The butterflies of Great Britain : with their transformations delineated and described / by J.O. Westwood.

THE Butterflies OF GREAT BRITAIN

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J. O. WESTWOOD.

F.L.S. &c

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BUTTERFLIES OF GREAT BRITAIN

WITH

THEIR TRANSFORMATIONS

Delineated and Described

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J. O. WESTWOOD, F.L.S.

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PREFACE.

The proprietor of the works entitled "British Butterflies and their Transformations," and "British Moths and their Transformations," having determined to reissue the former at a price which would place it within the reach of every student, it has been considered that the most satisfactory manner of carrying this resolution into execution would be to reduce the size as well as bulk of the work, without, however, omitting any important or necessary information. To effect this, a set of fresh plates has been drawn by myself, in which every decidedly authenticated British species of Butterfly is illustrated together with the preparatory states of nearly all the species, copied from the works of Hübner, Godart, or other trustworthy authority. The doubtful species have not, however, been entirely omitted, but are shortly noticed in a Supplement.

With the view of imparting additional interest to the present work, I have, where possible, illustrated the species by means of specimens remarkable either from being gynandromorphous, or from exhibiting some other anomalous peculiarity. The circumstance that the opposite sides of the bodies and wings in the individuals of the former class of monsters are those of the opposite sexes, has been so far favourable to the work, in its limited extent, by enabling the characters of the two sexes to be shown in a single figure.

An Introduction, containing the general characteristics of the Butterfly tribes, in greater detail than in the original work, has also been added. In

this Introduction I have embodied the results of a very minute and microscopical examination of a vast number of species which had been rendered necessary for my completion of the great work on the "Genera of Diurnal Lepidoptera," commenced by Mr. Edward Doubleday, and in which several important characters, hitherto almost or entirely neglected by Lepidopterists, were examined in detail: such as the structure of the palpi and fore legs, the veining of the wings, the articulation of the antennæ, the ungues and their appendages, and the external marks of distinction between the sexes in the different groups. Many of these neglected characters were found to be of great value, not only as indicating family and generic, but often even of specific distinctions.

Two elementary plates, devoted to the illustration of the general characters of the Butterfly tribes, and containing a great number of microscopical details, both of their perfect and preparatory states, have also been added, and which, in conjunction with the full description given of these two plates, it is hoped will be of great service to the entomological tyro, leading him to examine the beautiful organizations of these creatures, instead of resting contented with securing fine specimens for his cabinet; the best methods of doing which are also given at the end of the Introduction.

J. O. W.

December, 1854.

INTRODUCTION.

I. GENERAL CHARACTER OF THE ORDER LEPIDOPTERA.

The beautiful tribes of Butterflies and Moths constitute one of the primary divisions or orders of winged insects, which has been termed Lepidoptera (Scale-winged) by Linnæus, the great nomenclaturist of the animal and vegetable kingdoms: a name derived from the Greek, in allusion to the structure of the wings, which are four in number, of a membranous texture, and covered on both sides with innumerable minute scales, resting upon each other like the tiles of a roof, and easily removed. It is to these scales that the insects are indebted for their splendid colours, the membrane of the wing itself being colourless.

The head is free—that is, not received in a frontal cavity of the thorax—and is furnished on each side with a large compound eye, and above with a pair of elongated antennæ, variable in form, not only in the different species, but also often in the sexes of the same species, and which in the butterflies are almost always terminated by a knob-like club. The mouth occupies the lower part of the face, and appears at first sight to consist only of a long tongue, which the insect folds and unfolds in a spiral manner at will, and of a pair of scaly or hairy appendages, serving as a defence to the spiral apparatus when coiled up; but a more minute examination shows that the mouth is much more complicated in its structure, and that it exhibits all the parts (although generally in quite a rudimental state) of the mouth of the biting insects. In fact, by denuding the front of the head of its scales, two minute triangular pieces are observed at a small distance apart above the origin of the spiral instrument, and which are the rudimental mandibles, here apparently useless, as is also the small conical upper lip placed between these two rudimental jaws, below which on each side is an oval plate soldered to the head, from the upper part of which arises one of the lateral halves of the spiral instrument, which in effect is composed of the two lower jaws extraordinarily elongated, and applied together so as to form a sucking tube; at the base of each portion of this tube is a minute tubercle, which in some species is developed into an elongated pair of feelers, or maxillary palpi; the labial palpi being the large feelers between which the spiral maxillæ are placed when at rest, and arising from the sides of the lower lip, which, like the basal part of the maxillæ, is soldered to the head.

The transformations of these insects, which have attracted the attention of the most incurious observer from the earliest period, also serve to distinguish them from all other insects. The females deposit a considerable number of eggs, from which are hatched small worm-like jointed animals or larvæ, furnished with a scaly head, armed with a mouth and powerful jaws; six short scaly legs, attached in pairs to the three segments succeeding the head, and a variable number of short, thick, fleshy legs attached in pairs to the posterior segments of the body. The appearance of these larvæ is extremely variable, some being smooth, others warty, some hairy, etc. Their food consists almost entirely of vegetable matter. Whilst in this state they cast their skins several times, and when full-grown this operation is again repeated; but, instead of the insect reappearing as a caterpillar, it now more nearly resembles an Egyptian mummy; on minutely examining which, however, we can trace the rudiments of most of the limbs of the perfect insect, but closely applied to the body and covered by a general slender pellicle; the future wings occupying the sides of the anterior part of the body, between which are to be observed the leg-cases and the antennæ-cases. The form of these chrysalides, aureliæ, or pupæ (as the insects are termed in this state), varies greatly; those of butterflies may almost always, however, be distinguished by having several angular prominences in various parts of the body, whilst those of moths are conical and not angularly tubercled. This peculiarity seems dependent on the circumstance that the caterpillars of the latter tribes enclose themselves in cocoons or cases entirely of silk, or of silk mixed with various extraneous materials, within which angular prominences on the body would be inconvenient to the enclosed insect; the caterpillars of butterflies, on the contrary, rarely form cocoons, but are transformed to pupæ in the open air. After remaining a certain period in this state, the time for the bursting forth of the perfect insect arrives, and, after slitting the pupa skin in several directions, it disengages itself from its exuviæ, gradually extends its wings, and assumes all the beautiful characteristics of its perfect state.

The Lepidopterous insects were divided by Linnæus into three primary genera, Papilio, Sphinx, and Phalæna, each subdivided into minor groups, and corresponding with the butterflies, hawk-moths, and moths of English collectors. As, however, the number of species became more and more extended, and a more minute investigation of the characters of the species was made, it became necessary to introduce a much more extended mode of distribution, whereby the order was divided into three principal sections, Diurna, Crepuscularia, and Nocturna (corresponding with the three Linnæan genera). These have been again subdivided into families, and the latter into numerous genera and subgenera. The Crepuscularia

and Nocturna, or the hawk-moths and moths, are, however, much more closely allied together than either of them is to the Diurna; so that M. Boisduval, one of the best authorities upon the order, has judiciously proposed to adopt only two principal sections, Rhopalocera, or those with clubbed antennæ (butterflies), and Heterocera, or those with antennæ of variable shape, but never clubbed hawk-moths and moths).

II. CHARACTERS OF THE RHOPALOCERA, LEPIDOPTERA DIURNA, OR BUTTERFLIES IN GENERAL.

Of all the tribes of the animal creation, none, it may be safely affirmed, possess greater powers of attraction than the different species of Butterflies, with some of which all of us have been more or less familiar from our earliest childhood. With birds and flowers they may be considered as maintaining a constant rivalry, partaking of the activity and sprightliness of the former, as well as of the beauty of colour and fragile forms of the latter.

Confined, as our attention must necessarily be in the present work, to the natives of our own island—which cannot, of course, vie with the productions of tropical climates—we still find numerous instances of brilliancy of colour, often contrasted in the most remarkable manner, as well as elegance of markings, which are not surpassed by any other objects in the creation. The imperial gloss of the Purple Emperor Butterfly, the intense black and scarlet of the Red Alderman Butterfly, the vivid golden red of the Coppers, and the delicate blues of the Mazarine and Adonis Butterflies, may bear comparison with the colours of any exotic species; whilst the intricate markings of the fritillary butterflies, the eye-like spots of the Vanessæ and Hipparchiæ, and the silvery spots of some of the fritillaries, elicit our warmest admiration.

It is not, however, in the perfect, winged state alone that these insects attract our attention, since the remarkable transformations which they undergo have, in all ages, afforded materials for ingenious observation, and which, although for many ages regarded as instances of an absolute metamorphosis of one kind of animal into another, have still lost none of their marvellous character, since the researches of Godart and Swammerdam have taught us that the change was but the successive throwing off of the outer skin by an animal, which, being in its early states destined to feed upon vegetable matters, had no need of wings to seek its food, but which, when brought to maturity, required those organs to enable it to flit about from flower to flower, seeking a new kind of food in the honeyed nectar

of flowers, as well as to fulfil the great end of its existence in the reproduction of its kind.

The following lines, by the delightful poet Rogers, illustrate so many of these peculiarities of butterfly life, that I may be excused for quoting them in this place :—

> "Child of the sun! pursue thy rapturous flight,
> Mingling with her thou lov'st, in fields of light,
> And where the flowers of Paradise unfold,
> Quaff fragrant nectar from their cups of gold:
> There shall thy wings, rich as an evening sky,
> Expand and shut with silent ecstasy.
> Yet wert thou once a worm, a thing that crept
> On the bare earth, then wrought a tomb and slept.
> And such is man: soon from his cell of clay
> To burst a seraph in the blaze of day.

III. GENERAL CHARACTERS OF THE IMAGO, OR PERFECT STATE OF BUTTERFLIES.

In the perfect state, the three great divisions of the body observable in the Imago or perfect state of so many of the Ptilota, or winged articulated animals, are especially distinct, namely, the head, thorax, and abdomen: the first bearing the eyes, antennæ, and organs of nutrition; the second bearing the organs of locomotion, namely, the wings and legs; and the abdomen, destitute of external appendages, but containing the organs of generation at its extremity.

The head is free, that is, it is not received into the anterior cavity of the thorax, as in beetles or grasshoppers, being, on the contrary, attached to the front of the thorax by a very slender neck, which allows it to turn about, as on a pivot. It is generally transverse. The eyes are two in number, of large size, and placed at the sides of the head; they are hemispherical, and each consists of a vast number of minute hexagonal lenses, each possessing the power of a separate eye. These vary in size, and consequently in number, in different species; but in a species examined by M. Puget, each eye has been found to contain not fewer than 17,325 of these lenses, or 34,650 in both the eyes. A curious character, which has not been noticed with sufficient care, exists in the eyes of many species of butterflies: the walls or partitions between the lenses are, in fact, set with hairs of greater or less length.

The antennæ are of moderate length, and consist of a considerable number of articulations, which are often indicated by white scales. The number of these articulations has not hitherto been employed as a generic character, but I have found it of some value in discriminating nearly allied groups of exotic species. The

antennæ are terminated by a more or less distinct knob or club, in which the joints are much shorter than in the basal stem. In some groups the terminal portion is scarcely thicker than the base, whilst in others it is short and thick like a pear, and in some (Hesperidæ) it is terminated by a recurved point or hook. In Thecla Quercus I have noticed that the antennæ differ in colour on the under side of the club in the opposite sexes.

The mouth of the majority of the species of butterflies consists of the spiral tongue and a pair of palpi: the former is composed of two elongated semi-tubular pieces, which, from their position, represent the lower pair of jaws (maxillæ) of the beetles, and, like them, bear a jointed appendage or palpus at their base; in most of the species of butterflies, however, these maxillary palpi are extremely minute or rudimental; but in some of the moths they are greatly developed. This spiral tubular instrument is the chief organ by which, when unrolled, the butterfly sucks upon the nectar of flowers; it then resembles a slender black horny thread, which the insect thrusts into the nectary of flowers; it varies in length as well as strength in different genera, this variation evidently corresponding with a variation in the class of flowers resorted to by the insects. The minute investigation of the curious structure of the spiral tongue has been undertaken by Reaumur and other entomological anatomists, and is well adapted for the employment of the microscope.

In some species the extremity of each of the two pieces of which the spiral tongue consists is extensively furnished with a number of minute barrel-shaped papillæ, each of which is terminated by three more minute ones arranged around the extremity, with a central one rather larger than the rest. These appendages (which are especially distinct in the spiral tongue of the Red Admiral and Peacock Butterflies, Vanessa Atalanta and Io) are arranged in two rows along the lateral and anterior surface of each maxilla, for about one-sixth of its whole length. Mr. Newport has counted 74 in each maxilla, or 148 in both. From their structure, and from being always plunged deeply into any fluid when the insect is taking food, they may probably be regarded as organs of taste. They are scarcely perceptible in the common white butterflies. There are also some curious appendages arranged along the inner anterior margin of each maxilla, in the shape of minute hooks, which, when the proboscis is extended, serve to unite the two halves together, locking across each other like the teeth in the jaws of some fishes; and Mr. Newport believed that the points of the hooks of one series are inserted into little depressions between the hooks of the opposite series, apparently forming the anterior surface of the canal or tube of the spiral tongue, through which the food ascends into the mouth. How this, however, is effected does not appear to have been yet

satisfactorily determined: some having imagined it to be simply by capillary attraction; and others that it is forced along by successive undulations and contractions of the sides of the tube, occasioned by the action of the transverse muscles; or, lastly, that the lateral canals within the body of each maxilla (which Mr. Newport considered to be the proper tracheæ of the organs) assist by producing a vacuum within the mouth and tube, which facilitates the conveyance of the food more rapidly along it. With a view to determine this point, Mr. Newport gave sugared water, coloured with indigo, to two specimens of Pieris Napi; and, on attentively examining the front of the spiral tongue with a microscope while the insects were busily employed in partaking of the fluid, he observed the particles of indigo disseminated in it ascend along the tube, not in a gradual and regular succession, as must have been the case had the ascent of the fluid been occasioned simply by capillary attraction, but pumped up, as it were, sometimes in a full stream, in quick succession for one or two seconds, as if the insect was then sipping a full draught; whilst at others a few particles only ascended quickly, followed by still fewer with a much slower motion, thus indicating distinct intervals between each draught or ascent of fluid. Hence Mr. Newport offered the following explanation:—"The insect, when it alights upon a flower, makes a forcible expiratory effort, by which the air is removed both from the tracheæ that extend through the proboscis, and from those with which they are connected in the head and body, and at the moment of applying its proboscis to the food, makes an inspiratory effort, by which the tube is dilated, and the food ascends in it at the instant to supply the vacuum produced, and is carried onward by the same act to the mouth, and from thence, by the action of the muscles of the pharynx, into the œsophagus and stomach, without any interruption of the function of respiration: the constant ascent of the fluid into the mouth being assisted by the action of the muscles of the proboscis, which continue in action during the whole time the insect is feeding." (Newport in "Cyclop. Anat. and Phys.," art. *Insecta*.)

When unemployed and rolled up, the spiral tongue is guarded at the sides by a pair of elongated, scaly jointed appendages, which are advanced in front of the head, and which are the representatives of the labial palpi, being attached to the flattened plate which represents the lower lip or labium. In general these organs consist of three joints, more or less strongly covered with scales or hairs; and I have observed that in some groups the sexes differ in the relative proportion of the joints of these palpi.

The thorax is a solid oval mass, generally wider than the head, and varying in size in different groups according to the greater or less powers of flight pos-

sessed by the species: thus we find in some of the Nymphalidæ, which contain many of the most powerful flyers among the Diurna, the thorax is very robust, and well fitted for enclosing the powerful muscles acting upon the wings.

The wings, four in number in all butterflies, are, in comparison with the body, of very large size; they consist of a thin transparent elastic membrane, traversed and supported by a number of tubular nervures, or, more properly speaking, veins; the researches of recent anatomists having clearly proved them to be employed in circulating the aerial and aqueous fluids by which, in the first instance, the wings, whilst in a moist and corrugated state, are expanded to their full size, and through which subsequently the circulating medium emitted from the great dorsal vessel, or heart, flows. In many species of butterflies, there is an evident difference in the form of the outline of the wings of the opposite sexes.

The examination of veins of the wings, or the Pterology of these insects, has lately been pursued to a considerable extent; for although, from the days of Jones, who published a memoir on the subject in one of the early volumes of the "Linnean Transactions," the variations of this character have been partially employed, yet it is only within the last few years that a general and careful revision of the character, as exhibited in the numerous modern genera, has been attempted. In all butterflies the fore wings are furnished with four primary veins, two of which emit branches: these are, 1st, the costal, which runs contiguous to the costa, and is simple; 2nd, the sub-costal, which runs quite close to the costal for about half the length of the wing, where it commences throwing off branches (typically four in number), which generally join the costa or fore margin itself; 3rd, the median, which is the strong vein in the middle of the wing, divided typically into three branches; and, 4th, the sub-median, running parallel with the hind margin, and always simple. Besides these, there are between the posterior branch of the sub-costal and the anterior branch of the median, two branches, or discoidal veins; which have, according to their position, been occasionally assigned to the sub-costal and median, but which Mr. E. Doubleday considered as the terminal branches of a fifth vein, of which the obliterated base was supposed, typically, to run between the sub-costal and median veins. In Papilio, these two discoidal veins are united together, as well as joined to the sub-costal and median veins, by transverse veinlets, which Mr. Doubleday termed disco-cellular, and which, when present, close the discoidal cell. In many butterflies, however, one or other of the disco-cellular, connecting veinlets are wanting, and then the discoidal cell is open at its extremity. The veins of the hind wings are ranged nearly as in the fore wings, except that there is only one discoidal vein, the discoidal cell being closed or open as this vein is united with the median vein by a disco-cellular veinlet or not. Moreover, in the hind wings the costal vein

is generally furnished, near the base, with a short spur or branch running towards the costa; and, I believe, it is this spur which, in the moths, constitutes the bridle or bristle hooking the fore to the hind wings, the costal portion of the hind wings of the butterflies being obsolete in the moths; whilst the veinlet or branch by which it is traversed in the butterflies is still present in the moths, but formed into a free and simple spur.

The beauty of the wings of these insects depends upon the coating of minute scales with which they are covered on both sides, and which may be compared to the scales of fishes, or to the tiles on the roofs of houses. Of their extreme minuteness some idea may be obtained when it is stated that in the space of a square inch no fewer than 100,736 of these scales have been counted; and when it is remembered that many exotic butterflies measure from six to nine inches in expanse, and are of corresponding width, it will be easily conceived how countless must be their number. They are inserted into minute cells or elongated cups, arranged in rows across the membrane of the wing by means of very short slender footstalks. In many species these scales exhibit the most brilliant metallic tints, such, for instance, as the splendid American species of Morpho, whilst others have the under side of the wings ornamented with splendid silvery spots, and, in a few instances, the wings reflect in certain positions a remarkably vivid opaline gloss. Their texture has lately formed the subject of extensive microscopical investigation; and, as some of them are marked with numerous parallel longitudinal impressed lines, they have been used as valuable test-objects by microscopists.

According to M. Bernard Deschamps, these scales differ, not only in the granulations and striæ with which their surface is covered, but also in the number of the membranes of which they are composed; having arrived at a knowledge of the latter curious circumstance, from the scales being occasionally imperfect in certain parts, giving an opportunity of investigating them more perfectly than when entire; hence he is induced to consider that all these scales are formed of two or, more commonly, of three lamellæ; and it is always upon the superior layer that the granulations of which the colouring matter of the scale is composed are to be found. These granulations are of a regular form, and their number is sometimes so considerable that the scale is entirely opake; when it exhibits striæ it is always upon the second lamella that they are placed. These striæ are often parallel, and formed of minute granulations like oval or round pearls placed end to end. Those scales which have the striæ without granulations have only two lamellæ: the inferior surface of the second (when only two) or of the third lamella, in almost all butterflies, has the property to reflect prismatic colours more intense and beautiful than those on the upper surface, which give the colon to the wing. (Deschamps in

"Ann. Sci. Nat.," February, 1835. Bowerbank, "Ent. Mag.," No. 23. Read in "London and Edinburgh Phil. Journal," Oct., 1839.)

The form of these scales is extremely varied, being generally of a more or less oval form, narrowed at the base, and widened at the outer extremity, which is more or less notched or toothed. Several of these scales are represented in the "Journal of a Naturalist," second edition; and a writer in Loudon's "Mag. Nat. History," No. 11, suggests that they may possibly be of service as affording specific distinctions in closely allied species (vol. iii. p. 87). Without adopting such an opinion it is evident that, although a considerable variation in the forms of the scales, even upon a single wing of any species, is to be observed, yet there is a preponderance of a certain form in many which I have examined. The accompanying figures represent the more ordinary form of the scales on the fore wings of Papilio Machaon (pl. B. fig. 2), Parnassius Apollo (fig. 3), Leptosia candida (fig 4), Pieris Daplidice (fig. 5), Apatura Iris (fig. 6), Pieris Rapæ (figs. 8, 9), Polyommatus Corydon (fig. 10), P. Brassicæ, female, and black markings of the male (fig. 11), white parts of the male of ditto (fig. 12), and Polyommatus Boeticus (fig. 13).

A remarkable peculiarity connected with these scales has lately been observed by microscopists, both in England and France, but has not yet received so much attention from entomologists as it deserves. It consists in the discovery of a distinct kind of scale upon the wings of the males of some of the species of Diurna, of which no traces occur in the wings of the females. These male scales are dispersed singly, without any order, over the surface of the wing, and, from their peculiar form, have been termed plumules by M. Deschamps. The species which have hitherto been found to possess them belong to the genera Pieris and allies, Argynnis, Hipparchia, and Polyommatus; and it is chiefly in those species of which the males have the upper surface of the fore wings ornamented with patches of velvet-like hairs that these curious scales are to be met with. In Pieris Rapæ and Napi, they are of a reversed heart shape; the basal peduncle arising between the lobes and the tip more or less elongated, and furnished with a number of minute plumules. In P. Rapæ I found but few in the discoidal cell, but they are numerous in P. Napi. In P. Brassicæ, however, it seems to me that they constitute nearly the entire covering of the wing, and are of a very elongated form, gradually narrowed to the tip, where they are plumulose. In P. Cratægi, Daplidice, Cardamines, and Leucippe, they are oblong, rounded at the base, with the tip more or less conical, and strongly plumulose. In Hipparchia Megæra, Mera, and Fauna, and in Argynnis Paphia and Adippe, they are elongated, and more closely resembling those of P. Brassicæ, except that they are lanceolate at the extremity. In several species of Polyommatus they are oval or rounded, and sometimes sub-truncate,

without any trace of plumules, but with the disc marked with several rows of small tubercles. The cells in which their basal peduncles are implanted in the wing are shorter and wider than those of the ordinary scales, and they are placed irregularly between the rows of the latter.

The wings of the males of many species of butterflies are also distinguished from those of the female by bearing velvet patches of hairs or down upon different parts, either of the membranes, or upon the veins themselves; thus Papilio Paris and some of its allies, and Argynnis Paphia, have the longitudinal veins beyond the middle of the wing densely clothed with hairs. In the Hipparchiides, several of the species have oblique patches of hairs on the disc; the same also occurs in the males of several of our British Skipper Butterflies; in some of the hair streaks there is a velvet patch near the tip of the discoidal cell; and in some exotic species of Papilio and various other groups, the wings of the males are furnished with singular tufts and patches of long hairs, sometimes of a colour quite unlike that of the ground colour of the wing.

The legs of these insects are slender, and of moderate length; they are six in number, and consist of the usual pieces, the thigh being generally the strongest, and often fringed with long hair; the tibia is more slender, often rather thickened towards the tip, where it is generally furnished with a pair of short spurs or moveable spines; in some groups, also, it is furnished in the middle, on the inside, with a flattened elongated spur.

The tarsi, or terminal portions of the legs, are generally nearly equal in length to the tibiæ, but more slender, five-jointed, the under surface of the joints often furnished with rows of very minute spines, and terminated by two small curved claws, which are sometimes bifid or bipartite, and often with lateral appendages of a leathery texture (pseudonychiæ), which are finely hairy, and often divided into two lobes, the outer one being more slender and longer than the other; besides which the tarsi are, in many groups, furnished with a leathery pad, or pulvillus, inserted between the terminal ungues. These appendages afford excellent characters for the discrimination of the family and sub-family groups.

In a great number of the species of butterflies, the two fore legs are very short, weak, and unfitted for walking; hence these species, which include the Nymphalidæ and several other groups, have been termed tetrapods, or four-footed butterflies. In fact, with the exception of the Papilionides, Pierides and Hesperidæ, all the groups of butterflies have the fore legs more or less imperfectly developed. In general these imperfect legs, although having the different portions of the limb separate, have only a single joint in the tarsus; this part of the leg, however, offers

numerous remarkable modifications, both generically, specifically, and even sexually. In the "Genera of Diurnal Lepidoptera," Mr. Edward Doubleday and myself very carefully investigated the structure of the legs, through the whole of the genera. In the Nymphalidæ the fore legs are small, and the males have the tarsal portion composed of a single elongate-oval flattened plate, deeply fringed with hairs, and destitute of claws or hooks; whilst, in the females, it is generally more or less distinctly articulated, the articulations being oblique, and armed beneath, as well as the tip of the tarsus, with short spines, but without ungues. The same general structure occurs in the Hipparchiides (or Satyridæ); but occasionally the fore legs are here so minute as to be quite invisible amongst the hairs of the breast. In the Lycænidæ the fore legs have the appearance of being perfect, although shorter than the hind ones; but the males have the tarsal portion ex-articulate, and terminated by a single horny obliquely curved point; whilst the females have the fore tarsi articulated and furnished with terminal claws with their appendages.

The abdominal portion of the body is generally of an elongated oval or subcylindrical form, narrower but longer than the thorax, to which it is attached by a very small portion of its diameter. It consists of six or seven joints, and bears within the extremity the organs of generation.

In great numbers of the species of butterflies, the two sexes are, more or less, easily distinguished by the form and colouring of the wings, the males in such cases being almost always more gaily coloured; this is especially the case with the Blues, Coppers, Purple Emperor, etc., in all which the upper surface of the wings alone exhibit this sexual distinction. The males of P. Cardamines have a bright orange spot at the tips of the fore wings; in Thecla Quercûs, on the contrary, the individuals which have a bright purple patch on the upper side of the fore wings, and which have been described by most authors on that account as the males, are in fact females. Some Argynnes have black longitudinal ribs on the fore wings of the males; and Mr. Haworth describes the female of Vanessa Atalanta as differing from the male, in having a minute white dot in the central red fascia of the fore wings. Mr. Babington has noticed a difference in the colouring of the pupæ of the two series of Papilio Machaon.

The majority of these insects are but short-lived, but certain individuals of some species survive the winter, passing that period of the year in a state of lethargy, in obscure corners of out-houses, etc. It has been generally supposed that these (which chiefly belong to the genus Vanessa) were females which had been produced late in the preceding autumn, and which, although impregnated at the time, had had the instinct to delay the act of oviposition until the renewal of the season brought forth a supply of food for their offspring. M. Boisduval opposes this, stating that he had seen V. Polychloros and Urticæ in this state in the month

of August, and that their impregnation does not take place till the following spring; and Mr. Stephens states that both sexes of Gonepteryx Rhamni hybernate. Other species appear to be double-brooded in the course of the year (Papilio Machaon, Gonepteryx Rhamni, etc.) Some of these, however, in certain seasons, seem to be only single-brooded. Some of the larger species of butterflies (especially Cynthia Cardui) have occasionally been observed to migrate in immense swarms, forming columns ten or fifteen feet wide; these have especially been noticed in Switzerland, by Bonelli, De Loche, and others. The physical causes which have induced these extraordinary flights have not been sufficiently explained.

The variation in the flight of the different species and tribes of these insects, owing to the structure of the body, and size and strength of the wings, has been but slightly investigated. M. Donzel has, however, published a curious memoir upon the peculiarities in the flight of different species whilst coupling; and Messrs. Lacordaire and Wallace have also respectively published interesting memoirs on the differences in the habits and mode of flight of the Butterflies of Brazil.

IV. THE PREPARATORY STATES OF DIURNAL LEPIDOPTERA.

By the exercise of that marvellous power to which the name of Instinct is applied, the female butterfly selects with remarkable care, in order to deposit her eggs thereon, such plants as are especially fit for the nurture of the caterpillar when hatched from them: thus, the female of the common white butterfly places her eggs on cabbages; the tortoiseshell and peacock butterflies, upon nettles, etc. In the choice of these particular species of plants there appear to be certain principles of distribution which have not been sufficiently attended to, and which, in fact, cannot be sufficiently determined until a more general knowledge is obtained of the habits of exotic butterflies. Still, however, we are able, even among the comparatively few species which are natives of these islands, to perceive the existence of an intimate connection between certain families of butterflies and certain natural orders of plants: thus, among the Pierides, the species of the typical genus are almost exclusively devoted to the Cruciferæ, Resedaceæ, and Tropeolums, and those of the genus Colias, on the contrary, feed upon Leguminosæ; among the Nymphalidæ, the fritillary butterflies select the various kinds of violets; some of the Vanessæ feed on nettles, and others on different trees; the Limenites on honeysuckles; the Apaturæ on the species of Salix. On the other hand, the caterpillars of all the Hipparchiides feed on grasses; the Lycæni æ and Hesperiidæ seem more varied in the selection of the plants for the food of their larvæ.

There is considerably more diversity in the shape of the eggs of butterflies than in most other tribes of insects; and the regular ornamentation of their surface by raised lines, dots, transverse bars, etc., renders them beautiful objects for the microscope. Those of allied species agree together in general form, and, therefore, seem to indicate generic or family groups. Those of Vanessa Urticæ, Io, and Atalanta are cylindric-ovate, with the centre of the top depressed, and with eight longitudinal ribs, which are conical, the whole surface more or less marked with very fine transverse lines. That of Vanessa Polychloros, on the contrary, is globose, but with the top produced into a cone, and the surface smooth. Those of the Hipparchiides are globose, and much more elaborately ornamented; that of Pilosellæ is widest at the base, and has about twenty longitudinal slender ribs, and is marked with delicate transverse lines, the upper end with fine scallops, like the eye of a composite flower. That of Hyperanthus is globose, with a great number of longitudinal rows of fine granules like a minute Echinus. That of Ianira is also globose, but with a number of longitudinal ribs, the interstices, especially at the top, being prettily scalloped, and the surface marked with dark bands. That of Ægeria is also globose, but is entirely covered with minute hexagonal spaces, resembling network. The Pierides, P. Brassicæ, Napi, and Rapæ, have flask-shaped eggs, which are marked with numerous longitudinal ribs and fine transverse reticulations; and that of Argynnis Lathonia is like the bowl of a reversed egg-cup, with numerous irregular longitudinal ribs and fine transverse lines.

The development of the young larva within the egg has been very carefully traced by Herold, from whose fine work the accompanying figures have been taken. Plate B, fig. 33, represents the egg of the common garden white butterfly (P. Brassicæ) with the outer envelope, transparent, showing the little caterpillar rolled up within it: in figure 34. The outer envelope is stripped off, exposing the caterpillar as it lies in the egg, immediately before it is hatched. Figure 35 represents the caterpillar in the act of making its way out of the egg and figure 36 exhibits it in the act of performing a remarkable portion of its economy, namely, that of eating the egg-shell—a proceeding of very common occurrence, shortly after it is hatched.

The caterpillars are, for the most part, at first, of a dark colour, previous to their first moulting, which takes place several days after their birth; after this event, however, they appear with their respective colours. They are generally of a long cylindric form, those of the Lycænidæ, being, however, short and closely resembling wood-lice in shape. The body consists of twelve segments, exclusive of the head: and they breathe by means of nine small apertures or spiracles on each side of the body. Some are slightly hairy, others quite smooth, and many have simple or

branching spines upon the different segments of the body arranged symmetrically The majority have sixteen feet, of which six are scaly, and of a conical form, and attached in pairs to the first three segments succeeding the head ; and the remaining ten are membranous, and beset with numerous minute hooklets : these are attached in pairs to the sixth, seventh, eighth, ninth, and last segments of the body.

The growth of these insects is effected in the same manner as that of all the annulose animals, namely, by the repeated shedding or peeling off of the outer covering of the body with its appendages : a process rendered necessary by the fact, that this outer covering is the representative of the bony system of the higher animals, enclosing within it the more delicate organs, which, as they increase in growth, swell out until the outer covering, which is not similarly elastic, bursts, and gives place to a coat of increased dimensions. This process is, in fact, precisely like that which takes place when a person, who has put on a pair of tight kid gloves on going into a ball-room, becomes heated, and the fingers of the glove burst from the swollen state of the hand, when he is obliged to put on a larger pair. This operation, which is repeated several times by the caterpillar in the course of its existence in that state (being, in fact, the only means by which it can be said to grow), is often exceedingly painful, sometimes causing the death of the caterpillar, which, owing to some circumstance or other, does not possess sufficient strength to accomplish it. Ordinarily, however, the actual shedding of the skin only lasts three or four minutes, although, both before and after that event, the caterpillar remains for a short time in an inactive state. At this period of its existence, the head of the caterpillar is furnished with a pair of very powerful horny jaws, each almost of a triangular form, and having a transverse motion; besides these, there is a pair of fleshy lower jaws, with short articulated palpi, and a fleshy lower lip united to the latter, and furnished with a curious apparatus for spinning silk. The sides of the head are likewise furnished with twelve detached simple globular eyes, exceedingly minute, scarcely perceptible, and quite unlike the eyes of the future butterfly. It now feeds voraciously on leaves, gnawing them to pieces with its powerful jaws. Having, however, arrived at its full size as an adult caterpillar, and being in this state incapable of reproducing its species, it now prepares for those singular changes of form and functions which are destined to end in the production of a beautiful creature, perfect in its kind, and fitted for the performance of those acts which are the end of its existence.

It now ceases to eat, voids whatever portion of its food remains unassimilated, quits the leaves, and seeks a secure situation in which to throw off its skin and undergo its inactive and helpless state, in which it is generally quite naked (*i. e.*, not

enclosed within a cocoon), as well as exposed to the air, the caterpillar not descending into the ground, as is generally the case with those of moths.

How can an animal, having completely cast off its outer covering, which was furnished with legs, and assumed a state in which the rudiments of legs are completely soldered to the body and incapable of rendering the least assistance, support itself from falling to the ground? This is a problem difficult to solve; and yet the difficulty is overcome by the caterpillars, in several different manners, depending, in a great measure, on the position in which the future chrysalides are destined to be placed: some being suspended in the air, vertically, head downwards, the tip of the tail being the only point of attachment to a leaf or twig; others, on the contrary, are attached against walls, palings, etc., having the head higher than the tail; and many are placed horizontally, these being attached, not only by the tail, but by a skein of silk passing across the middle of the body. The various details of the modes by which these different styles of suspension are effected will be found in the descriptions given in the text of this work, under Papilio Machaon, Pieris Rapæ, Vanessa Io, and the genus Thecla.

There is a curious circumstance connected with this subject, and which appears not easily reconcilable with our ideas of the instincts of animals, namely, that those butterflies which, in the perfect state, are furnished with six perfect legs, attach themselves, on assuming the pupa state, in such a position that, on arriving at the perfect state, they will have occasion only to burst their fetters and creep at once along the surface upon which they have been affixed; whilst those butterflies which have the fore legs rudimental, and incapable of rendering any assistance, suspend themselves vertically, attached only by the extremity of the abdomen—so that they must necessarily come into the perfect state head downwards, and have to ascend the outside of the fragile pupa case with the assistance only of their four hind legs, before they can obtain a sure footing on the twig or leaf from which they have been suspended.

Unlike the caterpillars of some species of moths, those of very few butterflies have been ascertained to be social, in the strict sense of the word; examples of the spirit of sociality, however, occur, in a slight degree, in the caterpillars of peacock and tortoiseshell butterflies, which feed upon nettles, and also in those of one of the species of fritillaries which feed upon the plantain, but their nests are of a very slight texture. A very perfect instance of this kind of sociality has, however, been described by myself in the first volume of the "Transactions of the Entomological Society," in the case of a gregarious nest-making butterfly found in Mexico, the nest resembling a moderate-sized wash-leather bag. This appears to be the same species as that mentioned by Mr. Hardy in his "Travels in Mexico," and who describes the

nests as being enclosed apparently in white paper bags, in the manner of grapes in England, to preserve them from birds and flies. He had the curiosity to examine one, which he found to contain numberless caterpillars.

The caterpillars of the Hesperidæ, or Skipper Butterflies, differ from those of the other butterflies in spinning a web-like covering of silk for the reception of the chrysalis; whilst that of the Apollo Butterfly is still more distinct, since it encloses itself in a kind of cocoon formed of numerous leaves woven together with silken threads. But the chrysalides of the majority of butterflies are naked, of an angular form, some having the head terminated by two short and conical horns, whilst others have this part prolonged into a point. Different parts of the body likewise present various eminences, of which the number, form, size, and arrangement, vary materially. Many species in this state are remarkable for the brilliancy of the golden or silvery spots with which they are adorned, whence, in fact, the names chrysalis and aurelia, by which this state has been distinguished, are derived. An explanation of this peculiarity will be found in the article on the Vanessa Urticæ, in the pages of this work.

On examining a chrysalis we are enabled to discover, without difficulty, encased in separate portions, the various parts and limbs of the future butterfly: thus the eyes appear, of an oval or rounded and convex form, on each side of the head; and the wings, of a small size, are folded flat upon the sides of the body; whilst, arising from the head and lying along the breast, are to be observed several slender divisions, which, on being carefully examined, are easily discovered to be the two filaments of the spiral tongue, the coverings of the legs and those of the two antennæ, the latter being the outermost pair, and distinctly articulated along their whole length, and thickened towards the tip; the joints of the abdomen are all plainly indicated by various indentations, but the lower pair of wings and the hind legs are not visible, being concealed beneath the preceding pairs of those organs. Each of these different limbs or appendages is enclosed in its own separate case or sheath, the whole being laid in close juxtaposition, and soldered together side by side, so as to exhibit the appearance of a uniform surface or covering, formed of an entire piece; but careful experiments with chrysalides, at different periods of their existence, and even with caterpillars just before changing to chrysalides, prove not only that each of these cases can be detached or raised from the rest of the body, but that the limb itself can be withdrawn from its case; so that, in fact, the only difference between the chrysalis of a butterfly and the pupa of a bee or beetle consists in the fact that the limbs of the future butterfly are disposed in close juxtaposition, and soldered to the body, whereas they are free (although immovable, except just previous to assuming the imago state) in the immature beetle and bee.

It is scarcely necessary to observe that, whilst remaining in the chrysalis state, the insect takes no sustenance.

The newly formed chrysalis, on being opened, appears to contain only a mass of pulp or soft fluid matter, in which the traces of the limbs of the future butterfly can only be observed by careful investigation, although all its external organs are visible on the exterior in a very short period after the skin of the caterpillar has been cast off. Indeed, Swammerdam (whose incomparable dissections of various insects in their different states induced our celebrated English naturalist, John Ray, in his "Wisdom of God in the Works of the Creation," to place him at the head of those observers who had, by their exquisite investigations, completely overthrown the doctrine of spontaneous generation) very plainly demonstrated, in various experiments, that, even before the period when the caterpillar is ready to become a chrysalis, all the organs of the butterfly might be discovered within the body of the former, thus satisfactorily showing that the chrysalis is no other than "a beautiful and orderly representation of such limbs of the caterpillar as have grown under its skin; for, though the limbs now mentioned may be seen under the insect's skin at the time it crawls and eats in the form of a caterpillar, nevertheless it is in this state, on account of their extreme tenderness and delicacy, a very difficult matter to have a satisfactory view of them. They are, in fact, as fluid as water, and they lie folded up in many very tender membranes interwoven with pulmonary tubes."

Hence, too, the incorrectness of the application of the terms, metamorphosis and transformation (implying, as they certainly do, supernatural changes similar to those described in the fables of the old classical poets), to the various stages of development exhibited by an insect in its passage to the perfect state. Swammerdam was, indeed, so well aware of the impropriety of this, that we find him, now nearly two centuries ago, observing, "The particulars here named, being rightly understood, the change, or, to express it more properly, the growth of the creature from the caterpillar state into an aurelia, cannot but appear plain and intelligible; for the whole operation consists in this, that the caterpillar casts its skin, and shows the parts which had hitherto lain concealed, unfolds its limbs, and arranges each in its right place with great regularity and order. This is the whole operation to which so many authors have substituted a monstrous metamorphosis, or absolute change of one creature into another, not to be found anywhere but in their own misguided imaginations. Thus it is that we are apt to err when, depending too much on our own reason and imagination, we sit down contentedly in our studies, and feed ourselves with our own weak fancies, instead of looking for truth into the magnificent works of the Creator, though such inspection alone can give us just notions of what we desire to know."

When the insect has remained under the form of a pupa for a sufficient length of time to bring all the various enclosed organs to a proper state of consistence, the period of bursting through the walls of its prison may often be easily ascertained: the golden colour with which it had been adorned becomes indistinct; and in those chrysalides which have the skin of a sufficient thinness, the colours of the wings of the enclosed butterfly may be distinctly perceived. The extremities of the legs are now observed to move very plainly, and at length this motion is so much increased, and the wings are so enlarged, that it is no longer possible for the dry and brittle envelope to withstand the movements and dilatations of the enclosed butterfly; it accordingly gives way in a longitudinal slit down the middle of the back, where there is usually a suture for this purpose. This slit rapidly extends along the head, and then down the breast, on each side of the cases of the antennæ, so that the skin of the chrysalis is burst into four distinct and regular-formed pieces, one of which had previously enclosed the antennæ, legs, etc.; another the abdomen, and the remaining two the two pairs of wings. The butterfly now makes its escape out of this rupture, its wings soon assume their full size, the insect emits a quantity of reddish or luteous coloured liquid (which has, on one occasion at least, been regarded by the superstitious as bloody rain), and in a short time it is enabled to join its companions in the air,

"Where he arriving, round about doth fly
From bed to bed, from one to other border,
And takes survey, with curious busy eye,
Of every flower and herb there set in order;
Now this, now that, he tasteth tenderly,
Yet none of them he rudely doth disorder,
Ne with his feet their silken leaves deface,
But pastures on the pleasures of each place."—SPENSER.

V. DIRECTIONS FOR COLLECTING AND REARING THE CATERPILLARS, AND PRESERVING THE PERFECT INSECT.

It may be taken for granted that the examination of a cabinet of butterflies, or even the sight of a few individuals hovering over a bed of flowers, cannot fail to induce a desire to form a collection of these lovely creatures; in like manner the investigation of their singular transformations, rewarded, as it is sure to be, by the development of beautiful *fresh* individuals, is equally likely to produce a similar result. With the young, especially, this desire is always great; while, therefore,

the preservation of a few individuals of each species may be sanctioned, the wholesale capture of specimens adopted by some persons is as greatly to be censured, as is the amiable unwillingness of others to injure one of these creatures, which they have tended through its preparatory states, and at length seen arrive at maturity.* To those, therefore, whose delicate sympathies shrink from making Entomology a study on account of the *cruelty* of killing the necessary specimens, a few remarks on this subject will be necessary, as an introduction to the directions which follow for collecting and preserving these insects.

Among the various passages from the writings of poets and moralists (who, although destitute of all knowledge of natural history, are yet set up as oracles on this particular question) which have been continually quoted as proofs of the cruelty of killing and preserving insects, none have been so often applied, or, rather, misapplied as the following from Shakspere :—

> "The poor beetle that we tread upon,
> In corporal sufferance finds a pang as great
> As when a giant dies."—*Measure for Measure.*

These lines, separated from those which immediately precede them, certainly convey such a picture of the sufferings of the "poor beetle" as is sufficient to deter many from the pursuit. There are, however, few instances of a more complete perversion of the meaning of a poetical quotation than occurs in this passage. Claudio is in a dungeon, from which the compliance of his sister Isabella with the terms of the Viceroy would set him free. She dreads that his fear of death may overcome his sense of honour, and that he may urge her, as eventually he does, to adopt that remedy which, "to save a head," would "cleave a heart in twain." Under this apprehension, she bids him fearlessly to meet death, which she endeavours to prove is not to be dreaded, exclaiming—

> "Oh, I do fear thee, Claudio, and I quake
> Lest thou a feverous life should'st entertain,
> And six or seven winters more respect
> Than a perpetual honour. Darest thou die ?
> The sense of death is most in apprehension,
> And the poor beetle," etc.

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* Of this latter feeling, an instance at the present moment lies before me. A lady of rank in India, having forwarded to me several volumes of beautiful drawings illustrating the transformations of the Lepidoptera of that country, all of which she set at liberty as soon as she had drawn them. From not having microscopically delineated the minute structural details of the veins of the wings, antennæ, palpi, legs, etc., it is not possible to determine with sufficient precision many of the species which she has illustrated; and hence a positive loss to science has accrued, which the preservation of a single individual of each species would have prevented.

The object of the fair pleader, being to encourage her brother steadfastly to encounter death, would hardly have been forwarded by depicting that consummation as attended with great corporal sufferance. It has, accordingly, been urged that Shakspere's purpose was to show how little a man feels in dying, and that even a beetle, which feels so little, feels as much as a giant does. The less, therefore, the beetle is supposed to feel, the more force we give to the sentiment of Shakspere. (Bennett in "Zool. Journ." Bird in "Entomol. Magaz." Patterson, "Insects in Shakspere.") Mr. Humphreys, on the other hand, argues with great tact, if this were the meaning of Shakspere, his language would have been—

> "The dying giant,
> In corporal sufferance, feels no greater pang
> Than the poor beetle that we tread upon,"

and that his intention was to show that a man of courage ought to look upon death as the common lot of every living thing—that at every incautious step we may cause that pang of death to be borne by some poor insect, which feels as keenly as ourselves, though deprived of the means of expressing pain, or the mental strength to overcome it; and that, therefore, man, the most perfect of created beings, ought not, with his superior advantage, to shrink from the pang which the poor beetle bears, when honour bids him face it, "The simile of the beetle being only rendered inappropriate by modern discoveries in Entomology, which have proved that a crushed beetle cannot 'feel a pang as great as when a giant dies,' but, on the contrary, that all insects are, from the nature of their structure, incapable of acute sensations of pain."

This appears to be unquestionably the case, from the fact which the minute anatomical investigation of the structure of insects has revealed, that, although possessed of numerous nerves, they have no well-defined organ representing our brain, the organ of concentrated feeling, where all the nervous conductors meet. On the contrary, they possess a series of distinct ganglia, or knots of nervous substance, each of which emits nerves to the contiguous parts, so that the sensations are not all carried to one grand central focus of acute sensibility, as with us, but form, as it were, separate systems, any of which might be destroyed without communicating its acuter sensation to the rest.

The consequences of such an arrangement of the nervous system may be illustrated by a few actual facts:—1. On one occasion, whilst collecting, I pinned a dragon-fly through the thorax with a moderate-sized pin, in order to place it in my collecting-box; by some accident the pin became loose in the box, on opening which, the insect flew away, with the pin remaining fixed through its body.—2. On another

occasion, a grasshopper, which I had placed in a small box, in its efforts to escape, jerked off one of its hind legs. On the following morning, on opening the box, the insect was as lively as ever, having made a meal, during the night, of its own leg. —3. A daddy long-legs, or a midge, when even slightly handled, will throw off its legs without the least apparent effort or pain at the result.—4. Both ants and white ants, after coupling, throw off their wings of their own accord. —5. A dragon-fly was on one occasion struck down by Mr. Haworth, and in so doing its long abdomen was accidentally severed from its body; notwithstanding the loss, it greedily devoured two small flies, and after Mr. Haworth had fixed to it a false paper abdomen, it devoured another insect, and on being set at liberty, flew away without the least difficulty. 6. Moths, when transfixed with a pin against the trunk of a tree, whilst asleep remain immovable.—7. Beetles transfixed with a pin have remained alive many months.—Other equally striking facts might be adduced to prove that insects do not experience pain in a like degree with the higher animals, and that *cruelty* is not an objection to be made to the practical study of Entomology. Besides, cruelty is an unnecessary infliction of suffering, as when a person is fond of torturing creatures from mere wantonness, without any useful end in view, or has recourse to circuitous modes of killing, when direct ones would answer equally well. The sportsman may perhaps be said to be cruel (although it is not often that this charge is raised against him), for his primary object is amusement, and, unlike the Entomologist, he is not adding to the general stock of knowledge. But all dispute may be ended, by the very simple expedient of killing the insect by dipping the pin with which it is transfixed in prussic acid, or, better still, by putting the insects, before pinning them, in a glass vessel half filled with pounded laurel-leaves, by which they are killed in a few seconds.

To become a fortunate collector, requires not only much industry in the pursuit, but also a keen observation and study of natural phenomena in general. For instance, many persons, with all the necessary enthusiasm and industry, and perhaps a great sacrifice of time, take numerous collecting excursions with scarcely any success whilst others, with less eagerness and much less expenditure of time, seldom return without numerous captures. The cause lies in a proper selection of season and weather for the objects in pursuit.*

It is almost useless to attempt collecting winged insects during a cold east or north-east wind; and places at other times abounding in insect life will then be still,

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* This and the remaining paragraphs are taken, with slight alterations, from Mr. Humphrey's Directions, given in the Supplement to "British Butterflies and their Transformations."

and to all appearance deserted. A warm and genial day is therefore, above all things, necessary; and to secure this desideratum it is necessary to become as far as possible *weather-wise*. Mr. Ingpen, in his excellent little work upon collecting insects, mentions many circumstances which different writers have considered infallible *signs* of fair weather; but he considers most of them doubtful—such as the opening of the pimpernel, the early flight of the cabbage-white butterfly, etc., etc.; whilst he considers the *high* flight of swallows an almost certain forerunner of a fine day. Sir H. Davy, in his delightful "Days of Fly-fishing," has philosophically accounted for this and many other natural phenomena which have become popular omens. "Swallows," he says, "follow the flies and gnats, and flies and gnats usually delight in warm strata of air; and, as warm air is lighter and usually moister than cold air, when the warm strata of air are high, there is less chance of moisture being thrown down from them by the mixture with cold air; but when the warm and moist air is near the surface of the earth, it is almost certain, as the cold air flows down into it, a deposition of water will take place." He further observes, "It is always unlucky (for anglers in spring) to see a single magpie,—but *two* are a good omen; and the reason is, that in cold and stormy weather one magpie always remains sitting upon the eggs or young ones, to keep them warm; when the two go out together, the weather is warm and settled." Another popular sign of fine weather is, when the red clouds of the setting sun take a tint of purple; upon which the same author remarks, that "the air when dry refracts more red or heat-making rays; and, as dry air is not perfectly transparent, they are again reflected on the horizon. I have generally observed a coppery or yellow sunset to foretell rain; but as an indication of wet weather approaching, nothing is more certain than a halo round the moon, which is produced by precipitated water; and the larger the circle, the nearer the clouds, and consequently the more ready to fall." I must not omit, in conclusion, his beautifully simple verification of the rustic couplet,

> "A rainbow in the morning, is the shepherd's warning:
> A rainbow at night, is the shepherd's delight."

"A rainbow can only occur when the clouds containing or depositing the rain are opposite the sun: and in the evening therefore the rainbow is in the east, and in the morning in the west; and, as our heavy rains in this climate are usually brought by westerly winds, a rainbow in the west (occurring only in the morning) indicates that the bad weather is on the road, by the wind, to us; whilst a rainbow in the east (occurring only in the evening) proves that the rain in these clouds is passing from us."

These remarks of the philosophic fly-fisher, beside the general information they convey, may teach the young entomologist how to select his weather with a good chance of a fine day; and also that popular omens are not to be rejected at once, but are generally founded on truths, however deeply concealed by an accumulation of fancy or superstition. Having stated that a favourable day is indispensable to a successful search for insects—more particularly as I am now referring principally to butterflies, as the only class of insects treated of in this volume—it is next necessary to suggest the best seasons for search. Long, then, before any specimens are to be taken in the winged state, the collector may, as early as the end of January, search for the chrysalides of such species as pass the winter in the pupa state; upon walls or palings, near the food of the larvæ; and others still attached to the withered stems of the plants of the previous summer. Caterpillars may be collected as early as the beginning of April, and the best time to find them is early in the morning and late in the evening, or even night, as many species remain concealed during the greater part of the day, and some feed only at night; consequently, a search for them by day would be fruitless; though some might occasionally be found by pulling up the plants and carefully examining the roots, about which they sometimes lie concealed. Caterpillars may be sought all through the summer, and, as some butterflies are what is called double-brooded, their larvæ are to be found as late as September. The particular season in which each species is found is described in the text. Some, however, can scarcely ever be seen, as they feed at the top of high trees, where they may be taken by shaking or beating the branches—such, for instance, as the larva of the purple hair-streak butterfly, which feeds upon the oak, which tree is very well suited for the occupation of the entomologist; each tree affording shelter and food to various tribes of insects, too numerous to specify. A white cloth or sheet should be spread upon the ground before beating or shaking trees.

Wherever the collector is a draughtsman, a careful and exceedingly accurate drawing of several individuals of every species of caterpillar should be taken, and each caterpillar kept separate, and distinguished by a *number* corresponding with a *number* attached to the drawing; and by this system, not only every butterfly will be assigned to its proper caterpillar (which has not always been the case), but even the male and female caterpillars may perhaps be distinguished by unvarying markings, as distinct, no doubt, in many instances, as those of the perfect insects themselves; a fact which it would be highly interesting to prove satisfactorily.

The caterpillars, when taken, should be touched with care, as they will not bear rough handling. A large box should be prepared for them with a gauze lid, and

should contain several divisions, each distinguished by a *number;* each division should also have a little earth, mixed with rotten wood at the bottom, which may be prevented from getting too dry and dusty by keeping a layer of damp moss upon it. In the corner of each division should be placed also a phial of water, in which a branch of the plant which the insect feeds upon will be kept fresh; it should, however, be renewed every day, or even twice a day, if possible, care being taken not to disturb the caterpillars at the time they are casting their skin, which occurs several times before they attain their full growth, varying in different species. It will be understood that the earth at the bottom of the divisions is for the use of such caterpillars as undergo their change in the ground.

To rear caterpillars from the egg is much more difficult; but the most certain method is by placing the eggs securely upon a branch of the proper food of the species, in the open air, and, to prevent escape, enclosing the branch in a gauze or muslin bag or frame. It will be found necessary, however, to remove them to other branches as often as the leaves are destroyed, or become unfit for food. Caterpillars, when taken nearly full-grown, may also be treated in this way with great success; but great care must be taken in removing the chrysalides to a box covered with gauze as soon as they are formed, and they must in all cases be examined frequently, as, if the perfect insect remains long in the box without being secured, the wings will become injured by its endeavours to escape; and one great advantage of rearing them from the caterpillar state is, that more perfect specimens are secured than could possibly be obtained by capturing them in the winged state, as even the exercise of flying destroys the downy bloom which they exhibit on first emerging from the chrysalis.

To capture the winged insect flying, or settled upon a flower, or on the ground, gauze nets are used, of two or three sorts,—such as the bag-net (like a fisherman's landing net), the large flap-net, like a bat fowling-net, and which will be found described in Mr. Ingpen's little work, or the "Entomologist's Text-Book." For instance, to capture the high-flying purple Emperor a bag-net is sometimes used, fixed to a rod or pole, twenty feet long; but Mr. Ingpen mentions that he is sometimes, in common with other strong flyers, brought to the ground by throwing up a piece of stone or tile in his course, which he follows in its fall, and sometimes alights upon it, when he is easily taken.

When captured, the butterfly must be killed, either by a sharp squeeze of the body beneath the base of the wings, or by putting it into a jar with bruised laurel-leaves, care being taken not to rub off the down from the wings; a pin must be passed through the thorax, and the wings kept expanded upon a flat cork setting-

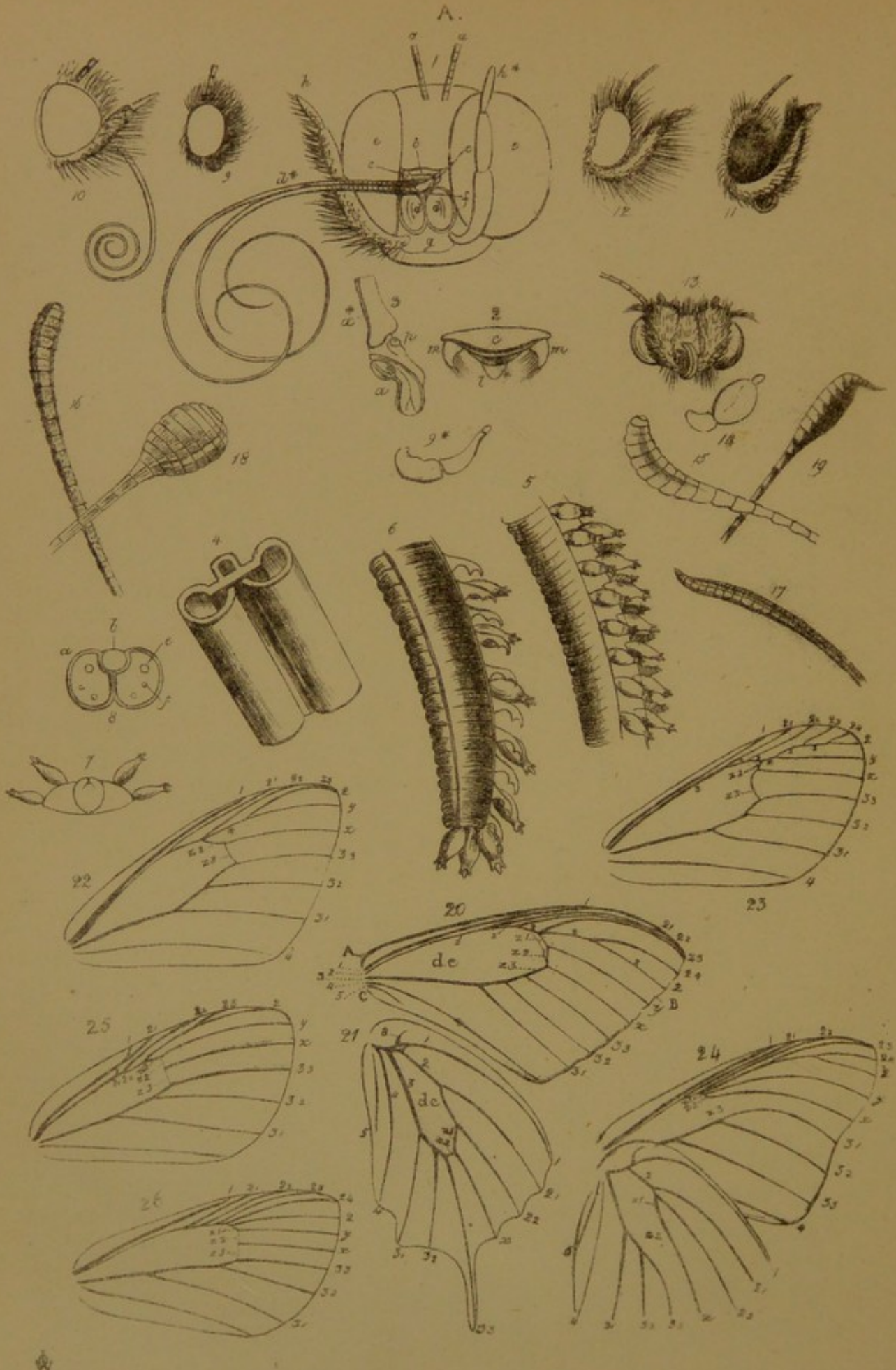
board, by thin braces of card until the insect is perfectly dry. This requires several days, varying according to the weather, after which it is ready to be placed in the cabinet, which must on no account be made of cedar wood, and the drawers of which must be kept supplied with small quantities of camphor. When the season is past, both for taking the insects in the larva or imago state, the leisure hours of late autumn may still be occupied in search of chrysalides. These may be sought, as the garden flower-beds are dug over, upon the plants on which they have fed, and on walls and palings; but in the latter situations it frequently happens that they are diseased individuals, which, pierced by the female ichneumon fly, in order to deposit her eggs in their bodies, have wandered from their food, and in their *malaise* sought a shady and solitary retreat, instinctively, perhaps, endeavouring to escape their enemy, who generally pierces them in the bright sunshine. Chrysalides taken in such situations will frequently, when they burst, instead of the expected butterfly, discharge a hundred minute maggots which quickly form small silken cocoons, within which they change to chrysalides, from each of which eventually issues a small fly, which, in its turn, seeks some unhappy caterpillar, and, by means of its sharp ovipositor, places a number of eggs in its body, the maggots hatched from which feed upon its vitals till it is destroyed. The ichneumon of the small silken cocoons, mentioned above, seems to confine its ravages to the caterpillars of the cabbage-white butterfly; but each species has its peculiar foe of this description, some large and some small, the former depositing only one or two eggs in the body of each caterpillar, the latter from ten or twelve to near a hundred. The caterpillar of the common lacquey moth may often be noticed wincing under the repeated punctures of its ichneumon foe, till it at last falls from the branch upon which it was feeding; it, however, soon resumes its food, doubtless with redoubled rapacity, to satisfy the insatiate legion within, till, overcome by exhaustion, it crawls away to fix itself in some solitary place, where the chrysalis is found.

After the season of collecting is entirely over, or when bad weather confines the student to the house, he may occupy his leisure time in arranging his collection; and I would strenuously advise him to do so, not merely as a pretty display of beautiful objects, but with due regard to nomenclature and system. Doubtless, the most deeply interesting portion of natural history is the observation of the habits, physiology, structure, and properties of organised creatures (by far the greater number of which belong to the entomological division); but their proper and convenient arrangement, according to the most recent terms and system of science, is absolutely necessary for the successful progress and application of all knowledge: and even those who are confining themselves to the arrangement of the mere

nomenclature of the catalogue, are doing good service to the advancement of the science. The elaborate and searching observations of Reaumur and Bonnet would have been much more valuable had they been conducted with such a view to system and arrangement; whilst as it is (as mentioned in Kirby and Spence's Introduction), some of the insects of which they have recorded the most interesting circumstances, cannot, from their neglect of system, be at this day ascertained. No one, for instance, knew Reaumur's *Abeille tapissière* until Latreille, happily combining system with attention to the economy of insects, proved it to be a new species, Megachile Papaveris. Even with the assistance of carefully-coloured portraits, it is almost impossible so to describe insects as to render them recognisable with certainty, unless the accepted terms and systematic classification be also employed; and in the "Entomologist's Text-Book," allusion is made to the fact that many rare insects, of which engraved portraits have been given by the early entomologists, have from this cause been thought to be new species.

Kirby and Spence affirm that a well-arranged system, with proper terms and names, is as necessary to the understanding of a science as is a dictionary to the understanding of a foreign language. "The labours of a Michaelis or a Laplace might be sealed books to us without dictionaries of the French and German languages; and, in fact, a good system of insects, containing all the known species, arranged in appropriate genera, families, orders, and classes, is in reality a dictionary, enabling us (without the incalculable loss of time which would otherwise occur) to ascertain the name of any given insect, and thus to learn all that has been recorded of its properties and history, as readily as we determine the meaning of a word in a lexicon."

As far as regards the systematic position of any insect connected with the order treated of in the present volume, the student will have, comparatively, little trouble. The veriest tyro will at once know that any *butterfly* or *moth* must belong to the order *Lepidoptera*. He will perceive that as a *butterfly* it must belong to the section *Diurna;* a few striking characteristics will show him to which family he must refer it, and it then only remains to ascertain its genus; and, supposing it to belong to the genus *Vanessa*, it will not be at all difficult to ascertain the specific name, as the different species of this genus are at once obviously distinguishable by their various markings alone, without reference to their minute structural characters, which should, however, always be attended to by the student. If, after pursuing this course, he finds he has an insect evidently of the genus *Vanessa*, or any other, but that it accords with none of the species described in the works of Boisduval and other authors who have written upon this order, he may hope to have been the discoverer of a new species, particularly if he reared it from the caterpillar, and (having procured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an accurate drawing of it) if he finds it differ from those of the different species of the genus in question, he must then, from its characteristic differences of structure or marking, seek to give it such a specific name as will be acknowledged by science, and will serve to distinguish it from the rest of the genus, and also describe it by such *characters* as he will find in this work. It is true that in butterflies, which, besides their conspicuous colouring, fly at high noon, the collector can hope to make few discoveries of this description; nevertheless several such have occurred even within the last twenty or thirty years; and when we consider that the beautiful Lycæna dispar was only discovered about the year 1822, there are possibly still some novelties in store for the industrious collector, even among our butterflies.

In conclusion, I have only to say that if the reader has any doubts respecting the utility and importance of Entomology as a science, let him not only inquire what eminent men have devoted a large portion of their lives to its pursuit, but let him at once read Kirby and Spence's Introduction to their beautiful work upon the subject—one of the most interesting and convincing pieces of writing in the language; and let him there learn what light has been thrown by the science upon the labours of the silkworm, whose product furnishes labour and subsistence to millions; upon the ravages of the turnip-fly, or the instinctive mechanism of the bee or the ant, and upon those links which it furnishes to the great chain of organization and intelligence, from infinite perfection to the brink of dreary nothing.

VI. DESCRIPTION OF THE TWO ELEMENTARY PLATES.

DETAILS OF THE IMAGO, OR PERFECT STATE.

PLATE A.—*The Head and its Organs.*

Fig. 1.—Head of Pieris Brassicæ, the large Garden White Butterfly, highly magnified,* with the parts of the mouth spread out, so as to exhibit their structure. a a, bases of the two antennæ; b, representative of the upper lip or labrum; c c, representatives of the two upper jaws or mandibles; d, d, the flat oval bases of the two halves of the spiral tongue (or representatives of the maxillæ) applied to the face; d*, the apical portions of the same, forming, when united, the spiral tongue; f, the minute rudimental maxillary palpus at the base of each maxilla; g, the lower lip applied to the face; h, one of the labial palpi spread open; h*, the other palpus denuded of scales and hairs; e e, the two eyes.

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* With the exception of plate A, fig. 20, and plate B, fig. 38, all the figures in the two elementary plates are more or less magnified.

Fig. 2. — The upper lip and mandibles of Pieris Daplidice; c, the clypeus, or basal portion; l, the lip or labrum; m m, the two mandibles. (Savigny).

Fig. 3.—The base of one of the maxillæ (half of the spiral tongue) of Pieris Daplidice; a, the basal portion applied to the face (in fig. 1 d); p, the minute maxillary palpus (in fig. 1 f); a*, basal portion of the spiral part of the maxilla. (Savigny.)

Fig. 4.—Portion of the spiral tongue of a Lepidopterous insect, showing the two halves, and the small central orifice. (Reaumur.)

Fig. 5.—Part of the external surface near the extremity of the spiral tongue of Vanessa Atalanta, showing three of the series of minute barrel-shaped appendages or papillæ, with which it is furnished, as described above. (Altered from Newport.)

Fig. 6.—Extremity of the internal, or concave surface of the spiral tongue of the same insect, showing the minute barrel-shaped appendages, as well as the row of hooklets by which the anterior edge of the two halves of the spiral tongue are locked together. (Altered from Newport.)

Fig. 7.—A section of the spiral tongue of ditto, close to the tip, showing the place of attachment of the small barrel-shaped appendages, two being attached to each maxilla. (Newport.)

Fig. 8.—Another section of the spiral tongue of ditto, near the base, showing the position of the tube b; the large trachea e, and the smaller one and nerve f; a, the outer surface of the maxilla. (Newport.)

Fig. 9.—Head of Papilio Machaon, showing the very small size of the labial palpus, nearly concealed among the hairs of the face; fig. 9 *, one of the palpi, removed and denuded of scales and hairs, showing the very minute size of the terminal joint.

Fig. 10.—Head of Pieris Daplidice, with porrected palpi, covered with scales and hairs, the spiral tongue unrolled.

Fig. 11.—Head of Vanessa Atalanta, seen sideways, with the labial palpus slightly setose, furnished with a small tuft of hairs at the extremity of the upper side of the second joint, and with the eyes very densely hairy.

Fig. 12.—Head of Hipparchia Janira, with the labial palpi very densely setose, and the eyes naked.

Fig. 13.—Head of Pamphila Sylvanus, seen in front, showing the very broad labial palpi, terminated by a small naked joint (the spiral tongue coiled up), and the base of one of the antennæ, each of which has a small transverse tuft of hairs extending over the eyes.

Fig. 14.—One of the labial palpi of the same insect denuded, showing the very thick second joint.

Fig. 15.—Extremity of the antennæ of Papilio Machaon.

Fig. 16.—Ditto of Gonepteryx Rhamni.

Fig. 17.—Ditto of Hipparchia Janira.

Fig. 18.—Ditto of Argynnis Aglaja.

Fig. 19.—Ditto of Pamphila Sylvanus.

Organs of Locomotion.

Fig. 20.—Fore wing of Papilio Machaon: A, the costal or anterior margin; B, the apical or outer margin; C, the inner or anal margin; d c, the discoidal cell; 1, 1, the costal vein; 2-2, the sub-costal or post-costal vein (its course indicated by a succession of minute figures 2, 2, 2, 2, 2); its four branches marked by the numbers 2^1, 2^2, 2^3, 2^4; 3, the median or mediastinal vein, its three branches marked by the numbers 3^1, 3^2, 3^3; 4, the submedian vein; 5, the anal vein; x and y, the two discoidal veins, connected together at the base by the transverse, middle disco-cellular veinlet z 2; the upper discoidal, y, being, moreover, connected at its base, with the sub-costal vein (exactly where the latter throws off its third branch 2^3), by the upper disco-cellular veinlet z 1, and the lower discoidal, x, being connected with the median by the lower disco-cellular z 3. In this example the lower discoidal, x, appears as strictly to be a branch or portion of the median as the third branch, 3^3, itself, but after tracing out the true analogues of these two discoidal veins in other groups of butterflies, there appear to be good grounds for regarding the two discoidal veinlets either as independent veins or as dependent upon the sub-costal. The real solution of this question (although the whole of the genera of Diurnal Lepidoptera have been satisfactorily analysed) cannot, however, be obtained until an equally careful comparative analysis of the whole of the crepuscular and nocturnal groups has been made.

Fig. 21.—Hind wing of Papilio Machaon. 1, 1, the costal vein; 2, the sub-costal vein; 2^1, 2^2, its two branches; 3, the median vein; 3^1, 3^2, 3^3, its three branches; 4, 4, the sub-median vein; 5, the anal vein; x, the single discoidal vein united to the sub-costal vein by the upper disco-cellular veinlet, z 1, and to the median vein by the lower disco-cellular veinlet, z 2; d c, the discoidal cell; 8, the forked pre-costal veinlet, the upper curved portion forming the free-bristle in moths.

Fig. 22.—Fore wing of Pieris Brassicæ, the veins lettered as in fig. 20. In this wing, the sub-costal vein, 2, extends exactly to the tip of the wing, emitting only three branches, the third, 2^3, being extremely short, and arising at a very short

distance from the tip; the upper discoidal, y (instead of arising at the extremity of the discoidal cell, as in fig. 20), arises from the under side of the sub-costal vein, at a considerable distance beyond the cell, hence there is no upper disco-cellular; the lower discoidal, x, being united to the sub-costal (exactly at the point where the second branch, 2^2, is emitted) by the middle disco-cellular, z 2, (which extends in such an oblique direction, that even z 2, as well as the lower discoidal itself, x, might almost be considered portions of the system of the sub-costal vein), and to the third branch of the median, 3^3, by the lower disco-cellular, z 3. Here we might say that there was only one discoidal vein, x, and that y was in fact the extremity of the sub-costal 2, but in that case the extremity of 2 would become the third branch of the sub-costal; but as it emits the minute branch 2^3 from its anterior edge, and as branches never emit branchlets, it follows that y, notwithstanding its position, is really the representative of y in fig. 20. The portion thereof indicated by the *, must, therefore, be regarded not only as representing portion of the sub-costal vein, but also the analogue of the upper disco-cellular, which is otherwise obsolete.

Fig. 23.—Fore wing of Euchloe Cardamines, the veins lettered as in figs. 20 and 22. Here the sub-costal vein 2 2, is furnished with its four branches 2^1, 2^2, 2^3, and 2^4, whilst the upper discoidal vein, y, is emitted from the under side of the sub-costal vein, beyond the discoidal cell, as in fig. 22; the space * being analogously composed as in fig. 22, but the relative position and size of the disco-cellular veinlets, z 2 and z 3, show a different arrangement.

Fig. 24.—Fore and hind wings of Apatura Iris, the veins lettered as before. Here, although the number of the veins and their branches, as well as their position along the outer margin of the wing, agrees with fig. 20, a very great difference exists in their arrangement on the disc of the wing; the discoidal cell itself is open, there being no trace of the lower disco-cellular, z 3, and the upper and middle disco-cellular, z 1 and z 2, are reduced so greatly in extent as to form only the bases of the two discoidal veins, x and y, both of which here might be regarded as portions of the system of the sub-costal vein. In the hind wing also the discoidal cell is open, owing to the want of the lower disco-cellular veinlet, z 2, so that the upper disco-cellular, z 1, no longer forms a distinct portion by being angulated, but becomes the basal portion of the discoidal x.

Fig. 25.—Fore wing of Polyommatus Alsus, the veins and branches lettered as before. The peculiarity of this wing consists in the apparent branching of the costal vein, and its junction with the post-costal by a short, nearly transverse branchlet. I have had a long correspondence with M. Alexandre Lefevre on the subject of this and other analogous cases, and he adopts this view of the subject by

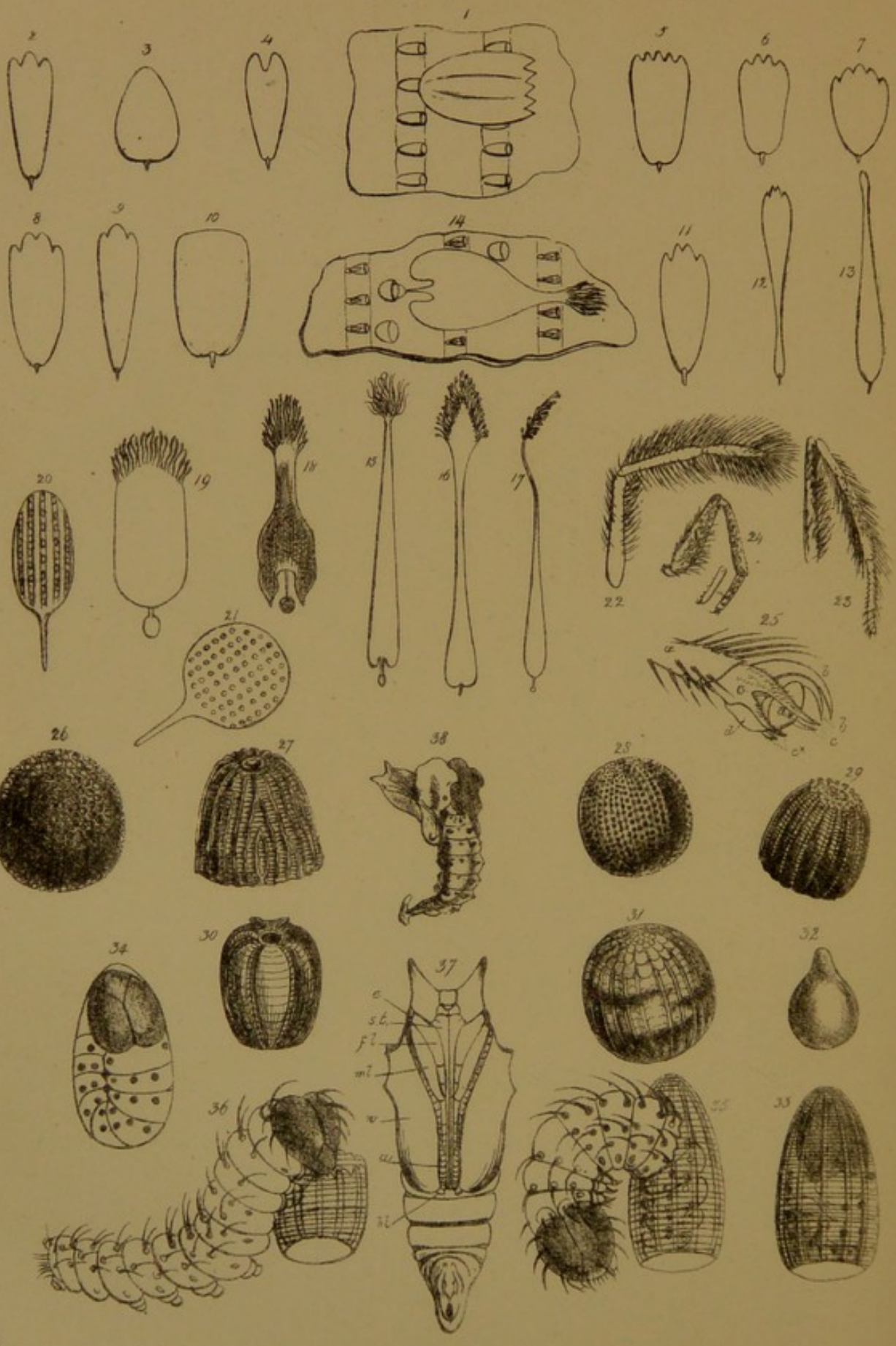
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Fig. 15.—One of the male scales or plumules of Pieris Brassicæ.

Fig. 16.—Ditto ditto, of Argynnis Paphia. (Deschamps.)

Fig. 17.—Ditto ditto, of Lasiommata Mæra. (Deschamps.)

Fig. 18.—Ditto ditto, of Pieris Rapæ.

Fig. 19.—Ditto ditto, of Euchloe Cardamines. (Deschamps.)

Fig. 20.—Ditto ditto, of Polyommatus Adonis. (Deschamps.)

Fig. 21.—Ditto ditto, of Polyommatus Cyllarus. (Deschamps.)

Fig. 22.—Fore leg of the male of Vanessa Atalanta.

Fig. 23.—Fore leg of the female of ditto.

Fig. 24.—Fore leg of Thecla Isocrates, male, with the tarsus detached and denuded.

Fig. 25.—Extremity of the hind foot of Argynnis; a, the extremity of the terminal joint of the tarsus; b b, the two simple claws or ungues; c, the base of the broad pseudonychia or leathery flap; c and c*, the extremities of both ditto; d and d*, the pulvillus or pad of the foot.

Details of the Preparatory States.

Fig. 26.—Egg of Lasiommata Ægeria. (Sepp.)

Fig. 27.—Egg of Argynnis Lathonia. (Sepp.)

Fig. 28.—Egg of Hipparchia Hyperanthus. (Sepp.)

Fig. 29.—Egg of Hipparchia Tithonus. (Sepp.)

Fig. 30.—Egg of Vanessa Io. (Sepp.)

Fig. 31.—Egg of Hipparchia Janira. (Sepp.)

Fig. 32.—Egg of Vanessa Polychloros. (Sepp.)

Fig. 33.—Egg of Pieris Brassicæ, ready to hatch, showing the head and curved body of the enclosed caterpillar through the transparent envelope. (Herold.)

Fig. 34.—The larva of the same insect, with the egg-case removed, showing it in its curved position previous to its bursting forth. (Herold.)

Fig. 35.—The larva of the same insect in the act of bursting out of the egg. (Herold.)

Fig. 36.—The larva completely disengaged from the egg-case, which it is in the act of devouring. (Herold.)

Fig. 37.—Chrysalis of Vanessa Urticæ, showing the arrangement of the limbs of the future butterfly: e, the eye; s t, the two halves of the spiral tongue laid along the breast; f l, the fore leg; m l, the middle leg; w, the fore wing; a, the clubs of the antennæ, which run upwards behind the eyes; h l, the extremity of the hind legs, which, as well as the hind wings, are concealed by the wings.

Fig. 38.—Exuvia of the chrysalis of Vanessa Polychloros, showing the four pieces into which it separates, on the exit of the butterfly.

DESCRIPTION OF PLATES.

FRONTISPIECE—Fig. 1. Vanessa Io (p. 51). 1a, Caterpillar. 1 b, Chrysalis.
Fig. 2. Vanessa C album (p. 46). 2 a, Under side. 2 b, Caterpillar. 2 c, Chrysalis.

PLATE 1.—Fig. 1. Papilio Machaon (p. 3). 1 a, Caterpillar. 1 b, Chrysalis.
Fig. 2. Gonepteryx Rhamni (p. 6). 2 a, Caterpillar. 2 b, Chrysalis.
Fig. 3. Aporia Cratægi (p. 25). 3 a, Caterpillar. 3 b, Chrysalis.

PLATE 2.—Fig. 1. Colias Edusa, gynandromorphous (p. 8). 1 a, Caterpillar.
Fig. 2. Colias Hyale (p. 10). 2 ♂, Male. 2 ♀, Female. 2 a, Caterpillar. 2 b, Chrysalis.
Fig. 3. Euchloe Cardamines, gynandromorphous (p. 27). 3 a, Caterpillar. 3 b, Chrysalis.

PLATE 3.—Fig. 1. Pieris Brassicæ (p. 14). 1 ♂, Male. 1 ♀, Female. 1 l, Caterpillar. 1 p, Chrysalis.
Fig. 2. Pieris Rapæ (p. 18). 2 ♂, Male. 2 ♀, Female. 2 l, Caterpillar. 2 p, Chrysalis.
Fig. 3. Pieris Napi (p. 20). 3 l, Caterpillar. 3 p, Chrysalis.

PLATE 4.—Fig. 1. Pieris Daplidice (p. 22). 1 l, Caterpillar. 1 p, Chrysalis.
Fig. 2. Leptosia candida (p. 29). 2 l, Caterpillar. 2 p, Chrysalis.
Fig. 3. Melitæa Cinxia (p. 34). 3 *, Under side. 3 l, Caterpillar.
Fig. 4. Argynnis Lathonia (p. 39). 4 l, Caterpillar. 4 p, Chrysalis.

PLATE 5.—Fig. 1. Melitæa Athalia (p. 34). 1 *, Under side. 1 l, Caterpillar. 1 p, Chrysalis.
Fig. 2. Melitæa Artemis (p. 32). 2 l, Caterpillar. 2 p, Chrysalis.
Fig. 3. Melitæa Selene (p. 36). 3 *, Under side. 3 l, Caterpillar. 3 p, Chrysalis.
Fig. 4. Melitæa Euphrosyne (p. 37). 4 l, Caterpillar.

PLATE 6.—Fig. 1. Argynnis Paphia, gynandromorphous (p. 42). 1 *, Under side. 1 l, Caterpillar. 1 p, Chrysalis.
Fig. 2. Argynnis Aglaja (p. 41). 2 ♂, Male. 2 ♀, Female. 2 l, Caterpillar. 2 p, Chrysalis.
Fig. 3. Argynnis Adippe (p. 40). 3 l, Caterpillar.

PLATE 7.—Fig. 1. Vanessa Urticæ, monstrous (p. 49). 1 l, Caterpillar. 1 p, Chrysalis.
Fig. 2. Vanessa Polychloros (p. 48). 2 l, Caterpillar. 2 p, Chrysalis.
Fig. 3. Vanessa Antiopa (p. 50). 3 l, Caterpillar. 3 p, Chrysalis.

PLATE 8.—Fig. 1. Vanessa Atalanta (p. 53). 1 l, Caterpillar. 1 p, Chrysalis.
Fig. 2. Cynthia Cardui (p. 55). 2 l, Caterpillar. 2 p, Chrysalis.
Fig. 3. Limenitis Sibilla (p. 58). 3 l, Caterpillar. 3 p, Chrysalis.

PLATE 9.—Fig. 1. Apatura Iris (p. 56). 1 *, Under side. 1 l, Caterpillar. 1 p, Chrysalis.
Fig. 2. Arge Galathea (p. 62). 2 l, Caterpillar. 2 p, Chrysalis.

Fig. 3. Lasiommata Ægeria (p. 64). 3 l, Caterpillar. 3 p, Chrysalis.

Plate 10.—Fig. 1. Lasiommata Megæra (p. 65). 1 *, Under side. 1 l, Caterpillar. 1 p, Chrysalis.

Fig. 2. Hipparchia Semele (p. 67). 2 l, Caterpillar. 2 p, Chrysalis.

Fig. 3. Hipparchia Tithonus (p. 68). 3 l, Caterpillar. 3 p, Chrysalis.

Plate 11.—Fig. 1. Hipparchia Janira, male (p. 68). 1 *, Female. 1 l, Caterpillar. 1 p, Chrysalis.

Fig. 2. Hipparchia Hyperanthus (p. 69). 2 l, Caterpillar. 2 p, Chrysalis.

Fig. 3. Cœnonympha Pamphilus (p. 73). 3 *, Under side. 3 l, Caterpillar. 3 p, Chrysalis.

Fig. 4. Oreina Cassiope (p. 76).

Plate 12.—Fig. 1. Cœnonympha Davus (p. 71). 1 a, 1 b, 1 c, 1 d, Varieties. 1 l, Caterpillar. 1 p, Chrysalis.

Fig. 2. Oreina Ligea (p. 75). 2 l, Caterpillar.

Fig. 3. Oreina Blandina (p. 75). 3 a, Under side.

Plate 13.—Fig. 1. Hamearis Lucina (p. 80). 1 *, Under side. 1 l, Caterpillar. 1 p, Chrysalis.

Fig. 2. Thecla Betulæ, female (p. 85). 2 *, Under side. 2 l, Caterpillar. 2 p, Chrysalis.

Fig. 3. Thecla Quercus, gynandromorphous (p. 86). 3 *, Under side. 3 l, Caterpillar. 3 p, Chrysalis.

Fig. 4. Thecla Rubi (p. 90). 4 *, Under side. 4 l, Caterpillar. 4 p, Chrysalis.

Plate 14.—Fig. 1. Thecla Pruni (p. 88). 1 *, Under side. 1 l, Caterpillar. 1 p, Chrysalis.

Fig. 2. Thecla W-album (p. 89). 2 *, Under side. 2 l, Caterpillar. 2 p, Chrysalis.

Fig. 3. Chrysophanus Phlæas (p. 92). 3 *, Under side. 3 l, Caterpillar. 3 p, Chrysalis.

Fig. 4. Chrysophanus Hippothoe (p. 95), male.

Plate 15.—Fig. 1 ♂. Chrysophanus dispar (p. 96). 1 f, Female. 1 *, Under side. 1 l, Caterpillar. 1 p, Chrysalis.

Fig. 2. Chrysophanus Hippothoe (p. 98). Upper side, male. 2 l, Caterpillar. 2 p. Chrysalis.

Fig. 3. Chrysophanus Virgaureæ (p. 99). Upper side, male. 3 l, Caterpillar. 3 p, Chrysalis.

Fig. 4 ♂. Polyommatus Argiolus (p. 103). Upper side, male. 4 f, Female. 4 *, Under side.

Plate 16.—Fig. 1 ♂. Polyommatus Alsus. (p. 102). 1 ♀, Female. 1 *, Under side. 1 l, Caterpillar. 1 p, Chrysalis.

Fig. 2 ♂. Polyommatus Acis (p. 105). 2 ♀, Female. 2 *, Under side.

Fig. 3. Polyommatus Arion (p. 106).

Fig. 4 ♂. Polyommatus Corydon (p. 107), male. 4 *, Female. 4 l, Caterpillar. 4 p, Chrysalis.

Plate 17.—Fig. 1. Polyommatus Alexis (p. 111), gynandromorphous. 1 *, Under side. 1 l, Caterpillar. 1 p, Chrysalis.

Fig. 2 ♂. Polyommatus Ægon (p. 114), male. 2 ♀, Female. 2 *, Under side. 2 l, Caterpillar. 2 p, Chrysalis.

Fig. 3. Polyommatus Agestis (p. 116). 3 *, Under side.

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CONTENTS.

THE

BUTTERFLIES

Of Great Britain,

AND

THEIR TRANSFORMATIONS.

The Diurnal Lepidoptera, or butterflies, corresponding with the Linnæan genus Papilio, are distinguished from all other insects of the same order, not only by having the antennæ long and slender, and terminated in a larger or smaller club, which in the terminal family is hooked at the tip, but also by the want of a bristle at the base of the anterior margin of the hind wings beneath, which, passing through a loop on the under side of the fore wings of the moths, retains them in their proper place during flight. The wings also, when at rest, are mostly carried erect over the back, their upper surfaces being brought into contact. The flight of these insects is diurnal. Their caterpillars are constantly furnished with sixteen feet (six thoracic, eight ventral, and two anal). Their chrysalides are almost always naked, attached by the tail, and often by a girth round the middle of the body; they are often angular in their form, and are scarcely ever enclosed in a cocoon.

The British Diurnal Lepidoptera are divisible into the five following families:— 1. Papilionidæ (including two sub-families, Papilionides and Pierides). 2. Nymphalidæ (including the Hipparchiides, or the Satyrides of Boisduval, or Thysanuromorpha of Horsfield, and some other minor tribes separated by Boisduval). 3. Erycinidæ. 4. Lycænidæ. 5. Hesperidæ.* The last family differs from all the others in the habit of the caterpillars rolling up leaves, within which they undergo their transformations.

* Of each of the five families mentioned above, we possess in Great Britain a considerable number of species, except of the third, which is more especially tropical in its geographical range, Brazil and the East being the chief localities of the Erycinidæ; our only British representative of the family being rather an aberrant species. Of the great family Heliconidæ (including the Danaides), which are also especially tropical in their range, we do not possess a single species in this country. Moreover, in the fine work upon the Genera of Diurnal Lepidoptera, commenced by the late Mr. E. Doubleday and completed by myself, several additional families have been introduced amongst the butterflies. As they are, however, of small extent, and consist also exclusively of exotic species, I have not thought it necessary to allude to them further in the present work.

FAMILY I.

PAPILIONIDÆ, Leach.

This family consists of some of the most gigantic species of butterflies, distinguished by having all the six feet in the perfect state fitted for walking, the anterior pair not being more or less rudimental; the hind tibiæ have only a single pair of spurs at the tip; the tarsal ungues are distinct and exposed; the antennæ are never hooked at the tip, the club being distinct, but variable in form; the palpi are variable, but the third joint is never suddenly slenderer than the rest, and naked; the central cell of the hind wings is always closed behind by a vein. The caterpillars are elongated, nearly cylindrical, and naked; the chrysalides are attached not only by the ordinary anal hooks, but also by a girth round the middle of the body. In one genus (Parnassius) they are, however, enclosed in a rough cocoon.

This family is divisible into two sub-families, Papilionides and Pierides. The first sub-family, Papilionides, has the anal edge of the hind wings concave, or cut out to receive the abdomen; the anterior tibiæ have a spur in the middle; and the tarsal ungues are simple. The caterpillars are furnished with two fleshy retractile tentacles, forming a fork upon the back of the segment succeeding the head.

GENUS I.

PAPILIO, Linnæus.

The antennæ are elongate, with a moderate-sized club, gradually formed and somewhat curved; the palpi are very short, so as to be scarcely seen,—they appear only two-jointed, the third joint being almost obsolete; the spiral tongue is long; the eyes are large and naked; the abdomen rather short, and ovate-conical; the wings are elongate, and more or less toothed at the edges, the posterior pair being often produced into a long tail, and having the anal margin cut out to allow the motion of the abdomen; the strong central vein of the fore wings emits four branches behind; and the middle cell of the hind wings is closed and emits six veins. The fore legs are alike in both sexes, they are fitted, as well as the four hind ones, for walking; the anterior tibiæ have a single strong spur

1.

at the middle, the four hind tibiæ have two long spurs at the tip of each. The larvæ are naked, and furnished on the neck with a fleshy furcate tentacle, which they are able to retract or exsert at will. The chrysalides are attached by the tail, and girt round the middle with a silken thread, with the head pointing upwards, and forked, or bimucronate.

This genus is extremely numerous, Boisduval having described as many as two hundred and twenty-four species, exclusive of several which he has detached under other generic names. They are mostly of large size, and are found in the tropics, only three or four species being natives of Europe.

SPECIES 1.—PAPILIO MACHAON. THE SWALLOW-TAIL BUTTERFLY.

Plate i. figs. 1—1 a, 1 b.

Synonymes.—*Papilio* (*Equites Achivi*) *Machaon*, Linn. Syst. Nat. ii. 750. Donovan Brit. Ins. 6, pl. 211. Lewin Brit. Butt. pl. 34. Harris Aurelian, pl. 36. Westwood Ent. Text Book, tab. 4, fig. inf.; ditto Introd. ii. p. 332, fig. 95. 1—10. Duncan Brit. Butt. pl. 4, fig. 1. *Papilio Reginæ*, De Geer Gen. 6. 30. 5. *Jasonides Machaon*, Hübner. *Amaryssus Machaon*, Dalman Pap. Suec. 85. 1.

This beautiful butterfly varies from three inches to three inches and nearly three-quarters in the expanse of the wings, which are of a yellow colour with black markings, the fore wings having a large patch of black at the base; the anterior margin is black, with three large black subcostal marks; the nerves are also broadly black, as is also the apical margin, in which are eight yellow lunules, above which is a thick sprinkling of minute yellow scales; the posterior wings are more strongly denticulate at the edges, and produced behind into a pair of rather long tails; they are yellow, with the inner margin and a very broad apical border black, the latter with six yellow lunules, above which is a thick sprinkling of blue scales. The anal angle is ornamented with a brick-red eye, margined with yellow beneath and with blue above, the latter having also a black crescent above it.

The under side of the wings is much paler than the upper, the black markings being less extended; the apical yellow lunules of the upper side are replaced by a narrow continuous bar, above which the yellow irroration is much stronger; the broad black apical bar of the hind wings is much paler, the black being confined to the curved margins of the bar, and in the middle of the hind wings are three triangular brick-red spots; a spot of the same colour also exists in the squarish yellow submarginal spot nearest the fore edge of the hind wings.

This species is very widely dispersed, being found all over Europe, Siberia, Syria, Egypt, the coast of Barbary, Nepaul, Cashmere, and the Himalayan Moun-

tains, from which last locality I possess a specimen, captured by Professor Royle, which scarcely exhibits the slightest differences when compared with English specimens. In our own country it chiefly occurs in the fenny districts of Cambridgeshire and Huntingdonshire, but it has also been captured in Hampshire, Middlesex, Sussex, Essex, and Kent. The caterpillar is of a fine green colour, with velvety black rings, spotted alternately with fulvous-red. It is found in June and September, there being two broods in the year, according to Boisduval; but this is doubted by Stephens, the perfect insect being taken from the beginning of May to the end of August in England. It feeds upon various umbelliferous plants, especially on the marsh-milk parsley (Selinum palustre), fennel (Anethum fœniculum), and wild carrot (Daucus carota), preferring the flowers. The fork-like tentacle on the neck is of a red colour, and emits a strongly-scented liquor when alarmed, by which it is said to drive off the Ichneumon flies. The mode in which the transformation of this butterfly is effected has been carefully investigated by Reaumur. When full-grown, the caterpillar discharges from the spinning apparatus in the middle of the under part of the mouth a small quantity of silk, forming it into a little mass, which it lays hold of with its hind pair of feet; it then attaches another thread on one side of the twig at some distance in advance of the small mound, and gradually forms it into a loop, attaching the other end of the thread to the opposite side of the twig, and holding it open by means of its fore legs; it then spins a sufficient number of similar threads, until the loop has acquired sufficient strength for its destined use. When it is completed, the insect, still holding it open by means of its fore legs, somewhat in the same way as a skein of silk is held on the hands whilst being wound off, slips its head between these legs, and thus passes the loop over its back, and by the repeated action of the anterior segments, it gradually brings it to that part of the body best calculated to balance it when it shall have assumed the chrysalis state. It sometimes, however, happens that, notwithstanding all its care, the threads of the loop slip off its legs. This is indeed a woful calamity to the poor larva, which has the greatest difficulty, and is sometimes unable, to re-collect the threads of the loop upon its legs, trying every contortion of limb to effect this purpose, but sometimes in vain. Should it, however, succeed, the body is stretched forward in a right line, and remains in this position until the skin is cast, being slit down the back by the contortions and annular contractions of the insect, the girth being too loose to form a material hindrance to its being slipped beneath backwards to the tail, where it is ultimately thrown entirely off.

The second sub-family of the Papilionidæ, PIERIDES, has the anal edge of the hind wings formed into a gutter to receive the abdomen; the anterior tibiæ do not possess a spur in the middle; and the tarsal ungues are one- or two-dentate.

The caterpillars are not furnished with a nuchal fork. They are slightly pubescent, and rather slender at each end of the body.

GENUS II.

GONEPTERYX, LEACH. RHODOCERA, BOISDUVAL.

The antennæ are rather short and robust, terminated by a club gradually formed, commencing nearly at the middle of the antennæ, the apex not compressed and slightly truncate; the scales on the front of the head form an erect tuft; the palpi are as long as the head, distinctly three-jointed, the third joint small; the wings are ample, the anterior angulated at the tip, and the posterior nearly in the middle of the hind margin; the fore legs are alike in both sexes, the tibiæ not armed with a spur in the middle, and the tarsal ungues bifid, with slender pulvilli. The larvæ are elongated, slightly pubescent, attenuated at each end. The chrysalis is gibbose, much bent, terminated like a spindle at each extremity, always attached by the tail and by a transverse girth across the middle.

M. Boisduval rejects Dr. Leach's name for this genus, Gonepteryx (misquoted by the former under the name Gonopteryx), because it is too much like Gonoptera, proposed *long afterwards* by Latreille for another genus of Lepidoptera; and because names ending in *pteryx* have but little euphony, and ought only to be used in Ichthyology, where they are more prevalent. All these reasons appear to me insufficient; I have, therefore, retained Dr. Leach's name, which in some of my early works I had slightly altered to Goniapteryx, in order to make it more in accordance with its Greek derivatives, γωνια an angle, and πτερον a wing. As, however, this alteration has not been adopted by subsequent writers, and as I have found by experience that it is preferable to retain even a nonsense name to a perpetual alteration of terms, I have thought it better to recur to the Leachean designation.

SPECIES 1.—GONEPTERYX RHAMNI. THE BRIMSTONE BUTTERFLY.

Plate i. figs. 2, 2a, 2b.

SYNONYMES.—*Papilio* (*Dan. Cand.*) *Rhamni*, Linn. Syst. Nat. ii. p. 765. Donovan Brit. Ins. 5, pl. 145. Lewin Brit. Butt. pl. 31. Albin Brit. Ins. pl. 3, fig. 3 e. h. *Gonepteryx Rhamni*, Leach, Stephens, Curtis, Duncan Brit. Butt. pl. 5, fig. 1. *Goniapteryx Rhamni*, Westw. Introd. Gen. Syn. p. 87. *Rhodocera Rhamni*, Boisduval Hist. Nat. Lep. 1, p. 602. *Anteos Rhamni*, Hübner. *Ganoris Rhamni*, Dalman.

This butterfly varies in expanse from two inches to three inches and a half. The male has the upper side entirely sulphur-yellow, and the female greenish white, with an orange spot at the extremity of the discoidal cell of each wing, and some very minute ferruginous points at the place of union of the veins with the margins of the wings. The under side of the wings is paler than the upper, especially in the males; and the orange discoidal spot is replaced by a ferruginous dot, whitish in the centre, between which and the marginal ferruginous points is a row of fuscous spots.

Mr. Curtis has figured a variety of this insect captured near Peckham, with the upper wings variegated with orange, slightly as in G. Cleopatra; thus proving the correctness of the statement made to me by M. Boisduval, that he had reared G. Rhamni and Cleopatra from eggs deposited by the female of the former, the larvæ producing the latter offering no variation from those from which the latter were reared. (See also his Hist. Nat. Lepid. i. p. 602.)

To no species of butterfly can we apply with greater effect, by transposition, Mrs. Barbauld's beautiful image of the origin of the snowdrop:—

> As if "Flora's breath, by some transforming power,
> Had changed" a flower into a butterfly.

Sporting about in some flowery nook in the very first sunny days of February and March, this butterfly looks more like the petals of the primrose over which it hovers, floating on the breeze, than a living creature. These early specimens have survived the winter, and produce eggs from which a fresh brood of butterflies is produced in May, and another in the autumn, some of which last again survive the winter.

The caterpillar is green, finely shagreened with black scale-like dots on the back, with a whitish or pale green line on each side, the upper edge of which is shaded off into the general colour. It feeds on the buckthorn (Rhamnus catharticus), and the berry-bearing alder (Rhamnus frangulus), as well as on Rhamnus alaternus. The chrysalis is green, with several reddish dots; it is very gibbous in the middle, and attenuated like the end of a boat in front; it is attached by the tail on a per-

pendicular branch, and fastened with a loose silken thread round the middle of the body; the pupa state lasts about a fortnight. This butterfly occurs commonly in various parts of England, as far north as York, Windermere, and Newcastle; but Mr. Duncan states that it has not yet been found in Scotland.

GENUS III.

COLIAS, Fabricius.

The species of this genus, like the preceding, are distinguished by the brilliant yellow or orange colour of their wings; but they are more or less bordered at the tips with black, and are never angulated. The fore wings exhibit also on both sides a discoidal black spot, and the posterior a central spot, which is orange above and generally silvery beneath, The antennæ are short, nearly straight, gradually clavate to the tip, which is truncate; the palpi are shorter than in Gonepteryx; the head has no frontal tuft; the fore wings are sub-triangular, and the posterior are rounded; the fore legs are alike in both sexes; the tarsal ungues bifid, and the pulvilli very minute. (A highly magnified figure of the ungues and their appendages is given in the Crochard edition of the Règne Animal, Insectes, pl. 132, fig. 3, c.) The caterpillar is naked, elongate, cylindric, very finely setose and tubercled; the chrysalis rather short, subangulated, gibbous, slightly beaked in front, attached by the tail and by a girth behind the thorax.

From the great similarity of some of the numerous species of this genus and their apparent variation, much confusion has occurred in the investigation of the British species; Mr. Stephens describing four (exclusive of P. Palæno, Linn., a reputed British species, and P. Helice, Haw., a presumed variety of C. Edusa), whilst Mr. Curtis only admits two. The Rev. W. Bree has published a memoir on the British species in the Magazine of Natural History, No. 26.

The generic name Colias appears to have been inappropriately derived by Fabricius from Κολίας, a word used by the Greeks for some kind of fish.

SPECIES 1.—COLIAS EDUSA. THE CLOUDED-YELLOW BUTTERFLY.

Plate 2, fig. 1, 1a.

SYNONYMES.—*Papilio Edusa*, Fabricius Ent. Syst. v. iii., part 1, p. 206. Donovan Brit. Ins. 7, pl. 238, fig. 2 (female). Harris Aurelian, pl. 29, fig. n ♂, fig. m ♀.

Colias Edusa, Stephens, Curtis, Duncan Brit. Butt. pl. 5, fig. 2.

Papilio Hyale, Esper, Donovan Brit. Ins. 2, pl. 43, fig. sup. ♂.

Papilio Electra, Lewin, pl. 32 (and Linn. Syst. Nat. ii. 764, teste Newman Ent. Mag. 1, 85).

Var. *Papilio Helice*, Hübner, Haworth.

Var. *Papilio Chrysotheme*, Stephens, but not of Esper.

Var. *Colias Myrmidone*, W. & H. Brit. Butt. pl. 42, fig. 1—3, but not of Ochsenheimer and Godart.

The expansion of the wings of this species varies from nearly two inches to two inches and a half. The upper surface of the disc of the wings in both sexes is a rich orange colour, the males having a round discoidal black spot on the fore wings, and a broad black apical margin irregularly toothed within, extending through both wings, with several narrow orange lines running through the black border, indicating the place of the nerves; the disc of the hind wings is somewhat darker, with a large discoidal bright-coloured orange patch. The upper side of the female differs in having the broad apical border marked with several irregular yellow spots, and more indistinctly indicated in the hind wings, which are darker and yellower than in the males.

Beneath, both sexes are nearly alike, the disc of the fore wings being lighter orange, with a black discoidal spot, the margins greenish, with a row of blackish spots at some distance from the apical margin; the hind wings are greenish, with a round silver discoidal spot surrounded with red, and accompanied by a smaller silvery dot; between this and the apical margin is a row of brownish red dots. The figure of this species, on plate 2, represents a remarkable gynandromorphous specimen, captured at Riddlesdown, near Croydon, Surrey, in August, 1847, in the possession of S. Stevens, Esq., of which the left side is that of the male, and the right side, as indicated by the size and form of the wings, is female, further distinguished by the marginal yellow spots on the anterior wing of that side. A previous figure of this specimen has been published by Mr. W. Wing, in the Transactions of the Entomological Society of London.

Most modern Entomologists are agreed in regarding the PAPILIO HELICE of Hübner and Haworth, figured by Stephens (Illustr. Haust. pl. 2*, and our Brit. Butt. pl. 2, fig. 8), as a variety of the female of Colias Edusa, from which it differs in having the ground-colour of the disc of the wings, as well as the spots in the black apical margin, yellowish white. No corresponding variety of the male has yet been observed.


♂
1
♀
2♀
2♂
3
♀
♂
2b
2a
1a
3a
3b

Small specimens of this insect, measuring only about an inch and three-quarters in the expanse of the fore wings, and of a paler fulvous-lutescent colour, were also given by Mr. Stephens, in his Illustrations, as the PAPILIO CHRYSOTHEME of Esper (W. & H. Brit. Butt. pl. 3, fig. 1—3). The hind margin of the fore wings is also rounder, the marginal fascia differently formed, the dusky base of the wings more expanded, and the black discoidal spot of the fore wings pale in the centre. Supposed to have been taken in Norfolk, or near Epping. The true Chrysotheme is a native of Eastern Europe as well as of North America. Another variety, captured by Mr. Stephens on the south coast, between Dover and Brighton, was considered by that author as the COLIAS MYRMIDONE of Hübner, and as such introduced into our "British Butterflies," pl. 42, fig. 1—3. It measures only an inch and two-thirds in the expansion of the fore wings, the dark border of which is not divided by slender yellow lines. The true Myrmidone is a native of Hungary, Southern Russia, etc.

The caterpillar of C. Edusa, which feeds upon Medicago lupulina, various species of Trifolium, and other leguminous plants, is green, with a lateral stripe varied with white and yellow, and with an orange dot on each segment. The chrysalis is green, with a lateral yellow line and several ferruginous dots.

Boisduval gives Europe, Egypt, the coast of Barbary, Nepaul, Cashmere, Siberia, and North America as the localities of this species. Mr. Burchell is stated by Mr. Duncan to have found it in South Africa; but this I apprehend must have been the species described by Boisduval, from the Cape of Good Hope and Caffraria, under the name of C. Electra of Linnæus, by whom also the Cape of Good Hope was given as its locality. Hence, from the similarity of the two species, it is that I have hesitated to consider our English species as the true C. Electra, as stated by Mr. Newman. Indeed, upon examining the Linnæan Cabinet, I find that the Colias preserved therein, attached to the label of "Electo" (subsequently altered to Electra in the printed work of Linnæus), is the male of a species closely allied to our Edusa, in which the dark border of the fore wings is not divided by the orange veins, and the silver spot on the under side of the hind wings is very small, with a very minute brown dot attached to it. Moreover, specimens of our Edusa are attached to a label, also in the handwriting of Linnæus, marked "Pteridis;" and on referring to the works of Linnæus, we find no such species, but P. Palæno described with the "habitat in Pteride Aquilina." It is to be feared that some confusion has been introduced into the arrangement of these insects.

This is one of those species of butterflies whose periodical appearance (every three or four years, as stated by some writers) has so much perplexed Entomologists.

Various opinions have indeed been suggested by authors, in order to account for this singular circumstance; such as the failure of their natural enemies, the Ichneumonidæ, or insectivorous birds—an increased temperature—or the dormant state of the eggs, until called forth by some latent coincidences. All these opinion are, however, but merely conjectural; nor can the matter be cleared up until a more minute inquiry into the habits of the species has been made.

SPECIES 2.—COLIAS HYALE. THE PALE-COLOURED YELLOW BUTTERFLY.

Plate 2, fig. 2 ♂, 2 ♀, 2a, 2 b.

Synonymes.—*Papilio* (*Danai Candidi*) *Hyale*, Linn. Syst. Nat. ii. p. 764. Lewin Brit. Butt. pl. 33. Donovan Brit. Ins. 7, pl. 238, fig. 1 (male).

Colias Hyale, Ochsenheimer, Leach, Stephens, Curtis Brit. Ent. pl. 242; Duncan Brit. Butt. pl. 6, fig. 1.

Le Soufre, Ernst, Pap. d'Europe.

Papilio Palæno, Esper, 1, pl. 4, fig. 2. Fischer Entomol. de la Russ. Lepid. pl. 11, figs. 1, 2. (Colias P.)

This species is from two inches to nearly two inches and a quarter in expanse. Its upper surface is of a sulphur colour in the males, or of a cream colour in the females; in other respects the sexes are nearly alike, having a black discoidal spot and an irregular, broad, black, apical margin, in which is an interrupted series of spots of the same colour as the ground of the wings; the hind wings are darker on the disc, with an orange-coloured discoidal spot, and the margin is very slightly and irregularly marked with black. The fore wings are beneath whitish yellow, with the apex orange-yellow, having a row of transverse blackish marks parallel with, but at some distance from, the apical margin; the discoidal spot is black, with a yellowish middle; the hind wings beneath are orange-yellow, with a large silvery spot, accompanied by a minute eye-like dot surrounded with reddish, and between these and the apex of the wings is a row of small blackish spots.

The caterpillar, which feeds on Medicago, various species of Trifolium, and other leguminous plants, is of a velvety green colour, with two lateral yellow stripes, and with black dots on the segments; the chrysalis is green, with a yellow lateral line.

Although very abundant on the Continent (where it appears to be double-brooded, May and August, or September, being the times of its appearace), and extending to the north of Africa, Siberia, Cashmere, and Nepaul, this butterfly is much rarer in England than the preceding; the coasts of Kent, Sussex, and Suffolk having furnished the greatest number of specimens. Others have been found in Epping Forest, and near Halvergate, in Norfolk.

GENUS IV.

PIERIS,* Schrank, E. Doubleday (Gen. D. Lep.) PONTIA, Stephens, etc.

In its present restricted state this genus consists of species which, from their common occurrence in our gardens throughout the summer, have attracted our earliest attention; their almost uniform white colour, and the places where they mostly frequent, having led to their receiving the ordinary name of Garden Whites. From the preceding genus they are distinguished by the more acute tip of the fore wings, and by their longer and slenderer antennæ, which are terminated by a broad compressed and obtuse club. The palpi are short, three-jointed, nearly cylindrical, with the terminal joint as long as or rather longer than the second. The legs are long, slender, and alike in both sexes, the anterior pair being perfect.

The tarsi are terminated by two equal-sized hooklets much curved, each having a small tooth on its under side; between these hooklets is a long fleshy pulvillus, and each is laterally defended by a long conical hirsute appendage. The details of this curious structure are represented in the Crochard edition of the Règne Animal, lately published. Curtis describes the claws as unidentate or bifid; but I have found their structure uniform in all the species I have examined, agreeing also in this respect with the black-veined white and orange-tipped butterflies.

The wings are opaque, and thickly clothed with scales, thus disagreeing with the black-veined white and Apollo. The upper wings are at once distinguished from those of all the other Pierides by having only one very short vein emitted close to the apex of the wing from the third branch of the postcostal vein; this peculiarity, first noticed by me in "British Butterflies," will further distinguish this genus from the black-veined white, in which the same typical arrangement exists, but the short vein above mentioned is considerably longer and more distinct.

From Gonepteryx Rhamni, in which the arrangement of the veins is nearly as in P. Cratægi, they are at once separated by the form and colour of the wings. From the orange-tipped butterfly they are distinguished by the shape and variegated colours of the wings, and especially by the apical veins of the fore wings, which are more numerous in that insect than in Pieris; the palpi also differ as well as the transformations. The Bath white, which is united with the orange-tipped butterfly in the genus Mancipium, by Stephens and Curtis, is certainly referable to this genus, with which it is united by Boisduval and Ochsenheimer.

* Derived from Πιερὶς, plural Πιερίδες, the Muses, a poetical license similar to that used in giving the name Parnassius to the genus having P. Apollo for its type.

The caterpillars are cylindric and fleshy, with numerous minute points, or larger tubercles, which emit pale hairs, and are arranged in regular transverse series. The chrysalis is angulated with a short process in front of the head, and with a projecting lateral appendage behind (not in front of, as described by Stephens) each of the wing-cases. They are generally to be found attached to walls by a little tuft of silk at the tail and by a girth round the middle of the body. They do not constantly place themselves in one position with the head upright, but undergo this state in various positions.

The genus is very extensive, the species being distributed over most parts of the globe, but especially in the intertropical parts of the Old World, the western hemisphere being comparatively poor in species. In the great number of the species there exists a considerable number of natural divisions, as pointed out by Boisduval and Lacordaire. The caterpillars of such species as have been observed in the preparatory states, feed on the Cruciferæ, especially the species of Brassica, as well as on the Resedaceæ, Tropæolums, and Capparideæ. They sometimes abound to a very great extent, especially when their natural enemies have failed; at such times our cabbages, cauliflowers, etc., become a prey to them, but their taste is so accommodating that they freely devour imported plants belonging to allied natural families. The prevailing colour is white, of a more or less clear hue, with a black edge at the extremity of the fore wings. The females in our indigenous species are mostly marked with black spots in the posterior part of the disc of the fore wings. Some of the exotic species are much more varied in their colours.

The number of British species of this genus has been the subject of much recent inquiry, it having, until within the last fifteen years, been considered that there were but three—P. Brassicæ, Rapi, and Napæ, exclusive of P. Daplidice and Cardamines. In 1827, however, Mr. Stephens increased the number to seven in his Illustrations, separating P. Chariclea from P. Brassicæ, P. Metra from P. Rapæ, and P. Napææ and Sabellicæ from P. Napi. It is proper, however, to state that all these supposed new species had been indicated by previous authors, as will be noticed from the synonymes given below. The propriety of their separation has, however, been questioned by several writers, amongst whom the Rev. W. T. Bree has published some observations in opposition to the views of Mr. Stephens in Loudon's Magazine of Natural History, vol. iii., contending that as the three old-established species are exceedingly variable, the supposed new species ought only to be regarded as varieties of them. With the view of showing the grounds upon which these additional species rested, and of directing attention to the elucidation of the question, we gave figures of all the species, in some instances from the collection of Mr. Stephens

himself, in our "British Butterflies," since which time, however, Mr. Stephens, influenced by the opinions expressed by Mr. H. Doubleday and other excellent practical Lepidopterists, has reduced the four additional species to the rank of varieties in his Museum Catalogue of the British Lepidoptera. The transformations of these supposed species, which would at once determine the question of their specific rank, have not, however, been yet investigated.

No generic names have been so completely unsettled as the synonymous ones of Pontia and Pieris, a defect which has resulted from the want of some settled principle regulating the adoption of names of genera when an old-established genus has been cut up into several others. In the works of Stephens, Curtis, and others, Pieris is the generic name used for the black-veined white, and Pontia for the garden white butterflies. Boisduval, adopting the French mode of nomenclature, followed by E. Doubleday, has employed the name Pieris for the genus of the garden whites, with which he has also associated the black-veined white and the Bath white butterflies, whilst he has given the name of Pontia to a few exotic species. Ochsenheimer, on the other hand, in accordance with the system of German nomenclature, has given all the whites, including the black-veined, the Bath white, the orange tip, and the small wood white, under the name of Pontia. Such confusion as this is disgraceful, and ought to be no longer tolerated, although numberless other instances (in which the very commonest insects are known by three different generic names in England, France, and Germany) might be adduced to prove the necessity for some decisive step to remedy the evil. In one respect, naturalists (with the exception of a few vain persons who hesitate not to displace old specific names to make way for others of their own) are agreed in adopting the name first proposed for any genus or species, and to reject all subsequent ones proposed for the same group or species as synonymes. In the present instance, therefore, by the adoption of this principle alone we shall be able to remedy the defect pointed out. The name Pieris was first proposed by Schrank for all those butterflies which Linnæus had united together under the sectional name of Danai Candidi,* including the brimstone and clouded yellow butterflies with the whites, as well as the Parnassii. About the same time Fabricius prepared the manuscript of his Systema Lepidopterorum, in which he gave the name of Pontia to the black-veined white and garden whites, and that of Colias to the brimstone and clouded yellows. But this work has never been published, and a very short generic abstract alone was given by Illiger some years afterwards, in his Entomological Magazine. Of these two last-mentioned names Colias is adopted by all entomologists for the

* Palman, in 1815, united all the Danai Candidi into one genus, named Ganoris.

clouded yellow butterflies, and were we therefore to adopt the other Fabrician name Pontia, we should do injustice to Schrank, because Colias and Pontia are together synonymous with Pieris, which would thus be thrown out of use, but which on the contrary ought to be used for the great bulk of the white butterflies; other generic names being given to such aberrant species (but few in number) as may be required to be separated from the rest.

In any case, the mode in which these names have been used has been erroneous, for if we consider the black-veined-white as the type of Pieris, it is also the strict type of Pontia, and therefore is synonymous therewith; or if on the other hand we regard the garden whites as the types of Pieris, as I contend ought to be done, the black-veined white ought either to receive a new generic name or be generically termed Pontia.

In this view of the subject, and still further in order to remedy the confusion above alluded to, I consider it necessary entirely to reject the name Pontia except as a synonyme; to employ Pieris for the garden whites, as the natural types of the great body of the genus; and to give other generic names to such of the species of whites as have been separated therefrom.

SPECIES 1.—PIERIS BRASSICÆ. THE LARGE GARDEN WHITE BUTTERFLY.

Plate iii. fig. 1 ♂, 1 ♀, 1 l, 1 p.

Synonymes.—*Papilio* (*Danai Candidi*) *Brassicæ*, Linn. Syst. Nat. ii. 759. Donovan Brit. Ins. vol. 13, pl. 446. Lewin Brit. Butt. pl. 25. Haworth.

Pontia Brassicæ, Fabricius, Ochsenheimer, Leach, Stephens, Curtis, Jermyn, Duncan Brit. Butt. pl. 7, fig. 1, 2.

Pieris Brassicæ, Schrank, Latreille, Boisduval, Zetterstedt.

Ganoris Brassicæ, Dalman.

Catophaga Brassicæ, Hübner.

Var. *P. Chariclea*, Stephens.

This is one of the commonest species of butterflies, occurring in all parts of the country. It varies in the expanse of its wings from two and a half to two and three-quarter inches. The upper side of the wing is white, the fore wings having a broad black patch occupying the apex of the upper side, being larger in the females than in the males, with its inner edge more or less distinctly notched; there is also a small black patch on the fore edge of the hind wings on the upper side. The under side of the fore wings is marked in both sexes with two black discoidal spots beyond the middle of the wings (which also appear on the upper side of these wings in the female), and the under side of the hind wings is dull yellow, covered with very minute black irroration. The black apex of the fore wings is represented on the under side by a yellowish mark. Sometimes, but rarely, the males have a black spot on the disc of the anterior wings above.


2♂
3
3♀
3♂
2♀
1♂
2♀
1♀
1
1♀
2

Specimens of small size, varying in expanse from two and a quarter to two and a half inches, distinguished from P. Brassicæ by the dissimilar colour of the apical spot on the anterior wings above, which is ash coloured, without any internal indentations, and in the female deeply clouded with black, were separated by Mr. Stephens under the name of P. CHARICLEA (Ill. pl. 3*, fig. 2). The cilia of all the wings in these individuals is pale yellowish white; the ground-colour of the under side of the hind wings is more intense, and they are more deeply irrorated with black, and the time of their appearance is in April, and the first half of the following month, occurring in localities where subsequently P. Brassicæ abounds.

Mr. Stephens argued at some length against the opinion that the early appearance of these specimens can affect either their size, colour, or form of their markings; it still, however, remains to be proved whether these characters be constant or merely variable.

The caterpillar of this species has been described as greenish yellow, with three yellow lines, but the entire ground-colour of the caterpillar is uniformly greenish yellow, the segments being almost covered with black tubercles, varying in size, and emitting white hairs (three of the larger ones on each side of each segment forming a triangle); but these tubercles are so placed as to leave a clear line on each side above the legs and one down the back; the head, fore legs, and anal segment are also black. The chrysalis is pale greenish, spotted with black, with three yellow lines.

"The larvæ of this insect," observes Mr. Haworth, "multiply so much in dry seasons as to make great havoc amongst our cabbages, etc. Small birds destroy incredible numbers of them as food, and should be encouraged. I once observed a titmouse (Parus major) take five or six large ones to its nest in a very few minutes. In enclosed gardens, sea-gulls with their wings cut are of infinite service. I had one eight years, which was at last killed by accident, that lived entirely all the while upon the insects, slugs, and worms which he found in the garden. Poultry of any sort will soon clear a piece of ground, but unless they are of the web-footed kind they do much damage by scratching the earth." (Lepid. Britann.) Great numbers of these caterpillars are also destroyed by a very minute species of ichneumon-fly (Microgaster glomeratus), which deposits a considerable number of its eggs in the body of the living caterpillar, which are soon hatched, and produce minute footless grubs, that continue feeding upon the fat internal parts of the caterpillar, which, notwithstanding their presence, feeds on as though unconscious of any injury. When, however, the time for its assuming the pupa state arrives, it creeps up the adjacent walls, but instead of changing to a chrysalis the little parasite

grubs burst through its skin, which shrivels up into a small compass, arrange themselves close together by the side of the exuviæ of the caterpillar they have destroyed, and each spins for itself a little oval cocoon of yellow silk, which ignorant persons mistake for the eggs of the caterpillar and destroy, thus foolishly killing their benefactors. In a short time the little parasites appear in their new form of active four-winged ichneumon flies.

The transformations of this species have been carefully investigated by Swammerdam and Réaumur, whose researches, in conjunction with the anatomical details of the same species published by Herold, have left nothing to be desired on the subject. The first of these authors chose this species to illustrate his "History of an Animal in an Animal, or the Butterfly hidden in the Caterpillar; which is a third particular example, serving as an additional illustration to the second method of the third order or class of natural transformations." The observations of this most indefatigable and celebrated author had for their object the proof of the natural production of insects from eggs laid by parents of the same species, and of the natural transformation of insects; and it is impossible to conceive more conclusive proofs, than are contained in his writings and figures, against the old theories of spontaneous generation and absolute metamorphosis.

The eggs of this butterfly, observed by Swammerdam, are oval, with fifteen small longitudinal ridges converging to the centre of the smaller extremity of the eggs; the ribs themselves, and the membrane of the egg between them, being also divided crosswise by regular grooves or channels. These eggs are deposited in clusters on the leaves of cabbages, etc., the larger end being applied to the surface of the leaf. After several changes of the skin, the caterpillar prepares to undergo its change to the chrysalis state, and spins a little hillock of silk, which it seizes firmly with the hooks of its anal feet. It has still, however, to construct a silken girth across the middle of its body, which it effects in a manner the most simple and least liable to accidents of the three modes adopted for this purpose by the different kinds of caterpillars which fasten themselves by girths. The swallow-tail butterfly presents us with one of these modes, in which, owing to the comparatively slight flexibility of the body, the caterpillar is forced to hold the skein of silk open by means of its fore legs. The species of hair-streaked butterflies (Thecla) offer another mode, as will be detailed in our observations on that genus; but the caterpillars of this genus have a very flexible body, so that they are able to throw back the head until it extends to the back of the fifth segment of the body, its fore legs being elevated in the air, it then applies the spinneret of its lower lip to the surface on which it is stationed, close to one of the first pair of fleshy pro-legs, and has only

to carry its head over the body to the opposite side to fix the other end of the thread. It then causes its head to return by the same route, emitting a second silken thread in like manner, one end of which it fastens at the spot at which the first was terminated, and the other end where the first was commenced. By repeating this manœuvre a certain number of times, the skein of silk becomes sufficiently strong to bear the insect, and Réaumur states that it is composed of about fifty threads, as he had observed a caterpillar spin thirty-eight, and about a dozen had been already spun when he commenced the observation. The number of these threads being completed, it only remains for the caterpillar to disengage its head from beneath the skein; a thing which might appear difficult, but which is easily effected by the caterpillar; to effect this it brings the head close to the surface on one side, where the threads are all fastened together; where, in fact, there is less liability to separate them from each other, which would be the case were the head to be withdrawn whilst it lies upon the middle of the back of the caterpillar, when the threads are of course loosest. It is then carefully withdrawn. The skein might be supposed to be too loose for the chrysalis, being spun over the body when that is doubled; but the future movements both of the caterpillar and chrysalis require that the skin should not be too tight, but should allow a little play in all directions; moreover the body, of course with the head turned back, as in the operation of spinning the skein, was stretched out, so that its natural diameter was considerably reduced. Having thus completed its skein, it reposes quietly at full length, or rather its body contracts in length and becomes thicker, and at length the skin of the fore part of the back bursts and the head of the chrysalis appears; by continued writhing of the body the slit is enlarged and the skin pushed backwards beneath the skein of silk and thrown off at the tail, in the manner described under P. Rapæ.

This butterfly appears in the perfect state about the middle of May, or earlier if the weather be favourable, according to Stephens. It deposits its eggs at the end of the month, the caterpillars from which are soon hatched and feed together until the end of June, when they change to chrysalides, which period lasts from seven to about sixteen days (according to the heat of the weather). The perfect butterfly appearing therefore in July, and depositing eggs which produce caterpillars, which become full fed so as to undergo their change to chrysalis in the autumn, in which state they remain till the following May. It is very common throughout Europe, and is also found in Egypt, Barbary, Siberia, Nepaul, and even Japan. The individuals from the two latter localities are, however, doubtfully regarded by Boisduval as distinct.

SPECIES 2.—PIERIS RAPÆ. THE SMALL GARDEN WHITE BUTTERFLY.

Plate iii. fig. 2 ♂, 2 ♀, 2 l, 2 p.

SYNONYMES.—*Papilio* (*Dan. Cand.*) *Rapæ*, Linn. Syst. Nat. ii. 759. Haworth. Lewin Brit. Pap. pl. 26. Wilkes, pl. 97.
Pontia Rapæ, Ochsenheimer, Stephens, Curtis, Duncan Brit. Butt. pl. 7, fig. 3.
Pieris Rapæ, Latreille, Boisduval, Zetterstedt.
Ganoris Rapæ, Dalman,
Catophaga Rapæ, Hübner.
Var. *P. Metra*, Stephens.

By persons ignorant of the nature of the growth and transformations of insects, this butterfly is considered as the young of P. Brassicæ, with which indeed it exhibits considerable resemblance, although it is usually considerably smaller, varying, however, from one and two-thirds to nearly two and a half inches in expanse. It is of a creamy white on the upper side, the tip of the fore wings having a very slight fuscous, dusky or black irregularly defined mark, not extending along the entire margin of the wing. On the under side this mark is replaced by a pale yellow mark, and the hind wings on the under side are also yellow, thickly spotted towards the base with black atoms. The males have moreover a black spot, and the females two round spots on the upper side of the fore wings, and both sexes have two black spots on their under side. The females have often also an elongated patch on the inner margin of the fore wings above, and there is a slight black mark on the costa of the hind wings. All the markings vary greatly, and some females have the upper side dirty pale buff.

Individuals of small size, varying from twenty to twenty-five lines in expanse, and being also early in their appearance (being only found early in April, or even at the middle of March, and not in July and August), were separated by Mr. Stephens, under the name of P. METRA (Ill. Lep. i. p. 19, 146. Duncan Brit. Butt. pl. 8, fig. 2; and our "Brit. Butt." pl. 5, fig. 5, 6). The male had long previously been figured by Petiver, under the name of Papilio alba media immaculata (Pap. pl. 1, fig. 13, 14), and the female under that of Papilio alba media trimaculata (Pap. pl. 1, fig. 11, 12). They are distinguished by the comparative slenderness and truncation of the fore wings, which are consequently very acute at the apex, which is slightly clouded with dusky; and by the black base of the wings. The male has a single obsolete dusky spot, and the female two, that at the anal angle being geminated; this sex has also the basal half of the wing much clouded with dusky: the posterior wings in both sexes are white, with the base black, and a dusky costal spot. Beneath, the sexes are similar; the anterior wings are white, with the tip yellow; the base and two obsolete spots dusky; the posterior wings are bright yellow, with a pale orange streak on the costa, strongly irrorated throughout with dusky, the anterior half of the discoidal cell being least speckled; the antennæ, legs, and body resemble those of P. Rapæ;

the ciliæ are entirely clear white. Mr. Stephens describes two varieties of the male, in which the markings are less distinct, or even almost entirely obliterated. He also in his appendix mentioned several circumstances in support of the specific distinction of these early "small whites," which had long been known amongst collectors under the name of "Mr. Howard's white." If indeed it be proved that these "early whites" exhibit constant distinctions of form, size, colour, and markings, it seems impossible to suppose that their detention in the chrysalis through the winter months should have the effect of producing such striking peculiarities. The caterpillar has not, unfortunately, been yet observed, "but the chrysalis does not materially differ from that of P. Rapæ." Several of our best Lepidopterists regard it, however, merely as a variety of P. Rapæ (as does also Mr. Stephens himself, in the British Museum Catalogue of British Lepidoptera).

If the perfect insects of this and the preceding species, P. Brassicæ, agree so closely together, their preparatory states are totally unlike, affording reason to believe that the specific distinctions of the other presumed species might also be better determined by their preparatory states. The eggs of this species are placed singly, and not in clusters, upon various species of Brassica, Reseda, etc.; the caterpillars are pale green, with a slender yellow dorsal line, and an interrupted yellow line above the feet on each side, in which the spiracles are placed; the head, feet, and tail are also entirely green; the body is transversely wrinkled, and the segments are but slightly indicated. Under a lens the whole body is seen to have a vast number of very minute black tubercles arranged in transverse rows. It feeds on the interior leaves of the hearts of cabbages, etc.; it is therefore much more obnoxious than P. Brassicæ. It is from this circumstance well known in France under the name of the *ver du cœur*.

The mode in which the transformation of this insect from the caterpillar to the chrysalis state is effected has been carefully described by Réaumur. Having attached itself by the hind feet to the little bundle of silk at the tail, and suspended itself by a silken skein across the middle of the body, in the manner described in our observations on P. Brassicæ, it remains for about thirty hours unchanged, or rather the change is going on beneath the skin of the caterpillar, which gradually becomes of a dusky colour, owing to the separation of the body of the chrysalis within; the throwing off of the skin is effected very rapidly, "*c'est l'affaire d'un instant*," says Réaumur. After a variety of contortions the skin of the back slits near the head, and forms a passage sufficiently large for the passage of the whole body of the chrysalis. When the head of the chrysalis is disengaged, it rests upon the old skin of the caterpillar, but it remains now to draw the hind part of the

chrysalis out of the slit, or what is the same thing, to push back the caterpillar skin until it becomes a crumpled mass near the spot where the two hind legs are fixed; this is effected by the alternate lengthening and shortening of the chrysalis. The skein of silk across the body is now seen to offer but little obstacle to the pushing back of the exuvia by the contraction of the rings of the chrysalis. When the exuvia has been pushed back so as to cover only about one-third of the length of the chrysalis, the insect ceases this operation, it being more convenient for it to withdraw the extremity of the chrysalis out of the aperture (being upheld by the transverse girth), and then push it back outside the exuvia till it reaches the little bundle of silk, into which it fixes the little hooks at the extremity of the tail. It then rids itself of the exuvia by a semicircular movement of the extremity of the abdomen, which is at the time curved, whereby it pushes the exuvia out of its old position and breaks the threads of silk to which it was attached, wher it falls down. The chrysalis then remains quiet, being fixed exactly in the same situation and manner as the caterpillar. The chrysalis is yellowish, greenish grey, or brownish, often with three sulphur yellow lines.

According to Mr. Stephens, the first brood appears at the end of April, and the second about the beginning of July; but there is evidently no regularity in the broods, as may be seen from the following result of the observations of Jacob L'Admiral of the dates in which specimens of this species spun their skeins, became pupæ, and appeared as butterflies, with the number of days in which they remained as pupæ.

	SPON.	WIERD EEN POPJE.	EN KAPEL.	IN DAAGEN.
De eerste,	18 July, 1720.	20 July.	5 Augustus,	— 16
De 2de,	6 July, [Juny ?] 1728.	8 Juny.	19 Juny,	— 11
De 3de,	13 September.	16 September.	1 April,	— 197
De 4de,	2 September, 1739.	4 September.	23 September,	— 19
De 5de,	2 September.	5 September.	28 May,	— 265

Like P. Brassicæ, this species inhabits the whole of Europe, from Lapland to the south, and is found in Egypt, Barbary, Asia Minor, Siberia, and Cashmere. The P. Ergane, Hübn. (P. Narcea of Dahl and Treitschke) and the P. Nelo of Borkhausen, are probably varieties of this species.

SPECIES 3.—PIERIS NAPI. THE GREEN-VEINED WHITE BUTTERFLY.

Plate iii. fig. 3, 3 l, 3 p.

SYNONYMES.—*Papilio* (*Dan. Cand.*) *Napi*, Linn. Syst, Nat. ii. 760. Lewin Brit. Pap. pl. 27. Donovan Brit. Ins. vol. viii. pl. 280, fig. 1. Albin Ins. pl. 52, fig. d—g. Wilkes Ins. pl. 98.

Pontia Napi, Fabricius, Ochsenheimer, Stephens, Curtis, Duncan Brit. Butt. pl. 9, fig. 1.

Pieris Napi, Schrank, Latreille, Boisduval, Zetterstedt.

Ganoris Napi, Dalman.

Catophaga Napi, Hübner.

Var. *P. Napææ*, Esper.

Var. *P. Sabellicæ*, Petiver (*Bryoniæ*, Godart).

This species is at once distinguished by the green colour of the parts of the

wings adjoining the veins on the under side; whence the English name of the species. It varies in the expansion of its wings from one and one-third to two inches. The wings are white above, except at the base, which is generally black; the tip is also dusky; the apex of several of the branches of the subcostal and median veins marked with small triangular spots. The males have generally a black spot between the middle and apex of the wing. The females have the apical dark mark larger, and have also two large black spots towards the posterior margin; the hinder one being connected with a black dash on the inner margin. On the under side, the fore wings of the males have the tip yellow, the nervures dusky, and two black spots corresponding with those of the females. In both sexes the hind wings are pale yellow beneath, with the veins broadly margined on each side with dusky greenish, and the hind wings have a small dusky mark on the costal edge above. The fore wings in the females are more rounded than in the males.

Specimens of this species, having the veins on each side strongly margined with brown, and with the fore wings described by Mr. Stephens as nearly of the form of those of P. Cardamines, have been cousidered as a distinct species, figured long ago by Petiver, under the name of P. Sabellicæ (Papil. pl. 1, fig. 17, 18, male; fig. 15, 16, female), and by Mr. Stephens, under the same name (Ill. 1, pl. 3*, fig. 3, 4). Godart also considered them as distinct, in his great Monograph of the Butterflies (P. Bryoniæ, Enc. Méth. 9, p. 162). Mr. Stephens's description is not, however, quite correct, the apex of the fore wings being as acute as in P. Napi, but the lower portion of the outer margin of the wing is greatly dilated. In my specimen of the female, the difference in the form of the wings when compared with a male of P. Napi (in which the expansion, measured from tip to tip, is precisely similar) is most striking; for on measuring the expanse from the base to the apex of the middle branch of the median wing-vein of this specimen of P. Sabellicæ, each wing is found to be more than 1⅓ line longer than the same portion of the wing in P. Napi; thus making a difference of nearly a quarter of an inch across this part of the wing, although the measure between the tips is alike. It is true that the females of P. Napi are described as having the "anterior wings more rounded than the male," but Mr. Stephens also describes and figures a male with the characters of P. Sabellicæ. Such a character, if found permanently in conjunction with the dark margins of the veins of the wings both on the upper and under surface, ought certainly to be deemed of specific value, although Boisduval gives it as a variety of P. Napi, describing only the female; whilst Zetterstedt describes both sexes of this as variety B of P. Napi, but adds that the females were most abundant. He, however, states that he had repeatedly captured the true males of P. Napi united

with the females of his variety B (or P. Sabellicæ). He had also reared a female of his var. B from a yellowish green chrysalis, very similar to the ordinary chrysalis of P. Napi, on the 20th of June. So that the preponderance of evidence is against the specific rank of P. Sabellicæ, and it is reduced to a variety by Mr. Stephens, in the British Museum Catalogue.

Amongst the varieties of this insect should also most probably be arranged the PAPILIO NAPÆÆ of Esper, distinguished by being of a larger size than the ordinary specimens of P. Napi, varying from $1\frac{5}{8}$ to $2\frac{1}{8}$ inches in expanse; "the male has the upper surface of the wings milk-white, with the tip, a spot, and two or three triangular dashes on the hind margin of the anterior, black; beneath, the latter have slightly dilated greenish nervures, with two cinereous spots placed transversely, and a yellowish tip; the posterior wings are pale yellowish, with a deeper costal streak; the basal nervures above, dilated and greenish. The female has the tip of the anterior wings and three spots, one of which is subtriangular, and placed on the inner edge of the wings, black or dusky, and the posterior wings are clearer yellow. The nervures on the under surface of the posterior wings are more or less dilated in different specimens." Such is the description given by Mr. Stephens; who, however, adds, "I think with Godart that it may only be a very large variety of P. Napi, but as it appears to have characters sufficient to constitute a distinct species, the determination of this point must be left for future investigation." The caterpillar and chrysalis have not been observed, nor have any circumstances connected with the time or place of its appearance been given, so that we have even less ground for considering it as distinct than exists in respect to P. Chariclea and Metra.

This is a very common and very variable insect, being found, especially at the middle of May and beginning of July, in gardens and pastures, the larva feeding on the Navew and other species of Brassica, Reseda, Raphanus, and other plants. It is pubescent, of an obscure green colour on the back, but brighter on the sides, with the spiracles red, placed upon a small yellow spot on each segment. The chrysalis is greyish, or yellowish green, with black spots.

SPECIES 4.—PIERIS DAPLIDICE. THE BATH WHITE BUTTERFLY.

Plate iv. fig. 1, 1 l, 1 p.

SYNONYMES.—*Papilio* (*Dan. Cand.*) *Daplidice*, Linn. Syst. Nat. ii. 760. Lewin Brit. Papil. pl. 28. Donov. Nat. Hist. Brit. Ins. 6, pl. 200.

Pontia Daplidice, Fabricius, Ochsenheimer. Steph. Ill. Curtis Brit. Entomol. pl. 48.

Mancipium Daplidice, Stephens Nom., Duncan Brit. Butt. pl. 9, fig. 2.

Pieris Daplidice, Schrank, Latreille, Boisduval, Zetterstedt.

Synchloe Daplidice, Hübner (Verz. bek. Schmet.)

The Slight Greenish Half-mourner, Petiver Pap. pl. 2, fig. 8, male.

Vernoun's Greenish Half-mourner, Petiver Pap. pl. 2, fig. 9, female.

This very rare butterfly varies in the expanse of its wings from an inch and


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

two-thirds to nearly two inches. The wings are of a white colour, those of the males being rather more cream coloured. The upper side of the fore wings is blackish at the base, and is marked with a rather large discoidal black spot at the extremity of the discoidal cell, in which the transverse veins appear of a white colour. The apex of these wings is irregularly black, the dark colour being broadest towards the front margin, extending only to the middle branch of the mediastinal vein, and being irrorated with white, having also four irregular white spots in the black patch, which is darker in the females than in the males; the females have moreover a small black patch near the inner margin of the fore wings; the upper side of the hind wings is white, but exhibits traces of the markings on the under side, in consequence of their slight transparency; indeed, in the female, these traces are more or less distinctly marked with black scales, especially along the edge. On the under side the markings are alike in both sexes, the male having the spot on the inner edge of the fore wings, which is wanting on the upper side in this sex. The marks of the fore wings on the under side are of a greenish colour. The under side of the hind wings is yellowish green or greenish (in some females), with three large white spots, forming a triangle towards the outer base of the wing, succeeded by an irregular white bar beyond the middle of the wing, traversed by yellowish veins and with five white clavate spots on the outer margin. The male moreover differs from the female in the form of the fore wings, which are more acute at the apex than in any other species of this genus,* and with the external margin slightly concave, instead of being convex, as in the female. This remarkable sexual difference, hitherto I believe unnoticed in this species, occurs as we have seen, but in a less striking degree, in P. Napi and its var. Sabellicæ. The caterpillar, which feeds upon various wild Resedaceæ and Cruciferæ, such as wildwoad, base rocket, and cabbage, is, according to Boisduval, of an ashy blue colour, covered with small black granules, with four white longitudinal stripes, marked at each incision with a lemon-coloured spot. The belly and legs are whitish, with a yellow spot above each of them. The chrysalis is greyish, dotted with black, with several reddish stripes. Our figures of the larva and pupa (carefully copied from Hübner) differ in their colours from the individuals described and figured by Boisduval in his Collection Iconographique des Chenilles d'Europe.

On the Continent, two broods of this insect appear in the course of the year.†

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* Notwithstanding this circumstance, the species was placed by Stephens at the head of his second division of Pontia, characterised by having "the anterior wings distinctly rounded at the tip," in contradistinction from the typical species, P. Brassicæ, etc., in which they were described as "obtusely angled."

† In April and May, and afterwards in August, according to Godart; but Boisduval gives April and May, and June and July, as the time of its appearance. Mr. Stephens captured his specimen, however, in the middle of August.

It is found in dry and sandy situations, and is very common, especially in the more southern part of the continent of Europe, as well as in Barbary, Asia Minor, and Cashmere. In this country it is very rare. According to Ray, it was formerly taken by Vernon near Cambridge; and Petiver records it as having been taken near Hampstead. Lewin informs us that it was named the Bath White, from a piece of needlework executed at Bath by a young lady, from a specimen of this insect, said to have been taken near that city. Mr. Haworth, in his Lepidoptera Britannica (pref. p. xxvi.), states that it had been taken in the preceding *June* (not May, as mentioned by Stephens) in White Wood, near Gamlingay, Cambridgeshire. Mr. Stephens captured it on the 14th August, 1818, in the meadow behind Dover Castle, where other specimens have since been captured (Entomol. Mag. iii. 409). According to Mr. Dale, a specimen was also taken about the same time near Bristol.

Our recent English entomologists have been singularly unfortunate in respect to the generic relations of this insect. Mr. Curtis first proposed forming it and P. Cardamines, L., into a section of the genus Pontia, having the wings variegated beneath, and the terminal joint of the palpi shorter than the second. Subsequently, Mr. Stephens, although noticing Mr. Kirby's observations on the peculiarity of the metamorphosis of P. Cardamines, adopted this section under the name Mancipium—Hübner. In none of his characters of the section, however, except the trivial one of the variegated under surface of the wings, is there any agreement between P. Daplidice and Cardamines. The labial palpi in a female of Daplidice which I have dissected, have the second and third joints of equal length, although Savigny and Curtis figure the third as scarcely more than half the length of the second; the anterior wings of the female Daplidice are not rounder than those of P. Napi, whilst we have seen that they are much more acute in the males. At the same time, the character of the transformations of the two species is totally distinct (comp. plate ii., fig. 3 a, 3 b; those of P. Daplidice agreeing with the rest of the genus Pieris). Moreover, the antennæ in Daplidice are terminated by a suddenly formed flat club, which is even broader than in P. Napi, whilst in P. Cardamines the club is long, and gradually formed; and, lastly, the veins of the fore wings* are arranged as in Pieris Napi, differing from those of P. Cardamines.

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* In the specimens of P. Daplidice, the wings of which I have examined and denuded of scales, the third branch of the postcostal nerve is destitute of the short branch *emitted* close to the apex of the fore wing in the other species of Pieris; but the position of this little branch varies in the different species of Pieris, and it is sometimes even wanting, as I have more recently discovered; indeed, I possess specimens, one fore wing of which possesses this short branch, and the other wants it. Typically speaking, however, it is the character of Pieris.

GENUS V.

APORIA,* Hübner. PIERIS, Stephens, E. Doubleday.

This genus is closely allied to the garden-white butterflies, but is distinguished from them not only by its habits subsequently detailed, but also by various peculiarities in its structure. The palpi are rather short, with the basal joint longest and most robust, the second and third of nearly equal length, the third being, however, much slenderer than the second; the antennæ are terminated by a gradually formed slightly compressed club; the wings are almost diaphanous, surrounded by a distinct vein, the cilia being very short, and the discoidal cell in all the wings being closed, the fore wings are somewhat triangular, but with the apex and posterior angle rounded off; the apical veinlet, which is the third anterior branch of the postcostal, is forked more strongly than in the garden-whites; the legs and ungues are formed as in the same insects. The larva is elongated, slightly fusiform, hirsute; and the chrysalis is angulated, but not boat-shaped, with an obtuse beak in front and the tail conical, attached in the same manner as all the other Pierides.

The palpi have been relied upon as the chief character of the genus, but from the variations which are found even in the British species of garden-whites, it appears to me an unsatisfactory one. The antennæ and subdiaphanous wings are of more importance.

I must refer to my observations under Pieris for the reasons which have induced me to reject the name of Pieris used for this insect by Stephens and others, and to employ one proposed long ago for it by Hübner. It is on this account that I have also rejected Donzel's name, Leuconea.†

SPECIES 1.—APORIA CRATÆGI, Hübner. THE BLACK-VEINED WHITE BUTTERFLY.

Plate i. fig. 3, 3 a, 3 b.

Synonymes.—*Papilio* (*Dan. Cand.*) *Cratægi*, Linn. Syst. Nat. ii. 758. Lewin Papil. pl. 24. Donovan Brit. Ins. vol. xiii. pl. 454. Albin Brit. Ins. pl. 2, fig. 2, a—d. Wilkes M. & B., pl. 95. Harris Aurelian, pl. 9, fig. g—k.

Pieris Cratægi, Schrank, Latreille, Boisduval, Zetterstedt, Stephens, Curtis B. E. pl. 360. Duncan Brit. Butt. pl. 11, fig. 2. E. Doubleday.

Pontia Cratægi, Fabr., Ochs., Leach.

Leuconea Cratægi, Donzel, Ann. Soc. Ent. de France, 1837, p. 80.

Aporia Cratægi, Hübner (Verz. bek. Schmett.)

This remarkable insect varies in the expanse of its wings from 2½ to 2⅝ inches.

* Probably derived from the Greek ἀπορια, destitutus sum, from the nakedness of the wings.

† M. Donzel was induced to form this insect into a genus intermediate between Pieris and Parnassius, chiefly from the peculiarity which he observed, that the female carries the male when flying together coupled. He further states that it differs from Pieris in having ten distinct terminal nerves, whilst there are only nine in Pieris: he, however, overlooks the small apical branch which also exists in Pieris, although it is sometimes necessary to denude the wing of its scales before it can be seen in that genus.

The wings are entirely of a white cream colour, and are alike on both sides, the veins being black and more or less dilated, their extremities in the fore wings being accompanied by triangular dusky spots. In the female the veins of the fore wings are generally of a brownish hue.

The caterpillar is at first black, but is afterwards thickly clothed with whitish hairs, with the sides and belly of a leaden grey colour, marked with two longitudinal red or yellow stripes. The chrysalis is of a greenish white, with two lateral yellow lines and a great number of black dots.

This is a very destructive insect on the Continent, its larva feeding in society under a silken web not only on the white thorn (Cratægus oxyacantha), but also on the Prunus spinosa, the cherry, pear, and other fruit trees. M. Kollar has given a long and interesting account of its proceedings in his work on obnoxious insects, to which I must refer the reader, and of which a translation by Miss Loudon, illustrated with woodcuts, has recently been published, with additional notes by myself. De Geer has also given an account of its transformations. It is fortunate, however, that this insect is of uncommon occurrence in this country, so that hitherto we have not experienced any of the injuries which it is capable of inflicting, and which led Linnæus to call it the pest of gardens. Pallas also relates in his travels that he saw this butterfly flying in such vast abundance in the environs of Winofka, that he at first took them for flakes of snow. It appears in this country somewhat periodically, being found plentifully in the New Forest, Hampshire, and at Combe Wood in Surrey, although I have never seen it in the latter place during many years' collecting. It has also been taken at Chelsea, Muswell Hill, Herne Bay, Glanville's Wooton (Dorset), Enborne (Berkshire), and other parts of the south of England. In France there appear two broods, one in the spring, the other in autumn. Their periodical appearance may probably be owing to the failure in the preceding year of their natural enemies, but the cultivator ought to take advantage of their appearance in the winged state in order to prevent their increase, as the destruction of one female butterfly would prevent the deposition of a certain number of eggs, and the mischief attendant thereupon.

GENUS VI.

EUCHLOE,* Hübner. ANTHOCARIS, Boisduval.

This genus is closely allied to Pieris in many respects, but differs in others, which are considered as of primary importance; the palpi are especially distinct,

* Derived from the Greek εὖ very, and χλοη the green herb, in allusion to the spotted green wings.

the second joint being very long, and the third very minute, not being more than one-fourth of the length of the preceding.* The antennæ are short, and terminated by a gradually formed oval compressed club; the fore wings are much more dilated and rounded at the tips, and in order to support this increased expanse, the third branch of the postcostal vein emits from its upper side two distinct veins.† The under wings form a slight channel for the abdomen. The wings are somewhat transparent, so as to show the markings of the under side when viewed from above. They are generally ornamented with a bright orange spot at the tip in one or both sexes, and on one or both of their surfaces.

The caterpillars are much more slender than those of Pieris; pubescent and attenuated at each end of the body. The chrysalis is naked, strongly boat-shaped, and more or less curved, pointed at each end, and destitute of lateral points. Boisduval states that the segments of the chrysalis are immovable.

SPECIES 1.—EUCHLOE CARDAMINES. THE ORANGE-TIPPED BUTTERFLY.

Plate ii. fig. 3, 3 a, 3 b.

SYNONYMES.—*Papilio* (*Dan. Cand.*) *Cardamines*, Linn. Syst. Nat. ii. pl. 761. Lewin Papil. pl. 30. Harris Aurelian, pl. 22, fig. g. h. Wilkes Brit. M. & B. pl. 99. Donovan Brit. Hist. pl. 169.

Mancipium Cardamines, Stephens, Duncan Brit. Butt. pl. 10, fig. 1, 2.

Anthocaris Cardamines, Boisduval, Godart.

Pieris Cardamines, Schrank, Latreille, Zetterstedt.

Ganoris Cardamines, Dalman.

Euchloe Cardamines, Hübner (Verz. bek. Schm. 1816).

This beautiful insect varies in the expanse of its wings from $1\frac{1}{8}$ to 2 inches. The ground-colour of the wings is white; on the upper side the base is black; there is a black semicircular mark at the extremity of the discoidal cell, and the apex is black, with pale spots along the margin. In the males, the space between the discoidal spot and the dark apex is suffused on both surfaces with bright orange, which is entirely wanting in the females; the upper surface of the hind wings is white, but exhibits the traces of the markings which ornament the under side; the cilia is marked with seven black dots. The fore wings on the under side are yellowish at the base, and the dark apical spot is pale grey varied with green; the under wings on this side in both sexes are marbled with white and green, the veins being edged with yellow.

Mr. Stephens describes several varieties—one having a black spot on the upper surface of the hind wings and another with the black lunule of the fore wings almost obliterated. Mr. Haworth also describes a variety of the male having the orange

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* Boisduval describes the last joint of the palpi as "à peine aussi long que le précédent."—(Hist. Nat. Lép. 1, 556.) But my description is taken from a carefully dissected specimen of E. Cardamines.

† Boisduval figures Anthocharis Antevippe (Hist. Nat. Lép. pl. 18. fig. 3) with only one vein from this third branch as in Pieris.

spot almost obliterated above; and Boisduval mentions a variety of the female having an orange spot on the under side of the fore wings.*

The larva is green, slightly pubescent, very finely dotted with black, with a white lateral stripe. It feeds upon Cardamine impatiens (whence its specific name), Turritis glabra, Brassica campestris, etc. The chrysalis is at first green, but in a few days it assumes a yellowish grey colour with brighter coloured stripes.

This is a very abundant species, sporting about sunny lanes and pastures, and open places in woods, in the early spring. Mr. Stephens states that of six pupæ of this species, two came to perfection at the end of May, one in the beginning and one at the end of June, and the other towards the middle of July; thus accounting for the apparently long continuance of the insect in the perfect state.

GENUS VII.

LEPTOSIA,† HÜBNER. LEUCOPHASIA, STEPHENS.

This genus is at once distinguised from its allies by the very peculiar form of the wings, which are narrow, elongated, and slender, the anterior being rounded at the tip, and the posterior slightly grooved. The head is of moderate size, with the eyes large and prominent; the palpi short, the basal joint being very large and broad, the second small and square, and the third very small and rather oval; the antennæ are terminated by a rather abruptly formed obconical compressed club; the thorax is very small, and the abdomen very long and slender. Like its allies, the wings of the female are more rounded at the tip than those of the male. The discoidal cell in both the fore and hind wings is very short, scarcely extending beyond one-fourth of the length of the wing from the base; this cell is closed by a transverse vein. The arrangement of the veins of the fore wings is peculiar, differing from every other English butterfly. The postcostal vein, instead of emitting several distinct branches in front, emits but one, which branches off at the apex of the discoidal cell; but this branch emits four veins in front, so that in effect an equal support is given to the membrane of the wing, as though these veins had separately branched off from the main postcostal vein.‡ The ungues are distinct and bifid.

The caterpillar is slender, attenuated at each end, very slightly pubescent. The chrysalis is angulated, spindle-shaped, nearly resembling that of E. Cardamines, but not bent in the middle, and with the segments moveable.

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* The remarkable specimen represented in figure 3 was taken near London, and is in the collection of Mr. H. Doubleday; the wings on the left-hand side being masculine, and those of the right feminine. It is copied from Mr. Wing's plate, in the Transactions of the Entomological Society, vol. v. A similar specimen is figured in the French Annales for 1853.

† Evidently derived from the Greek λεπτος, slender, in allusion to the delicate form of the wings.

‡ The same arrangement of the veins is found in Euterpe Charops, figured by Boisduval (Hist. Nat. Lép. pl. 18, fig. 2).

The habits of the species materially differ from those of Pieris, the perfect butterfly frequenting woods, as its English name indicates, and its larva feeding on leguminous herbs.

SPECIES 1.—LEPTOSIA CANDIDA. THE WOOD WHITE BUTTERFLY.

Plate iv. fig. 2, 2 l, 2 p.

SYNONYMES.—*Papilio (Dan. Cand.) Sinapis*, Linn. Syst. Nat. ii. 760. Lewin Papil. pl. 29. Donovan Brit. Ins. vol. viii. pl. 280, fig. 2. Harris Aurel. pl. 29, fig. t. u.

Pontia Sinapis, Fabr., Ochs., Leach.

Pieris Sinapis, Schrank, Latreille, Godart.

Leucophasia Sinapis, Stephens, Boisduval. Duncan Brit. Butt. pl. 10, fig. 3.

Ganoris Sinapis, Dalman, Zetterstedt.

Leptosia Lathyri, Hübner (Verz. bek. Schmett.), p. 95.

Leucophasia Loti, Rennie Conspect. p. 4.

Papilio Candidus, Retzius (Gen. et Sp. Ins. De Geer), p. 30.

This delicate little butterfly varies in the expanse of its wings from $1\frac{1}{3}$ to $1\frac{5}{8}$ inch. The wings are of a pure white colour on the upper side, with a roundish dark blackish spot occupying the tip of the fore wings, and which in the females is of a paler greyish colour. In some specimens, however, this apical patch is entirely wanting.* The under side of the fore wings has the fore margin greyish coloured, interrupted by a more or less distinct whitish crescent-like mark, placed at the extremity of the discoidal cell, the base and tip of these wings being of a very pale yellowish green; the under side of the hind wings is slightly stained with greenish yellow, with the veins and two irregular and often interrupted transverse bars of a greyish ash colour.

The caterpillar is described by Boisduval as green, with the dorsal vessel rather darker, and a lateral yellow stripe situated above the feet. The chrysalis is at first of a greenish yellow, but subsequently of a whitish grey, with red dots on the sides and upon the wing-cases (Collect. Iconogr. des Chenilles d'Europe).

The caterpillar feeds upon Vicia cracca, and on the species of Lotus, Lathyrus, and Orobus, growing in woods. Linnæus, however, says of it, "Habitat in Brassica et affinibus;" and Fabricius, "Habitat in Brassica, Sinapi, Rapa," and hence the name of P. Sinapis was given to it. As, however, such is now ascertained not to be the case, the insect confining its attacks to a very different natural order of plants, I have thought it more proper to refer to the name proposed by Retzius, the commentator of De Geer, rather than to give it a new specific name, or adopt that proposed by Hübner, which has subsequently been misapplied to another species.

Its flight is slow and undulating; it is by no means a common insect, frequenting the glades in woods of the southern counties of England, and appears to be double brooded, being found in the winged state in the middle of May and beginning of August.

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* These individuals were considered by Borkhausen as a distinct species, which he named *P. Erysimi*.

FAMILY II.

NYMPHALIDÆ, Swainson.

The butterflies of which this family is composed are for the most part very beautifully coloured, and of very robust structure; so that their flight is powerful and quick. They may be said to be of the middle size; few equalling the giant size of some of the Papilionidæ. Their chief characteristics, however, consist in the very short fore feet in both sexes, which are quite unfitted for walking, and in the chrysalides being simply suspended by the tail. The antennæ have the extremities generally furnished with a more or less distinct club, which is never hooked; the hind legs have only a single pair of spurs at the extremity of the tibiæ, and the posterior wings have a groove to receive the abdomen. There is comparatively slight variation in the arrangement of the veins of the wings throughout the British genera of this family, if we except the more or less complete closing of the discoidal cell of the hind wings.* The caterpillars are variable in their structure, but in general they are clothed with numerous strong spines; others have the body smooth with the head or tail forked. The chrysalides are naked, and often armed with small conical protuberances. They are also often ornamented with golden or silvery spots. It will be observed that, by the arrangement of the butterflies here adopted, the Papilionidæ are far removed from the Lycænidæ, which agree together in the girthed condition of the chrysalis, and in the fore feet being fitted like the others for walking. M. Boisduval has endeavoured to obviate this objection by introducing the Lycænidæ between the Papilionidæ and Heliconidæ, whilst Dr. Horsfield has commenced the arrangement of the butterflies with the Lycænidæ, followed by the Papilionidæ. As, however, I consider the Papilionidæ as the types of the Diurnal Lepidoptera, and consequently as most worthy to be placed at the head of the section, and as there certainly exists a natural transition from the Papilionidæ to the Heliconidæ and Nymphalidæ (see my Introduction to Mod. Classif. of Insects, vol. ii. p. 342—353), I have adopted the arrangement of Stephens and other English authors. Some of the genera of this family recede from the others in having the club of the antennæ slender and very gradually formed, the larvæ smooth, with an anal fork and the pupa smooth. These have been separated by Dr. Horsfield as one of the five primary groups of butterflies; but the

* Since the earlier editions of this work were published, Mr. E. Doubleday has submitted the wings of this family to a rigid examination (Linn. Trans., vol. xix. p. 477). His plate, however, only exhibits several trivial variations in the position of the small branches of the postcostal vein, and the insertion of the transverse vein which closes the discoidal cell of the fore wings.

genera thus characterised, Apatura, Hipparchia, etc., possess so few characters in common, and are in other respects so closely allied to the typical Nymphalidæ, that it is not material, in a work of such confined limits as the present, to separate them therefrom.

GENUS VIII.

MELITÆA,* Fabricius.

This genus is distinguished from the majority of the family by the very large and flattened club of the antennæ and the naked eyes. The palpi are long, ascending, and wider apart at the tip than at the base. The second joint is by far the largest, the third joint being small but variable in shape. The head is of moderate size; the fore wings rather long and triangular, but with the outer margin always rounded; the hind wings are rounded, and generally destitute of silvery markings. The fore legs are spurious in both sexes;† the four hind legs are terminated by tarsi, described as having double nails, or with simple claws furnished with an unguiform appendage; the ungues are, however, simple, acute, and strongly curved, each with an external pubescent curved and bifid appendage on the outside, and there is a large fleshy pulvillus between the ungues. The characters laid down by Entomologists for the separation of this genus from the next, appear to me by no means satisfactory; indeed, the French and Germans seem to rely chiefly on the presence or absence of silvery spots on the under side of the wings; they accordingly unite Euphrosyne and Selene with Argynnis, of which, indeed, they are made the types both by Hübner and Ochsenheimer, which is thus made to contain very distinct groups. The fact, however, appears to me to be that the Fritillaries, as these spotted butterflies are called, instead of forming two genera, constitute a number of sub-genera of equal rank. With this view I propose the following arrangement, upon external characters alone, of the British Fritillaries.

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* A fanciful name, probably derived from μελι, honey, from the ground-colour of the wings; or perhaps from Μελιταία, the name of an ancient town in Thessaly.

† Mr. Curtis describes them as similar in the sexes, imperfect, hairy, and four or five-jointed; his pl. 386, fig. 8, represents the fore legs as very hairy, and 8 b the tarsus as composed of three joints. The anterior tarsi, however, offer a most tangible character for the determination of the sexes. Their structure, for the first time described by me in "British Butterflies," is as follows:—In the males they are not only very much more hairy than in the females, as pointed out by Zetterstedt, but entirely destitute of articulations, whilst in the females they are much less hairy, and distinctly composed of five joints, even without denuding them of scales, each of the joints having two short spines at the extremity of the inside. Mr. Curtis's description is therefore that of the female, and his fig. 8 that of the male fore leg, his fig. 8 b being certainly erroneous.

1. Fore wings with the anterior margin straight or slightly concave; exterior margin rounded. Artemis.

2. Fore wings with the anterior and exterior margins rounded; not silvery beneath. Athalia, Cinxia.

3. Anterior and exterior margins of the fore wings rounded; hind wings silvered beneath. Euphrosyne, Selene.

4. Fore wings broad with simple veins, the fore margin rounded, and the outer margin concave. Lathonia.

5. Fore wings broad with dilated discoidal veins in the males, and with the outer margin generally concave. Paphia, etc.

This distribution appears to me to be confirmed by the structure of the palpi; thus, Artemis and Cinxia materially differ from each other in this respect, although Mr. Stephens places them in the same subsection. As, however, our English species constitute two, at first sight, tolerably distinct groups, founded on a general uniformity and smallness of size, and rounded outer margin of the fore wings in Melitæa, and a larger size, generally accompanied by a concave outer margin to the fore wings in Argynnis, I shall adopt the arrangement of our English authors. In respect also to the arrangement of their wing veins, the British species form two groups; first, the Melitææ, in which the postcostal vein only emits one branch before joining the transverse vein, and a second at the junction of the transverse and postcostal veins, this second branch emitting three branchlets extending to the costa; and, second, the Argynnes (including, however, Lathonia), in which the postcostal vein of the fore wings emits two branches before joining the transverse vein, and a third branch at the junction of the transverse and postcostal veins, this third branch emitting two branchlets. A further distinctive character has recently been pointed out by Drs. A. and O. Speyer, the tarsi of the four hind legs not being spiny on the upper surface in the Melitææ whilst they are invariably so in the Argynnes.

SPECIES 1.—MELITÆA ARTEMIS. THE GREASY FRITILLARY.

Plate v. fig. 2, 2 l, 2 p.

Synonymes.—*Papilio Artemis*, Fabricius, Lewin Brit. Papil. pl. 15. Harris Aurel. pl. 28, fig. e—i. *Melitæa Artemis*, Fabricius, Ochsenheimer, Hübner, Stephens, Duncan Brit. Butt. pl. 13, fig. 2. *Papilio Maturna*, Esper. *Papilio Lye*, Borkhausen. *Papilio Matutina*, Thunberg. *Papilio Lucina*, Wilkes Eng. Ins. pl. 114.

This very distinct species varies in the expanse of its wings from $1\frac{1}{3}$ to nearly 2 inches. The wings on the upper side are of a darkish orange colour, varied especially from the base to beyond the middle of the wing with black and straw-coloured markings, which are succeeded on both wings by a broad orange bar,


1
2
3a
3
3r
3p
4r
1a
1r
1p
2r
2p

ornamented in the fore wings of fine specimens with a row of small straw-coloured dots, and on the hind wings with a similar row of black dots; this bar is followed by a row of black lunules, between which and the black margin of the wing is a row of orange or straw-coloured spots. The fore wings beneath are of a paler and more obscure orange colour, with the black and straw-coloured marks almost obliterated, except at the tip, which is pale. The hind wings beneath have three yellowish bands margined with thin black lines: the first near the base, irregular and oblique; the second broader and curved, in the middle of the wing; and the third composed of marginal lunules, between which and the preceding bar is a row of black dots, each surrounded with a pale circle. The specimens vary considerably in the intensity and size of the markings. One of these varieties is figured by Mr. Duncan in his British Butterflies, plate 14, fig. 2, but mistaken for Melitæa Cinxia. Two others are figured by Mr. Dale in Loudon's Mag. of Nat. Hist. No. 34. The fore wings have the anterior margin straight or rather slightly concave, the palpi are comparatively short, with the terminal joint nearly half as long as the preceding, and attenuated to the tip.

The caterpillar is very spiny; black above and yellowish beneath, with a row of small white dots down the back and sides, the legs are red-brown, the head and spines of the body black. It feeds on the Devil's-bit Scabious, and both the species of Plantain. When full grown it draws several blades of grass together, and fastens them at the top with threads, suspending itself, according to Moses Harris, in the centre beneath. The chrysalis is pale with dark spots. The caterpillars are hatched in the autumn, the young brood passing the winter under a common web. They are full fed in April. The chrysalis state continues about a fortnight, and the butterfly is found in the months of May, June, and July, in swampy places, and is thence called the Marsh Fritillary by Bingley. The following localities have been given for it. Near Brighton; Enborne, Berkshire; Beachamwell, Norfolk; Clapham Park, Bedfordshire; Glanville's Wootton and Dartmoor; Ambleside; Monk's Wood and Holmefen, Huntingdonshire; Eriswell, Mildenhall, and near Beccles, Suffolk; near Haverfordwest, near Durham, and near Belford, Northumberland. In profusion near Aldwinkle, Northamptonshire. Near "Coleshill, Woodstock, and Coventry" (Rev. W. T. Bree).

Papilio Maturna of Linnæus, a species closely allied to Artemis, but differing especially in the dark markings of the under side of the fore wings, and the want of the row of black dots near the margin of the hind ones, has been recorded by Stewart and others as a native species, but on insufficient authority, having been mistaken for P. Maturna, Fabricius (our M. Athalia).

SPECIES 2.—MELITÆA CINXIA. THE GLANVILLE FRITILLARY.

Plate iv. fig. 3, 3*, 3 l.

SYNONYMES.—*Papilio Cinxia*, Linn. Lewin Pap. pl. 14. Donovan, pl. 242, fig. 1. Wilkes Brit. Ins. pl. 111. Harris Aurelian, pl. 16, fig. a—f.

Melitæa Cinxia, Ochsenheimer, Boisduval, Stephens, Curtis.

Schænis Cinxia, Hübner (Verz. bek. Schm.)

Papilio Delia, Hübner, Papil.

Papilio Pilosellæ, Esper.

Papilio Trivia, Schrank.

Papilio Abbacus, Retzius.

This butterfly varies from $1\frac{3}{4}$ to nearly 2 inches in the expanse of the wings. The upper surface of the wings is uniformly fulvous, with numerous black markings; the base and costal edge of the fore wings is black, with fulvous dots; the discoidal cell has a broad central and apical black bar, with a fulvous middle; beyond this, there are four waved bands of black, the last being marginal; the same markings exist in the hind wings, besides which there is a row of round black dots on a fulvous ground near the margin of the wing. The fore wings, beneath, are fulvous, with the black spots nearly obliterated; the apex being very pale yellow with black dots; and the hind wings have three broad and very irregular pale yellow bars edged with thin black lines, and marked with black dots, between the basal and middle one of which is an irregular fulvous bar, and between the middle and apical ones is a row of fulvous eyes, with a black dot for a pupil. The fore wings have the costal margin evidently rounded; the palpi are long, with the last joint more than half the length of the second joint, and very acute at the tip. The caterpillar is intensely black, very slightly spotted with white; the head and pro-legs fulvous. The chrysalis is brownish, with rows of fulvous tubercles on the back. The butterfly is rare. It appears in June and July (Harris says the middle of May). The caterpillars are hatched in the autumn, living in societies under a kind of tent formed by drawing together the tips of the leaves on which they feed, and covering them with a web. It is found in meadows near woods, especially in the south of England. Near Ryde and the Sand-rock Hotel, Isle of Wight; Dover, Birchwood, Dartford, Kent. It has also occurred in Yorkshire and Lincolnshire. "Once taken by Mr. Walhouse, near Leamington" (Rev. W. T. Bree).

SPECIES 3.—MELITÆA ATHALIA. THE PEARL-BORDERED LIKENESS FRITILLARY.

Plate v. fig. 1, 1*, 1 l, 1p.

SYNONYMES.—*Papilio Athalia*, Esper.

Melitæa Athalia, Ochsenheimer, Stephens, Duncan Brit. Butt. pl. 12, fig. 2.

Cinclidia Athalia, Hübner (Verz. bek. Schmet.)

Papilio Dictynna, Lewin, pl. 14, fig. 5, 6. Haworth, Jermyn, but not of Fabricius.

Papilio Maturna, Fabricius, Wilkes, pl. 112. (The Heath Fritillary.) Harris Aurel. pl. 38, fig. f, g.

The White May Fritillary, Petiver.

Var. *Melitæa Pyronia*, Hübner, Stephens (*Papilio Eos*, Haworth).

This species is nearly an inch and three quarters in expanse. The upper surface of the wings is black, the fore wings having two fulvous bars across, and one at the

extremity of the discoidal cell, and with a narrow bar behind the middle of the preceding; there are also three curved rows of fulvous spots between the middle and external margin of the wing, the third of which has the markings much smaller than the two preceding bars; these markings also run across the hind wings, the base of which is black, with a very few small spots. Beneath, the fore wings are fulvous, with slight black marks indicating the situation of the principal markings on the upper side; the spots along the outer margin and at the apex are straw coloured. The hind wings beneath are fulvous at the base, which colour extends nearly to the middle of the wings; nearly at the base is an irregular bar of four straw-coloured spots, succeeded by a single spot of the same colour, all having a slender edge of black; a broad curved bar of straw colour runs nearly across the middle of the wing, margined with black lines, and having a slender black line running irregularly through it towards the base; this bar is succeeded by a row of fulvous lunules; the margin of the wing consisting also of straw-coloured lunules edged with black, and having a thin scalloped line of black running through it close to the margin.

Several varieties of this species are described by Mr. Stephens, varying in the size of the fulvous markings, whereby they either become confluent from their larger size, or are almost obliterated by the black becoming more prominent.

The caterpillar is black and spiny, with two white dotted lines on each segment, and white tubercles on the sides. It feeds on the narrow and broad-leaved plantain, and according to Wilkes on the common heath. The butterfly appears from the beginning of May to July, frequenting heaths, marshes, etc. It is rare near London, but abundant in some parts of Devonshire, Dartmoor, and near Bedford; Coombe Wood, Harley Wood, Essex; Aspley Wood, Bedfordshire; Caen Wood, Middlesex, and Faversham.

Melitæa Pyronia, Hübner, Stephens, or the Papilio Eos, Haworth, is considered by Ochsenheimer, Curtis, and Stephens to be a variety of this species. That it is not a distinct species I infer from the irregularity and want of tessellation in the markings, the typical individuals of all the Fritillaries being more or less distinctly tessellated. The specimen figured by Mr. Stephens (Illust. Haust. pl. 4*, fig. 1, 2) was taken by Mr. Howard at Peckham in June, 1803, and is rather more than an inch and a half in expanse, with the fore wings above deep fulvous; the veins, blotches in the middle, a waved streak and marginal band black; hind wings above black, with a waved bar of six fulvous spots beyond the middle; beneath, the fore wings are fulvous, but paler at the tips, with two black spots at the base, and a broad black bar in the middle divided by fulvous veins, and with a row of black lunules near the margin; hind wings fulvous at base, with about

eight confluent black patches; the middle of the wing occupied by a broad whitish band, intersected by blackish veins, followed by a row of fulvous lunules with black edgings; the outer margin straw coloured, with a row of ochraceous lunules in the middle.

Papilio Tessellata, *serotina subtus straminea*, or the Straw May Fritillary of Petiver (Papil. pl. 3, fig. 11, 12) is also now considered by Stephens and Curtis as a variety of P. Athalia. In Petiver's time it was "pretty common in Caen Wood," where Athalia also occurred. It is paler above than that species, and the fore wings are more fulvous beneath; the hind wings beneath are entirely straw coloured, with black veins; at the base are three large yellow spots edged with black; a broad curved fascia of straw-yellow runs across the middle of the wings, edged with black, and with an irregular black line running through the middle of it; this is succeeded by a row of black lunules, and the margin is straw-yellow with a black vandyked line running along it.

SPECIES 4.—MELITÆA SELENE. THE APRIL OR SMALL PEARL-BORDERED FRITILLARY.

Plate v. fig. 3, 3*, 3 l, 3 p.

Synonymes.—*Papilio Selene*, Fabricius, Haworth.
Melitæa Selene, Stephens. Curtis Brit. Ent. pl. 386. Duncan Brit. Butt. pl. 13, fig. 3. (*M. Silene.*)
Argynnis Selene, Ochsenheimer, Boisduval, Hübner (Verz.)
Papilio Euphrasia, Lewin Pap. pl. 13.
Var. *Papilio Euphrosyne*, Esper. Harris Aurelian, pl. 31, fig. i—k.
Var. *Papilio Thalia*, Hübner, Haworth.

This species varies in its expanse from 1⅝ to nearly 2 inches. It is fulvous on the upper side, spotted with black; four irregular bars run across the discoidal cell, succeeded first by a single spot extending from the costa, and then an interrupted row of four spots, then a row of seven small round black dots, and a row of black lunules reaching to the margin, which is edged with black; the hind wings are similarly marked beyond the middle, but the base is black, with numerous fulvous angular-shaped marks, amongst which a spot in the centre of the discoidal cell, with a round black dot in the middle, is most conspicuous. The fore wings on the under side are nearly marked as above, except that the spots are smaller, and the apex is varied with ferruginous and straw coloured; the hind wings beneath are most beautifully tessellated with white, straw colour, buff, dark ferruginous, and silver, the several markings being edged with black lines, and the veins being black. The red mark in the middle of the discoidal cell, with a black dot in the centre, is here conspicuous, succeeded by an oblong silvery patch, between which and the outer angle are three smaller silvery patches, there being also a marginal row of

six wedge-shaped silvery marks on the outer margin. The hind wings are much narrower than in M. Euphrosyne; so that the space between the longitudinal veins is narrower, and the markings consequently not so broad.

The caterpillar is black, with a pale lateral stripe; the spines are half yellow, and two on the neck are larger than the rest, and project forwards. The chrysalis is dirty greyish coloured.

This species is common in various places in the south of England; Dartmoor, Lyndhurst, Newcastle, and Durham have also been mentioned as its localities. It frequents heaths and waste grounds. Although occasionally captured in May and July, the beginning of June appears to be the period for the exclusion of the first brood, the second being produced in August and September.*

It is liable to vary considerably; Mr. Stephens describes a specimen with the upper surface of the wings whitish.

Papilio Thalia of Hübner and of Haworth is also considered by Mr. Stephens as an accidental variety of this species, although it has been questioned whether the Thalia of Haworth may not be a variety of Euphrosyne. Haworth's variety, copied, in plate 9, fig. 12, of "British Butterflies," from Mr. Stephens's figure, drawn from Mr. Haworth's specimen, is thus described by Mr. Stephens:—"Wings above, pale fulvous, irregularly spotted with black; anterior, beneath, pale, varied with yellowish and ferruginous towards the tips, with some obsolete black and dusky spots on the disc; posterior wings variegated with ferruginous, yellowish, and greenish, with the pupil of the ocellus very large; the discoidal silvery spot produced to the hinder margin, and the usual marginal spots lengthened inwardly; the usual fasciæ are obliterated, but the silvery spot at the base is somewhat apparent."

SPECIES 5.—MELITÆA EUPHROSYNE. THE PEARL-BORDERED FRITILLARY.

Plate v. fig. 4, 4 l.

Synonymes.—*Papilio Euphrosyne*, Linnæus. Lewin Pap. pl. 13, Donovan, pl. 312.

Melitæa Euphrosyne, Leach, Stephens, Curtis, Duncan Brit. Butt. pl. 15, fig. 2.

Argynnis Euphrosyne, Ochsenheimer, Boisduval, Hübner (Verz.) Harris Aurelian, pl. 40, fig. e, f.

This species is closely allied to the last, but is rather larger, varying from $1\frac{3}{4}$ to nearly 2 inches, and having the hind wings far less strikingly variegated on the under side. The upper side of all the wings so closely resembles those of M.

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* In Loudon's Mag. Nat. Hist., No. 21, are some observations by the Rev. T. W. Bree relative to the double-broodedness of this species; in reply to which, Mr. Newman stated, in No. 22, that this species appears in the summer fifteen days later than M. Euphrosyne, and lasts till the end of July, after which it never reappears. Mr. Dale, however (Ent. Mag. 1, 357), speaks of it as double-brooded, and that the two broods vary in the same manner as those of M. Euphrosyne.

Selene, that no further description is required of them; the under side of the fore wings is also similar to that of the same species, but the black markings are not so distinct, and the apex of the wing has the buff much deeper and the ferruginous marks much paler. The hind wings, beneath, have all the markings much less distinct than in Selene, there being moreover only one small patch towards the base, a large spot at the apex of the discoidal cell, and seven marginal wedge-shaped marks of silver. The centre of the discoidal cell is rusty red, with a yellowish spot in the centre, having a black dot in the middle; between the central and marginal silvery spots is a row of round rusty red dots.

Mr. Stephens mentions several varieties of this species; in one of which the silvery marginal spots are wanting; another, with "the basal half of all the wings, above, black, spotted with fulvous, with large black spots on the anterior wings beneath," seems in some degree to resemble the specimen figured in plate 9, fig. 11, of "British Butterflies," from my collection, in which all the black markings on the upper side of the fore wings are suffused, except the row of submarginal round spots; the markings on the hind wings are somewhat more distinct. The under side scarcely differs from typical individuals. The Rev. Mr. Bird possesses another variety nearly white.

This species is the most abundant of all the Fritillaries, especially in woods in the southern parts of the kingdom; it is also found plentifully in various parts of Scotland. The larva is black and spiny, with two rows of orange dots on the back.

It feeds on various kinds of violet, and there are two broods in the year, the butterfly first appearing in May, and again at the beginning of autumn.*

GENUS IX.

ARGYNNIS,† Fabricius.

Referring to the observations under the genus Melitæa, relative to the characters of that and the present genus, we may define this to be distinguished chiefly by the larger size of the insects, the silvery spots which ornament the under side of the wings, which are broad and of ample size, the ordinarily concave posterior margin of the fore wings, the tessellated appearance of their upper surface, and the dilatation of the branches of the median and the anal vein of the fore wings in the

* The Rev. W. T. Bree published some observations relative to the double-broodedness of this species, in Loudon's Mag of Nat. Hist. No. 21, in reply to which, Mr. Newman, in the next number of the same work, stated that at Birch Wood, Kent, this butterfly appears at the end of May by thousands, and lasts till the end of June, but that it never reappears afterwards. Mr. Dale, however (Ent. Mag. 1, 357), speaks of it as double-brooded, and states that the spring brood varies very much in its markings, and that the September brood varies in colour, being much yellower.

† A fanciful name, being one of the denominations of Venus (Vollm. *Vollst. Worterb. der Mythol.* Stuttg. 1836).

males of most of the species. The antennæ are terminated by a suddenly-formed broad compressed, or rather spoon-shaped, club; the head is broad, the eyes are large and naked, the fore legs rudimental.* The ungues of the four posterior tarsi are formed as in Melitæa, and their structure has been carefully illustrated in the Crochard edition of the Règne Animal, Insectes, plate 135. I have purposely omitted all mention of the form of the palpi in the above characters, as this character does not appear to me of any value in separating the Fritillary butterflies into two genera, the true types of Melitæa, or those without silvery spots, having the terminal joint as large and acute as it is in the typical Argynnes, whilst Mr. Stephens has observed that Lathonia and Euphrosyne agree together in their palpi. Lathonia moreover differs from the other Argynnes in several other important respects, so that it must evidently be regarded as an intermediate form: I therefore place it at the head of the genus, in order that it may be brought into connection with the silvery spotted Melitææ.

SPECIES 1.—ARGYNNIS LATHONIA. THE QUEEN OF SPAIN FRITILLARY.

Plate v. fig. 4, 4 l, 4 p.

Synonymes.—*Papilio Lathonia*, Linnæus, Lewin pl. 12. Donovan Brit. Ins. vol. iii. pl. 73.
Argynnis Lathonia, Fabricius, Ochsenheimer, Leach, Stephens, Curtis, Duncan Brit. Butt. pl. 16, fig. 2.
Issoria Lathonia, Hübner (Verz.)
Papilio Principissa, Linnæus, olim.
Papilio Latonia. Denn. and Schiff. *Argynnis Latonia*, Zetterstedt.
Papilio Lathona, Hübner (Schm. Eur.)

This exquisite insect is generally about two inches in expanse. The upper surface of the wings is fulvous orange, with numerous very distinct and mostly rounded black spots; those of the apex of the fore wings uniting with the dark margin, and enclosing several small paler buff patches. The anal and median veins are not dilated in the males. Beneath, the fore wings are marked nearly as above, except that the apex of the wing has a broad ferruginous patch, at the base of which is a silvery spot, succeeded by two small eyes, between which and the margin are several oval silver patches; the hind wings on this side are pale buff, varied with reddish brown, ornamented with numerous silvery patches, varying greatly in size and form, of which there are about fourteen between the base of the wings and a row of seven dark brown ocelli with silvery pupils, between each of which and the margin of the wing is a large silvery patch.

The caterpillar, according to Godart, is greyish brown, with a white dorsal line spotted with black, and with two brownish yellow lines on the sides; the

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* The fore legs are described by Curtis as "alike in both sexes." They differ, however, in the sexes, in the same manner as the fore legs of Melitæa, described in a preceding page. I have represented their structure in P. Paphia, in my Introd. to Mod. Classific. vol. ii. p. 353, fig. 98, 4, 5, 6, 7.

spines and legs pale yellow; it feeds on heartsease, sainfoin, and borage. The pupa is varied with brownish and greenish, and ornamented with metallic spots. The perfect insect appears in August and September; but, according to Godart, the later specimens survive the winter, and again appear in spring. Mr. Dale says there are two broods (Ent. Mag. i. 356). By Petiver it is recorded as occurring again in May; but Mr. Stephens's specimens captured in the middle of August were much faded, so that he is led to believe that the species is double-brooded. This butterfly, although still accounted a great rarity, occurs in numerous situations wide apart. The following are some of its localities: —Gamlingay, Cambridgeshire; Stoke-by-Nayland, near Wisbeach; Halvergate, Norfolk; Battersea Fields, Dover, Colchester; Birch Wood, Kent; Hertford.

SPECIES 2.—ARGYNNIS ADIPPE. THE HIGH-BROWN FRITILLARY.

Plate vi. fig. 3, 3 l.

Synonymes.—*Papilio Adippe*, Linnæus, Esper, Lewin Pap. pl. 30. Donovan Brit. Ins. pl. 448. Harris Aurelian, pl. 28, fig. a—d.

Argynnis Adippe, Fabricius, Ochsenheimer, Stephens, Duncan Brit. Butt. pl. 16, fig. 1.

Acraea Adippe, Hübner (Verz.)

This species varies in the expanse of the wings from $2\frac{1}{2}$ to $2\frac{3}{4}$ inches. The upper surface is uniformly of a rich fulvous orange, except at the base, which is greenish, with numerous black markings, many of which assume a crescent shape, especially the row running near the outer margin of the wing, and which are united to two slender marginal black lines. The fore wings in the males have the two inner branches of the median veins strongly dilated in the middle, the anal vein being scarcely dilated. The under side of the fore wings almost resembles the upper, except that the spots towards the apex of the wing assume a rich brown colour, some being marked with silver spots. The hind wings are on this side varied with buff, ferruginous, and brown; at the base are about seven silvery patches, disposed somewhat in a circle, beyond which is an irregularly curved row of about nine or ten silvery patches, varying in size, succeeded by a row of rusty red spots, some of which have the centre silvery; there is also a row of seven submarginal silvery wedge-shaped spots. In both sexes the outer edge of the fore wings is slightly concave.

Several varieties of this species have been observed, in which the spottings of the wings become more or less confluent.

The caterpillar is at first red, but subsequently olive green, with a white line down the back, and white spots on the sides. It feeds on the heartsease and sweet violet. The chrysalis is reddish, with silvery spots. This state lasts about a fortnight: the butterfly appears at the end of June or beginning of July. The


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butterfly frequents heaths and the borders of woods, and is far from uncommon in most of the southern counties of England.

Godart, Ochsenheimer, and Curtis consider it doubtful whether this insect be the P. Adippe of Linnæus, considering that the A. Niobe of Hübner, etc., is the true Adippe. Professor Zetterstedt has, however, shown the correctness of the ordinary opinion respecting the names of this species. The true Niobe, which Stewart gives as British, and of which Mr. Dale possesses a specimen, which he obtained from the professedly indigenous collection of Dr. Abbot, is indeed very similar to our common Adippe, but it is rather smaller, with the base of the wings above more dusky, and the posterior beneath much more strongly variegated with yellow (or rarely silver) spots; but a more important character is the very slight incrassation of the veins of the fore wings of the males.

SPECIES 3.—ARGYNNIS AGLAJA. THE DARK GREEN FRITILLARY.

Plate vi. fig. 2♂, 2♀, 2l, 2p.

Synonymes.—*Papilio Aglaja*, Linnæus. Lewin Pap. pl. 11. Donovan, pl. 302. Wilkes, pl. 115. Harris Aurelian, pl. 26, fig. o, p.
Argynnis Aglaja, Ochsenheimer, Stephens, Jermyn, Duncan Brit. Butt. pl. 15, fig. 1.
Acidalia Aglaja, Hübner (Verz.)
Papilio Æmilia, Acerbi.
Var. *Papilio Charlotta*, Haworth.

This species is closely allied to the preceding, which it very much resembles, especially on the upper side of the males, differing, however, in several characters which do not appear to have been previously attended to. The two inner branches of the median vein are much more slightly dilated in the males, the anal vein being on the contrary more strongly dilated; the outer margin of the fore wings in the males is almost straight, or scarcely perceptibly concave, whilst that of the females is distinctly rounded, and the hind wings are destitute beneath of the rich-coloured row of eyes between the two outer rows of silvery spots; it is, occasionally, also rather wider in expanse of the wings than A. Adippe. The general colour is also paler, with the marginal band darker coloured. The females are much paler than the males, with the submarginal row of spots above still paler. Beneath, the hind wings are varied with green and yellow, with about seven silvery spots at the base, an irregular row of seven silver spots beyond the middle of the wing, and a row of seven submarginal transverse spots of silver, bordered above with greenish crescents.

Papilio Charlotta of Haworth (Lep. Brit. p. 32; Sowerby Brit. Misc. pl. 11 Bree in Loudon's Mag. of Nat. Hist. vol. v. p. 750; Arg. Caroletta, Jermyn; "British Butterflies," pl. 12, fig. 1, 2), is regarded by Stephens and Curtis as a variety of this species, differing from it in having two of the costal spots on both sides of the fore wings united, and only nineteen instead of twenty-one silvery spots on th

under side of the hind wings, several of the ordinary spots at the base being confluent.

Several specimens of another still more striking variety (at first given by Stephens as a variety of Adippe) have also been captured, in which the upper surface of the fore wings is almost entirely of a dark brownish black, except a black linear fulvous mark, and beyond it a much smaller mark of the same colour; with a row of faint tawny spots running parallel with the hinder margin. The hinder wings have the markings considerably more distinct. Beneath, the ground-colour of the fore wings is dark ferruginous, and that of the hind wings pea green, with twenty-one silvery spots. This variety has been figured by Curtis (Brit. Ent. pl. 290), and by the Rev. W. T. Bree (Loudon's Mag. Nat. Hist. vol. v. p. 749), and has been taken near Ipswich and Birmingham. Mr. Curtis mentions a variety intermediate between this and the preceding, and in the Magazine of Natural History (No. 26) a pale buff-coloured variety is mentioned with the spots and markings very faint.

The caterpillar is blackish, with a whitish line down the back and another at the side, above which is a row of eight small red spots. It feeds on the dog's violet. The perfect insect appears in July and August. It is a common species, and is found throughout the whole kingdom, frequenting heaths, meadows, woods, and downs.

SPECIES 4.—ARGYNNIS PAPHIA. THE SILVER-WASHED FRITILLARY.

Plate vi. fig. 1, 1*, 1l, 1 p.

SYNONYMES.—*Papilio Paphia*, Linnæus. Lewin Pap. 9. Donovan, 7, pl. 247. Wilkes, pl. 110. Harris Aurelian, pl. 34, fig. k—n.

Argynnis Paphia, Fabricius (type species), Ochsen., Stephens, Curtis, Duncan Brit. Butt. pl. 14, fig. 1.

Argyronome Paphia, Hübner (Verz. d. bek. Schmett.)

This is the largest of our strictly British Fritillaries, varying from $2\frac{3}{4}$ to 3 inches in the expanse of the wings, which are of a fulvous colour in the male on the upper side, but paler and tinged with greenish in the female, with numerous black spots and bars, there being three distinct rows of spots along the outer margin, the most external of which are diamond-shaped; besides which, the males have the anal vein and the three branches of the median vein strongly dilated and black in the middle. The under side of the fore wings is paler, with black marks; but those adjoining the outer margin are almost obliterated, and replaced near the tip with greenish scales. The hind wings are greenish, with two short silvery bars near the base, a narrower one running obliquely across the middle of the wing, and another marginal one; between the two last is a row of green circles, and another of green lunules forming the inner margin of the marginal band.

Two specimens of a fine variety of this species, which has been regarded as a distinct species, and figured by Ernst, are in the British Museum, from one of which plate

12, fig. 3 of "British Butterflies" was taken. It was captured many years ago by Mr. Dale, and is a female, and has the upper surface of the wings very dark, with some whitish spots near the tips of the fore wings. Similar individuals have not unfrequently been met with on the Continent, where they are known under the ordinary name, "*le Valaisien.*" Their specific identity with A. Paphia has been demonstrated in a remarkable manner—Hübner having figured (pl. 190, fig. 935, 936) a specimen, apparently female, the right wings of which are coloured as in the variety, and the left as in the type of the species. A still more remarkable specimen has been figured by M. Wesmael, in the fourth volume of the Bulletin of the Academy of Brussels, (of which I have given a copy in the accompanying figure), in which the right wings were those of the male type, except that the marginal row of spots were as large as in the female; the left fore wing exhibited a complete *mélange* of the male and female, as well as of the variety and typical individuals, the ground-colour being fulvous as in the male, but the markings, especially at the tip, dark as in the female, with the white spots of the variety, the upper side of the hind wings entirely coloured as in the dark variety.

Another gynandromorphous individual is mentioned by Ochsenheimer, the right wings of which are those of the male, and the left those of the female. In Loudon's Magazine of Natural History, the capture of an English specimen is noticed, according with Ochsenheimer's description.

The caterpillar is light brown, with a row of yellow spots on the back. The spines are long, the two next the head being longer than the rest. It feeds on the dog's violet, raspberry, and nettle. The chrysalis is grey, with the tubercles gilt.

This is an abundant species, especially in the south of England, occurring also in Scotland. It flies in July.

GENUS X.

VANESSA,* Fabricius.

This genus may be considered as comprising the most beautiful and highly ornamented of our British butterflies, distinguished generically from the preceding Nymphalidæ by having the eyes pubescent and the wings angulated, by which latter character, as well as by the more sudden formation of the club, they are separated from the terminal genera of the family. The head is narrower than the thorax, with

* More properly Phanessa, being derived from Φάνης, one of the Greek names of Love. Hedrich Mythol. Lex. 1724. Vollm. Vollst. Worteb. 1316.

the eyes large, lateral, and densely clothed with very fine hairs; the labial palpi are of moderate length, contiguous and parallel to each other, being obliquely elevated in front of the head, and three-jointed, the middle joint being much the longest, and the third short, and when denuded of its scales and hair, somewhat pointed at the tip. The antennæ are rather long, slender, and terminated by an abruptly-formed, short, somewhat cylindrical club, never flattened nor spoon-shaped. The body is very robust, and well formed for sustaining the powerful flight of these insects. The wings are of large size, with the outer margin not only scalloped, but the anterior have the third and sometimes the last scallop but one, strongly angulated (the tip being, as it were, falcated), and the posterior have the middle of the outer margin also equally angulated. The discoidal cell in both pairs of wings is closed by an oblique vein. The fore legs are very short and rudimentary, so as to be quite unfitted for walking; they are composed of the ordinary parts, except that the tarsal portion is formed into a flat inarticulate plate, which, as well as the tibia, is very densely clothed with hairs. The hind feet are long and strong, the tarsi of the ordinary size, five-jointed, and terminated by two curved ungues, on the outside of which is a pair of similarly formed membranous appendages bifid at the base, the under division being very short; between the ungues is a short pulvillus or cushion.*

The caterpillars are long, cylindric, and clothed with numerous bristly spines, arranged in whorls round the body, each segment (except that immediately following the head) having a whorl of these spines. The head is generally entire, but in some of the species it is bituberculated. The pupa is considerably angulated, with the head bituberculated; and it is adorned with silvery and golden hues. It is suspended by the tail.

The genus is of considerable extent, but none of the exotic species exceed those of our own country in beauty; indeed, it is impossible to find more exquisite contrasts of colour or delicacy in pencilling than is exhibited by some of our British species. The caterpillars are gregarious in some of the species, but those of the rest live solitary; the different species of Urtica afford nourishment to the caterpillars of several of them. In their perfect state, several of the species are long-lived, and are often to be seen in the autumn, especially delighting to frequent the

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* De Geer (Mémoires, tom. i. p. 652, and tab. 20, fig. 12) describes and figures the hind tarsi of V. C-album as furnished with four ungues of equal size and form; and in the Crochard edition of the Règne Animal, Insectes, pl. 135, fig. 3 e, the lateral appendage of the ungues of V. Io, Antiopa, Urticæ, etc., is represented as forming only a simple and undivided piece; but in P. Atalanta these lateral appendages are distinctly bifid, the inner division being about half the length of the exterior.

dahlia, Michaelmas daisy, and other composite flowers. Ivy also, when in flower, is a particular favourite with them; and some are very fond of ripe fruit; V. Atalanta being even said to be sometimes very destructive to it, especially cherries, by extracting the juice, probably taking advantage of previous injuries occasioned by birds, wasps, and flies. This unusual propensity is occasioned by a very beautiful apparatus forming part of the spiral tongue (or maxillæ), which has recently been described by Mr. G. Newport in his valuable article "Insect," in the Cyclopædia of Anatomy and Physiology. This consists of a great number of minute papillæ along the anterior and lateral margins of the spiral tongue, in the form of little, elongated, barrel-shaped bodies, terminated by three smaller papillæ arranged around their anterior extremity, with a fourth one a little larger than the others, placed in their centre. These papillæ are arranged in two rows along the lateral and anterior surface of each maxilla near its extremity for about one-sixth of its whole length, there being seventy-four in each maxilla or half of the spiral tongue. Judging from their structure, and from the circumstance that they are always plunged deeply into any fluid when the insect is taking food, Mr. Newport suggests that they are probably organs of taste. They are largely developed in this genus, but in Pontia and Sphinx Ligustri they are scarcely perceptible. There are also some curious appendages arranged along the inner anterior margin of each maxilla in the shape of minute hooks, which when the proboscis is extended serve to unite the two halves together. In this genus they are described by Mr. Newport as falcated, and furnished with an additional tooth a little beyond the apex; they are so exceedingly minute, and arranged so closely together, that their true form is with difficulty distinguished. They lock across each other like the teeth in the jaws of some fishes, and Mr. Newport considers that the points of the hooks in one-half of the proboscis are inserted when the organ is extended into little depressions between the teeth of the opposite side, so that they form the anterior surface of the canal. That they really form the anterior surface of the canal or tube, seems evident from the distinctness with which coloured substances are observed to pass along the tube when the insect is taking food. It occasionally happens that some of these insects survive the winter, passing that period of the year in a state of lethargy. It has been generally supposed that these are females, which had been produced late in the preceding autumn, and which, although impregnated at that time, had not deposited their eggs, but waited until the renewal of the season brought forth a fresh supply of food for their offspring. M. Boisduval, however, opposes this, stating that these individuals had entered their lethargic state at a much earlier period (having observed V. Polychloros and Urticæ in this state in August), and that their

impregnation does not take place until the following spring. Mr. Brown also opposes the ordinary opinion in Loudon's Magazine of Natural History, No. 39, founding his observations on the Lepidoptera of Switzerland. The Rev. W. T. Bree, however, whose practical knowledge of the subject renders his opinion of so much weight, opposes the statements of Mr. Brown, and supports the generally-received opinion in a subsequent number (42) of the same Magazine.

The true Fabrician type of this genus is Pap. Io; but Ochsenheimer introduced P. Levana and P. Cardui (which Fabricius placed in the genus Cynthia) into the genus, forming the latter and P. Atalanta into a first section, thus making P. Cardui stand as the type of the genus. Hübner, also, in his Verzeichniss, gave P. Cardui as the true Vanessa; P. Atalanta, under the subgeneric name Pyrameis; C-album, under that of Polygonia (since changed by Mr. Kirby to Grapta); P. Polychloros, Urticæ, and Antiopa under that of Eugonia; P. Io, under that of Inachis; and P. Levana under that of Araschnia.

The British species form three evidently natural divisions, which appear to me to be equivalent in value to those which I have proposed amongst the Fritillaries.

1. Fore wings with the anal margin very strongly emarginate; posterior wings with a short tail. Caterpillars gregarious, with two tubercles on the head. C-Album. (G. Grapta, Kirby; E. Doubleday, Gen. D. Lep., 195).

2. Fore wings with the anal margin nearly straight; posterior with a strong angular prominence in the middle of the hind margin. Caterpillars gregarious, without the two tubercles on the head. Urticæ, Polychloros, Antiopa, Io. (G Vanessa, E. Doubleday, Gen. D. Lep., 199).

3. Hind wings rounded and scalloped. Caterpillars solitary, without the two tubercles on the head. Atalanta. (G. Pyrameis, Hb.; E. Doubleday, Gen. D. Lep., 202; with the addition of Cardui and Huntera, as a second section in the genus).

This plan of distribution, which I proposed in the first edition of "British Butterflies," was adopted by Mr. Edward Doubleday, after a careful investigation of the allied groups, as the "Genera of Diurnal Lepidoptera," with the addition of Cynthia and Huntera as a second section in the third division.

SPECIES 1.—VANESSA C-ALBUM. THE COMMA BUTTERFLY.

Frontispiece, fig. 2, 2 a, 2 b, 2 c.

Synonymes.—*Papilio C-Album*, Linnæus, Lewin Brit. Papil. pl. 5. Donovan Br. Ins. 6, pl. 199. Albin Ins. pl. 54. Harris Aurelian, pl. 1, fig. a—d.

Vanessa C-Album, Ochsenheimer, Curtis, Stephens, Duncan Brit. Butt. pl. 17. fig. 1. Westwood Mod. Class. v. ii. p. 353, fig. 98, 1.

Polygonia C-Album, Hübner (Verz. bek. Schmett.)

Comma C-Album, Rennie Conspect.

Vanessa (*s—g. Grapta*), Kirby, Fauna Am. Bor. p. 292.

This is the smallest species of the genus, measuring only from 1¾ to rather more

than 2 inches in the expanse of its wings. Its form is also quite unlike that of any of the other species, having both the exterior and anal margins of the fore wings strongly emarginate as well as the former scalloped. In its general colour and markings, however, it bears so strong a resemblance to V. Polychloros, that it might at first be easily regarded as a distorted and stunted variety of that species. The wings above are of a tawny orange colour, with the broad outer margins dark coloured. There is a black bar running across the middle, and a broader one at the extremity of the discoidal cell, and between the latter of these and the tip of the wings is another abbreviated and more indistinct dark bar. On the posterior part of the disc of the fore wings are also three round black spots and a dusky patch near the anal angle. The hind wings are dark at the base, with three black discoidal spots and a row of deep crescents in the broad dusky border. On the under side all the wings are of a greyish ashen colour, with very numerous more or less distinct transverse and irregular dark dashes, and a darker brown irregular bar running across the wings, between which and the outer margin are two irregular rows of dull greenish marks, with a small black dot in the middle (these markings vary, however, greatly in intensity in different individuals); in addition to which the disc of the hind wings is ornamented with a white mark like a C.

This species is subject to an extraordinary variation in the form of its wings. In some specimens the incision in the outer margin of the fore wings (extending from the first branch of the median vein to the main branch of the postcostal vein) is so deep that it forms nearly a semicircle, whilst in others it is scarcely more than a sextant; the other indentations being equally varied. Mr. Haworth alludes to this, observing, "Femina paullo pallidior et subinde minus laciniata" (Lep. Brit. p. 26). The larva is not gregarious, of a brownish red colour, the back being reddish in front, with the hinder part white; it is remarkable for having the sides of the head produced above into two conical tubercles, which, as well as the spines on the segments of the body, are bristly. It feeds on various trees and plants, especially hops, nettles, elm, willow, honeysuckle, etc. The chrysalis is flesh coloured or brownish, narrowed in the middle, and spotted with gold. Harris says it remains in this state about fourteen days. There are two broods in the year, the first appearing in June, and the second in August or September. The latter brood are said to be of a paler colour than the summer ones.

This is by no means an uncommon species, being generally distributed. Near London, Hertford, York, Fifeshire, etc., are recorded localities; and the Rev. W. T. Bree informs us that in some years it is not uncommon in many parts of Warwickshire; and Mr. F. Bond finds it common at Barnwell Wold, Northamptonshire

De Geer (who as well as Réaumur, "Mémoires," tom. i. pl. 27, has given a very exact account of this species in its different states, "Mémoires," tom. i. p. 250, pl. 20, fig. 1—12) observes that it evidently passes the winter in the perfect state, as specimens are occasionally observed in the first days of spring.

SPECIES 2.—VANESSA POLYCHLOROS. THE GREAT TORTOISE-SHELL BUTTERFLY.

Plate vii. fig. 2, 2 l, 2 p.

SYNONYMES.—*Papilio Polychloros*, Linnæus, Haworth. Lewin Papil. pl. 2. Donovan Brit. Ins. vol. viii. pl. 278. Albin Ins. pl. 55. Wilkes, pl. 108.

Vanessa Polychloros, Ochsenheimer, Curtis, Stephens, Duncan Brit. Butt. pl. 17, fig. 2.

Eugonia Polychloros, Hübner (Verz. bek. Schmett.)

This species is larger than either the preceding or following, with both of which it agrees in the general character of its markings, the wings measuring from 2⅓ to 3 inches in expanse. On the upper side all the wings are of a dull orange colour, darker at the base. The anterior have four black subquadrate spots on the posterior part of the disc, and three larger abbreviated fasciæ on the costal edge. The outer margin is dark, with an irregular pale line. The hind wings have a large black costal spot, and the outer margin is obscure, with dull blue crescents, and two slender pale lines, parallel to the margin. The under sides of all the wings are clouded with numerous fine black transverse streaks and lines, the basal half being darkest; or rather, there is a very broad ash-coloured fascia beyond the middle of both wings. Beyond this, and parallel with the outer margin, is a row of dull bluish lunules; the hind wings have a small white dot in the middle. There are several varieties, arising from the greater or less extent of the black markings.

The caterpillar feeds on the elm, and is gregarious, at least previous to the first moulting of the skin, the young brood living beneath a common silken web. It is blackish or brownish, with a lateral yellow line, and the spines subramose and yellow. The chrysalis is flesh coloured, with golden spots, and is attached to the bark of the trees on which the larvæ feed.

The perfect insect appears in the middle of July;* but some individuals survive until the following spring, when they appear in a faded state. It is occasionally very abundant, breeding in the environs of the metropolis where elms abound. I have taken it at Chelsea and it used to be found in Copenhagen Fields, and numerous other localities in the south of England have been given. Mr. Duncan also says that it had been found as far north as Dunkeld, and in many intervening places. It is, however, very uncertain in its appearance. Réaumur has given ample illustrations of the transformations of this species, in his "Mémoires," tom. i. pl. 23.

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* On the Continent, it is stated to appear in the spring and at the close of the summer; but I apprehend that the early spring specimens are the remnant of the preceding years, and not a distinct brood.


1
1l
2
1p
3
2p
2l
3l
3p

SPECIES 3.—VANESSA URTICÆ. THE SMALL TORTOISE-SHELL BUTTERFLY.

Plate vii: fig. 1, 1 l, 1 p.

SYNONYMES.—*Papilio Urticæ*, Linnæus, Lewin Pap. pl. 3. Donovan Brit. Ins. vol. ii. pl. 55. Albin Ins. pl. 4, f. 6. Wilkes Ins. pl. 107. Harris Aurelian, pl. 2, fig. i—n.

Vanessa Urticæ, Fabricius, Ochsenheimer, Stephens, Duncan Brit. Butt. pl. 19, fig. 1.

Eugonia Urticæ, Hübner (Verz. bek. Schmett.)

This very beautiful but most abundant species varies in the expanse of its wings from 1⅞ to 2⅓ inches. The wings above are of a rich orange colour; the anterior dark at the base, with three short broad costal bars, between which the ground-colour of the wings is paler; behind these are three unequal-sized round spots. The exterior margin of all the wings is black, with a row of blue lunules, and two pale slender parallel submarginal lines. The basal half of the hind wings is also black. Beneath, the orange colour is replaced by pale stone colour, and the two smaller posterior discoidal spots are wanting. The margins of all the wings on this side are freckled with brown, having a row of black lunules. Various varieties have been described and figured, in which the black spots are either more or less obliterated, or are enlarged, so as to become confluent. A fine individual of the latter kind is figured by the Rev. W. T. Bree, in the New Series of the Magazine of Nat. Hist. Suppl. pl. 15; and "Brit. Butt.," pl. 13, fig. 13, in which the second and third costal black bars are united, whilst the two round discoidal spots are wanting; the hind wings are uniformly obscure.

The caterpillars of this species are found on the common nettle in the beginning of June and the middle of August; they are gregarious in the early period of their lives, and are dusky coloured, varied with green and brown, with paler lines down the back and sides, and with the head black, the body beset with strong branched black spines. The chrysalis is brownish, with golden spots on the neck, and sometimes entirely golden. This golden appearance (which suggested to the early naturalists the names of Chrysalis from the Greek, and Aurelia from the Latin, names for gold, and which is so conspicuous in the pupæ of this and the other species of this genus) is owing simply to the shining white membrane immediately below the outer skin, which being of a transparent yellow, gives a golden tinge to the former. Its appearance, however, was seized upon by the alchemists as a natural argument in favour of the transmutation of metals; nor was it until the researches of Réaumur in France, and of Ray and Lister in England, that its real nature was discovered, the last-named author having imitated it by putting a small piece of black gall in a strong decoction of nettles; this produces a scum, which, when left on cap-paper, will exquisitely gild it, without the application of the real metal. Réaumur also mentions that, for producing this appearance, it is essential that the inner membrane of

the chrysalis should be moist; whence may be explained the disappearance of the gilding so soon as the fluids within the body have been absorbed by the formation of the limbs of the butterfly (British Cyclop., art. Aurelia).

The perfect insect is very abundant, and appears in the beginning of July and September, often surviving the winter, and coming abroad the first warm days, having been noticed in the Isle of Wight even so early as the 8th of January. It is distributed all over the kingdom, extending to the northern extremity of Scotland, in which country it is known under the name of the Devil's or Witch's Butterfly! In the south of Europe it continues on the wing through the winter; and according to Mr. Brown (Mag. Nat. Hist., No. 9), it would appear that none of the specimens of this species hybernate in Switzerland, and reappear in the spring.

Mr. Stephens possessed a most remarkable specimen of this species, now in the British Museum Collection, having five wings, the fifth of small size, being implanted on the disc of one of the hind wings, which it resembles in its markings. It was captured by Mr. Doubleday near Epping. It is represented in plate vii., fig. 1.

This species afforded the great anatomist Swammerdam materials for a most elaborate memoir on the structure of the larva, and the mode of its transformation to the pupa state. His figures occupy two folio plates (34 and 35) in his great work on insects.

SPECIES 4.—VANESSA ANTIOPA. THE WHITE BORDER OR CAMBERWELL BEAUTY.

Plate vii. fig. 3, 3 l, 3 p.

SYNONYMES.—*Papilio Antiopa*, Linnæus, Haworth, Lewin Papil. pl. 1. Donovan Brit. Ins. vol. iii. pl. 89. Harris Aurel. pl. 12, fig. a—c. Wilkes, pl. 113.

Vanessa Antiopa, Ochsenheimer, Stephens. Duncan Brit. Butt. pl. 18, fig. 2. Curtis Brit. Ent. vol. ii. pl. 96 (V. Antiope).

Eugonia Antiopa, Hübner (Verz. bek. Schmett.)

This fine species varies in the expanse of its wings from $2\frac{5}{6}$ to $3\frac{1}{2}$ inches. The wings are on the upper side of a rich claret black, with the apical margin and two costal spots near the extremity of the fore wings, of a white or whitish colour, slightly speckled with black; the white margin is preceded by a series of blue spots, on a black bar. Beneath, the wings are dark brown, with a very great number of slender transverse black lines. The white margin and costal spots are as on the upper side; but the black subapical bar, with its blue spots, is almost obliterated. The hind wings are marked in the centre with a minute white spot. The pale margin of the wings varies to deepish yellow. The caterpillar, which is gregarious, is of a black colour, with squarish dorsal spots, and the abdominal pro-legs of a red

colour.* It feeds on the willow and birch, always selecting the highest branches, according to Harris, and is found at the beginning of July. The chrysalis is blackish, spotted with fulvous, and is dentated. The perfect insect appears at the beginning of August, but sometimes survives the winter, and deposits its eggs in the following spring. It appears to be distributed nearly over the whole of the kingdom,† having been found as far north as Ayrshire. It must now, however, be considered as one of our rare butterflies, although about seventy years ago it appeared in such immense numbers throughout the kingdom that the Aurelians of that day thence gave it the name of the Grand Surprise. Since that period, however, it has become rare, but appears periodically, after a lapse of eight, ten, or more years. "To suppose they come from the Continent is an idle conjecture, because the English specimens are easily distinguished from all others by the superior whiteness of their borders. Perhaps their eggs in this climate, like the seeds of some vegetables, may occasionally lie dormant for several seasons, and not hatch until some extraordinary but undiscovered coincidences awake them into active life" (Haworth Lep. Britann. p. 28). It received its English name of the Camberwell Beauty from having been observed at that village, to which it was attracted by the willows, which grew there in profusion.

SPECIES 5.—VANESSA IO. THE PEACOCK BUTTERFLY.

Frontispiece, fig. 1, 1 a, 1 b.

SYNONYMES.—*Papilio Io*, Linnæus, Haworth, Lewin Papil. pl. 4. Donovan Brit. Ins. pl. 206. Albin, pl. 4, f. 5. Wilkes, pl. 106. Harris Aurelian, pl. 8, fig. f—k.

Vanessa Io, Fabricius, Ochsenheimer, Stephens, Duncan Brit. Butt. pl. 18, fig. 1.

Inachis Io, Hübner (Verz. bek. Schmett.)

This very beautiful insect, which measures from 2½ to 3 inches in the expansion of its wings, may be considered as one of the commonest of our butterflies. The fore wings on the upper side are of a dark but rich red colour. The costa is varied with black and yellowish buff patches, the base of the costa being marked with black and yellowish transverse streaks. Near the apex of the wings is a very large eye, in which red, black, yellowish buff, and leaden blue are agreeably blended. The outer margin of the wing is dark brown; and there are five blue spots, three of which appear in the eye and two below it. The hind wings are of a darker red, the base and apex being brown; near the outer angle is a very large eye, with a black centre, in which are several blue markings. This is surrounded by a whitish circle, which

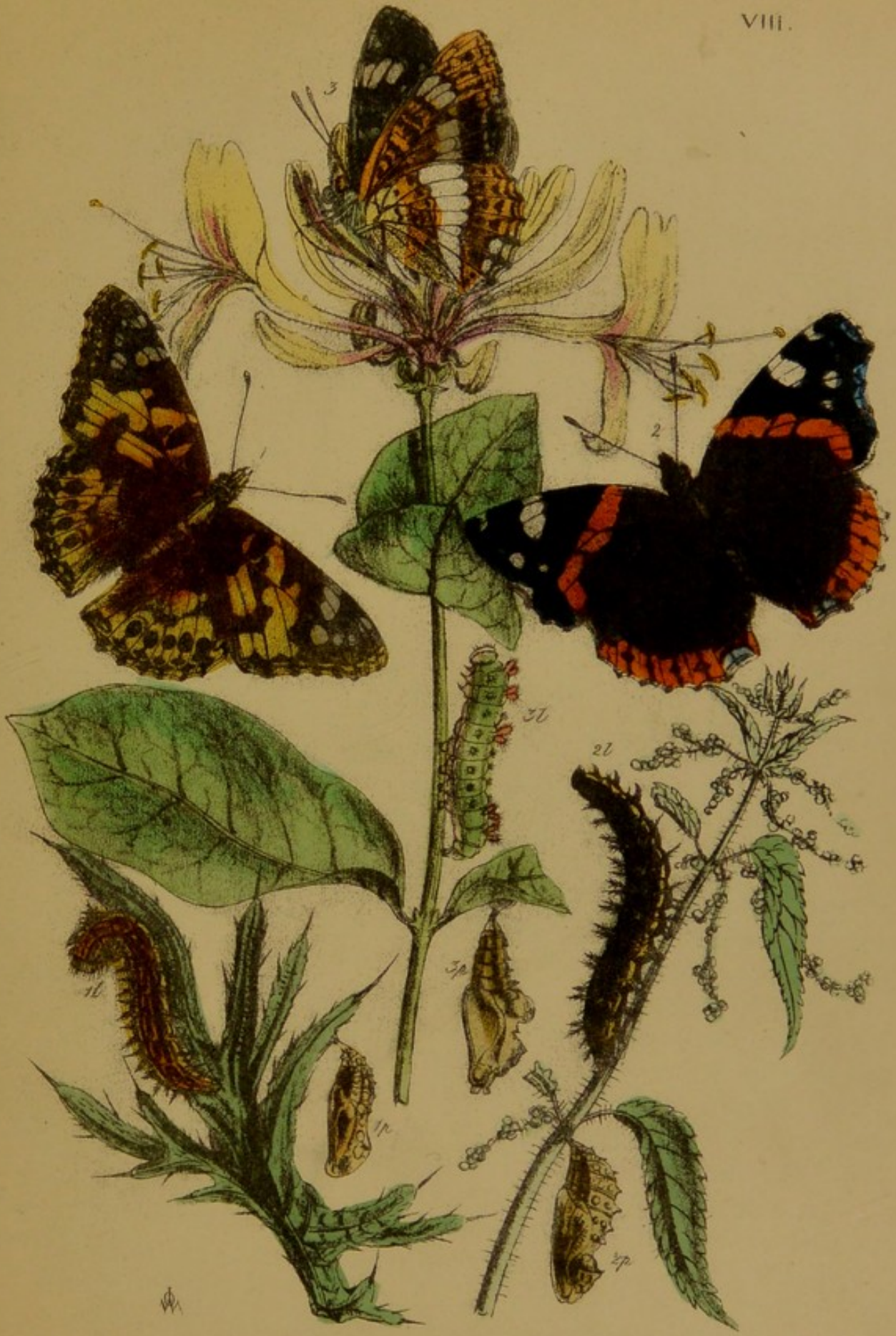
* De Geer has illustrated the transformation of this species, in his "Mémoires," tom. i. pl. 21, and has figured several varieties in the spines of the larvæ; these spines do not exist on the segment succeeding the head.

† Mr. F. Bond took it at Kingsbury, Middlesex, on the 10th April, 1847; it has also lately been taken at Hampstead, Tunbridge Wells, near Cambridge, Yaxley, etc.

is deeply margined with black towards the base of the wing. All the wings beneath are dark brown, with black transverse streaks; the anterior having five small pale marks, representing the blue dots of the upper side, and the posterior having a broad central darker bar, margined with black, within which is a small central white spot.

The caterpillar, which is gregarious, spinose, black, spotted with white, and with the hind legs red, feeds on the common stinging-nettle, and is found at the beginning of July. The chrysalis is greenish, dotted with gold, and dentated. The imago appears in the middle of July, and often survives until the following spring, when the female deposits its eggs. Although very abundant in England, it appears not to extend further north than the Frith of Forth; and in the south of Scotland it is but sparingly seen.

This butterfly and its preparatory states have formed the subject of one of the most interesting of the "Mémoires" of Réaumur, by whom it was selected as an example to illustrate the manner in which the butterflies which are merely suspended by the tail in the chrysalis state effect their transformations. If the proceedings of the swallow-tail or cabbage butterflies on assuming the pupa state (see *ante*, pp. 9 and 23) have excited our admiration, the mode in which these caterpillars change to *suspended* chrysalides is far more extraordinary. Like the former, each constructs a small button of silk, to which it firmly attaches itself by the hooks of the hind feet. When this is effected, the head is permitted to hang downwards. Whilst thus suspended, it succeeds, after at least twenty-four hours' contortion, in forming a slit down its back, through which the head of the chrysalis is protruded, and the caterpillar skin gradually pushed upwards to the tail. A delicate operation has still to be performed: the caterpillar was suspended by the hooks of its own hind legs to the silken button; but not only has the still partially enclosed chrysalis to disengage itself entirely from the skin of the caterpillar, and *attach itself* to the silken button, but also to get rid of the old and no longer necessary caterpillar skin. To effect these objects, the chrysalis carefully withdraws its tail from the skin, seizing hold of the outside of the latter by pressing two of the rings of its body together, and enclosing between them part of the old skin. By repeating this proceeding, it at length pushes its tail upwards, till it reaches the silken button, to which it fastens itself by means of the hooks with which the tail of the chrysalis is furnished. We now see the chrysalis suspended head downwards, by the side of the old caterpillar skin, which it ultimately gets rid of by a succession of gyrations, which burst the silken threads holding the caterpillar skin, and which, no longer supported, falls to the ground.


3
2
1
3b
2b
1b
3p
2p
1p

SPECIES 6.—VANESSA ATALANTA. THE RED ADMIRAL, OR ALDERMAN BUTTERFLY.

Plate viii. fig. 1, 1 l, 1 p.

SYNONYMES.—*Papilio Atalanta*, Linnæus, Haworth, Lewin Papil. pl. 7. Donovan, vol. viii., pl. 260. Albin, plate 3. Wilkes, pl. 105. Harris Aurelian, plate 6, f. a—h.

Vanessa Atalanta, Fabricius, Stephens, Curtis. Duncan Brit. Butt. pl. 20, fig. 1.

Pyrameis Atalanta, Hübner (Verz. bek. Schmett.) E. Doubleday, Gen. D. Lep.

Ammiralis Atalanta, Rennie.

This remarkably rich-coloured butterfly is one of the commonest of our native species. It varies in the expanse of its wings from 2½ to 3 inches. The ground-colour of the upper surface of the fore wings is intense velvety blue black, brownish at the base; having an irregular oblique central bar of bright red, slightly curved on the side nearest the tip of the wing, and formed as it were of large squarish confluent patches; it does not quite extend to the anal angle of these wings. Between the fascia and the apex of the fore wings is a large costal white spot, beyond which is a curved row of five white spots, of which the first and fourth are the largest. Still nearer the margin of the wing is an obscure bluish wave. The hind wings are blackish brown above, with a broadish red margin, in which are four black dots, and there are two obscure confluent blue spots at the anal angle. On the under side the fore wings are black, the base with several narrow red and bluish transverse stripes; the red oblique bar is here present but more broken, between which and the large costal white spot is a horseshoe blue mark. The apex is ashy brown, with two small brown eyes with white centres and two white spots. The hind wings on this side are brown and most beautifully mottled with black and grey, with a large triangular pale spot in the middle of the costal margin, and two transverse and wedge-shaped discoidal black marks. Near the margin of the wing is a row of four obscure eye-like patches. In some specimens the red bar of the fore wings bears a small white dot near its hinder extremity; these, according to Mr. Haworth, are the females.

This species differs from all the foregoing, not only in the form of the wings, of which the anterior are less strongly angulated, and the posterior rounded, but also in several other characters, especially the form of the palpi and the habits of the caterpillars. Hence Mr. Kirby suggests, in the Fauna Boreali Americana (p. 294), that it "seems rather to belong to the genus, or perhaps sub-genus, Cynthia; at any rate, it forms a connecting link between it and Vanessa."

The caterpillar is of a dusky green colour, with a yellowish dorsal line and also a pale line on each side above the feet. The chrysalis is brownish or blackish, beneath grey with golden spots.

The caterpillar feeds on the common nettle, especially preferring the seeds, and

is found in July; the imago is abundant wherever this plant is common—it appears at the beginning of August, and survives the winter, the female depositing her eggs in the following spring.

According to Sepp, the caterpillar shortly after it is hatched selects a nettle-leaf, which it draws together with threads into a roundish hollow form, leaving for the most part an opening into the interior both before and behind, thus serving both for shelter and food until almost devoured, when it selects a fresh leaf and proceeds with it in the same manner, one caterpillar only being found on a single leaf, thus indicating a peculiar liking for a solitary life; a circumstance confirmed by the eggs being laid singly and apart, whereas caterpillars hatched from eggs deposited in clusters are gregarious. The caterpillar state lasts about five weeks.

The species appears to be very widely distributed. I have received specimens from North America, which, although slightly differing from our native individuals, I cannot regard as specifically distinct. Such is also the opinion of Mr. Kirby, who has described his American specimens under this name.

It also occurs throughout Europe and along the African shores of the Mediterranean. It delights in the flowers of the ivy and dahlia, and is a remarkably bold insect, whereof some remarkable instances are mentioned in "Loudon's Magazine of Natural History" (No. 25).

GENUS XII.

CYNTHIA, Fabricius.

This genus, or perhaps rather sub-genus, differs chiefly from Vanessa in the form of the wings, the anterior pair being very slightly angulated at the tip, whilst the hind ones are rounded and scalloped, and in certain trivial distinctions, as in the club of the antennæ, which is very short and compressed, and in the palpi, which are long, deflexed, pointed and beak-like; the second joint, with the posterior half, pilose. The caterpillar and chrysalis resemble those of Vanessa. By Curtis, it is united with the last-named genus. As, however, C. Cardui is not one of the types of the genus as established by Fabricius, it is perhaps best to retain it, considering, however, the exotic species Papilio Arsinoë and Œnone as the types of the two sections into which it is divided, and regarding Cardui as an aberrant species leading to Vanessa. Mr. E. Doubleday has also united it with Atalanta into the genus Pyrameis, divided into two sections, restricting Cynthia to P. Arsinoë, and giving Œnone and its allies under the generic name of Junonia (Gen. D. Lep., p. 212).

SPECIES 1.—CYNTHIA CARDUI. THE PAINTED LADY.

Plate viii. fig. 2, 2 l, 2 p.

SYNONYMES.—*Papilio Cardui*, Linnæus, Fabricius, Haworth, Lewin Pap. t. 6, f. 1—4. Donovan Ins. v. 9, tab. 292. Shaw Nat. Miscell. 9, tab. 430. Panzer Faun. Ins. Germ. 22, 19. Wilkes Papil. t. 107, f. 1. Albin Ins. t. 56. Harris Aurelian, t. 11, fig. e—f.

Libythea Cardui, Lamarck.

Vanessa Cardui, Godart, Latreille, Meigen, Hübner (Verz. bek. Schmett.)

Cynthia Cardui, Fabricius, Kirby (F. B. A.), Stephens, Duncan Brit. Butt. t. 19, f. 2.

This elegant insect in its markings might at first sight be mistaken for a mottled and faded Atalanta; so closely allied are the two species together, although perfectly distinct both in habits and markings; being in fact widely separated in the Linnæan system, one belonging to the Nymphales Phalerati, and the other (C. Cardui) to the N. gemmati, in consequence of the wings being marked with eye-like spots. It varies in the expanse of its wings from 2⅛ to 2⅞ inches. The fore wings on the upper side are at the base brown; the disc tawny orange,* with three somewhat square black spots; the apex blackish, with five white spots, the largest of which is on the costa, and the four others form a curved line, between which and the margin is a slender whitish line. The hind wings above have the base and costal margin brown; the disc fulvous, with numerous black marks arranged, as it were, in four transverse rows, the second forming a row of round darker-coloured spots, the fourth being marginal, the margin itself whitish. Beneath, the fore wings are nearly marked as above, but the fulvous colour is more diffused; the dark spots are smaller, and the apex of the wing is dark stone colour, instead of black. The hind wings below are beautifully mottled with pale olive brown, yellowish buff, and white, the veins being white; near the hind margin is a row of slender blackish blue marks, above which are four beautiful eyes, the two middle ones being smaller than the outer ones, which are circled with black. The markings vary in size in different individuals, Mr. Stephens having described several varieties. The caterpillar is spined, of a brown colour, with interrupted lateral yellow lines; it is solitary, and feeds on the Carduus lanceolatus, and other species of the same genus, as well as on the nettle, mallow, artichoke, etc. It is found in the middle of July. Like that of V. Atalanta, it draws up the leaves upon which it is feeding with its threads, and like it, is solitary in its habits. The chrysalis is brown, with ash-coloured lines and golden spots.

This is one of those species of butterflies remarkable for the irregularity in its appearance; in some years occurring plentifully even in the neighbourhood of London, after which it will disappear for several years. Indeed, instances are on record in which, owing to the vast numbers, migration has become necessary; and in

* The tawny orange marks on the right fore wing bear a tolerably good resemblance to a map of England and Ireland.

the "Annales des Sciences Naturelles" for 1828, an account is given of an extraordinary swarm which was observed in the preceding May in one of the cantons of Switzerland, the number of which was so prodigious that they occupied several hours in passing over the place where they were observed. The precise causes for this phenomenon were not investigated, and the time of the year is remarkable. Like V. Atalanta, the species is very widely dispersed, being an inhabitant of North America, New South Wales, India, Java, both extremities of Africa, Brazil, etc.

There are numerous notices relative to this butterfly contained in "Loudon's Magazine of Natural History," Nos. 4, 13, 18, 26, 31, and 39, to which I must refer the reader.

GENUS XIII.
APATURA,* Fabricius.

The insects composing this splendid genus are at once distinguished from all the preceding genera of this family by having the antennæ very gradually thickened towards the tips into a club, whilst it is separated from Hipparchia by their being straight and not curved, and by the robust structure of the insects. It agrees with the Fritillaries in having naked eyes, by which character it is at once separated from Limenitis. The palpi are close together and compressed, so as to form an elongated beak pointed at the tip. The body is robust, the wings powerful, the anterior having the posterior margin entire, and the hind wings scalloped. The discoidal cell of the wings is not closed; the fore legs are rudimental, with the tarsi articulated; thus differing from Vanessa. The four hind legs are terminated by two strong ungues, defended at the side by bifid membranous appendages.

The larva somewhat resembles a slug, having the body thickest in the middle, fleshy, destitute of spines, except a pair on the crown of the head and the bifid tail. The chrysalis is compressed, with the head-case bifid. This variation in the form of the larva has induced Dr. Horsfield to unite this genus with Hipparchia and some others into a distinct primary division of the Diurnal Lepidoptera named Thysanuromorpha, from a supposed resemblance to the fork-tailed Thysanuræ, or spring-tailed insects! The only British species is the following.

SPECIES 1.—APATURA IRIS. THE PURPLE EMPEROR.

Plate ix. fig. 1, 1*, 1 l, 1 p.

Synonymes.—*Papilio Iris*, Linnæus, Haworth, Donovan, pl. 37. Lewin Papil. pl. 16. Wilkes, pl. 120. Harris Aurelian, pl. 3, fig. sup.

Apatura Iris, Ochsenheimer, Leach, Stephens. Curtis, pl. 338. Duncan Brit. Butt. pl. 21.

Doxocopa Iris, Hübner (Verz. bek. Schmett.)

This fine insect varies in the expanse of its wings from 2½ to 3¼ inches. The

* More properly Apaturia, a name of Venus, from ἀπάτη. Vollm. Vollst. Worterb. p. 271.


1
1b
1c
1p
2
3
3b
2p
3p

wings of the male are above of a blackish hue, with a splendid purple blush, varying according to the position from which they are seen, and marked in the middle and towards the hinder margin with white spots, the inner ones forming the curved upper extremity of a bar which runs across the hind wings nearly to the anal angle; this angle itself being orange, with two black spots, above which is an ocellus. The under side of the fore wings is varied with grey, orange, fulvous, and black, there being an interrupted, curved, white fascia across the wings, behind which is a black eye with a lilac centre surrounded by a broad orange circle, in which are two white spots. The hind wings on this side are grey, with a broad white bar attenuated towards the anal angle, on each side broadly ferruginous; the anal angle ferruginous, above which is a black eyelet with a lilac pupil and orange iris.

The wings of the female are brown, destitute of the purple lustre, but marked as in the male.

The caterpillar is green, with pale yellow lateral oblique stripes. It feeds on the broad-leaved sallow, and is found at the end of May. The chrysalis is of a pale green colour. The perfect insect is found in the middle of July in woods, in various parts of the south of England. Epping Forest, Great and Little Stour Woods, Wrabness, and Ramsay, Essex; Badly, Dodnash, and Raydon Woods, in Suffolk; Clapham Park Woods, Beds; Brinsop Copse, Heref.; Enborne Copse, Berks; near Warminster, Wilts; New Forest; Christchurch, Hants; Monkswood, Camb.; near Hertford, and Coombe and Darenth Woods,—have been given as its localities; to which we may add, that it is "occasionally though rarely seen in Warwickshire, near Doncaster, and in the Isle of Wight." (Rev. W. T. Bree, MSS.), and that Mr. F. Bond finds it in some seasons very common in a wood near Norman's Cross.

Owing to the habit which the Purple Emperor exhibits of fixing his throne on the summit of a lofty oak, from the utmost sprigs of which, on sunny days, he performs his aërial excursions, defending his territory against a rival emperor with the greatest energy, it is necessary to use a bag net fixed at the end of a slender rod twenty or thirty feet long. He is exceedingly bold, and will almost suffer himself to be pushed off his seat. The females are much rarer, and do not take such lofty flights as the males.

GENUS XIV.

LIMENITIS,* Fabricius.

This genus is closely allied to Apatura, but differs in its general weaker formation, and in the hinder margin of the fore wings being rounded, and not concave as in the

* One of the names of Venus. Vollm. Vollst. Wort. 1143.

Purple Emperor; the hind wings are more rounded, and the eyes are pubescent. By these characters, and by the gradual formation of the straight club of the antennæ, it is distinguished from all the other genera of this family; the palpi are not contiguous, as long as the head, not pointed at the tip, and clothed with scales and hair; the hind wings have the discoidal cell open; the fore legs are short in both sexes; the tarsi of the males formed of a single joint clothed with long hairs and terminated by a small single unguis; those of the females not like those of the males, as stated by Curtis, but articulated; the four hind legs are formed as in Apatura. The larvæ are long, cylindric, with several pairs of obtuse hirsute spines on the back, and lateral fascicles of hairs. The chrysalis has the head also beaked, and is very gibbose beneath. It is suspended by the tail. The close relation of this genus and Apatura in the perfect state is sufficient to prove that they are not referable to separate primary groups of the Diurnal Lepidoptera, on account of the differences in their caterpillar state.

SPECIES 1.—LIMENITIS SIBILLA. THE WHITE ADMIRAL.

Plate viii. fig. 3, 3 l, 3 p.

Synonymes.—Male, *Papilio Sibilla*, Linnæus, Fabricius, Stewart, Doubleday. Stephens Cat. Lep. Brit. Mus.

Female, *Papilio Camilla*, Linnæus, Haworth. Lewin Papil. pl. 8. Donovan Ins. 8, pl. 244. Harris Aurelian, pl. 30, fig. m, n.

Limenitis Camilla, Leach. Curtis Brit. Ent. pl. 124. Duncan Brit. Butt. pl. 20, fig. 2. Hübner (Verz. bek. Schmett.) Stephens Illustr.

The wings of this species measure from 2 to 2½ inches in expanse. The upper surface is dull black, with a curved interrupted row of white spots extending from near the middle of the costa of the fore wings to the anal angle of the hind ones; in addition to which the anterior have several additional small spots near the apex, and the posterior have an obscure reddish spot at the anal angle, within which are two black dots. Beneath, the ground-colour of the wings is yellowish brick-red, with the white spots of the upper side conspicuous; in addition to which all the wings, especially at the base, are marked with black streaks and dots, and the hind wings, between the white band and the margin, have two rows of black dots and two rows of crescents on the margin. The fore wings also exhibit near the anal angle several additional white spots; and the anal edge of the hind wings is pale bluish.

A remarkable variety, in which the white spots on the wings are nearly effaced, the white band being also entirely or nearly obliterated, as well as the dark mark on the under side, is figured by the Rev. W. T. Bree, in "Loudon's Magazine of Natural History," vol. v. p. 667. The specimen was taken near Colchester, by Dr. MacLean. Mr. Ingall also possesses a similar specimen from the same neighbourhood.

The caterpillar is green, with the head, legs, and dorsal tubercles reddish. It feeds on the honeysuckle. A careful figure of it, from an original drawing in the collection of M. Boisduval, is given in the Crochard edition of the "Règne Animal, Ins." pl. 137, fig. 4. The chrysalis has the head beaked and bifid, and a very large and prominent dorsal appendage. It is brownish or green, with golden spots.

The butterfly appears in July, and is a rare species, although formerly more abundant; it appears widely distributed over the southern parts of the kingdom. Near Peterborough; near Ipswich; Hartley Wood, Essex; near Rye; Coombe Wood; near Finchley; Birchwood, Kent; Enborne Copse, Berks; New Forest; "abundantly in woods near Winchester; also a specimen in the Isle of Wight." (Rev. W. T. Bree, MSS.)

"The graceful elegance displayed by this charming species when sailing on the wing is greater perhaps than can be found in any other we have in Britain. There was an old aurelian of London so highly delighted at the inimitable flight of Camilla (Sibilla), that long after he was unable to pursue her he used to go to the woods and sit down on a stile, for the sole purpose of feasting his eyes with her fascinating evolutions." (Haworth, "Lep. Brit." p. 30).

The remaining British species belonging to the family Nymphalidæ constitute a group of very great extent; the number of the European species being considerably more than one-third of the whole of the Diurnal Lepidoptera of Europe. They form the genus Hipparchia of Fabricius (together with part of his genus Melanitis, or the subsequently named genus Satyrus of Latreille, or Erebia of Dalman). By Boisduval they are formed into a distinct tribe, Satyrides (Satyridæ, Swainson), and by Hübner into a stirps named Driades; whilst by Dr. Horsfield they are considered as the types of one of the five primary divisions of the Diurnal Lepidoptera, most of the other Nymphalidæ belonging to one of his other primary divisions.

These butterflies are of the middle size, with the wings ornamented beneath with eye-like spots, and entire or scalloped, but never angulated, nor with the outer margin of the fore wings concave. They have the discoidal cell of the hind wings closed, whilst the base of one or more of the longitudinal veins of the fore wings is dilated and vesiculose. The general arrangement of these veins offers no difference between this genus and the other Nymphalidæ. The two fore legs are minute and rudimental in both sexes; the antennæ are terminated by a curved club, which is generally slender and spindle-shaped, but in a few species very distinct; the eyes are either naked or hairy; the palpi are not close together, the under side being clothed with

long hairs. But the most characteristic mark of distinction consists in the form of the caterpillars, which are attenuated at the posterior extremity, and pisciform, with the tail terminated by a small fork; the body is destitute of spines, and is generally pubescent, with the head more or less rounded, and sometimes heart-shaped. The chrysalis is but very slightly angulated, and almost destitute of prominent tubercles.

The species feed exclusively upon the different species of grasses, and are consequently widely dispersed almost over the whole globe.

The relations of these insects with the other tribes of Diurnal Lepidoptera are very interesting. In the form of the caterpillars, as well as of the imago, as suggested by Mr. Curtis, they approach Pieris (Pontia); but the supposed resemblance with the Melitææ appears to me to be very slight. Boisduval has more correctly indicated the relation of their larvæ with those of Morpho and Brassolis, as well as with Apatura, and of the imago with Biblis.

The distribution of these insects has hitherto received but little attention. By Mr. Curtis (who has in these insects alone departed from his usual plan of giving only one illustration of each genus) they were formed into a single genus, divided into two groups, from the hairy or naked eyes. Mr. Stephens, by a more careful examination of the structure of the different species, divided the genus into five sections, in the following manner:

A.—Eyes pubescent; wings, especially the posterior, more or less denticulated; palpi moderately hairy; frequent woods, lanes, and highways. *Ægeria, Megæra.*

B.—Eyes naked; the wings, especially the posterior, more or less dentated; palpi moderately hairy; frequent heaths, commons, and meadows; subdivided, from the form of the club of the antennæ, and of the wings. *Semele, Galathea, Tithonus, Janira, Hyperanthus.*

C.—Eyes naked; anterior wings entire, rounded, posterior dentated; palpi hairy, terminal joint short, obtuse; frequent mountainous districts or swampy heaths. *Ligea, Blandina.*

D.—Eyes naked; wings elongate, pilose, entire; palpi very hairy; frequent mountainous districts. *Cassiope.*

E.—Eyes naked; wings entire; palpi slender, moderately hairy; terminal joint very long, acute; frequent boggy heaths and marshy places in mountain districts. *Polydama, Davus, Hero, Ascanius, Pamphilus.*

M. Boisduval, in his beautiful "Icones des Lépidoptères," has divided these insects into four genera:—Arge (the group typified by Galathea); Erebia, corresponding with the mountain groups (Stephens's sections C and D); Chionobas, an

Arctic group; and Satyrus, formed of the remainder, and divided into nine races.

M. Duponchel, in a memoir published in the "Annals of the French Entomological Society," for 1833, regarded these insects as constituting but a single genus, and as divisible into nine groups, characterised by the variations in the dilatation at the base of the veins of the wings (a character entirely neglected by our English authors), and the form of the antennæ. The following are his groups, with the names of the English (including the doubtful) species belonging to each.

1. Graminicoles, Galathea. 2. Ericicoles, Phædra. 3. Rupicoles, Briseis and Semele. 4. Herbicoles, Janira and Tithonus. 5. Vicicoles, Megæra and Ægeria. 6. Ramicoles, Hyperanthus. 7. Dumicoles, Hero, Ascanius, Iphis, Davus, and Pamphilus. 8. Arcticoles (no British species). And 9. Alpicoles, Cassiope, Blandina, and Ligea.

The great extent of the group, and the variation in the characters noticed above, to which others of still greater importance (but which have been neglected by preceding authors) must be added, have induced me, after much consideration, to break up the old genus Hipparchia, instead of treating it as I have done the Fritillaries and Vanessæ, and to adopt a plan of distribution intermediate between those of Boisduval and Duponchel. The genera Arge (Graminicoles, Dup.), Chionobas (Arcticoles, Dup.), and Erebia of Boisduval (Alpicoles, Dup.), appear to me to be natural groups, although there is a marked difference in the form of the wings of Blandina and Cassiope, belonging to the last-mentioned group; but the genus Satyrus of Boisduval is a complete magazine, comprising species with naked and hairy eyes; smooth and pubescent larvæ; one, two, or three of the veins dilated at the base, etc. From this mass I therefore propose to detach the Vicicoles of Duponchel, having, in addition to his characters, the eyes hairy, and his Dumicoles, additionally distinguished by the glabrous larvæ and very long terminal joint of the palpi. I thus leave together all the species which have the anal vein of the fore wings not swollen, the mediastinal and median alone being more or less dilated. This group will will therefore correspond with Mr. Stephens's section B, after the removal of Galathea.

These groups are further confirmed by the variations in the structure of the fore feet in the different sexes; a character which has been neglected by all previous authors, except Mr. Curtis, who, without noticing the variations or even the sexual distinctions in this part, merely describes the fore tarsi of the genus as four-jointed; whilst Zetterstedt states that the males have the fore legs pilose, and the females almost naked, without mentioning the difference in the number of their joints or in their formation.

GENUS XIV.

ARGE,* Schrank.

This genus is distinguished by having the eyes naked; the antennæ elongated, with a long and slender spindle-shaped club gradually commenced; the palpi are composed of attenuated joints, the last of which is distinctly pointed and naked at the tip, the under side of the preceding joints clothed with long hairs; the hind wings are dentated; the mediastinal vein alone of the fore wings is vesiculous at the base, both above and beneath. The fore legs, in both sexes, are so extremely minute as not to be visible amongst the hairs upon the breast; those of the female are still more minute than those of the male, but shorter and thicker in proportion to their size; they are alike clothed with scales, and the tarsal portion is not articulated.

The larvæ have the body slightly thickened in the middle, cylindric, attenuated to the tail, which is forked. The chrysalis is destitute of tubercles.

The perfect insects are found in grassy places in woods.

This genus is exclusively composed of the species (numerous on the Continent, but of which only one has been found in England) which have the ground-colour of the wings white, marked with black spots; hence they are called by the French Leucomélaniens, White Satyrs and Semi-deuils (half-mourners). They constitute the group Graminicoles of Duponchel. M. Lefebvre has published a valuable memoir on this group, in the first volume of the "Annals of the Entomological Society of France."

SPECIES 1.—ARGE GALATHEA. THE MARBLED WHITE, HALF-MOURNER, OR MARMORESS.

Plate ix. fig. 2, 2 l, 2 p.

Synonymes.—*Papilio Galathea*, Linnæus, Haworth. Lewin Papil. pl. 28. Donovan Brit. Ins. vol. viii. pl. 258. Wilkes, pl. 100. Harris Aurelian, pl. 11, fig. g—k. *Hipparchia Galathea*, Leach, Stephens, Curtis. Duncan Brit. Butt. pl. 23, fig. 1. *Arge Galathea*, Boisduval, Hübner. *Satyrus Galathea*, Latreille, Duponchel.

This singularly marked butterfly, which from the contrasts of its colours was called the "half-mourner" by our early aurelians, varies in the expanse of its wings from 2 to 2⅛ inches. Its colours, which are yellowish white and almost black, are distributed in nearly equal proportions over the wings. The ground-colour on the upper side is almost black, with one large whitish oval spot near the base of the

* Probably derived from Ἀργῆς, *albus*, from the prevailing white colour, or else from Ἀργός, *ictus* from the weak flight of the insect.

costa, succeeded by four long whitish patches, the two middle ones being nearest the apex of the wings, and smaller than the others; between these and the apex are two smaller white spots, and there is a row of white submarginal spots. The hind wings have a large oval whitish spot near the base, succeeded by a very broad bar of the same colour, and with a row of submarginal white crescents varying in size.

The markings on the under surface of the wings are nearly similar, except that the blackish markings are much paler, especially in the hind wings, where they are irrorated with buff. Moreover, the fore wings have a small black eye, with a white centre near the tip; and the posterior wings have five eyes placed just above the white submarginal crescents (the third crescent from the outer angle of the wings not having an eye), and the eye nearest the anal angle being doubled.

The female differs in being of a larger size and in having the under surface of the wings of a yellower hue than in the males. Some specimens in the British Museum are so strongly characterised in this respect, that I at first thought it probable they constituted a distinct species. Varieties of this species are described both accidental and apparently permanent. Of the former, one of the most singular is represented in our "Brit. Butt." pl. 17, fig. 5, 6, from a specimen taken near Dover, and kindly communicated to us by the Rev. W. T. Bree, who has published a notice of it in "Loudon's Magazine of Natural History," vol. v. p. 335. A similar variety is also figured by Ernst, "Pap. d'Europe," 1, pl. 30, fig. 60. The black marks in this variety are very greatly suffused over the largest portions of the wings. An apparently permanent variety, with pale yellowish brown markings in lieu of the black ones, is described by Stephens. The Arge Procida of Herbst is esteemed by Boisduval also as a local variety, owing to climate: the black markings in this are much more extended, especially on the upper surface of the wings. In like manner, Boisduval regards the Arge leucomelas of Esper as another local variety, in which the hind wings on the under side have the black markings replaced by so very pale a shade of buff as to cause the wings to appear almost white, the eyelets being always absent.

The caterpillar is yellowish green, with a darker line down the back and on each side. It feeds on the cat's-tail grass.

The perfect insect appears in June and July. It especially frequents damp open places in woods, and although local, it seems to be distributed over the greater part of England; it has not, however, been found in Scotland. Mr. F. Bond has taken it at Kingsbury, Middlesex; in Rockingham Forest; and at Barnwell Wold, Northamptonshire.

GENUS XVI.

LASIOMMATA,* Westwood, Stephens, (Cat. Brit. Mus.)

This genus is at once distinguished from all the other Hipparchiides by having the eyes thickly clothed with hairs, in addition to which the palpi are very slender, moderately clothed to the tip beneath with long hairs, the terminal joint being very short; the wings, especially the posterior pair, are denticulated, and considerably varied, the fore wings with one, and the hind ones with five or six eyes; the antennæ are straight, distinctly annulated with black and white, and with the club pyriform; the mediastinal and median veins are more or less swollen at the base, the anal one being simple. The fore legs, although considerably smaller than the intermediate ones, are yet very conspicuous; they are of equal length in both sexes, but those of the males are comparatively slender and more densely clothed with long slender hairs; the tarsal portion in the male is simple, but in the female it is broader and articulated with several short strong spines at the tips of the joints on the under side; the larva of L. Megæra is elongated, villose, with two short points at the tail, and the pupa is short, thick, with small angular points, and two points at the head; it is suspended by the tail. The chrysalis of L. Mæra, according to M. Marloy, is suspended by the tail in the open air; it is naked and angular with two points on the head, and with broad brown bands on the wing-covers. This genus corresponds with the first section of Hipparchia, of Curtis and Stephens, and with Duponchel's fifth group, Vicicoles, the species being stated to occur in the neighbourhood of habitations. Stephens more correctly states that they frequent woods, lanes, and highways. They form Hübner's two groups, Pararge and Dira.

SPECIES 1.—LASIOMMATA ÆGERIA. THE SPECKLED WOOD, OR WOOD ARGUS BUTTERFLY.

Plate ix. fig. 3, 3 l, 3 p.

Synonymes.—*Papilio Ægeria*, Linnæus, Haworth. Lewin Papil. pl. 19. Donovan Brit. Ins. 14, pl. 498. Wilkes Engl. Butt. pl. 103. Harris Aurelian, pl. 41, fig. f—i. Sepp. 1, tab. 6.

Hipparchia Ægeria, Fabricius, Ochsenheimer, Leach, Stephens, Curtis. Duncan Brit. Butt. pl. 23, fig. 4.
Satyrus Ægeria, Latreille, Boisduval, Duponchel.
Pararge Ægeria, Hübner (Verz. bek. Schmett.)

This butterfly varies in the expanse of its wings from 1½ to 2 inches. The ground-colour of the wings on the upper side is brown. The fore wings are marked with a number (ten or eleven in the strongest marked individuals) of pale buff patches of variable size, placed irregularly; the one nearest the apex of the wing

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* Derived from the Greek Λάσιος, *hirtus*, and ὄμμα, *oculus*, from the hairiness of the eyes.


1*
3
1p
1
1?
3p
2
2?
3?
2?
3p

being ornamented with a black eye, having a white dot in the centre; the hind wings are more sparingly marked with pale patches, but in the centre towards the margin they have three larger eyes placed in a bar of pale buff. On the under side, the brown colour in the fore wings is more clouded, the apex being much paler, with the eye near the tip, whilst the hind wings are more varied with lighter and darker undulations, the outer angle being paler, and a row of six white dots, varying in size near the hinder margin (which has sometimes a purplish tinge), the larger ones replacing the others of the upper side. There is great variation in the size and number of the pale spots, as well as of the clouding of the under surface of the wings, and the females are generally ornamented with larger and more numerous spots than the males.

The caterpillar of this species is green, with white longitudinal lines, and a spined tail. It feeds upon grasses, preferring the common couch-grass, and is found in March, May, and June, the perfect insect appearing in April, June, and August, there being several broods in the course of the year. It delights in lanes and glades of woods, and is a common species, occurring from Dover to the north of Scotland.

SPECIES 2.—LASIOMMATA MEGÆRA. THE WALL BUTTERFLY.

Plate x. fig. 1, 1*, 1 l, 1 p.

Synonymes.—*Papilio Megera*, Linnæus. Lewin Papil. pl. 21. Donovan Brit. Ins. 8, pl. 279. Sepp. v. 2, pl. 2, 3. Wilkes, 53, pl. 102.

Papilio Mægera, Haworth.

Hipparchia Megæra, Ochsenheimer, Leach, Stephens, Curtis.

Satyrus Megæra, Latreille, Boisduval, Duponchel.

Dira Megæra, Hübner (Verz. bek. Schmett.)

Papilio Mæra, Berkenhout. Harris Aurelian, pl. 27, fig. a—g.

This pretty butterfly varies in the expanse of its wings from 1½ to nearly 2 inches. The ground-colour of the upper surface of the wings is of a fulvous yellow, with several transverse irregularly undulating brown bars, the base of the hind wings being also brown, as well as the margin of all the wings. Near the tip of the fore wings is a large black eye with a white pupil; and the hind wings have a row of from three to five black eyes, varying in size, the middle ones also having a white pupil. The male differs in having a broad oblique brown bar extending across the middle of the hind part of the fore wings. On the under side, the fore wings are nearly marked as above, except that the brown bars are more slender, and the broad oblique bar of the male is wanting. The ocellus is surrounded by a brown ring, and accompanied by another minute ocellus. The under wings are beautifully freckled with ashy and brown, with many waved darker marks, forming a broadish

curved bar across the middle of the wings, beyond which is a row of six beautiful eyes, that at the anal angle being double, succeeded by a row of darker waves.

The caterpillar is slender, pubescent, and of a light green colour, with darker lines on the back and sides. It is found at the beginning of May and August, and feeds on grasses. The imago appears in July and August, and is a common and widely-dispersed species, frequenting lanes and roadsides, delighting to settle on walls (whence its ordinary English name), flying off when approached, and settling at a short distance, again to be disturbed at the approach of the passer-by.

GENUS XVII.

HIPPARCHIA,* Fabricius.

This genus is distinguished from the preceding (with which it agrees, in having the mediastinal and median veins above more or less dilated at the base), in the naked eyes. The wings are generally considerably variegated, and more or less denticulated, especially the hinder pair, and the palpi moderately hairy. The antennæ vary in the construction of the club, which in some species is long, slender, and fusiform, and in others abrupt and broad. The fore legs are of comparatively moderate length, and distinctly visible in both sexes, those of the males being much more densely clothed with hair, and those of the females rather larger. The tarsal portion is simple in the males, but articulated in the females, without, however, the short spines at the tips of the joints beneath observed in the Lasiommatæ.† This genus comprises the greater part of Stephens's section B of Hipparchia, and with Duponchel's Ericicoles (Phædra, etc.), Rupicoles (Briseis, Semele, etc.), Herbicoles (Janira and Tithonus, etc.), and Ramicoles (Hyperanthus, etc.)

The larvæ are conical, with the head round, and the tail bifurcate; they are marked with several longitudinal black stripes. M. Marloy, who has published a short notice on the larvæ of these insects, in the "Annals of the Entomological Society of France" for 1838, mentions that the chief cause why these larvæ are so

* Unmeaningly derived, by Fabricius, from the Greek Ἱππαρχία, *præfectura equitum*.

† The tarsi above described are those of Semele. The fore legs of Janira are shorter (although conspicuous) and very slightly pilose, with the tarsal portion in the males short and slightly compressed, but longer in the females, and articulated. In other respects they are nearly alike in size and appearance. In Tithonus they are very minute in both sexes, but rather larger in the females, and very slightly hairy in the tarsal part, more elongated than in the male, and thick at the tip. The same minuteness of size occurs also in Hyperanthus, thus confirming the subdivisions established on other characters.

seldom met with is, that they conceal themselves and remain inactive during the day, but come forth to feed by night, when they may be found in great numbers with the help of a lamp. The caterpillars of Briseis and Semele form large cocoons under ground, composed of grains of earth fastened together with a little silk; their chrysalides are short, ovoid, glabrous, contracted, with the head obtuse and the tail pointed. Janira differs from the preceding, in having the chrysalides naked, angular, with the head bifid, and suspended head downwards. The larva of Tithonus, according to Boisduval, has the hairs of the body bifid.

SPECIES 1.—HIPPARCHIA SEMELE. THE GRAYLING.

Plate x. fig. 2, 2 l, 2 p.

SYNONYMES.—*Papilio Semele*, Linnæus. Lewin Papil. pl. 17. Donovan Brit. Ins. pl. 259. Haworth. Harris Aurelian, pl. 44, fig. d, e.

Hipparchia Semele, Ochsenheimer, Leach, Stephens. Duncan Brit. Butt. pl. 22, fig. 1, 2.

Satyrus Semele, Latreille, Boisduval, Duponchel.

Eumenis Semele, Hübner.

This is the largest of our common British Hipparchiæ, measuring from $2\frac{1}{8}$ to more than $2\frac{1}{2}$ inches in expanse. The fore wings on the upper side are of a dull brown colour, with a broad interrupted bar of various size near the extremity, in which are two black eyes; the hind wings are brown at the base, with a brighter coloured bar near the margin, having a single black eye with a white centre, near the anal angle; on the under side, the fore wings are darker at the base, with the extremity yellowish or pale buff, terminated by a narrow dusky margin. The two ocelli are here distinct, the anterior one being largest; the under wings on this side are marked with very numerous, short, slender, transverse, white, brown, and black streaks; the basal half is darkest, and is terminated by a very irregular broad paler bar; near the anal angle is a nearly obsolete eyelet.

The markings vary greatly in size as well as in the intensity of their colours; and the females have the marks and eyes larger, but paler.

The caterpillar is green or grey, with the belly and legs brownish; it is rather more than an inch long; its body is thick, hard, and conical, with five blackish longitudinal lines, the dorsal one being the darkest. It forms a cocoon in the earth, according to M. Marloy. The butterfly, which appears in July, is rarer than the preceding, owing to its preferring certain localities, such as heaths (Newmarket, Gamlingay, and Salisbury Plain, for example); and rocky places, such as Arthur's Seat, near Edinburgh; and stony places, near Durham and Castle Eden Dene. Mr. Wailes also observed it frequently on the sea-coast, near South Shields, where the magnesian limestone occurs, although not found on the opposite side of the Tyne,

where there is no limestone; and Mr. F. Bond has found it in the New Forest, and at Lulworth Cliffs very common.

SPECIES 2.—HIPPARCHIA TITHONUS. THE GATE-KEEPER, OR LARGE HEATH BUTTERFLY.

Plate x. fig. 3, 3 l, 3 p.

SYNONYMES.—*Papilio Tithonus*, Linn. (Mantissa). Lewin Pap. pl. 22. Harris Aurelian, pl. 44, fig. f, g.
Hipparchia Tithonus, Ochsenh., Steph., Curtis. Duncan Brit. Butt. pl. 23, fig. 2, 3.
Pyronia Tithonus, Hübner (Verz. bek. Schmett.)
Papilio Tithonius, Villars (not his Pilosellæ).
Papilio Herse, Hübner, Pap.
Papilio Phædra, Esper.
Papilio Pilosellæ, Fabricius, Haworth. Donovan Brit. Ins. v. 12, pl. 405.

This common butterfly varies from 1½ to nearly 2 inches in the expanse of its wings, the ground-colour of which on the upper side is of an ochre yellow, with a broadish brown margin. The base of all the wings is also brown; near the apex of the fore wings is a large black eye, in which are two small white dots; near the anal angle of the hind wings is also a nearly obsolete eye, more strongly marked in the female. The male is distinguished by its smaller size, more obscure colouring, and by having a broad brown oblique patch in the middle of the posterior disc of the fore wings. The fore wings on the under side are coloured as on the upper, except that the brown patch is wanting in the males; the hind wings, on the contrary, are of a golden brown at the base and margin, with an irregular waved greyish buff band running across the middle, having a brown patch near the outer angle, in which are two small eyes, and another patch and ocellus towards the anal angle, sometimes accompanied by one or two small white ocelli. The size of these ocelli, as well as their number, varies in different specimens.

The caterpillar is greenish, pubescent, with a reddish line on each side, and a brownish head. It feeds on the annual meadow-grass, and also (according to Haworth) on the Hieracium Pilosella. It is found in this state in the beginning of June, and the butterfly appears in the middle of July. It is a very abundant species, frequenting pasture lands and lanes throughout the kingdom.

SPECIES 3—HIPPARCHIA JANIRA. THE MEADOW BROWN BUTTERFLY.

Plate xi. fig. 1, male, 1 *, female, 1 l, 1 p.

SYNONYMES.—*Papilio Janira*, Linnæus (male), Turton, Stewart.
Hipparchia Janira, Ochsenheimer, Stephens, Leach, Curtis. Duncan Brit. Butt. pl. 24, fig. 1, 2.
Papilia Jurtina, Linnæus (female). Lewin Pap. pl. 18. Donovan, 1, pl. 320. Haworth. Harris Aurelian, pl. 32, fig. a—e.
Papilio Hyperanthus, Wilkes, 53, pl. 101. Albin, pl. 53, fig. a—e.
Epinephile Hyperanthus, Hübner (Verz. bek. Schmett.)

This most abundant species varies in the expanse of its wings from 1½ to 2 inches. As its English name imports, the prevailing colour of the wings on the

upper side is obscure brown or almost black, especially in the males. Both sexes have a small black eye, with a white centre, placed on a small fulvous patch near the tip of the fore wings; and the female has a large fulvous patch beneath the ocellus, which is sometimes also slightly visible in the males; on the under side the wings are brighter coloured, the fore ones being dark orange yellow, lighter beyond the middle, and with the margin pale brown. The ocellus near the apex is also here present; the basal half and the margin of the hind wings are tawny brown, separated by a broad irregular paler bar, in which are from one to three minute dark dots. The markings of this species, however, greatly vary in size, as well as occasionally in colour; and the ocellus of the fore wings is sometimes without and sometimes with two white dots; occasionally also it is accompanied by one or two black spots beneath, as in fig. 2. A very remarkable variety is represented in our "Brit. Butt.," plate xlii., fig. 6.

The caterpillar is pubescent, green, with white longitudinal lines, and the tail is forked. It feeds on several species of grass, especially Poa pratensis. The chrysalis is naked and angular, suspended by the tail, with two sharp points at the head.

The butterfly, which is to be found in every meadow and grassy lane, is one of the commonest of our English species, and occurs all over the kingdom. Mr. Knapp, the author of the pleasing "Journal of a Naturalist," notices that it appears but little affected by the diversity of seasons, being equally copious in damp and cheerless summers as in the driest and most arid ones. In 1826, however, which was exceedingly parched, the number of these butterflies was so great as to attract the attention of different persons.

Linnæus mistook the sexes of this butterfly for different species; but their specific identity has long been unquestionably established. In such cases the name given to the male specimens is retained instead of that of the female.

SPECIES 4.—HIPPARCHIA HYPERANTHUS. THE RINGLET BUTTERFLY.

Plate xi. fig. 2, 2 l, 2 p.

Synonymes.—*Papilio Hyperanthus*, Linnæus. Lewin Pap. pl. 20. Donovan Brit. Ins. 8, pl. 271. Haworth. Harris Aurelian, pl. 35, fig. d—h)not of Wilkes).
Hipparchia Hyperanthus, Ochsenheimer, Leach, Stephens, Curtis, Duncan.
Papilio Polymeda, Scop. Hübner, Pap.
Satyrus Hyperanthus, Boisduval.
Enodia Hyperanthus, Hübner (Verz. bek. Schmett.)

This plain-coloured butterfly varies in the expanse of its wings from 1½ to nearly 2 inches. The upper surface of all the wings is dark brown, without any shade or mark except one or two small and more or less distinct ocelli near the hind margin

of the fore wings, and with several similar ocelli near the margin of the hind wings. On the under side, the ground-colour of the wings is rather paler, but uniform; whilst the ocelli of the upper side are here repeated in the hind wings, but greatly increased in size, there being generally two near the outer angle, and three between the middle and the anal angle. But these ocelli vary in an endless manner; in some the ocelli being not only very large and connected together, but also accompanied by smaller ocelli attached to them; whilst in others the ocelli are obliterated, the fore wings being without any spots, and the hind wings with only three minute white spots. Every intermediate variety is found.

The caterpillar is pubescent, of a greyish white colour, with a slender black dorsal line; and sometimes it is entirely blackish. It feeds on the Poa annua, and other grasses, keeping during the day at the roots. The perfect insect appears at the end of June, and is found in damp grassy places about woods and lanes, and seems to be generally dispersed and abundant throughout the country.

GENUS XVIII.

CŒNONYMPHA, Hübner.

This genus comprises the smaller species of the Hipparchiides, distinguished from all the rest by several evident characters; the wings are entire and not denticulated, the anterior pair having the three veins (mediastinal, median, and anal) strongly and equally swollen, the eyes naked, the palpi slender, moderately hairy, with the last joint very long and acute, the antennæ annulated with grey and brown, with a decided club.

The fore legs (in C. Pamphilus) are of comparatively moderate length, those of the males very densely clothed with long hairs, those of the females almost naked, with the tarsi long and articulated, almost resembling a perfect foot; whilst the tarsi of the males are very short and simple.

The larvæ are completely glabrous and shining; thus differing from the larvæ of all the preceding species of this sub-family.

This genus, to which I have applied Hübner's name (Cœnonympha), corresponds with Stephens's section E, and with Duponchel's group Dumicoles.


1a.
1b
1c
1d
2.
2b
3a
3b
1e
1f

SPECIES 1.—CŒNONYMPHA DAVUS. THE SMALL RINGLET BUTTERFLY.

Plate xii. fig. 1 a, 1 b, 1 c, 1 d, 1 l, 1 p.

Synonymes.—*Papilio Davus*, Fabricius, Haworth, Jermyn (but not of Godart).
Hipparchia Davus, Ochsenheimer, Curtis, Stephens.
Papilio Philoxenus, Esper.
Maniola Tiphon, Schrank (not P. Tiphon), Esper.
Papilio Hero, Donovan Brit. Ins. 6, pl. 186. Lewin, pl. 23, fig. 5, 6, (but not P. Hero of Linnæus).
Var. *Papilio Tullia*, Hübner, Pap. 243, 244.
Var. *Papilio Musarion*, Borkhausen.
Var. *Papilio Polydama*, Haworth, Stephens.
Var. *Papilio Polymeda*, Jermyn.
Var. *Papilio Typhon*, Haworth.
Var. *Hipparchia Iphis*, Stephens.

This plain-coloured butterfly varies in the expanse of its wings from 1½ to 1¾ inch. On the upper side they are of a brownish ochre colour, the base being rather darker and the fringe of a pale grey; parallel to the outer margin of the fore wings are the rudiments of two eyes, and occasionally one or two smaller ones. Traces also of several eyes appear near the margin of the hind wings. Beneath, the fore wings have the basal half of a somewhat brighter ochre; this is succeeded by a narrow irregular pale bar (narrowed to the hinder margin), the space between which and the outer margin of the wings is greyish brown, with only two larger ocelli, and sometimes with one, two, or three additional smaller ones. The hind wings beneath are dark brownish grey at the base, the outer margin of which is angulated, this is followed by a broad irregular whitish central bar; which is succeeded by brownish grey usually ornamented with six large ocelli, having a black iris surrounded by a whitish or fulvous ring, with a small silvery central dot. The markings on the under side of the wings vary in size, and the eyes in number; sometimes the whitish middle bar is interrupted in the centre, and the anal ocellus is generally doubled. The outer edge of the hind wings is whitish and the fringe brownish.

The specimen first described by Mr. Haworth was captured near Manchester, in the month of July. Since that time it has been plentifully taken in the marshes between Stockport and Ashton, near that town. Trafford and White Moss, also near Manchester, and Shorn Moor, Yorkshire, have likewise been given as its localties.

This species is subject to considerable variation, not only in the general colour of the upper surface, but also in the greater or less clearness and size of the pale bars and eyelets of the under surface; these varieties, moreover, appearing to be somewhat influenced by locality.

Papilio Polydama of Haworth (Polymeda of Jermyn, but not of Scopoli, the last-named author having given that name to Hyperanthus) is considered by Curtis as a variety of Davus; whilst Mr. Stephens at first gave it as a distinct species, but subsequently, in the Appendix to the first volume of his Illustrations, asserted it

to be a variety of Typhon of Haworth. It measures about an inch and a half in the expanse of its wings, the fore pair of which, on the upper side, are of a greyish ochre, with two obscure blind eyes; the hind wings above are brown, but with the inner edge broadly whitish or buff, with a small obscure eyelet near the anal angle. The fore wings beneath are of a brownish ochre, blackish at the base and ashy at the tips, with an abbreviated whitish fascia across the middle, between which and the outer margin are two eyes of small size; the hind wings beneath have a broad basal bar of greyish brown externally dentated, terminated by a whitish irregular bar, sometimes almost interrupted in the middle, beyond which the wings are ashy, with six small eyes surrounded with a whitish ring, three of which are usually much smaller than the others. The ocelli, as well as the ground-colour of the wings, vary considerably.

This variety was first found in the county of York in the month of June, and subsequently on the 21st of July, 1809, by the Rev. W. T. Bree, on the moors between Bala and Festiniog, North Wales, in company, however, with a specimen of Typhon, Haw. Mr. Weaver also found it plentifully in North Wales, in 1827; whilst he found Typhon still more profusely in Cumberland one month later. According to Mr. Wailes, however, both Typhon and Polydama occur plentifully on damp heaths in Northumberland in the beginning of July, and Mr. Curtis states that Typhon is taken near Manchester in company with Davus.

Another variety, which has been named TYPHON by Haworth, and IPHIS by Stephens (but not of the German and French writers), varies from 1½ to 1⅝ inch in expanse. On the upper side the wings are usually of a rusty grey or ochre colour, having the base brownish. The hind wings are generally darker, and without any trace of rudimental eyes, but sometimes with distinct ocelli, varying in number near the tip; on the under side the fore wings are dusky at the base, with the disc rusty ochre, followed by an abbreviated irregular white stripe; the outer part of the wing being greenish ash, and bearing generally two (but sometimes as many as five) small eyes, which are occasionally obsolete; the hind wings beneath are of a greenish brown at the base, with an irregular *interrupted* whitish bar beyond the middle of the wing, succeeded by an ochre shade in the female, but greenish brown in the male, and generally ornamented with six small eyes, but their number is liable to great variation. The females are further distinguished by having the wings paler and more ochreous, and marked on the upper side with a large pale blotch on the disc of all the wings.

This variety was first taken in June, in Yorkshire, near Beverley. Many years afterwards it was again found by Mr. Haworth, in a marsh near Cottingham, in the

same county. It also occurs in Scotland, Wales, Cumberland, Northumberland, the Shetland Islands, and other parts of the north of Great Britain. It was found by Mr. Weaver, in Cumberland, unaccompanied by the variety named Polydama, which he had found in North Wales nearly a month earlier; although, according to Mr. Wailes, both occur in company in Northumberland.

It will be seen by the synonymes how great a confusion has prevailed as to the specific name of the insect. Mr. Stephens first described it under the name of Iphis, which he afterwards altered to Polydama, regarding it as identical with the Polydama of Haworth, which he had also at first considered as distinct. If Polydama, however, be a variety of Davus, some other name must be given to this, if specifically distinct; and although the synonymes of Esper (to Tiphon) are disputed, and the change of the name to Typhon not perhaps strictly correct, yet it would be better to recur to the name imposed by my lamented friend and tutor in Entomology, Mr. Haworth, instead of giving it a new specific name, which would otherwise have been rendered necessary. Recent observations, however, seem fully to confirm the specific identity of all these supposed species, of which the local varieties appear constant, as stated in the "Entomologist," p. 191; but Mr. Hodgkinson ("Zoologist," p. 1882,) states that the specimens captured in Arran connect the Rannock with the Cumberland varieties.

SPECIES 5.—CŒNONYMPHA PAMPHILUS. THE SMALL HEATH BUTTERFLY.

Plate xi. fig. 3, 3*, 3 l, 3 p.

Synonymes.—*Papilio Pamphilus*, Linnæus. Lewin Papil. pl. 23, fig. 3, 4. Haworth, Stewart, Harris, Aurelian, pl. 21, fig. e—h. De Geer Mém. 2, pl. 2, fig. 3.

Hipparchia Pamphilus, Ochsenheimer, Leach, Stephens, Curtis. Duncan, Brit. Butt. pl. 26, fig. 3.

Papilio Nephele, Hübner, Pap.

This, which is one of the commonest of our British butterflies, varies in the expanse of its wings from 1⅛ to 1½ inch. The wings on the upper side are of a pale tawny or fulvous colour, with the entire margins brownish; the anterior pair having an indistinct ocellus near the tip, sometimes accompanied by a still smaller one, or by one or more black spots. The hind wings have sometimes also an obsolete ocellus near the anal angle. On the under side the fore wings are fulvous, with the base and apex ashy, a rather large ocellus being placed near the tip, having a black iris and white pupil, and surrounded by whitish. The hind wings are brown at the base and ashy at the tips, with an abbreviated whitish band across the middle, beyond which are several minute indistinct ocelli. Varieties occur in which

the ocelli are more or less obliterated, and in the males the dusky edging of the wing is more decided than in the females.

The caterpillar feeds upon *Cynosurus cristatus*, and is found at the beginning of May and August. It is greenish, with a dusky line down the back and a pale line down each side. The perfect insect is found abundantly on heaths and dry pasture lands, appearing at the beginning of June and September. Moses Harris also states that there is a brood in April, making three in the course of one year

GENUS XIX.

OREINA,* Westwood, (EREBIA, Boisduval, Doubleday, but not of Dalman).

This genus is distinguished from the other British species of Hipparchiides by having none of the veins of the wings dilated at the base. The antennæ are slender, with a more or less globular or pyriform club. The eyes are naked, the palpi hairy, the wings varying in shape, the anterior being either rounded or elongate, and the posterior denticulated or entire. The fore feet in the males of Blandina are very small, so as not to be visible among the hairs of the breast, and very densely hairy; those of the female, on the other hand, are comparatively long, quite visible, slender, naked, and with the tarsal portion articulated.

This genus, to which Boisduval inappropriately applied Dalman's generic name of Erebia (which is a synonyme of Hipparchia or Satyrus) is composed of species for the most part natives of mountainous districts; hence I have applied to it a name derived from the Greek, in allusion to this habitat. The continental species are very numerous, and very difficult to determine. Boisduval states that they exclusively inhabit the Alpine mountains, and the mountain districts of Central Europe, being but very rarely found on the plains, except where the vegetation has an alpine character. They are not found on the mountains of the north of Europe (where they are replaced by the species of Chionobas), nor on the mountains of the south of Europe. They constitute Duponchel's ninth and last group, named from the same circumstance Alpicoles; which that author suggests may be formed into two divisions, from the entire and denticulated wings; indeed by Stephens they are, from this circumstance, separated into two groups, forming his sections C and D of Hipparchia. The species with denticulated hind wings are termed Epigea by Hübner, whilst those with entire wings are his Melampias.

* From the Greek Ὄρειος, *monticola*, from the species generally frequenting mountain districts.

SPECIES 1.—OREINA LIGEA. THE ARRAN BROWN BUTTERFLY.

Plate xii. fig. 2, 2 l.

SYNONYMES.—*Papilio Ligea*, Linnæus. Sowerby, Brit. Miscell. pl. 2.
Hipparchia Ligea, Ochsenheimer. Stephens Illust. Haustell. 1, pl. 6, fig. 1, 2, 3. Duncan. Brit. Butt. pl. 25, fig. 1.
Papilio Alexis, Esper.
Papilio Philomela, Hübner, Papil. Esper.
Erebia Ligea, Dalman, Boisduval, Stephens Cat. B. Mus.
Epigea Ligea, Hübner (Verz. bek. Schmett.)

This rare butterfly measures from 1⅞ to 2 inches in the expanse of its wings, which are of a dark rich brown, all the wings having a broad oblong patch of red near the outer margin, within which, on the fore wings, are four eyes, black (with white pupils in the females), the two nearest the apex confluent, and in the hind wings three ocelli, which are also blind in the males. On the under side the wings are of a paler brown, and the band is brighter in the fore wings, but almost obsolete in the hind ones, which are ornamented beyond the middle with an abbreviated and irregular white band, between which and the hind margin are three black ocelli, with white pupils, each surrounded by a red ring. The fringe of all the wings is alternately brown and white.

Asserted to have been taken in the Isle of Arran, by the late Sir Patrick Walker and Alexander Macleay, Esq., in July or August; but Mr. H. Doubleday places it among the "reputed" British species. It is described as occurring in France and Sweden, and as appearing in meadows and open spaces of woods.

The caterpillar is green, with a dusky line down the back, with several white lines along the sides.

SPECIES 2.—OREINA BLANDINA. THE SCOTCH ARGUS BUTTERFLY.

Plate xii. fig. 3 a, 3 b.

SYNONYMES.—*Papilio Blandina*, Fabricius. Sowerby British Miscell. 1, pl. 7.? Donovan, vol. 12, pl. 426.
Erebia Blandina, Dalman. Stephens Cat. Brit. Mus.
Hipparchia Blandina, Ochsenheimer, Stephens, Curtis. Duncan Brit. Butt. pl. 25, fig. 2.
Papilio Medea, Hübner.

This species varies in the expanse of its wings from 1⅝ to 2 inches. The upper side of all the wings is of a dark uniform brown colour, the fore wings having a dark orange patch near the apex, the lower part being narrower than the upper, from which it is ordinarily separated by a constriction in the middle of the patch. The upper part of this patch bears a united pair of black eyes, having white pupils, and the lower part has a single eye, similar in colour but smaller, which is occasionally obliterated. The hind wings are ornamented with a curved bar (or rather a united series of round marks), of obscure orange near the hinder margin, in which are generally three small black eyes with white pupils, and a black dot in the outer part of the bar. Specimens occasionally occur with as many as five

ocelli on the fore wings. Others have only two ocelli in the hind wings. The fringe of all the wings is brownish, but paler and interrupted in the females. On the under side the fore wings are of a somewhat redder brown, with an orange bar ocellated as above; the hind wings have the base greyish brown, succeeded by a broad irregular red brown bar, which extends beyond the middle of the wings; this is again succeeded by a rather narrower greyish bar, in which are three minute rudimental ocelli; and the margin of the wing is brown. The colouring of these bars varies considerably, not only according to the localities where the specimens are taken, but also in the sexes, as represented in the upper series of figures in "Brit. Butt.," plate 23. Ordinarily, however, the specimens taken in Scotland have the bars more indistinctly marked. There are numerous continental species closely allied to this insect.

Messrs. Stephens and Curtis only mention the island of Arran and Castle Eden Dene as the localities for this species; but Mr. Duncan adds, that "it occurs in some plenty over a district of considerable extent in Dumfries-shire, near Minto in Roxburghshire, occasionally near Edinburgh, and probably in most of the southern counties of Scotland. Mr. Wailes informs us that it exists in profusion in one or two places in the magnesian limestone district not far from Newcastle, and Mr. F. Bond has it from Durham. The caterpillar is light green, with brown and white longitudinal stripes; head reddish. The egg is ribbed, and of a whitish colour, speckled with brown.

SPECIES 3.—OREINA CASSIOPE. THE SMALL RINGLET BUTTERFLY.

Plate xi. fig. 4.

SYNONYMES.—*Papilio Cassiope*, Fabricius.
Hipparchia Cassiope, Ochsenheimer. Stephens Illustr. Haust. 1, pl. 8, figs. 1, 2, 3. Curtis. Duncan Brit. Butt. pl. 24, fig. 3.
Melampias Cassiope, Hübner.
Papilio Æthiops minor, Villars.
VAR.—*Papilio Mnemon*, Haworth Ent. Trans. 1, 332.
VAR.—*Hipparch. Melampus*, Newm. Zool. 29 (not of Esper).

This species differs from the two preceding species of this group in having the wings much more elongated; the hind pair being also entire and not denticulated. The fore wings generally measure 1¼ or 1⅓ inch in expanse. The wings above are of a brown colour with a silky gloss; the fore wings having a red bar near the extremity interrupted by the veins, and not extending to the margins of the wings; in this bar are generally four small black dots with obscure pupils; but specimens occur with only three, two, or even no ocelli, whilst in others the bar itself is reduced to a few red spots. The hind wings have also a red bar near the extremity, bearing three similar eyelets. On the under side the fore wings are redder brown, with

the red band marked with four black spots, whilst the hind ones are ashy or coppery-brown with three black spots, each surrounded by a slender red ring. Variations occur in the number and size of the spots as well as of the band.

The mountainous districts of Cumberland and Westmoreland are the only localities yet indicated for this small species, upon which Mr. Curtis makes the following observations: –"The males in forward seasons have appeared as early as the 11th of June; but last year (1829), when Mr. Dale and myself visited Ambleside, they were later, the first being taken the 18th of June; and they did not become plentiful till the 25th. They are found amongst the coarse grass that covers considerable spaces abounding with springs on the sides of mountains. They only fly when the sun shines, and their flight is neither swift nor continued, for they frequently alight amongst the grass; and, falling down to the roots, their sombre colour perfectly conceals them. The females are later, and have been taken even in August. We found the males on Red Skrees, a mountain near Ambleside; and Mr. Marshall took them at Gable-hill and Stye-head, between Wastwater and Borrowdale."*

Hipparchia Mnestra of Ochsenheimer (and our plate xlii., fig. 4, 5,) was introduced into the list of English species without authority, in the second edition of the "Butterfly Collector's Vade-Mecum," on the examination of a variety of Oreina Cassiope in the British Museum, in which the fascia on the fore wings has only two eyelet spots. Mr. Stephens, however, corrected the error, in his "Illustrations" (Haustell, vol. i. p. 63); but Mr. Curtis has subsequently given Mnestra as a British species, in the second edition of his "Guide," but accompanied by a mark of interrogation. That gentleman has, however, recently observed to me in a note, "You will observe that Mnestra Hub.? is *queried*, and it may be only the female of Cassiope." The true Mnestra, as carefully figured by Boisduval, in his "Icones Historiques des Lépidotères d'Europe," v. i., pl. 35, fig. 1—4, has the disc of the under side of the fore wings in both sexes rich red brown; the fore wings are also "proportionellement assez courtes arrondies." It is found in various parts of Switzerland, especially near the Great and Little St. Bernard. The males have the red band of the fore wings unspotted, and in the females it has two eyes on each side.

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* The butterfly described under the name of Melampus by Mr. Newman (in Zoologist, p. 729), is not the species so named by Esper, but is now regarded as a variety of this species. It measures 1½ to 1¾ inch in the expanse of the fore wings, which are blackish brown; the fore wings with a subapical ferruginous patch divided by the veins, bearing several black dots; hind wings with three ferruginous spots bearing black dots. Beneath red brown, with broad brownish margins, and with the fascia and spots less distinct; hind wings rufo-atomose, with three red spots and black dots. Taken on the mountains in Perthshire, by Mr. Weaver, in July.

FAMILY III.

ERYCINIDÆ.

This family of butterflies is distinguished by the males having only four ambulatory feet, whilst the females have six, or in other words, the fore legs of the males are rudimental, whilst they are perfect in the females; the anal edge of the hind wings is but slightly prominent, the discoidal cell is open, or closed either entirely or partially by a false nervure. The claws of the tarsi are minute, and scarcely perceptible. The caterpillars are very short, pubescent or hairy, and the chrysalis is short and contracted.

The insects of this family are of small size, and almost exclusively confined to South America. They are often very brilliant and varied in their colours, their wings being mostly marked with spots. They, however, exhibit a certain appearance of weakness in their formation quite unlike that of Nymphalidæ. M. Lacordaire, nevertheless, informs us that the flight of the South American species is very rapid, and that the majority rest with their wings extended on the under side of the leaves. The only British species which belongs to this family (forming, indeed, an aberrant group therein) is the small fritillary known to collectors under the name of the Duke of Burgundy, which differs from all the Nymphalidæ (in which family it has been arranged by Stephens, Curtis, etc.) in several important respects, especially in the perfect structure of the fore legs in the females, the minute simple ungues, the posterior tibiæ destitute of spurs, the onisciform larva, and the girt chrysalis. In its general appearance, however, as well as in its colours and markings, it bears a more immediate resemblance to the small fritillaries of the genus Melitœæ, but the relation is one of analogy and not of affinity, the general appearance alone constituting the resemblance, whilst in its more important structural characteristics it possesses no real relation with the Melitœæ. How far it would be advisable (as has been done by Mr. Stephens in the British Museum List) to invert the arrangement of the genera constituting the family Nymphalidæ, in order to bring the Hipparchiides into conjunction with the Pierides, and thus terminate the family with the Melitœæ (which would be thus brought into connection with the present family) is very doubtful. Such a step would, moreover, completely overturn the arrangement of Dr. Horsfield, and the *natural* transition of the genera which he laboured to propound.

The only British Genus is the following :

GENUS XX.

HAMEARIS, Hübner. (NEMEOBIUS, Stephens.)

This very interesting genus is distinguished from all the preceding by the small size of the insects, as well as from all the Nymphalidæ by the nature of its transformations. The head is rather small, with the eyes hairy, and the short palpi not extending beyond the tuft of hairs on the forehead; they are slender, and three-jointed, the second joint long, and the third small and subglobose. The antennæ are slender, and terminated by an abrupt compressed club. The fore wings are short and somewhat triangular, the front margin being nearly straight, the hind wings are rounded and denticulated. The veining of the wings is peculiar, and has not been before described. In the fore wings the veins are arranged as in Argynnis; the postcostal vein superiorly emitting two branches before reaching the transverse vein which closes the discoidal cell. A third branch is emitted at the place of the junction of the transverse with the postcostal veins; this third branch superiorly emits two branchlets; the postcostal vein after emitting this third branch is simple, and extends to below the tip of the wing. In the hind wings the vein which corresponds with the postcostal one emits an outward branch (which extends to the outer angle of the wing), at a considerable distance *below* the place from whence the interior branch of this postcostal vein is emitted.* Whereas in the other Fritillaries the outward branch originates considerably nearer the base of the wing than the inward branch. The fore legs are short, imperfect, and thickly clothed with hair in the males, the tarsal portion being destitute of articulations. In the female the fore legs, on the contrary, are as perfect as the others, and clothed with short scales; the tarsi being as long as the tibiæ, composed of five distinct joints, terminated by minute simple claws and pulvilli. The tibiæ of the hind feet are destitute of spurs.

Mr. Stephens, with philosophical tact, pointed out the propriety not only of separating this genus from the other Fritillaries, but also noticed its variance in several respects with the characters of the family Nymphalidæ, in which he placed it, such as the simplicity of the claws and posterior tibiæ. He was, however, unacquainted with the caterpillar and chrysalis states. These have, however, since been figured by Mr. Curtis (copied from Hübner), and fully prove the correctness of Mr. Stephens's suggestion of the distinction between this genus and the other

* I have only found this peculiarity in several species of Erycinidæ.—(See Boisduval, "Hist. Nat. Lep.," pl. 20, 21.)

Nymphalidæ, the caterpillar being onisciform, and the chrysalis not only attached by the tail, but also fastened by a girth across the middle of the body.

The only British species is,

HAMEARIS LUCINA. THE DUKE OF BURGUNDY FRITILLARY.

Plate xiii. fig. 1, 1*, 1 l, 1 p.

Synonymes.—*Papilio Lucina*, Linnæus. Lewin Br. Pap. pl. 15. Donovan Brit. Ins. vol. 7, pl. 242, f. 2. Harris Aurelian, pl. 27, fig. n—o. Haworth (not of Wilkes, pl. 114, which represents Artemis).

Nemeobius Lucina, Stephens. Horsfield. Duncan Brit. Butt. pl. 12, fig. 1, Boisduval Hist. Nat. Lep. vol. 1, pl. 2 B, fig. 8. Westwood Introd. to Mod. Classif. of Ins. vol. 2, p. 357, fig. 99, 12—14.

Hamearis Lucina, Hübner. Curtis Brit. Ent. pl. 316.

Melitæa Lucina, Ochsenheimer, Leach, Jermyn.

This pretty little butterfly varies in the expanse of its wings from 1 to 1½ inch. On the upper side the ground-colour of the wings is brown, ornamented with numerous orange-coloured marks and spots, forming in the fore wings three transverse series. The one nearest the base of the wings is most irregular, forming two strong curves; in the second, the spots are of unequal size, the two nearest the costa being very minute, and the two following the largest; the terminal row consists either of a series of oval spots, with a black dot in the centre of each, or orange crescents. The cilia is alternately black and white; the hind wings are brown, with about four small irregular pale spots, and a submarginal row of spots or lunules as in the fore wings. Beneath, the wings are much more varied in their colours, the ground colour being much paler; the orange spots again appear, but are separated from each other by black marks towards the hind margin of the fore wings; the hind wings are ornamented towards the base with an abbreviated bar, formed of four or six white oblong spots; this is succeeded by an orange bar, which is followed by an irregular white bar, formed of nine unequal-sized white patches. Along the margin is a row of fulvous ocelli, with a black dot in the middle of each, edged behind with white. The ground colour of the wings of the female is black instead of brown, with the markings larger and brighter coloured; the latter in the males are occasionally almost obliterated, except the marginal ones.

The following account of the preparatory states of this interesting insect is quoted by Mr. Curtis, from Hübner's valuable work on the "European Lepidoptera:"—"The eggs are found solitary, or in pairs, on the under surface of the leaves of *Primula veris* and *elatior* at the beginning of summer; they are almost globular, smooth, shining, and pale yellowish-green. The caterpillar feeds on the leaves; its head is roundish, heart-shaped, smooth, shining, and bright ferruginous, black only on the mouth and about the eyes; its body is almost oval, but long, depressed, and set with rows of bristly warts; the other parts are set with feathery hairs; on the back, at least, from the fourth joint to the tail, there is a black dot on each joint,


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and on the sides similar, but less distinct spots; the colour is pale olive orange; its feet are rusty brown; the spiraculæ black; claws and belly whitish. It moves very slowly, rolls itself up when disturbed, and remains in that state a long time. Soon after the middle of summer it becomes a pupa, not only fastening its body by the apex, but also by spinning a cord across its middle; in this state it remains until the end of the following spring. Hübner, who reared it from the egg, says also that the caterpillar throws off five skins before it becomes a pupa, and its appearance, at different ages, varies considerably. The larva represented (and copied in our figure), he found on a *primula* in his own garden."

Coombe Wood; Darenth, Kent; Boxhill; Dulwich; the New Forest; and in Dorsetshire, Berkshire, and Barnwell-wold, Northamptonshire, are given for the localities of this rather uncommon species; and Mr. Duncan adds, that it has been also taken as far north as the neighbourhood of Carlisle, by Mr. Heysham.

FAMILY IV.

LYCÆNIDÆ, Leach.

The present family (corresponding with the Polyommatidæ of Swainson and the Vermiform Stirps of the butterflies of Dr. Horsfield) comprises a numerous assemblage of small and weak, but beautiful creatures, distinguished by the minute size of the tarsal claws; the apparent* identity in the fore tarsi of both sexes, the fore legs being fit for walking; the hind tibiæ with only one pair of spurs; the antennæ not distinctly hooked at the tip; the last joint of the palpi is small and naked; the anal edge of the hind wings slightly embraces the abdomen; the discoidal cell of the hind wings is apparently closed by a slender vein. The caterpillars bear a very considerable resemblance to wood-lice, the head being retractile, and the feet very minute; the body is oval and depressed; the chrysalis is short, obtuse at each end, and girt round the middle as well as attached by the tail.

The family comprises several distinct groups, namely, such as are known to collectors under the names of blues, coppers, and hair-streak butterflies, respectively distinguished in our indigenous species by their varied tints of blue, fiery red, or dusky, with slender lines on the under side of the wings. In many of the exotic species, however, these colours run beyond the limits of their respective groups, thus

* The fore tarsi have been described by Messrs. Curtis, Stephens, etc., as identical in both sexes; but in examining the Indian Thecla Isocrates, I discovered that the tarsus of the male consists of a long simple joint; and I subsequently found the same to be the case in Polyommatus Corydon.

forming a series. The majority have the entire under surface of the wings, or at least the anal angle, ornamented with beautiful eye-like spots of various colours Some of the exotic species are amongst the most lovely of the butterfly tribes In many of these, the hind wings are produced into very long tails. Their flight is varied, some delighting to sail over the tops of oaks and other trees, on which they have passed their preparatory states, whilst others are feeble and slow in their motions, flying over low grass and herbage.

Dr. Horsfield has investigated the transformations of several of these insects, in his *Lepidoptera Javanica*, the larvæ of which vary very considerably in their form, some exhibiting a much slighter resemblance to wood-lice than others; some are very rough on the upper surface of the body; and that of Thecla Xenophon, a Javanese species, has several rows of fascicles of hairs. They have hitherto been observed to feed only upon the leaves of different plants and trees in the larva state; but a beautiful Indian species (Thecla Isocrates) resides within the fruit of the pomegranate—several (seven or eight) being found within one fruit—in which, after consuming the interior, they assume the pupa state, having first eaten as many holes as there are insects through the rind of the fruit, and carefully attached its footstalk to the branch by a coating of silk, in order to prevent its falling. (Westwood, in "Trans. Entomological Society," vol. ii., pl. 1).

I have already (in p. 30) referred to the arrangements which have been proposed by various authors, in order to bring this family, with its girt chrysalids, into connection with the Papilionidæ, in which the chrysalis is also girt. We are not sufficiently advanced in the knowledge of the transformations of exotic Lepidoptera to determine the soundness of these different views.

GENUS XXI.

THECLA, Fabricius.

This genus, as characterised by our English species, is at once known from the two following by the very gradually formed club to the antennæ, the short terminal joint of the palpi, the hairy eyes,* the short triangular fore wings and hind wings generally furnished with a short tail and strongly scalloped near the anal angles, and by the under surface of the wings being generally ornamented with one or two delicate lines of a pale colour on a dark ground. This last-mentioned peculiarity has led to the insects of this genus being named by collectors "hair-streak butterflies."

* Mr. Curtis, "Brit. Ent." pl. 264, represents the eyes of this genus as naked, although he describes them correctly

No genus has ever more strongly proved the great advantages to be derived from a minute, analytical examination of the different organs of insects than the present. For want of such an examination in the structure of the feet, which in this group affords sexual differences, the males of the beautiful species, Thecla Quercus, are described in all previous works on English butterflies as the females, and vice versâ. Even by Messrs. Curtis and Stephens, who introduce the structure of the fore feet into the characters of the genus, they are described as "alike in both sexes." For our knowledge of the peculiarities existing in these organs in the different sexes we are indebted to Dr. Horsfield, who was accordingly enabled to determine the sexes of the species with precision. The male anterior tarsus consists of a single long joint; which is as long as the entire *articulated* tarsus of the female, and when covered with scales might easily be regarded as similarly articulated. The intermediate thigh is also furnished with a remarkable tooth near the extremity, and there is a corresponding notch in the tibia.

In preceding pages (4 and 16), I have described the two different plans adopted by elongated Caterpillars, in order to effect their transformation beneath a girth across the middle of the body. The caterpillars of the present family, by their short wood-louse form, at first sight present far more apparent obstacles to the accomplishment of such a proceeding. We have only to fancy to ourselves a very stout little man, with his arms bound to his sides, and his legs tied together, laid upon his stomach on the ground, and whilst in that situation compelled to attach a rope on one side of his body, to carry it across his back, to fasten it on the other side, and then to undress himself. Reaumur has, however, so carefully and circumstantially described the proceedings of a species of this genus,* that we are enabled to bring the whole process before our mind's eye. When the period for the transformation of the insect is arrived, the caterpillar attaches itself by the tail, and shortening the fore part of the body by contracting the segments considerably, it emits an arched thread from the extended spinneret of its mouth, which it attaches at one side of the head; it then carries the thread to the other side, having the instinct to extend it to a fit length, in order that when the process is complete the body may neither be too much tightened nor too loose for support. After attaching a number of threads by passing the head backwards and forwards, omitting a continuous thread from the mouth during the process, a skein of between 50 and 60 threads (as Reaumur supposes) is formed, of a fit length, attached at each end at the sides of the head; which, as already stated, is drawn considerably backwards,

* Linnæus gives Reaumur's insect as his Papilio Pruni, but this it can scarcely be, for Reaumur's description does not accord with that species, and Reaumur found his larvæ on the elm.

owing to the great contraction of the anterior segments of the body. In this consists the chief difference between the proceedings of these insects and those of the swallow-tailed and cabbage butterflies, described in our previous pages, the head of the caterpillars of those species, owing to the slender form of the body, being thrown over the back, or greatly elevated. During the process of spinning this skein of thread, the caterpillar has contrived to insinuate its head beneath them, so that the skein rests upon the scaly back of the head, and when the skein is completed it gradually pushes the front of its body beneath the skein, pressing its body down as closely as possible, until it contrives that the middle of the body shall be girt by the skein. The difficulty is apparently increased by the very great delicacy of the threads, and by the body of the larva being clothed with strong short bristles. When completed, the skin of the caterpillar bursts, and the pupa appears; the process of getting rid of the old skin being similar to that adopted by the other girt caterpillars of the butterflies mentioned above.

The caterpillars of this genus are not found on herbaceous plants, but frequent trees and shrubs, over which the perfect insects fly. The species are very numerous, although we possess but very few; and even amongst those some very peculiar distinctions occur. Thus, in Thecla Quercus (contrary to the general rules of insect colouring), the female puts on the "imperial purple;" the fulvous patch in the fore wing of the female of Thecla Betulæ is found in the females of some exotic species, the males of which are adorned with the purple tint, whereas the males of Thecla Betulæ are obscurely coloured. The males of Thecla Rubi, Spini, and W-Album, are distinguished by having a small ovate glabrous patch at the extremity of the discoidal cell of the fore wings on the upper side.* Th. Rubi differs from all the rest in not having the hind wings tailed, and by the underside of the wings being neither marked with the slender pale hair-streak, nor by any ocellus at the anal angle.

Dr. Horsfield, who has described twenty-six species of these insects, found in Java, has divided the genus into two subgenera,—Thecla proper, and Amblypodia. Unfortunately, however, he did not investigate the peculiarities of the veins of the wings of his subgenera and sections; a character which the reader need scarcely be reminded has been already shown, in the pages of this work, to be of primary importance in determining natural groups. Although previously so greatly neglected, this character supplies the means of dividing our English species into two primary

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* This is produced by the dilatation of the base of the 2nd and 3rd branches of the postcostal vein.

groups,* which ought, perhaps, consistently to be considered as distinct subgenera, supported as they are by some other characters. It is, however, perhaps more advisable (until the exotic series of species is carefully investigated), to leave the genus entire, indicating the groups into which the British species are divisible. This plan is also adopted, because the investigation of the peculiarities in the veining of the wings is attended with great difficulty, the scales having to be carefully removed from the surface of the wings. It is certainly remarkable that we should find, in species so closely allied together as all the British Theclæ are, such a variation in the veins; more especially as we have seen that nearly all the Nymphalidæ, varying as they do so greatly in their preparatory as well as perfect forms, exhibit a general identity in the arrangements of these veins—but Nature, in every extensive group, shows us the impropriety of trusting to a single character, which, in some tribes, may be most important and constant, whereas, in others, it may become variable and of secondary importance.

Retaining Thecla Betulæ as the true Fabrician type of the genus, I divide it in the following manner:

I. Those in which the postcostal vein of the fore wings emits two branches before its union with the ordinary transverse vein, and a third branch beyond its union therewith; this third branch sending forth a superior branchlet. Males without a patch at the extremity of the discoidal cell of the fore wings; antennæ with the club very gradually formed.

Sp. 1. Thecla Betulæ. 2. Thecla Quercus.

II. Postcostal vein of the fore wings emitting, in both sexes, three simple branches before and none after its union with the ordinary transverse vein. Males with a thickened patch at the extremity of the discoidal cell of the fore wings; antennæ with the club more suddenly formed.

A, with the hind wings tailed. 3. Thecla Pruni. 4. Thecla W-Album. 5. Thecla Spini. 6. Thecla Ilicis.

B, with the hind wings not tailed. 7. Thecla Rubi.

SPECIES 1.—THECLA BETULÆ. THE BROWN HAIR-STREAK.

Plate xiii. fig. 2, 2*, 2 l, 2 p.

Synonymes.—*Papilio Betulæ*, Linnæus. Haworth, Donovan, vol. 8, pl. 250. Albin, pl. 5, fig. 7. Wilks, Brit. Butt. pl. 117. Harris, Aurelian, pl. 42. Lewin, pl. 42.

Thecla Betulæ, Fabricius. Leach, Stephens, Curtis, Duncan, pl. 27, fig. 1.

Lycæna Betulæ, Ochsenheimer.

Strymon Betulæ, Hübner (Verz. bek. Schm.)

This species being the true Fabrician type of the genus Thecla, is placed at the

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* Hübner unites all the Theclæ into one family (Fam C. Armati), of his Adolescentes, separating Rubi under the generic name of Lycus, and Quercus under that of Bithys; the remainder forming his Strymon. Ochsenheimer gives our Thecla as the third family of Lycœna, separating, however, Rubi from the rest, and uniting it with the second family containing the Coppers.

head of the species of Hair-streak Butterflies; moreover it is the largest British species of the genus, the fore wings extending from 1⅛ to rather more than 1½ inch; their upper surface is of a rich brown with a satiny gloss; the fore wings, in both sexes, are marked at the extremity of the discoidal cell with a short transverse black line, generally succeeded in the males by an obscure orange cloud (which is, however, sometimes wanting), and which in the females is replaced by a large kidney-shaped orange patch; the cilia is whitish; the hind wings are marked at the anal angle and at the base of the tail (and of the succeeding lobe of the female) with orange; there is also a minute white spot near the anal angle. The under side of the wings is tawny yellow, with the edge brighter orange; at the extremity of the discoidal cell of the fore wings is a short transverse dark line, edged with white, between which and the extremity of the wing is another broader dark orange wedge-shaped spot extending rather more than half-way across the wings, edged with a very slender dusky line, which is margined with white on the outside. The hind wings are somewhat richer coloured, especially near the anal angle, with an abbreviated white line edged externally with a dusky line extending half-way across the middle of the wing; between this and the margin of the wing is another slender irregular white line, edged internally with a dusky line, the space between these two dusky lines being rich orange; the anal angle is marked with small black spots, and the cilia on each side of the tail is striped with brown.

The caterpillar is pale green with paler oblique lines along the sides, and straight ones down the back. It feeds on the birch, black-thorn, plum, etc. The chrysalis is brown, with darker marks. The perfect insect appears in the month of August. It is by no means a common species, although widely distributed: Coombe, Birch, Hornsey, and Darenth Woods; Raydon Wood, near Ipswich; Barnwell-wold, Northamptonshire; Monks Wood, Cambridgeshire; Berkshire, Dorsetshire, Devonshire, Dartmore, and Norfolk, are given as the localities of this species.

SPECIES 2.—THECLA QUERCUS. THE PURPLE HAIR-STREAK BUTTERFLY.

Plate xiii. fig. 3, 3*, 3 l, 3 p.

Synonymes.—*Papilio Quercus*, Linnæus. Lewin, Pap. pl. 43. Donovan Brit. Ins. vol. 13, pl. 460. Wilkes, pl. 116. Harris, Aurelian, pl. 10, fig. a—g. Albin, pl. 52, fig. a—c.
Thecla Quercus, Leach. Stephens, Curtis, Boisduval, Duncan, Brit. Butt. pl. 27, fig. 3—4. Westwood, Introd. to Mod. Class. of Ins. 2, p. 357. fig. 100—8.
Bithys Quercus, Hübner.
Lycæna Quercus, Ochsenheimer.

This species varies in the expanse of its wings from 1¼ to 1½ inches. On the upper surface the wings are of an obscure blackish-brown, more or less tinged in the males with a purple hue, which extends all over them, except along the hind margin; the intensity of this purple tinge varying in different individuals.

The female, on the contrary (which is generally smaller than the male), has the wings brownish-black, with a splendid glossy blue patch, which nearly covers the discoidal cell of the fore wings, and extends towards the anal angle of these wings (differing, however, in size in different specimens), the hind wings being immaculate. On the underside there is no difference in the markings between the two sexes, the general colour being of a pale ashy-brown, the apical portion being rather paler; beyond the middle of the fore wings is a transverse straight white slender bar, which does not extend to the anal angle, edged internally with brown, and between this and the margin is a row of darker spots, edged with grey, those near the anal angle being the largest and varied with fulvous; a more irregularly waved white line runs across the hind wings beyond the middle, also edged internally with brown, and between this and the margin of the wing are two rows of whitish-grey scallops terminating towards the anal angle in a fulvous eye, having a black pupil, and edged internally with black, the anal angle itself is also marked with fulvous and black. The tail of the hind wings is of a black colour, and not so long in this species as in T. Betulæ. The body is black above, ashy-grey beneath, the eyes are margined with white, and the club of the antennæ is reddish on the under side.

Our figure 3 represents a remarkable specimen, taken in Scotland by Mr. Weaver in 1854, in which (although the antennæ and fore legs on both sides are decidedly female) the two wings on the right side are masculine, and those on the left are feminine.

This species is found about the middle of July, flying over the tops of oaks. It occurs plentifully throughout England, but is rare in Scotland. The caterpillar also feeds on the oak, and is a thick onisciform sluggish creature, clothed with short hairs, and with the upper surface of the body of a rosy hue with several rows of dark greenish lines or dots. In this state it offers several peculiarities worthy of notice, the head is small, and entirely retractile beneath the first segment of the body, which is semicircular and margined with two dark scaly patches in the middle; this segment also bears a pair of spiracles, which are wanting in the two following segments; they exist, however, in the fourth, fifth, sixth, seventh, eighth, ninth, tenth, and eleventh segments. It is remarkable that the three terminal segments are soldered together without articulation on the upper side, although traces of articulation occur beneath. The feet are very minute. The anal prolegs appear placed on a distinct fleshy segment. (*See* my "Introd. to Mod. Class. Ins." ii., fig. 100. 9, 10.)

The caterpillar is found in the beginning of June. The chrysalis is of a shining

rusty-brown colour, with three rows of brown spots on the back. A writer in "Loudon's Magazine of Natural History" (No. 32) states that the caterpillar of this species goes under-ground to effect its transformations, but its ordinary habit is certainly to attach itself to the underside of the leaves of the oak.

SPECIES 3.—THECLA PRUNI. THE BLACK HAIR-STREAK BUTTERFLY.

Plate xiv. fig. 1, 1*, 1 l, 1 p.

SYNONYMES.—*Papilio Pruni*, Linnæus, Hübner.
Thecla Pruni, Stephens, Illustr. Haust, vol. 2, p. 66, note (not vol. 1, p. 77, which is W-Album). Curtis, Brit. Entomol. pl. 264. Duncan, Brit. Butt. pl. 28, fig. 1.
Thecla Spini, Brit. Butt. p. 30.
Strymon Pruni, Hübner (Verz. bek. Schm.).
Lycæna Pruni, Ochsenheimer.

This species measures from 1¼ to nearly 1¾ inch in the expansion of its wings, which are of brownish-black colour, the anterior in the males having a small silky oval patch near the middle towards the costal margin, the posterior wings have two or three (and sometimes more) orange-coloured lunular spots near the hind margin towards the anal angle, where there is a small bluish dot occasionally, as in the upper figure of the twenty-fifth Plate. The orange lunules exist along the entire margin of the hind wings, and extend into the fore wings; but such is of rare occurrence, if indeed it be not the character of the female, as stated by Mr. Stephens. Beneath the ground colour is of a lighter brown, having an ochre-tint; the fore wings having a slender nearly straight bluish-white line extending across the wing beyond the middle, and reaching to the inner margin of the hind wings, where it assumes a more irregular appearance, somewhat resembling an obtuse W; beyond this line the fore wings are marked with several obscure fulvous patches, those nearest the anal angle being preceded by a small black and silvery dot or eyelet; these black spots, seven in number and edged internally with silver, are more conspicuous on the hind wings, and are succeeded by a broad fulvous bar extending to the anal angle, the outer edge of which is marked with semicircular black marks (followed by a silvery line), those nearest the anal angle being the largest; the anal angle itself is black with a silvery dot. The cilia is black at the base, and externally silvery with black spots; the tails are black, the antennæ are annulated with white, and the eyes are margined with the same colour.

This butterfly has only been known as a native species during the last few years, the earliest notice of its occurrence having been given by Mr. Stephens, as above referred to (and not in vol. ii., p. 69, of the "Illustrations" as referred to by Mr. Stephens in vol. iv., p. 382). Shortly afterwards it was figured by Mr. Curtis in his "Illustrations," who states that a number of specimens had been taken in Yorkshire, by Mr. Seaman, in the preceding July (1828). Mr. Stephens states,


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however, that this locality is erroneous, and that the insect occurs in profusion in Monk's Wood, Herts. It is true we find a Thecla Pruni, in English works published previous to this period, but the fact was that English entomologists had mistaken the next species (Thecla W-Album) for the Linnæan Papilio Pruni, until the capture of the real species enabled them to correct their error. Mr. Bree informs us that this butterfly has been taken by his son in great abundance in Barnwell-wold, in July, 1838, where also Mr. F. Bond has since found it equally common.

The caterpillar is green, with oblique yellowish lines at the sides, and darker marks down the back. The chrysalis is brown, with lighter markings and dark tubercles.

SPECIES 4.—THECLA W-ALBUM. THE W-HAIR-STREAK BUTTERFLY.

Plate xiv. fig. 2, 2 *, 2 l, 2 p.

Synonymes.—*Papilio W-Album*, Villers Ent., vol. 2, pl. 4, fig. 12.

Thecla W-Album, Hübner, Godart, Stephens, Illust. vol. 2, p. 66; Curtis; Duncan, Brit. Butt. pl. 28, fig. 2.

Papilio Pruni, Lewin Pap. pl. 44. Haworth, Donovan, Brit. Ins. vol. 13, pl. 437.

Thecla Pruni, Leach, Jermyn, Stephens's Illust. vol. 1, p. 77.

Strymon W-Album, Hübner.

Lycæna W-Album, Ochsenheimer.

This species is closely allied to the preceding, but may at once be distinguished by the want of the orange marks on the upper side of the wings, and the more acute form of the W near the anal angle of the hind wings beneath, whence the name of the species. The expansion of the wings varies from a little less than 1¼ to rather more than 1½ inch. The upper surface of the wings is of a uniform dark brown or blackish, with a minute white, and sometimes a few rufous scales near the anal angle. The males have an oval glabrous spot near the middle of the fore wings towards the costa. On the under side, the ground colour of the wings is of a paler brown, and the fore wings are marked beyond the middle with a transverse white line (which is rather broader and more wavy in the female than in the male), and which does not extend to the anal angle; the hind wings are traversed by a slender white line beyond the middle, which is more slender and greatly angulated near the abdomen, forming the letter W. A row of slender black lunules (slightly edged internally with white) runs nearly parallel with the outer margin of the hind wings, succeeded by a fulvous band extending from the anal angle about half-way towards the outer angle of this pair of wings, where it becomes gradually obliterated; externally this band is marked with black semicircular spots, succeeded by a silvery line at the base of the cilia (those nearest the anal angle being largest); the anal angle itself is black, with a silvery dot. The tails are black, tipped with white those

of the females being the longest: the antennæ are ringed with white, the tip reddish, the tarsi whitish, ringed with brown.

The caterpillar is green, the posterior segments of the abdomen being spotted with dark red, and two rows of small dots down the middle of the back, which is dentated, and paler oblique lateral marks. Previous to undergoing its transformations, it assumes a brown colour. The elm and the black-thorn have been given as its food. The chrysalis is brown, with a white head.

Until recently this was a scarce insect, and was confounded with the preceding.* In July 1827, however, Mr. Stephens found it in myriads enlivening the hedges for miles in the vicinity of Ripley (but not to the north or north-west of the village, although the bramble, upon the blossoms of which it chiefly delighted to settle, was in equal profusion there). Of their astonishing numbers then observed, an idea may be obtained when it is stated that he captured nearly 200 specimens in less than half an hour as they approached the bramble-bush near which he had stationed himself. This is the more remarkable, as he had never previously observed it in that neighbourhood, although he had frequently collected there; near Windsor, Cambridgeshire; near Ipswich, and Bungay, Suffolk; and Southgate, Middlesex, have been given as additional localities. The Rev. W. T. Bree also informs us that his son has taken it sparingly in Barnwell-wold, and that it occasionally occurs near Allesley; and Mr. F. Bond, that it occurs at Monks Wood, Cambridgeshire, and near Yaxley, its larva feeding on the elm.

SPECIES 5.—THECLA RUBI. THE GREEN HAIR-STREAK BUTTERFLY.

Plate xiii. fig. 4, 4*, 4 l, 4 p.

SYNONYMES.—*Papilio Rubi*, Linnæus, Lewin Pap. pl. 44. Haworth, Donovan, Brit. Ins. vol. 13, pl. 443. Wilkes, pl. 118. Harris, Aurelian, pl. 26, figs. a. b. d. g. Albin, pl. 5, fig. 8.

Thecla Rubi, Leach, Stephens, Curtis, Duncan, Brit. Butt. pl. 28, fig. 3.

Lycus Rubi, Hübner. (Verz. bek. Schmett.)

This species, which from the nature of the food of its larva is more frequently observed flying nearer the ground than its congeners, varies in the expanse of its wings from one inch to an inch and a third; on the upper side the wings are of a uniform obscure brown colour, with a slight silky gloss, especially in the male, which has an oval opake spot near the middle of the wing towards the costa; the base of the wings has also a slight greenish tinge; on the under side the wings are of a uniform pea-green, except along the inner edge of the fore wings, which is hidden by the fore edge of the hind ones, and is of a brownish colour. The hind wings are marked beyond the middle with a row of minute white dots, which vary in their size,

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* "Papilio W-Album, Villars, 2, 83, t. 4, t. 12, a. P. Pruni nullo modo differt." Haworth "Lep. Brit." p. 38.

being sometimes obsolete, and sometimes so large as to form a streak across the wings. The tail is obsolete, its place being indicated by a slight projection or tooth, besides which there are several others, so that this pair of wings is denticulated. The ciliæ are brown, dotted with black in the hind wings. In addition to the variation in the size of the white dots on the hind wings beneath, Mr. Stephens mentions a variety in which the fore wings on the under side have a row of white dots on the front margin; the female has also occasionally a pale whitish oval dot near the middle of the fore wings towards the costa.

The caterpillar is pubescent, light green, with lateral rows of triangular yellow spots, and a white line above the legs. The head is black. It feeds on the bramble, broom, dyers'-weed, etc., and may be found at the middle of July. This butterfly, which flies over white thorn hedges, and especially bramble-bushes and other low shrubs on which the caterpillar feeds, further differs from the rest of the genus in being double-brooded; the first brood appearing in May or at the beginning of June, and the second at the beginning of August. It appears to be distributed over the greater part of our island; it has, however, only been observed in the southern counties of Scotland.

GENUS XXII.

CHRYSOPHANUS, Hübner; (Polyommatus, Boisduval; Lycæna, Stephens.)

This genus, restricted to the butterflies which are termed Coppers by collectors, is distinguished from the other species of the family not only by the brilliant colour of the upper surface of the wings, but by having the antennæ long, and terminated by an abrupt fusiform club, which is not spoon-shaped; the hind wings more denticulated than in the Blues, but destitute of the tails; the pulvilli of the feet are also larger than in the last-named genus, whilst the naked eyes separate the species from those of Thecla. In the males of most of the species the hind wings have the anal angle produced, and in the females the hind margin of the wing joining the angle is subemarginate. The palpi are nearly straight, with the last joint naked, rather long and subulated, and the head is narrower than the thorax. The postcostal vein of the fore wings emits three branches extending to the costa, the third of which, arising near to, or rather beyond, the union of the postcostal with the ordinary transverse vein, is forked, as in Thecla Quercus, and Betulæ. Boisduval's figure of the veins of this genus, "Hist. Nat. Lep." 1, pl. 6–C, fig. 7, is (as I am sorry to say is the case with many of his other figures of the veins) inaccurate. The ground

colour of the wings above is fiery orange, at least in one sex, and the females have the upper side of the wings always marked with black spots.

The caterpillars resemble rather elongated woodlice, and appear somewhat hairy when seen through a lens. They feed on low plants. Dr. Horsfield, indeed, considers that the chief difference between his genera Polyommatus and Lycæna depends on the variation of the metamorphosis, the larva in the former being regularly rounded or cylindrico-gibbose; in the latter more oblong and impressed at the sides. He, in fact, states that in the antennæ and palpi of these two genera no tangible difference can be pointed out; the distinction derived from the wings is, however, more decisive, the differences, though not easily described in words, being readily seized by an experienced eye. The British Blues are altogether without tails, and their character is well preserved in the oriental tropical regions; but it is remarkable that in that part of the world no true Coppers have been discovered, which, in Europe, chiefly constitute the present genus.

The relationship of this genus with that of the Blues is indeed very close, and we accordingly find considerable diversity of opinion as to the employment of the generic names of the two groups. Latreille in all his works employed the name Polyommatus for the whole of the species of the present family, giving at the first our Thecla as the primary division, whilst in his late works he gives one of the Blues as an example of the genus. Fabricius separated some of the Hair-streaks under the name of Thecla, retaining the Blues and Coppers, together with a great number of foreign species, under the name of Lycæna, which name Ochsenheimer employed, arranging, however, the entire family under this generic name, and forming the Blues, Coppers, and Hair-streaks into three groups or families. Mr. Curtis, in his "British Entomology," gave the Blues and Coppers under the genus Lycæna; but in his "Guide" he has adopted the nomenclature of Mr. Stephens, namely, Thecla for the Hair-streaks, Lycæna for the Coppers, and Polyommatus for the Blues.

Dr. Horsfield, in his beautiful work on the Lepidoptera of Java (which, it is to be hoped, will still be completed, at least as far as regards the diurnal Lepidoptera), placed in the genus Polyommatus only two Javanese species allied to P. Alsus and P. Argiolus, but greatly enlarged the limits of Lycæna, making it comprise many Blues; whilst Boisduval adopts the name Lycæna for exotic insects, such as P. Bœticus, Linn., calling our Blues by the name of Argus, taken up from Scopoli and Geoffroy, and our Coppers Polyommatus.

Such is one of the many instances of confusion to be met with in the works of modern entomologists, owing to the want of some fixed principle regulating the adoption of old generic names when the genera are required to be cut up into minor

groups. The names both of Lycæna and Polyommatus were, as we have seen, intended to indicate groups of greater extent than our present genera. If, therefore, we form our Coppers into one group, and our Blues into another, the generic names Lycæna and Polyommatus, as intended by their original proposers, are not applicable thereto, unless indeed we can ascertain that they were regarded by the proposers of such names as their types; and we have seen that such is not the case with either name; the Hair-streaks being placed at first at the head of Polyommatus by Latreille, whilst we find the Coppers at the end of the genus Lycæna of Fabricius. The Purple Emperor, again, is placed at the head of the Argus group by Geoffroy, which also includes the Blues and the Coppers. In such cases my opinion is that (in order to avoid such distracting confusion) wherever a species or division of a genus is separated from an old genus, a new name ought to be given to it, unless such species or division be the true type of the old genus, when, of course, it will retain the old generic name. Instances might be pointed out in which entomologists are agreed as to the nomenclature of a group, although from the non-adoption of some such principle as this, an old generic name has been abstracted from the true type of a genus and conferred upon an aberrant species; but in the case of the Copper and Blue Butterflies no such uniformity of opinion prevails, each writer having acted without any principle. In the present instance, therefore, I feel no hesitation in rejecting the nomenclature of recent Lepidopterologists, being convinced that a revision of the entire family Lycænidæ will necessitate the establishment of a much greater number of named groups, when the name of Lycæna will have to be restored to the true type of the genus. I have, therefore, adopted Hübner's name Chrysophanus for the present group, which is quite expressive of their splendid appearance, being derived from the Greek words Φρυσός, gold, and φαίνω, to appear.

SPECIES 1.—CHRYSOPHANUS PHLÆAS. THE COMMON COPPER BUTTERFLY.

Plate xiv. fig. 3, 3*, 3 l, 3 p.

Synonymes.—*Papilio Phlæas*, Linnæus. Haworth, Lewin, pl. 41. Donovan, vol. 13, pl. 466. Harris, Aurelian, pl. 34.

Lycæna Phlæas, Fabricius. Ochsenheimer, Leach, Stephens, Curtis. Duncan, British Butterflies, plate 30, fig. 3. Wood, Ind. Entom. t. 2, fig. 56.

Chrysophanus Phlæas, Hübner (Verz. bek. Schmett.)

Polyommatus Phlæas, Boisduval.

This very pretty, and at the same time abundant, species varies in the expanse of its wings from 1 to 1½ inch. The fore wings on the upper side are of a shining fiery copper-colour, ornamented on the disc with from eight to ten black spots of unequal size and dissimilar shape, of which the three or four nearest the extremity of the wing are placed transversely, and more or less confluent, and are preceded by a detached spot which is larger than the rest. The front margin of the wing is

narrowly, and the hind margin broadly edged with brown: the hind wings above are dark brown, powdered at the base with copper, with several nearly obsolete black marks on the disc; near the hind margin is a bar of copper of variable breadth, edged above and beneath with black spots, so as to cause the bar to appear as if formed of five confluent patches. The upper row of these black spots is often preceded by blue irrorations. Beneath, the fore wings are of a fulvous colour, without any gloss, the black spots being more distinct and slightly edged with buff, one near the base of the wings, and a minute one on the costa near the tip, being on this side quite distinct; the hind margin is drab-coloured, with several dark-coloured crescents next the anal angle; the under wings on this side are also drab-coloured, with numerous minute, nearly obsolete brown marks placed transversely, and with an obscure narrow orange band parallel with the hind margin. The tails in this species are longer than in the others of the genus. The body above is black, with tawny hairs about the head and thorax, and drab-coloured beneath. There is no difference in the colour and markings of the two sexes.

The perfect insect is distributed throughout the country, and appears at the beginning of April, June, and August: thus there are several broods in the course of the year. The caterpillar is green, with a pale dorsal and lateral line, and feeds on the sorrel. I have received specimens from North America.* It also occurs throughout Europe and in Asia.

This species, in the similarity of the markings in the two sexes, the greater length of the tails of the hind wings, and in the circumstance of there being several broods in the course of the summer, is aberrant from the general characteristics of the genus. This is one of our most elegant and active butterflies, frequenting pasture-lands, commons, heaths, etc., and keeping up a continual warfare with its fellows. Its beautiful appearance in the glowing sunshine, especially when contrasted with the colours of the flowers on which it delights to settle, renders it conspicuous to every passenger.

There is considerable variation in the intensity and extent of the copper markings of this species. In addition to these ordinary variations, three other more striking varieties have been found: one, in which the copper band of the hind wings is quite obliterated; another, in which the copper colour on both surfaces of the wings is replaced by milk-white (of which variety there is a specimen in the Collection of the Entomological Society of London from the cabinet of Mr. Kirby);

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* It is proper to observe, that my American specimen differs in the decided black spotting of the under side of the hind wings, the bright red streak near their hind margin, and in wanting the minute spot on the costa of the fore wings; but these characters can scarcely be held to constitute a distinct species.

and a third (figured in our "Brit. Butt." plate 28, fig. 8), in which, on the contrary, it is the black portion of the wings which is replaced by milk-white.

SPECIES 2.—CHRYSOPHANUS CHRYSEIS. THE PURPLE-EDGED COPPER BUTTERFLY.

Plate xiv. fig. 4.

SYNONYMES.—*Hesperia Chryseis*, Fabricius.
Papilio Chryseis, Haworth. Sowerby, British Miscell. 1, pl. 13.
Lycæna Chryseis, Ochsenheimer. Stephens, Duncan, Brit. Butt., pl. 30, fig. 1. Wood, Ind. Entom., t. 2, f. 57.
Chrysophanus Chryseis, Hübner (Verz. bek. Schmett.)
Papilio Hippothoë, var., Esper, pl. 62, fig. 1.
Pap. Eurydice, Borkhausen.

The expansion of the wings of this handsome species is about two inches and a half. The upper side of the wings in the male is of a shining copper-colour, of a redder tint than in C. Phlæas. At the extremity of the discoidal cell in all the wings is a slender black bar; the hind margin is brown, within which, as well as along the front edge of the fore wings, is suffused a rich purple tint, which extends also along the anal edge of the hind wings, which in that part have the ground colour of a brown hue, which extends in a broad margin along the extremity of these wings, having an ill-defined series of copper spots near the anal angle. The female, on the contrary, has the disc of the fore wings above of a dull copper colour without any gloss, and with the edges brown; there is also a dot in the middle, and a bar at the extremity of the discoidal cell, a curved bar of six brown spots beyond the middle of the fore wings, and a more indistinct row of smaller spots nearer the margin; the disc of the hind wings is entirely brown, with a narrow bar of dull orange near the anal angle, spotted with brown both above and below. Beneath, both sexes are alike, except that the fore wings of the female have the disc more suffused with orange. The ground colour of all the wings on this surface is ashy drab, with the margins more grey, and the base more slate-coloured or bluish; the fore wings have about seventeen black spots of variable size, ocellated with white; the three anterior ones placed longitudinally, the third being transverse, succeeded by seven in a curved series, the remainder more indistinct, and running parallel with the extremity of the wing; each of the hind wings is marked with about thirty similar ocellated spots, those at the base of the wings being scattered about, whilst the others are arranged in transverse curved bands, those upon the margin of the wing being almost obsolete; between these and the preceding row of spots, the wings are dashed with orange near the anal angle. There is, however, considerable diversity in the ground colour of the wings beneath, as well as in the number of spots; the specimen figured, for example, in the upper part of our plate 28, has fewer than the ordinary number of ocellated spots.

This is one of the rarest British species; indeed, by some collectors its claim to be considered an indigenous insect is considered as doubtful. Mr. Stephens informed me that Dr. Leach received fine and recent specimens from the vicinity of Epping for several successive seasons previous to the termination of the war in 1815. I believe, however, they were obtained from a dealer, who persisted in keeping the precise locality secret. This, of course, he would have done whether the specimens were native or obtained from abroad, as it would have diminished their value, if British, had other collectors been made acquainted with the spot. It is also said to have been taken in Ashdown Forest, in Sussex. It appears at the end of the summer, frequenting marshy places.

SPECIES 3.—CHRYSOPHANUS DISPAR. THE LARGE COPPER BUTTERFLY.

Plate xv. fig. 1 ♂, 1 ♀, 1*, 1 l, 1 p.

Synonymes.—*Papilio dispar*, Haworth. Kirby and Spence, Introd. to Ent. 1, pl. 3, f. 1, male.

Lycæna dispar, Curtis, Brit. Ent. 1, pl. 12. Duncan Brit. Butt. pl. 29, fig. 1—2. Wood, Ind. Ent. t. 3, f. 59, male and female. Swainson, Zool. Illust. n. ser, pl. 132.

Polyommatus dispar, Boisduval, Icon. Histor. Lepid. Eur. pl. 10, fig. 1—3.

Papilio Hippothöe, Lewin, Pap. pl. 40. Donovan Brit. Ins. pl. 217.

Papilio Hippothöe, var., Esper. Pap. pl. 14, fig. 1—2.

This splendid species varies in the expanse of its wings from 1½ to rather more than 2 inches. The upper surface of the wings in the male is of a brilliant fiery copper colour, similar in its tone to that of L. Phlæas. The fore wings are marked with a small black spot in the middle, and a transverse one at the extremity of the discoidal cell; between the latter and the outer margin of the wing are to be observed traces of the spots of the under side; the front margin and extremity of the fore wings are narrowly edged with black, which is broadest at the apex of the wing. The hind wings have also a slender transverse mark at the extremity of the discoidal cell, between which and the hind margin are also traces of the rows of spots of the under side; the hinder and anal margin are also black; on the margin are five black spots, the anal one being doubled. The fore wings in the female on the upper side are of a darker copper colour, the base and fore margin being irrorated with brown; on the disc are eight black spots, one within, and another at the extremity of the discoidal cell, the others forming a transverse bar beyond the middle of the wing, the inner one being doubled. The rudiment of another spot also appears near the base of the wing. The black outer margin is broader than in the male. The disc of the hind wings in this sex above is brown-black, more or less irrorated with copper, the veins being copper-coloured, running into a bar of copper near the hinder extremity of these wings, the edge itself being brown with six

triangular black-brown spots extending into the copper bar and giving it a lobed appearance.

On the under side both sexes are alike; the disc of the fore wings being pale fulvous with the edges ashy, with ten very distinct black ocellated spots, each with a slender pale iris: three of these spots are placed longitudinally, the others forming a waved band across the wing, the two inner ones being small, more or less confluent; this is succeeded by a row of obscure unequal-sized dark spots. The hind wings beneath are of a pale silvery blue, which becomes greyer as it recedes from the body, with a slender oblique bar at the extremity of the discoidal cell, and about twenty-five black spots, various in size, those towards the base of the wings being placed irregularly and ocellated with white, as well as the transverse irregular row formed of nine spots beyond the middle of the wing. This is succeeded by a row of dark spots, followed by a submarginal fulvous bar, between which and the grey extremity of the wing is a very indistinct row of similar spots. The caterpillar is described by Mr. Stephens as "somewhat hairy, bright green with innumerable white dots; it feeds upon a kind of dock. The chrysalis is at first green, then pale ash-coloured, with a dark dorsal line and two abbreviated white ones on each side, and lastly sometimes deep brown." The fen districts of Cambridge and Huntingdonshire are the localities for this beautiful species, which appears not to be known as a native of any other part of Europe. Benacre, Suffolk, and Bardolph Fen, in Norfolk, have also produced it. It is also said to have been taken by the botanist Hudson in Wales; but Mr. Stephens thinks it probable that this locality belonged to P. Hippothöe. Donovan states that the specimens from which his figures are drawn were from Scotland; but Mr. Haworth says, "Nunquam in Scotiâ ut amicus meus E. Donovan ex informatione erroneâ dixerit."

Within the last twenty years the insect has become common in collections, owing to the immense numbers taken by collectors in the former localities, which, together with the draining of the fens, as I understand, has almost, if not entirely, extirpated the species.

Boisduval, who at first gave it as Hippothöe, has since figured it under the name of Polyommatus dispar, observing, "ce joli Polyommatus n'est très probablement qu'une variété locale d'Hippothöe, remarquable par sa taille. Il est au moins un tiers plus grand qu'Hippothöe du Continent; ses ailes sont d'un fauve plus vif, et elles ont souvent un reflet un peu purpurin."

The end of July and the beginning of August is the period of the appearance of this insect in the perfect state; it is found flying amongst the reeds growing in the fens, and is very active. In "Loudon's Magazine of Natural History," (No. 37,) Mr. Dale has noticed a variation in the form of the wings of this species.

SPECIES 4.—CHRYSOPHANUS HIPPOTHÖE. THE DARK UNDER-WINGED COPPER BUTTERFLY.

Plate xv. fig. 2♂, 2l, 2p.

SYNONYMES.—*Papilio Hippothöe*, Linnæus. Rosel, Ins. Bel. cl. 2, t. 37, f. 6—7, male. Haworth, Ent. Trans. p. 333 (nec. Lewin et Donovan).

Lycæna Hippothöe, Stephens. Curtis, Duncan, British Butterflies, plate 30, fig. 2. Wood, Ind. Entomol. pl. 2, fig. 58, male; pl. 3, fig. 58, female.

Polyommatus Hippothöe, Boisduva..

Chrysophanus Hippothöe, Hübner (Verz. bek Schmett.).

This species, which has been regarded by many Entomologists as specifically identical with the preceding, differs from it in its constantly smaller size, the fore wings never expanding more than an inch and a half. It is, therefore, described by Linnæus as of the size of Virgaureæ.* The wings of the male on the upper side are of a pure tawny or fulvous colour, with the outer edges alone black, and in the hind wings marked within with small black spots, of which the fourth is placed nearer the base of the wing. In most specimens there is also a transverse line at tne extremity of the discoidal cell. The female has the upper surface of the fore wings dull copper with spots, arranged as in Ch. dispar ♀, but smaller. The hind wings have the entire upper surface dusky without orange veins, but marked with darker spots, the margin itself being black and internally crenated. On the under side both sexes resemble each other, the disc of the wings being luteous ash-coloured, with fewer and smaller spots, but similarly ocellated, as in Ch. dispar, three of larger size being placed along the discoidal cell longitudinally, succeeded by an irregular row placed transversely, and several very minute ones parallel with the outer margin; the hind wings beneath are ash-coloured, with about seventeen ocellated spots, and a fulvous band on the hinder margin anteriorly spotted with black.

Although regarded by some authors as specifically identical with Ch. dispar, the present species differs in its smaller size, more tawny hue of the upper side of the wings of the male (generally destitute of the small transverse bar or streak at the extremity of the discoidal cell of the fore wings), fewer and smaller spots on the under side of the wings, and more uniform hue of the hind wings of the female, which seems to warrant a specific distinction between the two insects: moreover, as Mr. Stephens observes, amongst several hundreds of Dispar which have been taken at Whittlesea Mere, not one specimen occurred agreeing with the true Hippothöe. Nothing is known with certainty as to the true locality of this species, of which several specimens were preserved in old English collections. It is presumed however, that one of these was taken in some part of Kent, having been obtained

* In the Linnæan Cabinet, a specimen of Chr. Chryscis is attached to the Linnæan label of C. Hippothöe.

from an old collection made in that county, known to collectors under the name of the Kentish Cabinet.

SPECIES 5.—CHRYSOPHANUS VIRGAUREÆ. THE SCARCE COPPER BUTTERFLY

Plate xv. fig. 3 ♂, 3 l, 3 p.

Synonymes. — *Papilio Virgaureæ*, Linnæus; Haworth; Donovan, vol. 5, pl. 173, male; Lewin, pl. 41, f. 1—2.

Lycæna Virgaureæ, Fabricius; Ochsenheimer; Stephens, Brit. Ent. 1, pl. 9, fig. 1—2, male, fig. 3, female. Duncan, Brit. Butt. pl. 29, fig. 3; Wood, Ind. Ent., t. 3, fig. 60, male and female.

Chrysophanus Virgaureæ, Hübner, (Verz. bek. Schmett.).

This very distinct species is about the size of Ch. Hippothöe, the fore wings expanding about an inch and a half; the upper surface of all the wings is of a very rich yellow copper colour, without any discoidal spots or any clouds indicating the situation of the spots on the under side of the wings; the margin of all the wings is black, and more or less narrow; the hind wings having, moreover, a few black spots near the posterior edge, and confluent with the dark margin, except the two next the anal angle, which are close together and smaller than the rest. The female is more obscure in the colours of the upper side, with a spot in the middle, and a larger one at the extremity of the discoidal cell; beyond this is an irregular row of black spots, which is succeeded by a submarginal row of six large somewhat confluent black spots. The hind wings are more variegated in their appearance than in any other species, being of an obscure fulvous colour at the base, a large discoidal patch and several dashes of brown between the veins of the wings (including a transverse curved row of seven larger spots, nearly square, beyond the middle of the wing), and a marginal row of smaller ones of a dusky brown colour. Beneath, the sexes are nearly similar, being of a dull fulvous stone colour, the base and extremity being irrorated with greenish. In the discoidal cell are two small black spots, and a transverse one at its extremity; beyond this are six or eight small black spots placed irregularly but in pairs, and beyond this the margin is clouded with a row of dusky spots. The posterior wings are dusky at the base, and they are marked with about twelve small black spots, those towards the base of the wing being placed irregularly, but those near the middle placed in a series across the wing, each with a small patch of white below it, so as unitedly to form an interrupted white bar. Near the anal angle are a few orange spots, and the angle itself is rather acute, and has an emargination adjoining it.

The caterpillar is pubescent, and of a dull green colour, with a pale yellow line on the back, and pale green streaks on the sides. It feeds on the Golden-rod, Sharp-dock (Rumex acutus), etc. The chrysalis is brownish yellow, with dusky red wing-covers.

No specimens of this species having occurred for a great number of years, the claim of this insect to be regarded as indigenous has begun to be questioned. It has at all times been very rare. According to Lewin, two specimens of it were taken by himself in marshes; and Donovan states that one was once taken in Cambridge. The marshes in the Isle of Ely and Huntingdonshire are also stated as localities of this butterfly, which appears in the perfect state at the end of August. I possess a specimen, given to me by the late Mr. Haworth as an undoubted native specimen.

POLYOMMATUS,* Latreille (op. recentior).

(*Polyommatus*, Stephens; Curtis; Horsfield; nec Boisduval. *Argus*, Geoffroy, Scopoli, Boisduval. *Lycæna*, fam. A. Ochsenh. Fabricius.)

Referring to the observations made under the genus Chrysophanus (pp. 91, 92), as to the close relationship existing between that genus and the present (which comprises the Blues of collectors), it will be sufficient in this place to observe that this genus is distinguished by having the upper surface of the wings generally of a blue colour, especially in the male, but occasionally brown in the females, with a row of fulvous spots near the outer margin; the under surface generally greyish with numerous ocelli, with black pupils surrounded by white irides.

The antennæ are filiform, and terminated by an abruptly-formed elongated compressed club terminating in a lateral point. The palpi are longer than the head, with the terminal joint naked and sharp. The fore legs have been described as alike in both sexes; but such is not the case. (See *ante*, p. 81, note, and my Introd. to "Mod. Class. of Ins.," vol. ii., p. 358, fig. 100., [12. 13.]). The tarsi are furnished with minute simple ungues extending beyond the minute pulvilli. The wings are entire and without tails, the posterior being scarcely denticulated at the anal angle. The larvæ are onisciform, with the head and feet very small and scarcely perceptible, the body laciniate, the back elevated and generally beautifully coloured. The pupa is rather long, naked, and of a whitish colour, with some dusky spots on the back and sides. The species generally undergo their transformations on the stem of a plant, but occasionally beneath the surface of the earth.

The genus extends all over Europe. Species are also found in the north of Africa, the Cape of Good Hope, Madagascar, the Isles of France and Bourbon, the East Indies, and North America. Boisduval also mentions a species from New Ireland. I possess several species from New South Wales; and Captain Ross

* Πολὺς, many, and ὄμμα, an eye, in allusion to the numerous ocelli on the under side of the wings of the genus.

brought one from the Arctic regions. Mr. Swainson, however, informs us that they are almost unknown in South America. Caterpillars of such species as have been observed feed upon leguminose herbs, such as Trifolium, Lotus, Onobrychis, Medicago, etc.

From the generic synonymes given above, it will be seen that the French, German, and English schools of Entomology are at variance as to the name to be given to these insects. If in this instance I have followed the authors of our own country, it is; first, because Latreille himself, the founder of the genus, has in his later works given one of the Blues as its type; secondly, because the name is a very expressive one for the Blues; and thirdly, because the objections to the use of either of the names of Argus or Lycæna for the present group are as strong as those against the employment of that of Polyommatus.

The number of the species in the genus being considerable, Ochsenheimer divided it artificially into two sections, according to the presence or want of a row of fulvous spots within the hind margin of the posterior wings beneath. Subsequently Mr. Stephens observed, that "P. Argiolus differs from its indigenous congeners by the form and texture of its wings; that P. Alsus, Agestis, and Artaxerxes are characterised by a uniformity of colouring in both sexes; while the remaining species are distinguished in general by the males being blue above, and the females brown, excepting Po. Arion and Alcon, in which the latter sex is known by a predominance of brown above, and by having the disc considerably spotted with dusky or black, and that the five first species (Argiolus, Alsus, Acis, Arion, and Alcon,) are destitute of a marginal fascia beneath, which is, however, rudimentary in the two last-mentioned insects. Again; some few of the species have the eyes pubescent, while others have them naked." ("Illustr. B. Ent." Haust. 1., p. 85.)

Dr. Horsfield, in the "Lepidoptera Javanica," divided the genus Polyommatus into two subgenera; the first named Pithecops, from the peculiar aspect of the chrysalis, distinguished by a very distinct habit and aspect, "owing to the great length and lateral expansion of the wings, to their comparative *narrowness*, and to their (especially the posterior pair) being regularly elliptical and rounded in the anal region." This subgenus is represented in the European Fauna by P. Alsus and several others described by Ochsenheimer, having the character "alæ integerrimæ." The subgenus Polyommatus, properly so called, is characterised by Dr. Horsfield by having the margins of the hinder wings with the anal extremity angular, and produced to a short, rounded point. Mr. Stephens, in his subsequently published Catalogue, adopts these two subgenera as sections, giving Argiolus and Alsus, as well as Acis, as belonging to Pithecops; and in his

manuscripts, which he was so kind as to allow me to examine, he confines Pithecops to Argiolus, giving Alsus, Acis, Arion, and Alcon under the sectional name of Nomiades, and the remainder under that of Agriades, from Hübner. As, however, Dr. Horsfield gives Alsus expressly as the European type of Pithecops, which he characterises by the comparative narrowness of the wings, and as Argiolus has broader wings than any other European species, we must restrict Pithecops to P. Alsus; which species, indeed, possesses a peculiarity in the arrangement of the veins of the fore wings which has not hitherto been noticed, and which I have found in no other Lepidopterous insect, thus confirming Dr. Horsfield's views. As, however, in treating on the genus Thecla, I did not consider it advisable to separate T. Rubi, although differing from the other species in the veins of the wings, so I shall not in the present genus separate Alsus generically from the rest, considering them too closely allied together to allow of such a step. My arrangement of the species is therefore as follows:

Section I.—(Pithecops, Horsfield.) First branch of the post or subcostal vein of the fore wings coalescing with the mediastinal or costal one, and subsequently again branching off from it. P. Alsus.

Section II.—(Polyommatus proper.) First branch of the post or subcostal vein free, and extending to the costa of the fore wings; the other veins as in Thecla proper.

subsection I.—Hind wings without a submarginal row of fulvous spots on the under side.

A. Wings broad, hind wings rounded; females blue above, with broad dark margin to the fore wings. P. Argiolus.

B. Wings more triangular, hind pair more ovate. P. Acis, Arion, and Alcon.

subsection II.—Hind wings with a submarginal row of fulvous spots on the under side, comprising all the other species, which may be divided into groups according to the colour of the upper side of the wings in the opposite sexes.

SPECIES 1.—POLYOMMATUS (PITHECOPS) ALSUS. THE BEDFORD BUTTERFLY.

Plate xvi. fig. 1♂, 1♀, 1*, 1l, 1p.

Synonymes.—*Hesperia Alsus*, Fabricius.
Papilio Alsus, Gmelin; Lewin, Pap. pl. 39, f. 3, 4; Donovan, Brit. Ins. 9, pl. 322, fig. 1.
Polyommatus Alsus, Stephens; Curtis; Duncan Brit. Butt. pl. 31, f 3; Wood, Ind. Ent. t. 2, f. 62.
Nomiades Alsus, Hübner (Verz. bek. Schmett).
Papilio minimus, Esper, Schaffer, Villers.
Papilio Pseudolus, Borkhausen.

This is the smallest of our British Butterflies, the expanse of the fore wings generally varying from ⅝ to 1 inch. On the upper side the wings are of an obscure brown colour, with a slight blue gloss towards the base, especially in the males, of


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4♂
4♀
4♂
4♀
1♂
1♀

which sex I possess a specimen, in which at least half of the atoms of the disc of the wings are silvery blue; the female, on the contrary, is more obscure. The fringe of the wings is white; on the under side all the wings are of a light ash colour, with a slender black lunule at the extremity of the discoidal cell; half-way between this lunule and the hind margin of the fore wings is a transverse row of black, ocellated spots, with white irides, the two inner ones being more confluent; the hind wings have three or four similarly ocellated spots, irregularly placed in the basal half of the wings, beyond the middle of which is a waved row of seven or eight similar spots; and on the margin of these wings is a black spot, at a short distance from the anal angle, unnoticed either by Haworth or Stephens, and several obsolete brown spots. The number of the spots on the disc of the wings is, however, liable to variation.

This plain-coloured little butterfly, remarkable for the great delicacy of the markings on the under side of the wings, appears at the end of May and beginning of July, and occurs in a number of localities in different parts of the country. South Creek, Norfolk; Brandon Warren, Suffolk; Dartmouth; near Andover, Hants; Birch and Darenth Woods, Kent; and near Hertford, are mentioned by Mr. Stephens; near Darlington, in great abundance, by Mr. J. O. Backhouse; near Amesbury, Wilts, by the Rev. G. T. Rudd; near Newcastle, by Mr. Wailes; near Durham, and in most of the northern counties of Scotland, by Mr. Duncan; near Cambridge and Newmarket, in chalk pits, common, by Mr. F. Bond; and in the Isle of Wight, also between Woodstock and Enstone, near Cheltenham, Dover, etc., by the Rev. W. T. Bree.

The caterpillar is green, with yellow dorsal and lateral lines; it feeds upon Astragalus cicer, according to Godart.

SPECIES 2.—POLYOMMATUS ARGIOLUS. THE AZURE BLUE BUTTERFLY.

Plate xv. fig. 4♂, 4♀, 4*.

Synonymes.—*Papilio Argiolus*, Linnæus, Syst. Nat. 2, 790. Haworth; Donovan, British Insects, vol. 14, pl. 481. Lewin Pap. pl. 36, fig. 4—6.
Lycæna Argiolus, Ochsenheimer, Leach, Samouelle.
Polyommatus Argiolus, Latreille; Stephens; Curtis; Wood, Ind. Entomol. pl. 2, fig. 61. Duncan, Brit. Butt., pl. 31, fig. 1, 2.
Agriades Argiolus, Hübner (Verz. bek. Schmett).
Papilio Acis, Hübner, Pap. fig. 272—4.
Papilio Cleobis, Esper. Pap.
Papilio Argus marginatus, De Geer, Gen. Ins., 30, 3.

This delicate butterfly measures from an inch and a sixth to an inch and a half in the expansion of its wings, which in the male are, on the upper side, of a delicate light blue, with a tinge of a pinkish-blush: the costa of the fore wings being still paler. At the extremity of the wings in this sex, there is a narrow border of dark

brown, which colour also extends at the tips of the principal veins of the wings into the fringe, which is otherwise of a white colour; in the hind wings the fringe is entirely white, preceded by a very slender dark-brown line at the edge of the wings; the base of the wings is also darker. On the under side, the wings are of a very delicate greyish-white, tinged with silvery blue, especially at the base of the hind wings; the fore wings are marked with a slender blackish transverse line at the extremity of the discoidal cell; beyond this are five or six black spots, one placed a little in advance of the others, and nearer the fore margin of the wings; the others are more oblong and placed obliquely; that near the posterior angle being sometimes geminated; between this row of marks and the margin are several almost obsolete dusky crescents. The hind wings beneath are marked with ten or twelve small black dots, placed irregularly, one of which is at the anal angle; besides which there appear traces of a submarginal row of dusky crescents above a row of dusky spots; there is also a very slender dusky line at the extremity of the discoidal cell.

The female differs from the male in being generally of a smaller size, with the blue colour of the upper side of the wings somewhat paler, but it is more particularly distinguished by having the extremity of the anterior and the entire outer margin of the fore wings marked with a broad black or dark-brown border. The hind wings are also marked with a submarginal row of dark-brown or black spots, which are sometimes so large as to be almost confluent; the costa of these wings is also dusky. In other respects, as well as on the under side of the wings, there is scarcely any difference between the two sexes. The spots on the under side of the wings, as well as the dusky markings of the female, vary considerably in size; the former also differs in number in different individuals. The caterpillar is pubescent, of a greenish-yellow colour, with a bright green line down the back, the head and legs being black. It feeds on the buckthorn and holly.

The chrysalis is smooth, brown and green, with a dark dorsal line.

This pretty species differs materially in its habits from its congeners, frequenting gardens and plantations where the holly abounds.* It is by no means uncommon, although certainly local. Some years ago it appeared for two consecutive years in my garden at Hammersmith, where some hollies had then recently been planted, but I have not since seen it. Epping Forest, near Ripley, near Dartford, and various parts of Norfolk, Suffolk, Hants, and Devonshire, are recorded as its localities by Mr. Stephens. Not unfrequently near Newcastle, in places where hollies abound,

* It is a more restless and high-flying insect than any of the other Polyommati, hovering and vapouring about the trees and bushes. Mr. Bree also observes that it does not evince the same partiality for settling upon flowers and leaves of humble growth, as it does for settling on the leaves of the holly.

and also in Castle Eden Dean, by Mr. Duncan. The Rev. W. T. Bree informs us it is common near Allesley in the early spring (as early as the middle of April), and that he has taken it in the Isle of Wight in the month of July. Mr. F. Bond finds it common near Dropmore and in Hainault Forest. The middle of May and end of August are given as the times of its appearance by Haworth and Stephens, but the Rev. W. T. Bree states that it seems to be only single-brooded near Allesley; during the present season he has not, however, observed it in any of its usual localities near Coventry. In "Loudon's Magazine of Natural History," Nos. 21, 23, 24, 27, 30, 65, and 66, are various communications relative to this butterfly, chiefly connected with the question as to whether it is a single or double brooded species.

SPECIES 3.—POLYOMMATUS ACIS. THE MAZARINE BLUE BUTTERFLY.

Plate xvi. fig. 2♂, 2♀, 2*.

Synonymes.—*Papilio Acis*, Wiener Verz., Ernst. 1, pl. 42, fig. 88, a—d.
Lycæna Acis, Ochsenheimer.
Polyommatus Acis, Stephens; Curtis; Wood, Ind. Ent. t. 2, f. 63. Duncan, Brit. Butt. pl. 31, fig. 4.
Nomiades Acis, Hübner (Verz. bek. Schmett).
Papilio Cymon. Lewin, Pap. pl. 38, f. 6, 7. Haworth; Jermyn.
Lycæna Cymon, Leach; Samouelle.
Papilio Argiolus, Esper. Schmett. t. 21, f. 1. Hübner Pap. p. 56, f. 267—9.
Papilio Semiargus, Borkhausen.

This very distinct species differs from the two preceding in the complete diversity in the colour of the upper surface of the wings of the two sexes, being blue in the male and dark brown in the female. The expansion of the wings is rather more or less than an inch and a quarter. The upper side of the wings, in the male, is of a dark-purplish blue, the costa of the fore wings with a very thin edging of white. The outer margin in all the wings is narrow and dark brown, which colour runs up into the wing along the veins; the fringe of all the wings is white. Beneath, the wings are of a pale greyish-brown, the base being saturated with blue; there is a slender transverse dark line at the extremity of the discoida cell of each wing, beyond which is a curved row of irregular-sized black spots, margined with white rings, there being sometimes as many as seven such spots on each wing; that near the anal angle of the hind wings being minute and doubled; there are also sometimes one or two ocellated spots near the base, but the number of these spots is liable to considerable variation. All the wings have a very narrow outer marginal line of darker brown.

The female differs from the male in having the upper side of all the wings dark brown, sometimes with a slight purplish irroration towards the base in both pair of wings.

This rare species frequents chalky districts. The late Mr. Haworth gave

Yorkshire and Norfolk as its localities, and Miss Jermyn, Sherborne, etc., Dorsetshire. Various parts of Cambridge, Hampshire, and Windlesham-heath, Surrey, are mentioned by Mr. Stephens. There are also some notices of this insect in the 31st and 32nd Numbers of "Loudon's Magazine of Natural History," by the Rev. W. T. Bree, who informs us that he once took it in Coleshill Park, Warwickshire, also near Hinkley, Leicestershire: other specimens have also been taken in Worcestershire. Mr. F. Bond used to take it on the Gog-Magog Hills, and at Haylingfield, near Cambridge.

SPECIES 4.—POLYOMMATUS ARION. THE LARGE BLUE BUTTERFLY.

Plate xvi. fig. 3.

SYNONYMES.—*Papilio Arion*, Linnæus. Faun. Suec. 1073. Haworth; Lewin, Pap. pl. 37, f. 1—2. Donovan, Brit. Ins. v. 6, p. 184, fem. Hübner, Schmett. pl. 54, fig. 254—6.

Lycæna Arion, Ochsenheimer; Leach.

Polyommatus Arion, Latreille; Stephens; Curtis; Wood, Index Ent. t. 3, fig. 64, ♂ ♀. Duncan, Brit. Butt., pl. 32, fig. 1.

Nomiades Arion, Hübner (Verz. bek. Schmett).

This fine and very rare species generally measures somewhat more than an inch and a half in the expanse of its wings, which are of a rather dark purplish-blue in the males, with the anterior or costal margin pale brown; but the outer margin in all the wings is rather broadly black; in addition to this, the males may be distinguished from those of every other indigenous species by having a black crescent at the extremity of the discoidal cell, and five black oval spots between it and the dark border on the upper side of the fore wings; the hind wings have also several black oval dots beyond the centre, and a submarginal row of black spots ocellated with blue; the fringe is white. Beneath, the ground colour of the wings is ashy-grey, rather darker in its tone than in P. Acis; strongly suffused with shining blue atoms, at the base especially, on the hind wings. The fore wings have one circular and one kidney-shaped black spot, ocellated with whitish in the discoidal cell, beyond which is a very curved row of large black spots similarly ocellated; parallel with the outer margin of the fore wings are two rows of black spots, separated from each other by whitish atoms, and the extreme margin of the wings is also black, and the fringe, which is white, is marked at the tips of the longitudinal veins with black spots. Each of the hind wings is marked with about twenty-six black spots, which (with the exception of those which are nearest the margin of the wing) are ocellated with whitish; three of these spots form a curve near the base of the wings, and are followed by a curved short transverse line at the extremity of the discoidal cell; this is succeeded by an irregularly-curved row of

eight ocellated spots; beyond this, are two rows of spots, parallel with the posterior margin, and the fringe is marked in the same manner as in the fore wings.

The female is distinguished by having the wings more suffused with dark brown, and the spots on the disc of the fore wings are larger and longer than in the males; the spots are also occasionally more numerous, and the edges of the wings with a broader dark margin. There are, however, several varieties described, in which the number and size of the spots vary considerably, and Mr. Stephens mentions one variety in which the wings are almost immaculate above. A variety of this species has been regarded as the P. Alcon of Fabricius. It was taken in Buckinghamshire many years ago, and was described bp Mr. Stephens from Mr. Haworth's collection.

Mr. Haworth received this species from Dr. Abbot, who took it near Bedford, in the Mouse's Pasture; where Mr. Dale again took it 1819. It is also recorded as having been taken on Dover Cliffs, Marlborough Downs, and on the hills near Bath; also on commons near Bromham, Bedfordshire, near Winchester, and on bramble-blossoms in some parts of North Wales. The species has also been recently taken by Mr. Queckett in some profusion, as well as by Mr. Bree's son and Mr. F. Bond, in the beginning and middle of July, at Barnewell Wolde, near Oundle, Northamptonshire, where Mr. Bree himself also found it on the 4th of July, 1840.

SPECIES 5.—POLYOMMATUS CORYDON. THE CHALK-HILL BLUE BUTTERFLY.

Plate xvi. fig. 4♂, 4♀, 4l, 4p.

Synonymes.—*Hesperia Corydon*, Fabricius; Hübner, Pap. pl. 59, 286—8. Lewin's Pap. pl. 36, figs. 1, 2, 3. Donovan, Brit. Insects, pl. 231, f. 1, male. Esper. Schmett. t. 33, fig. 4.

Polyommatus Corydon, Latreille; Stephens; Jermyn; Curtis; Wood, Ind. Ent. pl. 2, fig. 65. Duncan, Brit. Butt. pl. 32, fig. 3.

Agriades Corydon, Hübner (Verz. bek. Schmett).

Papilio Tiphys, Esper. Pap. pl. 21, cont. 1, fig. 4. (Female.)

Var. *Papilio Calæthys*, Jermyn, 2nd Edit. p. 169.

This species varies in the expansion of its wings from an inch and a third to more than an inch and a half. The male has the upper surface of the wings of a very light silvery blue, with the outer margin and veins dusky; close to the outer margin is a row of black spots, which are almost suffused with the dark margin of the fore wings, but are more distinct in the hind pair, two at the anal angle being smaller and close together; these spots are more or less annulated with silvery white. The fore wings in this sex are of a greyish white on the under side, with five rows of spots, four towards the base in pairs, one larger, and one smaller in each; then a

transverse nearly straight row of four spots, of which the inner one is doubled, succeeded by a curved row of four spots towards the costa, then two submarginal rows of dots, the inner ones being the largest, forming an interrupted bar, and the outer ones rounded and subocellated; the tips of the veins, and of the ciliæ opposite to the veins, are marked with dark spots; the disc of the hind wings is of a pale greyish-brown hue, the base strongly saturated with greenish-blue, each marked with about twenty blackish ocellated spots, an almost blind white spot at the extremity of the discoidal cell; the space beyond the two middle spots in the outer curved series is also white. Seven or eight of the terminal spots are ocellated, each being preceded by an angular black mark, and a small patch of orange colour; the extreme edge of the wing is also blackish, and the fringe is white.

The female differs from the male in having the upper surface of the wings of a brown colour, with a small paler spot in the middle of each, that in the fore wings having a black pupil; moreover, there is a submarginal row of ocelli having the pupil black, surrounded by a whitish iris, the upper part of the hind wings being orange; these ocelli are also sometimes preceded by a row of almost obsolete pale lunules; in some specimens, however, the appearance of these ocellated spots is almost lost; on the under side the ground colour of all the wings is considerably darker than in the males, and the ocelli are much more distinct; they are, however, similar in their number and situation to those of the male, but the fringe is more strongly marked alternately with brown.

There are a number of varieties in our cabinets resulting from the greater or less distinctness of the ocelli, and the greater suffusion of brown over the wings of the male. One of these varieties having the wings "above, brown with a blue disc, and a whitish discoidal dot with a black pupil; beneath, the posterior wings have a discoidal, white, cinctured crescent, with a waved band of seven undulated spots towards the hinder margin," constitutes the POLYOMMATUS CALÆTHYS, of the second edition of Miss Jermyn's "Butterfly Collector's Vade Mecum."

The caterpillar is green, with yellow dorsal and lateral lines. It is stated to feed upon the wild-thyme. The perfect insect appears in July. I is local in respect to the districts in which it is found, especially frequenting chalky places. In such places it is, however, very abundant. From Dover, along the southern coast near Shoreham, Newport in the Isle of Wight, and near Darenth Wood in Kent, various parts also of Suffolk, Oxfordshire, Cambridgeshire, are recorded as its localities. It is also "very abundant on the hills above Prestbury, near Cheltenham, and near Winchester. A single specimen was also taken a few years ago near Knowle, Warwickshire," as we are informed by the Rev. W. T. Bree.

SPECIES 6.—POLYOMMATUS ADONIS. THE CLIFDEN BLUE BUTTERFLY.

Plate xviii. fig. 1 ♂, 1 ♀, 1*.

SYNONYMES.—*Hesperia Adonis*, Fabricius.

Papilio Adonis, Lewin, Pap. pl. 38, fig. 1—3; Haworth.

Lycæna Adonis Ochsenheimer; Leach; Samouelle.

Polyommatus Adonis, Stephens; Curtis; Wood, Ind. Ent. pl. 2, f. 66; Duncan, Brit. Butt. pl. 33, fig. 1—2.

Papilio Argus, Donovan, Brit. Ins. pl. 143, fig. 1, female (not the upper figures, which belong to P. Alexis, and not the Pap. Argus of Linnæus).

Papilio Ceronus, Hübner, Pap. pl. 295—297.

Papilio Bellargus, Esper; Villars; Müller.

Var.? *Papilio Hyacinthus*, Lewin. (C. P. Dorylas, Steph. Ill.)

This, the most splendid of all the British blues, varies from 1¼ to 1½ inch in the expanse of the wings, which in the males are of a most lovely, shining, silvery, azure blue; the costa of the fore wings rather more silvery, and the outer margin of the wings with a slender dark line, the fringe white, with small brown patches at equal distances. On the under side the ground colour of the wings is darker than in the corresponding sex of P. Corydon, and the ocelli are more strongly marked, although nearly similar in their situation; there is, however, only a remote spot preceding the dot at the end of the discoidal cell of the fore wings, and the succeeding series of spots is more continuous, the fifth from the costa not being thrown so much forward as to break the curve, as it is in P. Corydon. The ocelli and other spots on the under side of the hind wings are, however, almost exactly placed as in that species, and they are also similarly coloured.

The female has the upper surface of the body and wings of a dark-brown colour, the disc towards the base being sometimes saturated with blue; there is a small black spot at the extremity of the discoidal cell in each wing, and in the hind wings there is a submarginal row of ocellated black spots, the inner part of the iris of each being marked with an orange curve, the ocelli towards the outer angle being almost obliterated; some specimens also have the rudiments of a series of fulvous arches nearer the outer margin, the fringe is brownish white, interrupted with brown spots; on the under side the ground colour of the wings, as in P. Corydon, is darker than in the males, and the ocelli larger and more conspicuously ocellated with whitish, although similar in their situation. The position, size, and number of the ocelli on the under side are liable to some variation; and I possess several specimens in which the opposite sides do not exactly correspond with each other in these particulars: the white blotch on the hind wings and the orange submarginal spots are also sometimes almost obliterated. Mr. Stephens, in the "Brit. Mus. Catalogue," gives the P. Hyacinthus of Lewin as a variety of this species, and as identical with the insect which had been considered in the "Butterfly Collector's Vade Mecum" and the "Illustrations," as the *P. Dorylas* of Fabricius, which is a native of the Alps and Pyrenees.

The caterpillar is described by Fabricius as being green, with dorsal rows of fulvous spots. The perfect insect appears to be double-brooded, the first specimens appearing at the end of May, and the others at the middle of August. It occurs in various parts of the southern counties of England, especially in chalky districts, in some profusion. It also occurs in some parts of Suffolk. As it is by far the most lovely of the British blues, it used to be much sought after by the Spitalfields collectors, who, as Mr. Haworth states, made distant pedestrian excursions for the sole purpose of procuring its charming males to decorate their pictures with:—a picture consisting of numerous and beautiful Lepidoptera ornamentally and regularly disposed, having been the ultimate object of these assiduous people in the science of Entomology. These pictures were of various shapes and sizes, and Mr. Haworth mentions having seen some which contained at least five hundred specimens. Such was the custom some twenty-five years ago, and it is this class of persons whose feelings Crabbe thus records in his "Borough"—

"There is my friend the weaver; strong desires
Reign in his breast,—'tis beauty he admires.
See! to the shady grove he wings his way,
And feels in hope the rapture of the day:
Eager he looks, and soon to glad his eyes
From the sweet bower by Nature form'd arise
Bright troops of virgin Moths and fresh-born Butterflies;—
He fears no bailiff's wrath, no baron's blame,
His is untax'd and undisputed game."

Indeed so strong is the "fancy," as it is termed, with some of these laborious collectors, that I have known some, who, after toiling at their weaving-machines all the week, have started at ten o'clock on Saturday night, in order to arrive at Darenth and Birch Wood by daybreak, so as to collect the twilight-flying moths. Daniel Bydder—one of the most industrious of these collectors, and who was employed by Dr. Leach to collect for him in the New Forest (where he discovered Platypus cylindrus and Cicada Anglica—was, I believe, the first of the Spitalfields collectors who attempted to arrange his insects scientifically, and now, following the example of the Entomological Society, they have formed themselves into a Society of "Practical Entomologists," and have a well-arranged collection, meeting at regular intervals, in order to communicate to each other the result of their captures, which are duly chronicled in the "Zoologist."


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SPECIES 7.—POLYOMMATUS ALEXIS. THE COMMON BLUE BUTTERFLY.

Plate xvii., fig. 1, 1*, 1 l, 1 p.

SYNONYMES.—*Papilio Alexis*, Wiener Verzeichniss, p. 184; Hübner, Pap. pl. 60, fig. 292.

Polyommatus Alexis, Latreille; Stephens; Curtis; Wood, Ind. Ent. pl. 3, fig. 69, m. and f. Duncan, Brit. Butt. title page.

Papilio Icarius, Villars; Haworth; Lewin, Pap. pl. 38, fig. 4, 5, 8, Esper, Schmett, t. 32, fig. 4, m.

Papilio Argus, Wilks, pl. 119; Donovan, Brit. Ins. pl. 143, upper figures; Harris Aurelian, pl. 39, fig. g—i.

Lycæna Dorylas, Leach; Samouelle; but not of Hübner.

Var. ? *Papilio Hyacinthus*, Lewin, Pap. 37, fig. 4, 5, 6; nec Fabricius, Haworth (P. Dorylas Steph., Ill. i. 90).

Var. *Polyommatus Labienus*, Jermyn.

Var. *Polyommatus Thestylis*, Jermyn.

Var. *Polyommatus Lacon*, Jermyn.

Var. *Polyommatus dubius*, Kirby MSS.

This, one of the most abundant of our native butterflies, varies in the expanse of its wings from less than an inch to nearly an inch and a half. The upper surface of the wings in the males is of a fine silky lilac-blue, the anterior margin of the fore wings being edged with white, the outer edge of all the wings with a slender dark line, and the fringe white. The body is clothed with long whitish-blue silken hairs. The under side of the wings is also very similar in its marking to the two preceding species, but the ground colour of the wings is rather paler. There is an ocellated spot in the middle of the discoidal cell, with another, more indistinct, beneath it, which is sometimes connected with the innermost ocellus of the series between the extremity of the discoidal cell and the outer margin of the wing; the base of the hind wings is strongly glossed with shining bluish-green atoms, and the sub-marginal row of fulvous markings on the hind wings is very distinct, the marks at the anal angle being duplicated. In the centre of the hind wings is a triangular white spot, generally with a black dot in the centre, preceded, towards the base, by four ocelli, placed obliquely, and between the middle ocelli of the row beyond the centre of the wing and the orange spots is a white patch; there is also a slender black marginal line, and the fringe is white.

The female differs in having the upper side of the wings brown, the disc more or less suffused with blue; there is also a submarginal row of fulvous spots, which are sometimes obsolete in the fore wings; in the hind wings they are preceded by black lunules, and succeeded by black sub-ocellated spots. On the under side the ground colour of the wings is browner than in the males, and the ocelli larger and more distinct. The base in these wings is also less strongly tinged with green. The fringe in this sex is rather darker than in the male, especially at the base, but not spotted, by which it is at once known from the female of P. Adonis. Varieties occur in this, as in the preceding species, in which the number and size of the ocelli beneath, and markings on the upper side, are more or less obliterated. I possess indeed some specimens in which the opposite sides are not alike in these respects.

One of these varieties, which Mr. Haworth thought might be a hybrid between Adonis and Alexis (but which Mr. Stephens, in the "Brit. Mus. Catalogue," gives as a variety of P. Adonis), has the two spots towards the base of the fore wings, on the under side, obsolete, and the upper sides of the wings of the female more strongly saturated with blue. This forms the species P. Hyacinthus of Lewin and Haworth.

Others, again, of very small size (not expanding more than 10½ lines), have the upper side of the wings of a very pale lilac-blue, and the spots on the under side very small and pale, the inferior spot at the base of the fore wings obsolete, only five spots in the curved row beyond the middle of the discoidal cell, and the fulvous lunules almost obsolete, the two basal spots on the costa of the hind wings large and black. I have made this description from Mr. Kirby's original specimen on which the Polyommatus Labienus was proposed. This is to be noticed, because Mr. Stephens, in the "British Museum Catalogue," gives Labienus as identical with his P. Eros (Haust. i. 93), and both as varieties of Alexis. The variety incorrectly given by Mr. Stephens in his "Illustrations" as the Eros of Ochsenheimer has the upper side of the wings peculiarly pale in the males, with a dark border, and without the fulvous marginal band beneath, whilst the upper surface of the female is much darker.

Polyommatus Thestylis of Jermyn is formed upon large female specimens of this species, in which the blue of the upper surface of the wings is much more extended than in ordinary individuals; "the anterior wings beneath with a large kidney-shaped blackish spot cinctured obscurely with white, the concave side turned towards the interior margin; the posterior wings with the spot next the costal margin kidney-shaped; the concave side turned towards the disc; the number of ocelli in all the wings varies considerably, and the kidney-shaped spot is sometimes interrupted."

Polyommatus Lacon of Jermyn is another variety, in which the disc of the wings beneath is only marked with a triangular spot; "the hind margin of the anterior with a few indistinct dusky marks, and of the posterior with a fulvous band terminated internally with a series of black wedge-shaped spots, and externally with black dots on a white ground."

Mr. Stephens also adds that some specimens even differ in form from the rest, some of the females having the anterior wings very much rounded at the tip; whilst in others they are somewhat acute. In some females also the disc of the wings on the upper side is entirely brown, whilst in others it is nearly as blue as in the males, with a black discoidal spot.

Other specimens, which were inaccurately regarded by Mr. Stephens as P. Eros of Ochsenheimer, and P. Icarius of Esper, were also considered by Mr. Edward Doubleday, and subsequently by Mr. Stephens, to be varieties of P. Alexis.

Mr. Stephens also possessed some specimens of the males which have the wings very transparent, and of a more silvery blue; and the females very blue, with very distinct red lunules adjoining the black submarginal and distinct ocelli, which he regarded as probably belonging to a distinct species.

This species also appears to be subject to gynandromorphism to a greater degree than any other of our butterflies, although this is probably owing to its being a more abundant species. Several instances of this are contained in the British Museum Cabinet, one of which is represented in "Brit. Butt.," pl. 34, fig. 11; other instances are recorded in the "Annales de la Société Entomologique de France," "The Field Naturalist," and another, captured in August, 1854, at Riddlesdown, Surrey, by F. T. Hudson, Esq. (in which, contrary to the more usual condition of such specimens, the left side is masculine, and the right side feminine), is figured in pl. 17, fig. 1.

The caterpillar is slightly pubescent, and of a bright green colour, with a dark dorsal line, adjoining to which are rows of yellow spots. It is found at the end of April and of July, and feeds upon different grasses. The wild liquorice and wild strawberry are also mentioned by Mr. Stephens as its food.

This common insect seems to be distributed over all parts of the kingdom, and is double-brooded, the first appearing about the end of May (but later in the northern parts of the country), and the second in August. It frequents meadows, grassy places at the sides of lanes, and pasture-lands. Mr. Knapp thus describes some of its habits:—"We have few more zealous and pugnacious insects than this little elegant butterfly, noted and admired by all. When fully animated, it will not suffer any of its tribe to cross its path, or approach the flower on which it sits, with impunity; even the large admirable Atalanta at these times it will assail and drive away. Constant warfare is also kept up between it and the small copper butterfly; and whenever these diminutive creatures come near each other, they dart into action, and continue buffeting one another about till one retires from the contest, when the victor returns in triumph to the station he had left. Should the enemy again advance, the combat is renewed; but should a cloud obscure the sun, or a breeze chill the air, their ardour becomes abated, and contention ceases. The pugnacious disposition of the Argus butterfly soon deprives it of much of its beauty; and, unless captured soon after its birth, we find the margins of its wings torn and jagged, the elegant blue plumage rubbed from the wings, and the creature become dark and shabby."—*Journal of a Naturalist*, p. 277.

SPECIES 8.—POLYOMMATUS ÆGON. THE SILVER-STUDDED BLUE BUTTERFLY

Plate xvii., fig. 2 ♂, 2 ♀, 2 l, 2 p.

SYNONYMES.—*Papilio Ægon*, Borkhausen, Hübner.

Papilio Argus, Linnæus. Faun. Suec. 1074. Lewin, Pap. pl. 39, fig. 5—7. Haworth (not P. Argus of Donovan, vol. 4, pl. 143 ♂, which is the male of P. Alexis).

Lycæna Argus, Fabr., Leach, Ochsenh., Hübner, Pap. tab. 64, f. 316 ♂, 317, 318, ♀.

Polyommatus Argus, Stephens. Duncan Brit. Butt. pl. 33, fig. 3, Wood, Ind. Ent. t. 2, fig. 71.

Lycæides Argus, Hübner (Verz. bek. Schmett.).

Papilio Idas, Linnæus, Faun. Suec. 1075 (female), (P. Argus β. Linn. S. N. 2, 790), not P. Idas of Lewin, Donovan, and Haworth, which is P. Agestis.

Hesperia Acreon, Fabricius (variety ?).

Papilio Argyrognomon, Borkhausen (variety ?).

Papilio Argiades, Esper. Papil. 1, pl. 101, cont. 56, fig. 6 (variety).

Polyommatus Alcippe, Kirby's manuscripts, in Mus. Ent. Soc. Lond. (variety).

Polyommatus maritimus, Haworth's manuscripts (variety).

Pap. Leodorus, Esper. Pap. 1, pl. 80, cont. 30, fig. 1, 2 (variety).

This pretty butterfly generally measures about an inch and a quarter in the expansion of the wings, which have the upper surface, in the male, of a fine, deep, lilacy blue, with the front margin of the anterior pair silvery white; of which colour also are the hairs on the wings, especially in the hind pair. The apical margin of all the wings on this side is broad and black, the dark colour slightly ascending along the veins into the disc of the wing, and in the hind wings assuming the appearance of oval, marginal spots. The ciliæ, both above and below, are white, a very slight black spot at the extremity of each of the veins being alone visible at the base of the fringe; the body above is clothed with silvery and blue hairs, the eyes are margined with white; and the antennæ are black, with white rings, the upper side of the club black, and the lower fine orange. Beneath, the wings in this sex are of a pale greyish colour, the base being saturated with blue; at the extremity of the discoidal cell of the fore wings is an oval, black ocellus, edged with white; this is succeeded by a curved row of six similar ocelli, varying in their form and size; the innermost of these spots is often doubled; then follow two rows of dark spots, the inner row formed of arched spots, and the outer one of round, smaller ones; the space preceding the former is whiter than the rest of the wing, and the space between the two rows of spots is often coloured with orange: the margin of all the wings is slender and black, and triangularly dilated at the extremity of the veins. The hind wings have more numerous ocelli; namely, three small, round ones near the base, one transverse near the middle, a much curved and irregular row of eight beyond the middle, beyond which the wing is whiter than in the other parts; then follows a curved row of eight black arches, and a fulvous band, on which are about the same number of round black spots, most of which are adorned with silvery scales.

The females are larger than the males, and have the upper surface of the wings of a dull warm, brown colour, darker at the base, and near the extremity of the

wings is a series of fulvous, arched spots, occasionally more obsolete on the fore wings; along the margin of the hind wings is also occasionally a very slender, dull white, interrupted streak. The ciliæ are also dusky, especially at the base. Beneath the ground colour of the wings is darker grey, or brownish ashy, which throws the white ocelli and other markings beyond the middle curved row of spots into stronger contrast. Moreover, the submarginal orange band is brighter coloured, the dark marking by which it is edged being more distinct. The female often differs by having the disc of the wings on the upper side more or less (and especially in the hind wings) suffused with blue.

Some striking varieties of this species have been observed. In one, captured by the late Mr. Hatchett, at Coombe Wood, the upper surface of all the wings is of a pale fulvous, tawny colour, like that of Hipparchia Pamphilus. In another, taken by the late Mr. Haworth, in salt marshes, near Holt, Norfolk, and thence named by him P. MARITIMUS, the ocelli on the disc of the under side of the wings are elongated into those on the middle of the wing, being almost confluent with the following row of spots. To a specimen of this variety in the cabinet of the Entomological Society of London, is attached the manuscript name of ALCIPPE, of Kirby; but Mr. Stephens applies that name to another, and apparently very distinct variety, of smaller size, having "the wings *narrower*, blue above, with a broad black margin to all the wings, the under side of the male of a deep greyish or drab colour, the ocelli very distinct in the female, and the oblique series on the posterior wing consisting of four."

The caterpillar is described as being of a dull green colour, with whitish tubercles, and a blackish head and legs; a line down the back and sides, oblique marks on the latter, of a dark red colour, bordered with white. It feeds on broom, sainfoin, and other kinds of Trifolium and allied genera. The chrysalis is at first green, and afterwards brown.

This species frequents lanes, marshy commons, damp fields, etc., about the middle of July, not appearing to be attached to chalky districts. Although not apparently found in the north of England, it is sufficiently common in various parts of the south; Coombe and Darenth Woods, Ripley Green, Wood Hay Common, Hants; Parley Heath, Dorset; Coleshill Heath, Warwickshire (as we learn from the Reverend W. T. Bree); and other localities are recorded by preceding authors.

SPECIES 9.—POLYOMMATUS AGESTIS. THE BROWN ARGUS BUTTERFLY.

Plate xvii., fig. 3, 3*.

Synonymes.—*Papilio Agestis*, Wien. Verz., Hübner, Pap. pl. 62, f. 303, 304.

Polyommatus Agestis, Jermyn, Stephens, Duncan, Brit. Butt., pl. 34, fig. 1. Wood, Ind. Ent. t. 3, f. 9, and t. 2, f. 72.

Agriades Agestis, Hübner, Verz. bek. Schm.

Papilio Idas, Lewin, Pap., pl. 39, f. 1, 2. Donovan, Brit. Ins., vol. 10, pl. 322, f. 2. Haworth, Jermyn (not *Idas*, Linn., F. S., which is the female of Argus).

Lycæna Idas, Ochsenheimer, Leach.

Pap. Medon, Esper., Pap., pl. 32, Suppl. 8, f. 1.

We have now taken leave of the species of Polyommatus in which the males are ornamented with blue or purple tints on the upper surface of the wings. In both sexes of this species the wings are coloured alike, being of a fine silken brown, with a very slender pale margin along the costa, and with a row of small bright orange-coloured lunulated spots; marked on the outside in the hind wings with small black round dots. There is also a small black crescent at the extremity of the discoidal cell of the fore wings. The fringe is white or pale brown, with minute dark lines at the extremity of the veins. The upper surface of the body is black, with greyish hairs. The under side of the wings is of a brownish ash colour, the fore wings with a rather large and very distinct white spot, generally inclosing a smaller black one at the extremity of the discoidal cell, succeeded by a *strongly curved* row of five or six (the inner one when present being minute and duplicated) similar ocelli. These are succeeded by the same number of fulvous patches edged within with a brown curve, and marked next the margin with a brown spot. The margin is slender, and blackish brown, dilated at the tips of the veins, and white within; and the fringe white, slightly marked with brown at the extremity of the veins. The hind wings are tinted with blue at the base, which is marked with three ocelli; the discoidal white spot is transverse-oval, and emits a small branch behind; it is but slightly marked with black in the centre; beyond this is a curved and irregular row of eight white spots, varying in size (the middle one being confluent), each of which has a black dot in the centre. Then follows a row of slender, black, pointed arches, edged within with a slender white line, and externally bearing a row of fulvous patches succeeded by a row of white, connected, transverse-oval spots, each bearing a small black dot; the margin is very slender, and black, and dilated at the extremity of the veins.

The female differs in not being so intensely brown on the disc of the wings, and in having the fulvous band of spots larger and more distinct, extending to the front margin of the fore wings, and more strongly marked with black spots on the hind wings. Varieties occur in the number of the spots on the under side of the wings, and in the size and extent of the row of fulvous spots.

The expansion of the wings in this species varies from an inch to an inch and a quarter.

This species appears to be double-brooded: May and June, and July and August, being the times of its appearance in a winged state. It is found in most of the southern counties of England in tolerable abundance, as well as in various localities in Norfolk and the adjacent counties. The most northerly recorded situation is Seaham Dean, near Sunderland. "Ventnor, Isle of Wight; and Devil's Ditch, Newmarket: common." F. Bond, Esq.

The caterpillar is green, with a pale angulated row of dorsal spots, and a central brownish line. It feeds, according to Haworth, on grasses, but Esper figures it upon the wild strawberry. It appears in this state in the months of April and June.

In the "Entomological Magazine" (vol. ii. p. 515), Mr. Newman endeavoured to prove that this species and the two following "are but one species." Specimens taken at Ramsgate, Dover, Hythe, Hastings, Rye, Brighton, Worthing, Little Hampton, Chichester, Portsmouth, Isle of Wight, Dorsetshire, and Somersetshire, exhibit the "typical form" of the species (as described above); at Birmingham, Worcester, and Shrewsbury, "an evident change has taken place, the band of rust-coloured spots has become less bright; at Manchester these spots have left the upper wing almost entirely; at Castle Eden Dean they are scarcely to be traced, and a black spot in the centre of the upper wing becomes fringed with white; in some specimens it is quite white; the butterfly then changes its name to Salmacis. We proceed further northward, and the black pupil leaves the eyes on the under side, until at Edinburgh they are quite gone; then it is called Artaxerxes." Mr. Stephens does not, however, agree with Mr. Newman in this respect, stating that "his definitions do not accord with my series of specimens of the three insects obtained from nearly every one of the localities enumerated by him." ("Illustr. Haust." 4, p. 382.) Boisduval also gives the Artaxerxes as distinct, stating that its fore wings are proportionably longer than those of Agestis; to which I may add that the relative position of the spots (which seems to me in this genus to afford a good specific character) is different in the two species, especially on the under side of the upper wings.

SPECIES 10.—POLYOMMATUS SALMACIS. THE DURHAM ARGUS BUTTERFLY.

Plate xvii., fig. 4.

SYNONYMES.—*Polyommatus Salmacis*, Stephens, Illust. Haust. vol. iii. p. 235. Wood, Index Ent. t. 3, p. 73, ♂ ♀, and fig. 12. Duncan, Brit. Butt. pl. 34, figs. 2 and 3.

This species is intermediate between Agestis and Artaxerxes, and varies in the expanse of its wings from 1$\frac{1}{16}$ to 1$\frac{1}{8}$ inch. The upper side of the wings is of a silky

blackish brown colour, with a black spot at the extremity of the discoidal cell in the males, and a white one in the females, which is, however, sometimes obsolete, especially in the latter sex. There is also a row of submarginal fulvous spots on the hind wings, which sometimes also extends along the margin of the fore wings, but it is occasionally almost obsolete in the male. The fringe is white, with slight brown marks at the base. The under side of the wings is of a brownish grey, the anterior wings having a white spot at the extremity of the discoidal cell, succeeded by a curved row of similar spots, each marked in the centre with a dusky point; there is also a submarginal row of orange spots bounded above with a dusky crescent, and marked beyond with a dusky spot surrounded with white, the extreme margin being marked by a dusky line: the posterior wings have several white spots towards the base; a larger discoidal one, a curved irregular row of white tuberculated spots beyond the middle, with a broad patch of white connecting the middle spots with the submarginal band of fulvous spots, which are similar in their markings to the corresponding row of the fore wings: the white subocellated spots on this side of the wings have the middle marked more conspicuously with a dusky spot in the females than in the males.

Mr. Stephens's short description of this species is as follows:—"Alis fusco-nigris, subtus fuscescentibus maculis subocellatis, anticis supra in masculis puncto discoidali atro, in fœminis albo; posticis utrinque fascia submarginali rubra;" and Mr. Wailes, an acute entomologist, resident upon the spot where the species occurs, namely, Castle Eden Dean, near Durham (it also occurs in the magnesian limestone district, near Newcastle), entirely coincides with Mr. Stephens in considering it as a distinct species, observing, however, that Mr. S.'s description is not quite correct, since, out of at least 150 specimens, the variety with the black spot forms two-thirds of the whole; and that neither sex possesses exclusively either the white or black spot; though the majority of the former variety are males. ("Entomol. Mag." i. p. 42.) He further states that this butterfly appears to be confined to the sea-banks, having only seen a few stragglers so far from the coast as half a mile. It appears in July. It is, however, considered by some of our best entomologists as a local variety of the next species.

SPECIES 11.—POLYOMMATUS ARTAXERXES. THE SCOTCH BUTTERFLY.

Plate xvii., fig. 5, 5*.

Synonymes.—*Hesperia Artaxerxes*, Fabricius. Lewin, Pap. pl. 39, fig. 8—9. Haworth. Donovan, Brit. Ins. v. 16, pl. 541 (Papilio Art.).

Lycæna Artaxerxes, Leach.

Argus Artaxerxes, Boisduval, Icon. Hist. Lep. pl. 14, fig. 7—8.

Polyommatus Artaxerxes, Stephens. Jermyn, Wood, Ind. Ent., pl. 3, f. 74 and 13. Duncan, Brit. Butt., pl. 34. fig. 4.

This species is closely allied to the preceding, if, indeed, that be not a local

variety of this. It varies in the expanse of the wings from an inch to an inch and a sixth. The upper surface of the wings in both sexes is of a silky blackish-brown colour, with the anterior margin very slender and white, and a small white spot at the extremity of the discoidal cell; and in a few instances, a similar minute white spot occurs on the disc of the hind wings above. There is also a submarginal row of small orange-red marks on all the wings, although they are often almost, or even entirely, obsolete in the fore wings. The fringe is white, slightly marked with brown at the base opposite to the extremity of the veins. The under side of the wings is of a greyish brown; the anterior wings having a large round patch at the extremity of the discoidal cell, succeeded by a *slightly curved* row of white oval spots; beyond this is a row of fulvous spots, bounded within by dusky crescents, edged with white, and terminating in round black spots; beyond which is a slender bar of white immediately preceding the slender dark margin which is dilated at the extremity of the veins. The under side of the fore wings is marked by four white spots, forming an oblique line at the base; the spot at the extremity of the discoidal cell is white, and of transverse-oval form, emitting a minute straight branch from its outer edge; near this, on the costa of the hind wings, are two white spots, and there are six others, forming an interrupted white bar beyond the middle of the wings, those in the centre being confluent, and thus forming a larger white patch; the margin of this pair of wings is ornamented with fulvous spots and other markings, exactly corresponding with those on the margin of the fore wings.

The female, as in Agestis, closely resembles the male, but the submarginal row of fulvous spots is generally larger and more extended into the fore wings than in the male. The upper side of the antennæ is like that of Agestis, except that the extremity of the club is reddish; their under side is almost entirely whitish.

Like several of the allied species, this insect is double-brooded, appearing in June and August. Fabricius, by whom the species was first described, gave it as a native of *England*, from the drawings of Mr. Jones. It appears, however, to be exclusively an inhabitant of Scotland, and was, until lately, supposed to be only found on Arthur's Seat, Edinburgh, being of such rarity, that scarcely a single cabinet possessed a specimen,—the owners endeavouring, according to the bad taste of the day, to supply its place with a drawing of the insect stuck in their cabinets. More recently, however, it has occurred in considerable plenty, not only in the locality above mentioned, but also on Salisbury Craigs, King's Park, and near Duddingston Loch, Pentland Hills; near Queensferry and Rosslyn Castle; Jardine Hall, Dumfriesshire; and Flisk, in Fifeshire. The other localities mentioned by Mr. Stephens appear to belong to Salmacis, except the last, "Dartmoor, 23 August, 1823, Dr. Leach," which is probably erroneous.

In addition to what has been already observed under P. Agestis, relative to the specific rank of this and the two preceding species, it must be stated, that, although Agestis is very abundant on the Continent, the continental entomologists have never met with a single specimen of Artaxerxes, their cabinets being entirely furnished with Scotch specimens.

FAMILY V.

HESPERIIDÆ.

This family, which is the last in the general arrangement of the diurnal Lepidoptera, was well indicated by Linnæus, under the title of Papiliones Plebeii Urbicoli, and is composed of a very distinct tribe of butterflies, constituting, indeed, a primary division amongst them, which Boisduval has termed Involuti, from the circumstance of the caterpillars enclosing themselves in a curled-up leaf; and thus, as well as in several other important characters, approaching the moths.

The six feet are of uniform size in both sexes; the hind tibiæ have a pair of spurs at the apex, and generally another pair near the middle of the limb, a character found in none of the preceding butterflies; the hind wings are generally horizontal during repose, and in some species all the wings are placed in this manner (Tamyris Zeleucus, Fab. Swainson "Zool. Ill.," vol. 1, pl. 33). The antennæ are wide apart at the base, and are often terminated in a very strong hook; the labial palpi have the terminal joint very small; the spiral tongue (or maxillæ) is very long, and the discoidal cell of the hind wing is not closed.

The caterpillars, of which, however, but few are known, are cylindrical, without spines, with the anterior segments narrowed, and the head very large, which thus appears to be borne upon a footstalk; the hind part is always obtuse. The larvæ * roll up leaves, in which they construct a very slender silken cocoon, wherein they are transformed to chrysalides, which are entire and without angular prominences.

Poey, in his "Centurie des Lépidoptères de Cuba," pl. 4, and Swainson, in his "Zoological Illustrations," vol 1; Abbot and Smith, Reaumur, Stoll, Hübner, etc., have represented the transformations of various species. The chrysalis is generally smooth, but occasionally angulated, of a lengthened form, and attached at one end

* "The larvæ of the Hesperiidæ are so strikingly distinguished from those of the Polyommatidæ, and the only one known of the Erycinidæ, that it is really surprising how entomologists still continue to arrange them in the same group."—Swainson, "History of Insects," p. 97. Nothing more completely proves the ignorance of this writer of the works of modern entomological writers, by the majority of whom Hesperia is constituted into a separate family.

as well as girt round the middle, the transformation being effected in the rolled-up leaf which served the caterpillar as its abode.

The species are of comparatively small size, and of obscure colours; but many are ornamented with pellucid spots; and others have the hind wings furnished with long tails. The body is short, very robust, and their flight is accordingly very strong, rapid, and so peculiar, that they have obtained the name of skippers—indicative of their singular short, jerking kind of flight. They also frequently settle on flowers, leaves, or branches, as well as upon the ground, with which their dull colours well associate.

H. Tages (according to Dr. Abbot, "Lin. Trans.," vol. 5, p. 276) flies early in the morning; its flight being extremely short, and very near the ground. Mr. Curtis mentions the curious circumstance, that old specimens, whilst alive, frequently lose one or both of their palpi: an accident he had only observed amongst the Pyralidæ.

The relations of these butterflies with other insects are very interesting. Latreille united in the same group a singular exotic genus, Urania, which is nearly related to the Hesperi-sphingides. Mr. Swainson, indeed, states that their *palpable affinity* to the *hawk-moths* has induced almost every writer to place them as the connecting link between the diurnal and crepuscular Lepidoptera; but such is not the case: it is with the Hesperi-sphingides that they are nearest allied, their relationship with the hawk-moths being very slight. They have another relation with the Tortricidæ, a family of small moths, founded merely upon the habit which is exhibited by the caterpillars of both groups of rolling up the leaves of plants, and which, in the Tortricidæ, becomes a practical source of annoyance in many instances. These relations are self-evident; but another has rocently been pointed out, which appears to me to be so far-fetched and ridiculous as to merit only silence, were it not that it forms part of a system which is asserted to be all-natural, and which is to supersede all others hitherto or hereafter to be promulgated. "The Natural Arrangement of Insects," of Mr. Swainson, furnishes us (p. 205) with a test of the relative position in Nature of the tribes of the Coleoptera, founded upon the corresponding position of the families of the diurnal Lepidoptera. The Hesperiidæ are here made to represent the Malacoderm-beetles, because the skin of the larvæ of the former is said to be so thin that the caterpillars are obliged to defend themselves by the artificial means of curled-up leaves. "The Hesperiidæ are, in fact, the *soft-skinned butterflies*, just as the Malacodermes among the Coleoptera"!!*

* In like manner the Erycinidæ represent the Monilicorn beetles, because the larva of the former resembles that of a Cassida or Tortoise beetle; and the Satyridæ [Hipparchiides] represent the Capricorn beetles, because the antennæ in the perfect insects of both groups are pre-eminently long, and because the head of the larvæ of these butterflies is often armed with long horns!! Scientific trifling can scarcely go further than this.

England is comparatively poor in the species of this family—tropical America being the metropolis of the group; at least 300 species having been collected in that part of the world. Other parts of the world, as India, New Holland, South Africa, and Europe, possess various species, but fewer in number. Boisduval thinks that there are more than 400 species in collections, but that number is certainly now more than doubled.

The species are very closely allied together, and difficult to be determined, except by very precise examination. M. Rambur has, however, proved in the last number of his "Faune Entomologique de l'Andalousie," lately published, that good specific distinctions exist between nearly allied species in the structure of the male organs of generation.

The study of the whole of this extensive family can alone determine the propriety of the distribution of the species into genera or still minor groups. It is impossible to examine the very few indigenous species we possess, without being convinced of the difficulty of attempting this from so small a portion of the group. For instance, the antennæ in Malvæ or Alveolus, and Tages, have the club differently formed, and the position of their wings in repose is different, although they agree in the folded costa of the fore wings of the males, and in the curved clava of the antennæ. Again, the club of the antennæ differs in its form in every one of the species composing the genus Pamphila of Stephens; and yet this is the character which the last-named author uses to characterise the two genera into which he has divided the British species. Hübner, Boisduval, and, still more recently, Zeller, have attempted the distribution of the species into subordinate groups, and it is much to be regretted that Mr. Swainson's researches in this difficult family have not yet been published. In the "Genera of Diurnal Lepidoptera" I have recently undertaken a generic revision of the family.

PYRGUS, Hübner (THYMELE p. Stephens).

The species of this genus, or rather sub-genus, are distinguished by the greater length of the palpi, which are very hairy, and extend in front of the head, being at least as long as the head, the terminal joint being slender, distinct, and exserted. The antennæ are rather short, without any hook at the tip, and terminated by a gradually formed arched club; the head is rather broad, with a tuft of recurved hair at the base of the antennæ, and the thorax robust. The wings are short, and rounded along the outer margin in both sexes; the front margin towards the base in the males being folded, the base rounded: the mediastinal vein scarcely extends


1♂
1♀
5♀
1♀
4♀
4♂
2♀
2
3♀
3
3♂
2♀

beyond the middle of the front margin of the wing; the postcostal one extends to a short distance below the apex of the wing, emitting on its front side four straight branches, the fourth of which runs to the tip of the wing; it also emits a branch from its posterior side. The great median vein is divided into three branches, and between the anterior one of these and the posterior one of the postcostal vein is a straight free vein.* The males are not distinguished by having a thickened oblique patch upon the disc of the fore wings. The wings in repose are *deflexed*. The abdomen in the males is narrow, with the tip bearded, whilst in the females it is more robust, with the tip acute and nearly naked. The cilia of the wings is long, alternately black and white, and the wings are also of a dark colour, spotted with white.

The larvæ are naked, or but very slightly pubescent, resembling those of the Tortricidæ, with a large head, the following segment being attenuated; generally subsisting upon the rolled-up leaves of malvaceous plants. The pupa is entire, and conical in its form, enclosed in a cocoon, and fastened by the tail as well as by a girth round the middle.

As there are a considerable number of species agreeing with Malvæ, I have retained that as a type of a distinct genus, for which I have employed Hübner's name in preference to that of Thymele of Fabricius (used by Stephens), the real types of which are exotic tailed species, and because it has a priority of date over that of Syrichtus of Boisduval, employed for the group.

SPECIES 1.—PYRGUS MALVÆ. THE GRIZZLED SKIPPER.

Plate xviii., fig. 3, 3 l.

Synonymes.—*Papilio Malvæ*, Linnæus, Faun. Suec. 1081. Lewin, pl. 46, f. 8—9. Haworth, Turton. Harris, Aurelian, pl. 32, fig. l—m.

Hesperia Malvæ, Leach, Curtis. Dalman, Hesp. Su. 202, 6. Zetterstedt, Faun. Lapp. p. 915 (not Thymele Malvæ of Stephens and Wood, nor of Fabricius).

Syrichtus Malvæ, Boisduval, Icon., p. 231.

Papilio Alveolus, Hübner, Pap. t. 92, f. 466, 467.

Thymele Alveolus, Stephens, Duncan, Brit. Butt. v. 2, pl. 1, f. 1. Wood, Ind. Ent. t. 3, f. 75. E. Doubleday (Cat. Brit. Lep. 1848).

Pyrgus Alveolus, Hübner (Verz. bek. Schmett.). Stephens, Cat. Brit. Mus. Lepidoptera.

Papilio Sao, Bergsträsser, Eur. Schmett. t. 40, f. 8. Faun. Franc. pl. 26, f. 7, 8.

Hesperia Fritillum minor, Fab. Ent. Syst. 3, part 1, p. 351, pl. 356.

Papilio Fritillum, Lewin, pl. 46, f. 4, 5 (variety).

Papilio Lavateræ, Fabricius, Haworth, Jermyn (variety). Not P. Lavateræ of Hübner.

Papilio Altheæ, Borkhausen (variety).

Papilio Malvæ minor, Esper.

This species generally measures about an inch in the expanse of the wings, varying a little both more or less. On the upper side the wings are of a dark brown

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* I have found no material variation, in regard to the arrangement of the veins of the wings, in any of the indigenous species of the entire family.

colour, marked with many small, squarish, cream-coloured spots, of which there are about fourteen on each of the fore wings; the ground colour of which, especially towards the base, is much powdered with white, especially in the males. The middle of the hind wings is marked with several more or less confluent larger spots, and beyond the centre is a curved row of six small dots. The cilia is white, spotted alternately with black; the body has a greenish hue. Beneath, the ground colour of the wings is much paler, the spots towards the tips of the wings forming fine lines; the spots are also larger and more numerous on the hind wings, especially towards the base, and the front margin has a large white blotch; the veins in these wings are also pale-coloured.

A not very uncommon variety, regarded by Fabricius, Lewin, etc., as distinct, is represented in our "Brit. Butt." pl. 38, fig. 7 and 8, in which there is a white oblong blotch in the middle of the fore wings towards the posterior margin, visible on both sides, which is frequently duplicated from the confluence of two contiguous spots. The white dots are also longer and larger than in the typical individuals. Mr. Stephens possessed a specimen with one of the fore wings marked as in the variety, and the other as in the type.

The caterpillar is green, with pale longitudinal stripes, a black head, and a yellow ring round the neck. It feeds on the teazle, the leaves of which it rolls up.

This is a common and generally dispersed species, occurring in woods and dry pastures in Kent, Surrey, Essex, Hertford, Wilts, Durham, Cambridge, Northumberland, and the south of Scotland. It appears at the end of May. Reaumur has given the history of this species in the eleventh plate of his first volume. The Rev. W. T. Bree informs us that he once took the "variety?" regarded by some writers as distinct under the name of Fritillum, near Yarmouth, in the Isle of Wight; and that a friend takes it in some abundance in the Forest, near Bewdley, Worcestershire. "It seems to be, like the White Colias Edusa, what may be called a permanent variety, or one which is constantly occurring."

I have followed Boisduval and Zetterstedt in restoring to this species the name of Malvæ, that name, in the handwriting of Linnæus himself, being attached to his specimen of this insect in the Linnæan Cabinet. His words also, "margine *quasi dentato*, interjacentibus maculis albis," distinguish it at once from P. Malvarum.

NISONIADES, Hübner (THANAOS, Boisduval)

This group differs from the preceding in having longer, slenderer antennæ, with


1
4♂
2♂
2♀
4♀
2♀
4l
1l
3♀
1p
3♂
2l
1p
4p

the club attenuated at the tip; the palpi with the last joint thicker; the anterior margin of the fore wings slightly angulated beyond the middle; the surface of the wings not tessellated, and the fringe alternately spotted. It agrees with it in having the wings identical in the outline in both sexes, and in the costa being folded at the base in the males. The wings are deflexed in repose, and they are longer than the abdomen. The difference in their colour in the two sexes indicates a relation with the following group. As there are several species which agree in these respects, I have adopted the group with Hübner's name, which is prior to that of Boisduval.

SPECIES 1.—NISONIADES TAGES. THE DINGY SKIPPER.

Plate xix. fig. 1, 1 l, 1 p.

SYNONYMES.—*Papilio Tages*, Linnæus, Lewin, Pap., pl. 45, f. 3, 4. Haworth, Harris Aurelian, pl. 34, fig. 0.

Hesperia Tages, Fabricius, Leach, Jermyn.

Thymele Tages, Fabricius (Gloss.), Stephens, Duncan, Brit. Butt. 2, pl. 1, f. 2. Wood, Ind. Ent. pl. 3, f. 76.

Thanaos Tages, Boisduval, H. n. Lep. pl. 9, B fig. 8

Nisoniades Tages, Hübner (Verz. bek. Schm.).

The expansion of the wings of this species is about an inch and a quarter. The upper surface of the wings is brown, the fore wings marked with alternate waved bands of darker brown and grey, which in some specimens are in bright relief against each other, and separated by paler zigzag marks; in addition to which there are several indistinct whitish dots, one brighter than the rest being placed near the extremity of the costa; and there is also a marginal row of dull white dots. The hind wings are brown, with a small discoidal spot, beyond which are two rows of nearly obsolete paler dots. Beneath, the colour is uniformly greyish brown, the fore wings not shaded as above, but marked as well as the hind wings with the traces of the pale dots of the upper side. The male is duller and more uniformly coloured than the female.

The caterpillar is bright green, with the head brown, with yellow dorsal and lateral stripes dotted with black. It feeds on the field Eryngo, and bird's-foot lotus.

This species frequents woody pastures, heaths, etc., and is found in the beginning of May, in June, and the middle of July. It is by no means so common as Malvæ. It appears to be very widely extended, for, in addition to the numerous localities in various parts of England given by Mr. Stephens, Mr. Duncan mentions several places in Scotland where it has also occurred. Mr. F. Bond finds it very abundantly at Stanmore Common (Middlesex), and Devil's Ditch, Cambs.

CYCLOPIDES, Hübner (STEROPES, Boisduval).

The typical species of this group differs from the preceding, in its long acuminated fore wings, short hind wings, scarcely bent club of the antennæ, and want of a fold at the base of the costa of the fore wings; and from the following, by the more slender body, differently formed club of the antennæ, and especially by the want of an oblique black patch across the middle of the wings of the males, and the identity of colouring in the sexes. The palpi are exserted, and as long as the head, with the terminal joint nearly concealed by hairs. The body in the males is long and slender, and slightly tufted at the tip. The antennæ are short, with the club stout, nearly straight, and not hooked at the tip. The wings are brown, tessellated with bright orange spots of a square or roundish form. A more important character, however, than any of the preceding, consists in the posterior tibiæ possessing only a pair of spurs at the tip.

Boisduval's name for this group is inappropriate, not only because there is a Coleopterous genus Steropus, but also because one of the European Hesperiidæ is specifically named Steropes.

SPECIES 1.—CYCLOPIDES PANISCUS. THE CHEQUERED SKIPPER.

Plate xviii., fig. 2, 2*, 2 l.

Synonymes.—*Hesperia Paniscus*, Fabricius, Ochsenheimer, Leach, Jermyn, Curtis.

Papilio Paniscus, Donovan, vol. 8, pl. 254, fig. 1; Haworth.

Pamphila Paniscus, Fabricius, Syst. Gloss.; Stephens; Wood, Ind. Ent. t. 3, f. 77; Duncan, Brit. Butt. 2, pl. 1, fig. 3.

Steropes Paniscus, Boisduval, H. n. Lep. pl. 9 B, fig. 7.

Cyclopides Paniscus, Hübner (Verz. bek. Schmett.).

Papilio Brontes, Hübner.

Papilio Sylvius, Villars.

This pretty species is generally about an inch and a quarter in the expansion of its wings, which on the upper side are of a dark brown colour, spotted with orange; the anterior with a large orange blotch in the middle, marked towards the costa with a small square brown spot; beyond the middle is an irregular bar of orange, divided by the veins of the wings, and interrupted in the middle; the two small spots which are wanting to complete the bar being pushed outwards nearly to the margin of the wing, which is also marked with a row of fulvous dots. The hind wings are marked in the middle of the disc with three large round spots, and a submarginal row of smaller dots; the fringe is brown, the extremity being dirty orange. Beneath, the ground colour of the wings is tawny; the anterior with three discoidal and four smaller posterior dusky spots, which is also the colour of the

veins at the extremity of the fore wings, and the entire veins in the hind wings, which are ornamented with pale buff spots, edged with brown; five being on the disc of larger size, and a submarginal row of smaller ones, the outer two of which are the largest. The antennæ on the under side are bright orange. The spottings differ in size in different specimens, but there is no material difference between the sexes.

The caterpillar has the head black, the neck with an orange ring; it is dark brown on the back, with two pale-yellow stripes on the sides. It feeds on the Plantago major and Cynosurus cristatus. The perfect insect appears at the end of May. It is a very local species, although where found it is abundant. Castor Haglands Wood, near Peterborough; Clapham Park Wood, Bedfordshire; Whitewood, Gamlingay, Camb.; near Dartmoor; near Luton, Bedfordshire; a wood near Milton, Northamptonshire: are recorded by Curtis and Stephens as its localities; and the Rev. W. T. Bree informs us that he took it abundantly the latter end of May, 1825, in Barnewall Wolde, near Oundle, and in Rockingham Forest, and that he has also taken it near Woodstock. "In profusion in Monk's Wood, Hunts, and in a wood near Oundle, Northamptonshire." H. Doubleday, Esq., in "The Entomologist," August, 1841.

PAMPHILA, Fabricius. HESPERIA, Boisduval.

These insects are at once distinguished from all the preceding, by the males possessing an oblique velvety patch of scales on the disc of the fore wings; moreover, when in repose the fore wings alone are elevated. There is also a diversity in the colouring of the sexes, the females being brighter than the males. The head is large, and as broad as the thorax; the eyes large and prominent; the palpi short, wide apart, very hairy, the last joint short, nearly naked, and exposed. The antennæ are terminated by a thick, nearly straight, club, which is often furnished at the tip with a hook. The thorax is very robust, and the body as long as the hind wings. The wings are entire, with the fringe not alternated in its colours; the anterior ones are elongated, and the latter slightly sinuated at the anal angle, forming a short rudimental tail. A character which I have not seen noticed exists in the typical species, the outer margin of the fore wings of the females being much more rounded than in the males. The general colour of the wings is either tawny orange, marked with brown, or brown, strongly marked with the former colour; and generally the colours are so disposed as to leave a series of squarish spots near the outer margin of the fore wings.

The powerful flight of these insects far surpasses that of the other Hesperidæ, owing to the strength of their muscles and superior robustness of the body. In the larva state they generally feed upon low plants, especially Gramineæ. The exotic species are very numerous. The species, native and reputed British, constitute several sections.

A. (Augiades, Hübn.) Antennæ hooked at the tip, head very large; palpi very short, squamose, last joint exposed; hind wings subtriangular. The doubtful native, Vitellius ? and its supposed female Bucephalus.

B. Head moderately large, palpi longer and hairy; hind wings more rounded, wings maculated; antennæ hooked at the tip. Comma and Sylvanus.

C. (Thymelinus, Hübn.) Head moderate, palpi moderately long and hairy; antennæ with the tip nearly straight, and not hooked at the tip. Linea and Comma.

SPECIES 1.—PAMPHILA SYLVANUS. THE LARGE SKIPPER.

Plate xviii., fig. 4 ♂, 4 ♀.

Synonymes.—*Hesperia Sylvanus*, Fabricius, Villars, Gmelin, Ochsenheimer, Curtis.

Papilio Sylvanus, Hübner, Lewin, Pap. pl. 46, fig. 1—3. Donovan, 8, pl. 244, fig. 2. Haworth. Harris, Aurelian. pl. 42, fig. 1.

Pamphila Sylvanus, Fabricius (Gloss.), Stephens, Duncan, Brit. Butt. 2, pl. 2, fig. 1. Wood, Ind. Ent. t. 3, fig. 80.

This, which is the largest of our British Skippers, sometimes measures nearly an inch and a half in the expanse of the wings. The upper wings are tawny brown above, with black veins; the costa, a spot on the middle, and an oblique bar beyond the middle, consisting of spots of varied size, emarginate behind, and extending nearly to the tip, the two small upper ones being near the margin, whilst three other small spots connected together towards the front margin form, with the preceding, a very irregular curved fulvous bar. The male has the base of the wings brighter orange than in the female, and an oblique central black patch of hairs. The hind wings are dark tawny above (darker in the female), with an oblong discoidal, and irregular submarginal row of paler spots. On the under side the wings are paler tawny, with a greenish tinge, the anterior at the base and the anal angle in the posterior brighter fulvous, the former with the base internally black. The pale spots on the upper side are here represented of a buff colour, but smaller in size. The antennæ are annulated, the club dark behind, pale in front; the latter has the tip very sharp, and bent into an acute and sudden angle.

This common species appears at the end of May, and again at the end of July. It frequents the borders of woods, lanes, etc., and occurs in most parts of the country.

SPECIES 2.—PAMPHILA COMMA. THE PEARL, OR SILVER-SPOTTED SKIPPER.

Plate xix. fig. 2♂, 2♀, 2 l

SYNONYMES.—*Papilio Comma*, Linnæus, Haworth, Lewin, Pap. pl. 45, fig. 1, 2. Donovan 9, pl. 295. Hübner, Pap. 795, fig. 479—481.

Hesperia Comma, Fabricius, Ochsenheimer, Curtis, Boisduval, Zetterstedt.

Pamphila Comma, Fabricius (Gloss.), Stephens, Duncan, Brit. Butt. 2, pl. 2, fig. 2. Wood, Ind. Ent. t. 3, f. 81.

Augiades Comma, Hübner (Verz. bek. Schmett.).

Female. Hesperia Sylvanus, Jermyn.

This local species bears considerable resemblance to the preceding, but is distinguished by its darker and more varied appearance, especially on the under side, caused by the pearly white spots, the very different shape of the fore wings in the males, and the different form of the club of the antennæ, and the terminal hook of the club. The fore wings measure $1\frac{3}{8}$ to $1\frac{1}{3}$ inch in expanse. On the upper side the wings are of a dark tawny orange, varied with brown, with the veins black. In the males the basal and central parts are tawny, with an elongated, rather narrowed, incrassated black patch, the middle ridge of which is glossy; in the female the basal and middle part of the wings (except the space between the postcostal and median veins, which is tawny) is dusky; the outer margin in both sexes is broadly dusky, with a very irregular and much broken and curved series of small spots, which are larger, more distinct, and paler coloured in the females. The hind wings are dusky, with the disc obscure tawny, marked obscurely with about five paler spots in the middle and towards the outer angle. On the under side the hind wings and the tips of the fore wings have a greenish tinge, which is brighter in the females; the hind wings marked with eight or nine squarish silvery white spots, three towards the base (two of which are often confluent), and the remainder forming a much-curved series parallel with the margin. All these spots are emarginate on the outside. The antennæ are annulated.

The larva is obscure green, marked with reddish, and shining; the head black; the neck with a white collar, and a row of black dots on the back and sides. It feeds on Coronilla varia on the Continent. The chrysalis is elongated and cylindrical.

The perfect insect appears in July and August, frequenting chalky districts near Croydon, and on the chalky downs near Lewes, Sussex. The Devil's Dyke, near Newmarket, and Old Sarum, Wilts, are recorded by Stephens as the localities of this uncommon species. In those places, however, it is very abundant. The Rev. W. T. Bree has also taken it near Dover.

SPECIES 4.—PAMPHILA ACTÆON. THE LULWORTH SKIPPER.

Plate xix., fig. 3 ♂, 3 ♀.

SYNONYMES.—*Papilio Actæon*, Esper, Hübner Pap., Fab. 96, figs. 488, 489, male; 490, female.

Hesperia Actæon, Ochsenheimer, Curtis, Brit. Ent. pl. 442. Godart.

Pamphila Actæon, Stephens, Ill. Haust. vol. 4, p 383. Wood, Ind. Ent. t. 3, f. 179. Duncan, Brit Butt. vol. 2, p. 121 (not figured).

Thymelinus Actæon, Hübner, Verz. bek. Schm.

The expansion of the wings in this species is about an inch in the female, or rather more. The male has the wings on the upper side dusky, with the disc glossed with tawny-orange; the veins black; the fore wings having the usual black oblique dash; occasionally there is a dusky patch at the extremity of the discoidal cell of the fore wings; the tawny colouring beyond this assuming the appearance of a curved series of spots. The under side is more uniformly orange. The disc of the fore wings in the female is more tawny orange: beyond the dark extremity of the discoidal cell is a curved series of six or seven orange spots, divided from each other by the veins of the wings. The under side in this sex has a pearly ochre lustre; a large orange patch on the fore wings extending to the tip of the discoidal cell, where the pale row of spots again appears, but more obscurely; and an oblique portion of the inner edge of the hind wings yellowish orange.

In its general character, and the almost uniform colouring of the male, this species approaches Linea, but the more maculated appearance of the female approaches nearer to the preceding species.

This extremely local species was discovered in August, 1832, by J. C. Dale, Esq., at Lulworth Cove, in Dorsetshire, in considerable numbers, frequenting thistles. It has since been found by the Rev. J. Lockey near the Burning Cliff, in Dorsetshire, in plenty. Mr. Humphreys mentions that he took it in 1835, at Shenston, near Lichfield, where it was in great plenty.

SPECIES 5.—PAMPHILA LINEA. THE SMALL SKIPPER.

Plate xix., fig. 4, 4 l, 4 p.

SYNONYMES.—*Hesperia Linea*, Fabricius, Ochsenheimer, Leach, Curtis, Boisduval.

Papilio Linea, Haworth, Donovan, vol. 7, pl. 236, f. 2, male. Harris, Aurelian, pl. 2, f. 1.

Thymelinus Linea, Hübner (Verz. bek. Schmet.).

Pamphila Linea, Fabricius, Gloss. Stephens; Wood, Ind. Ent. t. 3, f. 78. Duncan, Brit. Butt. 2, pl. 1, f. 4.

Papilio Thaumus, Esper, Lewin, Pap. pl 45, f. 5—7. Stewart.

Papilio Comma, Barbut.

Papilio Flavus, Müller.

This common little species varies in the expanse of its wings from an inch to an inch and a quarter. The wings above are fulvous, with the veins brown, and a dark margin; the male is distinguished by the ordinary oblique line of black scales on the disc of the fore wings, which is wanting in the female; in which sex the

ground colour is not so bright, and the dark margin more suffused within, like the male, however, this sex is destitute of the maculations observable in the preceding species. Beneath, the wings are almost of a uniform colour. The fore wings beneath are paler than above; the base brownish, and the margins pale; the hind wings are ashy-fulvous, with a large fulvous spot at the anal angle. The club of the antennæ in this species is nearly straight, and not hooked at the tip.

The caterpillar is solitary, of a deep green colour, and unspotted, but having a dark line down the back, and two whitish lateral lines margined with black. It feeds on the mountain air-grass and other grasses. The chrysalis is enclosed in a slight cocoon, and is of a green colour.

This species is one of the commonest of the family—flying about low bushes at the outskirts of woods, making its appearance in the beginning and middle of July, and middle of August, and appearing to be distributed all over the country.

APPENDIX OF REPUTED BRITISH BUTTERFLIES.

1. Papilio Podalirius (the scarce Swallow-tail). Linnæus; Birkenhout; Curtis, Brit. Ent., pl. 578. Westwood and Humphreys, Brit. Butt., pl. 1, f. 4. Measures three to four inches and a half in expanse. Pale yellow, with six black bands running across the fore wings, the alternate bands abbreviated, the others running across the hind wings; all the wings with a black border, bearing yellow lunules in the hind wings, which are tailed, and have a red, blue, and black eye at the anal angle. Inhabits southern and temperate Europe. There were specimens reputed as British in several old cabinets; another is stated to have been taken by the Rev. Mr. Hope; and a very dark-coloured individual, said to have been taken by Mr. Read, near Windsor, is figured by Curtis, and has been considered as the variety from Spain and Northern Africa, named P. Feisthamelii, of Duponchel. See Brit. Butt., pp. 8, and 137.

2. Parnassius Apollo (the Crimson-ringed Butterfly). Linnæus; Haworth, Lep. Brit., p. 29; Westwood and Humph., Brit. Butt., pl. 7, f. 1. Measures three to three inches and a half in expanse; wings white, slightly transparent, the anterior with black spots, and the posterior with two crimson eyelets, each surrounded by a black ring. Erroneously stated to have been taken in the Hebrides, and more recently said by Duncan to have been seen on the West Coast of Scotland. Common in the alpine regions of Europe.

3. Parnassius Mnemosyne, Latreille (Papilio Mn. Linnæus; Turton; Jermyn; Wood, Ind. Ent., pl. 53, f. 4). It is smaller than Apollo, from which it is at once distinguished by wanting the eyelets. The veins are slender and blackish, the fore wings with two black spots in the discoidal cell. It inhabits the Alps, Pyrenees, Switzerland, Sicily, Sweden, Hungary, and Russia.

4. Papilio (Colias) Electra, Linnæus,

5. Papilio (Colias) Chrysotheme, Esper,

6. Papilio (Colias) Myrmidone, Esper,—as stated in pp. 8 and 9, remarkable specimens of Colias Edusa, have erroneously been regarded as individuals of these three distinct species, of which no British examples have occurred.

7. Papilio (Colias) Europome, Esper; Hübner; Wood, Ind. Ent., pl. 53, f. 2. (Northern Europe.),

8. Papilio (Colias) Palæno, Linnæus. (Alpine Europe.),

9. Papilio Philodoce, Godart (Colias Europome, Steph. Ill., pl. 1*). North America. Specimens of these three species occurred in some of the old cabinets, in which they were probably introduced, either intentionally or by mistake, as specimens of the pale Clouded Yellow, Colias Hyale. No authentic instance of the capture of either of the three species has been recorded.

10. Aporia Monuste, Linnæus (Pontia Feronia, Ernst, *Papillons d'Europe*, vi. p. 209; Stephens, Ill. Haust. 1, 149). "Wings above, white; the anterior with a single row of

triangular brown spots touching the hinder margin, and terminating in a point on each nervure internally; beneath, immaculate; the anterior white, with a yellowish tint on the outer angle; the posterior entirely of the latter colour, irrorated with dusky." Ernst says of it, that it was "prise en Angleterre." No other authority exists for its being an indigenous species; and Mr. Stephens suggests that it may be a native of New England, in America, and in the Cat. Brit. Lep., British Musuem, he gives it as identical with Pieris Cleomes Bdv., from North America.

11. Melitæa Tharossa (Papilio Dan. Fest. Tharos, Drury, App. v. 2; Cramer, pl. 169, fig. E. F.; Argynnis Tharossa, Enc. Méth. 9, 289; Melitæa Tharos, Westw. in Drury, 2nd Edit. 1, p. 39). Wings black-brown, with many orange marks, some of which form an irregular bar beyond the middle of the fore wings, the tips and margins being dark. There is also a row of black round spots in orange spaces beyond the middle of the hind wings. This is a common North American insect; but Cramer, in figuring it, stated it was "reçu d'Angleterre;" whence it has been inferred that it was regarded by him as an English species.

12. Papilio (Melitæa) Maturna, Linnæus; Wood, Ind. Ent., t. 53, f. 5; Pap. Mysia, Hübner, f. 3. Linnæus having referred to Wilkes's figure of M. Athalia, among his synonymes of this species, the latter was introduced by Stewart into our Fauna, but without any authority.

13. Papilio (Melitæa) Parthenie, Borkhausen; Athalia; Hübner, f. 19, 20. Introduced by Lewin, (Brit. Butt., p. 32) without authority.

14. Papilio (Melitæa) Dia, Linnæus. Loudon's Mag. Nat. Hist., v. 751, fig. 124. Westwood and Humph., Brit. Butt., pl. ix., f. 5–7. Measures one inch and three-quarters in expanse. Closely allied to Selene, but darker above; hind wings beneath brownish-purple, with darker markings, and numerous irregular semi-metallic spots, six or seven small ones at the base, a band of silvery and yellow spots, and a submarginal series of silver lunules. Stated to have been taken in Sutton Park, near Birmingham, and near Alderley, in Cheshire; but doubts are entertained as to the correctness of these statements.

15. Papilio (Argynnis) Niobe, Linnæus; Wood, Ind. Ent., t. 53, f. 6. Measures one inch and two-thirds in expanse. Wings fulvous, spotted with black, beneath fore wings similar, but with smaller spots; hind wings buff, varied with dark red, with silvery or yellow spots, and a row of rusty eyelets with silvery pupils. Introduced by Stewart without authority.

16. Papilio (Argynnis) Cybele, Fabricius; Argynnis Aphrodite, Bree in Charlesworth Mag. N. H. iv. 131, pl. 10. A specimen of this North American insect was taken by Mr. Walhouse, in Upton Wood, near Leamington.

17. Papilio (Argynnis) Aphrodite, Fabricius; Westw. and Humphr., Brit. Butt., pl. xii., f. 4, 5. A figure of this North American species was published in Brit. Butt., Mr. Walhouse's specimen of the preceding insect having been considered as Argynnis Aphrodite. Both are, however, regarded as local varieties of the same species.

18. Papilio (Araschnia) Levana, Linnæus; Wood, Ind. Ent., t. 53, f. 9. Indicated as British by Turton, but no indigenous specimen exists.

19. Papilio (Junonia) Hampstedensis, the Hampstead Eye. Petiver Gaz. t. 5, f. 4. Westw. and Humphr., Brit. Butt., pl. xiv. f. 7. Of this exotic species (most probably identical with the Australian Junonia Vellida) nothing is known beyond Petiver's figure and description, referred to above, in which it is said to have been taken at Hampstead, and an apparently contemporary oil drawing, mentioned by Mr. E. Doubleday in the Genera of Diurnal Lepidoptera.

20. Papilio (Cynthia) Huntera, Fabricius; Westw. and Humphr., Brit. Butt., pl. xv., f. 5, 6. A specimen of this common North American species was captured by Captain Blomer, in Pembrokeshire.

21. Papilio (Limenitis) Populi, Fabr. (Papilio P. Linn. Stewart; Wood, Ind. Ent., t. 53, fig. 10). The wings above, brown, fasciated, and spotted with white; beneath, luteous, fasciated with white, and ornamented with blue spots. This fine Continental species, which is nearly three inches in expanse, appears to have been introduced in the English lists in consequence of Linnæus having erroneously referred to Ray's description of Sibylla, amongst his synonyms of Populi. No instance of its capture in this country is known.

22. Papilio (Limenitis) Camilla, Fabricius, but not of Linnæus; P. Sibilla, Drury, Steph. Ill. 1, 52 note; Wood, Ind. Ent., t. 53, f. 11 (but not of Linnæus). Is closely allied to L. Sibilla, Linnæus, with which it has been confounded by Fabricius. Stewart, who followed the nomenclature of the latter author, accordingly gave the Camilla, Fabr., as a native species. It is nearly two inches and a half in expanse; the wings above, dark brown, with a white fascia, without any red spot at the anal angle; beneath, orange-tawny, spotted as above. No authentic instance is recorded of its capture in this country.

23. Papilio (Lasciommata) Mæra, Linnæus. Closely allied to L. Megæra in its markings, but distinguished by the more distinct club of the antennæ; the wings are brown, the fore ones with a fulvous cloud near the tip, on which are a large and a small white and black eyelet; hind wings with two or three sub-marginal ocelli. Linnæus incorrectly referred this species to Merret and Wilkes, by mistake, for Megæra; hence Birkenhout and Stewart gave Mæra as British; but no instance is known of its capture in this country.

24. Papilio (Hipparchia) Phædra, Linnæus; Hübner, Pap., f. 127—129, Wood, Ind. Ent., t. 53, f. 13. All the wings on the upper side of a deep uniform brown, the fore ones with two large ocelli, and the hinder ones with a single minute one near the anal angle. Expanse two inches and a half. Introduced by Turton, but no authentic specimen is known. A native of Europe.

25. Papilio (Hipparchia) Hermione, Linnæus; Hübner, Pap., f. 122—124; P. Alcyone, W. V.; Esper, Wood, Ind. Ent., t. 53, f. 14. Wings above, brown, with a whitish bar, the anterior with two ocelli on each side; and the posterior beneath, marbled, with a white angular bar and a single ocellus. A native of southern Europe. Erroneously given as a native of Scotland by Stewart, who mistook a female of H. Blandina for this species.

26. Papilio (Hipparchia) Briseis, Linnæus; Fabricius; Westw. and H., Brit. Butt., pl. xix., fig. 1, 2. Expansion two inches and a half; wings denticulated, brown, with a greenish gloss, anterior with an interrupted row of whitish oval spots beyond the middle, the first and fourth bearing ocelli; hind wings with a more continuous broad fascia of whitish spots. A specimen of this continental species was reared by A. Lane, Esq., in 1839, from a larva found feeding on grass, near Newington, on the 11th of August, and was exhibited at the Entomological Society on the 7th of October following.

27. Papilio (Cœnonympha) Iphis, W. V., but not of Stephens, Haust., 1, 64. As stated in page 72, Mr. Stephens mistook one of the varieties of C. Davus (P. Typhon, Haw.) for this species.

28. Papilio (Cœnonympha) Arcanius, Linnæus; Curtis, Brit. E., pl. 205*. Westw. and Humphr., Brit. Butt., pl. xxii., fig. 5—8. Expands one inch and a half. Wings

above tawny, darker along the margin, a small obscure eye near the tip of the fore pair, and three or four very indistinct eyes on the hind pair; fore wings beneath fulvous, with a white bar beyond the middle; hind ones dark orange brown, with an irregular white fascia, beyond the middle; margin tawny; eyelets more distinct, with a silver submarginal line. Introduced by Turton. A single specimen, said to have been taken on the borders of Ashdown Forest, from Plastead's collection, is in Mr. Curtis's cabinet. It is common on the continent of Europe.

29. Papilio (Cœnonympha) Hero, Linnæus; Curtis, Brit. E., pl. 205. Westw. and H., Brit. Butt., pl. xxii., fig. 3, 4. Expands one inch and a half. Wings above fulvous-brown, with two blind eyelets near the tip and hind margin of the fore ones, and four larger and more distinct on the hind wings; beneath, fore wings coloured as above, with a narrow silver submarginal stripe extending through the hind wings, which have an irregular whitish bar rather beyond the middle, succeeded by orange, in which are seven ocelli, the two next the anal angle confluent. Introduced by Haworth. A single specimen, also from Plastead's collection, said to have been taken at Wythyham, on the borders of Ashdown Forest, is in the collection of Mr. Curtis. Another, said to have been taken at Lamberhurst, was obtained by Mr. Stephens; but some doubt must also have attached to this specimen, as the species is placed in the list of doubtful natives in Mr. Stephens's Brit. Mus. Catal.

30. Papilio (Oreina) Melampus, Fuessl, Ernst. As stated in p. 77, a variety of P. Cassiope, from Perthshire, was mistaken by Mr. Newman for this species, which inhabits the Alps of Switzerland.

31. Papilio (Oreina) Mnestra, Esper. As stated in p. 77, another variety of P. Cassiope was given in the second edition of Jermyn's "Vade Mecum," as this species, which inhabits the Alps of Switzerland.

32. Papilio (Thecla) Spini, Fabricius; Wood, Ind. Ent., pl. 2, f. 53. Westw. and H. Brit. Butt., pl. xxvii. fig. 1—5. Closely resembles T. Pruni. Wings above, brown, hind pair with several red submarginal spots; tip of tail white, beneath ashy, with a white streak, which is angulated at the anal angle, and several fulvous submarginal lunules, marked with black, and a large bluish spot at the anal angle, with a terminal black spot. Two specimens only, of very doubtful origin, have been recorded as British by Haworth and Stephens.

33. Papilio (Thecla) Ilicis, Esper; Westw. and Humph., Brit. Butt., pl. xxvii., fig. 6—8. This species was introduced into the last-named work on the authority of a specimen in Mr. Maynall's collection, said to have been taken in Yorkshire; but doubts are entertained as to the correctness of the statement. It is rather larger than Th. Spini. Wings above, blackish-brown, the fore ones in the female with a large orange patch beyond the middle; hind wings with an orange spot at the anal angle.

34. Papilio (Thecla) Titus (Hesperia Titus, Fabricius, Ent. Syst. 3, a. p. 297; Turton: Pol. Titus, Jermyn, Stephens). Wings above, brown, unspotted; beneath, also brown; the anterior with a hinder row of white and black lines; the posterior with a short central line, and a row of black spots ocellated with white. Near the margin is a row of red spots, each marked with a black dot. "Habitat in Anglia. Dom. Drury, Jones, fig. pict. 6, t. 44, t. 2." It appears that Fabricius derived his knowledge of this species from the same source whence he also described Artaxerxes, namely, Jones's Collection of Drawings. Beyond this we have no information respecting the species.

35. Papilio (Polyommatus) Alcon, W. V.; Stephens; Westwood and Humphr.,

Brit. Butt., pl. xxxii., fig. 4—6. Expanse one inch and a half. Wings above, nearly immaculate, shining violet blue; beneath brownish-ash; the anterior with ocellated black dots, a row of which is placed near the hinder margin, without lunulated spots; hind wings ocellated as in P. Arion, but with the hinder margin nearly immaculate. Female almost entirely brown above. A remarkable variety of P. Arion, in Mr. Haworth's Collection, taken in Buckinghamshire, was regarded by Stephens as this species.

36. Papilio (Polyommatus) Dorylas, W. V.; Wood, Ind. Ent., pl. 2, f. 67. Westw. and H., Brit. Butt., pl. xxxv., fig. 3–5. Expands one inch and a quarter. Wings above, of a bright azurine blue, with a slender marginal black line; the fore margin and fringe, white; the latter unspotted; the fore wings beneath are spotted, as in Adonis, but without the basal spot; and the hind wings have the white discoidal spot unspotted with black. Dr. Leach considered the common blue (P. Alexis) to be this species; and Mr. Stephens described a variety of P. Adonis (as stated in the "Brit. Mus. Catal." p. 20) under the same name. The true species is a native of the alpine regions of Southern Europe.

37. Papilio (Polyommatus) Icarius, Esper; Haworth; Ent. Trans., P. Amandus, Ochsenh. Expands one inch and one-third. Above, rich pale blue, with a broad hind black margin; fringe obscurely dotted, beneath deep ashy; anterior with a central spot, and a curved row of four or five submarginal ocelli; hind wings with a central bent streak, followed posteriorly with an irregular band of black sub-ocellated spots, a fulvescent streak, and a few marginal spots. Stated by Mr. Haworth to have been taken in Kent, but the specimens so named are regarded as varieties of P. Alexis. The true species inhabits the Pyrenees and Alps, etc.

38. Papilio (Polyommatus) Eros, Ochsenh.; Wood, Ind. Ent., pl. 3, f. 70. Westw. and H., Brit. Butt., pl. xxxv., fig. 1, 2. Expands one inch and a quarter. At once distinguished from P. Alexis (to which it is closely allied) by the peculiar pale upper surface of the wings of the male, with a dark border and a silvery greenish tinge, and from the female by the much darker upper surface. It is a native of the Alps. Mr. Haworth introduced this species in Entom. Trans., and Mr. Stephens added the description of a supposed variety of it; but in both cases varieties of P. Alexis had been mistaken for the true P. Eros, which inhabits the Alps.

39. Papilio (Polyommatus) Argus, Linnæus; ♀ P. Idas, Linn. The silver studded blue P. Ægon, Bork., has been regarded, until recently, as the P. Argus, Linn., but no authentic specimen of the latter is known.

40. Papilio (Pyrgus) Oileus?, Linnæus; Haworth (Ent. Trans.); Westw. and H., Brit. Butt., pl. xxviii., fig. 14, 15. Mr. Haworth applied this name to a specimen stated to have been taken in Bedfordshire, by Dr. Abbott, and which he considered identical with a species from Georgia, in his collection; but Mr. Stephens suggests that they might have been the P. Fritillum, Hübner, f. 461—465.

41. Papilio (Pyrgus) Malvarum, Ochsenh.; Westw. and H., Brit. Butt., pl. xxxix., fig. 1—5. P. Malvæ, Linn.? Fabricius; Stephens. The name of the Grizzled Skipper, P. Malvæ, has been applied by various writers to this species (which is at once distinguished by its dentated wings). But no specimen has hitherto been taken in this country.

42. Hesperia (Pamphila) Vitellius, Fabricius; ♀ Pamphila Bucephalus, Stephens; [illegible], pl. x., f. 2. Westw. and H., Brit. Butt., pl. xl., fig. 1, 3. Several specimens of this American species have also been taken in different parts of England; doubtless introduced with plants.

43. Hesperia (Cyclopides) Sylvius, Knoch, Hübner. Expanse one inch and a quarter. Wings tawny-orange above, with black spots, four on the disc, and a submarginal row of smaller ones; hind wings above, brown, spotted with orange, four spots being placed on the disc, and five near the margin. Several specimens of this species (which Boisduval regards as a variety of Paniscus) occurred in some of the old cabinets, but they are supposed to have been exotic specimens, introduced to supply the place of the then rare Paniscus, with which they were regarded as identical.

ALPHABETICAL INDEX.

Obs.—*The ordinary Synonyms of the Genera are enclosed in brackets, and those of the Species (including Varieties) are printed in Italics; as well as the doubtful Species, which are indicated by a * prefixed to their names.*