrausta*, *Ennychia*, *Threnodes*, *Hercyna*, &c., fly by day. Several species of *Pyrausta* and *Ennychia* are common in dry hilly districts in many parts of England;


1.
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7
9
10
16.
6.b
6.a
13.
1.
E.
F
14.a
14.b
17.
3.
2.b
2.a
15.
1.a
12.a
12.c
11.a
14.
B
1.b
12.b
11.b
C
D
A.

and we have figured **Pyrausta Purpuralis*, Linn. (Pl. 61, Fig. 5), and **Ennychia Nigrata*, Scop. (Pl. 61, Fig. 3), as familiar examples. *Threnodes Pollinalis*, figured at Pl. 61, Fig. 4, though common in many parts of Central Europe, is not British. The species of *Hercyna*, several of which are common in the Alps, are small black or brown moths resembling the species of *Ennychia* in size and appearance, but more dingy.

**Odontia Dentalis*, W. V., is a rather local insect in the south of England, though commoner on the Continent. It is remarkable for the zigzag markings on the fore-wings, from which it derives its name, and is found among viper's bugloss, on which the larva feeds. The moth and larva are represented at Pl. 61, Fig. 2, *a*, *b*.

The China-Marks are white, delicately-formed moths, more or less marked with brown and yellow, which are always found near water, for their larvæ feed on water-plants, and in some instances are even provided with branchiæ. **Hydrocampa Nymphæata*, Linn., is figured with its larva at Pl. 61, Fig. 1, *a*, *b*. It is common in England.

The Small Magpie-Moth (**Botys Urticata*, Linn.), figured with its larva at Pl. 61, Fig. 6, *a*, *b*, is abundant everywhere among nettles, in company with **B. Ruralis*, Scop., the largest of the British *Pyrales*, which expands nearly 1½ inches. The latter is a shining yellowish-white insect, with brownish-grey markings, and is not unlike **B. Hyalinalis*, Hübn. (figured at Pl. 61, Fig. 8), in shape and general appearance, though larger and paler. The latter species, and **B. Flavalis*, W. V. (figured at Pl. 61, Fig. 7), though locally common, are far less abundant than *B. Urticata* and *Ruralis*.

The *Chilonidæ* only include a few long-winged species, expanding from 1 inch to 1¼ inches, and generally of a greyish-ochreous or brownish colour, with the hind-wings paler-coloured and considerably broader than the fore-wings. They are generally found among water-plants, on which their larvæ feed.

The *Crambidæ*, or Grass Moths, abound in meadows in summer. In walking through long grass we cannot fail to disturb numbers of moths, sometimes with whitish fore-wings, and sometimes with narrow brown or yellow fore-wings, more or less streaked with white, and broad white or brown hind-wings. Their palpi, too, are very long, and project in front of the head in a kind of beak. They fly a little way, and then disappear suddenly; but on close examination we shall find them sitting head downwards on a grass-stem, with their wings folded round them in the smallest possible compass. **Crambus Selasellus*, Hübn. (Pl. 61, Fig. 9), though not one of our commonest species, is a sufficiently typical representative of the meadow-frequenting *Crambi*. But the species of *Crambus* are not exclusively confined to grassy places; for one of the prettiest species of the genus, **Crambus Pinetellus*, Linn. (Pl. 61, Fig. 10), frequents pine-forests.

The *Phycidæ* somewhat resemble the *Crambidæ* in shape, having rather narrow fore-wings and broad hind-wings. The antennæ often have a tuft of hair near the base in the males; and the palpi are sometimes long and straight, as in the *Crambidæ*, and are sometimes curved upwards. Their bodies are generally long and slender. Some of the smaller species are not unlike *Tortrices* or *Tineæ*. Some of their larvæ feed on trees, while others feed on dried fruits, with which new species are not unfrequently imported into this country. The smaller species expand about three-quarters of an inch; but the larger species expand 1 inch or more. Two of the largest and handsomest species are figured on our Plate 61. These are **Pempelia Semirubella*, Scop. (Fig. 11, *a*, *b*), and **Myelophila Cribrum*, W. V. (Fig. 12, *a*—*c*). The former is not uncommon on the downs in the south of England; and the latter is also most frequently met with in the south. Both are common in Europe and in Northern and Western Asia; and

as the larva of *M. Cribrum* lives in the stems of thistles, where it hybernates, it is singular that it is a less abundant insect than might be expected.

The *Galleriidæ* resemble the *Phycidæ* in appearance, but are rather stouter. Two species are parasitic in bee-hives, and are very destructive, devouring the wax, and eating through the combs. There are but seven European species, five of which are British, but only one is generally common—viz., **Aphomia Colonella*, Linn., the larva of which lives in the nests of wasps and humble-bees. The moth has reddish-white or grey fore-wings, with the costa greenish; and two dark zigzag transverse lines; near the middle of the wing are one or two dark spots; the hind-wings are grey. It expands about 1¼ inches. **Galleria Mellonella*, Linn., is the largest species of the family; it is figured on our Pl 61, Fig. 13. This species, as well as **Achræa Grisella*, Hübn., a much smaller grey moth, infests bee-hives, where the larvæ often commit great ravages. The species of the genus *Melissoblaptes*, Hübn., are probably not parasitic, for the only species of which the larva is known (*M. Cephalonica*, Staint.) was bred from dried currants.

TORTRICES.

THE moths classed under this heading are of small size, rarely expanding less than half an inch or more than 1 inch. The fore-wings are moderately broad, and the hind margin is generally nearly straight; the hind-wings are rounded, not much broader than the fore-wings; and the antennæ are always simple. The larvæ live in rolled-up leaves, from which they rush out when alarmed, and drop themselves down by a thread. Others live in the stems or roots of plants, or in the heads of composite plants, in seed-capsules, in fruits, or in galls. Many of the species are constant and sharply defined in their markings, but in other cases the markings are somewhat ill-defined, and so variable that it is difficult to find two specimens alike. The classification of the *Tortrices* is very unsatisfactory, for the attempts of some writers to subdivide the group have not met with general acceptance, and the composition of some of the larger genera is still very unsettled.

We have figured eight species to illustrate the *Tortrices*. **Antithesia Pruniana*, Hübn. (Pl. 62, Fig. 3), is a very common but very pretty species, the greenish larva of which lives between the leaves of cherry, sloe, plum, &c., in spring; the moth appears in summer. **Penthina Salicella*, Linn. (Pl. 62, Fig. 1), is another common species, though less abundant than the last. Its larva is dark brown, with a black head, and lives between the leaves of the willow. The most typical species of this group is the Green Oak-Moth (**Tortrix Viridana*, Linn.), which may often be dislodged in a perfect shower by shaking the branch of an oak-tree in summer (Pl. 61, Fig. 18, *a*, *b*). The green larva feeds on oak and other trees in spring, dropping down by a thread if disturbed. **Loxotænia Sorbiana*, Hübn. (Pl. 61, Fig. 17), is another common species, which proceeds from a dark grey or bluish-grey larva, which feeds between united leaves, and is not particular about its food, but lives on a variety of forest-trees. **Teras Caudana*, Fabr. (Pl. 61, Fig. 16), is a very variable insect, but may be recognised at once by the peculiar shape of the costa, which has given it the name of the Notch-Wing. The moth appears in autumn, and its green larva lives on poplar and willow. **Retinia Resinella*, Linn. (Plate 62, Fig. 2, *a*, *b*), is widely distributed on the Continent, but is a Scotch insect in Britain. It differs considerably in its habits from any of the foregoing species. The moth appears in May or June, and the female lays her eggs on the new shoots of the fir, when about as long

as a finger. The young larvæ hatch in a week, when they gnaw into the shoot, and live in a kind of gall formed by the exuding sap. They require two seasons to reach their full development. The species of the genus *Carpocapsa* live in fruits and seeds, and the larvæ of **Carpocapsa Pomonella*, Linn. (Pl. 62, Fig. 5, *a*, *b*), and **C. Funebrana*, Treitschke, often commit great ravages in our orchards. The larva of the first is not content with living in apples and pears, but lives under the bark of the trees also, and that of the second lives in plums. **Grapholitha Citrana*, Hübn. (Pl. 62, Fig. 4), is widely distributed in Central Europe, but is not generally common in England. It frequents dry heathy places. Two species of *Tortrices* of very similar coloration (**Xanthosetia Hamana*, Linn., and **X. Zœgana*, Linn.) are common among thistles.

TINEÆ.

The *Tineæ* are a very large group of moths, to which no less than a third of our British species belong. The great majority are, however, of small size, and very few even of the largest expand as much as 1 inch. Their larvæ differ much in habit; some live between the upper and under surface of leaves, forming blotches or galleries, which are conspicuously paler than the rest of the leaf; others live on hair or feathers (as our common Clothes-Moths), and others again on corn, rotten wood, or fungi; one species even lives in ants' nests. Many construct cases for themselves. The moths may generally be known by their long and narrow wings, with very long fringes; and their antennæ are generally simple. They are divided into a large number of families, a full list of which is given at p. xxvi. of the Introduction. We will proceed to notice a few of the most important.

The *Talæporidæ* are small brown or grey moths, expanding about half an inch. They appear in spring, and resemble *Psychidæ* in their habits, for the female is apterous, and the larva lives in a case.

The *Tineidæ* proper include our common Clothes-Moths, several species of which are common in houses; the best known are **T. Pellionella*, Linn., which is pale brown, with three spots on the fore-wings, and **T. Tapetzella*, Linn. (figured at Pl. 62, Fig. 6). Next to these, the most destructive species is **T. Granella*, Linn., the larva of which feeds on corn in granaries. Three other species of this family are figured. *Euplocamus Anthracinalis*, Scop. (Pl. 62, Fig. 7), is a large and handsome species, which is common on the Continent in May and June, though very rare, if found at all, in England; the larva feeds on rotten wood, and fungi growing on trees, in spring. **Incurvaria Muscalella*, Fabr. (Pl. 62, Fig. 8), is common in woods in May and June; the larva may be found among dried leaves during the winter. **Nemophora Swammerdammella*, Linn. (Pl. 62, Fig. 9), belongs to a genus remarkable for the great length of its antennæ. The moths fly at dusk in May and June, and are not uncommon; the larvæ mine in oak and beech leaves when young, and afterwards live on low plants in cases formed of dry pieces of leaf.

The family *Adelidæ* includes the genera *Adela* and *Nemotois*, both of which have very long antennæ, and are of a brilliant green or coppery colour. They appear from May to July, and fly by day. We have figured **Adela Degeerella*, Linn. (Pl. 62, Fig. 10), the larva of which feeds on wood anemone. The yellow band on the fore-wings, which enhances the beauty of this species, is absent in some of its allies.

The *Hyponomeutidæ* include among other species the Small Ermine Moths, which belong to the genus *Hyponomeuta*. They are all very similar, and the webs of the larvæ of **H. Padella*,

Linn., may often be seen covering our hedges and apple-trees, which the larvæ soon defoliate if their ravages are not checked. We have figured two species of this genus—**H. Evonymella*, Linn. (Pl. 62, Fig. 12), the larva of which feeds on bird-cherry; and **H. Cognatella*, Tr. (Pl. 62, Fig. 13, *a*, *b*—moth and nest of larvæ), which feeds on spindle-tree. These gregarious species are naturally abundant wherever they occur.

We have figured **Cerostoma Dentella*, Linn. (Pl. 62, Fig. 11), remarkable for its hooked wings, as our representative of the family *Plutellidæ*. The larva lives on honeysuckle in May, and the moth appears in summer.

The *Chimabacchidæ* are a very small family, comprising only three European species, all British. **Chimabacche Fagella*, W. V. (Pl. 62, Fig. 14), is found in woods in early spring; the wings of the female are short, and unfitted for flight. The greenish larva lives between leaves at the end of autumn.

The great family *Gelechiidæ* includes about one-fourth of all our British *Tineæ*. We have figured two species of the genus *Psecadia*, which is now placed in this family, though formerly included with the *Hyponomeutidæ*. *P. Pusiella*, Rœm. (Pl. 62, Fig. 15), is found in Central and Southern Europe in summer; the larva feeds on *Lithospermum* and *Pulmonaria* in May. *P. Bipunctella*, Fabr. (Pl. 62, Fig 16), is double-brooded, occurring in spring and autumn; its larva feeds on vipers' bugloss. Both these species are of very rare or doubtful occurrence in England. The genus *Depressaria* includes a number of common brown species, not unlike our Fig. 14 in shape, but rather smaller, which the old authors regarded as *Tortrices*. The abdomen is rather flattened, whence they are frequently called "Flat-Bodies" by collectors. They appear in summer and autumn, and generally hybernate, re-appearing in spring.

Most of the remaining families include very small insects, and no representatives are here figured. Many of them are highly beautiful, with brilliant metallic spots and markings.

A familiar representative of the family *Gracilariidæ* is **Gracilaria Syringella*, Linn., a delicate little pale grey moth, measuring half an inch across the wings, which is common among lilac and privet. Its larva lives gregariously in blotches on the leaves.

The larvæ of the *Coleophoridæ* form themselves cases, like those of the *Psychidæ*, but smaller. The moths are long and narrow-winged insects, expanding from half to three-quarters of an inch, and generally of pale colours; some are nearly white.

The majority of the *Elachistidæ*, *Lithocolletidæ*, *Nepticulidæ*, &c., mine in the leaves of various plants; many species of *Elachista* mining in the leaves of grasses. The family *Nepticulidæ* is remarkable for containing the smallest known Lepidopterous insect, **Nepticula Microtheriella*, Staint., which is purplish-brown, with a narrow white stripe across the fore-wings. It expands only one-eighth of an inch; and its larva mines in the leaves of the nut. It is so small that Mr. Stainton has sometimes counted more than twenty mines in a single leaf. Many of the allied species approach it in minuteness, but are not *quite* so small; one common *Nepticula*, **N. Aurella*, Haw., mines in bramble. The moth expands about a quarter of an inch, and is of a purplish-bronze, with a yellow stripe on the fore-wings.

PTEROPHORI.

The *Pterophoridæ*, or Plume Moths, have the fore-wings divided into two, and the hind-wings into three, by deep clefts, as shown in our figures. They are very delicately-formed insects, with long slender legs and bodies. (In the genus *Agdistis*, Hübn., the wings are not


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A

divided, but the few species which it comprises, only one of which, **A. Bennettii*, Curt., is British, may easily be recognised by their peculiar shape.) We have figured three species of this family on Pl. 62. **Pterophorus Pterodactylus*, Hübn. (Fig. 17), and **P. Pentadactylus*, Linn. (Fig. 19), are very common in England, especially the latter, which frequents weedy places in gardens, &c., and has a peculiar floating flight; their larvæ feed on convolvulus. *P. Carphodactylus*, Hübn. (Fig. 18), is common on the Continent, but is not a British species; the larva feeds on *Conyza squarrosa*.

Some authors consider the *Pterophoridæ* to be allied rather to the *Pyrales* than to the *Tineæ*.

ALUCITÆ.

The *Alucitidæ*, the last family of the *Lepidoptera*, includes only the single genus *Alucita*, Linn., which contains a few small dull-coloured insects, only one of which (**A. Hexadactyla*, Linn., the Twenty-Plume Moth) is British, with broad wings, each divided into six separate feathers. The larva of our British species feeds on the buds of the honeysuckle, and the little yellowish-grey moth, with darker lines on the wings, is often seen resting on tree-stumps, out-house walls, or even windows, in the country, with its wings expanded, for it is a common garden insect. It expands nearly three-quarters of an inch.



The Twenty-Plume Moth
(*Alucita Hexadactyla*).

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