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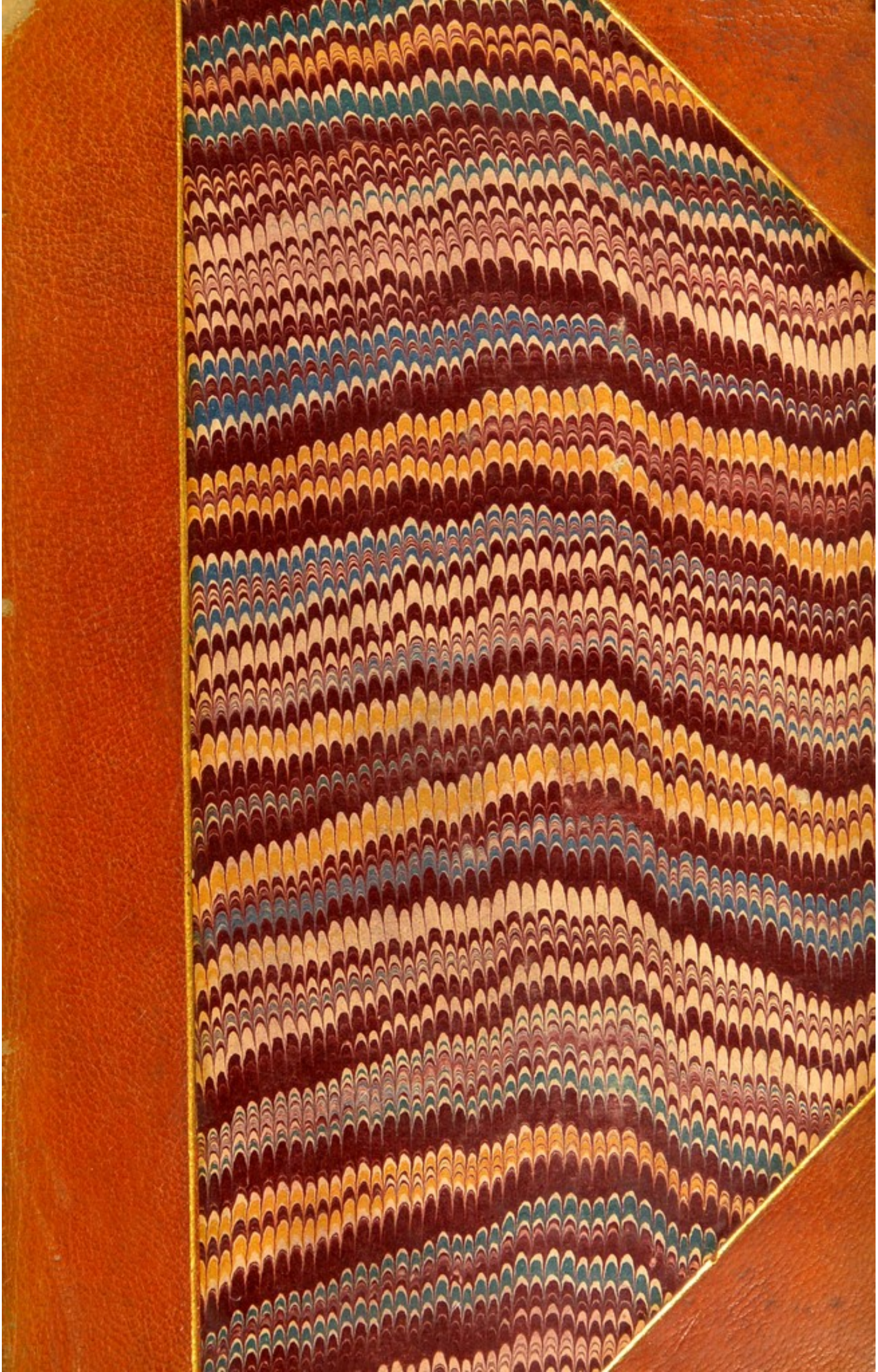
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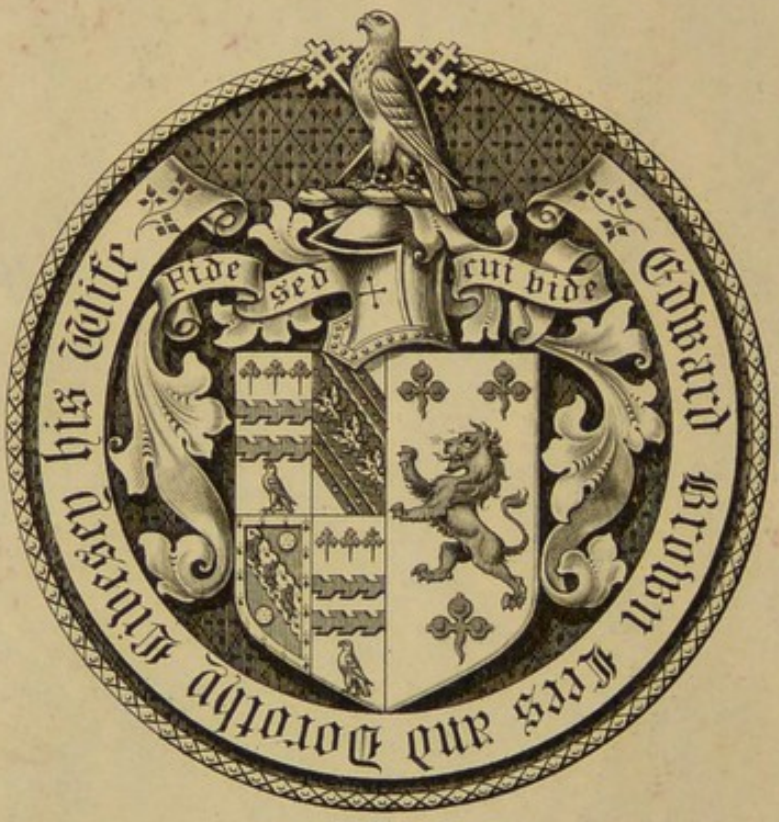
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FOREIGN INSECTS.

PLATE III.



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INSECTS ABROAD.

BEING A POPULAR ACCOUNT OF

FOREIGN INSECTS,

THEIR

STRUCTURE, HABITS, AND TRANSFORMATIONS.

BY THE

REV. J. G. WOOD, M.A. F.L.S. &c.

AUTHOR OF

'INSECTS AT HOME,' 'HOMES WITHOUT HANDS,' 'BIBLE ANIMALS,' ETC.

ILLUSTRATED WITH SIX HUNDRED FIGURES, BY E. A. SMITH AND J. B. ZWECKER, ENGRAVED BY G. PEARSON.

LONDON:

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PREFACE.

THE object of this work is two-fold; first to show the great and important part played by Insects in the economy of the world, and the extreme value to mankind of those insects which we are accustomed to call Destructives; and next to note the wonderful modifications of structure which enable the insects to fulfil their mission, and the surpassing beauty with which many of them are endowed.

Incidentally, many interesting points connected with insect life are described, as, for example, the manner in which many of them directly support human life by furnishing food, or being themselves eaten.

Thus Bees not only furnish honey, but in several countries are themselves eaten while in the state of grub-dom, together with the "bee-bread" which has been laid up in the cells. Several Wasp larvæ share the same fate.

Then, there are the Locusts, which, although they destroy vegetable life, are in many parts of the world invaluable in preserving animal life, by furnishing food, not only to man, but to beasts, birds, and reptiles. Termites, again, form a favourite article of food in almost every country where they are found; while in Australia, the fat-bodied Butterfly popularly called the "Bugong Moth," affords nourishment to thousands of the natives, and in a few weeks changes them from starvelings into plump and contented beings. The Dragon Flies are employed in the same manner in the same country.

Even in civilized lands insects are utilized for food. Putting aside the cheese mites and "hoppers" with which we are all familiar, we find the Mexicans employing a certain honey-gathering ant for the purpose of making mead. In Europe the common Wood Ant is much used in the manufacture of vinegar, and in the South of France the same insect is pressed into the service of the pastry-cook, being used to flavour a certain sort of cream called "*crême aux fourmis.*"

By way of retaliation, the voracious Mosquitos are themselves eaten in some parts of the world. It is related by Livingstone, that the insects swarm in such vast multitudes on the banks of the Nyassa Lake, that they are gathered in bags and pressed into circular cakes about an inch thick and seven or eight inches in diameter. These cakes, called "kungo," somewhat resemble caviare in flavour.

Larvæ, especially those of the larger beetles, form an important branch of food in many countries, and in some, as in certain parts of Australia, are absolute necessities. Among them may be mentioned the celebrated Gru-gru grub of the West Indies. It is the wood-boring larva of a gigantic Weevil, and when taken from the tree is held by the head and eaten alive. However repulsive the notion may appear, it has been found that when Europeans have once been induced to try the Gru-gru, they have always held it as one of their best dainties.

Perhaps the most curious article of insect-food is the egg of one of the Mexican Water-boatmen (Corixa).

These eggs are laid in countless numbers upon bundles of reeds which are sunk for the purpose. In a fortnight the reeds are covered with eggs, which are scraped off and made into cakes under the name of "haoutle."

Some of the insects are useful to man in a secondary manner by producing articles which are almost necessary adjuncts to civilization, such as the wax of the Bee, the irritant juices of the Blister Beetle, the dye of the Cochineal, and the "lac" of its near relative the Lac Insect.

Lastly, as to the book itself. Eight hundred and sixty insects have been described, six hundred of which have been figured, the illustrations and descriptions having all been made from the actual specimens. In order to ensure accuracy in rendering the "texture," the engraver has taken the trouble to inspect the insects themselves before touching the block on which they were drawn. The reader may form some idea of the labour which has been expended in the work, when I mention that more than three thousand drawers of insects have been examined, each drawer containing, on an average, some fifty specimens.

I now have the pleasing task of thanking most heartily the officers attached to the Insect Room in the British Museum, for the kind assistance which they rendered through some three years, and the generous manner in which they afforded information that could have been obtained from no other source.

Belvedere, S.E.
May 9th, 1874.

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INSECTS ABROAD.

CHAPTER I.

INTRODUCTION.

IN this our favoured country the insect tribes play apparently so insignificant a part in the economy of the world, that few except professed entomologists have the least idea of their real importance, their vast, silent, and unseen armies, and the enormous power which they wield.

I say unseen, because none but a practical entomologist ever sees one insect in ten thousand, even when they have attained their perfect state; and the most skilful naturalist can but conjecture as to the countless hosts of grubs and caterpillars that are hidden among the foliage, buried in the ground, submerged beneath the waters, burrowing under the bark or into the solid wood of trees, or leading a parasitic existence within the bodies of living animals. Insects pervade the whole of Nature, and the functions which they perform are so important, that they deserve from man far more attention than he generally condescends to bestow. Individually an insect is small, feeble, and, in the eyes of most persons, contemptible. Collectively, the insect tribes are a mighty host, exercising over our world an influence that excites equal wonder and admiration in the minds of those who can appreciate it.

Still, important as are the insects in this country, those of tropical lands have infinitely more influence, and that for a very

evident reason. They have more work to do. By dint of daily increasing and improving agriculture, and by the rapid growth of population, we have so completely altered the surface of our land, that many species which were formerly abundant have utterly perished, and many others are becoming scarcer year by year. Insects do not now play nearly so conspicuous a part as they used to do, and in consequence they do not attract the notice of persons unaccustomed to observe. It is otherwise in many other parts of the world, especially those which lie between the tropics; and the natural consequence is, that when inhabitants of more temperate climates travel in hot countries, the insects force themselves upon their attention.

Unfortunately for science, however, the average traveller never thinks of observing insects for their own sakes, and only takes notice of those which annoy him. Unless they bite him, sting him, spoil his clothes, attack his cattle, or eat his provisions, he passes them by with utter indifference, and seems not to be aware that such creatures as insects exist. As to searching for the work which they, like all created beings, have to do in the world, such an idea never enters his mind, and he seems to look upon insects merely as if they were made for the especial purpose of being either avoided or destroyed.

Yet, taking even the many insects which are most troublesome to travellers, we can see how important are the tasks which they have to perform, and how great is their influence upon the face of Nature.

Take the first insect of which travellers unite in complaining, the hated and dreaded Mosquito. In its perfect, or winged state, it is about as annoying a creature as can be, but then it must be remembered that the traveller is but a casual intruder in the natural domain of the mosquito, and must expect the consequences of his intrusion. Devouring travellers is not the normal occupation of the mosquito, for hundreds of successive generations may live and die, and not one of them ever see a human being. Their real object is a beneficent one. In their larval state they live in the water, and feed upon the tiny particles of decaying matter that are too small to be appreciated by the larger aquatic beings, and, by devouring them, purify the water and convert death into life. Even in our ponds at home, we are much indebted to the gnat larvæ for saving us from

miasma; while the vast armies of mosquito larvæ that swarm along the edges of tropical lakes and feed upon the decaying substances that fall from the herbage of the banks, purify at the same time the water and the atmosphere, and enable human beings to breathe with safety the air in which without their aid no animal higher than a reptile could have existed.

The next insect plague of which a traveller complains is generally summed up in the word Ants. He seldom troubles himself to ascertain the species of the ant, to preserve specimens for the benefit of science, or to obtain the least insight into their habits. All he knows or cares is, that some ants, which were very small, stung him, each sting feeling like the prick of a red-hot needle. Some, which were very large, bit him even through his clothes, and held on with such more than bull-dog tenacity, that after the bodies were torn away, the heads not only retained their hold, but went on biting.

Then, multitudinous ants, large, small, and middle-sized, swarmed into his room or tent, and ate up his provisions almost before his very eyes. If he put the legs of the table into water, they made extemporised pontoon bridges of their bodies and extended legs, and so enabled the ant-armies to scale the citadel, despite of the moat. If he hung his shelves from strings, the ants crawled down the strings. And, if he did succeed in isolating a table by putting the legs in saucers full of oil, the ants crawled up the walls, then on the ceiling, and then dropped on the table. They ate his food, they swarmed into his drink, and they tore to pieces all his birds and other specimens that he had collected.

Of course this conduct was anything but agreeable, and it was very natural that the traveller, looking at everything as it affected himself individually, should feel aggrieved, and wonder why such mischievous creatures should have been made. But if we put aside the temporary and individual inconvenience caused to the traveller or colonist, and look to the real mission of these detested insects, we shall find that they play on the land a part like that of the mosquitos on the water, and rank among the most important of the scavengers of the earth. Their presence is undoubtedly disagreeable to individual men, but mankind would suffer severely if the Ant tribes were to be extinguished.

Take two more insects, which are beyond measure annoying to man,—namely, the wood-boring beetles and the termites, otherwise, but very wrongly, called white ants. Nothing can be more disheartening to a planter than to have his trees and canes devoured by the beetles, and every bit of timber in his house destroyed by the termites. We shall in the course of this work see examples of the ravages of both insects, so that we need not go into details now. Yet, strange as it may seem, but for the effects of these wood-destroying insects there would be no forests at all. Suppose, for example, that all these insects were immediately exterminated, the results would be much as follows. A vast tree, one of the giants of the forests, dies, and is blown down in one of the fierce hurricanes of tropical climates. Where the tree fell, there it lies, and where it lies it cumbers the earth, and prevents other trees from springing up in its place. Years roll on and become centuries, tree after tree falls, and slowly but surely arrives the time when the place of the towering forest, with all its wealth of life, is taken by a vast wilderness of dead and fallen tree-trunks.

How different is the beneficent operation of Nature under the present conditions. Scarcely has a tree fallen than the insect hosts are at work on it. First come the large and powerful wood-boring beetles and deposit their eggs upon it. Armed with their sharp and strong jaws, which act like bone-nippers, the larvæ bore through and through the trunk, making tunnels like auger-holes, and so rendering the tree permeable to air and wet. Smaller beetles soon follow in the wake of the large, and bore out the softened wood, and a host of other insects set to work on the now decaying trunk, many using it as food, and others carrying it off as material for their nests. The rapidity of their work is astonishing, and in an exceedingly short time the entire tree is reduced to mere dust. "Put thy foot," writes Waterton, in his "Wanderings," "on that large trunk thou seest to thy left. It seems entire amid the surrounding fragments. Mere outward appearance, delusive phantom of what it once was! Tread on it, and, like the fuzz-ball, it will break into dust." And this dust serves as a fertilizer to the soil, and enables it to produce fresh trees in the place of that which had fallen.

Take the white ants again, even apart from their wood-eating propensities, and see what good service they do even by the

simple act of building their wonderful nests. They are perpetually engaged in transferring to the surface of the earth the soil which they have taken from beneath it, and so continually renewing and fertilizing it with fresh soil. These insects indeed play very much the part that our much-despised mole and worm do at home. It would be easy to multiply examples indefinitely, but I have chosen these insects in order to show how even the very creatures which are most detested by man, and do him the most direct damage, are indeed, though indirectly, among his best benefactors. Apart from direct benefit or injury to man, the whole of the insect tribes are working towards one purpose, namely, the gradual development of the earth and its resources. The greater number are perpetually destroying that which is effete, in order to make way for something better; while others, whose business seems chiefly to be the killing and eating of their fellow-insects, act as a check to their inordinate increase, and so guard against the danger of their exceeding their proper mission.

CHAPTER II.

TIGER BEETLES, OR CICINDELIDÆ.

At the head of the insect race are by common consent placed the multitudinous species which are collected under the common title of Geodephaga. This very appropriate title is formed from two Greek words, signifying devourers of the earth, and is given to the large group of carnivorous Beetles which live on the ground, in contradistinction to another great group of carnivorous Beetles which live in the water, and are called Hydradephaga, or devourers of the water. In both these groups, the larva or grub, and the perfect insect, agree in their general habits, so that the larvæ of the first group are always found on land, and those of the second group as invariably in the water.

Equally by common consent of entomologists, the Tiger Beetles have been placed at the head of the Geodephaga. Formerly they were all classed under one family, the Cicindelidæ, but of late years, in accordance with the ever-growing mania for subdivision and over-refining, they have been split up into a number of families, the first of which are the Mantichoridæ, a group of which we have no British representative. The name is a very curious one, and I will explain it before describing the insect which is our representative of the tribe to which it belongs.

Some 2,300 years ago, there lived a certain Greek historian named Ctesias, who was taken prisoner by Artaxerxes Mnemon at the battle of Cunaxa, so celebrated for the retreat of Xenophon's famous "Ten Thousand." Profiting by his honoured captivity of seventeen years, during which time he was the physician of Artaxerxes, he wrote a history of Assyria and Persia, in which he introduced accounts of sundry remarkable animals. There

were ants, for example, as large as foxes, and, above all, there was the Martichora, a Grecized form of the Persian word *Mard-khora*, or Man-slayer. This Martichora, a portrait of which is now before me, had the body of a lion, the head of a man, and the tail of a scorpion, armed at the tip with a bunch of porcupine's quills, which the Martichora used as missile weapons, flinging them at its enemies by a jerk of its tail.

Although the beast's mouth was armed with three rows of triangular teeth (evidently borrowed from the shark), the armed tail formed its principal defence; so that when hunters caught a young Martichora, they bruised its tail between two stones, so that it should never grow any more quills. Corrupted —probably for the sake of euphony—into Mantichora, this name was fancifully given to the present group of insects, in consequence of their size, strength, and ferocity.

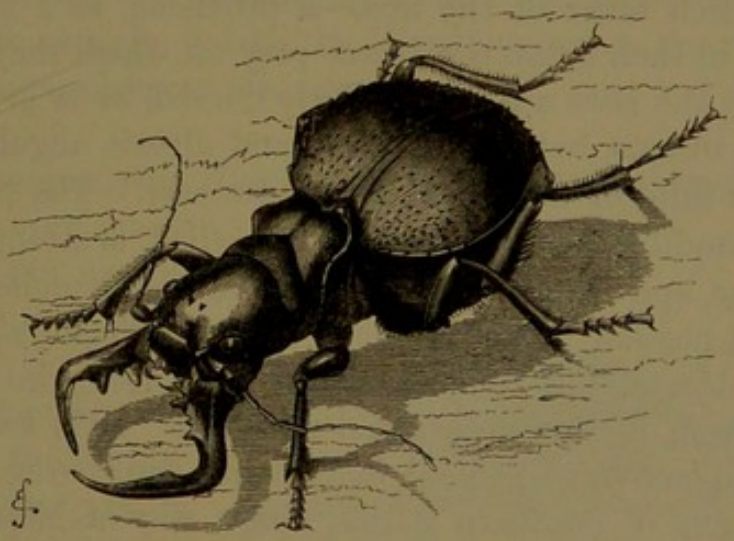


FIG. 1.—Mantichora mygaloides.

The species which has been selected for our example of this family is the *Mantichora* (not *Manticora*, as it is generally, but wrongly, spelled) *mygaloides*. It is a most extraordinary looking Beetle, and may well puzzle entomologists as to the place which it holds in the insect world. There is something about it that shows its connection with the Tiger Beetles, whose terrible jaws are absolutely exaggerated in the Mantichora. There is something about it that looks like a Carabus, or Ground Beetle, and the general shape of the body bears such a curious resemblance to that of the well-known Bird Spider of South America, that it

has received on that account the specific name of mygaloides, *i.e.* like the Mygale.

Its colour is black and shining, and the creature has a singularly menacing air, so that it well merits the fanciful name that has been bestowed on it. Generally, the Tiger Beetles are furnished with powerful wings, but the Mantichora is entirely wingless, the elytra or wing-cases being soldered together, so that the insect is unable to leave the ground.

The part of this Beetle which most strikes the eye is the head, with its armature of crooked and most powerful jaws. In the illustration the jaws are represented as they appear when open. When they are closed, they cross each other nearly as far as do the fingers of the clasped hands, so that a bite from one of these formidable insects is no joke, even to a human being.

Most, if not all, of the Tiger Beetles have their jaws thus crossing each other at the tips,—a provision, as I imagine, for retaining in their grasp the insect prey on which they feed. In this insect the jaws are not regularly curved, as is generally the case with insects, but take a sharp and almost angular bend at about one-third of their length from its base. The side of each jaw, or mandible, as it is scientifically called, is strongly toothed at the base, and altogether the insect possesses a prehensile apparatus that has few parallels among its many kinsfolk.

The habits of the Mantichora are just those which might be inferred from its appearance and structure. It is swift of foot, quick and active in general movements, and, living in the dry sandy plains of Southern Africa, has a way of hiding beneath stones from the fierce glare of the sunbeams, and of darting quickly from its place of concealment when any creature passes by on which it can pounce. The insect is represented of the natural size.

This tribe, the Mantichorides, is separated from the Cicindelides on account of the structure of the fore-legs, which have the tarsi similarly shaped in both sexes, and with cylindrical joints. The present species was called by Thunberg *Cicindela gigantea.*

Another tribe of the Tiger Beetles is that which is called Megacephalides, or Big-headed Tiger Beetles. In these, as the name implies, the head is very large, so as to give the insects

rather a clumsy look. Their legs are exceedingly long, and, indeed, it is not easy to say whether the large head, or the long and slender legs, first catch the eye. They are winged, but their wings are not nearly so long or so strong as those of our British Tiger Beetles, so that they are more to be found on the earth than in the air.

There is one species, indeed, *Megacephala sepulchralis*, a native of Brazil, which appears never to take to the wing, but runs very swiftly through the grass that grows on sandy soil in the forests. Most of the Tiger Beetles have a similar habit, and these insects are therefore often called by the popular name of Sand-runners, or Sand Beetles. This species gives out a perfume which much resembles attar of roses, but which changes after death to a very fœtid and disagreeable odour. The reader may perhaps remember that our common British Tiger Beetle exhales a strong and pleasing scent like that of crushed verbena plants, but happily, unlike the Brazilian insect, the odour does not become unpleasant after death.

THE accompanying illustration represents the largest of these insects, a very giant among its kin, drawn of its natural size. Its name is *Megacephala Senegalensis*, and, as the latter word implies, is a native of Senegal.

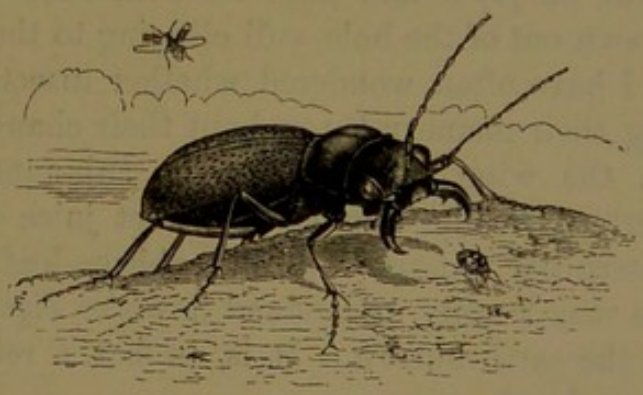


FIG. 2.—Megacephala Senegalensis.

As is often the case with Tiger Beetles, there is considerable variation in colour. The thorax, however, is always green and shining, and the elytra are always roughly punctated, *i.e.* covered with tiny holes as if the point of a blunt needle had been slightly pressed into the surface. There are very few Beetles which are entirely without these punctures, whose use, I believe, has never yet been ascertained or even conjectured; but in some species they assume a very decided importance, the interior of each puncture being brightly coloured, while the general surface is simply dull brown or black. We shall soon

see examples of these coloured punctures, none of which, as far as I know, are to be found in our insects at home.

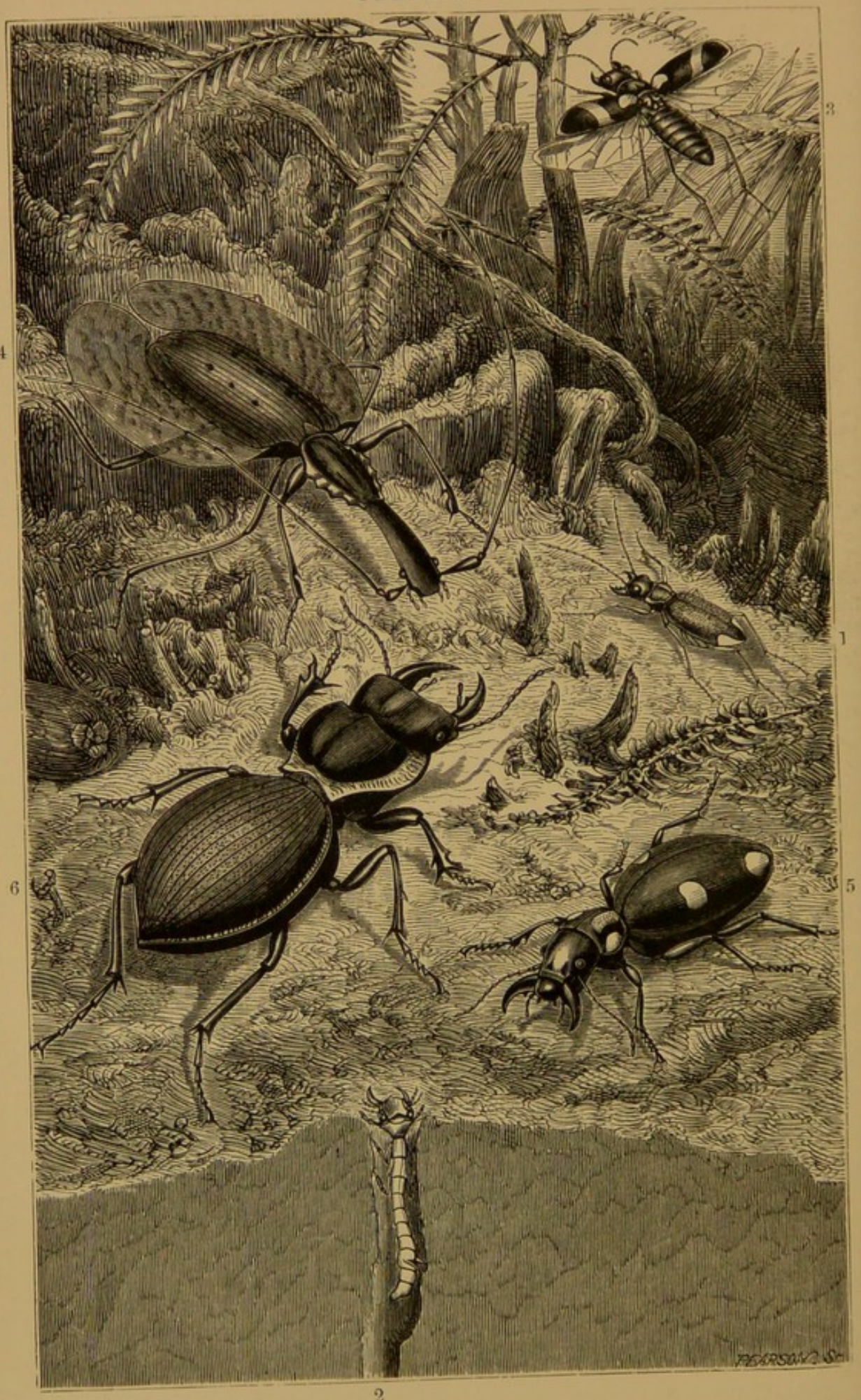
The colours of the elytra in this species are strangely variable, some specimens being brown, some green, and some blue, the two latter colours being often interchangeable in insects, whether British or foreign. The head is always coloured like the thorax, and the legs are pale yellow-brown.

THE habits of some species of Megacephala are not only terrestrial, but subterranean. There are in the tropical regions sundry Beetles belonging to the same group as our common Dor Beetle, which make burrows in the ground under animal refuse. There is a Brazilian species of Megacephala, which has an odd habit of taking possession of such burrows, and, like the knights-errant of old, defending them against all comers. Generally it remains near the mouth of the hole, menacing all foes, real or fancied, with its powerful jaws; but, should it find itself overmatched, it takes refuge at the bottom of the burrow. Even then it does not abandon its combatant character; for if a blade of grass be pushed down the hole, the Beetle is sure to seize it with its jaws, and hold on with such tenacity that it can be drawn out of the hole, still clinging to the end of the grass-blade.

I have often wondered whether insects are capable of retaining their memory throughout their changes, so that a dragon-fly on the wing can recollect its sub-aquatic existence, and the butterfly, while sipping the sweet juice of flowers, remember its caterpillar banquet on the cabbage-leaf. If such be the case, we may readily understand how the Tiger Beetle comes to resort to the earth-burrow. It is, in fact, a return to the habits of its larva-hood.

All the Tiger Beetles live, when larvæ, in burrows under a loose soil, remaining with their sickle-like mandibles expanded at the entrance, just like the jaws of a steel-trap, ready to seize any passing insect and carry it down to the bottom of the burrow, where it can be eaten in peace. And the mode of action when attacked is exactly the same in both cases, for, as all practical entomologists know, the recognised mode of obtaining the larvæ of Tiger Beetles without hurting them, is by poking a straw or grass-blade into their burrows, and pulling them out gently while they cling to the supposed enemy

PLATE I.



by their strong jaws. Field Crickets are taken in just the same manner.

On Plate I. Fig. 1, is seen a very pretty Beetle which belongs to the same tribe as the preceding insect. It has no popular name, however well it may deserve one, but is known to entomologists as *Tetracha punctata*.

It is a singularly beautiful insect, and, lovely as it is, to describe it is no easy matter.

Many of these Tiger Beetles are coloured in such a manner that it is utterly impossible to define their leading hue. It all depends on the direction of the light, and in many cases, as in the present instance, the real ground hue of the insect is a matter of considerable doubt. The chameleon is nothing to the Tiger Beetle. I have made plenty of experiments on both creatures, and come to the conclusion that all the ground colour of a chameleon *may* be defined; that of many a Tiger Beetle defies all definition. And the more pains that are taken, the more the microscope is set to work, the less defined is the ground colour.

In the present species there are only two points of colour which may be considered as fixed. One is a yellow patch at the end of the elytra, and the other is the yellowness of the legs and antennæ. As to the upper surface of the body, it may be said to be almost any colour. I have tried these Beetles in various lights, and have ascertained that the leading colour is blue, fiery crimson, green, or bronze, exactly as the light happens to fall upon the insect, not to mention the intermediate colours of purple and violet which ripple over the surface as the light is shifted. As the name implies, the elytra are deeply and boldly punctured. The insect is found along the banks of the great Amazon river.

At Fig. 2 of the same illustration is given the larva of this Beetle, for the purpose of showing the peculiar apparatus by which it is able to travel up and down the perpendicular tunnel in which it lives, and to maintain its place at the mouth of its burrow without fatigue.

On the back may be seen a bold hump-like process, and on the hump are two small but strong horny hooks, set upon the eighth ring of the body, counting from the head. These hooks are boldly curved backwards, and it is chiefly by their help

that the larva is able to scuttle up and down its tunnel with such rapidity. I never had the opportunity of seeing the larvæ of these exotic Tiger Beetles alive; but if their habits resemble those of our British species as much as their forms, there can be no difficulty in understanding the mode of their existence.

Perhaps some of my readers may be, or may have been, mighty bird-nesters, and been forced to climb trees which ran to some thirty or forty feet without a branch, and were far too large to be clasped by the arms and legs. Boys cannot carry ladders about with them, and the tree is absolutely inaccessible by ordinary means. But there is a hawk's nest on the topmost branches of the tree, and it is clearly impossible to allow the eggs to be hatched without paying a fair toll to the discoverer of the nest. So, out come the "climbing spurs," iron stirrups strapped to the foot, and having on the inside of each foot a sharp hook, with point downwards. A long withy is now cut—or in default of the withy a stout piece of iron wire will do—and is passed round the tree-trunk. The nest-hunter takes the ends of the withy in his hands, raising the loop as high as he can, and then jumps at the tree, supporting his body by the withy, and driving his climbing-irons well into the bark. By a judicious shifting of feet, the young climber very soon finds himself among the branches, where his spurs are worse than useless, and he hangs them on a branch while he goes after the eggs.

Now, except that the Tiger Beetle grub has to climb the inside of a cylinder instead of the outside, the mode of climbing is exactly the same. The larva stretches its body so as to raise itself as high as possible, and slightly bends its back, so that the points of the hooks hitch into the side of the tunnel. It then contracts its body, so as to haul itself up, and so, by repeating the process, rapidly reaches the mouth of the burrow. When there, the hooks which raised it serve to keep it in position; and when it wishes to descend, it has only to unhitch the hooks and straighten the body, when it slides down by its own weight. The larva seen in the illustration is drawn from a specimen in the British Museum.

Mr. W. Bates, in his "Naturalist on the Amazons," describes sundry species of Tetracha, and gives much curious and valu-

able information as to their habits, mode of life, and variety of colouring:—

"On the sandy beach I found two species of Tetracha, a genus of Tiger Beetles, which have remarkably large heads, and are found only in hot climates. They come forth at night, in the daytime remaining hid in their burrows several inches deep in the light soil. Their powers of running exceed everything I witnessed in this style of insect locomotion. They run in a serpentine course over the smooth sand, and when closely pursued by the fingers in the endeavour to seize them, are apt to turn suddenly back, and thus baffle the most practised hand and eye.

"I afterwards became much interested in these insects on several accounts, one of which was that they afforded an illustration of a curious problem in natural history. One of the Caripi species (*Tetracha nocturna* of Dejean) was of a pallid hue, like the sand over which it ran; the other was a brilliant copper-coloured kind (*Tetracha pallipes* of King). Many insects whose abode is the sandy beaches are white in colour; I found a large earwig and a mole cricket of this hue very common in these localities.

"Now, it has been often said, when insects, lizards, snakes, and other animals are coloured so as to resemble the objects on which they live, that such is a provision of Nature, the assimilation of colours being given in order to conceal the creatures from the keen eyes of insectivorous birds and other animals. This is no doubt the right view, but some authors have a difficulty in the explanation on account of the assimilation of colours being exhibited by some kinds and not by others living in company with them; the dress of some species being in striking contrast to the colours of their dwelling-place.

"One of our Tetrachas is coloured to resemble the sand, whilst its sister species is a conspicuous object on the sand; the white species, it may be mentioned, being much more swift of foot than the copper-coloured one. The margins of these sandy beaches are frequented throughout the fine season by flocks of sandpipers, who search for insects on moonlit nights as well as by day. If one species of insect obtains immunity from their onslaughts by its deceptive resemblance to the sandy surface on which it runs, why is not its sister species endowed in the same way?

"The answer is, that the dark-coloured kind has means of protection of quite a different nature, and therefore does not need the peculiar mode of disguise enjoyed by its companion. When handled it emits a strong, offensive, putrid, and musky odour, a property which the pale kind does not exhibit. Thus we see that the fact of some species not exhibiting the same adaptation of colours to dwelling-places as their companion species, does not throw doubt on the explanation given of the adaptation, but is rather confirmatory of it."

The problem which Mr. Bates endeavours thus partially to solve is a very curious and interesting one, and certainly is not settled by Mr. Bates's explanation. Were it true that all these insects were protected in one way or another, none of them would ever be eaten by other creatures. It is perfectly true that many insects are coloured so as to resemble the spots wherein they hide, and therefore escape the observation of birds and other insect-eaters. Some, again, resemble in shape as well as in colour the vegetation on which they live, such as the well-known caterpillars of the Geometræ, or Loopers, which so exactly resemble twigs that none but an entomologist could detect them. So far so good, but, I think, no further. I am inclined to demur to Mr. Bates's theory of the protection afforded by the evil odour of which he writes, and for this reason. Odours are grateful or the reverse according to the constitution of the smeller. For example, even in our own sense the appreciation of odours varies extremely. The close, filthy, fœtid atmosphere of an Irish cabin, which almost chokes an average Englishman, is like the breath of Paradise to the peasant owner. Put him in a large, clean, bright room, and he will complain of the cold, and make for himself a cabin in one corner, where he can be dirty and warm. Then, our nostrils are generally offended at the smell of rancid grease and unwashed humanity, which to a Kaffir are delightful as the perfume of the rose. To us, the stench of a putrefying animal is inexpressibly odious, and even hurtful, while to the vultures, and to whole tribes of insects, it is the delight of their lives. Therefore, though the odour of these highly-coloured, sand-loving Tiger Beetles be very detestable to human nostrils, it does not follow that it should be equally unpleasant to insect-eating birds.

Most of the dusky Beetles which Mr. Bates mentions have been formed into a separate genus called Phæoxantha. This term is formed from two Greek words, the former signifying dusky, and the latter yellow. The largest of them is called *Phœoxantha Klugii*, and is a curious-looking creature, quite unlike our English Tiger Beetles, except in the long, slender legs, and the sharp, sickle-like jaws with which the large head is armed. The general colour is dull, pale, yellowish brown, barred with a blacker hue. If this insect were running on ordinary sand, it would be difficult to track its progress, in consequence of the sandy colouring of its body, while, if it remained still, it would be almost impossible to distinguish the body amid the yellow sand and brown stones with which it would be surrounded.

There is a very small species of this genus, *Phœoxantha laminata*, which is found in Brazil. It is almost uniformly pale brown, and the hooks which arm the back of the larva are exceedingly long, stout, and boldly curved.

We now come to the typical tribe of this beautiful and interesting group of Beetles called Cicindelides, which are distinguished by the structure of the tarsus, or foot. In all these Beetles the males have the three first joints of the tarsus widened and flattened, while the corresponding joints of the female are uniformly cylindrical. There are so many species of Cicindelides, that we must content ourselves with a selection of one or two examples, the first of which is the Gold Cross (*Cicindela aurofasciata*) of India, one of the most striking, though by no means the most brilliant of the group. This very remarkable Beetle forms quite a type among its relatives, as in all of them there is a tendency to form a light-coloured cross on a dark ground, and in all, more or less, this cross is made by a V-shaped mark upon each of the elytra.



Fig. 3.—Gold Cross (*Cicindela aurofasciata*).

Such is the case with the present insect. The general hue of

the body is deep velvety black, and upon each of the wing-cases there is a V-shaped mark of golden yellow; the apex of the V being towards the suture of the elytra, so that the two V's form a St. Andrew's cross of yellow on a black ground. As a rule, the lower limbs of this cross are twice as wide as the upper, but there is a wonderful amount of variety in the cross-mark, not only in width, but in shape and colour. I have examined many specimens of this insect, and never found two which were exactly alike in the hue and form of their markings.

Perhaps the most variable of all the Tiger Beetles is that lovely insect the Chinese Tiger Beetle (*Cicindela Sinensis*—or, as it is sometimes but wrongly spelled, *Chinensis*). Owing to its extreme variableness, it is not an easy insect to describe, and it is a remarkable fact that certain recognisable varieties are found in different districts of China, so that the boundaries of such districts cannot be merely arbitrary, but must have some geographical foundation. As it is so variable, I have selected an average specimen from my collection, and describe it as an example of the ordinary colouring.

Just as in our common Tiger Beetles green is the leading colour, so blue takes the chief part in the Chinese Tiger Beetle. The ground hue of the elytra is deep, velvet azure, and they are edged with glittering golden yellow, which spreads over the shoulders so as to form a bold cross. Two bands of rich cream colour cross each elytra, near the tip, and there are two little spots of the same colour near the outer edge.

Under successive powers of the microscope a wonderful sight is revealed. On placing the insect under a moderate power—say about thirty diameters—the whole of the surface is seen to be broken up into innumerable shining points, all of which have a golden sheen when the direction of the light is changed. Those portions which are not touched favourably by the light look absolutely brown, and it is most interesting to shift the light in various directions, and see the dark brown spots flash suddenly into violet, purple, green, and gold, and change back again to their dull brown, according as the angle of light is altered.

Doubling the magnifying power adds to the revelation of this

insect's beauty, and shows that the glittering points are the edges of innumerable pits or depressions with which the entire surface is covered. It is not, however, until a power of some two hundred diameters is employed that the real nature of these points and the cause of their changeful beauty are shown. Not in the minutest spot is there a smooth portion, but the elytron is completely covered with an elaborate series of six-sided pits or shallow cells. In fact, when viewed with a high power and a favourable light, the upper surface of the elytron looks very much like a honeycomb, the cells with which it is covered being perfectly hexagonal. The sides, however, of the cells are not equal as in the honeycomb, but two opposite sides are twice the length of the others, so as to elongate the cells without altering their hexagonal form. The shape of the cells is best seen in the creamy spots, as the dazzling blue and green of the other parts rather distract the eye.

Each of these cells has its surface furnished with countless dented lines set parallel to each other, and producing, by means of their power of decomposing the light, the wonderful effects of colour which have been mentioned. The gorgeous metallic plumage of the humming-bird's breast owes its splendour to a similar cause, and so does the changeful purple of our "Purple Emperor" Butterfly. The opal and the pearl also owe their colours to this system of parallel lines, which can now be produced artificially on almost any substance. Delicate parallel lines can be ruled on steel or glass, giving to them a flickering brilliance of colour that seems quite foreign to the material, which, indeed, appears to be of secondary importance. As long as the lines are there, the material seems to be of little consequence; and if a piece of soft cobbler's wax be pressed on the ruled glass or steel, the lovely iridescence will at once be evident on its surface, despite the apparent incongruity of the dull black material and the splendid colours which play over it.

Such are some of the revelations of the microscope with regard to the colouring of the velvet-like surface of the elytra. Now, to the unaided eye, the vivid green and azure of the head are much more brilliant than the same hues in the elytra, while they are not so bright when placed under the microscope. The reason is this. The surface of the head is covered with a double series of wrinkled folds, which are so large that they can be

detected by the eye alone, while the innumerable cells of the elytra cannot be seen without a microscope.

The arrangement of these folds or wrinkles is worth notice. A line runs along the centre of the head, from which the wrinkles sweep in curves on either side, much like the lines of hair parted in the middle. Thus much can be seen with the naked eye; but if the microscope be used, it will be seen that each wrinkle is regularly and elaborately waved throughout its length, thus, ~~~~~~~; so adding to the richness of the effect. Still taking the human hair as our illustration, the waved structure of these wrinkles produces a similar effect to that which is obtained by ladies when they crimp their hair by artificial means.

I have already mentioned that the upper surface of this magnificent insect is entirely covered with wrinkles or cells, so as to give it a satiny or velvety appearance. The violet under surface is quite smooth, and looks like burnished metal, affording a fine contrast to the softly brilliant hues of the upper surface. The one dazzles and startles the eye, the other soothes and satisfies it. The principle which is so perfectly carried out in this insect is followed imperfectly by ourselves. When a draper shows a piece of silk, satin, or velvet to a lady, he does not spread it out flat, but gathers it into folds and artistic wrinkles.

The reason is evident enough. Supposing that a yard of silk or satin be spread flat, there is a certain amount of colour, with a tolerably uniform distribution of light and shade. But, let three yards of the same material be gathered into the same space, it is evident that three times the amount of colour is obtained, while each fold gives different gradations of hue according to the depth of shades. This is one of the many instances where man unconsciously borrows from Nature, and complacently thinks that he has invented something quite new.

Of the habits of this Beetle I know nothing by practical experience, but the specimen which has been most imperfectly described gives a curious proof that it must be quite as fierce as our British Tiger Beetles. The jaws of this species are long, sickle-shaped, deeply toothed on the inner edge, crossing each other when closed, and very conspicuous from their shining yellow colour. The jaws of this specimen are firmly closed, and hold in their grasp the fore-leg of another Beetle of the same species.

Two pieces of information are thus given. The first is, that the bold tooth on the inner edge of the jaw most effectually prevents the escape of any insect that may be seized. Let the reader imagine a pair of sickles, each having a sharp tooth some three inches long on the inner edge and about four inches from the base. Suppose the handles of the sickles to be joined at their ends by a rivet on which they can play, and we shall have a very tolerable imitation of the Tiger Beetle's jaws. The reader will at once see that if the sickles are closed so as to bring the handles together, the points will cross each other, and that if the leg or arm of a man be clasped in them the two teeth will give an additional hold, and, being nearer the base, will have a more powerful leverage than could be given to the points alone, however sharp they may be. A familiar illustration of this principle is afforded by the schoolboy in cracking a nut. He does not place it between his front teeth, but as far back as he can, so as to add as much as possible to the leverage.

The second piece of information is, that the insect was not killed as soon as caught, but was placed alive in confinement with others of its own kind. After the habits of such insects, the fellow-prisoners set to fighting, and this particular specimen succeeded in wrenching off the leg of its antagonist. The force required for such an act is wonderfully great. There are many insects that shed their limbs without seeming any the worse for it, but the Tiger Beetle is not one of them. It is predacious, and wants its legs for the purpose of chasing its prey. Consequently, these limbs are firmly jointed to the body, and the insect must have exerted very great strength to tear away the entire limb as it has done.

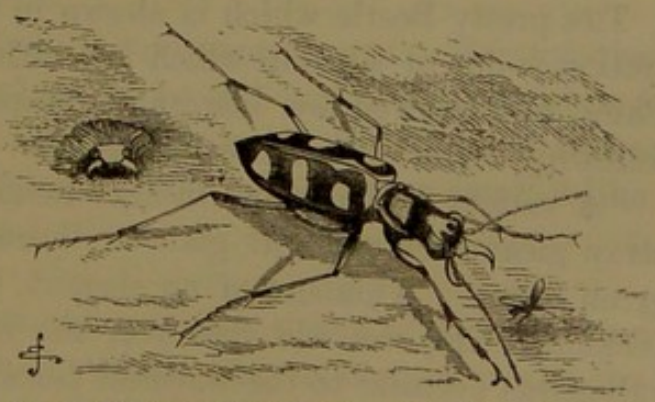


Fig. 4—Eight-spot Tiger Beetle. (*Cicindela octonotata.*) (Blue-green and yellow.)

Another lovely species is the Eight-spot of India (*Cicindela octonotata*), which is shown in the accompanying illustration. The colours of this most beautiful insect are much the same as those of the Chinese species, but their arrangement is more

decided and very different. The ground colour of the elytra is the deepest and richest velvet-blue, edged with emerald green over which plays a golden glitter. The thorax is golden bronze at the edges, while the centre is metallic red or bronze, shot with green. The head is coloured like the thorax, and the spots are golden yellow. The legs of this species are very long, slender, and give a sort of spidery look to the creature.

On Plate I., Fig. 3, is shown a very conspicuous example of the exotic Tiger Beetle. Its scientific name is *Calochroa princeps*, but we may safely call it the Belted Tiger Beetle, on account of the three bold bars or belts which run across the body. The ground colour of the insect is velvet-black, and the bars are bright "king's yellow," as a painter would term them. It is a native of India. There are nine species of this genus at present known, and all of them are remarkable for their very long and very slender legs, which give to the insects a spidery sort of look. The name Calochroa is formed from two Greek words, signifying "beautifully coloured," and is very appropriate, as the colours of the insect, though not so vivid and rich as those of the Chinese Tiger Beetle, are very striking, and contrasted in an exceedingly bold manner.

In all these Beetles the tendency in the markings to form a cross is very notable, and much more so when the wings are closed than when they are spread as if in flight.

The pretty Beetle which is shown in the accompanying illustration is one of a group which has rather peculiar habits. Mr. Bates, who allowed few insects to escape his notice, makes the following remarks on these Beetles:—

"A variety of beautiful insects basked on the foliage where stray gleams of sunlight glanced through the canopy of broad green leaves. Numbers of an elegant, long-legged Tiger Beetle (Odontocheila) ran and flew over the herbage. It belongs to a sub-genus peculiar to the warmest parts of America, the species of which are found only in the shade of the forest, and are seen quite as frequently pursuing their way on trees and herbage as on the ground.

"The typical Tiger Beetle, or Cicindela, inhabits only open and sunny situations, and are wholly terrestrial in their habits.

They are the sole forms of the family which occur in the northern and central parts of Europe and North America. In the Amazons region the shade-loving and semi-arboreal Odontocheilæ outnumber in species the Cicindelæ as twenty-two to six. All but one of this number are exclusively peculiar to the Amazonian forests, and this affords another proof of the adaptation of the fauna to a forest-clad country, pointing to a long and uninterrupted existence of land covered by forests on this part of the earth's surface."

Excepting that these South American species prefer the foliage to the ground, their habits are much the same as those of the ordinary Tiger Beetles. They prey upon other insects, and are able to catch even the swift-winged flies by pouncing on them as they settle on the leaves. I have seen the common green shore-crab catch bees and flies in a similar manner, watching them as they alight on the sand, and flinging itself on them before they could re-open their just-furled wings.

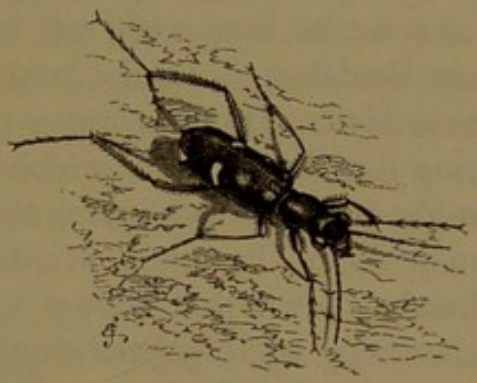


FIG. 5.—Odontocheila de Gandii. (Crimson with yellow marks.)

The name Odontocheila is formed from two Greek words signifying "toothed lip," and is given to this genus in consequence of the form of the upper lip, which is rather long and toothed.

The colour of this insect is very conspicuous. Most of the species are green, blue, or brown, but this little Beetle is shining metallic crimson bronzed with green, so that it blazes out like a red star amidst its duller companions. There is a small S-like white mark on the elytra.

WE now come to a most extraordinary group of Tiger Beetles called Collyridæ, in which the whole body is elongated, and the head and thorax are drawn out into a definite neck.

One of these Beetles, named *Therates labiata*, is a native of the Ké Islands, in the Malay Archipelago. Its colour is deep purple-black glossed with green, and its "labium" or upper lip is very conspicuous, being broad, and of a bright yellow

colour. It is owing to this peculiarity of the labium that the insect has gained the specific name of *labiata*.

Its habits are rather peculiar. Unlike our own Tiger Beetles, which are notable for their love of bright sunny spots, this Therates, though in the climate of the Ké Islands it might have as much sunshine as it liked, prefers damp and gloomy situations. Yet, even in these localities it displays the well-known characteristics of the Tiger Beetle, running and flying restlessly from spot to spot with a fussy eagerness, and evidently on the look-out for prey as it darts from leaf to leaf, and then quickly scurries over the broad foliage.

As is the case with our common Musk Beetle, its presence may be detected by the nostril before the eye can take cognizance of it. It gives out a powerful and pleasant odour something like that of roses, which Mr. Wallace conjectures to be used for the purpose of decoying the insects on which it feeds. I very much doubt, however, whether this can be the case. I have already shown that odours which are disagreeable to us are not necessarily so to other beings, and therefore that we ought not to assume that they are used for the purpose of protection. By parity of reasoning, though an odour may be grateful to us, it does not follow that it should be equally grateful to other beings; and I therefore find much difficulty in believing that one Beetle repels its foes by an odour which is disagreeable to man, and that another attracts its prey by an odour which is pleasant to him.

Mr. Wallace, to whom I am indebted for the foregoing information, remarks that in the forests of the Ké Islands, this and another Tiger Beetle, *Tricondyla aptera*, which will be presently described, were the only two common and conspicuous insects. The name Therates is a Greek word signifying "a hunter," and is very appropriately given to these quick, active Beetles, which apparently spend their whole time in the chase.

It is rather remarkable that the only two common insects in the forest should be not only Tiger Beetles, but even belong to the same family, the Collyridæ. The name of the second species is *Tricondyla aptera*, and, according to Mr. Wallace's description, it looks when alive very much like a large black ant, about an inch in length. At first sight it appears to be quite black,

but a closer inspection shows that the black is, in fact, a very deep purple.

It has no wings, as indeed is implied by its name "aptera," *i.e.* wingless, but its swiftness and quickness of foot compensate for its inability to fly. It is mostly found on trees, but it seems to prefer the trunks and branches to the foliage. Like our common creeper, the squirrel, and other tree-loving creatures, the Tricondyla has a habit of dodging behind the branches when approached, and, if the intending captor goes round the tree, the Tricondyla goes round also, and is so adroit in keeping the tree between itself and its enemy, that it can only be captured by a sudden run and quick snatch of the fingers. Like most of its kin, the Tricondyla emits a strong odour, which is, however, not at all pleasant, but bears some resemblance to the well-known and very repulsive odour of the cockroach.

A very good example of these curious Tiger Beetles is given in the accompanying illustration, which represents *Collyris acrolia*, an example of the typical genus.

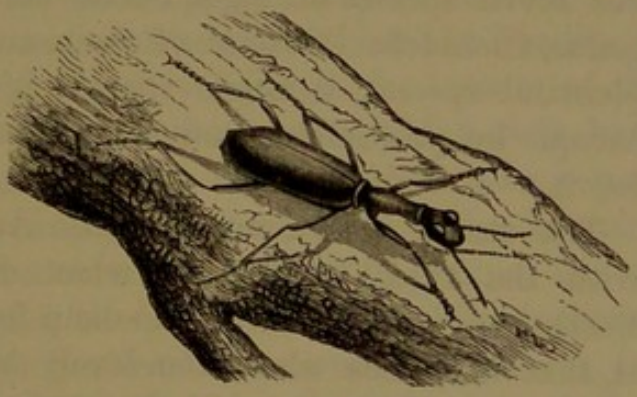


Fig. 6.—Collyris acrolia. (Deep indigo.)

Its colour is the deepest indigo, so deep that at first sight it looks black, just like the colour of our familiar Oil Beetle. The long thorax of this insect is boldly curved, and is globular in the middle. The creature has no wings, and the elytra are firmly soldered together to the very end of the body, as is often the case with wingless Beetles. The name Collyris refers to this structure, being composed of two Greek words signifying "glued tail."

There are many species of Collyris, all very much alike in colour and general form, and all having the otherwise small head boldly developed on either side, so as to leave room for the large and prominent eyes.

This is the last of the Tiger Beetles of which description can be given. They are, however, so numerous and so important

that they must not be dismissed without a few parting words.

On a review of British and foreign insects, we cannot but be struck with some remarkable phenomena. It might naturally be expected that the insects of tropical climates very far surpass in number and beauty those which inhabit the temperate zones. And, in comparing the insects of a tiny island like England with those of the vast tract which lies within the tropical belt, it is but natural to suppose that the disproportion of territory would be represented by an equal disproportion in the number, size, and beauty of the insect tribes. In a certain degree this theory is carried out by fact, but there are cases where it entirely fails, as we shall presently see. With the Tiger Beetles, however, the increase in the number of species is commensurate with the area of surface. In England we have but seven species of Tiger Beetle, all belonging to the typical genus, Cicindela. Several of them are very rare, and the most plentiful species, common though it may be, is seldom seen except by professed entomologists, who know where to look for it.

The reason is evident enough. Agriculture does not agree with the Tiger Beetle, and, when cultivation comes in, the Beetle goes out. There is no help for it, and the consequence is, that in places where the lovely beetles used to flash their blue and green armour in the sunbeams, like living sapphires and emeralds, as long as the land remained uncultivated, not a single specimen can now be seen, and the Tiger Beetle has been forced ignominiously to resign its place to the turnip-fly and the cabbage caterpillar.

No Tiger Beetle can exist in cultivated ground. They all love loose sandy soils, in which their burrows can be made without the likelihood of disturbance. Some prefer the seashore, and others the sandy, sheltered banks of inland districts. But in no case does a Tiger Beetle larva make its burrow in cultivated land. Its instinct teaches it to avoid such localities; and, if any adventurous individual did choose a garden or a cornfield, it would have no chance of attaining maturity, inasmuch as its burrow would be repeatedly filled up by the gardener or the labourer, and the insect starved before it could get its tunnel

into working order. All carnivorous creatures require a constant supply of nourishment. The internal fire fed by animal fuel burns fast and fiercely, so that a Tiger Beetle larva would die of hunger through a temporary deprivation of food which would little affect the turnip grub or the cabbage caterpillar.

Then, Tiger Beetles cannot exist in cold countries, because they could not obtain the needful supply of insect food. But when, as in the great tropical belts of the world, they find vast tracts of uncultivated land swarming with insect life, it is evident that all the surroundings are favourable to their development, and that therefore they may be expected to increase and multiply to the very utmost.

Their mission is evidently twofold. As carnivorous insects, they form part of the "balance-wheel" of creation which has already been mentioned; and, as burrowing larvæ, they aid in developing the power of the soil. Not only do they drill the surface of the earth with their perpendicular tunnels, thus admitting the light, air, and moisture on which the fertility of the soil so much depends, but they leave at the bottom of the burrows the rejected portions of the insects which they have slain and eaten, together with the whole of their own refuse, and therefore manure as well as lighten the ground. In cultivated land both these duties are performed by human labour, and the spade, the fork, and the plough do the work which was formerly left to the Tiger Beetles. The work being done, the Beetles are needless, and so perish from off a soil on which they have no duties to perform.

Though the indirect services which they render to man are thus evident, their direct services have scarcely been acknowledged. Yet there is at least one species which is used by man, though its use is very limited. This is a Mexican species called *Cicindela curvata*, which has a way of burrowing in moist sand. The natives have an idea that, like the Cantharis, or "Spanish fly," with which we are all familiar, it possesses medicinal properties, and so they prepare an infusion of the Beetles either in water or spirits. I am not aware that any other species of Tiger Beetle has been in any way utilized by man.

On seeing a fair collection of these insects, the most superficial observer must be struck with their marvellous beauty of form and colour. Even when placed in formal rows in a

cabinet, and disfigured by the graceless and lifeless attitudes in which entomologists will persist in setting all insects, without the least reference to their habits when living, they never fail to command attention even from those who know nothing of insects.

Excepting the dull-coloured Phæoxanthas, which have already been mentioned, the Tiger Beetles seem to concentrate in themselves every beauty of the insect race. Their colours are so brilliant as almost to pain the human eye. Flashes of the most resplendent azure, crimson, gold, emerald, purple, and every shade of every colour, meet the eye as it glances over the insects, and one which is not quite so dazzling as the others gives quite a sense of repose. There is, for example, one species, a native of Madagascar, which would when taken by itself command admiration. Its name is *Eurymorpha cyanipes*, and its colour is to the naked eye deep, dull green, except on the thorax, which is covered with a quantity of long snowy white hair. It is rather remarkable, on looking over the collection in the British Museum, how the eye finds itself instinctively resting on this insect, the cool green and white giving a feeling of repose to the sense of sight, which becomes absolutely fatigued with the gorgeous hues which meet it on every side.

Should any of my readers be a classical scholar and not an entomologist, he will probably be much surprised, and a little scandalized, that the name of Cicindela is applied to these Beetles. If we turn to the old classic authors, we shall find that the word Cicindela was originally used as the name of the glow-worm, and was probably applied to any luminous insect. Unfortunately, the earlier entomologists, when they first began their formidable task of classifying the insect tribes, fell into various errors regarding the relationships of the different groups.

One of these mistakes was made by Linnæus, who considered the glow-worm to be related to the Blister Beetle, and so gave it the name of Cantharis, while to the Tiger Beetles he applied the name of Cicindela, which by right belongs to the glow-worm. Subsequently he corrected several such errors, but persisted in retaining the name of Cicindela for the Tiger Beetles, and the result has been that, entomologically, the name

of Cicindela is now applied to the Tiger Beetle, and that of Lampyris to the glow-worm.

As to the arrangement of this large and important group of insects, there have been, and are still, many conflicting opinions. Some entomologists divide them into a number of distinct families, while others gather them all into one family under the common name of Cicindelidæ, but subdivide that rather unwieldy family into a number of tribes. I certainly think that the latter plan is the most in accordance with zoological fact, and I have therefore followed it in this work.

CHAPTER III.

GROUND BEETLES, OR CARABIDÆ.

THIS great family of Beetles is quite equal in importance to the preceding, but in one point of view it presents a curious contrast to the Cicindelidæ.

In England we possess but very few Tiger Beetles, none of them being brilliantly coloured, whereas the exotic Tiger Beetles outnumber ours by some twenty times, and exhibit a brilliancy and variety of colouring which none of the English varieties possess. Our seven little soberly-clad species look very insignificant beside the array of exotic Cicindelidæ, with all their flashing suits of azure, green, gold, and crimson. But when we come to the Carabidæ, the case is nearly reversed. None of the tropical countries can produce any species that can surpass our familiar violet Ground Beetle, and the handsomest of all the foreign Carabidæ is one that is a comparatively near neighbour of ours, being an inhabitant of Italy. Altogether, some three thousand species are known to entomologists, so that we can only select a few of the most conspicuous examples.

THE first is called *Procerus tauricus*, and lives, as its specific name implies, on the banks of the Bosphorus. It is an example of the genus to which belong the largest and handsomest specimens of this family, and which have been separated from the rest, not on account of their size, but on account of the structure of their feet. In the generality of the Carabi, the joints of the front tarsi are flattened and widened in the males, while they are cylindrical in the females. The Beetles, however, of which we are treating, have the joints cylindrical in both sexes, and they are on that account grouped together in the genus called *Procerus*. This word is Greek, signifying "a herald," and is given

the Proceri because they are, so to speak, the heralds or forerunners of the true Carabi. The accent, by the way, is laid on the second syllable, thus, *Procérus.*

This fine insect measures about two inches in length, and at first sight looks rough and black. All specimens indeed are black on the under surface, and some are black entirely. But many, such as the specimen from which the drawing is taken, are of the richest violet, with a tendency to purple, and a greenish sheen round the edges of the thorax and elytra. The whole of the upper surface is deeply and largely granulated and punctured, this structure giving increased richness to the splendid violet and purple with which it is adorned.



FIG. 7.—Procerus tauricus.
(Deep purple.)

It will be seen, on reference to the illustration, that the projecting tubercles which are formed of the granulations are arranged in nearly regular longitudinal rows, as is the case with several of our own Ground Beetles. This insect is spread over the eastern and southern parts of Europe, the Caucasus, and Asia Minor. It does not seem to flourish near the sea, and is found in best condition on the mountainous districts.

WE now take an example of the typical genus, the singularly beautiful *Carabus Adonis,* an insect which well deserves its name,

being both elegant in shape and splendid in colour. Moreover, its chief residence is Mount Parnassus. Indeed, so gorgeous is the colouring, that it really looks like a tropical insect.

As is often the case with Ground Beetles, this insect is exceedingly variable both in size and details of colour. Some specimens are scarcely as large as our common violet Ground Beetle, while others are fully twice as large. Then, the hues with which the body is adorned are equally variable. Usually, however, the middle of the body and elytra are deep black, which melts almost imperceptibly into green bronze, becoming fiery red along the edges of the thorax and elytra, the former of

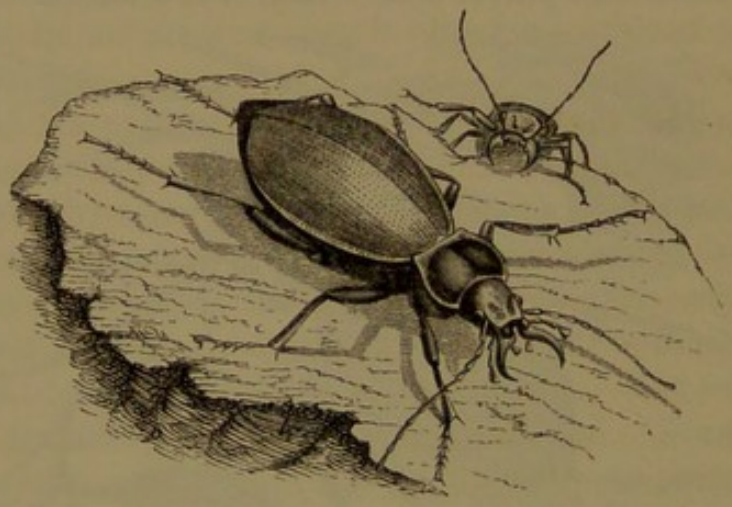


Fig. 8.—Carabus Adonis.
(Bronze-green, red edges.)

which is much flattened on the outer edges. In some specimens the whole of the thorax is bronze.

There is, I believe, scarcely one species of Carabus which does not develop colour of some kind, and such colours are invariably deep and metallic, so deep, indeed, that unless examined closely and with a favourable light, they really seem to be black. A good collection of Carabi is quite as splendid a sight as one of Tiger Beetles, and it is interesting to compare the two families, and see how differently the same colours can be developed. The very same hues of blue, green, gold, bronze, violet, purple, and crimson, which are found in the Tiger Beetles, are also found in the Carabi, the principal distinction being, that in the former insects the colours all have a velvety or satiny aspect, while in the latter they are shining like polished metal.

All these insects are carnivorous, and possess the power of emitting a very strong odour when handled or alarmed. This odour is not sweet and flower-like, as is the case with most of the Tiger Beetles, but is very fœtid, repulsive, and persistent, so that it clings tightly to the fingers of anyone who incautiously seizes a Carabus with the hand. If, however, the insect be smartly grasped across the body, just as one picks up a live lobster or crayfish, the fingers are quite safe, and the Beetle may discharge its red-brown evil-smelling liquid as much as it pleases without injuring its captor.

All British entomologists are familiar with the splendid but rare Beetle, the *Calosoma sycophanta*, with its glittering green and gold elytra, and deep purple head and thorax. The larvæ of this genus of Beetles feed upon the larvæ of other insects, mostly those of social moths, and are wonderfully voracious, so that if two of them happen to meet, one is sure to devour the other. It is rather a remarkable fact, that of all the Calosomas our British species is by far the most splendid. There is one Australian species, *Calosoma McLeayii*, which has similar colours, though not nearly so brilliant. As to the others, they are nowhere in the race for splendour of colour, and look quite dull and dingy beside the British species.

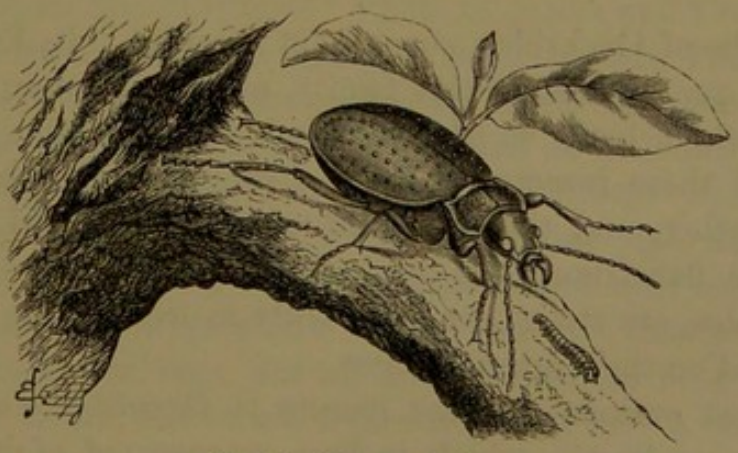


Fig. 9.—Calosoma Indicum.
(Brown, with burnished gold punctures.)

There is, however, one exception, namely, *Calosoma Indicum*, which requires a quick eye to see that it is an exception, for the Beetle appears at first sight to be plain chocolate brown. If we look at the British insect, we shall see that among the distin-

guishing marks are three rows of deep punctures on each of the elytra, the punctures being placed on the fourth, eighth, and twelfth striæ, or fine ridges, which run parallel to each other along the whole length of the elytra. In this Beetle the punctures, although their sides are polished and glittering, are of the same hue as the rest of the elytra. There are similar punctures in Calosoma Indicum, but the elytra are deep chocolate brown, while the punctures are not only polished and glittering, but shine with a golden lustre; in fact, they look as if each puncture had been lined with gold leaf, and then burnished to a mirror-like brightness.

In some lights these punctures are not seen, and it is scarcely possible with any arrangement of light to see the polished gold on both sides at once. In order to show this peculiarity, the artist has drawn the insect in such a manner that the glittering points are visible on one side, but not on the other. When I first saw these remarkable points, I thought that they must be lined with separate scales, like those of the weevils, but the magnifying glass soon showed that these punctures were simply gold-coloured and burnished. The whole of the upper surface of this Beetle is very finely granulated in distinct rows, the striæ, or ridges, being broken up by innumerable transverse depressions. As its name implies, this Beetle is a native of India.

THE tribe of Cychrides comes next in order. In England we have but one species of this family, namely, *Cychrus rostratus*, a Beetle which looks so like a weevil that it is often mistaken for one of these insects. All the Cychrides have their elytra fused together, and the last joint of the labial and maxillary palpi large, flat, triangular, and hollowed underneath. The jaws, or mandibles, are strong, project boldly in front of the head, and are toothed on their interior edges.

The most curious of these insects is *Damaster blaptoides*, a rare Japanese Beetle, which is here represented of its natural size. In this genus the mandibles have only one tooth, and that a large one, situated near the base. Each of the elytra is drawn out to a point at the end, and as they gape a little at their tips, the pointed ends are very conspicuous. Altogether, the Beetle gives an idea of having been once a stout insect, but drawn out when soft, so that it is feeble in comparison with its bulk.

Its limbs, together with its mode of walking, strengthen the idea; for instead of being, as most of the Ground Beetles are, quick, brisk, and active, it is slow and sluggish, crawling rather than running, even when it finds itself in danger.

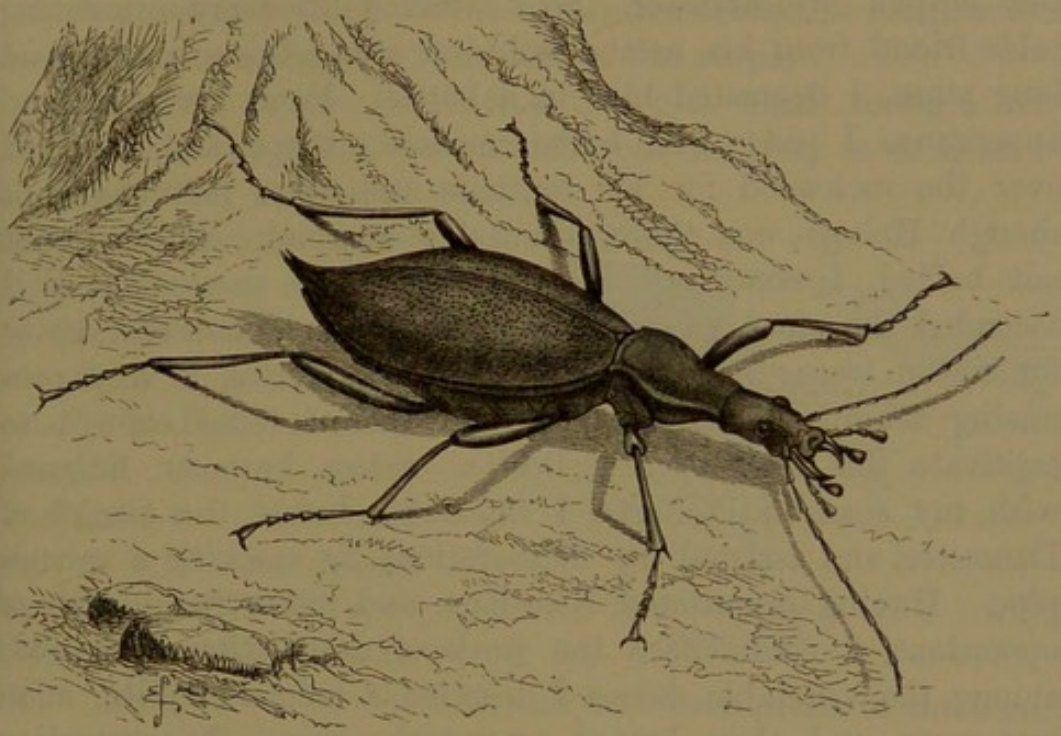


Fig. 10.—Damaster blaptoides.
(Dull black.)

The following lively description of the capture of a Damaster is taken from Mr. Fortune's "Visits to Japan and China." It is part of a letter addressed from Dr. Adams to Mr. Fortune:—

"I was walking solitarily—for all hands had gone on board to dinner—along the shell-strewn strand of Taleu-Sima, a jolly little island, not far from the shores of Niphon—walking along in a brown study, smoking a little clay cutty-pipe, and thinking chiefly of the contempt in which I should be held if some of my 'very particular' friends saw me in this very disreputable 'rig,' for my neck was bare, and my coat was an old blue serge; and as for my hat, it was brown felt, and I must say 'a shocking bad one.' However, the sun was bright, the clear blue rippling sea was calm, the little island was clear and verdurous, and I smoked serenely. On a sudden my abstract downward gaze encountered a grotesque Coleopteron, in a suit of black, stalking slowly and deliberately among the drift-wood at my feet—stepping cautiously over the spillacan twigs. At once I knew my Coleopterous friend to be *Damaster blaptoides;* for although

my eyes are small, yet I have been assured by a young lady friend of mine—sometimes irreverently called Polly—that they are penetrating; and my friend Adam White, when he warned me not to forget my 'Carabs,' had sent me a rough outline of the 'corpus' of Damaster. So I carefully lifted my unresisting sable friend from his native soil, and after giving him a good long stare, I deposited him in a bottle. From his name and appearance I judge him to be cousin to Blaps, and I turned over the rockwood for his brothers and other relations; but though Helops was there, Damaster was not. Puzzled, but not baffled, I conceived his taste was more particular, so I ascended the steep green sides of the island, and cast about for rotten trees; nor was I long in discovering a very promising stump, nicely decayed, and full of holes enough to captivate the heart of any Beetle. Being, however, fatigued with my scansorial efforts, I sat down before the citadel of Damaster, and assisted my deliberations by smoking a solemn pipe. Having propitiated Nicotiana, and matured my plan of operations, I commenced the work of destruction, when, lo! among the vegetable débris I descried a long dusky leg, anon two more, and then, buried among the ruins, the struggling Damaster.

"In this manner was the rarest Beetle known captured by a wandering disciple of Æsculapius and an eccentric Fellow of the Linnæan Society."

The colour of this insect is dull, dead black, and, both in general contour and in hue, it bears so great a resemblance to the well-known Churchyard Beetles (Blaps), that the specific name of *blaptoides*, i.e. like the Blaps, has been given to it. Since the above-mentioned letter was written, many other specimens of this curious Beetle have been taken, so that it is not now nearly so rare as it was then. Many more travellers visit Japan than was the case thirteen years ago, and the habits of the insect are better known.

THE second example of the Cychridæ belongs to the typical genus, and is named *Cychrus vidua*.

The shape of this Beetle is singularly elegant, as can be seen from the illustration. It is a native of North America. Both in shape and colour it presents a very decided contrast to its

relative, the Damaster, for its outlines are all graceful, and its colour peculiarly intense. The hue of this Beetle is the deepest purple-violet, the colour being almost painfully splendid in a brilliant light. The thorax has more blue in it than the elytra, which are deeply and rather coarsely granulated in longitudinal lines, so as to add to the vividness of the purple.

On looking at this Beetle from above, it seems to be a very bulky one; but when viewed sideways, its body is seen to be curiously flat, the depth being apparently quite disproportionate to the width. The object of this structure is evidently to enable the Beetle to creep beneath stones, under bark, and so to hide itself where a stouter insect could not enter. The specific name *vidua* is Latin (the "vidder" of Mr. Weller), and has been given to the insect on account of the very dark colour of its surface.

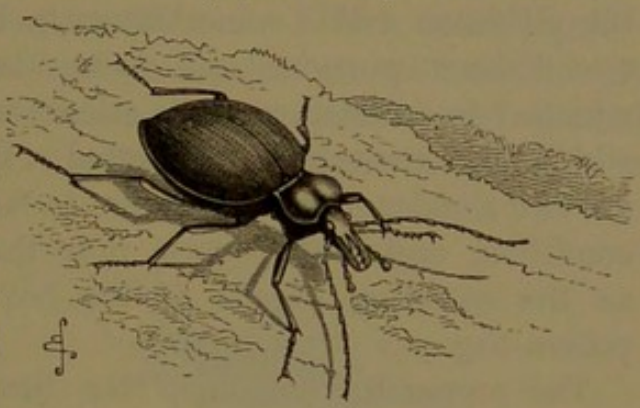


Fig. 11.—Cychrus vidua. (Deep purple.)

It has already been mentioned that the Carabidæ have the power of ejecting a noisome liquid when alarmed. Both from the mouth and the tail proceeds this weapon of defence, and in some of the species this latter liquid is so volatile, that when it comes into contact with the air it explodes with a slight report, leaving a cloud of thin smoke. This is specially the case with the tribe of Brachinides, of which our little Bombardier Beetle (*Brachinus crepitans*) is a familiar example. These Beetles are very social, and it is said that at least a thousand have been seen gathered under a single flat stone near the river's brink. On being disturbed they at once begin to eject the explosive liquid, and a smart fusillade is kept up for some time.

I remember that at one time schoolboys were in the habit of amusing themselves during the winter evenings by scattering coarse grains of gunpowder very thinly along the bars of the fire, and then waiting for them to explode singly. The little explosions of the Bombardier Beetles are exceedingly like those of the grains of powder, and, like gunpowder used in war, are

intended to be employed against an enemy. The foe in question is generally one of the larger Carabidæ, which would soon devour the small and helpless Brachinus were it not deterred by the repeated explosions and clouds of blue vapour that issue from its expected prey.

The fluid and the apparatus which secretes it have been carefully investigated by M. Léon Dufour. Like most internal organs, the secreting apparatus is double, one on either side of the abdomen. M. Dufour describes the organ as consisting of two distinct portions, one being the "preparatory organ" in which it is secreted, and the other the "conservatory organ," in which it is reserved until wanted. The actual secreting organs are two slender fibres, which are in fact glands in their earliest condition, and which open into the preparatory organ just as the secreting organs of the bee or wasp open into the poison-bag.

The preparatory organ of the Brachinus assumes two very different aspects, according to its degree of contraction or expansion. When contracted, it is a soft, round, opaque, whitish body, situated under the last rings of the abdomen. When expanded, it becomes oblong, translucent, filled with air, and occupying nearly the full length of the abdomen. The reservoir, or conservatory organ, does not alter its shape, but is always small, globular, reddish-brown, tough in texture, hollow in the inside, and placed within the last ring of the abdomen. Both sexes possess this apparatus.

As to the fluid itself, it is capable of staining the human skin black, and that so deeply that the stain remains for several days. Mr. Westwood, in his "Modern Classification of Insects," gives the following anecdote, which was narrated to him by the celebrated African traveller, Burchell:—

"While resting for the night on the bank of one of the large South American rivers, he went out with a lantern to make an astronomical observation, accompanied by one of his black servant boys; and, as they were proceeding, their attention was directed to numerous Beetles running about upon the shore, which, when captured, proved to be specimens of a large species of Brachinus. On being seized, they immediately began to play off their artillery, burning and staining the flesh to such a degree that only a few specimens could be captured with the

naked hand, leaving a mark which remained for a considerable time. Upon observing the whitish vapour with which the explosions were accompanied, the negro exclaimed in his broken English, with evident surprise, 'Ah! Massa, they make smoke.'"

The explosive fluid is soluble both in water and alcohol, and after repeated explosions deposits a sort of dust on the elytra. The interior of the reservoir is coated with the same dusty deposit.

The name Brachinidæ is derived from a Greek word signifying "short," and was given to these Beetles because most, though not all, of them have their bodies shortened and almost squared behind, as if they had been cut off abruptly with a knife or chisel.

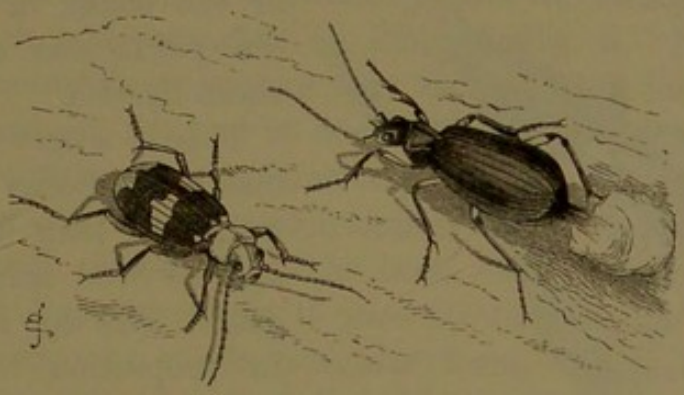


Fig. 12.—Pterosophus complanatus. (Dark blue with yellow marks.) Brachinus Sinensis. (Brown with green gloss.)

In the accompanying illustration the left-hand figure represents the *Pterosophus complanatus* of India. It is a very pretty creature, and in its general outline and the arrangement of its colours really exhibits a curious similitude to the well-known Asparagus Beetle of this country. The ground colour of the elytra is dark, shining, violet-blue, and the patches upon them are yellow, as is the thorax. The shortened form of the elytra is shown very plainly in this insect.

On the right hand of the same illustration is one of the largest of the true Brachini; namely, the Chinese Bombardier Beetle (*Brachinus Sinensis*). This insect really looks quite a giant among its kinsfolk; and if it be able to eject a corresponding quantity of the volatile fluid, it must be rather a formidable antagonist to any insect foe.

As is the case with many other Beetles, the colouring of this insect is rather variable. It may, however, be described as follows. The general hue is brown, slightly glossed, however,

with green. This latter colour does not extend to the legs, which are entirely brown. The elytra are covered with bold parallel ridges, an arrangement which gives the green gloss a wider play than if the surface were entirely smooth.

The tribe Lebiadæ comes next in order, and we will take but one foreign example of it. This is *Agra Megæra*, which is represented in the accompanying illustration. The Beetles belonging to this genus have the last joint of the labial palpi very broad, flattish, and axe-shaped. The body is much elongated, and the head is narrowed behind. The name Agra is Greek, and signifies hunting, or the chase, in allusion to the predacious character of these Beetles.

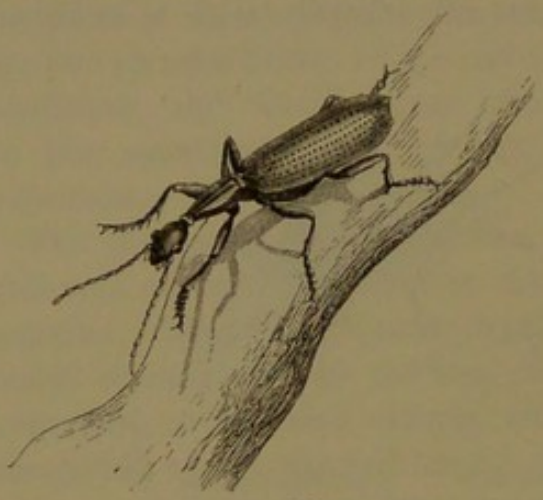


Fig. 13.—Agra Megæra. (Dark green.)

This is a very odd-looking insect, its thorax alone being nearly as long as the body, and its head being also elongated. The legs are elongated in proportion to the body, and so are the antennæ. The general colour is very dark green, the elytra are squared and deeply pitted, and the thorax is covered with wrinkles interspersed with large punctures. In this genus there is a bold distinction between the two sets of palpi, the maxillary palpi being simple and thread-like, while the labial palpi have the last joint flat and axe-shaped. All the insects of this genus, which is a tolerably large one, are natives of South America.

The habits of the Agræ are rather remarkable. They are tree-lovers, sitting motionless on the leaves, with their long fore-legs and antennæ stretched out in front of them. It is rather a remarkable fact that the leaves on which they are most frequently found are those which have been attacked by the leaf-rolling caterpillars, the roll forming a convenient couch whereon to sit.

They are very wary Beetles, and have that habit which is so detested by entomologists; namely, spying a foe at a distance, and instantly dropping from the leaf to the ground, where

they are safely hidden among the grass and other herbage. Although they use the grass as a city of refuge, they appear to be very ill at ease among it, their long heads and necks coming awkwardly in contact with the leaves among which they are crawling.

Of these curious Beetles forty species are known, the largest and handsomest of which is *Agra Moritrii*, an insect whose colour is rich metallic gold glossed with crimson. The whole of the upper surface is deeply pitted, which gives additional richness to the colouring.

AMONG all the Insects Abroad, there is not one which at first sight takes the attention more instantly than the strange-looking creature which is represented on Plate I. Fig. 4. No matter how large, beautiful, or strange may be the other insects with which it is placed, the eye at once fixes on this flat, leaf-like creature, in spite of its comparatively dull hue. Like most of the foreign insects, it has for some time borne no English popular name. Recently, however, it has been found in considerable numbers near Penang, where it goes by the popular name of FIDDLER, on account of its singular form, which has some resemblance to that of a flattened fiddle. Scientifically it is termed *Mormolyce phyllodes*, the meaning of which name will presently be explained.

It is a native of Java and China, and is not very scarce, being found, as might be surmised from its shape, under bark and in similar localities. It has well been said that Nature never leaves a crevice but she makes something flat to creep into it, and certainly the Mormolyce carries out this theory, for it is so flat, that if the crevice be only wide enough, its depth is of little consequence.

The actual body of this beetle, though long, is not very wide, the width seeming to have been given to the elytra, or wing-cases, and the edges of the thorax. The elytra are flattened in the most extraordinary manner. They are scarcely thicker than the paper on which this account is printed, and are of a horny and translucent character, so that they permit the legs to be seen through them. Indeed, so transparent are they, that if one of these beetles be held over a book printed in bold type, and the light carefully adjusted, the capital letters can be read

through the elytra, and the general shape of the smaller letters be made visible.

The colour of these elytra is dark red-brown. Their surface is highly polished, like shining horn, and is covered with rounded wavings like the marks left by the sea-ripple on the sand. The general appearance and colour of these strange elytra have been happily compared to the thin, flat, shining gingerbread called "jumbles." The edges of the thorax are also flattened, just as if they had been made of some soft substance and then pinched, and they are furnished with rather formidable-looking teeth at the sides.

The legs and body are much blacker than the elytra, but the blackness is evidently owing to the greater thickness, inasmuch as the thorax, which is red-brown at the sides, where it is thin, is red-black in the middle, where it is thick. If the elytra be separated, the wings can be seen snugly packed away between them and the body, so that we may consider it to be among the flying insects.

In consequence of its strange and almost eccentric shape, systematic entomologists were for a time rather puzzled as to the place which it ought to hold. Some wished to place it with the genus Sphodrus, on account of the structure of the mouth and the deep notch near the tip of the front tibiæ. Some ranked it with the Brachinidæ, or Bombardier Beetles, because it certainly has, with the exception of the flattened elytra, a decided resemblance to some of the genera of that family. Moreover, it has similar habits to the Brachinidæ, being always found hiding under some substance that will exclude the light, just as our common British Bombardier Beetles are always found hiding under stones. Some thought that it ought to come at the very head of the Beetle tribes, even taking precedence of the Tiger Beetles. However, the multitude of counsellors has found wisdom, and by degrees the Mormolyce has settled down into the place which it now occupies; namely, the family of the Pericalides.

Although a large Beetle, it does not seem to be a strong one, and, in spite of the saw-like edges of the thorax, its general aspect conveys an impression of feebleness. The head, for example, is small in proportion to the rest of the body, and is very much elongated and slightly flattened; the jaws are insignificant, and the legs give no indications of power. Indeed,

the large and long antennæ seem nearly as powerful as the legs, and quite as capable of offence.

Like many of its kin, the Mormolyce is exceedingly variable in point of size, some being an inch and a half longer and two-thirds of an inch wider than others. This perhaps does not seem so very great a discrepancy on paper as it really is in fact. A quarter of an inch makes a very great difference even in a large insect. Just as an elephant of nine feet high towers like a giant over his companion of eight feet, or a man of six feet over one of five, so does a Beetle of an inch and a quarter in length look gigantic when compared with one which only measures an inch. It is for this reason that entomologists are so very careful in measuring the dimensions of insects and their several parts.

Mr. W. L. Distant, during a recent visit to the British Museum, communicated the following particulars of this insect and its habits. Near Penang there are a number of very large trees, on whose trunks grow large fungi, like the boleti that grow on birch, oak, and ash in this country, and are used for sundry domestic purposes. If one of these boleti be torn off, the Mormolyce is generally found hiding between the fungus and the bark, the crevice being so narrow that no one who was unacquainted with the insect would think that so large a creature could find shelter there. It is much more active than might be supposed from its appearance, and as soon as it is exposed to the unwelcome light it runs off with such speed that a quick eye and hand are needed for its capture.

Mr. J. C. Bowring, who took many specimens of the Mormolyce in 1860, tells me that both the larva and pupa are found under the same fungus. The strangest part of this curious insect's history is, that during its lifetime the flat elytra are quite soft, only attaining their hardness and stiffness after death. He took the insect both in Java and Penang, and states that the specimens of *Mormolyce phyllodes* taken in Java were larger than those of Penang. There are now in the British Museum several specimens of the larva, pupa, and perfect insect, all caught and presented by this gentleman.

Now let us pass to the name of this most singular insect.

The word *Mormolyce* is Greek, and generally signifies "a hobgoblin." Literally, it is the exact analogue of our "bugbear"—

the word *Mormo*, or Mormon, bearing precisely the same signification as the old English *Bugge*, viz. some object of terror, and the latter portion of the word signifying "a wolf." There is certainly something very spectre-like and uncanny about the look of this strange beetle, which looks as if it had been smashed flat and in some strange way contrived to survive the accident and to maintain life in its flattened condition.

The name *phyllodes* is also Greek, and is taken from a word signifying "a leaf." Indeed, anyone who is in the least conversant with Insects Abroad must be struck with the singular resemblance in shape between the Mormolyce and the Leaf Insects, although they belong to totally different orders, one ranking among the Beetles and the other among the locusts and grasshoppers. Just as the leaf insects can sit among the foliage of a tree and be scarcely distinguishable, even by practised eyes, from the living leaves, so can the Mormolyce, which is one of the groundlings, sit among the brown and withered leaves which have fallen from the branches, and be equally indistinguishable from them. Whether these remarkable resemblances were intended for the purpose of protection is very doubtful, but there is no doubt that, whatever may be their object, they certainly perform that office whenever the Beetle ventures by day from the shelter of the fungus-home in which it generally hides itself during the hours of sunshine. As, however, the Beetle very seldom does so venture, its convenient resemblance to a withered leaf can scarcely be intended for defence.

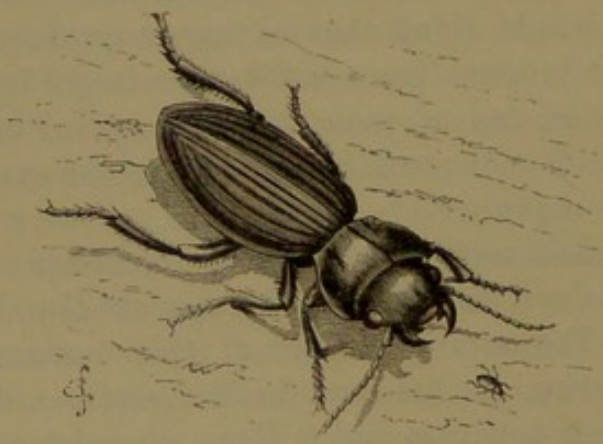


Fig. 14.—Enceladus gigas. (Shining black.)

The tribe of the Siagonides is represented by the insect which is known by the name of *Enceladus gigas*.

This is a remarkably fine and conspicuous insect, of elegant shape, and notable for the very broad collar which separates the thick, broad head from the thorax. The colour of the insect is very shining black, and the elytra are covered with bold,

parallel, longitudinal ridges interspersed with deep punctations. The thorax is very shining, and on either side, near the base, is a deep and large pear-shaped pit. A narrow groove runs along the centre of the thorax between the pits. It is a native of South America.

I very much regret the name that has been given to this insect, as nothing could have been more thoroughly inappropriate. The classical reader will remember that Enceladus was not only a giant, but a giant among giants, the leader of the rebellion against Jupiter, who was at last struck down by Jupiter's thunderbolts and condemned to perpetual imprisonment under Mount Etna, whose flames were the angry breath of the imprisoned giant.

The name of Enceladus therefore carries with it ideas of gigantic size, strength, and terror, and nothing can be more absurd than to give the name to any insect, especially one that is so slightly shaped as that which is shown in the illustration. It might with appropriateness be given to some new species of whale, elephant, rhinoceros, hippopotamus, or any large and terrible animal, but there is an absolute bathos in calling by the name of the dead giant who could only be vanquished by the thunderbolt, a pretty Beetle, several of which would go in the waistcoat pocket.

The Graphipterides are also represented by a single example, *Graphipterus variegatus*. All the members of this family have a rather curious aspect, and have been aptly compared by Mr. Westwood to broad Tiger Beetles. Their bodies are all short, and the abdomen is broad, oval, and much rounded, as may be seen by reference to the accompanying illustration.

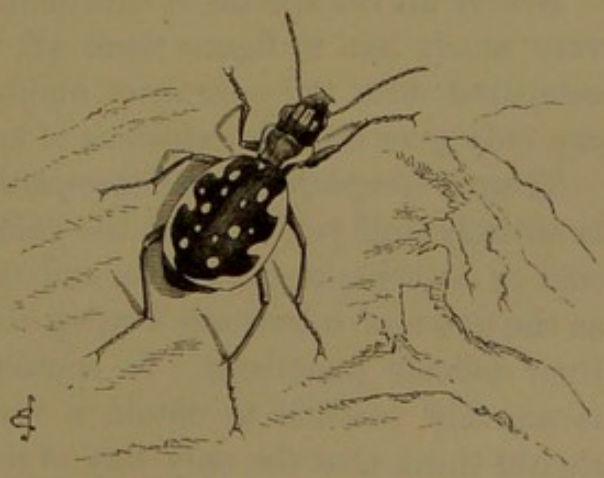


Fig. 15.—Graphipterus variegatus. (Dead black and white.)

The habits of these Beetles are rather unlike those of the Carabidæ in general. Usually these Beetles are nocturnal, hiding themselves by day

under stones, in dark crevices, and similar habitations, so that they are seldom found except by those who industriously look for them. But there is at least one species of Graphipterus, which was seen by M. Lefebre in Egypt, running about quite actively in the hottest part of the day. This occurred in March, and the insect was seen near the edge of the desert.

The same observer noticed that this is one of the noise-producing insects, being able, like our common Musk Beetle, to emit squeaking or creaking sounds. In this case the sound is produced by rubbing the thighs of the hind legs against the edges of the broad elytra.

There are many species of Graphipterus, the most striking of which is, in my opinion, the insect which is represented in the illustration. The colours are simply "dead" black and white of a rather peculiar texture, which cannot be seen without artificial aid. If a moderately powerful magnifier be brought to bear upon the insect, the whole of the white surface is seen to be covered with exceedingly minute longitudinal black streaks, looking like the smallest imaginable hairs, so that by them all shine and glitter are prevented. The dulness of the black portion is obtained in precisely the same manner, the hair-like streaks being best seen by a side light. The reader will doubtless notice the shape of the elytra, which are very wide behind, and then squared off abruptly. It is a very variable insect, both in size and colour. This species inhabits Egypt.

Nearly all the species of this genus are so pretty that I should very much like to figure them all, but our space is so limited compared with the enormous number of foreign insects, that I can only give brief descriptions of one or two.

There is *Graphipterus melanocephalus* of Southern Africa, which is entirely dull yellow. But the yellow is only a sort of powdery coat or covering to the elytra, and is almost as easily rubbed off as the down of a butterfly's wing, showing the black elytra with their delicate punctures. In consequence of this peculiarity it is scarcely possible to obtain a really perfect specimen, and I should think that the only way of doing so would be to rear the insect from the larva.

From the same district also comes *Graphipterus elegans*, an insect which thoroughly deserves its name. On the top of the head there is a spindle-shaped mark of deep brown-black, a

larger on the thorax, and a still larger on the middle of the elytra, all three joining each other. These marks are surrounded by a narrow band of pale golden yellow, then by a broad band of buff, and lastly by a second narrow band of yellow.

Then there is *Graphipterus Westwoodii*, yellow, with a large butterfly-shaped black patch on the elytra; *Graphipterus cordigera*, having a similar patch, but looking like a heart suspended by a string. *Graphipterus Senegalensis* is striped with narrow bands of yellow and buff-brown; and *Graphipterus exclamationis* is black, with a grey mark on each elytra, shaped just like a note of exclamation.

The generic name Graphipterus, or "written-wing," is given to the insects in consequence of the manner in which their elytra are decorated with marks defined as clearly as if they were drawn or written with a pen.

CHAPTER IV

GROUND BEETLES, OR CARABIDÆ (continued)

The tribe of the Anthiades comprehends some of the giants of the great family of the Carabidæ—insects which are not only large and powerful, but armed with jaws of enormous proportionate size. These jaws are, as is often the case with insects, fully developed in the male sex alone, the females having them comparatively small. From this fact we may infer that the great size, cruelly hooked shape, and sharp points of these jaws, show that, in the male at all events, they are not required so much for the purpose of obtaining food as of fighting.

One of these Beetles, *Anthia sex-guttata*, is shown on Plate I. Fig. 5. The colour of the insect is black, and the spots are either white or cream-coloured. Both in the colour of the spots, in its general size, and in the development of its jaws, it is quite as variable as our own Stag Beetle, and it is impossible to see a series of these Anthias without being struck by the curious resemblance in these points between two perfectly dissimilar insects. The peculiar projections of the thorax are covered with pale down, sometimes nearly yellow and sometimes white.

As to the habits of these insects, they can be inferred from a letter written by M. Westermann, of Copenhagen, to Mr. Westwood. The former gentleman had found in Bengal a curious larva, about three inches and a half in length, and, not knowing what it might be, sent it to M. Latreille, the celebrated naturalist. Mr. Westwood afterwards wrote to the discoverer of the larva, and received a letter, of which the following lines are an extract:—

"Being on a visit in Burdwan, in Bengal, one night returning home, I observed, by the light of a lantern, the larva crawling in the road. I immediately took it to be the larva of some large

Coleopterous insect, but had not the least idea to which it belonged till the day after, when I observed at the foot of a large banian tree several *Anthia guttata*, which, however, I could not secure, as they retreated into holes when I came near them. I therefore ordered my palankin bearers to dig them out, when we at the same time obtained another of the larva found on the preceding evening.

"Without being positive, as I wrote to M. Latreille, I now consider it to be that of an Anthia, and conclude it was in the habit during the night of leaving its hole and crawling about in search of worms. M. de Haan having observed to me that this larva appeared, according to his observations, to belong to an Elater, I informed him that on the very tree where we obtained the larvæ from the holes at the roots, I found *Elater fascipes* (Fabr.) in great abundance, this being the largest Elater which ever came under my observation in Bengal." Mr. Westwood is inclined to agree with M. de Haan, saying that the larva, although found in the same locality as the Anthia, does not belong to any Carabidous insect, whereas it does present many of the characteristics of Elater larvæ.

To my mind, the insect which is here represented is the most striking and characteristic of the whole genus.

The arch-looking jaws are of enormous proportionate size, bent rather than curved, and so long, that when they are closed their points cross each other even further than do those of any Tiger Beetle. The thorax is developed in a most singular manner —a projecting, heart-shaped, shining-black shield guarding the junction between the thorax and the abdomen, and in front of the shield two flattened discs rendering the thorax quite as wide as the abdomen. In the specimen from which the illustration was drawn, these discs are thickly covered with yellow down, a narrow belt of white down runs along the edges of the elytra, and there is a good deal of similar down on the antennæ. The rest of the insect is shining black. All the Anthias are confined to a few districts of Asia and the greater part of Africa.

The hideling habits of the insect are well shown in M. Westermann's letter. Generally the Anthiæ prefer dry and sandy soils, in which they scrape small hollows as hiding-places in which they lie in wait for their prey. "In manners" (writes Mr.

Duncan in the "Naturalist's Library"), "and even in the figure of their bodies, they bear a greater resemblance to the Beetle named *Broscus cephalotes*, found abundantly on the sandy shores of the sea in many places both in England and Scotland, than to any other British insect. They partake of the form which prevails among Beetles accustomed to burrow in the soil, and which is best exemplified in the Scarites and Clivinæ, or Mole Beetles as they are sometimes called, which live chiefly beneath the ground.

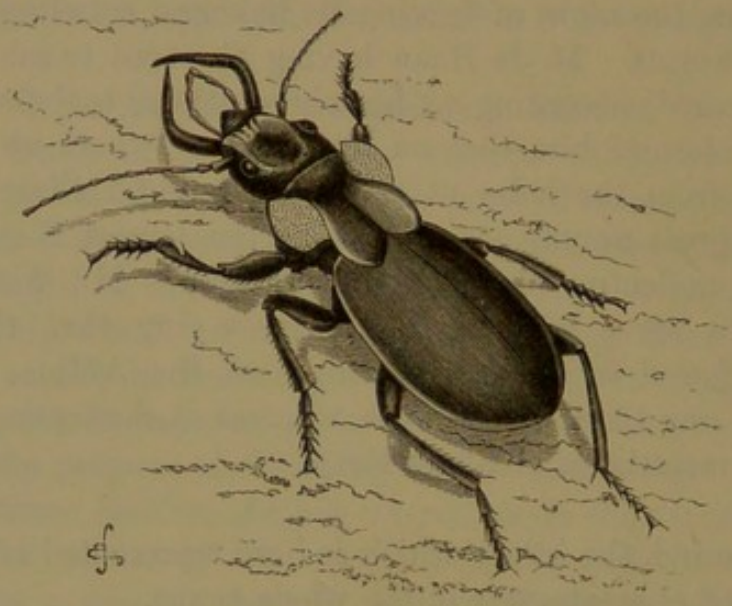


Fig. 16.—Anthia thoracica.
(Shining black; yellow down on thorax.)

"The head is very thick and strong, fitted to make its way through a resisting medium, and the thorax is attached to the abdomen by a narrow neck-like portion, which admits of the anterior part of the body being easily turned in a lateral direction, and therefore answers the same purpose as the flexibility of the vertebrate column in moles and other burrowing quadrupeds. The hinder part of the body is considerably wider than the anterior, a circumstance never observed in burrowing Beetles, properly so called, as it would materially impede the insect's progress through its cylindrical excavations."

It is one of the most variable of insects, and has consequently been described under several names. Some specimens are very much smaller than others, while the colour and arrangement of the down-clad patching differ so much that no one who did not thoroughly know the insect would be likely to imagine that

such differently coloured creatures could be only varieties of one species. Sometimes the band which edges the elytra is yellow instead of white, and sometimes it disappears altogether; while there are many specimens in which there is not only no white edge, but its place is taken by four large yellow spots. Most down-bearing Beetles are liable to similar variations, which in many instances are simply mechanical, the down getting rubbed off the more projecting portions and remaining in those which are hollow and therefore protected from friction. The present species is a native of Southern Africa.

The name of Anthia is scarcely appropriate when applied to this insect, or indeed to any insect whatever, as it was originally given by old Greek writers to some sort of sea-fish, and is therefore singularly unsuitable to an insect which loves dry and sandy places.

One of the most remarkable of the Anthiadæ is *Cypholoba Ranzonii*, a native of Southern Africa.



Fig. 17.—Cypholoba Ranzonii.
(Shining black; dull red inside the cells.)

This singular Beetle has very short and powerful jaws, curiously short antennæ, and a bold collar between the head and thorax and the thorax and abdomen. The colour is black, that of the head and thorax being rather dull, in consequence of the innumerable wrinkles with which it is covered, and which are too small to be seen without a magnifying glass.

The chief peculiarity, however, lies in the elytra. These organs possess very strong longitudinal ridges, connected at

regular intervals by cross ridges, so as to form a series of bold deep cells, six rows on each elytron, each cell surrounded by a wall of strong, shining black, horny material. These cells are, as it were, stamped so deeply into the elytra that their floors are exceedingly thin and fragile, and it is scarcely possible even to touch them with the point of a needle and not to break through the floor of the cell.

Each cell is paved with a dusky-looking substance of a rust-red colour. At first I took this substance to be formed of yellow down like that on *Anthia thoracica*, which has recently been described. The magnifier, however, soon showed that it was not down, and then I thought that it might be a mere powdery deposit, such as often settles on insects which have been kept for some years. Mr. F. Smith, of the British Museum, kindly undertook to examine the insect more thoroughly than I could venture to do with specimens not my own property, and found that, though the powder could be removed by friction, it could not be touched by either water, spirits of wine, or benzine, and was clearly a natural growth on the insect. This is the only species of its genus, but there are Beetles belonging to allied genera which are formed after the same manner, and have their elytra similarly covered with deep cells paved with reddish powder.

The family of the Morionidæ is represented by the insect called *Hyperion Schroeteri*, an inhabitant of New Holland.

At a first glance this Beetle does not seem to be particularly worthy of notice, but a short inspection shows that it is too remarkable to be passed over without description.

Its colour is wholly black, that of the head and thorax being of a satiny texture, owing to the innumerable punctures with which it is covered, and which are too minute to be seen by the unaided eye. There is a deep longitudinal line along the middle of the thorax, and a large, bold, deep impression on either side of the back of the head. There is also a deep impression on the forehead. The jaws or mandibles of this Beetle are very strong and powerful, and are remarkable for a very large tooth on the inner side near their bases.

Like the thorax, the elytra are black, but are covered with bold longitudinal ridges, each of which is well rounded and

highly polished, so that they look much like a number of ebony cylinders laid side by side. As is often the case with Beetles, a row of rather deep punctures runs along the outer edges of the elytra.

The most remarkable point in this insect is the mode in which the legs are set on the body. A reference to the illustration will show that the hind legs are placed so far from the middle pair that they seem to be set quite at the end of the body. On looking at the under-side of the insect, however, it is seen that the thorax is prolonged enormously, the lower and hinder portion, called technically the meta-sternum, running under the



FIG. 18.—Hyperion Schroeteri.
(Black.)

abdomen almost to its end. It is to this portion of the insect that the hind legs are attached, and thus the legs, which appear from above to be actually set on the abdomen, are really in their usual place.

The tibia of the hind legs are boldly curved, and in consequence of this peculiarity Mr. Westwood proposed a new generic name, viz. *Campylocnemis*, or "crooked shin." Its name would at all events have the advantage of being intelligible, whereas the name of Hyperion gives no intimation whatever as to the appearance, general form, or the structure of any part of the insect. However, the name Hyperion has the precedence, and

according to zoological custom, although not nearly so appropriate as Mr. Westwood's name, it must be retained.

All the three pairs of legs are very short in proportion to the size of the insect. As the Beetle is long-bodied, almost cylindrical, short-limbed, and possessed of powerful jaws, it has much the look of a boring insect, something like our own familiar little Beetle, *Clivina fossor*, which this insect very much resembles in general form. Nothing, however, is known of its habits, as is unfortunately too often the case with foreign insects. It is very rare, and neither of the two specimens in the British Museum is perfect.

THE important and interesting family of the Scaritidæ is represented by the largest known species, which is shown of its natural size on Plate I. Fig. 6. There is some difficulty about the name of this insect. It is called by one author *Scaritarchus Midas*, by another *Scarites gigas*, by another *Mouhotia glorissa*, &c. These names, however, have been resolved into two, both of which were given in 1862. *Mouhotia glorissa* was published a few months before its rival, and therefore is retained. Still, the first of these names is infinitely the better. The word *Scaritarchus* signifies "chief of the Scarites," or, to transpose the two portions of the word, "Arch-Scarites;" while the specific name *Midas* is singularly appropriate, referring to the golden lustre which makes the insect so conspicuous even at a distance.

In this fine Beetle the chief characteristics of the Scaritides are well shown, and almost exaggerated. These Beetles have the tibiæ of the fore legs broad, strong, and notched, evidently for the purpose of enabling them to dig in the ground. In this species the legs are not only powerful, but peculiarly long, and the tibiæ of the front pair are armed with three formidable teeth or spikes on the outer edge, those of the middle pair having two similar teeth. In fact, the Beetle has altogether a very spiky look, and would be very disagreeable if handled carelessly. The hind legs have not the spikes, but they have sometimes a tubercle or projection marking the spot where the spikes might be expected to be.

For every reason it is a very conspicuous insect. In the first place, it well deserves the name of Scaritarchus, for it looks among its kin like an elephant among Shetland ponies. It is

thickly and stoutly built, possessed of enormously powerful jaws, and, in consequence of its long legs, stands rather high from the ground.

Its colour is equally conspicuous. The head and greater part of the thorax and abdomen are dull black, but round both abdomen and thorax runs a broad band of most brilliant metallic colours, changing its hue with every shifting light, and scarcely any two portions appearing of the same colour at the same time. It is a sort of mixture of green and blue foil, fiery copper-red, and burnished gold, and is peculiarly fascinating to the eye. I should say that if one of these insects were walking at liberty in the sunshine, it could be detected at a distance of many hundreds of yards by the metallic gleams of this splendid border. The middle of the elytra, black though they be, is yet handsome, being covered with parallel rows of bold rounded tubercles.

As a rule the Scaritides are black and dull, so that the splendour of this species is all the more conspicuous. There are, however, two exceptions which are worthy of notice, both belonging to the same genus, and being inhabitants of Yucatan. One of these is called *Molobrus purpuratus*, and has a broad purple-copper band round the elytra, and a very narrow edge of the same hue to the thorax. The second is *Molobrus rotundiplanis*, which has its thorax surrounded with a narrow green edge, and a broad red-copper band round the elytra. Both insects are, however, comparatively small. The name *Molobrus* is Greek, signifying "a glutton," and is given to these insects on account of their voracity.

The explanation of the last-mentioned name indicates the general character of the Scaritides. They are pre-eminently carnivorous, feeding mostly on living insects and larvæ. For this purpose they are well fitted by their firmly mailed bodies, their powerful legs, and strong sharp jaws, which enable them to pursue their prey into their very strongholds and there to devour them.

Several entomologists have observed the habits of this species, and agree in their accounts. They say that it is accustomed to burrow under cowdung, using for this purpose its powerful palmated fore legs, after the well-known manner of the Dor Beetles. It does not, however, burrow for the purpose of laying its eggs, but for the sake of feeding upon the larvæ of the

various Beetles which are found in such situations. It has even been seen to fall upon the Beetles themselves, though of great size, to pull them in pieces, and devour them.

Like many other Beetles which are adorned with brilliant metallic hues, this insect seldom displays its beauties to the sun, but remains hidden in some dark place during the day, and only issues from its den after dark in search of prey. It is said to feed largely on cockchafers, which, like itself, are mostly nocturnal in their habits.

THE sub-family or tribe of the Panagæinæ is represented by several species, the first of which is the curious and rare *Tefflus Megerlei* of Guinea.

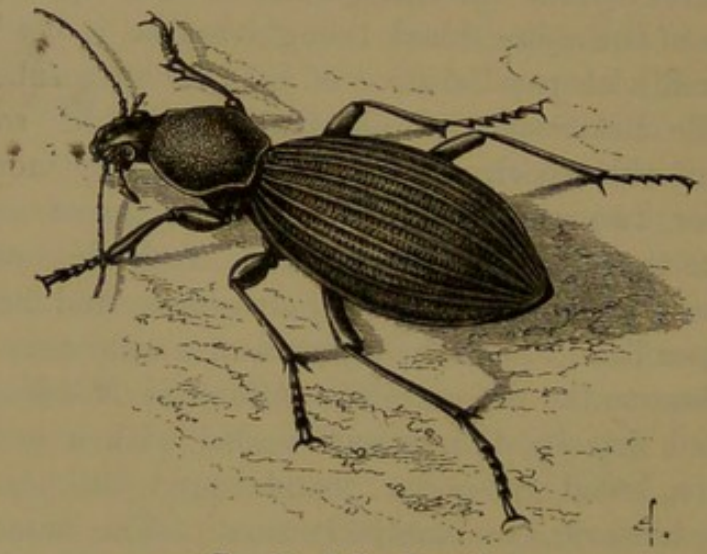


FIG. 19.—Tefflus Megerlei.
(Black.)

This insect is the largest of its tribe, though not the handsomest in point of colour, as we shall presently see. Its colour is black, but of different quality in the thorax and abdomen. The former is covered with a whole network of small and intricate wrinkles, like those in the faces of Rembrandt's old women. The latter, which is rotund and much depressed towards the end, has the elytra covered with bold longitudinal rounded ridges, set widely apart, and having between each ridge a double row of squared knobs, rather longer than wide. These knobs break up the light in a very artistic manner, and, in spite of the uniform black of the colour, give a variety of light and shade that could hardly be expected from so simple a device.

In point of colour, the two handsomest of the group are natives of Bolivia, and by far the finest of them is *Brachygnathus oxygonus*. It is not half the size of the Tefflus, but is a most resplendent insect, its thorax being polished, shining blue, glossed with intense yellow, especially at the edges. The elytra are covered with parallel longitudinal grooves, very deeply cut and slightly punctured, and are reddish bronze, changing into green when the light falls obliquely on them. Another remarkable characteristic of this insect is the shape of the thorax, which is flattened above, and the two hinder angles lengthened into sharp points. The head is very small, and the shape of the head and thorax together is very much like that of a deeply barbed spear-head. The jaws are small in proportion to the head, thus giving rise to the generic name *Brachygnathus*, *i.e.* "short-jawed." The specific name, *oxygonus*, or "sharp-angled," refers to the peculiar shape of the thorax.

The second brilliant species is *Brachygnathus pyropterus*, a Beetle coloured in a similar manner, though not so brightly, and not possessing the pointed angles of the thorax so proportionately long. The specific name, *pyropterus*, or "fire-wing," refers to the fiery-red bronze of the elytra.

ANOTHER species of this group is the East Indian *Eudema tomentosus*, which is shown in the accompanying illustration.

This is really a pretty, though not brilliantly coloured insect, attracting the attention of the entomologist by the strong likeness to its little British relative, *Panagæus punctatus*. The head and thorax are black, and so are the elytra, except that near the shoulder and tip of each elytron there is a large yellow spot, which gives to the Beetle a look as if it were yellow, with a large black cross drawn upon it. The elytra are boldly ridged and very finely punctured, and the whole body and limbs are covered with very minute black hairs, which extend even to the tips of the antennæ.

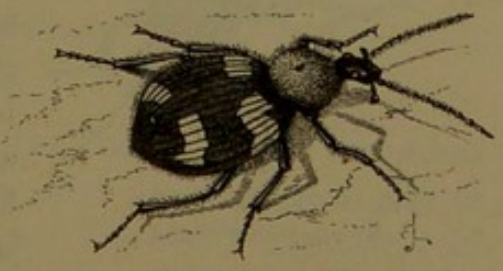


FIG. 20.—Eudema tomentosus. (Black and yellow; hairy.)

The generic name, *Eudema* (the "e" being short), signifies "beautifully banded," and the specific name, *tomentosus*, signifies

"downy." Some writers employ the generic name *Craspedophorus—i.e.* "hem, or edge-bearing,"—on account of the downy clothing which projects on all sides and forms a sort of edging or fringe round the body. There are several species of Eudema, and one of them, *Eudema eximius*, has five little round yellow spots on each elytron, set like the number five on a die. This is in itself nothing extraordinary, but the remarkable point is, that there is a small variety of *Eudema tomentosus* which resembles the last-mentioned insect not only in size, but in having five little yellow round spots on each elytron.

THE many insects that belong to the group of Chlæniides are remarkable for possessing very similar shapes, colours, and habits, no matter in what part of the world they may exist. Their general shape can be seen by reference to the accompanying illustration. Their colour is some shade of silky green or brown, with a light edge, and their habits are to haunt moist spots. The sea-shore is the great gathering-place of these Beetles, which love to hide under heaps of decaying seaweed, where they find shelter and food.

The present species is selected principally because it is nearly the largest of all the Chlæniides. It inhabits Senegal, and, when viewed among the long ranks of its kin, seems to be a very giant among them, so small are they in general. Some, indeed, may almost be ranked among the minute species, and the average size is barely one-fourth of the *Epomis Cræsus*. The name *Epomis* is a Greek word signifying "the point of the shoulder-blade," and is given to these insects in consequence of the pointed hind angles of the thorax.

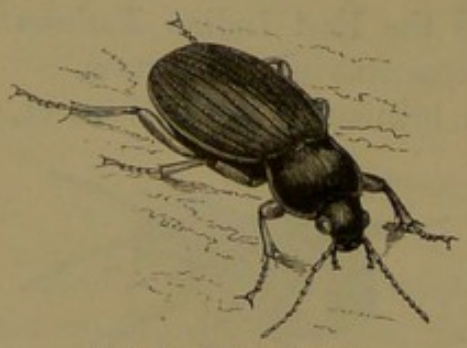


FIG. 21.—Epomis Cræsus. (Green, yellow edge.)

This is a handsome insect, the thorax being deep polished green, and the elytra black-green, surrounded with a broad yellow edge. The legs are pale yellow, something like the colour of the band round the elytra. This is, as I have already mentioned, the typical colour of these insects; but there are exceptions to every rule, some species being black, some entirely

green, and a very few purple, while one or two are marked with a black cross on the elytra, like that of Eudema.

A MOST conspicuous example of an exception to a general rule is found in the strange Beetle which is shown below, and which seems quite out of its place, looking, in fact, as if it ought to have been among the Scaritides. Still, if the reader will compare the structure of the legs of the Scaritides with those of the present insect, he will see that they must belong to two widely different groups. The front legs of the Scaritides are powerful, palmated, notched, and spiky, while those of the Dioctes are comparatively feeble, slender, without any palmations, and entirely spikeless. There are many other distinctions, but this is the principal.

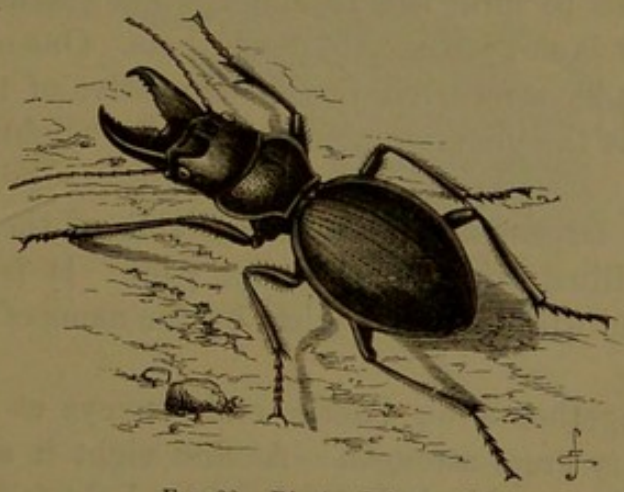


FIG. 22.—Dioctes Lehmannii. (Black.)

The chief points in the shape of this insect are the enormous development of the head and thorax, and the very small size of the rounded abdomen. The jaws are absolutely gigantic, and look as large in proportion as the bill of the Toucan or Hornbill does to the body of the bird. Then, in order to supply attachment to the large muscles which move these jaws, the head must necessarily be increased in size, and that in its turn requires a strong thorax to support it.

The legs of this insect are very long in proportion to its body, and are liberally supplied with hair. The colour is uniformly black, and the elytra are only marked by rows of very faint punctures. This Beetle is a native of Central Asia, and

the specimen which has been described was taken at Djan-djan. The generic name, *Dioctes*, is Greek, and signifies "a pursuer." The name Chlæniidæ, by which the whole tribe are distinguished, is also Greek: it signifies a soft woollen mantle of silky texture, and is applied to these Beetles on account of the peculiar silken gloss of their upper surface.

Next comes the tribe of Pterostichi. This name is formed from two Greek words, the former signifying "a wing," and the latter a "row" or "rank." It is given to these insects because their elytra are covered with bold ridges, set in rows or ranks parallel to each other. We have plenty of them in this country, mostly however small, black, and seldom noticed except by professed entomologists. They are all very quick and active in their movements, and, if disturbed from beneath the stones under which they love to hide, run to find another shelter with such rapidity that it is not too easy to catch them. One or two of our British species have received names expressive of this quality, among which is the generic name *Steropus*, or "lightning."

One of the largest and most remarkable of these insects is given in the illustration on the next page. It is a native of Java, and is known to entomologists by the name of *Catadromus tenebrioides*.

This is altogether a big Beetle, and conveys at once an impression of very great strength. At first sight it appears to be nothing but shining black, but when the light falls favourably upon it, both the thorax and the elytra are seen to be decorated with a band of deep, brilliant, shining green. On each of the hinder angles of the thorax there is a large and deep impression, and the interior of that depression is of a similar green. The elytra, which are rather flat, are boldly ridged, and there is a sort of flattening at the ends as if they had been pinched while soft. Along the green edge is a series of rather large and moderately deep punctures. With the exception of the green edging the whole of the insect is shining black.

Both the legs and jaws are exceedingly powerful, and the body is so formed, being of exactly equal diameter throughout its length, that the insect is evidently able to penetrate into places which would seem too small to conceal an insect of such

dimensions, and to chase and destroy those insects and other living creatures on which it feeds.

Its speed of foot is implied by the name *Catadromus*, which is formed from two Greek words signifying "running about," while the specific name of *tenebrioides* refers to its resemblance in point of general form to the well-known Meal Beetle (*Tenebrio molitor*), which is so prevalent in corn stores, and is the parent of the common meal-worm on which nightingales and other delicate cage-birds are fed. There is a variety of this insect in

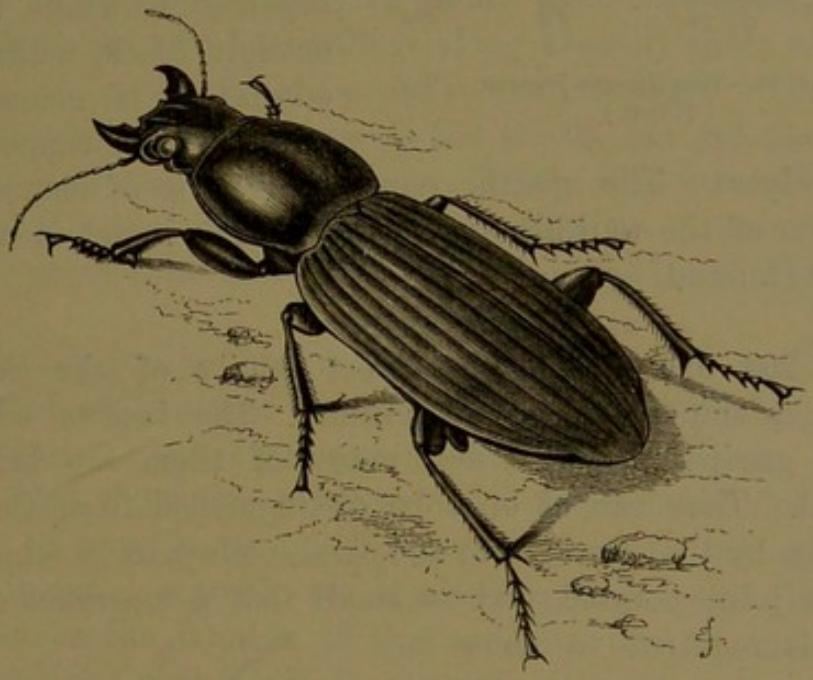


FIG. 23.—Catadromus tenebrioides.
(Black, green edge.)

which the colour, instead of being black, is reddish brown, the only sign of the splendid green margin being a very slight tinge of purple on the edges of the thorax.

A SECOND example of this tribe is found in the insect which is called *Homalosoma Vigorsii*, an insect which looks as if it were made especially to show what wonderful contrasts can be got out of the deepest black. The insect is wholly black, and yet it looks quite lively, contrasting favourably with many insects that even possess positive colouring. The head and thorax are shining as if made of polished jet. The elytra are also black, traversed by bold parallel ridges of shining black like that of the thorax. The spaces between the ridges or ribs,

if we may so call them, is soft, dull, dead black, very much like that of our common flat Silpha Beetles. The outer edges of the elytra are flattened, highly polished, and furnished with large and deep punctures.

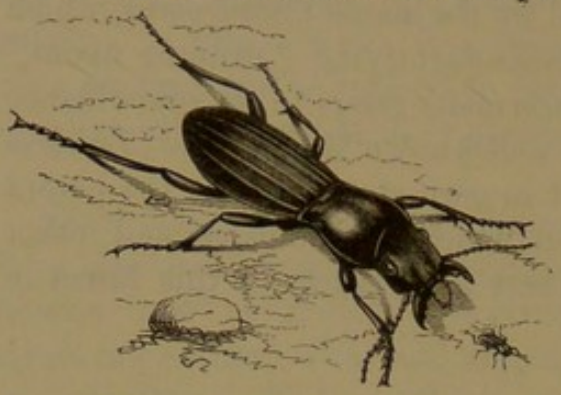


Fig. 24.—Homalosoma Vigorsii. (Black.)

The name *Homalosoma* signifies "similar bodied," and is given to the insect because its whole body is entirely black, without any admixture of colour, such as a green or coppery edge to the elytra. The specific name *Vigorsii* is of course given in honour of the well-known zoologist. The insect is a native of New Holland.

Our last example of the great family of the Carabidæ belongs to the tribe of Bembidiides. The insects belonging to this group are small, and many of them are brilliantly coloured. They can at once be distinguished from the other Carabidæ by the structure of the palpi, both pairs of which have the last joint pointed, and so small that a magnifier of some power is required to show it, even in the largest species. The tibiæ of the front legs are notched on the inside near the tip.

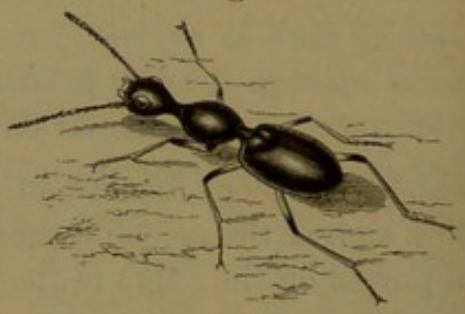


Fig. 25.—Pselaphanax setosus. (Reddish brown.)

They are semi-aquatic in their habits, some preferring the sea and others the fresh water. In our own country, plenty of them may be obtained under the hillocks of seaweed which are flung ashore by the waves during a storm, and are left to peaceful decay and to be the home of sand-hoppers and other shore-loving creatures. Even on those coasts which afford easy access inland, and where in consequence the seaweed has scarcely had time to settle on the beach before it is carted into the fields for manure, the Bembidiidæ may be taken in numbers, simply by following the men who carry off the seaweed, and in so doing

eject hundreds of living creatures from their hiding-places. Marshy places, especially those which edge the banks of tidal rivers, are well-known haunts of the Bembidiidæ, which absolutely swarm under the dead herbage, sticks, and other floating refuse which is so plentifully scattered about such lands.

Although they chiefly feed upon dead animal matter, they can seize and devour living prey, even though the animal attacked be much larger than themselves. Thus, our own little Beetle, *Cillenium laterale*, gets under stones and bunches of seaweed for the purpose of preying on the sand-hoppers, which, as everyone knows who has walked along a sandy shore and used his eyes, are fond of hiding under such shelters. The sand-hopper is often twice as large as the Beetle, but yet the insect seizes it under the body, holding on tightly with its notched fore legs, and so eating its way into the very centre of the creature's life, the nerve-cord that runs along the middle of the under surface.

The name Bembidiidæ is taken from a Greek word which represented an insect of some kind. Its primary signification is "a whip-top," but it was also applied to some insect. Except, perhaps, that the active movements of the Bembidiidæ may be thought to have some fanciful resemblance to the gyrations of a whip-top, I scarcely see the appropriateness of the name, especially as the Bembix of the ancients was an insect that buzzed, which the Bembidiidæ certainly do not.

The insect which has been selected as our foreign example of the Bembidiidæ is a most remarkable little creature. It scarcely looks like a Beetle as it runs along, and even in a cabinet it is generally mistaken for a little brown ant by non-entomologists. In proportion to the general dimensions the head is very large, furnished with exceedingly long antennæ, powerful jaws, and large, round, projecting eyes,—all these details pointing to the carnivorous and predacious habits of the insect, small though it be.

The head is connected with the thorax by a wonderfully thin and long neck, and that again with the abdomen in a similar manner, so that it really seems strange that the three parts do not fall asunder as the Beetle moves. The general colour of this curious little insect is shining reddish brown, except its legs and antennæ. The former are yellow except the latter

half of the thigh, which is black or green on its junction with the tibia. The long antennæ are variously coloured in four tolerably equal parts. The basal quarter is reddish dun, something like the hue of the body, only lighter. Then comes a black portion, then one pure white, and the last quarter is black.

The whole of the body is covered with bristles, which, though in themselves small, are quite large when compared with the size of the body. From this peculiarity the specific name of *setosus*, or "bristly," has been given to the insect. The generic name, *Pselaphanax*, has been given to the Beetle by way of a joke, on account of its very minute dimensions. It is composed of two words, the former of which signifies "feeling" or "groping by touch," and refers to the great development of the antennæ or feelers, which are as long as the head, thorax, and abdomen together. The second word signifies "a king," and has been given to the insect ironically, just as the name of "General" or "Admiral" is given to a very small dwarf, and the *sobriquet* of "Baby" is often applied to a man of gigantic stature.

As to the rest of the group, there is little of interest. They are mostly like our own species, so familiar to those who wander by the sea-shore or river brink and try to use their eyes. It is, however, worthy of notice, that not only do the Bembidiides approach the Water Beetles in their habits, but in portions of their forms. The reader will remember that the minute terminal joint of the palpi was mentioned as one of the distinguishing characteristics of this group. Now, there is a genus of the Water Beetles, called *Haliplus—i.e.* "a seaman"—which has the same joint of the same organ formed almost exactly like that of the Bembidiides.

THIS necessarily brief history of the Carabidæ requires a few remarks by way of summary.

In the first place, the word Carabus is apparently quite as inappropriate as is that of Cicindela. Originally it signified a "crab," which word indeed is nothing but a modified and contracted form of the Greek *Karabos*. So is the German *Krebs*, and so is the Latin *Scarabæus*. It was also employed to designate the cuttle-fish, on account of its mode of crawling, the name being composed of two Greek words signifying "to walk on the head." By Aristotle it is applied to an insect which is evidently

the Stag Beetle, but Linnæus was the first who gave it to the Ground Beetle; and though a protest was lodged against the name, it has been so universally employed that it will certainly continue to hold its place.

Now as to the part which the Carabidæ play in the world. They are of but very slight direct use to man. In fact, very few insects are directly utilized; and with the exception of the Bee, the Silk Moth, the Lac Insect, the Blister Beetle, and one or two others, the hundreds of thousands of insects that inhabit the world are not converted to any direct use.

With regard to the Carabidæ, the only direct use that is made of them, as far as I can discover, is that in some places where they are very numerous they are collected and boiled down so as to extract the fat, of which a kind of soap is made. I fancy that if the soap-makers in question were better entomologists they would not use for this purpose the perfect insects, but the larvæ, these being filled with fat which is afterwards absorbed into the complicated mechanism of the Beetle.

For my own part, I think that this non-usage of insects is not so much due to the useless character of the creatures as to our inability, or perhaps negligence, in discovering their properties. I have no doubt that man had long inhabited the world before he found out that the bee which could sting him could also furnish him with sweet honey, and that he must have been many years on the earth before he discovered that wax had any other use than to hold honey. Then man must have been very far advanced when he could utilize the silken thread spun by a caterpillar; for he must not only have felt the need of clothing, but must have passed through the stages of leaf-dress, skin-dress, and cotton or linen dress, before the beauty and strength of the silken fibre could have attracted him. It is so at the present day, and there are many countries where silk-producing insects live, and yet in which no use is made of the silk, the men of those countries regarding the cocoons much as we regard those of the commonest English moths or the webs of the garden spiders.

I cannot believe that the myriads of insects which surround us contain no more uses than those few which we have managed to discover and develop in so many thousand years, but think that we have neglected to look for those uses because insects

are small and appear to be beneath our notice. Yet it is just in such apparently insignificant things that the most important results are found. The steam-engine and the electric telegraph, which have altered the whole condition of civilized man, lay hidden for countless centuries in the bubbling of the pot and the child's amber toy; and so it may be that there lie still hidden in the insect hosts certain properties which may be as useful to man in their way as steam and electricity, and only wait for the hand of the discoverer to tear away the veil which conceals them.

CHAPTER V.

HYDRADEPHAGA, OR PREDACIOUS WATER BEETLES.

CONSIDERING the vast wealth of insect life which is seen in the hotter countries of the world, we might readily imagine that under a tropical sun every group of insects must be developed to the fullest extent.

The practical entomologist, however, knows that this is not the case. Some groups—such, for example, as the Long-horned Beetles and the Ants—swarm in such vast numbers that the insect-hunter finds almost every rood of ground add to his collection numbers of species hitherto unknown to science. And, if another collector should go over the same ground, the latter is nearly certain to find many species which his predecessor had missed, partly on account of the different mode of working which any two practical men must needs adopt, and partly because the numbers of the insects are so enormous that it is hardly possible for one individual to exhaust the resources of a single district, however carefully he may ransack it.

But, though some groups are so enormously strong in numbers, others are strangely deficient, sadly disappointing the entomologist, who thinks that he may add to the present stock of insect lore, information concerning numbers of species which he hopes to discover. Such a group is that which forms the subject of the present chapter. In this country, where the hottest summer heats are barely the average of a tropical temperature, where the thermometer often indicates a frost below zero, and where for months together the earth is often covered with snow and the water with a thick coating of ice, the Water Beetles thrive wonderfully. They are marvellously hardy beings, revelling in the full blaze of the summer sun, and yet darting about in the depth of winter, apparently quite as contented with the

water when covered with ice as when warmed by the hot sunbeams of July and August. Yet, though they are thus hardy, they have a manifest preference for warmth; and in any place which is kept exceptionally warm, there the Water Beetles and their larvæ flourish mightily.

Close by my house there is a little pond of this character. No wind but the soft southern breeze blows over it, and throughout the whole of the year every sunbeam that passes the barrier of the clouds falls on the surface of the pond. Consequently it absolutely swarms with aquatic Beetles, which can scarcely swim or dive through its waters without jostling each other; and if an ordinary insect net be simply drawn once through the water, it comes up laden with a large mass of kicking and struggling Water Beetles.

Such being the effect of warm temperature upon the aquatic Beetles at home, it is but natural to infer that the ponds and streams of tropical climates, which are much warmer than those of our own country, would furnish a vast number of new species to the insect-hunter. This, however, is not the case, for the whole of the tropical countries put together scarcely exceed our tiny island in the number, size, and beauty of their Water Beetles. Our common Great Water Beetle (*Dyticus marginalis*) is about as large and just as handsome as the finest of its tropical relatives, and among the whole of foreign Water Beetles there are very few that are in any way distinguished from our own insects.

Mr. Bates, in his "Naturalist on the Amazons," makes some remarks on this subject. While at Pará he was visiting a lake for the express purpose of collecting specimens of Natural History, but was much disappointed in one respect. "I was surprised to find no Coleopterous insects on the aquatic plants. The situation appeared to be as favourable for them as possibly could be. In England, such a richly-mantled pool would have yielded an abundance of Donaciæ, Chrysomelæ, Cassidæ, and other Beetles—here I could not find a single specimen. Neither could I find any Water Beetles; the only exception was a species of Gyrinus, about the same size as *Gyrinus natator*, the little shining Whirligig Beetle of Europe, which was seen in small groups in shady corners, spinning round on the surface of the water precisely as its congener does in England."

After examining carefully a vast number of foreign Water Beetles, I find that they are so exactly like our own familiar insects in size, shape, colour, and habits, that three examples will be quite sufficient to illustrate the whole of the Hydradephaga, numerous though they be.

The species which is shown in the illustration, *Dyticus latissimus*, is certainly the most conspicuous of these Beetles, and yet, as the reader may see, does not differ remarkably from our common *Dyticus marginalis*.

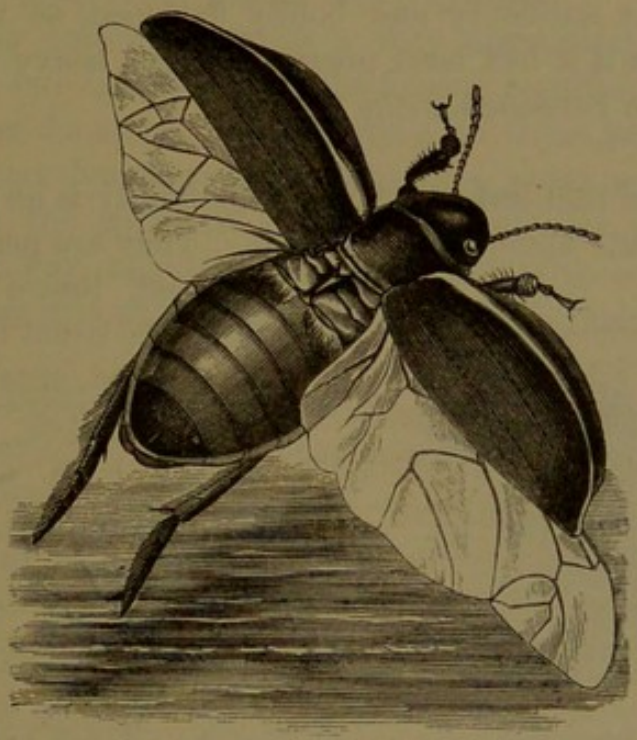


Fig. 26.—Dyticus latissimus.
(Brown, orange lines.)

The colours are the same, though perhaps rather brighter. The ground hue is very dark brown with an infusion of green, and this, besides orange, is the only colour. Round the edges of the thorax runs a band of orange, so as to leave a nearly square dark patch in the middle. Along the outer edge of the elytra there is a similar band, and there is another a little way inside it, running from the base of the elytron to the point, and rapidly becoming narrower as it approaches the tip. This second stripe forms the most conspicuous portion of the colouring, and is well shown in the illustration. There is also near the tip of the elytra a very faint and undefined stripe of orange drawn diagonally across, and looking as if it had been made

with a brush on a wetted surface. This streak varies somewhat in different individuals.

The specific name of *latissimus*, or "very wide," is given to it on account of the peculiar form of the body, which is wider and flatter than our British species. The epithet, however, applies especially to the elytra, which are formed after a rather curious fashion. Although flatter than those of the British Dyticus, they are yet moderately convex as far as the second orange stripe. This forms, as it were, the crest of a ridge, from which the elytron is suddenly and boldly flattened, so that it looks very much as if it had been pressed under a heavy weight when soft, and then hardened while flat.

Our second and last example of this family is an exception to the general rule among these insects. They are nearly all dull-coloured, brown and black being the usual hues, relieved in a few species by the orange stripes which have already been mentioned in connection with *Dyticus latissimus*. As to any definite pattern, there is none whatever, and therefore it is somewhat startling to find any of the family which not only possess bright colours, but are marked with a bold and sharply defined pattern.

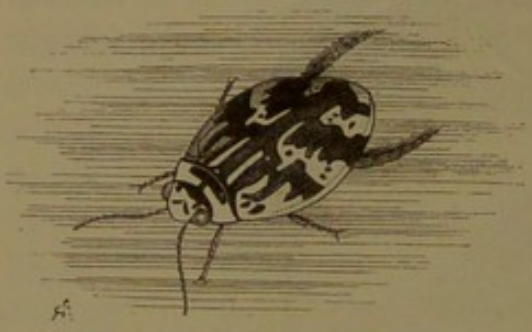


Fig. 27.—Hydaticus festivus. (Yellow and black.)

Such is the insect now before us, a native of the East Indies. It is exceedingly variable both in the details of the pattern and in the colour, and the present example has been selected as showing the kind of pattern which predominates. The colours are so exactly balanced that it is almost impossible to say which is the ground hue and which is the colour of the pattern, but as the dark hue is most conspicuous we will take that as forming the pattern.

The ground hue, then, is always some shade of yellow, in some specimens pale, but in others becoming nearly orange, and the pattern is deep, shining black, so that it must be a very conspicuous insect when darting through the water. In some specimens, however, where the ground colour is very decidedly

orange, the pattern is dark brown. The specific name of *festivus*, or "handsome," is given to it in consequence of its beautiful colouring.

The Gyrinidæ, or Whirligig Beetles, of foreign countries follow the same rule as the Dyticidæ, being scarcely larger than our familiar British species, and resembling them also in colour and form. There is, however, one group of Gyrinidæ which is so utterly unlike the British species that it is well worthy of description. This is the genus *Porrorhynchus*.

This rather crabbed word is a very appropriate one. It is composed of two Greek words, the former signifying "forward," and the other "a snout." It is given to these insects because their heads are lengthened in front to a point which projects forward like the snout of a pig or any similar animal. The word, by the way, might have been written with equal accuracy *Prosorhynchus*, and so the three successive "r's" might have been avoided.

In these Beetles the fore-legs, which are used for seizing their prey, are extremely long, forming a great contrast to the short limbs of our British species. The antennæ are very short, thick, and straight, and the eyes are yellowish white, showing out conspicuously against the dark shining head. The colour of the insect is very dark black-brown, with a distinct olive-green gloss, and very highly polished. If the reader will refer to the illustration, he will see that a stripe of lighter colour than the rest runs round the edge of the elytra. This band is yellow, sometimes pale, but in many specimens deepens into orange. The specific title *marginatus*, or "bordered," refers to this conspicuous stripe.



Fig. 28.—Porrorhynchus marginatus. (Black-brown, with orange edge.)

The general outline of these Beetles is very remarkable. The sharply-pointed snout has already been noticed. At the shoulder the body is widest, and then narrows very slightly towards the end, where it is abruptly squared off. Each elytron, however, is furnished at the tips with two long and sharp spikes, the object of which is not easy to determine. If the insect be viewed

sideways, it is seen to bear some resemblance in outline to a tortoise. The under surface is nearly flat, while the upper rises with a bold ridge in the middle, and thence flattens down to the tips of the elytra and the end of the snout.

The genus *Porrorhynchus* is a very large one, and has representatives in many parts of the world. In the British Museum there are specimens from North and South Africa, Madagascar, North and South America, India, and the Philippine Islands.

In the whole of the Water Beetles, however diverse their size, form, colour, or habitat, one characteristic is common to all,—namely, the polished smoothness of the entire surface, the manner in which all angular projections are avoided, and the absolute closeness with which the elytra are fitted together, so as to be not only water-tight but air-tight also. This structure is absolutely needed, because, although finding their food in the water, and passing the greater part of their time beneath its surface, they are really denizens of air, and not of water.

In fact, they play much the same part among the Insects as do the whales, seals, and dolphins among the Mammalia, living in the water though they do not breathe it, and imitating the fishes in mode of life though differing from them in mode of respiration. During their imperfect or larval life, they were actually inhabitants of the water, and capable of extracting the oxygen from it by means of gills, just as the fish do; but when they attained the perfect state, the gills, or "branchiæ," as they are scientifically termed, were lost, and another system of respiration was developed. Like all other insects, they then begin to breathe the same air as ourselves, but, instead of having the respiratory apparatus confined to the lungs, as is the case with us, they have it extending over the entire body, the tubes through which the air passes running even to the ends of the antennæ, and terminating in a series of apertures called "spiracles" along the sides.

Now, it is evident that if an insect has to fulfil two apparently opposite conditions—*i.e.* living beneath the water and yet breathing atmospheric air—it must possess some peculiar modification of structure whereby the air is ensured admission into the spiracles and the water is kept out of them. These conditions are fulfilled by the structure of the elytra, which are wide

enough to hang well over the spiracles, are sufficiently convex to contain air between themselves and the body, and fit so closely to each other and to the sides, that when they are closed no air can by any possibility escape.

By reason of this structure the insect is enabled to take with it a sufficient quantity of air for respiration, and when it needs a fresh supply it comes to the surface, opens its elytra slightly at the tips, admits the air, and dives again in its perpetual search for food. The process by which the air is passed through the respiratory organs of sub-aquatic insects, has already been described in my "Insects at Home," and need not be repeated here.

CHAPTER VI.

PAUSSIDÆ AND BRACHELYTRA, OR ROVE BEETLES.

ACCORDING to the system which is followed in this work, we take next in order a great tribe of Beetles which have been gathered together under the common name of Rypophaga, *i.e.* "refuse-eaters." As their name implies, these Beetles act the part of scavengers, feeding upon various substances, whether animal or vegetable, which would otherwise be decomposed and become nuisances. The exact order of these insects is somewhat obscure, and, indeed, it is not easy to fix the precise limit which bounds them. This work, however, treats more of the offices and forms of the insects than of the characteristics by which their systematic arrangement is described, and we will therefore content ourselves with selecting some of the most important examples of each group of the Rypophaga.

THE first family is that of the Paussidæ, and a most remarkable family it is. It is a tolerably large one in point of number, but all the species are very small, and require to be examined through a lens before their extraordinary structure can be properly made out. None of them exceed half an inch in length, while the greater number only attain half that measurement. Mr. Westwood has devoted much attention to these curious Beetles, and for further information on the subject I must refer the reader to his monograph on the Paussidæ, published in his "Arcana Entomologica," and illustrated with a number of coloured plates.

They are all dull and heavy in their movements, from which habit they derive their name of Paussidæ, that being formed from a Greek word signifying to "rest" or "repose." They

have been taken in various localities. Some, which were captured at Sierra Leone, were caught within houses at night. They had been evidently concealed in the ceiling, and when the candles were introduced they fell on the table and so were taken. Some species have been found in ants' nests, and others under dry patches of cowdung and beneath the bark of trees.

As to their habits little is known. Like most of the Rypophagous Beetles, they can fly well; and several species, found in the Moluccas, the Sunda Islands, and Senegal, have been observed to possess an explosive power like that of the Bombardier Beetles, which have already been described. Another curious property is thus described by Mr. Westwood:—

"Afzelius also states that on looking at one of his specimens of *Paussus sphærocerus* (remarkable for the globular, glossy, and pale-coloured club of its antennæ) in the evening, and happening to stand between the light and the box in which it was enclosed, so that his shadow fell upon the insect, he observed, to his great astonishment, the globes of the antennæ, like two lanthorns, spreading a dim phosphoric light. He adds, however, that he was prevented from ascertaining the fact by reiterated experiments, as his specimen died. May not the reflected light falling upon the semi-pellucid livid-coloured balls of the antennæ, give them the described appearances? Or may it not be accounted for precisely in the same manner as the light emitted by the shining moss mentioned in Loudon's *Magazine of Natural History*, No. XV. p. 463, by the late Mr. Bowman?"

On looking at a number of the Paussidæ, the observer is at once struck with the enormous comparative size and strange shape of the antennæ, which are as characteristic of these Beetles as is the proboscis of the elephant, the horn of the stag, or the long neck of the giraffe. Some antennæ look as if they were made of a number of flat discs strung together. A similar structure may be seen in some of our Rove Beetles, except that in them the discs are further apart. Some have their antennæ composed apparently of only two joints, one very large joint at the end and a very small joint next the head. The terminal joint takes all kinds of forms. Sometimes it is globular, sometimes pear-shaped, and sometimes nearly flat. Several species have the antennæ looking exactly as if a pair of bill-hooks had been stuck on the head, the points outwards; while others have

them of a similar form, and notched like a saw below; and others, again, have them axe-shaped, and furnished with two or more long teeth. It is impossible to figure or even describe all the varieties of form assumed by the antennæ, and I will therefore select one or two of the most conspicuous insects.

THE first example is *Homopterus Brasiliensis*, one of the few species that have been found in the New World.

This little Beetle measures rather more than a quarter of an inch in length. Its colour is wholly red, without any markings, whence its name of Homopterus, *i.e.* "equal-wing." The whole surface is very delicately punctured, and the thorax has a channel on either side, just within the hinder angles. The legs are very short and flattened, and the thighs are grooved so that the Beetle can close its legs and shut up the tibiæ into the grooves. The insect was taken on the Corcovado Mountain, near Rio Janeiro, by a negro in the employment of Mr. Miers. The whole body is rather flattened, and the head, including the whitish eyes, is a trifle wider than the thorax.

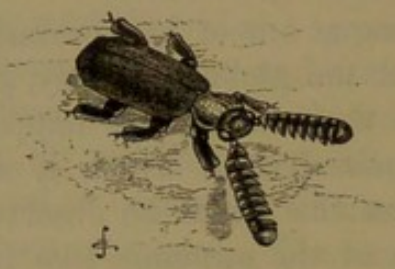


FIG. 29.—Homopterus Brasiliensis. (Red-dun.)

THE genus to which our next example of the Paussidæ belongs has been variously named. In Mr. Westwood's monograph it is called Platyrhopalus. This term is formed from two Greek words, one signifying "wide" or "broad," and the other a "war-club" or "mace." It is given to the insect on account of the structure of the antennæ, the terminal joint or club of which is very wide and rather flattened, like the head of a metal war-mace. This enormous joint is so large that it is actually wider than the thorax, and indeed, if one of the antennæ were detached and laid flat on the thorax, the head would be almost hidden, and the thorax completely so. The name Pherhopalus simply



FIG. 30.—Pherhopalus denticornis. (Red; black marks on elytra.)

signifies "club-bearing," and is scarcely so appropriate a name as Platyrhopalus.

This is rather larger than the preceding insect, sometimes approaching half an inch in length, and mostly exceeding one-third of an inch. The large, flattened club of the antennæ has a notch or tooth at its base, from which is derived the specific name *denticornis*, or "tooth-horned." There is a slight variation of form in this organ, some specimens having the club more pointed than others. It appears as if this remarkable club is formed by the fusing together of several joints; and Mr. Westwood points out that in the present species, as well as in some others, there are slight transverse impressions which seem to denote the lines of junction.

The same entomologist has examined in detail the structure of the organs of the mouth, which are quite as remarkable as the antennæ, and has given many figures of them. As, however, such details would scarcely be interesting to the general reader, however important they may be in a purely scientific point of view, I will only refer the entomological reader to Mr. Westwood's "Arcana Entomologica," vol. ii. Plate 68, pp. 75—78.

The colour of this insect is bright chestnut-red, and the markings on the elytra are black, but have a slight tinge of red in them. It inhabits Bengal.

THE last of the Paussidæ which we can mention is the *Pherhopalus aplustrifer*, which is shown in the accompanying illustration. This singular insect may be at once recognised by the shape of the antennæ, which have the outer edge developed into two long spines, the interval between them being deeply notched. The specific name *aplustrifer* refers to this peculiarity, being taken from the Latin word *aplustre*, which signifies a "pennon" or "streamer," the ends of which are mostly double-pointed, like the two long spines of the antennæ. The transverse impressions, which have already been mentioned, are very apparent in this species, and are sufficiently bold to resemble wrinkles.



FIG. 31.—Pherhopalus aplustrifer. (Yellowish red.)

The colour of the insect is yellowish red, without any markings,

and the upper surface of the body is covered with very minute punctures and fine down. This down extends even to the antennæ, and is longest towards the ends of the spines. The head is rounded in front, short, and the eyes are yellowish white. The body is flattened, and the elytra are of a rather brighter colour than the thorax and head. This is one of the small species, being under the third of an inch in length. It is a native of Bengal.

BRACHELYTRA, OR ROVE BEETLES.

The systematic arrangement of insects is always a troublesome matter. There are, it is true, certain groups which are tolerably well marked by Nature; such, for example, as those which have already been described. But there are many others which are vague and uncertain to the last degree, and even in the best marked groups the boundary line is very undecided, while the order in which they ought to come, and the relationship which they hold to each other, are points which it is very difficult to ascertain. Such is the case with the insects now before us.

It is easy to see that there must be some connection between the Rove Beetles and the Burying Beetles, but the exact succession of the connecting links has always been a matter of doubt. In this work we cannot do better than follow the example of the British Museum, and accept the arrangement of Lacordaire, who traces the succession as follows:—First come the Brachelytra, or Rove Beetles, followed by the Pselaphides, which have very short elytra, almost exactly resembling those of the true Rove Beetles. Then come the Scydmænidæ, and so to the true Burying Beetles; the remarkable blind insect called Leptoderus being evidently the connecting link.

The name Brachelytra, which is given to this group of insects, is a very appropriate one. It is formed from two Greek words, signifying "short wing-cases," and is given to the Beetles because their elytra, or wing-cases, are so short that they seem quite incapable of concealing wings which are large enough to sustain the insect in the air. Yet, underneath these tiny elytra

are packed a pair of broad and expansive wings, which in some of the species can be used almost as readily as those of a fly or a bee.

The popular name of Rove Beetles is also appropriate. They are veritable rovers, ranging over earth, air, and even water. That they can fly well has already been mentioned. They are found in decaying animal matter, in foul or decaying vegetable substances, under the bark of trees, within the nests of ants, wasps, and even in the habitation of the formidable hornet. Some of them haunt the blossoms of flowers; others, more darkling, hide themselves away in rocky crevices; while some few species are actually in the habit of living on the sea-shore below high-water mark, so that they are submerged for several hours twice every day.

As is the case with the groups which we have already described, the Brachelytra are but little represented in tropical countries, and, as a rule, those of temperate climates are superior both in size and colour to the inhabitants of tropical lands. I have, however, selected a few examples of foreign Brachelytra which present points of interest in which they differ from our own insects.

THE first insect is the *Sterculia fulgens*, a really splendid Beetle, outshining almost all the rest of its kinsfolk. The Sterculias are readily known by their very peculiar shape. The head is comparatively large, the antennæ are very long, and the eyes are very small. The thorax is so narrowed in front that it looks like a thin, slender neck, and it rises in the middle into a bold ridge. The mandibles are small, and are toothed at the base.

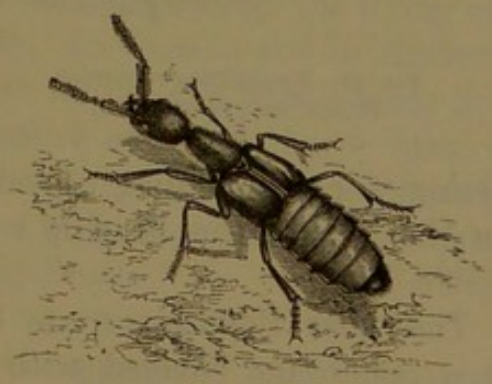


FIG. 32.—Sterculia fulgens.
(Metallic blue, purple, and copper.)

The present species is found in various parts of the West Indies, there being specimens in the British Museum brought from Jalapa, Cayenne, Surinam, &c. There are many species of this genus, some of which have not been named at the moment of writing this account, and they range widely in point of colour

and size, green and purple being the prevailing hues; while in dimensions many of them are but dwarfs compared with the present species.

The head and thorax of *Sterculia fulgens* is deep shining metallic blue, the head having a tendency to pink on the edges, and being covered with deep punctures. The elytra are also blue, but with a purple gloss, and deeply punctured, though not so boldly as the head. The abdomen is shining coppery bronze, and the whole of the under surface is blue, like that of the blue-bottle fly, and the limbs are of the same hue. It belongs to the family Xantholinidæ.

ANOTHER of these Beetles belongs to the typical family Staphylinidæ. This is *Staphylinus versicolor*, a native of Pará.

Though not as splendid as the preceding insect, it is yet far handsomer than any British species of the same genus, and deserves its name of *versicolor*, i.e. changeable colour. It is chiefly remarkable for the enormous size of the mandibles and the peculiar shape of the head, which is large, and has a bold keel running along its centre. The head of the male, indeed, is much larger and wider than the thorax, the great development of the jaws rendering a corresponding development of the head necessary. In the female the head is comparatively small, and the jaws feeble.

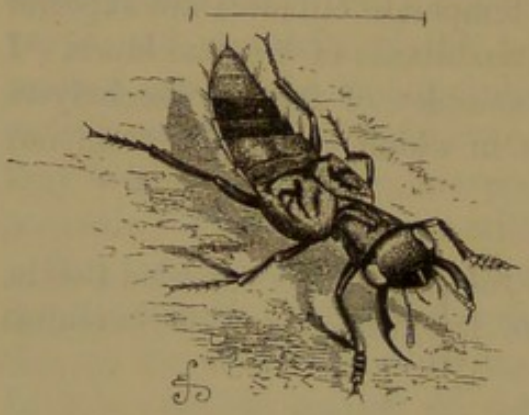


FIG. 33.—Staphylinus versicolor. (Black, with yellow hair.)

The jaws themselves are black, but in their inside there is a membrane covered with yellow hair. The head is dull black, mottled with yellow down, and so are the elytra, the down on them containing a slightly greener hue. The abdomen is black except the tip, which is covered with bright golden down. The insect is found in wet weeds, generally in decaying vegetable manure: indeed, it has a look as if it were meant to dwell in such places, its flattened body and drooping head showing that it is one of the darkling insects, meant to crawl into narrow

recesses and there to pass away the greatest portion of its existence.

Shaped strangely like the earwigs, the Rove Beetles have several similar characteristics. A Rove Beetle is but seldom seen in the open air, any more than is an earwig. Tear decaying bark away from a fallen tree-trunk, pull to pieces a fungus, turn over stones that are lying on the ground, dig up loose soil, shake the blossoms of flowers, and in each of these localities specimens of Rove Beetles may be found. Excepting the smaller species, which use their wings almost as readily as gnats, and really look very like those insects when flying, the Rove Beetles seldom take to the air in the daytime, so that even the closest observer has but few opportunities of seeing the manner in which the ample wings are folded and packed away under the tiny covering. Whether insects abroad follow in this respect the examples of insects at home, I cannot say, but I never saw either of our two largest species on the wing, and only once saw the Red Rove Beetle (*Staphylinus Cæsareus*) in the act of alighting.

Mr. Gosse, in his "Naturalist's Sojourn in Jamaica," has the following remarks on an insect of this family:—"In Helmet-shells buried for this purpose, I found a Brachelytrous Beetle, which enjoys a very wide geographical range. It is *Staphylinus* (*Creophilus*) *villosus*, which is so abundant in Newfoundland as to be quite a pest, crawling about and devouring the dying cod fish; it is there called the Fish-fly. In Canada and in Alabama (U.S.) I have also met with it, but rarely, and now I trace it to Jamaica. The Brachelytra, however, are very scarce here, as are the carrion-eating Beetles generally; their place is probably supplied by the Aura vultures. I only on one other occasion met with this fœtid and disgusting Beetle."

The family of the Oxytelidæ is represented by a very small, but a very singular insect, called *Megalops cephalotes*. In length it barely reaches a quarter of an inch, and, until a magnifying glass is brought to bear upon it, appears hardly worth notice. The lens, however, at once shows the extraordinary shape which is reproduced in the illustration. The creature seems all eyes, these organs being enormous in proportion to the size of the insect, and projecting from the sides of the head very much like two round

door-handles. The generic name *Megalops*, or "large-eyed," is given to the Beetle on account of this enormous development. It is the more striking because, as a rule, the eyes of the Brachelytra are small, and scarcely project at all from the head, as may be seen by looking at our largest and commonest species, the well-known "Devil's Coach-horse." What may be the use of such huge eyes is quite uncertain. At first sight it appears as if, like those of the Dragon-flies and many other predacious insects, they are intended to aid the Beetle in chase of prey. But the jaws are so slight and feeble that such an object seems scarcely possible. The specific name of *cephalotes* signifies "large-headed," and is given to the insect on account of its shape. Without the eyes the head is not remarkable in point of size, but the head and eyes together are so enormous in proportion to the rest of the body that the epithet of "large-headed" is quite appropriate.

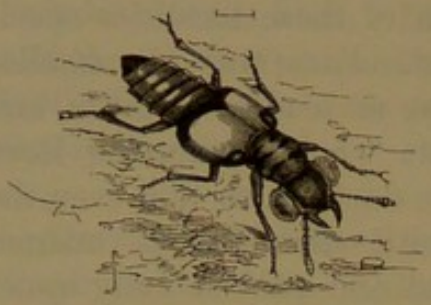


FIG. 34.—Megalops cephalotes. (Black, with yellow elytra, and red legs.)

The general colour of the insect is brownish black, the head and thorax being very rough and wrinkled. The elytra are yellow, and the legs and antennæ are red, the latter being tipped with a knob-like club. This curious insect is a native of Columbia.

CHAPTER VII.

NECROPHAGA, OR CARRION-EATERS.

Most of the insects which we have already seen performing the office of scavengers do that duty merely for their own sakes, devouring, and devouring largely, any decaying animal matter that they may find. We now come to a large group of Beetles which frequent similar substances for a different purpose. It is true that they do feed on the putrefying flesh of any dead animal that they can find, but that is not their chief object in visiting such substances. Their real business is to bury their eggs in it, so that the young may find plenty of food.

The first family of this important group is called Scydmænidæ, from a Greek word signifying "sullen" or "dull-coloured," and the name is given to the insects on account of the dull and dark appearance of most of the species. In our own country, the species, which are about nineteen or twenty in number, are very small, the largest being scarcely the tenth of an inch long. They are all more or less hairy.

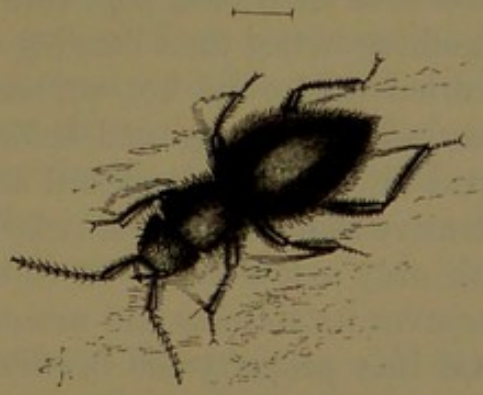


Fig. 35.—Erineus monstrosus. (Black.)

The curious Beetle which forms our example of the foreign Scydmænidæ is a native of Ceylon, and, like most of its British relations, is found in moist and marshy places, where there is plenty of decaying vegetable and animal substances. As may be seen by reference to the line above the illustration, which represents the actual length of the Beetle, though not a large

Beetle, it is quite a giant among its family. The actual colour of its body is reddish, and the surface is rather shining. It is, however, coarsely punctated, and densely covered with dead pitchy-black and very coarse hair, so that at first sight the insect appears to be a black one. These hairs even extend to the head and legs. The body is very convex, the head is much narrowed in front and broad behind, and the thorax has a very similar form, except that it is rounded and not squared behind. Altogether it is an odd-looking creature, and is valuable to English entomologists as being a naturally magnified example of the minute species to which he is accustomed at home.

THE next group of the Carrion-Eaters is popularly known by the name of Burying Beetles, because they always bury beneath the surface of the earth the substance in which they are about to lay their eggs. They themselves do not know the reason why they are impelled to this act, but there is no difficulty in understanding it. The larvæ or grubs, which are developed from their eggs, can only feed on soft substances. Their scientific name is Silphidæ.

There are many of the Carrion-Eaters which are strong-toothed, and can eat almost any animal substance that is less hard than bone; but those of the Burying Beetles cannot do so, and must have their food kept soft for them. For this purpose there is nothing better than burying it in the ground, where it cannot be dried up by the hot sunbeams or liquefied by the wet, and absorbed into the ground before the grubs have lived their full larval life. That wonderful substance, earth, is the best preservative that could be found. The body of an animal, if covered with only a few inches of earth, decays but very slowly, and preserves its softness and moistness to the last.

Of this property the Beetles in question are taught by their instinct to avail themselves, and, inadequate as their bodies may seem to be for such a task, they manage to bury beneath the surface of the ground any small animal that may be lying dead upon it. This they do, not by digging a hole and putting the animal into it, but by scooping away the earth from beneath it, and so letting it gradually down.

Even in our own country, where land is extensively cultivated, and where in consequence comparatively few carcases are allowed

to lie unburied, the Burying Beetles are very numerous, and their work is really valuable.. It is chiefly owing to their labours that a dead bird, mouse, rat, or any similar creature is so seldom seen. In the first place, all wild creatures, on feeling the approach of death, seek out some retired spot wherein to breathe their last; and, in the second place, their bodies are mostly found and interred by the Burying Beetles before they become offensive to the nostrils. The sensitive organs of these insects detect decaying animal matter at wonderful distances, so that if a dead bird be laid on the ground and left undisturbed, it is mostly beneath the surface in four or five days.

When collecting these Beetles for the purpose of dissecting them throughout their various stages of existence, and watching the development of the various organs, I used to take dead birds, mice, rats, or even pieces of butchers' offal, and hide them away in fields, taking care to place them on soft ground, and always covering them with a flat stone so as to prevent them from being seen. The stone was no impediment to the Beetles, who are directed by their olfactory and not their visual organs, and in the course of a single summer I thus obtained as many specimens as were needed.

Abroad, however, and especially in those vast tracts of land which have never been subjected to man, the Burying Beetles are, as might be supposed, larger, more powerful, and more numerous than they are with us, and perform good service in placing beneath the ground those dead animals which would otherwise be allowed to decay upon its surface. Thus they are not only scavengers, but agriculturists, for they enrich the soil by burying beneath its surface those substances which would only be wasted if allowed to decay above ground.

THERE is proverbially no rule without its exception, and such exceptions are found in this group of insects. Though the typical Beetles do bury decaying animal substances, several species do nothing of the kind, among which is the singular insect which is shown in the illustration on the next page.

It is a very odd-looking creature, with exceedingly long and slender legs and antennæ, and a very smooth and convex body. The creature is absolutely without eyes, so that the antennæ probably supply their place. The body is red, and the skin is

so translucent that when the light shines on it, it looks almost exactly like a red currant, the convexity of the body adding to the resemblance. The generic name of *Leptoderus* refers to this peculiarity, being constructed from two Greek words signifying "delicate-skinned." The specific name *sericeus* signifies "silky," and is given to the insect on account of a sort of silken gloss upon the surface of its body.

The habits of the Leptoderus are as remarkable as its form.

As far as is known, the insect is found only in one place in the world; namely, Carinthia, in Austria. It inhabits certain dark caves, and is found only in the deepest and darkest recesses of the caverns. The caves in question are profusely adorned with stalactites and stalagmites, and in their crevices the Leptoderus is to be found.

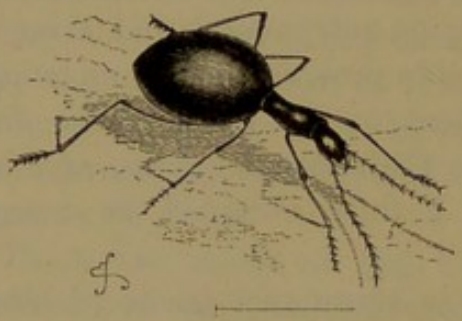


Fig. 36.—Leptoderus sericeus. (Translucent red.)

It walks very slowly and deliberately, standing high on its long and slender legs, looking, according to M. Lacordaire, as if it were walking on stilts. Being blind, it cannot see an enemy, but at the least noise it stops, crouches low upon the substance on which it is walking, tucks in its legs, lays its long antennæ over its back, and lies motionless until it imagines that all danger has passed away.

In such a locality it might appear to dread no enemy, but it has one foe which it may well fear. This is a spider belonging to the genus *Obisium*, which inhabits the same place, and, curiously enough, is also blind. The reader may perhaps be aware that there are many examples in the animal world of the absence of eyes in creatures that live in total darkness. We shall come to some more of them among the insects, and in the higher orders the most familiar examples are the Blind Proteus (*Proteus anguinus*) of the Adelsberg caves, and the Blind Fish (*Amblyopsis spelæus*) of the Kentucky caverns.

Now we come to the insects that really deserve the name of Burying Beetles, the first of which is *Necrophorus grandis* of North America. The genus to which this insect belongs is a

very extensive one, numbering a vast number of species, of which this is the largest. In the British Museum is a very fine series of these Beetles, and the observer is immediately struck with their great similarity in shape, colour, and in fact in almost every point except size, which, as has already been explained, has very little to do with distinction of species in Beetles.

In this insect the general colour is black, relieved by a red patch on the middle of the head and another on the middle of the thorax. There are also two orange patches on each of the elytra, one near the shoulder and the other at the tip. The powerful jaws are black, and so is the thorax on the edges, which are very boldly flattened, much like the brim of a hat, the middle of the thorax being much elevated and rounded. An orange line runs along the edge of the elytra.

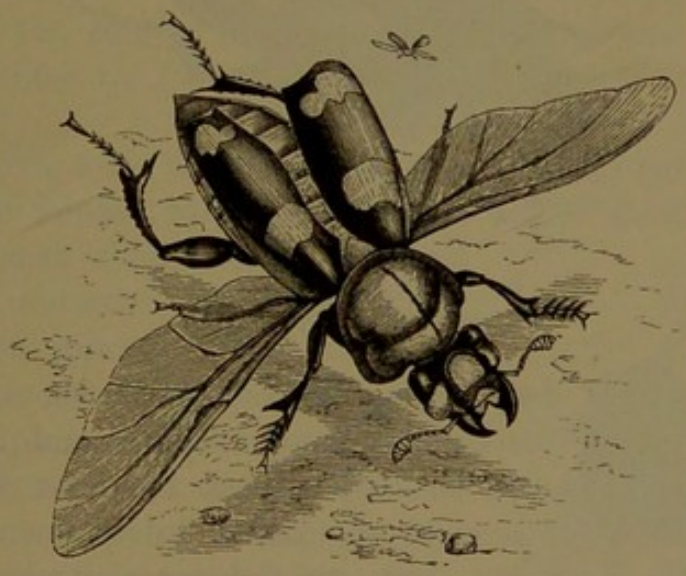


Fig. 37.—Necrophorus grandis.
(Black, with orange-red marks.)

One of the most striking points in this insect is the prevalence of a beautiful golden down. Between the head and the thorax there is a sort of downy collar, but the greatest development in this respect is on the tarsi of the fore-legs. The limb itself is quite black, and is armed with a number of sharp spikes. The chief point of interest, however, lies in the abundant gold-coloured down with which the tarsi are thickly clad, and which have a sort of sheen as if made of spun glass or the glossiest of silks.

THE Beetle which is here represented can be at once referred to its proper genus, if only by the shape of the ridges on its elytra. It is really a remarkable insect, and deserves a fuller notice than our limited space will permit. It has a considerable geographical range, as I have examined specimens that were taken in Borneo and India.

The general colour is dull black, and upon the elytra there are large spots of a paler hue, which evidently ought to show some definite colour. If a brush charged with benzine be drawn over the elytra, there is an instantaneous change, the lighter portions showing themselves as dull red, and the rest of the



FIG. 38.—Necrodes giganteus.
(Black, with dull red marks.)

elytra assuming a deeper black. Benzine, by the way, is an invaluable aid in detecting colour in dark and apparently uniform insects. It can be used without the least danger. It evaporates almost as soon as applied, and does not injure the most delicate of tissues, but, on the contrary, destroys any parasites that may exist in the specimen, and makes it peculiarly distasteful to any that may happen to attack it afterwards.

The antennæ of this Beetle are very remarkable in their structure. I can only describe the organ by likening it to a string of birds' eggs threaded on a grass stem, and tipped with a crown piece. The antenna consists of a number of oval and nearly equal joints, and at the end is one flat, circular joint, that irresistibly suggests the simile which has been mentioned.

The head and thorax are black, and the latter is boldly, not to say coarsely, granulated. The thighs of the hind legs are enormously large and powerful, like those of the grasshopper or

other leaping insect. This development is more conspicuous when viewed from the under side of the insect, the polished shining surface of those joints contrasting boldly with the dull downy surface of the under side of the body. Just below the bases of the hind legs are two large squared patches of dull yellow, and a quantity of yellowish down is scattered sparingly over the under surface. Like the preceding insect, it has the tarsi of the front legs adorned with golden down, but the tarsi are not spiked, and the down is neither so long nor so brightly coloured.

There is another foreign species of this genus which seems as if it were made to show the connection which exists between these insects and the Brachelytra. Its name is *Necrodes osculans,* and it is a native of India. The body of this insect is very long and narrow, closely resembling that of a Rove Beetle, and the similitude is increased by the dull black of its long body and the shining surface of its short elytra. The specific name *osculans,* i.e. "kissing," refers to this resemblance.

EVERYONE who has paid any attention to our own insects knows the Silphas, those rounded flat-bodied Beetles which are found in such abundance in dead and decaying animals, old bones, and similar substances. The banks of tidal rivers are always sure haunts of the Silphas, because the drowned dogs and cats are invariably left ashore some time or other, and the water has scarcely receded from them before they are assailed by swarms of Burying Beetles, Silphas, Histers, Rove Beetles, and their kin, not to mention the flesh-flies, blue, green, and grey, and other insects of similar habits.

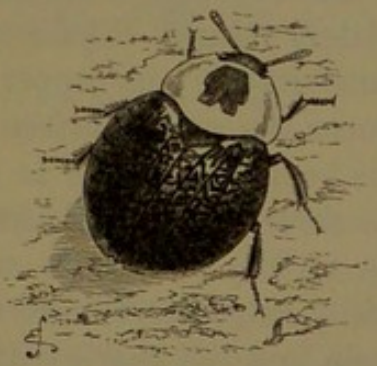


FIG. 39.—Silpha Americana. (Black, yellow thorax.)

All our own species are dull coloured, and, as a rule, so are the foreign Silphas, with one exception, which will presently be mentioned.

The fine insect which has been selected as an example of foreign Silphas is, as its name implies, an inhabitant of America, being found in Georgia. The general colour of the Beetle is dull

black, and there is a large dark spot on the middle of the thorax, which is much raised and of a bright yellow colour. The spot is slightly punctured, and has no definite boundary, the black fading by degrees through various shades of dun and brown into the yellow of the thorax.

Underneath, it is much handsomer than on the upper surface. If the insect be turned over, its actual body is seen to be quite small and narrow, the great width being obtained by the flattening of the elytra and the ends of the thorax. The body itself is dark brownish black, while the thin edges of the thorax are yellow and translucent. The edges of the elytra are also flattened, and at their extreme margin are turned up into a sort of narrow fold, which is covered with bright golden down. The chief beauty of the insect lies however in the flat portion, which is deeply crinkled, and of a vivid metallic green, deeply punctured. The contrast between the dark brown body, the streak of golden down, and the vivid glittering green band is very striking, and quite takes the observer by surprise when he sees it for the first time, as the upper surface gives no indication of the hidden beauty below.

I mentioned that there was an exception to the general colour of the Silphas. This is found in the insect which is appropriately termed *Silpha cælestina*, a Beetle which seems to have transferred to its upper surface the splendid colouring which adorns the under surface of the preceding insect. The head of this beautiful Beetle is shining polished green, and the thorax has three distinct colours, the fore-part being red coppery bronze, the middle dark blue, and the hinder portion dark green. The boldly ridged elytra are ultramarine blue, the body itself is dark green, and the legs are dark shining blue, so that there is scarcely a more beautiful insect in existence.

Many entomologists rank the group of Beetles to which our next example belongs in a separate family, under the name of Histeridæ. They are all flat, square, black, hard-bodied Beetles, with skins so hard and shining that they look and feel much as if they were incased in steel armour. None of our English specimens are large, but many of them are so hard that when they are "set" the entomologist is obliged to pierce them with a needle before he can get the pin through their steely elytra.

They frequent similar localities with the Silphas, and indeed are mostly found in company with them.

The present species has been chosen because it is a very giant among its kin. It is a native of Senegal, and its very appropriate name is *Hister gigas*, or the Giant Hister.

The colour of this insect is black, and, in proper condition, the surface is highly polished. An old specimen, however, is almost invariably dull-black, this effect being produced by innumerable scratches over the whole of its surface, caused by friction against the substance in which it has been burrowing. The jaws are large and curved, and cross each other at the tip when closed. There is a good deal of golden down about their base.

The thorax is smooth, but finely punctured, and the elytra are also polished, and marked with deep punctures, set in regular lines. The fore-legs, as is the case with burrowing insects in general, have very hard and powerful tibiæ, armed with projecting spikes. The middle legs are thickly haired. Altogether this is a very common insect, and scarcely looks like a Hister. It is so big, and so rounded, that it much more resembles one of the Dor Beetles, more especially as the armed fore-legs of both insects are almost identical in shape.

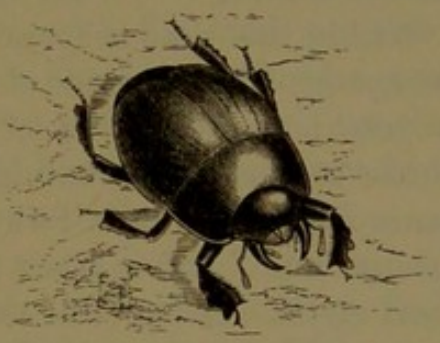


Fig. 40.—Hister gigas. (Steel black.)

The last of the Necrophaga which can be mentioned in this work belongs to the family of the Nitidulidæ. None of them are large Beetles, and, though they belong to the Necrophaga, many of them are found on flowers, under the bark of trees, and in the nests of hymenopterous insects. Of these last, our own species are mostly found in ants' nests, but that which is here represented inhabits the nest of a wild bee, called Trigona, inhabiting tropical America and New Holland.

The nest of this bee is very curious. It is not placed within a hollow tree or underground, as are the nests of most social honey-sucking bees, but is hung to the end of a branch, the tough wax being plastered against the boughs so firmly that the

nest maintains its place in spite of its weight and the tossing which it undergoes in windy weather. The honey is not deposited in continuous combs like those of the domestic bee, but in separate cells or "honey-pots." The wax is first formed into strings about as thick as crow-quills, and made into a sort of loose network, in the interstices of which the oval honey-pots are fixed, with their mouths upwards. The wax is of dark yellow-brown colour, much like that of old leather. There is a good specimen in the British Museum, where the Trigonas (*Trigona carbonaria* of New Holland) have deserted their usual trees and taken possession of an old box, which they have half filled with their curious combs.

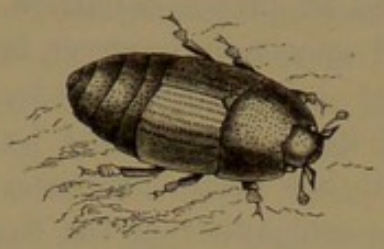


Fig. 41.—Brachypeplus auritus.

Within this nest is found the Brachypeplus, scattered among the sponge-like congeries of honey-pots and network. Its colour is very much like that of the wax, being reddish black, the former colour predominating around the edges of the body. The name Brachypeplus is formed from the Greek word signifying "short tunic," and is given to the insect on account of its very short elytra. The specific name *auritus*, or "eared," refers to the two ear-like projections from the head, which, as in all the Nitidulidæ, is deeply sunk in the thorax.

CHAPTER VIII.

PECTINICORNES, OR COMB-HORNED BEETLES.

According to the system of Lacordaire, the Beetles which next come before us are gathered into a group called Pectinicornes. This word signifies "combed horns," and is given to these Beetles on account of the rather peculiar structure of their antennæ. The tips of these organs are not pointed, nor simply clubbed, but their four last joints are furnished with flattened projections which stand apart from each other like the teeth of a comb. There is no definite number for these projections, or "lamellæ," as they are scientifically termed, and there are specimens in the British Museum which show that even in the same species considerable varieties may exist in this respect.

In that collection is a series of the common Stag Beetle (*Lucanus cervus*), showing a most singular variation in the number and shape of the lamellæ. Some have four lamellæ, some five, and some six. In some the lamellæ are shortened so regularly from the tip of the antennæ towards its base, that it is almost impossible to define where the ordinary joints end and the lamellæ begin. In some they are all very long, while in others they are very short, while one specimen has them so large and thick that they lose altogether the comb-like appearance, and look like a thick, flattened, solid club.

There is another peculiarity in these insects; namely, the extraordinary development of the jaws in the males. Our own Stag Beetle affords an excellent instance of this development, but some of the insects which will presently be mentioned show an enlargement of jaw before which the mandible of the Stag Beetle appears almost insignificant. So different an aspect is given to the males by their large jaws that they scarcely seem to belong to the same species as the females, and, indeed, in the

earlier days of Entomology the two sexes were set down as different species.

Then, in these Beetles a still further peculiarity is found; namely, the great variation in size of the males, and the difference in shape as well as in size of their jaws. It often happens that two males are found in the same locality, and that one of them will be at least four times as large as the other, while the jaws of the smaller specimen shall be comparatively small and feeble, and without the bold teeth and knobs which arm that of its larger relative. It is conjectured that this difference in size and development is caused by insufficient food during the larval state, as is known to be the case with some other insects, but the reason for the constant appearance of this arrested development in the Pectinicornes is not very easy to see.

Owing to their great size and remarkable development of jaw, this group of insects has always attracted attention. Dr. Thos. Mouffet, in his "Theatre of Insects," written about the year 1620, has a quaint description of Beetles belonging to the Lucanidæ:—

"Beetles are some greater, some less. The great ones, some have horns, others are without horns. Those that have horns, some are like Hart's horns, others like Goat's horns. Others have Bull's horns; others have ram's horns; some have horns on their nose: we shall speak of them all in order.

"The Platycerus, or Hart's-horn Beetle, is called Lucanus by Nigidius, as Pliny witnesseth. Some call it the Bull, others the Flying Stag. . . . Amongst all the horned Beetles, for the shape of its body, length, and magnitude, it may challenge the first place, and is the most noted. It is blackish, of a dark red, especially about the outward cover and the breast. It hath two whole horns without joynts, and with haunches like a stag, as long as our little finger in such as are grown up, but they are less and shorter in the young ones: or (as Pliny saith) it hath long and moveable horns nicked with cloven pincers, and when it will it can bite or nip with them.

"For it will close them wilfully, and useth its hornes for that end for which crabs and lobsters do their clawes. The eyes are hard, putting forth, and whitish: it hath fore-yards on both sides of them, one pair that are branched between the hornes and the eyes, the joynt thereof making almost a right angle, and two

more breaking forth from the midst of the forehead straight and plain, ending as it were in a little smooth knot: it goes upon six feet; the fore feet are longer and greater than the rest.

"Lonicerus makes this to be the male; but I (if there be any distinction between the male and the female) shall not doubt to call it the female; both because the other kindes of Beetles are less (for, as Aristotle observes, the males in insects are far less than the females). The male is altogether like it, but 'tis less both for body and hornes, which, though they be not branched on both sides, yet, pressed together, they do more sharply prick one's finger than the female doth."

The reader will doubtlessly have noticed the curious mixture of correct description and wrong theory in this passage. In the first place, Dr. Mouffet evidently thinks that the small undeveloped males are only young Beetles which will in time grow to a larger size; and in the next place he mistakes the male for the female—stating, however, with perfect accuracy, that the bite of the latter is sharper than that of her larger jawed mate.

We will now pass to an example of these Beetles, the first of which is the *Chiasognathus Grantii* of Chili.

I really hardly know where to begin in treating of this magnificent insect, which is equally surprising from its strange shape, its great size, and its marvellous colouring. We have nothing like it in England, and it is so peculiar in its form that, together with a few other Beetles, it forms the family of Chiasognathidæ.

This is a rather long word, but it is easily explained. The first portion of it signifies anything that is marked with a cross, like the Greek character χ or *chi*, or anything that crosses another in like form. The latter half of the word signifies "a jaw," and we shall frequently find it as forming portions of certain insects' names. This name is given to the insect on account of the extraordinarily shaped jaws of the fully developed male, which, when closed, really do bear some resemblance to the χ. The word, by the way, is not quite correctly spelled, the proper rendering being *Chiastognathus*.

The form of the extraordinary jaws is shown in the illustration, but it is impossible by the plain black and white of printer's ink to give any idea of their colour, which is shining dark bronze green, over which plays a crimson radiance according

to the slightest change of light. This crimson hue is strongest near the base and upon any projections. Each of the jaws has a bold curve downwards, and at the base is an enormous tooth, boldly curving forwards, and so large as almost to look like a second jaw. These teeth are never exactly of the same length, that of the right jaw being generally, though not always, larger than that of the left, and when the jaws are closed these teeth meet each other. The whole inside edge of the jaws is covered with small teeth, so that what with these little teeth and the large teeth at the base, the hold of the jaws is extremely powerful.

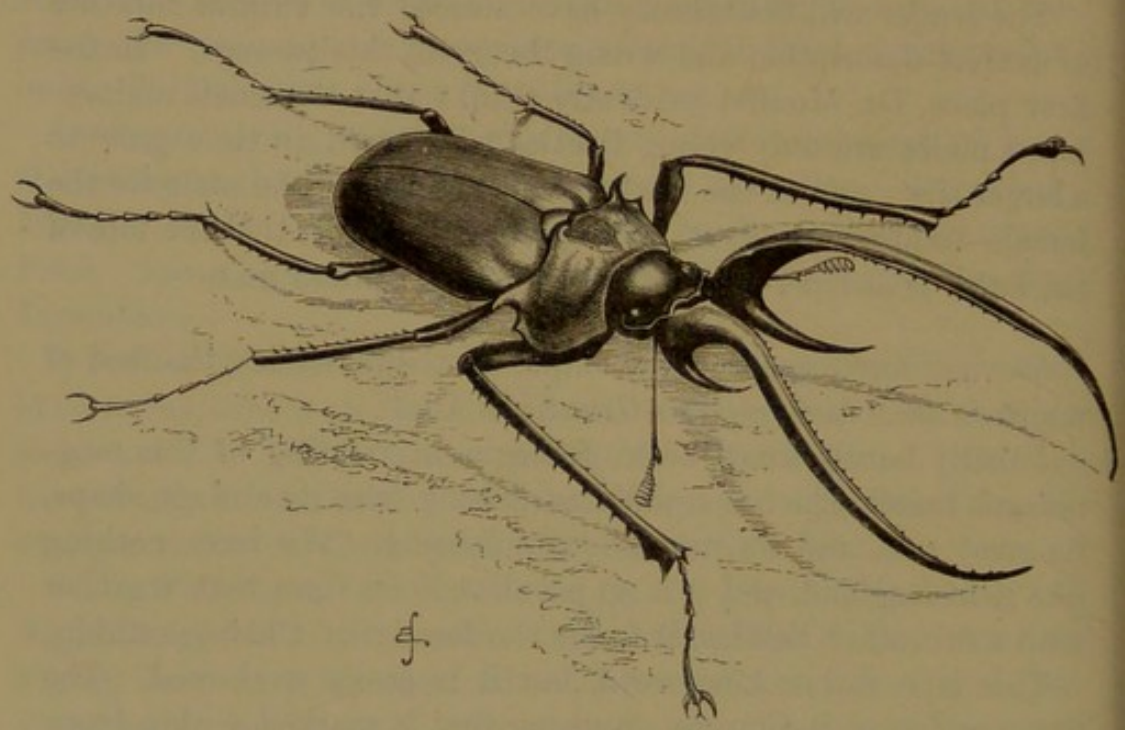


Fig. 42.—Chiasognathus Grantii.
(Green, bronze, crimson, and gold.)

Measured along the curve, the length of jaw in a fine specimen is no less than two inches and a half, while from base to tip in a straight line it is not quite two inches.

The head and throat are dark, metallic, shining green, glossed like the jaws with carmine, this gloss being very conspicuous at the hinder angles of the thorax, which project in two long and sharp spikes. There is a curious tuft of hair on the antennæ, just where the lamellæ begin.

The legs are coloured much like the jaws, and are armed with a multitude of thorny points.

The elytra are also green, but have a silky sort of a look. The carmine gloss also belongs to them, and is most apparent along the edges and in the suture. The under surface is also green, but is covered with a quantity of golden yellow down.

The female is shaped much like the male, except in the jaws, which are very short, stout, and rounded. Still, though they do not look so formidable as the enormous jaws of her mate, I think that if I had to be bitten by either insect, I would prefer the bite of the male to that of the female. She is green in colour, but the surface is not polished as in the male, and the green is altogether of a duller quality.

This splendid insect is tolerably common in forests, where it is found upon the trunks of trees, climbing them actively, and even gracefully. The great development of jaw in the males appears to be for the purpose of affording weapons whereby they may fight for their mates. During their combat they raise themselves upon their hind legs and bite fiercely, the stronger of them breaking the jaw of his weaker opponent. Nine specimens of this splendid genus are known to entomologists, but none of them are nearly so large and so plentiful as the present insect.

THE Beetle which forms our second example of this singular group is not so striking in point of form, but is much more

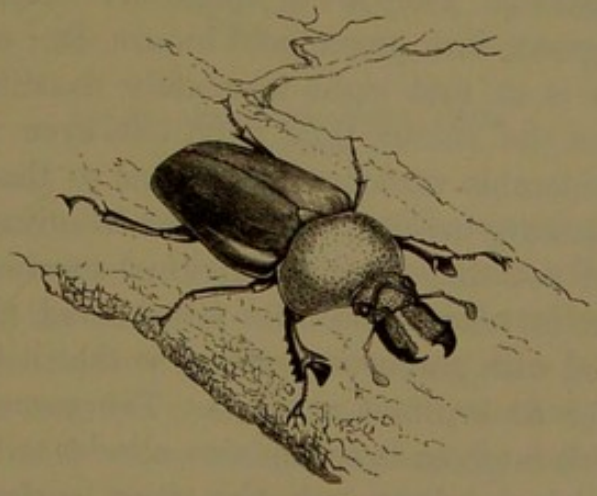


FIG. 43.—Lamprima aurata.
(Gold-green, glossed with copper.)

splendid in point of colour than the preceding insect. It is called *Lamprima aurata*, and is a native of Southern Australia.

In these insects the most striking point is the colour of the jaws. Generally among Beetles, however brilliantly the head, body, and elytra may be coloured, the jaws are either brown or black, whereas in these Beetles the jaws are not only as vividly coloured as the rest of the body, but in some cases are even of brighter and more conspicuous hues. Such is the case with the present insect, the jaws of which are shining coppery red, very deeply punctured, and their basal parts are black covered with rich golden down.

The thorax is gold-green, covered with large punctures, and having a large deep pit near each of the hinder angles. If examined with a moderately powerful lens, it is seen that the spaces between the large punctures are filled with innumerable tiny punctures, much too minute to be detected by the unaided eye. It is to these multitudinous punctures that the peculiar gloss of the surface is due.

The elytra are also gold-green, with a wash of coppery red, and at the shoulder of each elytron there is a large shallow pit. Like the thorax, the elytra are boldly punctured, but the lens shows that the whole of the surface is covered with the minutest imaginable furrows, drawn as if with a needle's point, from one puncture to another, in a sort of irregular pattern. The colour of the under surface is nearly the same as that of the upper.

There are many species of this genus, which seems to be restricted to Australia. They are of all colours—azure blue, coppery red, emerald green, dark green, gold bronze, &c.; so that a collection of them is at first sight absolutely dazzling to the eyes. Not only does the colour thus vary, but even in each species there is considerable variation in colours, so that in describing them it is necessary to select the average colouring of the species generally, and not that of any individual specimen. The name of *Lamprima* is taken from the Greek, and signifies anyone that is adorned with gorgeous clothing, so that it is a very appropriate title for so brilliant a genus. The name of *auratus*, or "gilded," which is given to the species, alludes to the conspicuous golden gloss which plays over the green surface as the light changes.

NEXT come the Lucanides, or true Stag Beetles, of which our common British Stag Beetle is so familiar an example. One of

the finest foreign Stag Beetles is *Cladognathus giraffa*, which is represented in the accompanying illustration. There is nothing remarkable in the colouring of this insect, which is very much like that of our own Stag Beetle, *i.e.* brown-black, with a tinge of chestnut-red on the elytra. But it is a very striking insect on account of its size and the shape of its formidable jaws. Their usual form in the fully developed male is shown in the illustration. They bear some resemblance to the gnarled boughs of a leafless oak-tree, and hence have secured for the genus the name of *Cladognathus*, i.e. "branch-jaw."

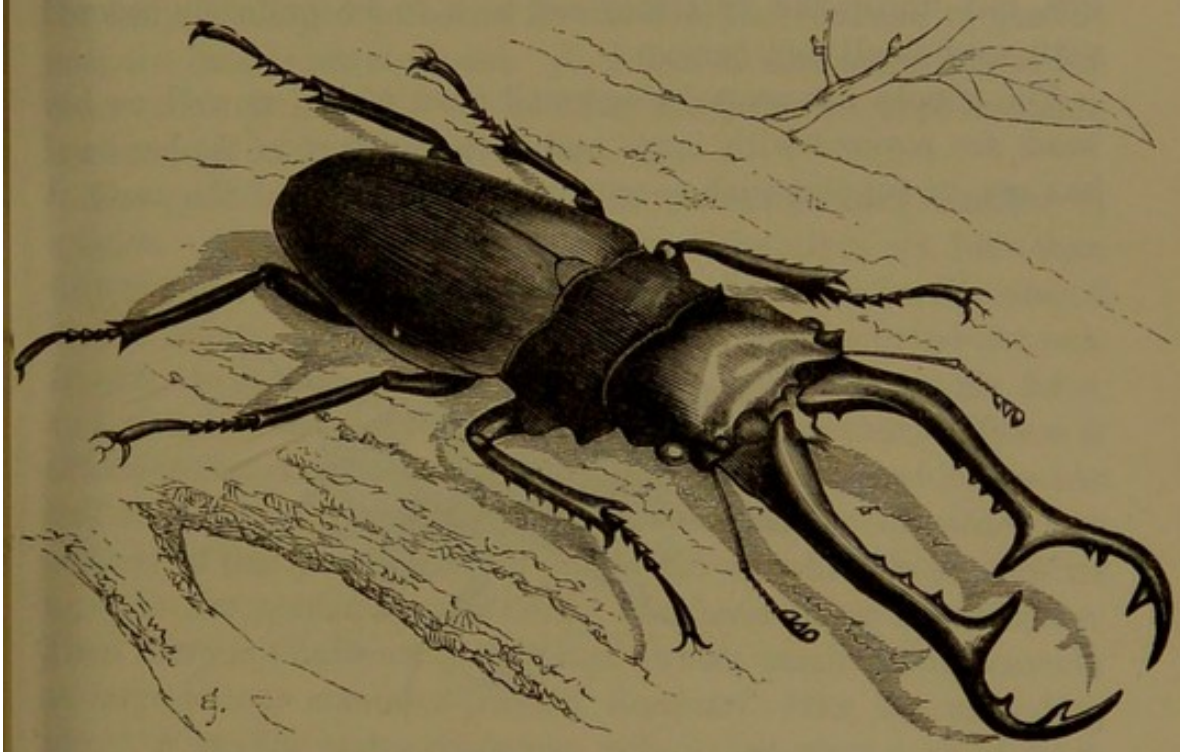


FIG. 44.—Cladognathus giraffa. Male.
(Brown-black.)

The reader will probably notice that the upper portion of each jaw is formed into three strong teeth, the third of which is much the largest. In no instance do these teeth exactly coincide with each other in both jaws, but in every case one is placed a little higher or lower than its companion tooth, so that when the jaws are closed the teeth cross each other, but do not meet. Beside these three principal teeth there is a row of saw-like projections on the inner side of the jaws, and at the base is a large rounded projection which seems to serve the purpose of adding to the firmness of the articulation. In colour the jaws are shining black.

If examined with a lens, the soft and almost velvety surface of the head and thorax is seen to be caused by an innumerable multitude of very minute projections or pustules, all perfectly circular, and placed just so closely together as to allow a small ring of level surface to be seen round each of them. When viewed with light that falls directly upon the surface, these rings appear to be not circles, but hexagons, just like the lenses of the insect's compound eye, or, to use a familiar example, like those glass tumblers whose outer surface is covered with small hemispherical knobs. The elytra are smooth to the naked eye, but under the lens they are seen to be profusely covered with very small punctures.

The female has remarkably small jaws, which, as well as her head, are covered with large and deep punctures. As her head has not to support such enormous jaws as those of the male, it

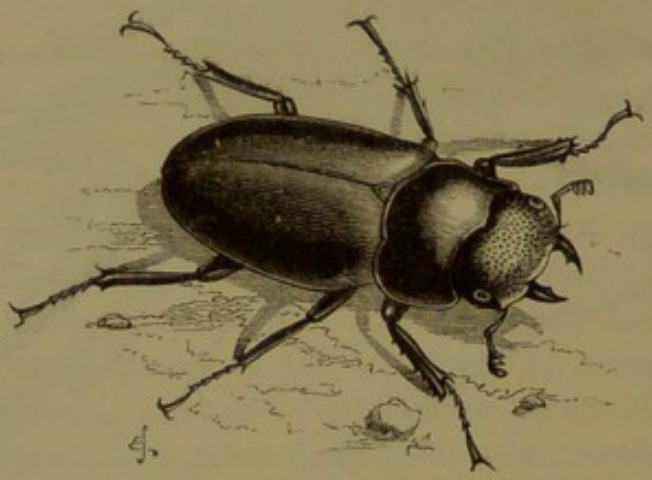


Fig. 45.—Cladognathus giraffa. Female.

is small in proportion to the jaws, and in consequence gives her an aspect very unlike that of her formidable mate.

There is no species of Lucanidæ in which the variation in the jaws of the fully and partially developed males is so marked as in this insect. In the collection of the British Museum there is a fine series of specimens, showing an amount of variation which would make anyone but an experienced entomologist believe that insects so different in size and shape must belong to different species. Indeed, as we shall presently see, many such varieties have actually been described and figured as different species. In one of these small males the jaws are not half as large as in the fully developed insect, and the boldly branch-

shaped projections from which the genus derives its name are represented by three little teeth, none of them larger than the saw-like scoopings on the jaw of the large insect. But the most conspicuous example of all is one in which the entire jaw is not much more than one-third of an inch in length, is scarcely thicker than a common worsted needle, and has only one very slight and blunt tooth near the middle.

It is rather remarkable that, however small may be the insect, however feeble its jaws, and however destitute these organs may be of the branch-like teeth which render the jaws of the fully-developed insect so formidable, the rounded projection near the base is never absent. It differs in size according to the dimensions of the jaw; but whether the latter be large or small, the rounded knob is always there.

The genus Cladognathus contains an astonishing number of species. Major Parry enumerates and describes no less than fifty-four, and it is almost certain that others will be discovered as the habits and haunts of the Beetles become better known. In order to show how different are these species in colour, form, and size, I will briefly mention one or two of them. There is *Cladognathus cinnamonea*, the largest specimen of which is not half the size of the ordinary *giraffa*, the elytra of which are entirely of that peculiar warm yellow-brown which is so familiar to us in the cinnamon, the thorax and head being black-brown. Then there is *Cladognathus vittatus*, quite a small insect, scarcely as large as our common Ground Beetles. Like the preceding insect, it has the elytra cinnamon yellow, but upon each of them is drawn a bold black band, or *vitta*, in consequence of which the name *vittata* has been given to the species.

Another is *Cladognathus occipitalis*, which in point of colour is perhaps the most conspicuous of the species. It is almost entirely yellow, but on the thorax there are two bold oval spots of shining black, each spot rising to a ridge; there is a similar spot, but diamond-shaped, on the middle of the thorax, and a black line is drawn along the sutures and round the edges of the elytra.

Although not the most striking in colour, yet, in my opinion, the handsomest in that respect is *Cladognathus inquinatus*. In this species the head and thorax are shining black, and the elytra are warm, ruddy chestnut. But each of the elytra is

edged with deep black, and a broad belt of the same colour runs along the sutures almost as far as the tip. Indeed, if other species were not known, we should have some difficulty in deciding whether black or yellow is the ground-tint of the elytra, so evenly are the two colours balanced.

THERE is one group of Oriental Stag Beetles which have the elytra more or less dun, upon which is a certain amount of black. They are gathered together under the generic title of *Odontolabris*, a term composed of two Greek words signifying "toothed forceps," and given to the Beetles on account of the powerful teeth with which their pincer-like jaws are armed. In all the species belonging to this genus, the eyes are completely divided by a horny projection technically named the "canthus," the club of the antennæ is formed of three joints, and in the males the tibiæ of the front pair of feet are armed with spines on their outside edges, the corresponding joints in the other limbs being smooth.

It is an extremely puzzling genus, owing to the extraordinary variation of form, size, and colour which prevails throughout it, and which is so erratic that our best entomologists have been perplexed about the systematic arrangement of the insects. The insect which has been selected as an example is so variable that it has been described and figured under different names, the so-called species having been afterwards proved to be nothing more than varieties. The name of this species is *Odontolabris Cuvera*, and the specimen from which the drawing was taken is a good average example of the colouring.

The head is large and squared, and in the front the upper edge is flattened and turned up something like the brim of a hat. The thorax is also squared, and at the hinder angles there are two sharp points, separated by a deep rounded notch. Both head and thorax are black. If the insect be turned over, each side of the head is seen to be covered with a multitude of pits about as large as those in a lady's thimble, a few of them, however, being much larger than the others.

The elytra are warm yellow, and down their middle runs a large black patch, shaped as shown in the illustration. Generally, a narrow line of warm orange runs along the edge of the elytra and skirts the black patch, but the variation in the depth and

extent of colour is so great, that scarcely any two specimens are exactly alike. Some, for example, have the elytra nearly all black, some are almost entirely brown, and some have scarcely any black about them. It has already been mentioned that in the Lucanidæ the males are liable to extreme variation in size, and it is rather remarkable that in this genus the females are principally varied in colour. This Beetle inhabits China and Northern India, and it is thought that certain well-marked varieties occur within certain geographical limits, as is the case with the Chinese Tiger Beetle.

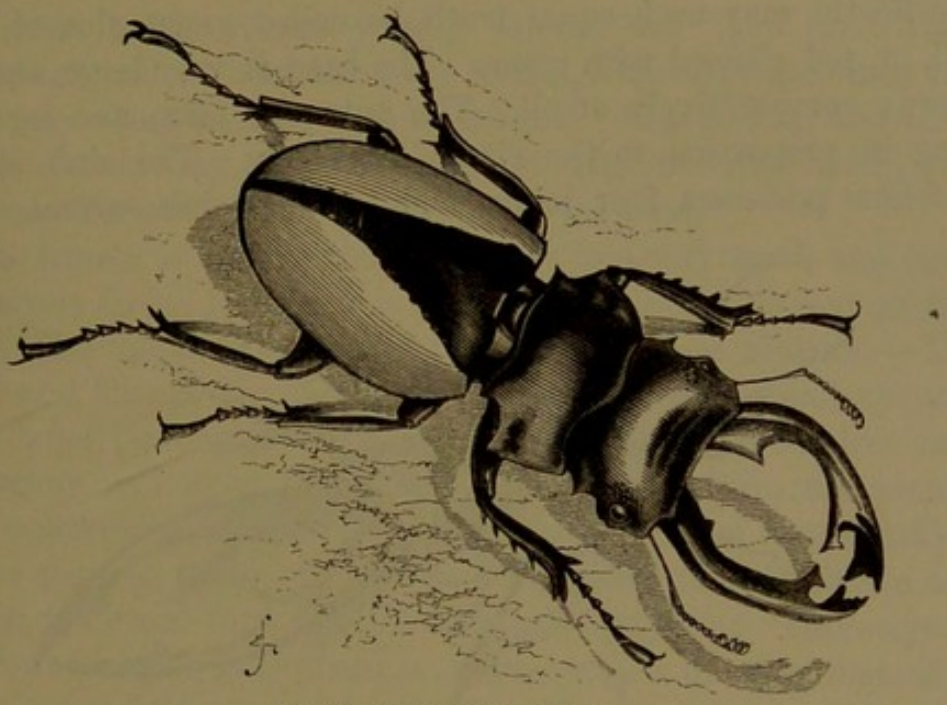


Fig. 46.—Odontolabris Cuvera.
(Black and warm yellow.)

There are several acknowledged species of the genus, the largest of which is *Odontolabris dux*, a really gigantic insect. Not only is it four inches in length, but it is broad, sturdy, and thick-set, and must be enormously powerful. When I first saw the splendid specimen in the British Museum, it recalled to my mind a saying of a well-known German physiologist, who occupied the table next to mine in the dissecting-room. "Ach," he muttered, *sotto voce*, "I wish a peetle so pig as a lopster." The incident had almost been forgotten, when the sight of this splendid insect recalled it to my mind, and I could not help thinking that if Dr. C—— could only have possessed the insect before it was pinned and dried, his desire for "a peetle so pig as

a lopster" would have been gratified. The colour of this large insect is wholly black, except a slight edging of golden down on the front and hinder edge of the thorax, and a coating of similar down on the inside of the tibiæ of the four hinder legs.

THE Beetle which is shown in the accompanying illustration is, though not so large as the preceding insect, a very conspicuous species, on account of its splendid metallic colouring. The colour is not easily described, for the green and red vary so much according to the light in which the insect is viewed, that the Beetle may with equal truth be called green glossed with red, or red glossed with green. The head is very large, and the thorax comparatively small. The antennæ, jaws, and legs are long in proportion to the size of the body. The club of the antennæ possesses four joints, and each jaw has several small

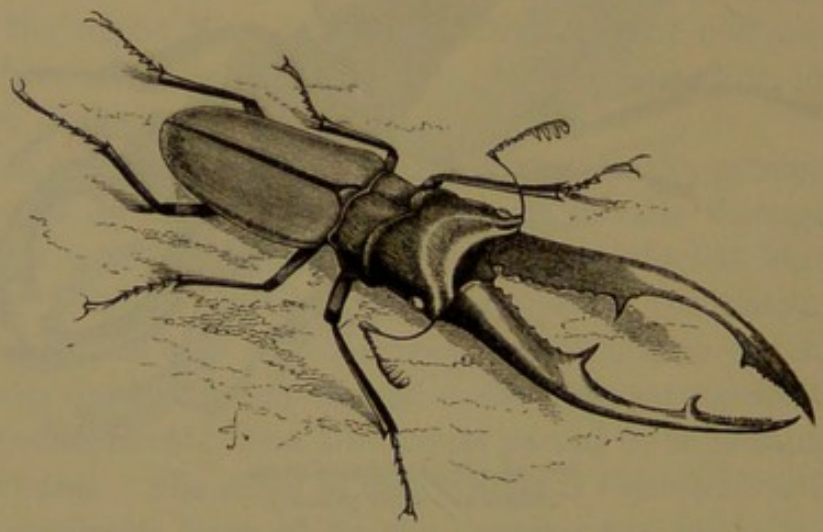


FIG. 47.—Cyclommatus tarandus.
(Red, glossed with gold-green.)

teeth near the tip, and two much larger teeth placed so as to divide the jaw into three tolerably equal portions.

The colour of the jaws is very beautiful, and arranged in a rather singular manner. As far as I can make out by careful examination, the original hue is metallic red, with a tinge of brown. But their whole surface is covered with a multitude of punctures, and the interior of each puncture is deep, shining green. Thus the reader will see that if lighted from above, when the interior of the punctures becomes illuminated, the green predominates over the red; whereas, if the light falls on the insect from the side, the interior of the punctures is thrown into

shade, and so the brown-red of the surface predominates over the green.

The thorax is covered with multitudinous bold punctures, between which run a vast number of tiny wrinkles, too minute to be detected by the unaided eye. The general hue of the elytra is yellowish green, with a peculiarly satiny gloss, while a narrow strip of dark metallic green runs on either side of the suture. Below, the insect is wholly green, but not nearly so bright as above.

There is, however, considerable variation in the colour, some specimens being almost wholly brown, and their mandibles very small and without the large teeth. One such specimen has jaws only about half an inch in length. Near the tip there is a row of sixteen very tiny teeth, then a large rounded notch, and then another row of minute teeth near the base.

The female is smaller than the male, has very small and comparatively feeble jaws, and is not so brilliantly coloured as her mate. The colouring of an average specimen is as follows :—The head and thorax are brown with a cast of green, and covered with large punctures. The elytra are reddish-brown, like new mahogany, and upon them deep circular punctures are plentifully scattered, between which are a vast number of tiny wrinkles.

The generic name of *Cyclommatus*, given to this Beetle and its kin, is formed from two Greek words signifying "circle-eyed," or "round-eyed." It is given to them because the eyes, instead of being completely severed by the "canthus" as in the preceding insects, so that they look rather like four than two eyes, are barely indented by it, and are therefore almost circular. The insect comes from Borneo.

According to the system of Lacordaire, the Beetles of which our common Dorcus is a familiar example are separated into a distinct group called Dorcides, which is chiefly distinguished by the club of the antennæ. This consists of four joints, and the projections are flatter than in the Stag Beetles. The whole body, too, is rather flattened.

Our insect is a small one, measuring only an inch in length, but the gigantic Beetle which represents the foreign Dorcidæ is four times that length, and correspondingly large in every respect. Its name is *Eurytrachelus Titan*.

Both names are appropriate. The generic name, *Eurytrachelus*, is formed from two Greek words signifying "broad-necked," and, as may be seen by reference to the illustration, one of the principal characteristics of the insect is its thick, sturdy form, the neck being as wide as any part of the body, and hardly any break of outline denoting the distinction between head, thorax, and abdomen. This peculiar form is the sure sign of a boring insect, and enables the creature to pass easily through passages in which any difference in diameter would cause it to stick fast. The name Titan is taken from that of the well-known mythological giant, the

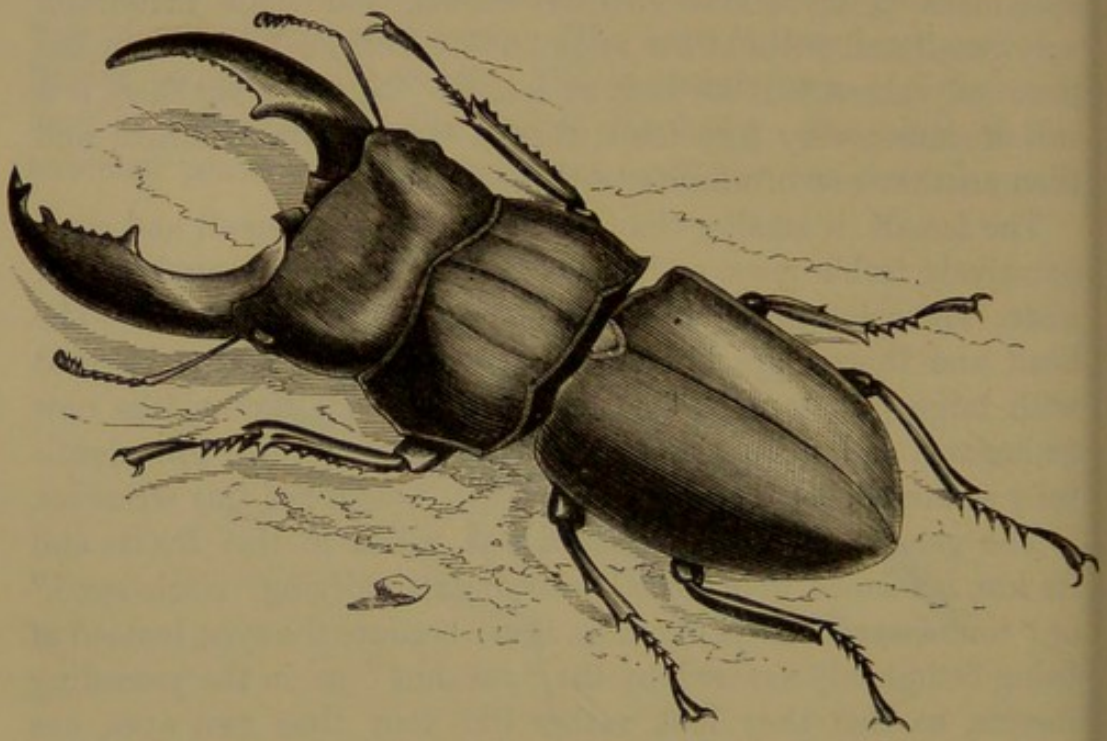


Fig. 48.—Eurytrachelus Titan.
(Black.)

eldest brother and rival of Saturn. This is indeed a very Titan among the Dorcidæ, though there is one of them, *Dorcus Antæus*, which does not fall very far short of the dimensions of the Titan. It is scarcely necessary to remind the classical reader that Antæus was another of the race of giants, and that his name is in consequence conferred upon a gigantic insect.

When the enormous and powerful jaws of the insect are closed, their armed points cross each other considerably, the right jaw passing above the left. The formidable teeth which spring from the centre of the jaw not only cross, but one passes

just under the other, so that when the mandibles are tightly closed, scarcely any space is left between them.

The colour of this Beetle is simply black, but it has a sort of satiny appearance which can only be explained by the magnifying glass. To the unaided eye both the elytra and the rest of the body have the satiny gloss, but with a difference of texture, like that of two qualities of satin. How this difference is obtained the lens reveals. The head and thorax are covered with myriads of raised semi-globular prominences, very similar in shape to those which stud the petal of a flower—say a geranium, and give it the peculiar softness which no pencil can even approach.

If we double a petal of a geranium, and place the folded portion under the microscope so as to look along it, we shall find that the edge, instead of being quite straight, is studded with a row of little semi-conical projections, thus ~~~~~~~~; each being in fact a partially developed hair. Now, if we take a portion of the present insect, or of any insect which possesses a similar texture of surface, and manage to get a side view of it, we shall find that it is studded with almost similar projections, they being partially developed spines or spikes. If, however, we shift our lens to the elytra, we shall see the difference of texture at once explained; for the surface, instead of being studded with little projections or "pustules," is covered with little hollows or punctures, each much the same size as the pustules.

There are many foreign Dorcidæ, one of which, *Dorcus Antæus*, has already been mentioned. The only other species that presents any distinctive points is *Dorcus Dehaanii*. The elytra of the female are covered with parallel rows of shining black ridges, and between each of the ridges is a double row of very large and deep punctures. These punctures are as dull as the ridges are bright, so that there is a very bold contrast between them.

THERE is a small British Beetle, familiar to entomologists who know where to look for it, but scarcely ever seen by others. It is called *Sinodendron cylindricum*, and it inhabits decaying wood, being generally found within fallen ash-trees. Its cylindrical body points it out at once as a boring Beetle, as does that of the Dorcus, and, indeed, these two insects are often found inhabiting the same tree.

Just as we have seen foreign examples of the Dorcus, so the *Ceruchus striatus* of Vancouver's Island appears a good example of the foreign Sinodendron. It is larger than our British species, and has the surface even more conspicuously marked. It gains its generic name of *Ceruchus*, or "horn-bearing," from the two horn-like projections of the head, which are but slightly indicated in the Sinodendron. When viewed sideways, the head is seen to be bent downwards, flattened and shovel-shaped, so as to assist the Beetle in forcing its way through the material in which it lives. Both in the larval and perfect states, these insects, as well as the Dorcus, inhabit rotten wood, so that the infrequency of their appearance in the open air is easily accounted for.

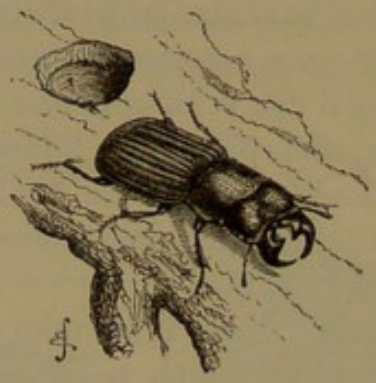


Fig. 49.—Ceruchus striatus. (Shining black.)

The surface of the insect is broken up in a very complicated fashion. The head is covered with large punctures, and so is the thorax, which has also two depressions or pits on each side, so large that they almost look as if they were injuries. The elytra are covered with bold ridges, and both they and the furrows between them are profusely covered with large punctures. According to the system of Lacordaire, this insect forms one of a group called Æsalides.

The next group, called Passalides, is looked upon as a link between the Pectinicorn and Lamellicorn Beetles, on account of the form of the larva, which, as we shall see, very much resembles that of a Lamellicorn Beetle. Our example of the group is the fine insect called *Neleus* or *Passalus interruptus*. It inhabits Demerara.

It is really a striking insect, though the colouring is very simple. The body is shining black, but there is a wonderful quantity of silky golden down, which contrasts boldly with the otherwise uniform black. The upper part of the head is thickly covered with this down, which in this place has a dash of orange in it, very much like the beautiful tuft on the head of our golden-crested wren. Tufts of similar hair project from the shoulders, and densely clothe the hind tarsi, which look like

yellow brushes. Along the middle of the thorax is a deep channel, and a few very shallow pits are scattered over it. The elytra turn rather abruptly over the sides, and that portion is covered with deep punctures. Each elytron is marked with ten bold striæ, and one of them, which runs from the shoulder, extends only half-way along the elytron, whence comes the specific name *interruptus*.

The habits of this insect are very similar to those of the Dorcus and Ceruchus, both larva and beetle living in rotten wood. The insects of this genus possess large wings, but the larger species appear seldom to use them. The smaller species, however, are more active, and are accustomed to fly about after dark.

The larvæ of Dorcus, Sinodendron, and their kin are, as is often the case with wood-boring larvæ, rather deeply ringed.

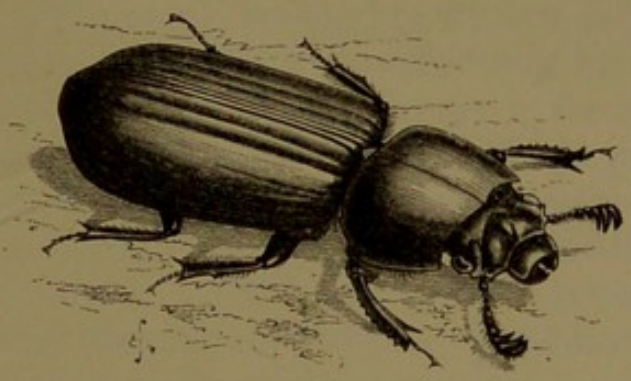


Fig. 50.—Neleus interruptus.
(Black, with golden down.)

In the Passalides, however, the larvæ are comparatively smooth, the rings are but slightly marked, and the general form very closely resembles that of the Lamellicorn larva.

M. Lacordaire, after giving a description of the insect, makes a statement which seems absolutely astounding. "All those insects which I have observed in America are remarkable for the rapidity with which they die when pierced with a pin. The most vigorous individual scarcely survived three or four hours after that operation" (vol. iii. p. 45).

From which account we gather that M. Lacordaire was accustomed to pin Beetles while still alive, and to allow them to remain for hours after "that operation" without killing them. There is a cool unconsciousness of cruelty about the whole statement which seems scarcely credible in a professed naturalist,

especially to English entomologists, who are always searching for the best means of killing as quickly and with as little pain as possible, the insects which they need for the purposes of science. The idea of pinning living Beetles, and then being surprised to find that they died in three or four hours, would never have occurred to the least humane of our entomologists. I can but wonder how long those Beetles might have lived which did not die within four hours of the "operation."

CHAPTER IX.

LAMELLICORN, OR LEAF-HORNED BEETLES, SOMETIMES CALLED PETALOCERA.

In most respects the Pectinicorn and Lamellicorn Beetles resemble each other, but in many points there are decided distinctions. In the first place, the form of the larvæ differs in both these groups, as has been mentioned in the last chapter; and, in the second place, the antennæ are differently constructed. In the Pectinicorns the club of the antennæ is formed by comb-like projections, whereas in the Lamellicorns the projections are flat, like the leaves of a fan. The name Lamellicorn is formed from two Latin words, the former signifying "a little flat plate," and the other "a horn." The second name, Petalocera, is Greek, and has precisely the same meaning, *i.e.* "petal-horned."

The larvæ of the Lamellicorn Beetles are odd-looking creatures, familiar to the practical cultivator who uses spade and fork himself, but never seen except when turned out of the earth. They are large, fat, smooth, paly-white grubs, always doubled up, and with the hinder end very much larger than the rest of the body. In uncultivated lands it is probable, if not certain, that all these subterranean larvæ perform a necessary and useful office. When, however, land is cultivated, and consequently the arrangements of Nature are altered, the office of the Lamellicorn insects is altered too, some being doubly useful, while others are definitely injurious. Taking our own country as the locality, and two Lamellicorn Beetles as examples, namely the Cockchafer and the Dor, we find that the former has now become an utter nuisance, destroying the roots of grass in its larval state, and the leaves of trees in its perfect condition; while the Dor Beetles confer singular benefits on the proprietors of pasture lands by seizing on the droppings of the cattle and

carrying them deeply into the earth so as to fertilize the soil and improve the crop of grass.

How effectively they perform this duty is scarcely to be known except by those who watch the habits of the insects. Last year I was much struck with the amount of work done by these Beetles. Not far from my house there is a field which is used as pasture land for cattle, and which is in consequence thickly sprinkled with their droppings. There had been a succession of moderately warm and very wet days, so that the ground was quite soaked with the rain. Having to search for certain wood-boring insects, I had to pass through the field, and was greatly struck with the appearance which it presented. Its whole surface was literally riddled with the holes of the Dor Beetles, the burrows being placed so closely together that every square foot of ground contained forty or fifty of them. Here, then, we have a vast army of agricultural labourers, working without wages, and doing in a short time the work which would have occupied a strong body of men for a considerable time, and would have forced them besides to take up the turf and re-lay it.

In warmer lands than ours similar Beetles also exist, but there are others who perform the same work in a different manner, as we shall presently see. The number and variety ot these insects are enormous. Some of them are quite small, soberly coloured, and smooth surfaced. Others are of huge dimensions, magnificently coloured, and furnished with the strongest imaginable projections from the head and thorax. Indeed, so important are they from their great numbers, the offices which they fulfil, the gorgeous colouring and gigantic dimensions of many of the species, that the late F. W. Hope told me that he very much doubted whether the Lamellicorn Beetles ought not to be placed at the head of the insects instead of the Geodephaga.

We will begin the history of the Lamellicorns with the Scarabeides, one of which is the most celebrated Beetle of their race—perhaps the most celebrated insect in the world. This is the Sacred Scarabæus (*Ateuchus sacer*), which was held in such veneration by the ancient Egyptians, and which is represented in such profusion on their tombs and even on their personal

ornaments. The reason for its sacred character, or at least one of the reasons, we shall presently see.

The mode of depositing its eggs is very remarkable. Our British Beetles merely dig through the patch of cowdung, carry some of it to the bottom of the hole, and therein lay a single egg. In those places, however, where the Sacred Scarabæus lives, such a proceeding is impossible, on account of the difference of the soil. The earth of our pasture lands is comparatively

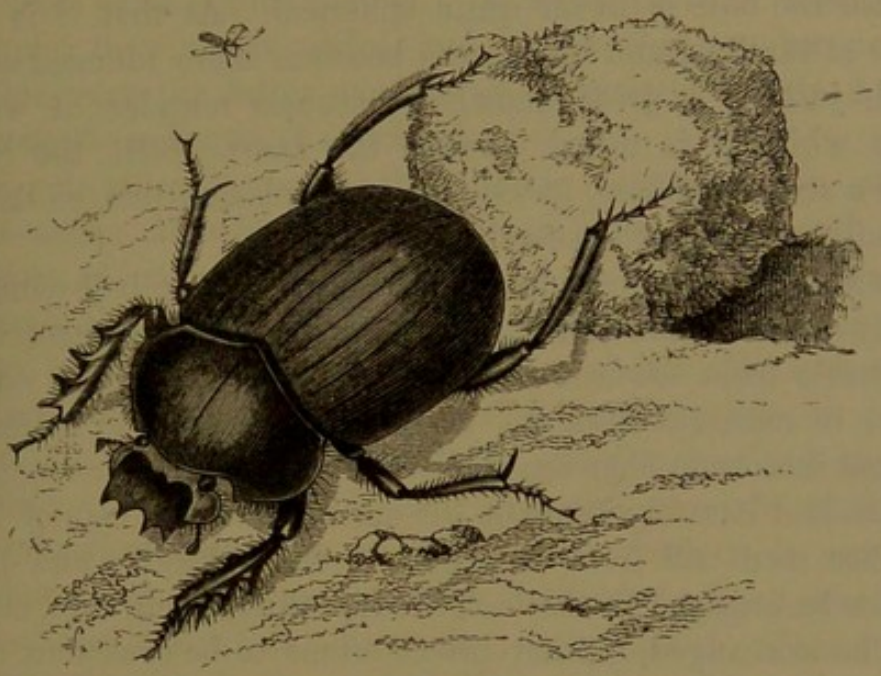


Fig. 51.—Ateuchus sacer.
(Black.)

soft and can be easily excavated, but, as a rule, in the country inhabited by the Sacred Scarabæus, the earth is hard and stony, so that the insect is obliged to search for a spot sufficiently soft to allow her to excavate. It is necessary therefore that the Beetle should be able to transport from place to place a sufficient amount of the material on which the young larva is to feed, and this she does in a very curious manner.

Taught by instinct, she gathers together exactly so much of the material as will give to the future young an ample supply of food, places in the midst an egg, works it into a rudely globular form, and then proceeds on her travels in search of a spot in which she can burrow. The mode of progression also is very peculiar. Turning her back upon the ball, and grasping it with

the hind legs, she works backwards, pushing the ball along much as a horse backs a cart.

Her perseverance in this work is really wonderful. The task is a very hard one, for the insect cannot see where she is going, and is just as likely as not to push the ball over a steep and stony hillock which she might have skirted without the least difficulty. When quite tired out, she rests for a while and then sets off again on her travels, seldom failing in the end to bring her labours to a successful conclusion. Her work is the harder because the ball is never quite spherical. At first it is made rather at random, and by degrees becomes more rounded as it is rolled, just as a great snowball becomes rounder as well as larger while it is rolled through the snow. Still, the ball is never a smooth sphere, but is of an irregular outline, so that the difficulty of rolling it is much increased.

There are two points in connection with this ball which are worthy of notice, the first being the instinctive attachment which the Beetle feels towards it, and the second the utter want of reason in such attachment. It is hardly possible to induce one of these insects to abandon the ball which contains her egg until she has laid it safely beneath the earth. But she cannot recognise her own ball from that of any other Beetle; and if two females be engaged in the task of depositing their eggs, and the balls be exchanged, neither insect seems to be conscious of the deception, but labours as cheerfully for the ball which contains her neighbour's egg as she did for that which held her own.

For the perfectly instinctive and wholly irrational attachment to the egg-ball, we have a parallel in our own country. There are certain little black-brown, swift-footed spiders, which spin no webs, but keep to the ground, on which they catch their prey by fair chase. The female Wolf Spiders, as these creatures are called, may be seen in the summer-time carrying about with them a little silken bag containing their eggs. Nothing can induce them to relinquish their treasure, and the spider would sooner lose her life than her egg-sac. Yet if, as is the case with the Scarabæus, the egg-sacs of two Wolf Spiders be exchanged, both creatures are perfectly satisfied; and even if a little particle of cotton-wool be rubbed up and placed in the way of a bereaved female, she will take it up and carry it about just as if it were her own egg-sac.

It is both on account of the shape of the egg-ball made by the Scarabæus, and of the intense love which the insect bears for it, that the ancients employed it as an emblem of the Divine Creator's power. The earthen ball, with the egg in its centre, was taken as an emblem of fertility, and the attachment of the beetle to the ball was recognised as an emblem of the Creator's love towards His creatures.

There are many species or varieties of this Beetle scattered over all the warmer portions of the world, and in most places they have some popular name. In many parts of America, for example, they are plentiful, and go by the popular name of Tumble-bugs, the latter word being in general use in America to designate a Beetle of any kind.

In general appearance this Beetle has rather a striking appearance. It is black in colour, and furnished beneath with a quantity of long, dense, brownish hairs, to which the earth clings so firmly that I have hardly seen a specimen which had not its downy coat clogged with soil. The head is very flat and shovel-like, and is cut into deep notches so that it seems to be surrounded with spikes. The tibiæ of the fore-legs are furnished on their outer edges with four long and powerful teeth; and when the Beetle assumes an attitude of which it is very fond, *i.e.* placing its fore-legs on either side of its head, the whole front of the insect looks like a flat, spiky wheel. This attitude was very familiar to the ancient Egyptians, and in almost every case where the Sacred Scarabæus is sculptured, whether it be the gigantic granite image in the British Museum, or the tiny gold, glass, or porcelain figures that are strung on necklaces and bracelets, the insect is represented in the attitude of rest, crouching low upon the earth, with its fore-legs on either side of its head. The body is very rotund, and the elytra are nearly smooth, being only marked by some lines of faint punctures.

The generic name *Ateuchus* signifies "unarmed," and is given to the insects because neither the head nor thorax possesses those horn-like projections which are so conspicuous in many of the larger Lamellicorns. The name *Scarabæus* has already been explained on page 62.

THE number of these Beetles is so very great that we must be contented with two types; namely, the Sacred Scarabæus which

has just been described, and the curious insect which is shown in the illustration below. The genus to which it belongs is distinguished by the hard and rounded body, the very long curved legs, and the general crab-like look of the insects. They are spread over a considerable portion of the globe, and, indeed, few of the warmer parts seem to be without them. Many species, such as our present example, inhabit Southern Africa; one, *Sisyphus Schæfferi*, is known to be European; and others are Asiatic. The most remarkable of the latter is the smallest of the genus, called *Sisyphus minutus*, the body of which is scarcely as large as a swan-shot.

All the legs of the *Sisyphus* are enormously lengthened, and are bent in a most singular fashion, the peculiar curvature not being properly visible unless the insect be viewed from behind and nearly at the level of the eye. This peculiar form of the leg is probably useful to the insect in rolling its egg-balls.

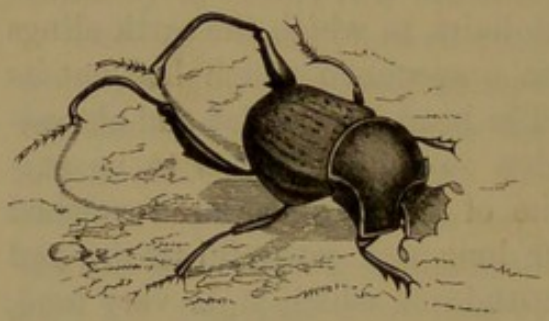


Fig. 52.—Sisyphus muricatus. (Brown-black, with jet-black tufts.)

The colour of this Beetle is dull brownish black, but upon the elytra are a number of tufts of jet-black downy hairs, that stand boldly from the surface on which they are planted, and are very conspicuous. The thorax is covered with a coating of very short and very dense down of a dark-brown hue, something like the fur of the mole. All these insects fly well, and, like our common Rose Beetles, keep the elytra almost closed, instead of spreading them as most Beetles do, when they fly.

The generic name of *Sisyphus* is given to these Beetles because their task of rolling their egg-balls has an evident analogy with that of the mythological Sisyphus. The specific name *muricatus* signifies "spiky," or "prickly," and is given to the insect on account of the bold spike-like hair-tufts with which its elytra are studded. The word comes from the Latin *murex*, a whelk, which, in the plural (*murices*), was employed to signify caltrops, or "crow's feet," *i.e.* iron spikes thrown on the ground to arrest the progress of cavalry.

I cannot quit these insects without quoting a few extracts

from De Mouffet's quaint and elaborate treatise upon the Sacred Scarabæus, in which he compares men and beetles together, and shows, very much to his own satisfaction, that the man ought to take example by the insect:—

"The Latines call it *Pilularius*, because it turns up round pills, which it fashions by turning them backwards with its hinder feet. All your *Pilularii* have no females, but have their generation from the sun; they make great balls with their hinder feet, and drive them the contrary way; like the sun, it observes a circuit of twenty-eight daies. . . . The Beetle called *Pilularius* makes a round ball of the roundness of the heavens, which it turns from east to west so long till it hath brought it to the figure of the world; afterwards it laies it up under the earth where it breeds, and when that hath so laid it up, it lets it remain there for a lunary moneth; when that is ended, it casts every ball out of its nest by itself, which being dissolved in water, the beetle-worm comes forth without wings, but in a few daies it grows up to be a flying Beetle. For this reason the Ægyptians consecrated this to Apollo, and adored it for no small god, by the curious interpretation of *Apion*, whereby he collected that the likeness of the sun was given to this creature, and so he excused the idolatrous customs of his country.

"They wonderfully hate roses as the plague of their family, but dung, especially of cowes, and dunghils, they love so much that, smelling the smell of them a very long way off, they will fly suddenly to it. But they go but slowly, yet they labour continually and exceedingly, and delight most of all to produce their young ones; for ofttimes the little round bals that they make, by the injury of the winds in places, fall away, and fall from a high place to the bottome; but this Beetle, desiring a propagation, watcheth with perpetual care, and raising this Sisyphian ball to its hold with continual striving, and that tumbling back again, at length she produceth it. And truly, unless it were endowed with a kinde of Divine soul (as all things are full of God's wonderfulnesse), it would faint and be spent in this great contest, and would never take this pains any more.

"Beetles serve divers uses, for they both profit our mindes and they cure some infirmities of our bodies. For when this living creature (and scarce a living creature, for it wants some senses), being of the basest kinde of insects, and nothing but a

crust, doth excel man in divers faculties, this should teach us modesty, temperance, labour, magnanimity, justice, and prudence. For, though its house be but a dunghil, yet it lives contented therewith, and is busied and delighted in it; nor doth it more willingly eat or drink among roses than in goat's dung, which smels in its senses as sweet as marjoram. For it lives by the laws of Nature, and will not exceed her orders.

"The greatest care it takes is to make the greatest bals it can, as if they were sweet bals which with wonderful labour it rolleth from her; and if it chance to roll its burden against some heap, that the bals slip away and fall down again, you would imagine that you saw Sisyphus rolling a stone to the top of a mountain, and falling back upon him, yet is it not weary, nor will it rest till it hath rolled it to its nest, so earnest is it about its work. But we poor men do nothing that is worth our labour, or as we have power to do, and we give off in the very steep entrance of vertue, and we spend all our pains and daies in idleness, following ill-counsel, till we get a habit of mischief to our own destruction.

"Who doth not see the courage of the Beetle? if he shall observe him fighting with an eagle (as 'tis related of the Beetles in India). And indeed, though the eagle, its proud and cruel enemy, do no less make havoc of and harm this creature of so mean a rank, than our lordly storks do to the peasant frogs; yet, as soon as it gets an opportunity, it returneth like for like, and sufficiently punisheth that spoiler. For it flyeth up nimbly into her nest with its fellow-souldiers the Scara Beetles, and in the absence of the old she-eagle bringeth out of the nest the eagle's eggs one after another till there be none left: which falling and being broken, the young ones, while they are yet unshapen, being dasht miserably against the stone, are deprived of life before they have any sense of it."

After narrating many similar anecdotes showing how the Beetle ought to "profit our mindes," the author proceeds to instruct us how to use the Beetle so as to "cure some infirmities of our bodies." Among many remedies the following deserves to be quoted:—"For the awaking of such as are troubled with the dead sleep and with the lethargy (when cantharides and cauteries have done no good), two or three Dung Beetles alive, put up together under half a walnut-shell, to be made fast about

the nape of the neck, being first well shaved, and upon the muscles of the fore-part of the arms (on every muscle one), and under the sole of each foot one, because this doth wonderfully rouze up such as are in a lethargy."

I should think that it did rouse them up! Let any of my readers take into his hand one of our common Dor Beetles, and let it try to scratch its way out. He will not be very long before he lets it go. The pain which must be inflicted by the large and powerful Scarabæus, especially when fastened on the tenderest parts of the body, which have already been blistered and cauterized, must be something almost too horrible to contemplate.

The next family is that of the Deltochilidæ, of which we have no example in England. These insects have the head almost

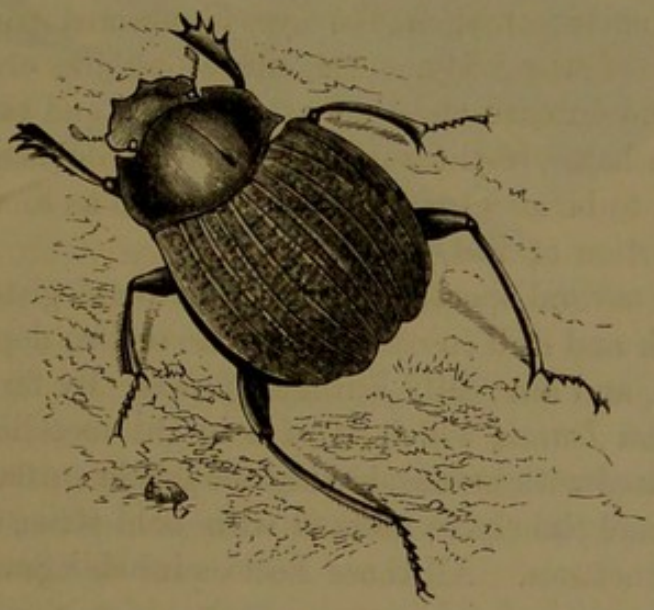


Fig. 53.—Deltochilum Macleayi.
(Black, with chocolate elytra.)

hexagonal, and the eyes are so completely divided by a broad band of horny substance, that a small portion of them appears on the upper part and a large portion on the lower. Indeed, the insect, like the well-known Whirligig Beetles, appears to have four eyes instead of two. The name *Deltochilum* is Greek, and signifies a delta-like or triangular jaw.

The tibia of the fore-legs are broad, flat, strong, and armed on their outside edges with three long and sharp spikes, evidently

used for digging purposes. It is rather remarkable that none of the specimens in the British Museum have any tarsi, and in all these Beetles the tarsus of the fore-legs is very small, and can be tucked away so as to be protected while the limb is employed in excavating the earth. Probably, in such operations the tarsus was broken off, but, as it is of such minute dimensions, the Beetles get on very well without it.

The head and thorax are black, the former being roughly granulated, and the latter very finely punctured, so as to give it a sort of satiny surface. The elytra are rather curious. They are very flat, and are roughly wrinkled. At first sight the wrinkles appear to be without any order, and to be scattered over the wing-cases as vaguely as wheat-blades appear to be on a field, from almost every point of view. But just as the wheat arranges itself in regular lines when viewed from the ends of the furrows, so do these wrinkles show themselves to be arranged in longitudinal rows when the eye is directed parallel to the central line of the body. The colour of the elytra is dark chocolate, and on each end they are flattened and turned up like the rim of a hat. If the insect be viewed edgewise, the elytra will be seen to be also turned downwards, so as to cover a considerable portion of the side.

There are several species known to entomologists. They are mostly black and dull in colour, but one or two depart from the general rule, and are really brilliant insects. By far the prettiest is *Deltochilum Icarus*, which is of a bright metallic copper-red, slightly glossed with bronze, having the whole surface very finely punctured, and the elytra marked with bold striæ, each covered with fine punctures. All these Beetles inhabit South America.

Next come the Coprides, of which we have some six or seven species in England, the best-known of which is *Copris lunaris*, the male of which has a long and upright horn on the head. The Coprides dig deep burrows, mostly oblique, and not perpendicular like those of our Dor Beetles. They have the power of making a creaking sort of noise, which is said to be produced by the friction of the tips of the elytra against the abdomen. This sound is conspicuous in the British species which has just been mentioned.

The finest foreign example of these Beetles is undoubtedly

the large and massive *Copris Hamadryas*. This insect is a wonderfully fine one, measuring two inches and a half in length, of a shining black colour, and being densely clothed in parts with long silken, gold-coloured down. It is found both in Africa and Asia. The general form of the male may be seen by reference to the illustration. The head, with its forked, upright horn, is deeply punctured and granulated, and so is the thorax, except in the middle, where it is highly polished, like black, burnished steel. The elytra are punctured in parallel

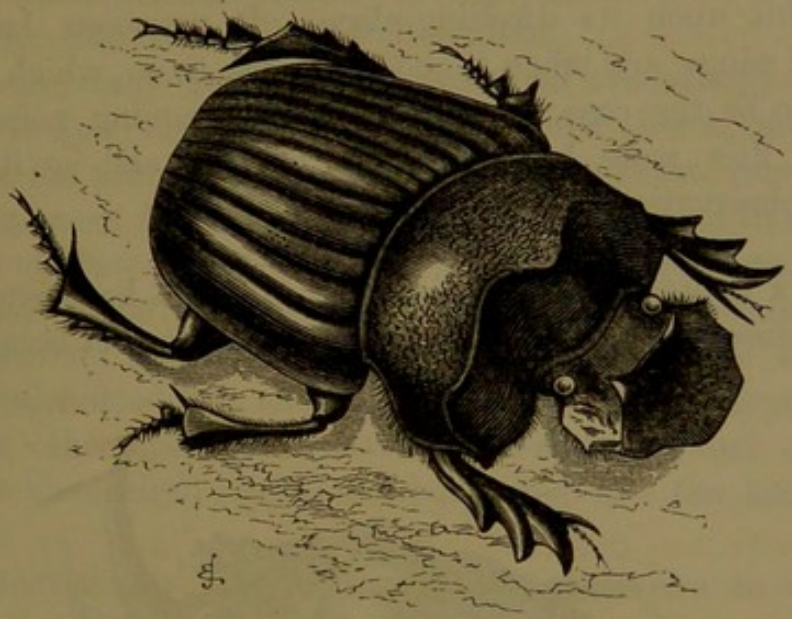


Fig. 54.—Copris Hamadryas.
(Black, with golden yellow down.)

rows, and are so highly polished that it is not easy to hold even a dead and dried specimen, as it persists in slipping through the fingers as though it were oiled.

The female is without the formidable-looking horn of the male, and even in the latter sex there is very great variation in the size and shape of the horn. Some of the species have a curious resemblance to the Dynastidæ, a family which will presently be described. The most curious of them is *Copris Laius*, which has two large pointed horns on the thorax, and a very long horn on the head, curved back so as nearly to touch those of the thorax.

If the insect be turned over so as to bring the under surface into view, the quantity of the golden down with which it is clothed is seen to be very great, especially in two large oval

patches under the head. The fore-legs are exceedingly powerful, and the tibia is flat, hollowed, armed with two very bold teeth on the outside, and its under surface is covered with a vast number of slightly curved ridges, running parallel to each other, and diagonally across the limb. The tarsus is so small that hardly anyone except an entomologist would notice it.

This species lives underground, at the bottom of very deep burrows, so that it would easily escape observation, even in localities where it was plentiful. As, however, like our own species, it lives under patches of cowdung, an entomologist can mostly hit upon its dwelling-place. It possesses large and powerful wings, and when it chooses to use them, which appears seldom to be the case, it makes a loud humming noise. Probably it flies more by night than by day, and so its flight escapes observation.

I HAVE chosen the splendid insect which is here figured, not only because it is the finest example of its genus, but because it is

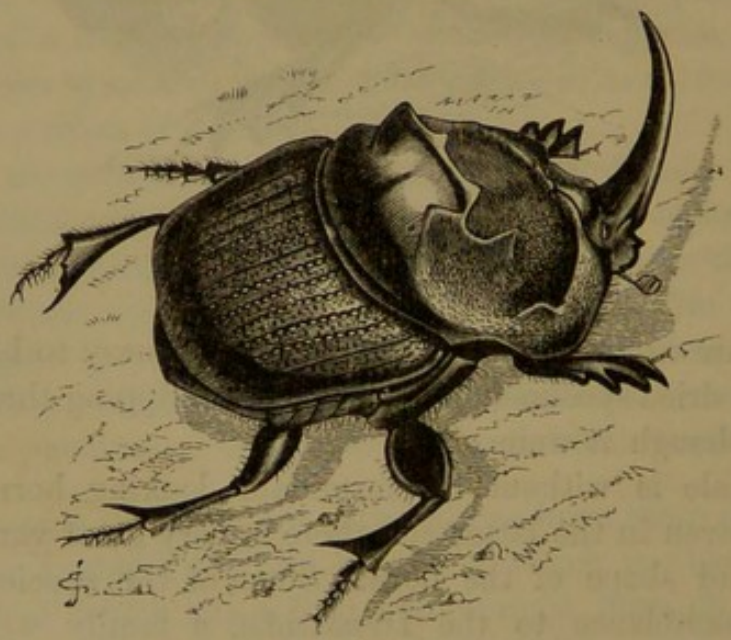


FIG. 55. - Phanæus lancifer.
(Purple and green, with violet elytra.)

also the rarest, the British Museum only possessing a single specimen, which was brought by Mr. Bates from Pará, on the Amazon River. The length of the specimen is an inch and three-

quarters, the thickness of the body is an inch, and the horn of the head is one inch and a third in length.

The colouring of this Beetle is singularly beautiful, and not very easy to describe. The head and greater part of the horn are deep purple, shot with green, or *vice versâ*, just as the light happens to fall on it; the tip of the horn being black. The square, flat plate at the hinder portion of the thorax is deep purple, and is thickly and boldly punctured. The strangely curved elytra are rich violet in colour, are boldly ridged, and between the ridges their surface is deeply granulated. The eyes are divided like those of the Deltochilum.

There are many species of this genus, all exceedingly variable both in colour and size. Some are quite black, and some blue, but the prevailing hue is green with a golden gloss. The generic name of *Phanæus*, or "conspicuous," is given to them on account of their beautiful colouring and strange form. Their habits are much the same as those of the preceding genus. Mr. Westwood mentions that one species, *Phanæus melon*, is found under dead fish, and yet smells strongly of musk; and that two other species, *Phanæus nigro-violaceus* and *sulcatus*, dig holes under dead snakes and bury them in a few hours.

THE next family, the Geotrupidæ, are so similar to our own familiar British species that I have only selected one species by way of example; namely, *Bolbocerus Reichei*, an insect which is spread over the greater part of Australasia.

It is a thick-bodied, sturdily built Beetle, and though not large, measuring not quite an inch in length, is one of the largest of the genus to which it belongs. Its colour is a very shining yellowish brown, so that the Beetle looks very much as if it were immature and had not been exposed to the light long enough to have assumed its deeper colouring. The elytra are covered with parallel punctured striæ.

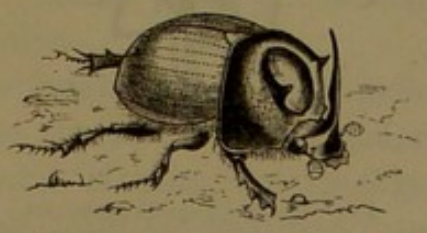


FIG. 56.—Bolbocerus Reichei. (Yellow-brown.)

The most conspicuous feature in this insect is the enormous horn which rises perpendicularly from the head of the male, and which gives to it, when viewed from the front, much of the air of a rhinoceros. The length of the horn is rather more than

half an inch. The lower surface of the insect is clothed with long and dense hair, of the same colour as the body. The name *Bolbocerus* is formed from two Greek words signifying "bulb-horned," and is given to this insect because the base of the horn is swollen into a sort of bulb.

Like many of their kin, the Bolboceri fly in the twilight. M. le Vaillant mentions that great numbers are captured by frogs and toads, and may be found in the stomachs of these creatures. The reader may not be aware that the stomachs of toads are recognised localities for many rare Beetles. The toad is out all night engaged in insect hunting. At dawn the entomologist catches him, kills him, opens his stomach, and finds in it plenty of Beetles, some of which are nearly sure to be rarities. I think that the late Rev. F. W. Hope was the first entomologist who made me aware of the value of a toad's stomach to the collector of Beetles. There are plenty of other insects in the same locality, but they are generally too much damaged to be placed in a collection, while the hard and horny mail of the Beetle suffers but little injury.

One example of the Hoplidæ must also suffice us. In England we have but one representative of this family, namely, *Hoplia philanthus*, a little dark Beetle which flies in the hottest sunshine, and has a habit of concealing itself in flowers, thus receiving the specific name of *philanthus*, or "flower-lover." The generic name of *Hoplia* is taken from a Greek word signifying "a heavy-armed soldier," and is given to the insects on account of their hard mail-clad bodies.



Fig. 57.—Hoploscelis grossipes. (Black head and thorax; chestnut elytra.)

The insect which I have selected at once arrests the eye on account of the extraordinary development of its hind-legs. The whole limb is very powerful, the thigh being large, stout, and rounded. The greatest development is, however, seen in the tibia, the end of which is very much widened, and is spread into two great horn-like projections, from the junction of which proceeds the long tarsus. The colour of the legs is shining

black; that of the head and thorax is also black, and that of the elytra is chestnut, or reddish brown. The insect is found at the Cape of Good Hope.

Though we have not space for more figures of Hoplidæ, some of the species are too remarkable to be passed over.

Some are covered with long hairs, one of them (*Anisonyx ursus*) looking so like a fat, hairy spider, that it might easily be mistaken for one. Its colour is black. But there is another (*Lynx crinitus*) which is equally hairy, and which is green. The most hairy of all, however, is the *Peritrichia*. This remarkable insect is so thickly covered with long hair, even to the ends of its legs, that it has no particular outline, and looks exactly like a small bundle of black hairs pinched loosely together.

Some of them are exceedingly beautiful in their colouring. One of them is bright green, covered with squared black spots arranged in regular rows along the elytra. Another, belonging to the genus *Ectinohoplia*, is velvety black, with two golden stripes on the thorax, and the whole of the elytra, except a patch in the middle, powdered with tiny golden spots. One specimen in the British Museum has the spots blue instead of gold.

The most beautiful of them all is the *Hoplia cærulea*, a Beetle rather larger than our own species. To the unaided eye it is of a beautiful pale blue, with a sheen like that of the richest silk. This lovely exterior causes thousands of them to lose their lives, for they are taken by collectors in vast numbers, and sold for the purpose of being made into those "beetle pictures" which are an abomination to every true naturalist.

When placed under the microscope with, say, a half-inch power, the secret of its beauty is at once disclosed. The reader may remember that many of the exotic Hoplias are thickly covered with hairs. In this species the hairs are modified into flattened scales, each scale having a changeable iridescence playing over its surface. Blue is the predominating colour, but when seen under the microscope, scarcely any two scales possess exactly the same colour. Some are deep azure, edged with crimson, while others are tipped with green and shining gold. Some are almost entirely green, with gold edges, while others are all gold except a slight edging of crimson.

There are other species in which the hairs are changed into scales, but in none are the scales so splendidly coloured as in *Hoplia cærulea*. One of these scale-bearing species is *Hoplia squamosa*, in which the scales are all of pale golden yellow. This is one of the smallest of the Hoplias, being no bigger than a small house-fly.

When alarmed, all the Hoplias have an odd habit of sticking out their legs in different directions, and remaining perfectly motionless for a time. They rest principally on the breast, supported by the middle pair of legs: the front pair are pushed out in front, and the hind-legs straightened as much as possible, and held high in the air. In this peculiar attitude the shape of the Beetle is quite altered, but whether it be intended as a mere counterfeiting of death, or as a protection against its enemies, is very doubtful.

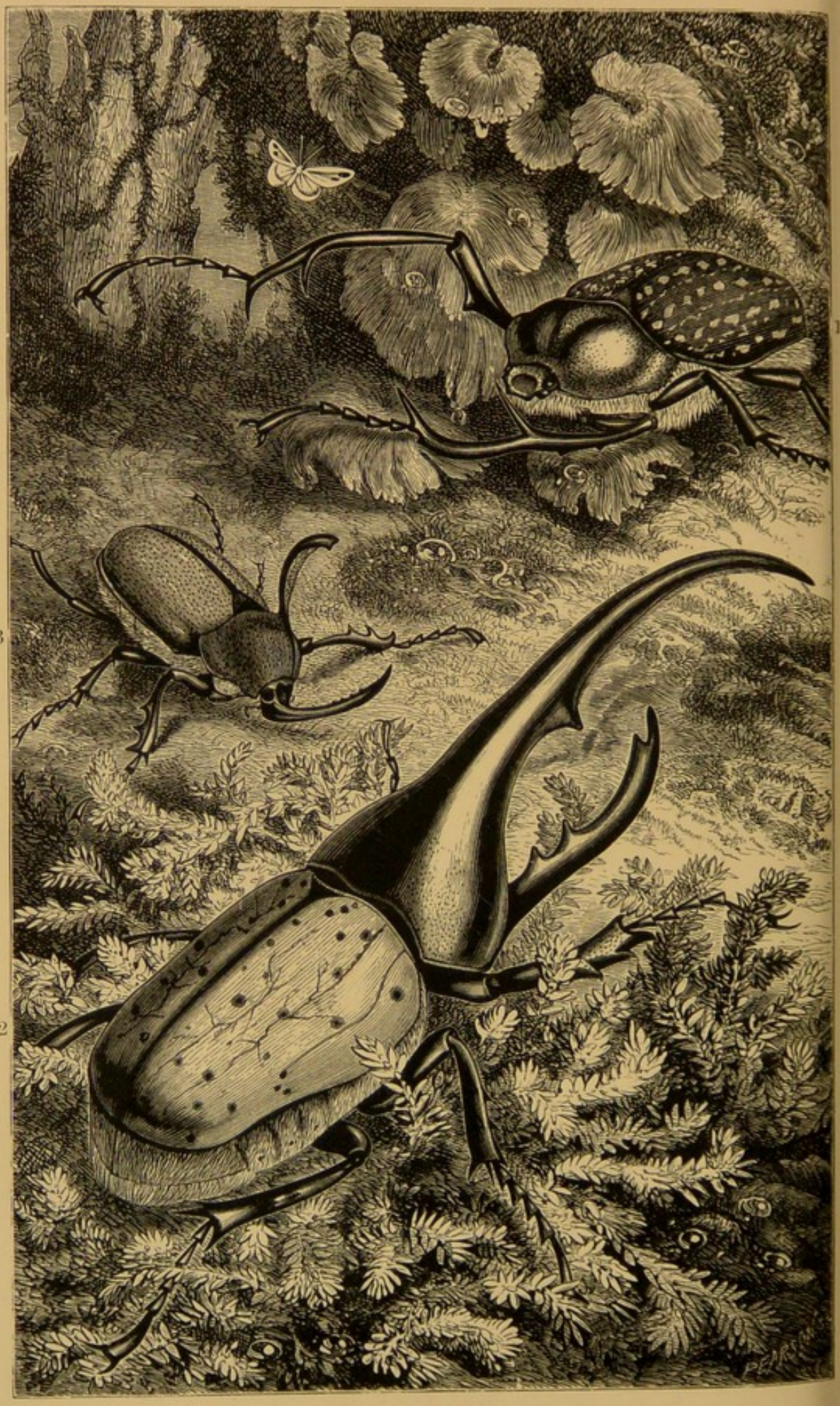
Now we come to the Melolonthides, or true Chafers, a family which is familiar to us on account of the Cockchafer and Summer Chafer, which are such pests both in their larval and their perfect stages.

The species which has been chosen as the representative of its family is a very large one, the specimen from which the figure was drawn being nearly two inches and a half in length and very stoutly built, though longer in proportion to its width than our own species. It is a native of India.

The colouring of this insect is rather curious, and cannot be properly seen without the aid of a tolerably powerful magnifying glass. The head and thorax are very dark blackish brown, and the elytra are red-brown, each having a small oblong white spot near the tip. These two white spots are very conspicuous, and have gained for the insect the specific name of *bimaculata*, or "two-spotted." When the magnifier is brought to bear on these spots, they are seen to consist of a number of long, leaf-shaped, white scales, projecting boldly over each other, and looking very much like a bunch of white leaves pressed nearly flat. The generic name *Leucopholis* is formed from two Greek words signifying "white-scaled," and is given to the insect in consequence of this formation.

On looking at the elytra with some care, the observer notices that they are sparingly powdered with tiny whitish marks.

PLATE II.



These marks are so minute that they really look like accidental particles of dust. When examined with the lens, each of these marks is seen to be a little white scale, shaped like a curved claw or horn, and projecting from the bottom of a shallow circular pit. These pits are set closely together and in exact order, so that their outer edges just touch each other. The whole of the under surface is provided with large yellow scales, so large that their shape can be seen without the aid of a glass.

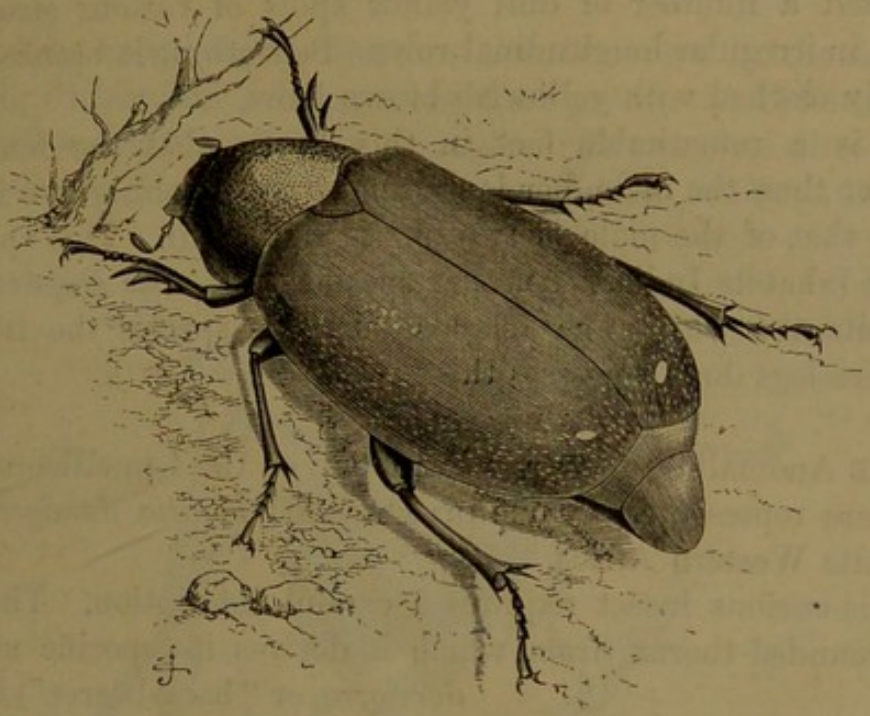


Fig. 58.—Leucopholis bimaculata
(Reddish-brown; two white spots.)

The larva of this insect must be a very large one, and, if it be voracious in proportion to its size, must destroy a vast amount of vegetation in the course of its long larval existence.

The magnificent Beetle *Eucheirus Macleayi*, which is shown on Plate II. Fig. 1, has caused some trouble to systematic entomologists on account of the difficulty which they find in ascertaining its exact place among insects. The latest and best authorities have decided that it belongs to the Melolonthidæ, and I therefore accept that arrangement.

In both sexes of this insect the first pair of legs are greatly developed, but in the male they are of enormous size. They are long, powerful, and curved, and the tibiæ have two long spikes on their inner edge, the second of which is remarkable for a sort of secondary spike or movable claw at its tip. The generic name

of *Eucheirus* signifies "beautiful hand," and refers to the peculiar development of these limbs.

The sides of the thorax are strongly toothed; there is a deep furrow or indentation along the middle, and the whole of the surface is deeply punctured. The colour of this insect is shining green on the head, thorax, and legs, with a slight gloss of copper. The elytra are green, of so deep a hue as to be nearly black, and they are glossed with golden bronze. Upon each of them are disposed a number of dull yellow spots of various sizes, disposed in irregular longitudinal rows. Beneath, it is bronze black, thickly clothed with yellowish brown hairs.

It is a remarkable fact in this Beetle that the female is smaller than the male, her length not quite reaching two inches, while that of the male is two inches and a half. This splendid insect inhabits India. Another species, *Euchèirus Dupontianus*, inhabits the Philippine Islands. In this species the tibiæ of the fore-legs do not possess the movable claw.

THE Anomalides form another group of the Lamellicorns, and are here represented by one insect, called *Popilia dorsigera*. It inhabits Western Africa.

This curious insect requires a careful description. The large and rounded thorax (from which it derives its specific name of *dorsigera*, or "back-bearer") is deep, shining green, and covered with a number of bold and deep punctures, looking very much like the little pits in a lady's thimble. The elytra are chestnut, or reddish brown, and from under their tips projects a double fringe of long, flat, white scales, graduated in length like the pipes of an organ. If the insect be turned over so as to bring the under surface into view, eight bands of somewhat similar scales are seen, each band reaching nearly but not quite to the central line of the body. The legs are of the same colour as the body.



FIG. 59.—Popilia dorsigera. (Green thorax and chestnut elytra, with white fringe.)

There are many species of Popilia, comprising a great variety of colour and form. Some are green, and look very much like

our well-known Rose Beetles, while others have the elytra covered with bold parallel ridges. The name *Popilia* has, unfortunately, no signification at all, being merely a classical proper name. The group of Anomalides is familiar to all entomologists on account of the pretty little June Bug (*Phyllopertha horticola*), which often occurs in such swarms as to do great damage in fields and gardens. Anglers use the insect as a bait, chiefly employing it in "dibbing" for chub and other fish.

THE very extraordinary Beetle which is shown in the accompanying illustration belongs to another group, the Pelidnotidæ, of which we have no British examples. It was first discovered in Peru by Humboldt, and is now known to be tolerably



FIG. 60.—Chrysophora chrysochlora.
(Golden green, glossed with crimson.)

common in some parts of the year. As is often the case among insects, and especially among Beetles, the chief peculiarities of structure only exist in the male sex. Indeed, in this, as well as in many other Beetles, the males and females have been described by different names as two distinct species.

The colour of this splendid insect is indicated by its scientific name, both being formed from the Greek. The generic title, *Chrysophora*, signifies "gold-bearer," and the specific name, *chrysochlora*, signifies "golden green." The leading hue of this

Beetle is, as its name denotes, golden green, but there is also a gloss of fiery copper-red, sometimes becoming rich carmine, which changes and flits from spot to spot as the light is altered. It is curious to see how a spot which has been emerald green, flecked with burnished gold, will, if the insect be moved but a hair's breadth, change to glowing carmine. The legs, especially the thighs of the hind-legs, seem to be more susceptible to this change. The reader will probably have noticed that the green and crimson are complementary colours.

The head is smooth, satiny green, profusely studded with minute punctures, and the thorax is like the head, except that it is granulated as well as punctured. The elytra are closely and finely granulated. The chief interest of this insect, however, lies in the enormous hind-legs, which are so large that in a well-developed male, whose head, thorax, and abdomen together measure an inch and a half, one hind-leg measures exactly two inches. If the Beetle be viewed from below, the enormous development of the thigh is seen, this portion of the leg being rounded, stout, and of a glossy satin-like green. On the tibia coppery red prevails, and the tarsus is deep purple. The tibia is slightly curved, and at its extremity is armed with an enormously long and sharp spine or spur, slightly curved.

The Chrysophora has a near relative, popularly and appropriately called the Kangaroo Beetle, because its hind-legs are proportionately as large as those of the kangaroo. Indeed, the Beetle seems to be all hind-leg, the body and the other four legs looking quite insignificant when compared with the gigantic hinder limbs. This is also a green Beetle.

CHAPTER X.

LAMELLICORNS (*continued*).

We now come to the family of the Dynastidæ, a family which, taken as a whole, comprises some of the largest and handsomest of all the Beetle race. The name *Dynastes* is taken from the Greek, and signifies "powerful," and is very appropriate to these large-bodied and stout-limbed insects. Most of them inhabit tropical regions, and we have none of them in England, though one species, *Oryctes nasicornis*, which is tolerably common on the Continent, was at one time reckoned among British Beetles.

The larvæ of the Dynastidæ reside in decaying vegetable matter, especially within rotten tree-trunks or branches, just as is the case with the common Rose Beetles of England. As the Beetles are exceedingly large, the larvæ are necessarily of gigantic proportions, and I fancy that the sight of a full-grown Dynastes larva would frighten almost anyone but practical entomologists. Even the larva of the common Stag Beetle is a terror to most persons unaccustomed to insects, and the larva of the Dynastes is to that of the Stag Beetle what a lobster is to a prawn.

I have already mentioned (on page 4) the incalculable service which the wood-eating insects render to the forest lands. Some strong-jawed insects are able to attack the tree as soon as it is fallen or has died, and, having riddled the timber with their galleries, their task is over. In the wet seasons the rain penetrates into these tunnels, lodges there, and decay sets in. In course of time the tree would gradually be formed into a vegetable mould, but so much time would be occupied by the process that the spot on which it lay would be absolutely barren, and so the forest would by slow degrees vanish from the face of the earth, did not these large Beetles accelerate the process of decay.

In temperate climates, such as our own, trees are comparatively few and their size comparatively small, and, in consequence, the Rose Beetles and their kin are quite large enough for the task which they have to perform. But in those lands where vegetation absolutely runs riot, where not only are the trees of gigantic dimensions, but the forest tracts are measured by thousands of square miles, the Beetles have a proportionately great task to perform, and are therefore not only multitudinous in number, but huge in size. Nothing but these gigantic larvæ could consume the enormous annual supply of decaying wood, and it is therefore in the heavily-timbered districts where they are most found.

We shall do well to treasure up those Dynastidæ, which have already become rare. I am sure that in course of time the Dynastidæ will suffer the same fate as has befallen the wild beasts of many countries, and that they will be driven further and further away from the habitations of men, until those species which are now common have become scarce, and the rarer species have perished altogether.

All the Dynastidæ are remarkable for the enormous development of the thorax and head with horny projections. If the reader will refer to Plate II. Fig. 2, he will see an admirable example of the Dynastidæ, called, from its great strength, *Dynastes Hercules*. In this insect the upper part of the thorax is prolonged into a single horn, so that the thorax is twice as long as the abdomen. This horn is curved downwards. The head is prolonged into a similar horn which is curved upwards, so that the head and thorax look like two enormous jaws, instead of being, as they are, two distinct parts of the insect. Indeed, on showing this Beetle to persons who were unacquainted with entomology, I have had great difficulty in persuading them that the thorax was not the upper and the head the under jaw, and have generally had to point out the real jaws of the insect before they could understand so strange a formation.

The whole under surface of the thorax-horn is clothed with a ridge of dense, stiff, short, golden yellow hairs, the object of which I have never been able even to conjecture, and a quantity of similar hair is on the under surface and edges of the abdomen. The thorax, head, and legs are shining black, and the elytra are

grey green, much wrinkled, and have a few black spots scattered over them. It has very large and powerful wings, which are needed in order to bear so bulky an insect through the air.

Some persons state that *Dynastes Hercules* saws off the branches of trees by grasping them between the head and the thorax and flying round and round the branch, the opposed projections acting like the teeth of a saw. The same story is narrated of other Beetles, but there is no direct evidence on the subject. It is certain, however, that the insect lives on the mucilaginous juices of certain plants, but whether it wounds those plants in order to obtain the juice is very doubtful.

According to Lacordaire, the habits of the various Dynastidæ are very similar. During the daytime they are seldom seen, having a habit of concealing themselves in dark hiding-places, or at most crawling in the recesses of woods. By night they come from their concealment and fly about the trees, in search, as M. Lacordaire thinks, of food, but, as Mr. Westwood more justly observes, of their mates. It is rather remarkable that, just as British Rose Beetles are sometimes found in ants' nests, some of their gigantic exotic relatives are found in similar places.

On the same plate, Fig. 3, may be seen an allied insect named *Golofa hastatus*. The Beetles belonging to this genus have been separated from the genus Dynastes on account of the formation of the tarsi. In the males the tarsi of the first pair of legs are very long, and so formed that they must always be curved when extended. The head and thorax are both armed with horns more or less upright.

The present insect, which is a native of Mexico, has both these horns very curiously developed. That on the thorax rises quite upright, and is slightly bent forward at the tip, which is diamond-shaped, or like the head of a spear. It is for this reason that the species has been given the name of *hastatus*.

The head horn, though curving slightly upwards, is directed forwards, and is most curiously formed. The projecting portion is deeply grooved along the middle, and its edges are cut into a series of bold teeth, from among which project a number of stiff, bristle-like hairs. Its length is rather more than three-quarters of an inch. The colour of the thorax is dark chestnut, except the horn, which is black and very shining, and the greater part

of it is covered with very large and deep punctures scattered rather sparingly over it. The elytra are rather light chestnut, except a narrow dark band which completely surrounds them. The length of the specimen from which the drawing is taken is rather more than two inches.

There are many species of Golofa, varying much in size and colour, but none are so handsome as that which has been chosen for illustration.

THE group of the Pimelopidæ is represented by the fine insect *Dipelicus Cantori*, which is shown in the accompanying illustration.

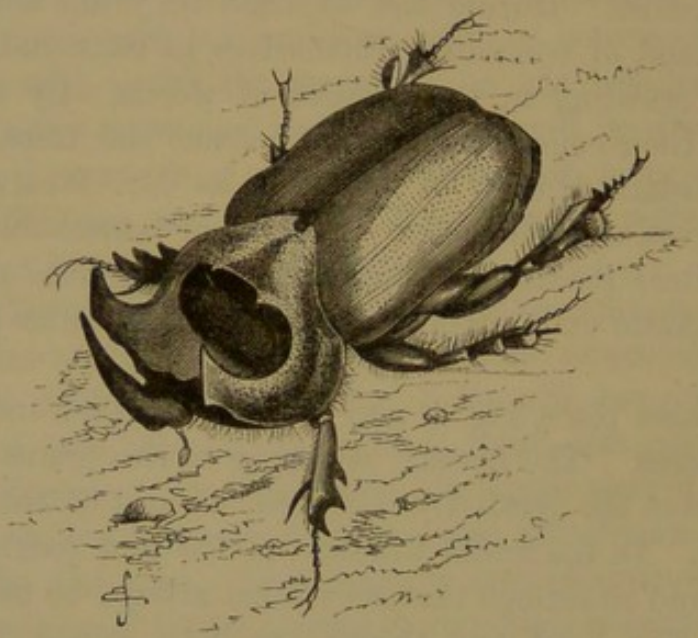


FIG. 61.—Dipelicus Cantori.
(Black head and thorax, chestnut elytra.)

This is a most extraordinary looking Beetle. It is solid, massive, and the thorax is most usually developed into two horns in front, then a deep scoop, and then an anvil-shaped, flat-topped, two-toothed projection. The head is armed with an upright horn, sharp and pointed at the tip, and much rounded at the base. The lower parts of both head and thorax are thickly clothed with long downy hairs. The colour of the head and thorax is black; that of the elytra is shining chestnut, and upon them are drawn a number of striæ, not parallel with the central line of the insect, as is mostly the case, but slightly diagonal, being wider apart at the base of the elytra than at their tips.

The most conspicuous part of the insect, however, is the hind leg. There is an old Oriental proverb concerning conceit: "The king sent his horses to be shod, and the Beetle held out his foot." Now, this Beetle looks exactly as if it were offering its foot for some such purpose. The thigh is rounded, thick, and highly polished. The tibia is of a most remarkable shape, almost conical in form, and looking as if it were made of two hollow cones, one placed within the other. The Greek name *Dipelicus*, or "double basin," is given to the insect in consequence of this singular formation. Three flattened projections are fixed to the second basin, if we may so call it, and curve over the small tarsus. The general appearance of this part of the leg is wonderfully like the hoof of a cart-horse. The middle pair of legs are formed after a similar fashion, but are smaller and not so conspicuous. The total length of the Beetle is about two inches.

The species was first discovered by Dr. Cantor in the island of Chusan, and is now known to be spread over Java generally.

We will now take a few examples of the Oryctides, that group to which belongs the *Oryctes nasicornis*, which has already been mentioned. The name is taken from the Greek word *Oryx*, which signifies "a long-horned antelope," and is given to these insects on account of the horny projections of the head and thorax.

The illustration on the next page represents the insect called *Megaceras chorineus*, which was brought by Mr. Bates from Pará in South America.

This is a very solidly-made insect, the thorax alone looking as if it could furnish sufficient material for half-a-dozen Beetles. This portion of the body is not merely developed with horn-like appendages, but is raised with a thick and apparently solid mass, covering over the head, and boldly scooped at the end so as to present the appearance of a pair of stout, blunt horns curving inwards.

The head is prolonged into a long curved horn, the end of which rises above the points of the thorax. The length of the head-horn is an inch and a half; the tip of it is widened and scooped, something like the thorax, but on a much smaller scale. At its base are the eyes, which are nearly but not quite divided

by a curved, forked band of the same material as that of which the head is composed.

The head and the upper part of the thorax are very polished and smooth, but on either side the latter is deeply wrinkled. The elytra are also black, but not so shining, and on either side of the suture there is a line of punctures. The generic name

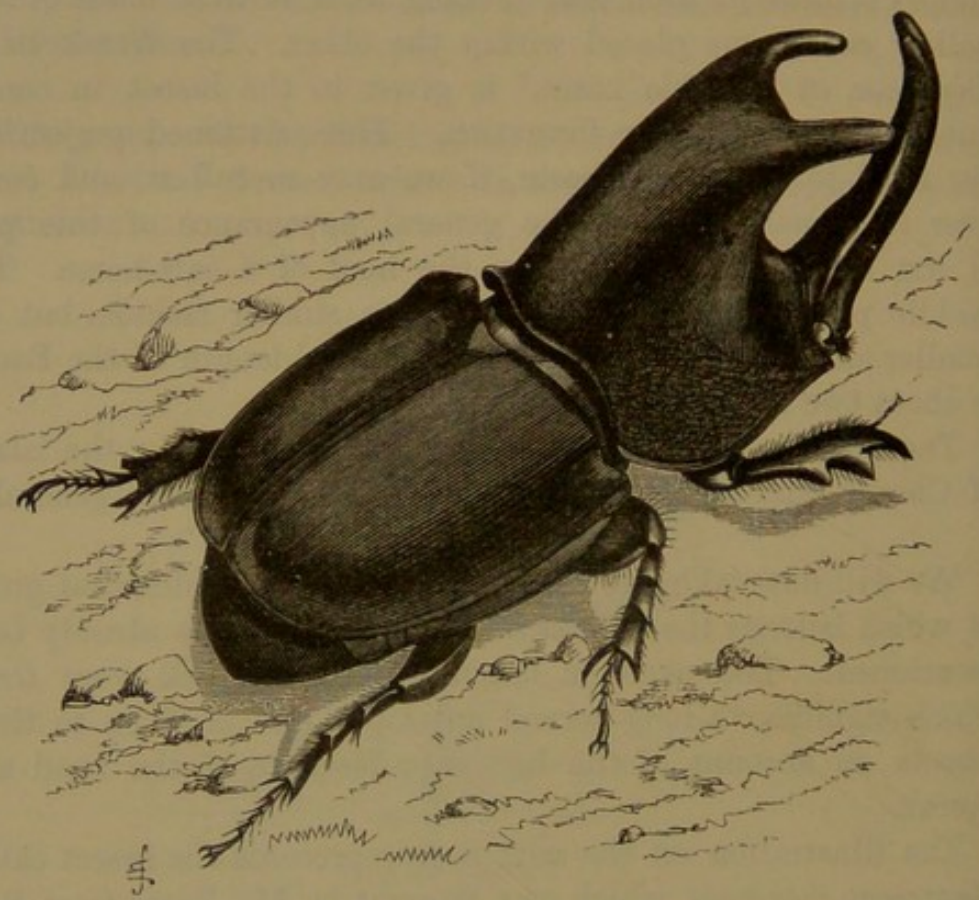


Fig. 62.—Megaceras chorineus.
(Black.)

of *Megaceras* signifies "large-horned," and is given to the insect on account of the great size of the horns with which the head and thorax are armed.

In those Dynastides and Oryctides which we have examined, the projections of the thorax are the most conspicuous parts of the insect. In the present example the thorax, though it rises rather high, and is developed into a double point in front, is quite thrown into the background by the enormous development of the head. The Megaceras has the end of the head-horn expanded and formed into two blunt projections, but this Beetle

has the horn doubly branched, and each branch forked. Indeed, the shape of it is exactly like that of the well-known sea-weed so familiar under the popular name of Carrageen or Irish Moss, and the scientific name of *Chondrus crispus*.

The colour of the head and thorax is black, the former being strongly wrinkled even to the tip of the horn, and the latter both punctated and granulated, so as to give it a duller surface than that of the head. The elytra are shining chestnut brown, some specimens having more red in them than others. The fore-legs are rather powerful, and the tibia is armed with three blunt and strong projections. The generic name *Xylotrupes* signifies

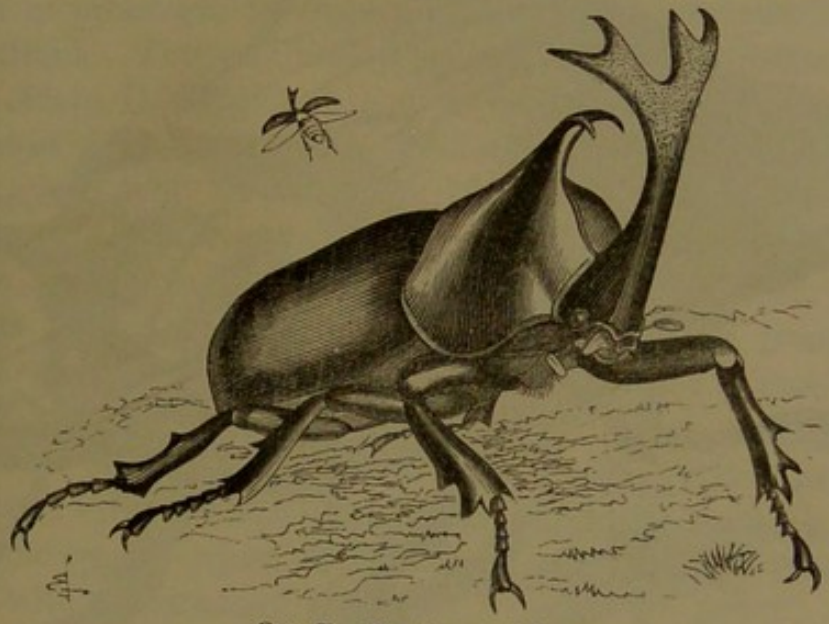


FIG. 63.—Xylotrupes dichotomus.
(Black head and thorax, chestnut elytra.)

"wood-borer," and is given to the insect on account of its supposed powers of cutting branches so as to feed on the sap which exudes from the wounded places; and the specific name *dichotomus* is also from the Greek, and signifies something that is divided into two parts. This name of course refers to the peculiar form of the head-horn. The insect is a native of China.

THE last of the Oryctidæ which we can mention is the splendid Beetle which has been appropriately named the ELEPHANT BEETLE (*Megalosoma elephas*).

In this enormous and formidable-looking insect the head is very much lengthened and developed into two distinct horns, one projecting in front just like the horn of the white rhino-

ceros, and the other curved forward somewhat in the shape of the letter C. The end of the first horn is boldly forked, and its length is exactly two inches in a fair specimen.

The colouring of the Elephant Beetle is very remarkable. The ground colour of the whole insect is black, but, with the exception of the first horn, the entire surface is so thickly covered with dense, soft, upright fur, that in a perfect specimen

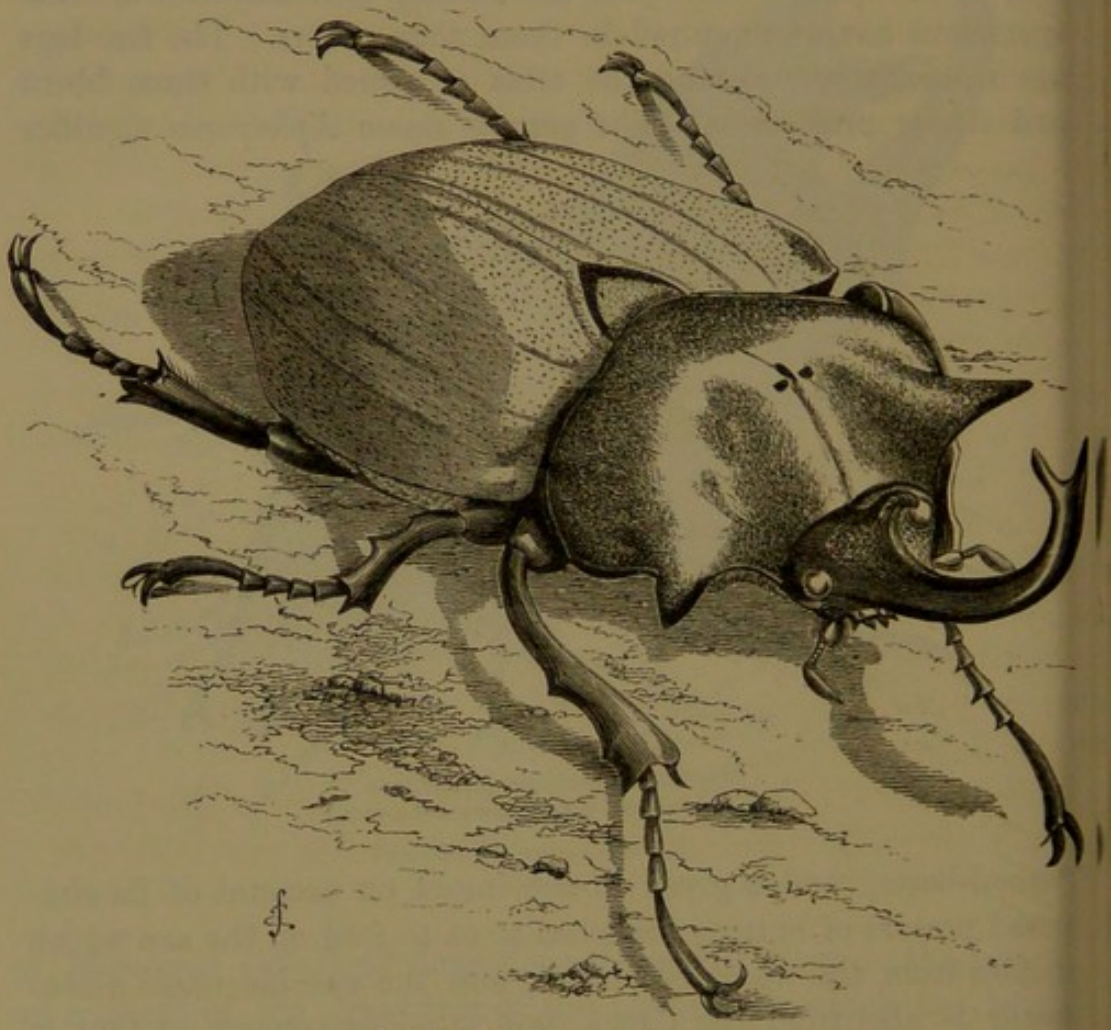


Fig. 64.—Megalosoma elephas.
(Black, covered with chestnut and yellow fur.)

the real colour of the Beetle cannot be seen. Such an insect, however, is very seldom found, and, as the fur comes off easily, almost every specimen has several bare patches from which the fur has been rubbed, and which show the black hue of the surface.

There is another species of the same genus, *Megalosoma Actæon*, in which the surface is entirely black and wrinkled. Upon the second horn the fur is dark chestnut brown, and a

similar but rather lighter hue upon the thorax, while the fur of the elytra is bright yellow, so that the insect presents a most remarkable aspect. Its total length is five inches, and the width of the body two inches, so that it well deserves the name of Megalosoma, *i.e.* "big-bodied." It is a native of Nicaragua.

THERE is a very remarkable group of Cetoniidæ, known by the name of Goliath Beetles. As their name imports, they are of very large size, some of them being the most gigantic of the insect race, though some are but of moderate dimensions. They are all distinguished by the peculiar construction of the head, which is prolonged in front and developed into two horn-like projections. This peculiarity belongs only to the males.

On Plate III. Fig. 1 is shown one of the handsomest and largest of these Beetles, called *Goliathus Druryii*, the latter name being given to it in honour of Mr. Drury, who figured it and first brought it into notice. Although the colours of this splendid Beetle are simple, they are very effective. The head, with its curious projections, is greyish white, except the front horns, which are black and very deeply punctated. The thorax is black, and upon it are drawn a number of stripes of creamy white, shaped as shown in the illustration. The elytra are warm chocolate, with a velvet-like surface, surrounded with a belt of the same creamy white as that upon the thorax. Below it is black, with a mixture of green.

The tibiæ of the first pair of legs are much flattened, and very deeply granulated and punctated. They are of a reddish hue. Those of the hind pair are furnished on the inner edge with a dense clothing, or rather ridge, of long golden hairs with a silken gloss. The tarsi are black, and if the insect be turned over, the thighs of the hind pair of legs are seen to be very strong and powerful, and at the base of each is a circular white spot one-tenth of an inch in diameter. The effect of this spot on the dark surface is very remarkable.

The length of the specimen is four inches and a quarter, and its breadth exactly two inches. It is therefore a very bulky insect, and even in its dried condition is exceedingly heavy.

For many years this was the rarest of insects. Only one specimen was known, that which was described by Drury, and was preserved in the Hunterian Museum of Glasgow. It had

been found dead, floating in the Gaboon River, opposite Prince's Island. Nothing was known of its habits until lately, when travellers have succeeded in capturing a tolerable number of specimens, one of which, now in the British Museum, is singularly valuable. That the Cetonia larvæ enclose themselves when full fed in earthen or wooden cocoons is well known, and naturalists were therefore anxious to know what kind of a cocoon could be constructed by the enormous Goliath Beetle. The question has been set at rest by the discovery of a cocoon of the present species, which is now in the nest-room of the British Museum.

It is oval, about as large as a swan's egg, and has wonderfully thin walls. The most remarkable point about it is the thick belt with which it is encircled, probably for the purpose of

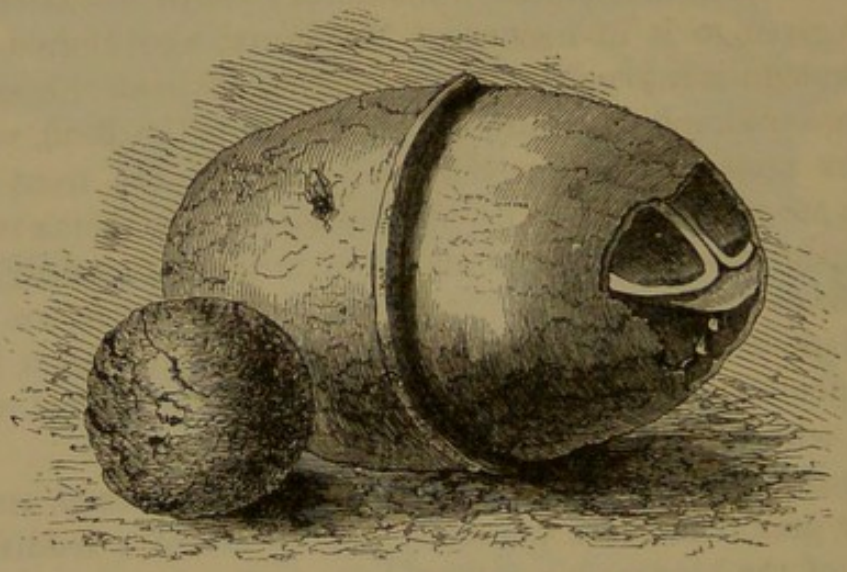


Fig. 65.—Cocoons of Scarabæus and Goliath.

strengthening it. How this belt was made is to me a mystery. A larva which inhabits a cocoon must of necessity make that cocoon from the inside, and how it is possible for a creature which builds its cocoon around itself to form an external strengthening belt is a riddle that has not yet been explained. The fact is patent—the means are unknown; and when those means are discovered, we shall have solved a very interesting problem in Natural History.

The above illustration of this invaluable specimen is taken from my "Homes without Hands," published by Messrs. Longman and Co. As, on account of the size of the cocoon, it

was impossible to give it of the full size, it has been reduced, and a common house-fly has been drawn upon it, so as to give some idea of its real dimensions. One end of the cocoon is broken so as to show the tips of the elytra and part of a tarsus. The best mode of realizing the real dimensions of the cocoon is to turn to Plate III. Fig. 1, on which the insect is shown of its full size, and then to compare it with the size of the Beetle as it appears within its cocoon.

The smaller cocoon, or earth-ball, is the work of a Scarabæus.

On Plate III. Fig. 2 is shown another example of the Goliath Beetles, remarkable for the extreme development of the head-horns. Its scientific name is *Dicranocephalus Bowringii*, the former of the two titles referring to the structure which has just been mentioned. It is formed from three Greek words, the first signifying "double," the second "a skull," and the third "a head."

This singularly pretty Beetle is a native of China. The head-horns are so curiously lengthened and curved that they much resemble those of the stag, and, as is often the case with Beetles in which there is a horn-like development of the head or thorax, the female is destitute of these appendages, while in the male they are exceedingly variable both in size and shape.

The whole surface of the thorax and elytra is covered with a very short, but very thick, yellowish green down, the ground colour being black. This is shown in one or two places, such as a belt round the edge of the elytra, a short elevated streak on the shoulder and at the tip, and a couple of rather long stripes on the thorax. As the yellow down is easily removed by friction, these bared portions look very much as if they had been rubbed; but on examination of a series of specimens we find that the bare marks are always in the same places and much of the same shape. Three species of the Dicranocephalus are known.

Our last example of the true Goliath Beetles is the *Rhamphorhina Petersiana*, which is shown on Plate III. Fig. 3.

The generic name *Rhamphorhina* is formed from two Greek words, which may signify either "beak-nosed" or "crooked-nosed." There are many species of this genus, differing very greatly in size, some being almost dwarfs, while others are com-

paratively giants. Still, though the Rhamphorhinas do belong to the Goliaths, none of them are very large; their brilliancy of colour, however, compensating for their lack of dimensions.

At first sight this Beetle gives the observer the idea that it is made of the most brilliant green porcelain, and, indeed, it almost looks as if it were artificial rather than a real insect. The oddly-formed head is flattened and rather scooped, and in the male is deeply toothed in front, and furnished with a sharp curving horn on either side, shaped very much like the well-known horn of the chamois. The head is white, and the horns are black. The head of the female is much smaller, entirely without horns, and almost entirely without the teeth on the front edge.

The thorax is rounded, very highly polished, and of the most vivid emerald green, with a sort of translucent effect about it, so that it looks very much as if it were made of the finest porcelain or enamel. The elytra are of a similar green, except that upon them is drawn a large white mark, the shape of which can be seen by reference to the figure. The legs are long in proportion to the size of the body, and the first pair are very much developed, and bear on the under side of the tarsus a bunch of long, golden yellow hair.

If the insect be turned over, the under surface is seen to be quite as beautiful as the upper, though in a different way. The under side of the head, instead of being white, is rich chestnut red, and the general colour of the body is bronze, with a porcelain-like surface, much like that of the thorax and elytra, though not so brilliant. One very curious point about this Beetle is the longitudinal projection between the middle and last pair of legs. This projection is pear-shaped, lies on the central line of the body, and is of an opaline green. It seems to have an analogy with the sharply-pointed projection in the Dyticus and other Water Beetles, though no one appears to have discovered its object.

The length of the specimen from which this description was taken is one inch and three-eighths. The female, besides being unarmed, is much duller in colour, and does not possess the peculiar porcelain or enamel-like surface which distinguishes the other sex. The length of a fine specimen is nearly an inch and a half.

The habits of the Goliath Beetles are very much like those of

our own Rose Beetles. They are mostly taken on the wing, and, as is the case with the Rose Beetles, the males are much more numerous than the females. In flight the elytra are not raised, and, indeed, are scarcely opened at all, the wings projecting at the sides of the nearly closed wing-cases.

They feed upon the liquid juices of various plants, mostly of trees. In some parts of Africa there is a sort of vine which climbs to the tops of trees, and is so full of sap that it affords plenty of drink for a thirsty traveller. This vine is frequented by several species of Goliath Beetles, which wound the vines with their horny jaws, and so drink the juices. Some species inhabit certain trees when they renew their buds and blossoms, the juices being then easy of extraction.

Thus, as is remarked by Dr. Harris, of Harvard University, "the food of the Goliath Beetle is fluid, like that of the *Trichii* and *Cetoniæ*, insects belonging to the same natural family; but the latter live chiefly on the nectar of flowers, and the former on the sap of plants. The long hooks on their maxillæ and the diverging rows of hair that line their lower lips are admirably fitted for absorbing liquid food, while their horny teeth afford these Beetles additional means of obtaining it from the leaves and juicy stems of plants when the blossoms have disappeared. Thus every new discovery in Natural History, even when least expected, serves to increase the evidence of skilful contrivance and perfect adaptation of structure in all organized beings."

Some species of Goliath Beetles are eaten by the natives of the country in which they live. They are gathered together, boiled over a fire, and are said to be very sweet and good. I suspect that if entomologists could only see some of the insects which are thus ignorantly eaten instead of being preserved for the benefit of science, they would feel like that well-known naturalist who, on finding that a savage had just eaten an animal until then unknown to science, could hardly refrain from cutting the man open on the spot.

We now pass to the true Cetoniides, the typical insects of this splendid family. The rare insect which is figured on the next page belongs to the sub-family, and is a native of Northern India. It is briefly described in Westwood's "Oriental Entomology" under the title of *Jumnos Ruckerii*. The generic name of this and

allied insects is due to the form of the snout, which is shaped something like the mathematical figure called a rhomb. The length of the male is nearly two inches.

It is a very handsome and striking insect, the contrast of colours being exceedingly bold. The thorax, which is covered with very fine punctures, is shining green with a gold gloss, and the elytra are of a similar colour, but having a changeable sheen so as to appear blue in some lights. The four spots on them are orange yellow. The legs are bright green, and the tarsi of

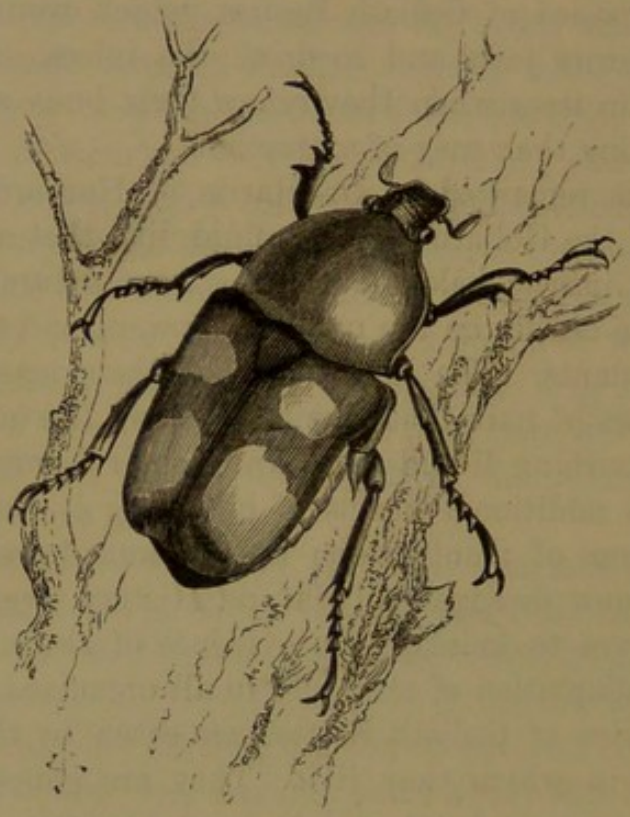


Fig. 66.—Rhomborhina Ruckerii.
(Green, orange spots.)

the middle and hind pair of legs are fringed with golden hair. Those of the first pair of legs are strongly toothed, especially at the junction of the tarsus. Underneath it is entirely green, glossed with coppery red.

There are many species of this genus, varying much in size and colour, the generality being of moderate size and brightly coloured, while others are of small dimensions and dull brown in hue. The species which is figured is at once the largest and most beautifully coloured of all the genus. These insects are mostly captured on the wing, but many specimens have been

taken in the hollows of trees, those being evidently the spots in which they have passed their larval existence.

Next comes the remarkable insect called *Gymnetis hieroglyphica*, a native of Brazil. The insects of this genus may be easily distinguished by the peculiar formation of the thorax. The scutellum is wanting, but in its stead the thorax is prolonged in the middle into a sharp point, which takes the place of the scutellum so completely that at a hasty glance that portion of the insect is not missed.

This is a very large genus, and, as a rule, all its members are very boldly marked. The present species is bright "king's yellow," with a slight mixture of red. It does not shine, but has exactly that appearance which is produced in water-colours by laying on a thick coating of body-colour. The marks are deep black, so as to give the insect a sort of zebra-like appearance. These marks are exceedingly variable, so that after examining a long series of individuals it is scarcely possible to find two specimens exactly alike. Underneath it is wholly black.



Fig. 67.—Gymnetis hieroglyphica. (Yellow, black marks.)

The insects of this genus, though they are true Cetonias, partake somewhat of the nature of the Goliath Beetles, in that they frequent the young leaves of trees rather than flowers. There are very many species, differing little in size, though considerably in colour. All, however, whatever may be their ground colour, yellow, chestnut, brown, or grey, are covered with black marks. One of the most striking of them, *Gymnetis holosericea*, has the middle of the body and elytra black, with boldly curved edges. Most species are black on the under surface.

We can only find space for one more example of the Cetonias, namely, the splendid insect called *Inca Sommerii*, the former of the names being given to it as being the Inca, as it were, or king, of the South American Cetonias, and the latter in honour

of M. C. Sommer, Esq., of Altona, who forwarded the insect to Mr. Westwood for description in his beautiful work, "Arcana Entomologica."

The genus Inca may fairly be considered as representing in tropical America the Goliaths of Africa and India, which so closely resemble it in the horn-like projections of the head that it might readily be taken for one of those insects. These horns only belong to the male, the head of the female being perfectly plain. In colour they are black, and they are furnished with a dense coat of orange fur, as shown in the illustration. The thorax is rich green with a velvety lustre, and has several

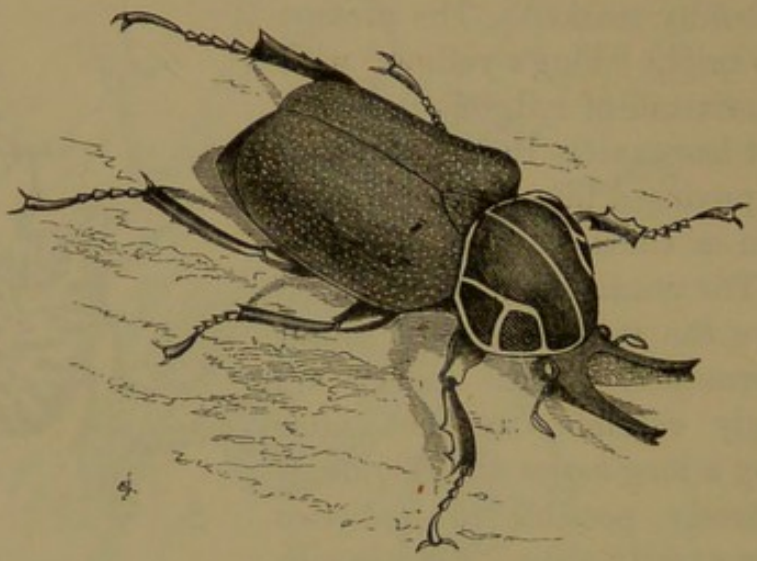


Fig 68.—Inca Sommeril.
(Velvet green, yellow stripes and spots.)

yellow stripes upon it. The elytra are also green, and covered with a number of small yellow spots. The legs are dull green, and it is of the same colour below, the thighs being sprinkled with reddish fur like that on the head.

This is an exceedingly variable insect. In the British Museum there is one specimen which is entirely without yellow spots, and another yellowish with green spots. Those which were sent by Mr. Sommer, and are described in the "Arcana Entomologica," had blue-black head and thorax with whitish stripes, the scutellum green, and the elytra purple green. It is as variable in size as in colour, but a fine male specimen measures about two inches in length, the female appearing smaller on account of the absence of head-horns.

The Incas, of which there are a tolerable number of species,

are, as a general rule, inhabitants of Mexico, though, as we shall presently see, the rule is not without its exception. They feed upon the young leaves of trees, and in the daytime may be seen flying round the trees at some height from the ground. During the early morning they sit among the foliage, resting, as do so many insects, on the under surface of the leaves, so as to be protected as much as possible from sight. The larvæ are found in rotten wood, much like those of our own Rose Beetles. One species, *Inca lineola*, was brought from Africa, having been captured at Sierra Leone by the Rev. D. Morgan. It is quite a small insect, not larger than our common Rose Beetle, but longer and more slender. It is curiously mottled with black, yellow, and grey, and has on each of the elytra a short black line, from which the specific name of *lineola*, or "little line," has been derived.

CHAPTER XI.

STERNOXI, OR SKIPJACK BEETLES.

I USE the word which is placed at the head of this chapter because it is a more appropriate name than that which is sometimes given to this tribe of Beetles; namely, Serricornes, or "saw-horned." Many Beetles might be termed Serricornes, but the name of Sternoxi, or "sharp-breasted," is expressive of a characteristic peculiar to this tribe. The Sternoxi have the sternum, or under part of the thorax, prolonged into a sharp, spike-like appendage, which fits into a corresponding hollow between the bases of the middle pair of legs. This structure can be easily seen by taking any of our common Skipjack or Click Beetles and examining it with a lens.

While so doing the observer will probably find that the insect will bend back the thorax, and then, with a smart jerk and a clicking sound, fling it forward. If at the time the Beetle be lying on its back, it will spring high into the air, and in most cases fall on its feet, this being evidently the object for which the structure of the thorax was intended, the legs being in many species so short, that if the insect falls on its back on a smooth surface it can scarcely ever regain its feet.

Perhaps the reader may ask why the Beetle should be so much in the habit of falling on its back that a special provision should be made to enable it to get upon its feet? The reason is, that whenever the insect is alarmed it always loosens its hold of any object to which it may be clinging, and falls to the ground, where it lies motionless as a stone, until the danger, real or imaginary, has passed away. Now, if it should happen to fall on a smooth instead of a rough surface, it would lie there until it died, the legs being so short that they could not touch the ground. The power of springing into the air, however, com-

pensates the Beetle for this defect, as it almost always turns over before it reaches the ground, and comes down with its feet well under it.

Such a process requires also a peculiar structure of the thorax. If the three parts of which it is composed are fixed tightly together the insect cannot leap, but if they are loosely jointed it can bend itself about in the way that has been described. Although many, not to say most, of the Sternoxi have this power, such is not the case with some of them, among which are the family of the Buprestidæ, to which our first few examples belong. All these Beetles have their heads sunk deeply into the thorax, and the antennæ short, boldly toothed, and inserted in cavities.

We have but few species of Buprestidæ in England, and they are but small and insignificant. Abroad, however, the Buprestidæ attain considerable dimensions, and many of them are so magnificently coloured as to take rank among the most splendid of the insect race. If anyone wishes to know what colour can do for an insect, he should visit the splendid collection of Buprestidæ made by the late Rev. F. W. Hope, and now in the Oxford Museum. As a rule their surfaces are highly polished, and they glow with every imaginable hue, the colours flitting from spot to spot as the light changes. Green and crimson are the two prevailing hues, but they are relieved by gold, fiery copper, azure, and purple.

This being the case, it is a matter of rule that the insects should be largely used as ornaments. Sometimes they are employed entire, but generally the wing-cases alone are used. In India, for example, the green wing-cases of a Buprestis are sewn in patterns upon dresses, sometimes formed into leaf-like groups, and often running in a pattern along the edge. The same wing-cases are also used as ornaments for baskets, fans, and other similar objects.

Among the savage tribes of Guiana the elytra of certain Buprestidæ are in great favour. They are strung loosely on the lovely feather aprons which the natives wear while executing their dances; and as the dancers move, the hard, pendant elytra clatter together in time to the steps. Children's rattles are also made of the same materials, the elytra being hung round a little wooden hoop, and sometimes three or four such hoops being

fastened above each other, and a little gourd suspended from the middle of them. A few small stones are in the gourd, and, to judge from analogies, such a toy must be very pleasing to a Guianan child, especially as it can easily be pulled to pieces.

THE first sub-family of the Buprestidæ is the Julodides, a beautiful example of which is the insect shown in the accompanying illustration. Before proceeding to the description of the various Buprestidæ, we will ascertain the meaning of the name.

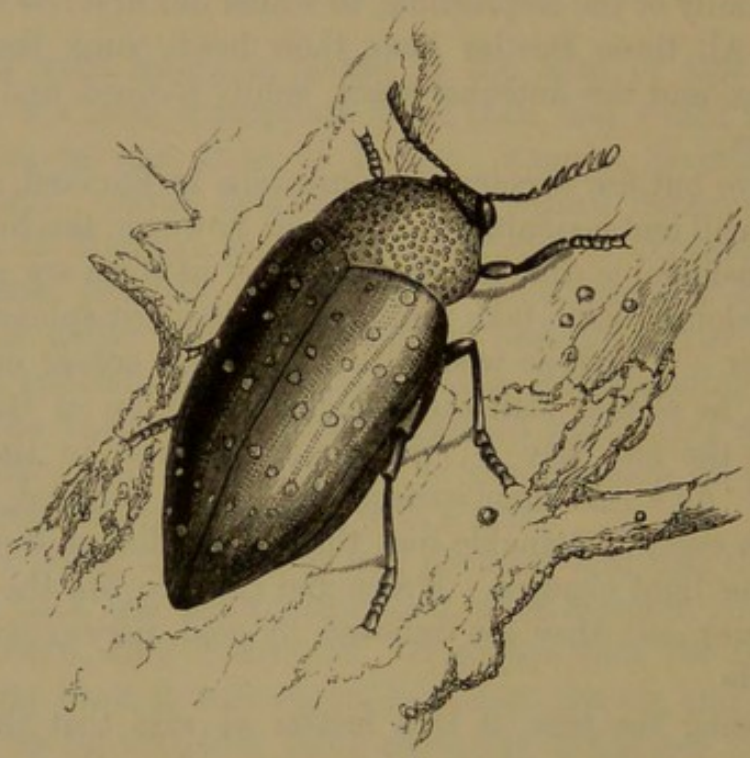


FIG. 69.—Sternocera sternicornis.
(Shining green, white spots.)

It is formed from two Greek words signifying "ox-burner," from an idea that it scorched or injured oxen whenever they happened to eat it as it lay concealed in the herbage on which they fed. That some poisonous insect was signified by the Buprestis is evident, because the references to it are so numerous and so specific. For example, a special law was made against its use in the Pandects of Budæus: "Qui Buprestem . . . aut mortiferi quid veneni ad necem accelerandam dederit, judicio capitali et pœna legis Corneliæ afficiator." (Whosoever shall administer a Buprestis or any other poison for the purpose of destroying life, shall be held guilty of a capital offence by the Cornelian law.)

The insect was said to have a very powerful odour, to be of a greenish gold colour, to be long in the body, and to have long antennæ. Putting all these descriptions together, there is little doubt that the Buprestis of the ancients was nothing more or less than the Cantharis, or Spanish Fly, and that the insects which we scientifically call Buprestidæ have nothing in common with the Buprestis except its name, which they have wrongfully usurped.

As to its manners and customs, it was a very curious Beetle indeed. According to De Mouffet, "It feedeth on flies, cankers, worms, and other the like insects, provided she kill them in fight, for those that dye of themselves, or are killed by others, she will not touch: when she hath filled herself with the carkasses of the slain, what she leaves she drawes into her hole, and when she is hungry again feeds on them. A great foe to the Beetle and the Lizard, aiming at their bellies (as being the softer and more penetrable part), which presently she gnaws through; and when she fears to be overcome or caught, presently she retreats and hides herself.

"Other savage qualities of this little creature let Peter Turner and William Brewer (physicians for learning and integrity of conversation second to none) relate, who, together with Pennius at Heidelberg, did observe its life and manners."

The larvæ of the Buprestidæ are wood-eaters, the eggs being laid in the chinks of tree-bark. In order to aid her in placing her eggs properly, the last segments of the abdomen are in the female formed into an ovipositor, with which she can push the egg into very narrow crevices. In consequence of this arrangement, when the insect is viewed on the under surface it seems to have only five segments to the abdomen, all the others being internal.

One of these Beetles passed a most singularly lengthened life. A fir-plank was brought from the Baltic, made into a desk, and then placed in a London office. For twenty years the desk stood like any other desk, but at the expiration of that time a living *Buprestis splendens* was discovered in the act of extricating itself from the desk. In order to discover the position which the insect had occupied, the upper part of the plank was planed away, and then the track of the larva was laid open. Whether the twenty years had been passed as egg, larva, pupa, or perfect insect, is unknown. Most probably it was in the

larval stage, as the larva always does live for several years before it becomes a pupa, and in this case development would be hindered by the dryness of the wood. Several other foreign insects have been imported in like manner, and are mostly found about the Docks.

The full account of this curiously prolonged life is found in one of the early volumes of the "Linnean Transactions," and in the same "Transactions" is an account of a larva of an Indian Buprestis, which had been sent over in a bale of goods, and had eaten its way completely through fifteen pieces of muslin—the holes which it made being of course multiplied by the folds of the muslin, which I should imagine must have furnished rather innutritious diet.

THE present species is a native of the East Indies, and is a very beautiful insect. The whole of the body is bright shining green above, and more polished on the thorax than on the elytra. Both thorax and elytra are covered with bold punctures, the former looking very much like the pits on a lady's thimble. On the elytra the punctures are not only deep, but on a close examination are seen to be white inside. This curious colouring is most perceptible on two large circular pits on the shoulders. Besides having these punctures, the whole of the surface of the elytra is covered with very tiny granulations. The boldly-toothed antennæ are covered towards their extremity with fine down.

On looking at the under surface a peculiar structure is shown, which explains the generic name. The middle portion of the thorax, technically named "meso-sternum," is prolonged into a rather long, stout, and sharp spine, which projects completely beyond the base of the first portion of the thorax, or "pro-sternum." If the reader will examine the under-surface of a common Rose Beetle he will see a similar development, except that the spine of the Rose Beetle is not so stout nor so proportionately large as that of the Buprestis. The generic name *Sternocera* is formed from two Greek words signifying "breast-horn," and is therefore a very appropriate one. The specific name *sternicornis* is nothing more than a literal Latin rendering of the same word. The whole of the under surface is green, speckled with tiny yellow hairs.

This is a very large genus, and has representatives from many parts of the world. They are of various sizes and various colours, most of them, however, being of brilliant hues, and the thorax the most polished part. Some are simply brown, black, or grey, while others are olive green or bright green. The most curious of them in point of colour is *Buprestis feldspathica*, in which the colour is purple, but highly iridescent. It comes from Western Africa.

THE group or sub-family of the Chalcophoridæ is represented by one or two examples, the first of which is the handsome Beetle called *Catoxantha gigantea*, a native of India.

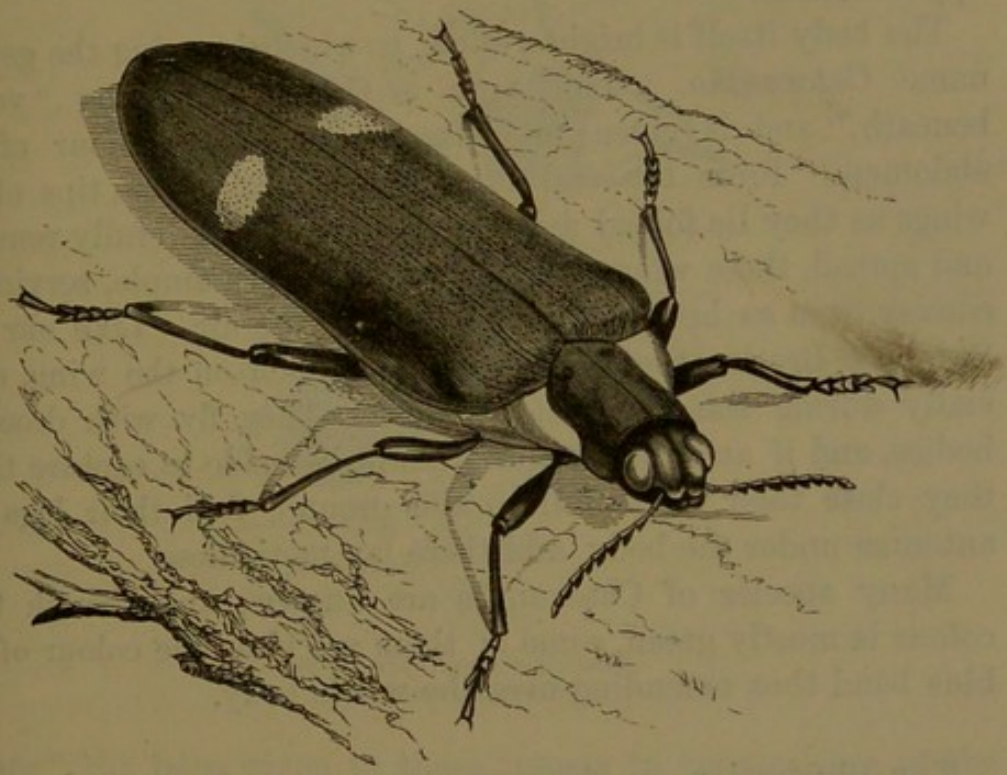


FIG. 70.—Catoxantha gigantea.
(Green, yellow spots.)

This splendid insect measures three inches in length, and seven-eighths of an inch in width. It is flatter in form than the last-mentioned species, and not so boldly punctured. The head and thorax are very dark green, and on either side of the latter there is a rounded patch, chestnut brown in colour, and covered with deep punctures. Just at the base of the thorax are two triangular depressions, one on either side of the central line. The colour of the elytra is bright, shining green, and on the

lower third of each is a large irregular patch of orange-yellow, surrounded by an indistinct but very beautiful blue band.

The under side is nearly as beautiful as the upper. In the first place, the under surface of the elytra is of the same lovely blue as that which surrounds the yellow patch. This is a most remarkable fact, because, as a rule, the under surface of elytra is dull, no matter what the upper surface may be. Take, for example, the elytra which have already been mentioned as attached to the dancing apron of the Guianan Indians. Above they are very brilliant, being of a metallic copper, glossed with green bronze; but below they are dull olive, inclining to brown, and scarcely showing a trace of the splendid colouring of the upper surface.

The body itself is bright yellow, to which is owing the generic name *Catoxantha*. This term is Greek, signifying "yellow beneath," and is given in consequence of the colour of the abdomen. From the end of the body project the tips of the wings as they lie folded under the elytra. If carefully removed and spread, these wings are found to be very ample, serving to convey even so heavy an insect through the air. Like our own Skipjack Beetles, the Buprestidæ are much on the wing, especially during the hours of sunshine. They fly with drooping bodies, and if an unsuccessful attempt be made to capture them, they close their wings, fall to the ground, fold their legs and antennæ under the body, and there lay motionless.

Many species of Catoxantha are known; and though their colour is mostly green, some of them are blue, the colour of the blue band thus extending over the whole body.

THE illustration on the next page represents a very beautiful Buprestis from Java.

It is rather deceptive in point of colour, and, large as it is, must be examined closely before its beauties can be known. At first sight it appears to be only a yellow and black Beetle, but on a careful inspection, aided by a strong light, it is seen to be one blaze of splendour. The centre of the thorax is rich violet, and on either side is a large patch of fiery, burnished copper, very deeply and profusely punctured. The elytra are smooth and of a "king's yellow" colour, while in their middle is a large circular patch of the most splendid purple, and the last third of

the wing-cases is of the same colour. A very strong light is needed to develop the full beauties of this splendid colour. It is so deep that in a poor light it looks black, but when properly illuminated the purple is so intense as almost to dazzle the eye; and as it is contrasted with its complementary colour, yellow, it necessarily appears peculiarly vivid.

If possible, the under surface is even more beautiful than the upper. The head and thorax are of the same coppery carmine as that which adorns the sides of the thorax; and the abdomen is shining violet, not quite so dark as the purple of the elytra. The legs are violet. The generic name of *Chrysochroa*, or "golden



Fig. 71.—Chrysochroa Buqueti.
(Yellow and deep violet.)

surface," has been given to these insects in consequence of the prevalence of golden yellow in their colouring. This is a large genus, and is represented in the East Indies, China, &c. One of the most startling in point of colour is *Chrysochroa vittata* of China. The elytra of this insect are burnished green glossed with gold, while down their centre runs a band (in Latin, *vitta*) of brilliant carmine. Another species, *Chrysochroa limbata*, though small, not an inch in length, and not shining, is yet a very beautiful insect. It is deep olive green; the elytra are boldly ridged, and round their edges runs a broad belt of golden yellow. The specific name *limbata* is formed from the Latin word *limbus*, which signifies a hem, border, or frill, and refers to this yellow belt.

THE group of Buprestides is represented by one insect, which, however, looks as if it could do duty for many. Like most foreign insects, it has no English popular name, but its scientific title—and, as we shall presently see, a very appropriate one—is *Stigmodera variabilis*. The generic name is formed from two Greek words, the former signifying "a mark" or "a blotch," and the latter "a back," in allusion to the bold markings of the elytra.

The specific name, *variabilis*, or "variable," is singularly appropriate; for whereas there are many specimens which are perfectly plain, and have no marks at all on the elytra, there

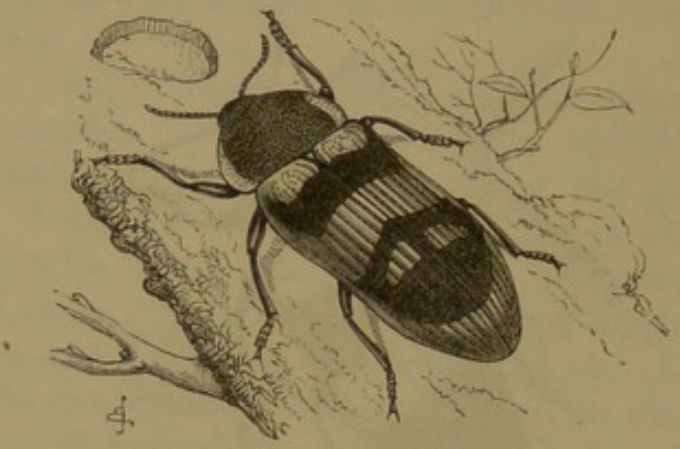


FIG. 72.—Stigmodera variabilis.
(Green and chestnut, with purple markings.)

are scarcely any two specimens which are precisely alike in every respect. I have looked through a long series of this extraordinary Beetle, and have not yet discovered two specimens which are exactly alike. As to the various divergences from the original type, whatever that may be, they are so numerous as to preclude all description. Suffice it to say that examples of this Beetle can be found which bear no more resemblance to each other than does a Newfoundland dog to an Italian greyhound; and yet, just as we acknowledge the dog to belong to the same species, so do we with regard to the Beetle. I should very much like to give figures of some of the principal varieties of this curious Beetle, but our space is far too limited.

We will begin with the specimen which is figured in the illustration, and which seems to be a fair example of the best type of this insect. The head and middle of the thorax are deep, rich, shining green, profusely and finely punctated, while the sides of the thorax are yellow. The ground colour of the elytra

is rich, warm chestnut, rather deeply furrowed, and each furrow being marked with a row of bold punctures. Across the elytra run four bands of the deepest purple, shaped as shown in the illustration. Below, it is bright, shining green, punctured like the thorax.

Now for some of our varieties, of which I shall only describe three or four. One has the elytra chestnut, and in the middle, nearer their base, there is a square violet spot. Exactly in the middle of the elytra is another violet spot shaped like the ace of diamonds, having a small square spot of the same colour on either side. Then comes a bar which extends nearly but not quite across the elytra, and a patch of the same hue occupies the extreme tip. Next, perhaps, we find a specimen which has markingsalmost exactly the same in point of shape and number, but deep green instead of purple or violet. Next comes a specimen where a diamond-shaped spot occupies the place of the square mark, and a chevron-shaped mark takes the place of the diamond in the middle. Some of these Beetles, indeed, would do very well to illustrate the elements of heraldry, and it would be very convenient if we could use the heraldic terms, such as "chief," "fesse," "party per pale," &c. &c., in describing colours or marks.

Some specimens are wholly brown, or very dark green; some are deep red, with one, two, three, or four bands of violet, blue, purple, black, or green. More than four bands I never saw. Some are so small as to be scarcely one-tenth the size of the specimen which has been figured, and without any marks on the elytra, which are uniform pale brown, the thorax being a few shades darker.

Being so exceedingly variable a species, it is naturally a very troublesome one to entomologists, who find that colour, size, and marks absolutely go for nothing at all, and have been obliged to discard them from their calculations. In consequence, there are few insects which have been furnished with so many names as this, zoologists having not only considered the varieties as different species, but even placed them in different genera.

We now come to the group of Elaterides, which are possessed of the power of leaping when laid on their backs. If one of the large species be taken, such as those which we are about to

examine, and held on their backs, the mode of jumping is at once seen. A very strong spine extends from the "pro-sternum," or first portion of the thorax, and projects so far backwards that its end passes into a deeply-grooved cavity formed by a projection between the middle pairs of legs. A side view of this spine shows that it is shaped just like the "pall" and ratchet in machinery; indeed, so exact is the resemblance, that in looking at the leaping spine of a large Elater, it seems as if the pall and ratchet must have been copied from it.

Now for its use. When the Beetle falls on its back, it first feels about with its legs, trying to find a foothold, and, after failing, makes up its mind to leap. It gathers up its legs closely to its body, and, in some instances, lays its antennæ in two grooves which run along the under surface of the thorax. It then bends its thorax very far back, so as to arch itself completely from the surface on which it is lying. This movement lifts the end of the spine just out of the notch in which it has lain, and which is so made that whereas the spine can be slipped out easily enough, it cannot be restored to its place without some force and a sharp jerk.

The insect then begins to straighten its body, but is prevented by the end of the spine. Were the spine perfectly stiff, the insect would probably never straighten itself again; but being highly elastic, it bends, and then springs into its place with a sharp clicking sound, thereby jerking the shoulders—if we may so call them—against the ground, and flinging the insect high into the air. Some writers have said that the end of the abdomen and the head are struck against the ground, but I am certain that the method which I have described is that which is employed by the Skipjack Beetles.

The name *Elater*, signifying "striking" or "bounding," refers to this remarkable power of leaping.

Our example of the Elaterides is the curious Beetle called *Alaus mœrens*, a native of India. The whole upper surface of this insect is cream colour clouded with grey, and covered with a number of black spots, streaks, and patches, too numerous to describe, and varying in different specimens. There is, however, always a large patch on the outer edge of each elytron, nearly in the middle. On a closer inspection it is evident that the real

colour of the elytra is black, and that the white surface, which looks just like paint, is only superficial. It is, however, stronger and attached more firmly than is generally the case, and will resist a moderate scratch of a needle.

When the antennæ and legs are tucked close to the body, this Beetle scarcely looks like an insect, but resembles a piece of bark covered with white lichen. I feel quite certain that if one of these Beetles were to cling to the bark of an old lichen-covered tree, the keenest eye would not detect it except by accident. Those who are practically acquainted with our own Skipjack Beetles know that there is one species, *Lacon murinus*, which is in colour so exactly like a piece of old bark, that if it flies to an elm or oak trunk and settles there, it will hardly ever be discovered, even though it were actually seen to settle.

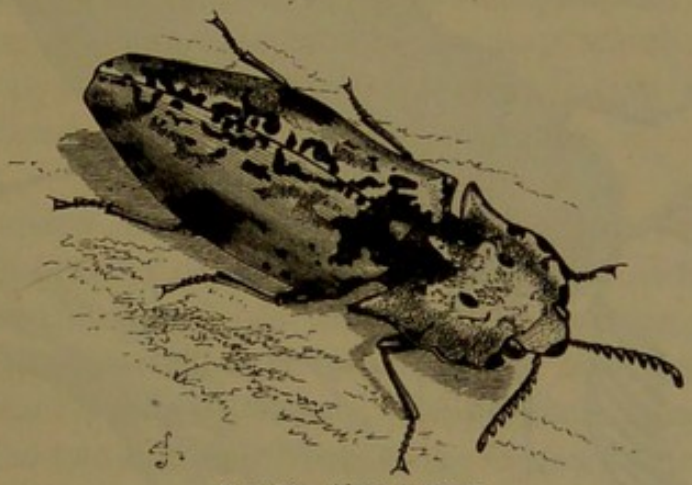


FIG. 73.—Alaus mœrens.
(Black and white.)

There are many species belonging to the genus, all of which are dressed in the same sober hues, and some are marked in a manner which is almost grotesque. One of these is *Alaus oculatus*, of Florida. The thorax in this insect is dark creamy grey, and on either side is a large oval spot of jetty black, surrounded by a narrow belt of pure white, so as to have an eye-like appearance reminding the English entomologist of the similar spots on the caterpillar of the Elephant Hawk Moth. Then there is another species, *Alaus lymphatus*, with the whole of the upper surface snowy white, relieved by a few small black spots.

The generic name *Alaus* is Greek, and signifies "dull" or "obscure," and the specific name *mœrens* is Latin, signifying

"mourning;" both names being given to the insect in consequence of the sober black and white of its colouring.

THE splendid insect which is shown in the accompanying illustration belongs to another group of Elaters. If the reader will look at the figure of the Alaus and at that of our present species, he will see that the ends of the elytra are, in the former insect, blunt and rounded, and in the latter, drawn out into long sharp points. The name *Oxynopterides*, which is given to this group, signifies "sharp-winged," and refers to this formation.

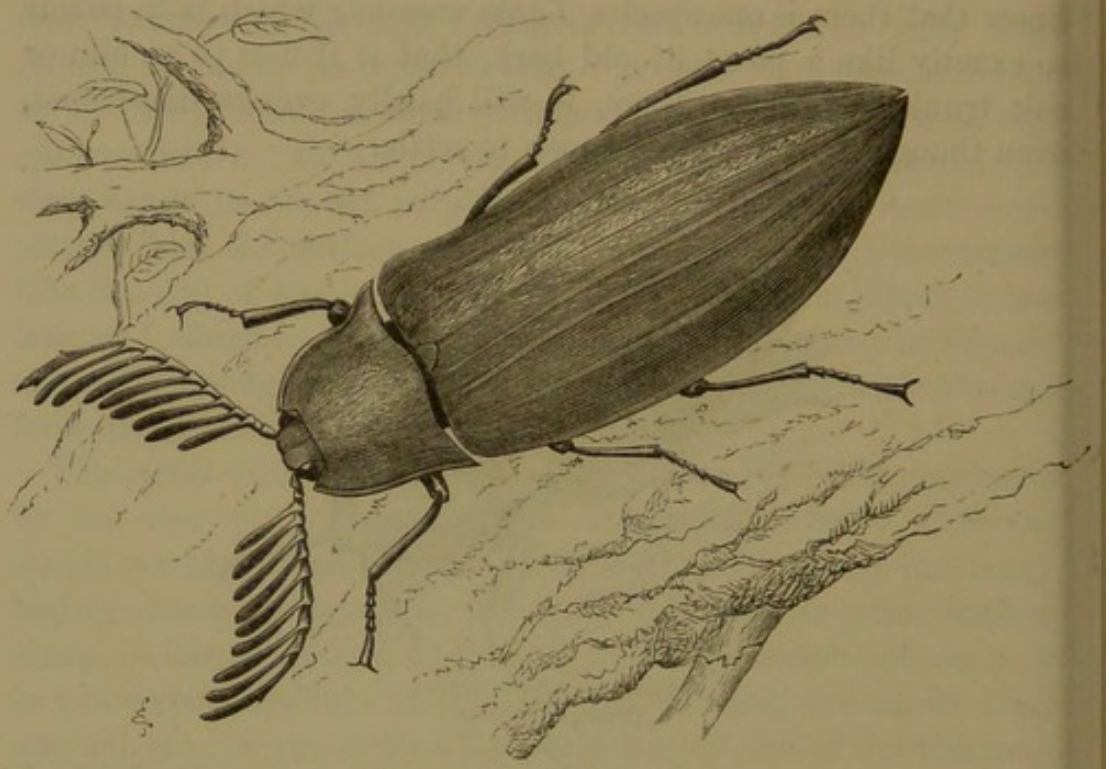


FIG. 74.—Oxynopterus Cumingii.
(Reddish brown.)

The most striking point in the appearance of this insect is the beautifully feathered structure of the antennæ in the male. To each of the joints is attached a long, narrow, flat projection, or "flabellum," not unlike those of the Lamellicorn Beetles, which gives to the whole organ the appearance of a fan. The female does not possess these beautiful appendages, her antennæ being only toothed, the point of each tooth showing where the flabellum would be in the other sex. So important is the antenna in the general appearance of the insect, that although the female is larger than the male, she absolutely seems to be smaller, so much

does the absence of the feathered antennæ detract from her appearance.

The colour of this fine Beetle is reddish brown, but there is a difference between the thorax and elytra. The former looks rather paler than it really is, because it is sprinkled with tiny, very short, yellow hairs. These hairs are not thick enough to constitute a downy coat, but are sufficiently plentiful to modify the colour of the surface. The elytra are mahogany-red, and each of them has three slight ridges extending throughout its entire length. The insect was brought from the Philippines by Mr. Cuming, whose exertions in the cause of science are of world-wide reputation.

Owing to the great size of this Beetle, the structure of the leaping apparatus is beautifully shown; and I should think that as the elastic spike is quite as large as a crow-quill, and about three-quarters of an inch in length, the leap which the insect makes must be an enormous one, and the clicking sound proportionately loud.

THE Elaterides are represented by an insect of universal celebrity, the FIREFLY of the Tropics (*Pyrophorus noctilucus*).

This wonderful insect has the power of emitting a powerful greenish light from two oval spots, one on either side of the thorax, together with a differently coloured light from the under surface. The two luminous spots of the thorax are pale shining yellow, and look very much as if a second pair of compound eyes had been placed there. This light has been so admirably described by Mr. Gosse in his "Naturalist's Sojourn in Jamaica," that I cannot do better than quote his account:—

"I will now speak of one other luminous insect, the Glow-fly (*Pyrophorus noctilucus*). From February to the middle of summer this Beetle is common in the lowlands, and at moderate elevations. Lacordaire's account of the luminosity of this Elater (known to me, however, only by the citation in Kirby and Spence's Introd. to Ent. ii. 333, 6th edit.) differs so greatly from the phenomena presented by our Jamaica specimens, that I cannot help concluding that he has described an allied but very distinct species, and I feel justified, therefore, in recording what I have myself observed.

"The light from the two oval tubercles on the dorsal surface

of the thorax is very visible, even in broad daylight. When the insect is undisturbed, these spots are generally quite opaque, of a dull white hue ; but on being handled they ignite, not suddenly, but gradually, the centre of each tubercle first showing a point of light which in a moment spreads to the circumference and increases in intensity till it blazes with a lustre almost dazzling. The colour of the thoracic light is a rich yellow green. In a dark room, pitch dark, this insect gives so much illumination as to cast a definite shadow of any object on the opposite wall, and when held two inches from a book the whole line may be read without moving it.

"The under part of the thorax has a singular appearance when the tubercles are fully lighted up; for the horny coat of skin, being somewhat pellucid, displays the light within redly and dimly, as if the whole thorax were red hot, particularly at the edges, immediately beneath the tubercles. When left alone, the insect soon relapses into stillness, and the tubercles presently fade into darkness, either total or redeemed only by a spark scarcely perceptible.



FIG. 75.—Cucujo, or Firefly
Pyrophorus noctilucus.
(Pale yellow-brown.)

"I had been familiar with this Glow-fly for some weeks, and had made the above observations on it without being aware that it possessed any other source of light than the thoracic tubercles. I had, indeed, remarked that when flying at liberty the light which it diffused was of a rich ruddy glow, and yet these individual insects, if captured and held in the hand, showed only green light. I much wondered at this, but knew not how to account for it until a friend explained it, illustrating his remarks by experiment.

"On the ventral surface, when the abdomen is extended, there is seen, between its first segment and the metathorax, an oval transverse space, covered with thin membrane, which glows with orange-coloured light, totally concealed, however, when the

abdomen is relaxed, by the overlapping of the metathorax. When the insect is placed on its back, it throws itself into the air like other Elaters; but if it be made to repeat this many times, it appears to become weary, and endeavours to raise itself by bending the head and the abdomen back, so as to rest on the extremities, in hope to roll over. It is when thus recurved that the abdominal light suddenly appears, the oval space being uncovered. When held in the hand, the same effect is produced by forcibly bending back the abdomen with the fingers; but this is not very easy of accomplishment, on account of the resistance of the closed elytra; but if these be held open with one hand and the abdomen recurved with the other, it is readily shown.

"As the open space, then, can be exposed only when the elytra are expanded, the reason is manifest why the red light is never displayed by the insect when walking or resting: the green thoracic light, on the other hand, may be displayed at any time; it is, however, very rarely shown during flight. On one occasion two or three glow-flies, having entered the sitting-room in the evening, gave out the red light most brilliantly as they flew round near the ceiling, the spectators being beneath them. One of these, being alarmed by my efforts to capture it, gave out the thoracic light also very brightly; and the mingling of the red and green light in the evolutions of flight produced an effect indescribably beautiful.

"That the thoracic light is subject to the will of the insect is indubitable; but whether the same can be predicated of the abdominal light I am not assured. During flight it is every second intermitted, as far as the observer can detect; but its appearance or disappearance may depend upon whether the dorsal or ventral surface is presented to the eye. This is when, soon after dark, the insect is sweeping in rapid, headlong, irregular curves over the fields or along the edges of the forest; when the appearance resembles that of a stick with the end on fire (but not in flame), carried or whirled along by one running swiftly; quenched suddenly, after a course of a dozen yards, to appear again at a similar distance. When slowly flying over the grass, the progress of one may often be traced by the red glare on the ground beneath; a space of about a yard square being brilliantly illuminated, when no light at all reaches the spectator's eye from the body of the insect.

"Whether any light would appear pervading the abdomen if the segments were stretched, I cannot positively say, for I have not in my journal any note on this point. I think not, however, for in my repeated handlings of these insects and experiments on their abdomens, I could scarcely have avoided extending the segments, even unintentionally; but I am quite certain I never saw any light except in the one ventral and the two thoracic spots. If one be trodden on, a mass of mixed light remains for some minutes among the fragments."

"The story told by Peter Martyr of these Elaters having been hunted for, to eat the mosquitos, is sufficiently amusing; of course it is not right to contradict a statement because one has never verified it, but I may be permitted to observe that I utterly disbelieve it. That they might afford a substitute for candles in performing household operations that required no great exactness is certainly true, provided they were constantly carried in the fingers; but if put under a glass, or allowed liberty in a room, as I have abundantly proved, they very quickly conceal their light. I have found, too, that one kept beneath a glass would display very little light the next evening, even under the excitement of being handled, and on the following night would be irrecoverably dark; this may have resulted from the lack of food, or of exercise; not, I think, from the lack of air or of moisture.

"Peter Martyr asserts that the natives of Hispaniola, at the time of the discovery, were in the habit of tying one of these glow-flies to each of their great toes when they journeyed by night through the woods; a thing not at all improbable. The two insects would throw a considerable light around the traveller's steps, and, if they should withhold their luminosity, might easily be replaced by others freshly caught. On this custom Southey, in the beautiful poem already quoted, has founded a pretty incident. When Coatel was guiding Madoc through the cavern—

> 'She beckoned, and descended, and drew out
> From underneath her vest, a cage, or net
> It rather might be called, so fine the twigs
> Which knit it, where, confined, two fire-flies gave
> Their lustre.'
>
> *Madoc*, 11, xvii."

"Of the earlier stages of any of these light-bearing insects I have been able to procure little information. About the middle of May a larva of an Elateridous Beetle was brought to me which was luminous; in the dark the whole insect was pellucid, but the divisions of the segments showed distinct light, blue and pale, not very vivid. It was impatient of being handled, and bit fiercely at the hand, but ineffectually. I suspect that it was the larva of the Glow-fly. The specimen is now in the British Museum. And at Content, in the latter part of July, I found in fresh-turned earth a larva of a Lampyris, small and lengthened: the abdomen, like that of the European glow-worm, was furnished with a retractile brush of divergent filaments, ordinarily concealed; but having no lens with me, I could not examine it particularly."

I may here mention that the light of the Cucujo has been tested by the spectroscope, but with very little result, the spectrum being merely a "continuous" one, *i.e.* without any bars across it, either dark or luminous. I have tried the common glow-worm by the same test, and found the same result. It is as well with the latter insect to have several specimens together, as the light is not nearly so powerful as that of the Cucujo.

It is said that the Cucujo will fly to a lamp or torch, but this statement has been denied by some travellers. That they have not succeeded in attracting the insect to a light may be true enough, but that the insect can be so attracted is perfectly true, as is shown by the following letter which I received lately from one of my brothers, who has lived for some years in Brazil, and has always taken great interest in entomology:—

"There was a very strange case of the attraction of light for some species of insects. On Tuesday last, a Brazilian gentleman was with me looking out of the door after dark, and we saw a very bright light some five hundred yards off. It was moving about the trees on the side of a high hill that rises from the side of the river.

"After watching it for some time, my friend said that it was a '*vagalume*,' and that if I put a light out at the door it would come to it. So, though rather unbelieving, I brought out a lamp, and, sure enough, the light, instead of continuing among the trees on the other side of the river, came straight to the lamp, and not two minutes from the time that I brought out the lamp

the creature was in the net. It turned out to be what in your Natural History is called the 'Cucujo.'

"I have it still alive in a chip pill-box, through which the light is perfectly visible in a dark place. I want to try some experiments with the luminous spots, and, if possible, detect their nature and origin."

That this habit of coming to the light was known to the earlier naturalists is evident from the same Peter Martyr, or Pietro Martire, to whom Mr. Gosse has alluded. In his "Decades of the New World" he remarks concerning the insect: "Whoso wanteth cucuij, goeth out of the house in the first twilight of the night, carrying a burning firebrande in his hande, and ascendeth the next hillock, that the cucuij may see it, and hee swingeth the firebrande about, calling cucuius aloud, and beateth the ayre with often calling and crying out, *cucuie, cucuie.*

"Many simple people suppose that the cucuij, delighted with that noise, come flying and flocking together to the bellowing sound of him that calleth them, for they come with a speedy and headlong course; but I rather think that the cucuij make haste to the brightnesse of the firebrande because swarmes of gnattes fly into every light, which the cucuij eat in the very ayre, as the martlets and swallows do. Some cucuius sometimes followeth the firebrande, and lighteth on the grounde; then is he easily taken, as travellers may take a beetle, if they have need thereof, walking with his wings shut.

"In sport is merriment, with the intent to terrify such as are afraid of every shadow, they say that many wanton wild fellowes sometimes rubbed their faces by night with the fleshe of a cucuius, being killed, with purpose to meet their neighbours with a flaming countenance; as with us wanton young men, putting a gaping vizard over their faces, endeavour to terrify children or women who are easily frighted."

Some of these insects have been brought alive to England, the bags in which they were kept being every day dipped in water. They fed upon sugar-cane, which they easily broke with their mandibles, and when the cane was exhausted they fed freely on brown sugar. Mr. Lees, who first succeeded in this attempt, remarks that when the insects were roused and in perfect vigour, the whole body seemed to be saturated with luminosity, even the back shining when the elytra and wings

were expanded. His account is given at length in the "Zoological Journal," vol. iii.

The larva as well as the perfect Beetle feeds upon sugar-cane, and, considering the vast numbers of the insect, it probably does much harm to the sugar crops. Mr. Hill suggests that as the sugar-cane, in order to prosper, requires a great amount of phosphates in the soil, the phosphorescent light may be primarily referred to the soil.

Beautiful as is this insect by night, it is by day but an ordinary brown Beetle, without a single element of beauty except a certain elegance of form. The thorax is dark brown, and the elytra apparently of a lighter colour. They are in reality black, but are covered with a pale dun-coloured down, which is but lightly attached and easily rubbed off. Below, it is black, rather deeply punctured, and thickly sprinkled with small yellowish hairs. There are several species of Noctilucus, but that which has been described is the best known and the most brilliant. This is by no means the only insect that is called by the name of Firefly; some are closely allied to the Cucujo, and others more nearly related to the well-known glow-worm.

CHAPTER XII.

MALACODERMI, OR SOFT-SKINNED BEETLES.

THE insects which are classed under the title of Malacodermi, or Soft-skinned Beetles, agree in some points with the Elaters, while in others they depart widely from them. The bodies of these insects, including the elytra, instead of being hard and firm, are soft, flexible, and generally covered with down. Indeed, the elytra are so delicate in some of these insects, that the circulation of the blood may be observed through their textures. It is easy enough to see the circulation in the wing itself, as anyone who has a microscope may prove; but that the tiny, transparent, colourless globules should be seen through the wing-case itself, is rather startling. The antennæ are long, slender, and often deeply-toothed, and the jaws are quite feeble. Our common "Soldiers" and "Sailors," and the glow-worm, are familiar examples of the Malacodermi.

In this country none of the Malacoderms attain very great size, neither is there much to notice in their forms. Abroad, however, they are much larger than in England, and assume some very singular forms, one or two of which will be presented to the reader.

THE Lycidæ are in many of their habits like our Soldier Beetles. They are found in flowers, especially the umbelliferous flowers that grow on the borders of woods. Everyone who has watched the habits of insects knows that the Soldiers thoroughly deserve their popular name, they being, in spite of their soft exterior and harmless appearance, the most combative of insects, even the two sexes fighting with each other, and the victor generally eating the vanquished. The Lycidæ are equally ferocious, and, from this propensity to kill and eat their fellow insects, have

derived their scientific name, which signifies "wolf beetles." Like our Soldiers, they are accustomed to let themselves fall to the ground when alarmed, and simulate death until they think that the danger has passed away.

The remarkable insect which is shown in the illustration affords a good example of the exotic Lycidæ. Its elytra are very broad and very flat, somewhat like those of the Mormolyce, or Fiddler, which is described on page 39. If the insect be viewed on the under surface, the elytra are seen to be exceedingly thin and almost transparent, with a sort of network texture wrinkled longitudinally, and having the edges slightly rolled over so as to form a narrow, strengthening rim. The head is lengthened, pointed, and turned downwards, so as to enable the insects to reach the flowers which are their legitimate food. The colour of this species, and indeed of nearly all the Lycidæ, is orange with black marks. This Beetle is a native of Africa, which is the home of the Wolf Beetles. The elytra are not quite rounded behind, but each is slightly scooped at the top, very much as if a piece had been bitten out of them. It is to this circumstance that the species owes its name of *præmorsus*, or "bitten."

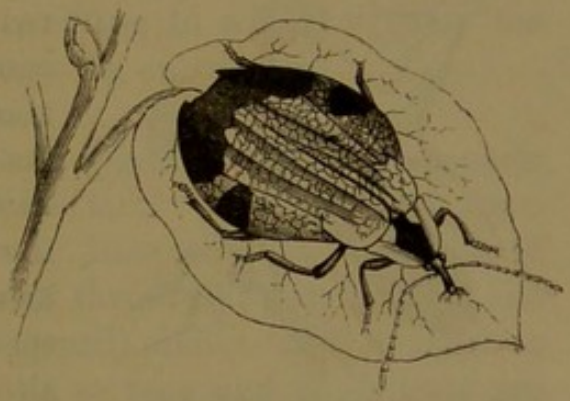


FIG. 76.—Lycus præmorsus. (Orange and black.)

There are very many species of Lycus, one of which, *Lycus scutellaris*, has the elytra scarcely thicker than silver paper, and instead of being scooped at the end, the tips are drawn out into black, flattened projections, very much like the wings of the Swallow-tailed Butterfly. Most of the species show scarcely any difference of shape in the two sexes, but some of them, such as *Lycus Bremii*, a native of Southern Africa, are extremely different, the male having the elytra wide and flat, while those of the female are not only narrow, but even scooped at the sides.

Nearly all the Lycidæ are foreign insects, but we have two British species, both belonging to the genus Dictyopterus. The best known of them is *Dictyopterus Aurora*, which is found in Rannoch Wood, Perthshire. It is almost always taken under

felled timber, and, being very slow in its movements, is easily captured. The colour of its elytra is red, and the length of the Beetle is barely half an inch. The generic name, *Dictyopterus*, is formed from two Greek words signifying "net-winged," and is given to the insect on account of the network-like texture of the elytra, which has already been mentioned in connexion with *Lycus præmorsus*.

THE very remarkable insect which is shown in the illustration belongs to a group which are appropriately named Rhipidoceridæ, from the structure of their antennæ. The name is Greek, signifying "fan-horned," and is given to the Beetles because the antennæ of the males are furnished with a number of flattened or linear appendages, which in some species radiate like the sticks of a lady's open fan. These insects are remarkable for another peculiarity. As a rule, the antennæ of Beetles have eleven joints, but those of the Rhipidoceridæ have from sixteen to forty joints, according to species. The present insect has, altogether, thirty-one joints; namely, three simple joints next the head, then four toothed joints, and then twenty-four joints each furnished with a flabellum of greater or less length. In the female the number of joints is less, and they are merely toothed.



FIG. 77.—Rhipidocera mystacina. (Black, speckled with white.)

The Beetle which is called *Rhipidocera mystacina* is a native of New Holland, and has been selected as forming an excellent type of the family. The thorax is black and hairy, and the elytra are also black, longitudinally ridged, deeply granulated, and decorated with a number of snowy white spots arranged in longitudinal rows. The legs are black, except the thighs, which are deep red.

The antennæ of this insect are singularly beautiful. Each of the numerous flabella with which it is adorned is formed very much like a spear, supposing the shaft to be beaten flat and more or less bent. In consequence of this formation, and the extreme regularity with which they are set on the antennæ, dark

patches seem to play among them as the light shifts, exactly as we have all seen when walking in a diagonal direction to a row of iron palings. The specific name *mystacina* is Greek, and signifies "moustached"—the latter word, indeed, being only a Gallicized form of the Greek, and from the French naturalized in English.

Like the preceding insect, the Rhipidocera is slow and sluggish in its movements, and neither on foot nor on the wing does it move swiftly enough to make its capture difficult. It never rises to any height in the air, but, like our own Soldiers and Sailors, is found on the low plants at the edges of the forests. It does not, however, feed upon the flowers, but prefers the leaves and the young tender shoots. M. Lacordaire believes that in its larval state it feeds upon decaying wood, as he once saw a newly-disclosed specimen sitting in a burrow near the entrance, as if about to emerge into the outer world.

Some allied insects are gathered together under the generic title of *Callirhipis*, i.e. "beautiful fan." The males of these insects have only eleven joints in their antennæ, but each of them is furnished with a very long, thread-like flabellum, in one species (*Callirhipis Childreni* of Brazil) almost three-quarters as long as the entire body. Indeed, so long and so delicate are they, that the observer naturally wonders how the insect can keep them in order, a task which seems impossible without the use of a comb. Another species (*Callirhipis Dejeani*) has the flabellæ of the antennæ much flatter, and pressed closely together, like the sticks of a lady's fan when closed.

In all these insects the males are much more common than the females, not so much on account of their greater number, as by reason of their habits. The male flies abroad, and can easily be seen, while in many of the species the female never moves out of the burrow in which she passed through her transformations, the male having to search for a mate under these very adverse circumstances, and not even having the satisfaction of seeing her when he has found her.

We now come to the family of the Cleridæ, a group of insects which is mostly brightly coloured and banded, and generally has the body covered with hairs. In their larval state many of

them feed upon the larvæ of other insects, especially upon those of the solitary bees. A very pretty species of this family, *Clerus formicarius*, is well known to English entomologists. It is a very pretty little Beetle, red, yellow, and black in colour. Even the larva is dark pink, spotted with black. Its larva is found under bark, where it feeds on the larvæ of other wood-boring Beetles.

The present insect, which is found spread over a considerable portion of Asia and part of Europe, especially round the shores of the Mediterranean, is in every way an admirable representative of the Cleridæ. In the larval or grub state it inhabits the nests of wild bees, the larvæ of which it devours. It is beautifully coloured. The head and thorax are of the richest blue, the colour of which is, however, rather obscured by the thick downy hairs with which it is covered. The elytra are warm dun, deeply punctated, and across them are drawn two broad bands of deep purple, a patch of the same hue occupying the tips of the elytra. Altogether, except that it is so much larger, it is wonderfully like the British Clerus which has already been mentioned. The legs are purple, just like the bands on the elytra. There is a downy clothing on the elytra, but the hairs are neither so thick nor so long as on the thorax and head. The wings are large, and, as is the case with our own insects, a portion of them can mostly be seen towards the end of the body, as the ends of the elytra slightly diverge.



Fig. 78.—Trichodes crabroniformis. (Yellow and purple.)

The generic name *Trichodes* is Greek, and signifies "fine hair;" and the specific name *crabroniformis* is Latin, signifying "hornet-like," in allusion to the dark stripes on the yellow body, which at a little distance really do give to the Beetle a very hornet-like air.

There are many species of these beautiful insects, nearly all of which have a strong family likeness. Some are very small, and some are very splendid in colour, the most striking of which is a North African species, rather larger than our common Tiger Beetle. It is very hairy, has a black thorax, and yellow elytra banded and edged with the deepest green.

THE curious family of the Bostrichidæ is represented by a fine and remarkable insect, *Apate terebrans*, a native of Western Africa. All the Bostrichidæ are cylindrical in form, and show at once by their shape that they are wood-borers. As their bodies and elytra are quite hard, it seems strange that they should be ranked among the soft-bodied Malacoderms. They are, however, so evidently allied to Beetles which are acknowledged Malacoderms, that although the Malacoderms are, as a rule, soft-bodied and the Bostrichidæ are hard-bodied, we cannot deny them their relationship. Only four British species of the Bostrichidæ are known. Others have been found in England, one of which, *Dinoderus ocellaris*, was discovered by Mr. Westwood floating in a cup of coffee. It was evidently an imported specimen.

All the Bostrichidæ may be distinguished by the shape of the thorax, which projects like a hood over the head. One of the British species has this peculiarity so well marked that it has gained the specific name of *capucinus*. The head cannot be retracted into the thorax, but the latter organ is so large that the head is quite hidden under it.



FIG. 79.—Apate terebrans. (Black.)

The species which is shown in the illustration is the largest of its genus. Although it is not very large, only about an inch in length, it is wonderfully stout and solid, and the holes which it makes must be of corresponding diameter. It has nothing remarkable about its colour, which is simply black, but its form is so curious as to require a somewhat detailed description.

Beginning at the head, we find that this portion of the body appears quite of secondary importance. It is bent downwards, and so completely concealed by the large, solid, hood-like thorax that when the insect is viewed from above the head cannot be seen at all. The jaws are small, but are yet strong and sharp, and capable of cutting their way entirely through wood.

Next comes the thorax. This is also black, and the fore portion of it is covered with a number of little tubercles that gradually increase in size until near the junction of the head

with the thorax. One of them on each side is developed into a veritable curved horn, having at its base another but shorter horn, so that the two look much like a pair of callipers with one leg rather shorter than the other. The back of the thorax is quite smooth, though profusely and finely punctated.

The elytra are very curiously formed. They are deeply ridged longitudinally, and nearly at the end each ridge projects in a sharp point. After this the elytra bend downwards over the end of the body in a manner which reminds the zoologist of the Pichiciago of South America.

The whole surface of the elytra is deeply granulated in rather a peculiar manner. Those of my readers who have been at Oxford must be familiar with a mode of ornamenting stone which was absolutely a passion some thirty or forty years ago. In order to break the lights, the stone-cutters were accustomed to carve the whole surface of the stone into a series of winding channels, to which they did their best to impart an air of unstudiedness, though it was only too evident that each line was carefully arranged before it was carved. But here, in the elytra of this Beetle, and produced by natural means, is the very effect for which these masons toiled in vain, the lights being well broken up, and yet no evidence of arrangement being visible.

Beneath, the Beetle is rather dull black, and is clothed with a thick coating of yellow fur.

There are many other species of Apate scattered over the world, some being inhabitants of Africa, while some are found in China, and others in India. The generic name is Greek, and signifies "deceit" or "craft." The specific name *terebrans* is Latin, and signifies "a borer."

CHAPTER XIII.

HETEROMERA, OR PARTY-LEGGED BEETLES.

Now comes a group of Beetles which are but poorly represented in England, though in the warmer parts of the world they are very numerous. These are the Heteromera, a word for which it is not easy to find an English synonym, except that which I have ventured to propose. It signifies "unequal jointed," and is given to them because the tarsus of the hind legs contains only four joints, while that of the first and middle pair contains five joints. In point of fact, however, the missing joint really does exist, though it is so small as to be hardly perceptible, being merged in the first or basal joint, which is longer than the others.

There is one foreign species which has even a less number of joints, the tarsus of the first and middle pair of legs having four joints, and that of the hinder pair only two. In fact, however, there are the same number as in the ordinary Heteromera, the apparent difference being caused by the fact that in all the legs two joints are fused together so as to appear like one. In this country the chief representatives of this group are the common Cellar or Churchyard Beetle, the Oil Beetle, the Meal Beetle, and the Cardinal Beetle. The eyes are almost invariably of a kidney-like shape.

The habits of these Beetles are exceedingly diverse, and it is generally easy to tell from the shape and colour of the insect what its habits are. Some frequent dark and damp places, just as do our common Cellar Beetles, and these insects are generally dull and sombre in colour, usually, if not always, being deep dull black. Some, which are dusky brown, inhabit sandy and dry places in hot countries; and others, again, of which our

beautiful Cardinal Beetle is a familiar example, frequent flowers.

The larvæ are as various in their habits as are the perfect insects. Some, such as the Oil Beetles (*Meloë*) and the Rhipiphorus, are parasitic in the nests of other insects, mostly those of the bee tribe, but not always.

For example, there is a curious little Beetle (*Symbius blattarum*) which, as its specific name imports, is parasitic on the bodies of cockroaches on board ship. I wish that some practical entomologist could establish the Symbius in our houses. Oddly enough, just as is the case with the insects in which it makes its larval residence, the male only is winged, the female possessing neither wings nor elytra. The larva of this Beetle is almost exactly like the perfect female, and might be mistaken for it save by the greater development of the antennæ in the perfect insect.

Some live under the bark of trees, some in fungi; some, such as the too familiar mealworm (the larva of *Tenebrio molitor*), in flour, bran, meal, biscuit-casks, and similar localities. Some are found within the stems and roots of living plants, and some on leaves. It is a pity that, as the habits of the larvæ are so diverse, so little should be known about them, especially as the foreign Heteromera are very numerous when compared with our own. Any entomologist whose vocation leads him to some hot portion of the earth, no matter in what country it may be, will find his labours amply repaid, and will confer an inestimable benefit to entomology if he will set himself the task of investigating the transformations of the Heteromera, many species of which he is sure to find if he looks for them.

Perhaps some persons may ask, what can be the use of studying the habits of insects and the mode of their transformations? I have already shown that, even with our limited knowledge on the subject, we know that the transformations of many insects are a great power in the development of the world. It is therefore but reasonable to infer that if our acquaintance with the subject were more complete, we should learn that even the smallest insects have their parts to play in the world, and that in proportion as man knows their capabilities, so is he carrying out one of the objects for which he, as well as they, were placed in the world.

Our first example of the Heteromera belongs to the family of the Anisosiidæ, and is called *Anisosis caudatus*.

This little Beetle is very simple in colour, being dull black, with a finely punctated surface. Its chief peculiarity lies in the tarsus of the hind legs. The reader will remember that in the Beetles of this division the tarsus of the hind legs only contains four perfectly developed joints. We should naturally therefore expect this member to be shorter than those of the first and middle pairs of legs. It is therefore very remarkable to find that in spite of this small number of joints this tarsus should be of any great length. Yet, in looking at this insect, we are at once struck with the extraordinary development of the tarsus of the hind legs. They are necessarily very slender, and almost look like little black hairs rather than joints. The magnifying glass, however, reveals that the four joints of the tarsus are each drawn out to a very great length, the basal or first joint being, as usual, the longest: indeed, the tarsus alone is nearly as long as the entire body. At the end of the tibia there is a very long and very slender spine, projecting inwards, so that the appearance of the limb is really remarkable.



Fig. 80.—Anisosis caudatus. (Black.)

The generic name *Anisosis* is Greek, signifying "unequal," and is given on account of the inequality in length of the legs. The Latin specific name *caudatus* signifies "tailed," and alludes to the shape of the body, which is narrowed at the end into a sort of tail. This species comes from Cape Negro.

The family of the Adesmiidæ is represented by an insect called *Adesmia variolaris*, which may be taken as the typical form of the family.

Although in its hues this insect is nothing remarkable, its colour being only soft brown, it is really a handsome Beetle, on account of the bold sculpturing with which the elytra are adorned. The whole body is very convex, and comes to a tolerably sharp point at the end. The elytra are very wide, folding over the sides of the abdomen so as to cover a full half

of it. Their upper surface is covered with large knobs running in longitudinal lines and very regularly arranged. These knobs are, in fact, nothing more than partly developed ridges, and the same can be said of any Beetle whose elytra are covered with symmetrically arranged knobs.

As in the last-mentioned insect, the hind legs are long, but in the Adesmia it is the tibia and not the tarsus which is lengthened. There are many species of Adesmia, nearly all of which are black, so that the present insect, which is a native of Old Calabar, looks quite handsome among its duller relatives. The specific name *variolaris* signifies "pitted with small-pox," and is given to the insect in allusion to the knobs or pustules with which the elytra are covered.

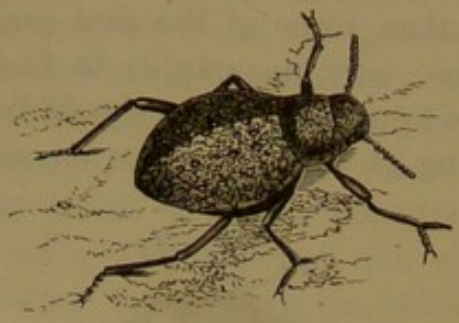


Fig. 81.—Adesmia variolaris.
(Brown.)

The family of the Zopheridæ is represented by a member of the typical genus *Zopherus Bremii*. Before proceeding further,



Fig. 82.—Zopherus Bremii.
(Yellowish grey, with black knobs.)

I may remark that some authors spell the generic name *Zophorus*, but wrongly. The word is Greek, signifying "gloomy," or

"dusky," and is given to the insects partly on account of their dull colouring, and partly because they hate the light and are always found in dark and gloomy places.

The present species is a very fine one. The head and thorax are black, but the elytra are covered with a coating of yellowish grey, which is very firmly adhesive to the surface, but can be scraped off so as to show that the natural colour of the elytra is black. The upper surface is covered with a number of bold, rounded knobs, arranged in regular longitudinal lines, and being much larger near the suture than on the edges. If the insect be viewed sideways, these knobs, the colour of which is black, are seen to project to a considerable height from the surface of the elytra.

Beneath, the colour is also dull black, but upon it are a number of round whitish spots, which on examination with a lens are seen to be formed exactly in the same manner as the white of the upper surface, and equally capable of being scraped off. The legs are black, but upon them are scattered a number of tiny white scales of the same character, only so small as to be mere specks, just as if a little of the finest flour had been dusted on them.

The habits of this insect are tolerably indicated by its shape and colour. It is a very slow walker, crawling along as if half stupefied, and even when dislodged from its hiding-place it never seems capable of hurrying its deliberate pace. It is to be found in woods, chiefly hiding itself in the bark or under the trunks of felled trees, or in the heaps of chips which the woodcutters have struck off while cutting down the trees. Consequently, an entomologist has a better chance of capturing this fine Beetle if he searches a spot where the woodmen have been at work, than if he goes into the yet untouched forest.

There are many species of Zopherus, all with similar habits, and all of sombre colours, the present species being perhaps the least dull of the whole genus. One of them is rather curiously coloured. The projections on the elytra are nearly hexagonal, and are set very closely together. As in *Zopherus Bremii*, the knobs are black and the flat surface white, so that the surface of the elytra looks something like a white net with an ebony ball in every mesh. The present species is a native of California.

Most of the Beetles which we are now examining are slow, sluggish, and dull black, or at all events sombre in hue, and so constant a character is this dulness that some systematic entomologists have gathered them into a general group under the name of *Melasoma*, or "black-bodied." These insects are indeed the typical representatives of the Heteromera; and as some of them are of considerable size, the structure of the foot can be arrived at without difficulty.

The family of the Blapsidæ is familiar to all English entomologists on account of our familiar insect the Cellar Beetle, or Churchyard Beetle (*Blaps mucronata*), which, as its popular name imports, is to be found in dark and damp places.

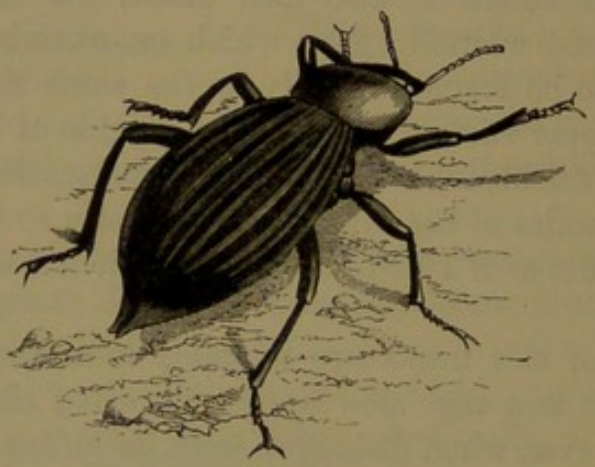


Fig. 83.—Blaps polychrestos.
(Dull black, washed with purple.)

All the Blapsidæ are so much alike in their habits that the description of one species will equally serve for others, no matter what may be their country. Of their own will they are never seen in the daylight, and even in their own familiar darkness they have no liveliness, but crawl sluggishly about with great deliberation, slowly lifting one leg after another, and reminding the observer of the gait of a tortoise. With such habits it is evident that they cannot need wings, and accordingly they are entirely without organs of flight, their elytra being so firmly soldered together that they cannot be separated without injury.

These Beetles emit an odour which is singularly unpleasant, and so peculiar as almost to baffle description. It is not like that of the larger Rove Beetles, of the Burying Beetles, or the Ground Beetles, but is a sort of mixture of them all, together

with a little asafœtida and any other odour which the reader may happen to dislike; and as it clings very tightly, and is not easily abolished, even by several washings, the Blaps is an insect to be let alone, especially as it does no harm.

The present species is found in the country through which the White Nile flows. Its colour is dull black, but when it is illuminated by a side light a slight wash of purple is perceptible. The whole surface is very finely punctured. In appearance it differs little from our own species, except that the elytra—instead of being brought to a single sharp point, from which the Beetle has derived its specific name of *mucronata*, or "dagger-shaped," —diverge from each other at the ends, which are prolonged into two rather long points.

In Mouffet's "Theatre of Insects" there is a quaint account of the Blaps, in which the author takes for granted that the insects are quite as disagreeable to each other as to mankind, and are perfectly aware of the fact:—

"It is of a pure black glistening colour, very slow-paced, as no creature the like, the body so framed and ordered that you would swear it were winged and had sheath-wings; nevertheless none of them have any wings, no, not the male itself amongst this sort of them (whatever *Pliny* dreameth to the contrary).

"It hath thin slender long shanks; remains in deep cellars; it creepeth very slowly, but at the least glimpse of light and whisper of talk, she hides herself; a shamefac't creature, certainly, and most impatient of light, not so much for its ill-favouredness, but the guiltiness of its conscience in regard of the stinke it leaves behind it, and of its ill behaviour, for it frequents base places, and digs through other men's wals, and doth not only annoy those that stand near it, but offends all the place thereabouts with its filthy savour. The mouth of it is forked, the back covered (as it were) with a sheath-wing; so solitary a creature that you shall scarce find two of them together."

It is rather remarkable that Mouffet, though he persistently calls the insect which he is describing a "Blat," and is good enough to place it among the Moths, gives a really fair figure of the Blaps and a very good description of the insect. Alluding to the then popular notion that the imperial purple dye (which was kept a profound secret by the few dyers who knew how to

prepare it) was made from the Blaps, he proceeds as follows:— "These little creatures, though they are baleful to nature itself, to men and bees, yet God hath endued them with sundry virtues, in which they excel the Blattæ Bizantine. For take off his shell or mail, which is thin between its head (called *papaver*) and its neck, what doth the belly contain but the ornament to dye withall, and to delight the eyes with their colour? And be it so that princes and great men will buy it though never so dear, and by the greatness of the price make it only fit for kings to wear; yet notwithstanding when you have heard the virtues of these Blattæ, otherwise so contemptible, you will say they are far more esteemed than purple."

The same writer then proceeds to affirm that the Blaps is a certain cure for ear-ache if beaten up with old wine, honey, pomegranate-rind, *unguentum Syriacum*, apple-juice, tar, and onion. This delightful mixture is to be boiled in a pipkin, and when cold to be poured into the ear.

The reader will remember that many of the dark-bodied Heteromera are very dull and slow in their movements. In allusion to this disposition the name of *Moluridæ*, or "sluggish,"

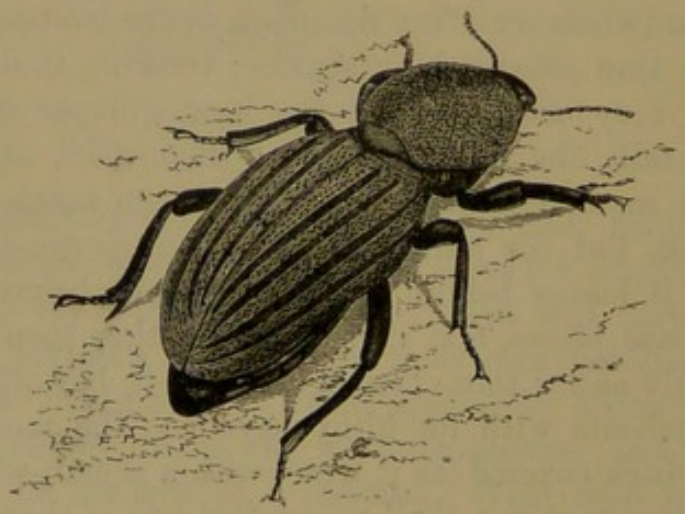


Fig. 84.—Moluris Rowleyiana. (Black.)

is given to the vast family of Beetles. The particular species which has been chosen as the representative is *Moluris Rowleyiana*. Moluris is one of the many genera that have been made out of Pimelia, which may almost be called a genus of all work, or a refuge for destitute Heteromera, so large did it

become by the additions which were perpetually being made to it.

The present insect is one of the largest of its kind, the specimen from which it was drawn being an inch and three-quarters in length. The colour of this species is black. The head and thorax are finely granulated, and if examined with a magnifier the whole surface is seen to have a peculiar gloss, caused by the edges of the granulations being highly polished, while the interior of the cells is dull and rough.

The elytra have several curved ridges upon their surface, not running parallel to the suture, as is generally the case with such ridges, but taking a slight and graceful double curve. These ridges do not extend throughout the entire length of the elytra, but start near the base and reach nearly but not quite to the tip. They are very narrow at their commencement, swell out gradually in the middle, and then become attenuated again towards the end, where they join each other. Beneath, the insect is wholly dull black, and the legs are of the same hue. There is a little golden down on the under surface of the shoulders.

The present species has rather a wide range of country, specimens in the British Museum having been taken both in East and West Africa. There are many species of Moluris, and it is worthy of remark that there are two distinct types of form, some of the insects being shaped like that which has just been described, while others are much thicker, more rounded, and have the thorax nearly globular. Among them may be mentioned *Moluris Rouletii*, which looks almost like a black spider, the abdomen being shaped almost exactly like that of our common garden spider, and the little head so overshadowed by the round globular thorax, that it scarcely seems to be a distinct part of the insect, and the two seem to be fused together, as is the case with the spiders. This species is quite smooth and shining, but others have a few waved marks on their elytra, very much like those of *Moluris Rowleyiana*.

Then there is *Moluris Perreti*, a very odd-looking spider-like Beetle, with curiously ornamented elytra. The upper half is tolerably smooth, but over the remainder of the surface are scattered a number of projecting knobs, while towards the tips the elytra are lengthened and flattened. *Moluris albifrons* of Southern Africa has a very curiously shaped body. The elytra

are flattened at the top, and dull black. They are then suddenly folded over so as nearly to cover the sides, and are then polished, shining black, of a steely character. The legs are entirely covered with pale yellow down, and contrast boldly with the shining black of the body. In some species the body is large, round, and thick, and upon it are scattered a number of long yellow hairs, which give the insect a sort of bee-like aspect.

It is said that in one of the allied species the female has a round, hard, granulated spot on the middle of the second segment of the abdomen, and that by striking this upon any hard substance she produces a sound which seems to attract the male. I very much doubt, however, whether this hard spot be used for such a purpose. In the first place, it would be no easy matter to strike hard enough to produce a sound which the male is likely to hear; and, in the second, such sounds appear to be always produced by the male insect, such, for example, as the grasshoppers, crickets, cicadæ, and the like.

THE family of the Amarygmidæ is represented by the remarkable insect which is shown in the illustration on the next page, and which has been hitherto undescribed. It is found in Southern Africa. At first sight it looks wonderfully like a cockroach, its long and comparatively slender legs stretching far from the body just as do those of a cockroach, and the long, slender antennæ of the male having a very blatta-like aspect. So great is the development of the limbs, that, whereas the entire length of the insect is only an inch and a quarter, the hind legs measure very nearly two inches in length. The generic name, *Eupezus*, signifying "well-footed," refers to the great length of limb.

The legs are black, and profusely punctured. The reader will notice that the length of the leg is chiefly owing to the development of the tibiæ, which are slender and slightly curved. Those of the first and second pairs of legs are clothed with dense golden pile, while those of the hind pair of legs are entirely plain. The object of this down is quite a problem to entomologists. It can hardly be meant for mere ornament, inasmuch as it often appears on the under side of the insect. It certainly must serve some definite purpose, though at present that purpose is unknown.

If it appeared always in one part of the body, some conjecture

as to its use might be offered; but it is exceedingly capricious, appearing now on one part of the body, now on another, and seeming to obey no particular rule. For example, in *Eupezus nigerrimus*, the down exists on two pairs of legs and not on the third. In the Moluris it occupies the shoulder and disappears from the limbs. In the Hercules Beetle a ridge of such hair runs along the under surface of the beak-like thorax, and in a weevil, which we shall presently see, the elongated head is surrounded with radiating golden down, so that it looks like a small bottle-brush.

Now, it is evident that whatever may be the function which this yellow down exercises, it must be one which belongs equally

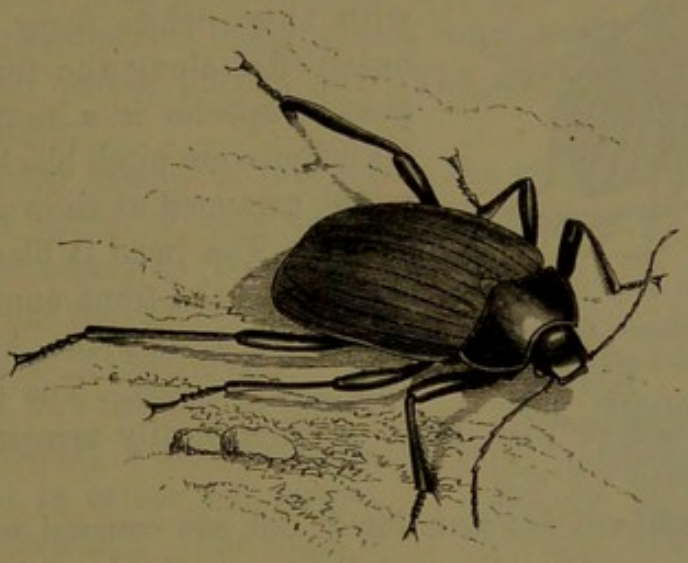


FIG. 85.—Eupezus nigerrimus. New species (Black.)

to all the parts of the body on which it appears, and that therefore it cannot be for the purpose of giving the insect a firmer hold, as has been suggested by those who have judged from its presence on the legs; or for the purpose of absorbing the juices of plants, as has been said by those who judged from its presence on the head; or for the purpose of affording warmth, as has been conjectured by those who judged from its presence on the body. There can be no doubt that it does exercise some function which it can discharge in all these positions, though what that function may be is at present a mystery.

To return to our present insect. The head and thorax are shiny black, and so are the elytra, which are striated and punc-

tured. In the male the antennæ are long and slender, as shown in the illustration, but in the female they are comparatively short, being only about one-half as long as the body. There are but a few species of Eupezus, all of which are black, though none are so jetty black, so shining, so large, or so long-legged as *Eupezus nigerrimus*.

Of the family of the Nycteliidæ we take as our example *Gyriosoma Leuzotii*. With regard to this genus, Lacordaire has the following statement :—"These are large and remarkable insects, mostly black, shining, and silky, having on each of the elytra a variable number of oblique channels which are filled with short, white furry down, lying nearly flat along the furrows." The present species is a native of Chili. Its colours are pitch black and greyish white, arranged as shown in the illustration. The head is black, and so is the thorax, the front angles of which are rounded, and the hinder angles long and pointed. The centre of the upper surface or disc, as it is scientifically termed, is thickly wrinkled.



Fig. 86.—Gyriosoma Leuzotii. (Black and white.)

The elytra are not punctated, but are covered with irregular striæ. Running from the scutellum towards the tips of the elytra are several white patches. These patches are irregular, not only in shape and size, but even in number, some specimens having only five, while others have six or seven. Beneath, the insect is pitchy black.

Like most of the Heteromera, this insect is of a shy and retiring disposition, hiding itself under stones and in similar localities, and is slow and sluggish in its movements.

The family of the Lagriidæ is very familiar to English entomologists on account of the only British representative of the family, *Lagria hirta*, so plentiful in the summer in hedges and upon flowers. The name Lagriidæ is formed from a Greek word signifying "a hare," and is given to these Beetles on account of the dense and long down with which many of the species are covered.

Lagria basalis, which has been chosen as the representative of the family, is a native of Northern India, and is a singularly beautiful insect. Its body is very convex, so as to be nearly cylindrical. The head and thorax are apparently black, but when viewed by a strong light are seen to be the very deepest purple, just as a so-called black coat is mostly blue, and not black. The elytra are curiously granulated, the granulations running in curves so as to produce a sort of uncertain spiral pattern, thus giving a peculiar soft richness to the surface. The colours of the elytra are so equally divided that it is not easy to say which is the ground hue. The basal half of each elytron is deep, glowing purple, to which fact the insect owes its specific name of *basalis*. The remainder of the elytron is yellow, the punctures or granulations being shown much more distinctly on the yellow than on the purple half. The under surface of the body is dull black.

There are many species of this genus, the present being by far the largest in point of size and the handsomest in point of colour. Little seems to be known of the larvæ of the various species and their habits. The larva of our own species is, like the perfect insect, clothed abundantly with long hairs, and its shape is rather cylindrical, but flattened beneath. The pupa is also hairy. Mr. Westwood mentions that he has often beaten the larva out of whitethorn hedges in the spring and autumn; and Lyonnet states that he took the larva at the foot of oak-trees, under a quantity of fallen leaves, on which they were feeding. Their larva is, however, generally thought to be carnivorous. When disturbed they roll themselves up, and Lyonnet states that they assumed the pupal form at the beginning of July, emerging in the perfect state in the wane of the same summer.



FIG. 87.—Lagria basalis. (Purple and yellow.)

THE Beetle which is represented in the illustration on the next page has never before been described. It belongs to the family Evanioceridæ, and I have given to it the name of *Trigonodera angulata*. The former of these names is Greek, and signifies

"triangular-skinned." It is given to all the Beetles of the genus because, when viewed from above, the thorax appears more or less triangular.

In the male insect the antennæ are beautifully feathered, and the eyes are greatly developed, meeting together on the top of the head. Indeed, the head seems to be all eyes, much like the head of a blue-bottle, and it is so bent downwards under the thorax that it cannot be seen when the insect is viewed from above. In the female the antennæ are comparatively simple, and the eyes are much smaller.

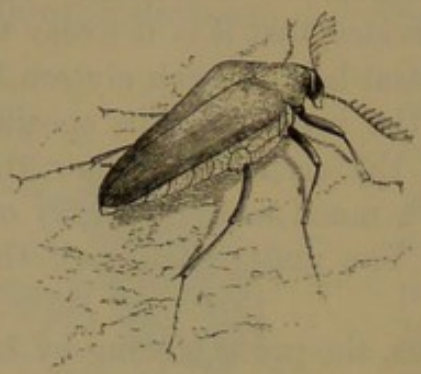


Fig. 88.—Trigonodera angulata. New species. (Reddish brown.)

In all the species of Trigonodera the hinder curves of the thorax are pointed, but in this species, especially when viewed in profile, the curves are elongated into such sharp, angulated points, that I have given it the specific name of *angulata*. Whether viewed from above or from the side, there is a curious high-shouldered appearance about the Trigonodera that is especially conspicuous in this species, it being the largest of the genus.

All the Trigonoderæ are soberly clad, and this insect is no exception to the rule, its colour being pale reddish brown above and below, and its surface covered with a soft, silky down. This hairy covering is easily rubbed off, and then shows the real colour of the deeper elytra beneath.

Australia has been celebrated as the home of some of the most singular mammals in the world, such as the Echidna, popularly called the Porcupine Ant-eater, the various species of Kangaroo, the Tasmanian wolf (which is not a wolf at all, but a marsupial), and the Duckbill. She likewise produces plants and trees which are quite as distinct from those of the old world as are her marsupials from ordinary mammals. And, as we shall presently see, she keeps up her reputation for strange forms by producing some very odd-looking, not to say grotesque, insects.

Among these are the Beetles belonging to the genus Helæus. So remarkable are the insects which constitute the family of the Heliidæ, and so bizarre are their forms, that I sincerely

regret the necessity for selecting only one species as an example of them.

The members of the genus Helæus are found throughout Australia, and, while agreeing in general form, have some remarkable varieties of detail. Among the details in which they agree is the flattening of the sides of the thorax and elytra, the abdomen and radial thorax being rounded, as is shown in the illustration. As to the head, it is quite invisible when the insect is viewed from above, being completely hidden under the flattened perthorax. There are no wings.

The colour of the present species is rather dark reddish brown, very much like that of the "jumbles," to which reference has been made in the description of the Mormolyce, or Fiddler Beetle,

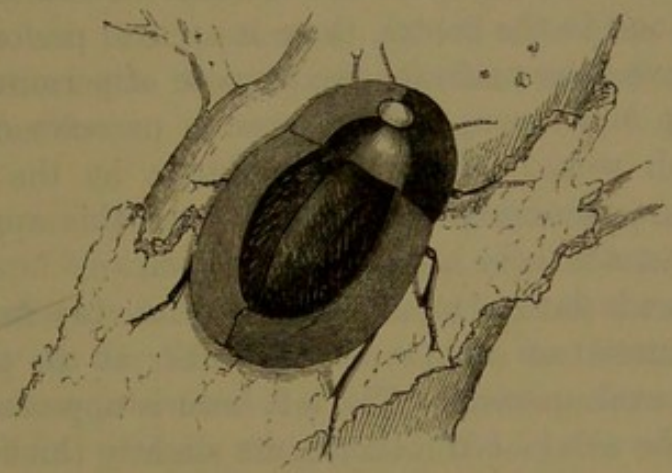


FIG. 89.—Helæus perforatus.
(Reddish brown.)

on page 40. As is the case with that Beetle, the colour is darker in the middle of the thorax and abdomen. The sides of the elytra are very much flattened and slightly turned upwards, so as to give to the insect the form of a shallow dish. We have no British insect which is exactly like it in this respect, but the flattened body of the common Water Scorpion (*Nepa cinerea*) will convey a tolerable idea of the Helæus. In spite of the large size of the elytra, there is not more material in them than would be the case were they not flattened, but they are so squeezed out that they are scarcely thicker than the paper on which this account is printed.

At the first glance at the insect it is evident that the middle of the elytra is covered with a dense coating of long hairs that stand boldly upwards, but have a very slight curvature at the

tips through their own weight. These hairs appear, when the insect is viewed from above, to be merely planted thickly on the elytra without any particular arrangement; but when the Beetle is viewed from either end, a really beautiful arrangement is at once visible. The hairs are set in rows running longitudinally upon the elytra and lying parallel to each other, being set, in point of fact, upon those ridges with which the elytra of so many Beetles are decorated. The extreme edges of the elytra are slightly thickened and rounded, evidently to give strength to a material so thin that the light shines plainly through it, even when the insect is in a cabinet.

Proceeding from the elytra to the thorax a similar structure is visible, except that there are no hairs. There is, however, a very curious element in this part of the body. Towards the front of the thorax, and in the centre, there is an oval perforation, which seems to have been made for the purpose of permitting the head to move up and down, and the eyes to perceive objects above them, which would otherwise be hidden by the overhanging thorax. On examining the insect closely, this apparent perforation is seen not to be a perforation at all.

The thorax is flat and moulded in front into two flattened horns, which are curved so as to cross each other at the tips and thus to leave an oval aperture. The left horn is uppermost, and they as well as the sides of the thorax are slightly thickened at their edges. The thorax and abdomen are so formed as to present an almost unbroken outline, scarcely any line of demarcation being visible except when carefully searched for. The true shape of the Beetle can only be seen by turning it over and looking at the under surface, when the distinction between the body and the flattened sides is shown very clearly.

There are many species of Helæus, all of which have some peculiarity which is worthy of notice. I can, however, only mention one of them, *Helæus echidna*, which was brought from King George's Sound by Captain Grey.

The thorax of this insect is black, highly polished in the raised and rounded middle and duller on the flattened sides. The elytra are also black, and they, as well as the thorax, are so boldly turned up on their flattened sides, that whereas *Helæus perforatus* resembles a dish, this species is more like a boat. On the raised centre of the elytra there are no hairs, but instead of

them are six rows of large, sharply-pointed spikes, those next the suture being the longest. It is in consequence of this structure that the insect has received the specific name of *echidna*, the spikes having some analogy with those of the well-known Echidna or Porcupine Ant-eater of the same country. Below, the insect is dull black.

The generic name *Helæus* (which ought properly to have been written *Hélaios*) signifies "an olive." I know not why it should have been given to these Beetles. The olive does not grow in Australia, and so the name could not have been given because the olive supplies food for the insect in any of its stages. And neither in form nor colour do the Helæi bear the least resemblance to olives. The specific name *perforatus* refers of course to the aperture in the thorax, but it would have been equally applicable to all the species, as in all the true Helæi the flattened horns of the thorax are curved over each other in a very similar fashion.

THE reader may remember that a reference was lately made to the great and unwieldy genus Pimelia, which has since been broken up, not only into genera, but even into families. The typical family is the Pimelidæ, of which the Beetle which is called *Prionotheca coronata* is a characteristic example. None of the Pimelidæ possess wings, and the elytra are soldered together, as is often the case with wingless Beetles. Respecting this family, Mr. Westwood has the following observations:—"But few of this extensive family of Beetles are found in this country; they are most abundant in Southern and Eastern Europe, and in the deserts of Africa. But little is known of their habits; they shun the light, and reside in salt or sandy situations, many frequenting the shores of the sea, particularly the Mediterranean.

"Their colours are black and obscure; they are uncommonly sluggish, and on being alarmed they emit a disagreeably fetid fluid, which in some species produces a coating of a whitish colour upon their bodies when dried. . . . The *Pimelia bipunctata*, observed by Latreille, inhabits the sandy shores of the Mediterranean, concealing itself in holes which it excavates with its legs. . . . Some few of the genera have only ten distinct joints in the antennæ."

The present species inhabits many parts of Africa, specimens in the British Museum having been brought from Egypt, Abyssinia, &c. The colour of the insect is black, but the thorax is so thickly covered with yellow hair that at first sight it seems to be yellow instead of black. The rather globular elytra are covered with little rounded knobs, running in parallel rows; and just at the edge, if we may so call it, where the elytra turn over the abdomen, there is a row of spikes radiating from a common centre like the rays of a coronet. The disc or middle of the elytra is plain black, but the rest is clothed with long yellow hairs, scattered rather sparingly over the surface, and without any apparent attempt at arrangement.



Fig. 90.—Prionotheca coronata.
(Black, reddish down on feet.)

Like the body, the legs are black, and are profusely though finely granulated. There is one peculiarity about them which is at once conspicuous; namely, the presence of a quantity of orange silken down upon the tarsi of all the legs. Beneath, the insect is dull black, and over the surface a small quantity of similar down is sparingly scattered.

In the British Museum there is an insect belonging to this genus which is considered to be a new species. It has a black head and thorax, and reddish brown elytra surrounded with a row of very small spikes. It was taken out of a Sinaitic mummy by Dr. Birch, of the British Museum. Whether or not it really be a distinct species I can hardly say, because the difference of colour could easily be caused by its long sojourn in the mummy.

Our last example of this group of Beetles is *Anomalipus lineatus*, which belongs to the family of the Opatridæ. We have two species of this family in England, the best known of which is *Opatrum sabulosum*, a Beetle which is found on the sandy shores of the southern coast. By some writers the word is spelled *Hopatrum*, but this is incorrect, as the Greek word, which signifies "sprung from the same father," does not contain the aspirate.

The name of *Anomalipus*, i.e. "anomalous foot," is given to the genus on account of the structure of the fore-legs. As the reader may see by reference to the illustration, the tibiæ of this insect are very large, flattened, and armed with spikes. They very much resemble the same members in the Scarabidæ, and are evidently used for the same purpose, *i.e.* digging. As if to show that such is really the object of these powerful limbs, the



Fig. 91.—Anomalipus lineatus. (Black.)

specimens of the Anomalipus which are brought to this country are generally so covered with the earth in which they have been excavating, that they must be washed before the markings on the body can be distinguished.

The general colour of the species is black, and its form is rather flattened. The thorax is widened, and on either side of the centre there is a large depression or pit, shaped something like a pear, the large end of which is uppermost. The elytra are really black, though at first sight they appear to be lighter than the thorax. This is caused by a quantity of brownish hairs, which are set in parallel rows between the boldly

projecting ridges which traverse the elytra. The contrast between these soft brown hairs and the shining black ridges is very strongly marked, and it is in consequence of this structure that the specific name of *lineatus* has been given to the insect.

The legs are also black, but the tibiæ have a decided wash of purple, and are very deeply granulated. The under surface of the thighs is thickly covered with golden red silken down, and a similar coating of down is seen upon the curved tibiæ of the hind-legs. The insect inhabits Southern Africa. There is in the British Museum a Beetle yet undescribed, which evidently belongs to this genus. It was brought from South Africa by the late Captain Speke. It is shaped much like the preceding insect, but is covered with spikes and projecting angles. The elytra are surrounded with spikes much like those of the Prionotheca: there are two bold horn-like spikes on the upper part of the thorax, the hinder angles of which are long and sharp. Altogether it must be a very unpleasant insect to grasp in the hand when alive, as its legs, though not so powerful as those of *Anomalipus lineatus*, are quite strong enough to force the spikes well into the hand. The colour of this species is dark brown.

CHAPTER XIV.

RHYNCHOPHORA, OR WEEVILS.

THE hidden virtues of the Weevils have yet to be discovered. That such virtues exist there can be no doubt, but at present they are so very deeply hidden that they are quite unknown.

We are perfectly aware that even in this country the Weevils do an enormous amount of direct injury to man. The Corn Weevil, for example, tiny though it may be individually, is collectively a formidable enemy, attacking grain in such vast swarms that the proprietors of corn-stores are obliged to sift their grain before they deliver it, and find that the Weevils which they have separated from the corn may be measured by the ton. Then the Rice Weevil is just as destructive in the grain from which it takes its name, and the Apple Weevil and the Nut Weevil do great damage in the orchards. Some Weevils attack trees, others garden plants, and others the growing crops of peas, beans, and other vegetables. Abroad, the Weevils are infinitely more destructive, because they are so much larger. There is, for example, the Palm Weevil, which will presently be described, which attacks the palm-trees and does much damage to them; and the Sugar Weevil, which causes like destruction among the growing sugar-canes.

None of our Weevils are large, and the most destructive of them are fortunately the smallest. Abroad, however, and especially in tropical climates, the Weevils attain very great dimensions, and their larvæ are correspondingly destructive. Yet, though some of these insects are so large, others are exceedingly small, some being so minute that without the aid of a magnifying glass it is not easy even to distinguish the order to which

they belong. Their variety in form and colour is quite as remarkable as is that of size.

Many of them are among the soberest of Beetles, clad in dull browns, blacks, and greys, while others are gorgeous beyond all powers of description, and look as though they had been clothed in mail formed of diamonds, rubies, emeralds, and opals, set in a network of gold. People in general do not know it, but we have in this country many Weevils which to the careless eye appear to be nothing more than little dull green Beetles, but which, when placed under a microscope and viewed in a strong light, blaze out with so intense a radiance of many-coloured refulgence that the eye can scarcely endure its splendour.

As to form, they exhibit the most extraordinary shapes, many of them being absolutely grotesque. Some of these Beetles are round, short, and squat, while others have their bodies, heads, or elytra elongated to the most extraordinary extent. Generally the antennæ of the Weevils are short, but there are some groups, examples of which we shall presently describe, that have the antennæ drawn out to as great a length as can be seen in any of the Longicorn Beetles. Some are smooth, while others are covered with spikes, knobs, and sharp edges. As to their number, I can best convey an idea of it by mentioning that in the British Museum there are one hundred and eighty drawers full of Weevils, so that to make a moderately comprehensive selection from such an array is no easy task. I have endeavoured, however, to choose from them those species which fairly represent the principal groups into which the Weevils are divided.

THE word *Rhynchophora* is Greek, signifying "beak-bearing," and has been given to the Weevils because in most of the species the head is elongated into a beak-like form of greater or less length. Some of them have the beak but slightly indicated, while in others the head is drawn out to a length that really seems incredible.

The family of the Bruchidæ are well known in England, better perhaps known than liked, except by professed entomologists. One of them, the Pea Weevil (*Bruchus pisi*), whose little white larvæ are so plentiful in peas, is a member of this genus, but is supposed to be one of the many Weevils which have been imported from other countries in cargoes of grain. The Red-

legged Weevil (*Bruchus rufimanus*), the larva of which resides within beans and other similar seeds, is a genuine Briton, as are the remaining six members of the genus.

All our Bruchidæ are little insects, but those of foreign countries often attain a considerable size. Such is the case with our present example of the family, *Carpophagus Banksii*, which is represented of its natural size. It is a native of Australia. The generic name of this insect, signifying "fruit-eating," denotes its habits, which are like those of the English Bruchidæ.

In this insect the thorax is black and finely granulated, and the elytra are dark chestnut, marked with a few slightly defined longitudinal lines. They are rather curiously formed, not reaching to the end of the abdomen, but being cut away diagonally on either side from the suture to the outer edge. The head is rather elongated and slightly curved downwards, and the antennæ are placed near its tip. The legs are strong, especially the thighs, which are pear-shaped, the smaller end being jointed to the body, and the larger bearing the curved tibiæ.



Fig. 92.—Carpophagus Banksii. (Black thorax, chestnut elytra.)

The name of Bruchidæ ought not to have been used for a Beetle of any kind. It rightly signifies a larval locust, and is derived from a Greek word which signifies "biting" or "grazing."

The Anthribidæ are represented in this work by two examples, one of them showing the ordinary shape and appearance of the insect, and the other the extravagance, if we may so call it, of variation which is sometimes found in foreign Weevils. We have eight British examples of Anthribidæ, the best known of which is the little *Choragus Sheppardii*, which has a habit of skipping and hopping about when disturbed. This power of jumping is the more remarkable because the thighs of the hind legs are not thickened, as is generally the case with jumping insects.

The Anthribidæ are not so injurious as the Bruchidæ, some living in fungi, some in decaying wood, and others being found

in flowers. Indeed, many of them are actually useful to man, inasmuch as they are parasitic on the Coccus, or Scale Insect, which is so injurious to many plants.

Our first example of these Beetles is called *Tophoderes frenatus*, and is a native of Madagascar. It is entirely black and white, and must be almost invisible if clinging to a lichen-covered tree-trunk. The surface is covered with variously sized and shaped tubercles, all of which are black. Along either side of the head and thorax runs a narrow yellowish white stripe, which is continued over the shoulders of the elytra. These stripes really look very much like the reins of a horse, and on their account the specific name of *frenatus*, or "bridled," has been given to the insect. Below, the surface is rather dull black, profusely and finely punctated. The legs, like the body, are parti-coloured, the thighs and tarsus being black, and the tibia white.



Fig. 93.—Tophoderes frenatus. (Black and white.)

The generic name of *Tophoderes* refers to the peculiar black and white colouring of the upper surface. It is composed of two Greek words, the latter of which means "a skin" or external surface, and the other signifies a kind of mottled stone, which is known to mineralogists by the name of "tufa," or "tuff-stone," this being a corruption of the Greek *tophos*. The Latin word *tophus* is only another form of the same word.

On looking at the figure of the last-mentioned insect, the reader will probably notice that the antennæ are much lengthened. This elongation extends through many of the allied species, some of which are so exactly like the Longicorn Beetles that it is scarcely possible to imagine them to be Weevils. The most remarkable species at present known of these long-horned Weevils is that which is represented in the illustration on the next page, and known by the name of *Xenocerus lineatus*.

The former of the two names seems to have been composed much as Dickens' author composed his work on Chinese metaphysics, by taking a cyclopædia and reading the article "China" under the letter *C*, "Metaphysics" under the letter *M*, and combining his information. The author has evidently got hold of an English-Greek lexicon, and, wanting an equivalent for "strange-horned," looked for the word "strange," or "stranger," under the letter *S*, and found *Xenos*. Then he looked for "horn" under the letter *H*, and found *Keras*. Then, by combining his information, he formed the word *Xenocerus*, not in the least seeing that *Xenos* signifies "a stranger," *i.e.* a guest, or a stranger in the house, and has nothing to do with the word "strange" in the sense of exceptional or wonderful, that being evidently the meaning which the writer meant to convey.

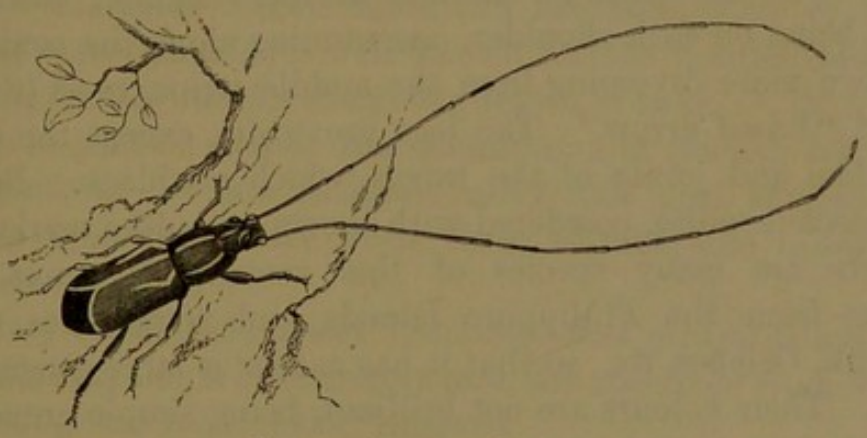


Fig. 94.—Xenocerus lineatus.
(Brown, with white stripes.)

The insect which is now before us comes from the Aru Islands, and is one of the many beautiful species which have been brought to England by Mr. Wallace. The antennæ of the male are of extraordinary length, and are extraordinarily slender except for the first two or three joints. The colour of the antennæ is black, except the first or basal half of the fifth joint, which is white. They are arranged much in the same manner in every specimen. The first joint is short, stout, and rounded. The next is long, and has a slight and somewhat variable double curvature. The third is very short; and the fourth is the longest of all the joints. Then comes the fifth joint, which is slender, short, and has the basal half white; and the rest of the joints are nearly equal in length and very delicate, no thicker, indeed, than an ordinary horse-hair.

As is the case with many insects, the antennæ of the female are very much shorter than those of the male, being, indeed, only about half as long as the body, and inconspicuous in every respect. In many cases the pattern of the body differs in the two sexes, so that the male and female might easily be mistaken for different species. The eyes are extremely large in the male, and their black globular surfaces seem to occupy the whole head.

The general colour of the body is chocolate brown, and upon it are drawn a number of pale whitish grey stripes, very symmetrically arranged. One runs along the middle of the head, and two others diverge from it on either side, the three looking very much like the well-known royal mark, the "broad arrow." Three similar stripes run down the thorax, but parallel to each other. The abdomen is adorned in like manner, one curved stripe being on each shoulder, one running along the centre, and then two more diverging from the middle stripe, so as to form a second "broad arrow." The legs are white, except the ends of the tibiæ and joints of the tarsus, which are black. Beneath, the insect is white, powdered with brown scale-like marks.

There are many species of this remarkable genus, some coming from the Philippine Islands and some from Ceram, Sarawak, Celebes, &c., so that it has rather a large geographical range. Their colours are not brilliant, being simple grey-brown or black, but there is always a pattern of white, so that the dark and light portions are boldly contrasted.

Considering the length and slenderness of the antennæ of these insects, it is evidently no easy task to preserve them in their integrity. Everyone who has collected insects knows how difficult it is to avoid snapping off the antennæ of insects, even when they are merely removed from one drawer to another. When therefore insects have to be packed for travelling, then to undergo journeys by land and water, and then, which is perhaps the worst trial of all, to be unpacked, pinned, and set the difficulty of saving these long and delicate antennæ may be imagined. The mode employed by Mr. Wallace is the best that I know.

He takes with him a number of hollow paper cylinders, just like squib-cases, varying considerably in diameter, so as to accommodate different-sized insects. When he has taken and

killed one of these long-horned Beetles, he pushes it head foremost into a suitable cylinder, taking care to let the antennæ lie along the sides of the body. The ends are then stopped, and there is the Beetle, perfectly safe. When packed for travelling, the cylinders, each with a Beetle inside it, are arranged in boxes, just like cigars, and by means of a little cotton-wool, tow, or similar substance, are kept from shaking about. When the cases are unpacked, the stoppers are taken out of the cylinders, and the Beetles gently drawn out with fine forceps. They are then placed in the "relaxing" pans, and in a day or two they are as easily set as if they had only just been killed.

Next come the Attelabidæ, a family in which the antennæ are not elbowed, as is the case with most Weevils. We have only two examples of this family in England. One of them, *Attelabus curculionoides*, is well known for the peculiar mode in which the female attacks the young leaves of oaks, *i.e.* by rolling them up in packets shaped like thimbles, and placing her eggs in the packets. It is a common insect, and most persons who use their eyes must have seen these thimble-like masses on the oak-trees.

The very remarkable insect *Trachelophorus giraffa* is a native of Madagascar, and is exceedingly rare, the specimen from which the drawing was taken being believed to be the only one known.

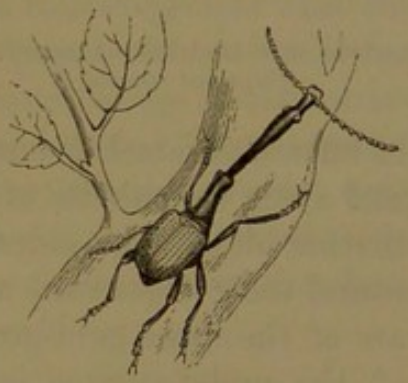


Fig. 95.—Trachelophorus giraffa. (Steel-blue head and thorax, dark red elytra.)

In this insect the antennæ are only of moderate length, but the head and thorax, especially the former, are inordinately elongated. The colour of the elytra is very dark red, and they are covered with punctures arranged in parallel rows. The body is stout and thick, and suddenly turned downwards at about two-thirds of its length from the base. The head and antennæ are very dark, steely blue.

The head is very movable in an up-and-down direction, and when it is bent downwards nearly at a right angle the Beetle has a most singular, not to say grotesque appearance, the attitude bearing much resemblance to that of a giraffe when trying to eat something on the ground. It is to this resemblance that the

specific name of *giraffa* is due. The generic name is Greek, and signifies "neck-bearer," in allusion to the elongated thorax.

Although only one specimen of this particular species is known, there are plenty of species belonging to the genus, scattered over many hot parts of the globe. For example, there are specimens in the British Museum from Java, India, Ceylon, the Philippines, Burmah, and China. None of them are so large as that which has been described, and many of them are quite small. As a rule, dusky red is the principal colour, but there is one little species from the Philippines, *Trachelophorus contractus*, which is quite black.

Of the typical genus there are not many species, and their colour is, with one or two exceptions, rather dull. One of the exceptions is *Attelabus sumptuosus*, which is really a splendid little insect, blazing out in beauty far beyond any of its fellows. It is, as are so many of the brilliantly coloured Beetles, a native of Mexico.



Fig. 96.—Attelabus sumptuosus. (Blue and crimson.)

At first sight this insect reminds the observer of the common but splendid Fire-tail bees of our own country. The whole upper surface is covered with punctures, and shining as if made of burnished steel or enamel. The head and thorax are crimson, and along the middle of the elytra runs a broad band of ultramarine blue. The sides of the elytra are shining crimson, and round their edges runs a narrow band of golden green. The legs are of the same gold-green as that of the elytra, and the whole of the under-surface is either blue or green according to the angle at which the light happens to fall on it, so that this insect very well deserves its specific name of *sumptuosus*.

The wings of all the species are large and ample. The only other species which even approaches this beautiful insect in colour is one that was brought from China and has not yet been described. It is very small, and of a dark blue colour, much like that of some of our well-known little Chrysomelas.

Why the name of *Attelabus* has been given to these insects I

cannot imagine, inasmuch as the word evidently signifies "a locust." Herodotus, by whom the name is mentioned, evidently takes it in this sense, as may be seen from a passage occurring in his Fourth Book, chapter 172:—"The Nasamones, a very numerous people, adjoin the Auschisæ westward. In the summer they leave their cattle on the coast, and go up to the region of Augila, in order to gather the fruit of the palm-trees, which grow in great numbers and of a large size, and are all productive. When they have caught locusts (*attelaboi*) they dry them in the sun, reduce them to powder, and, sprinkling them in milk, drink them." Moreover, another author describes certain insects as being "locust-eyed" (*attelab-ophthalmus*). It is a pity that such a mistake should have been made, as the word *Attelabus* would have answered very well as a name for a genus of locusts, and a suitable name for these Beetles could easily have been found.

Aristotle also describes the habits of the Attelabus, which are precisely those of the locust; and Mouffet remarks that "a little locust is said to be the mean between *Locust* and *Bruchus;* it hath such little wings that it is reputed to have none, and seems rather to creep than fly; for this cause, wheresoever it is bred, it bringeth all as it were to meal or rust, by grinding and consuming. It seems to some to be of the kind of Bruchus, till the wings grow forth, and then it growes into the number of the locusts." From this last sentence it is tolerably clear that the Attelabus was a locust in its larval or pupal state, when it has the form of the perfect insect, but without wings in the former state, and with undeveloped wings in the latter. The derivation of the word is so uncertain that I fancy Herodotus must have taken a local name and Grecized it, as he often was forced to do. Some writers, however, give it a very far-fetched derivation from a word which signifies "absence of wings."

In the family of the Brenthidæ we have another example of a misapplied name, the Greek word *Brenthos* signifying some unknown water-bird of a stately carriage. However, the name has so long been applied to these Weevils that the evil of retaining it is infinitely less than that of exchanging it for one that is more appropriate.

In England there are no Brenthidæ, and it is believed that only one species exists in Europe, namely *Arrhenodes coronatus*.

which was taken by Mr. Spence in Italy. It has also been found in ants' nests. As far as is known, the habits of the Brenthidæ are very similar in the different species. In the larval state they live under the bark of felled timber, and sometimes within the wood itself, but do not appear to injure living trees. Some of the North American species inhabit felled oak-trees, and have been found under the bark of "sleepers" on a railroad.

The extraordinary insect which is figured below is a native of Java. The head of the male is much elongated, and, slender as it is, would be still more slender but for the thick coating of brown scales with which it is clothed, and which gives it a roughness of surface which, when the insect is viewed through an ordinary magnifier, looks very much like the familiar maple-bark with its deep corrugations. In this insect, the head



Fig. 97.—Diurus furcillatus.
(Dark brown, with white spots.)

of the female is very much shorter than that of her mate. The long antennæ are similarly clothed, except that the seventh and eighth joints are white, and that the scales are lengthened into hairs.

It is worthy of notice that the antennæ are very movable, and retain their mobility after the insect is dead and quite dry. If one of these insects be taken and turned in various directions, the antennæ swing about as if they had been set on hinges; and, if a drawer full of the Diurus and its allies be moved, the effect of all the antennæ swinging about is most singular, not to say striking, all the insects looking as if they had come to life again, and waving their antennæ as if to show that they had done so.

The thorax is small and of a dark-brown colour, and has

nothing remarkable about it. The elytra, however, are well worthy of a careful examination. In the first place, they are elongated to a most extraordinary extent, and the outer edge of each is drawn out into a long, sharp, slender appendage as long as the abdomen and thorax together. Indeed, the entire length of the insect may be divided into three tolerably equal parts, the head being one, the body and thorax another, and the appendages to the elytra the third. These appendages are, like the head, covered with dark-brown scales, which give them a roughened outline.

By the unaided eye the upper part of each elytron is seen to be adorned with a tiny white spot, but a tolerably powerful magnifier is needed before the nature of the spots is made clear. The whole of the surface is deeply pitted in regular parallel rows, so as to look very much like a honeycomb. Many of the cells, especially those near the suture, are filled with some white material which produces the appearance which has already been mentioned. Even near the suture itself the white material has been lost out of several cells, which then show their full depth and assume the honeycomb-like aspect which has just been mentioned. Beneath, the insect is blackish brown, over which a number of white scales are sparingly scattered.

The generic name *Diurus*, or "double-tail," is given to these insects on account of the elongated elytra; while the specific name *furcillatus*, or "forked," refers to the mode in which the antennæ project from the end of the head like the prongs of a fork. Four species of Diurus are known, Sarawak and India being their homes. There are besides many allied genera, which in most respects resemble the Diurus.

ANOTHER example of this most singular family is called *Teramocerus barbicornis*, and comes from New Zealand. The generic name is formed from two Greek words signifying "delicate-horned," the antennæ of this genus being more slender than that of the last-mentioned insects, though they also are covered with down-like scales. In this insect, and that which will be presently described, the elongation of the head seems to have reached the greatest possible extent. In one specimen which I have just measured, the entire length, including the elongated elytra, is three inches and a half, of which the head alone

occupies an inch and three-quarters. If the Beetle be examined in profile, the head is seen to form a slight but graceful curve downwards, and, in order to enable it to make this curve without bringing the extremity of the head against the ground, the thorax takes a curve upwards.

Along the whole of the under-surface of the head runs a band of long yellow hairs, which towards the extremity becomes longer and thicker, and takes a dark-red hue. It is on account of this hair that the species has received the name

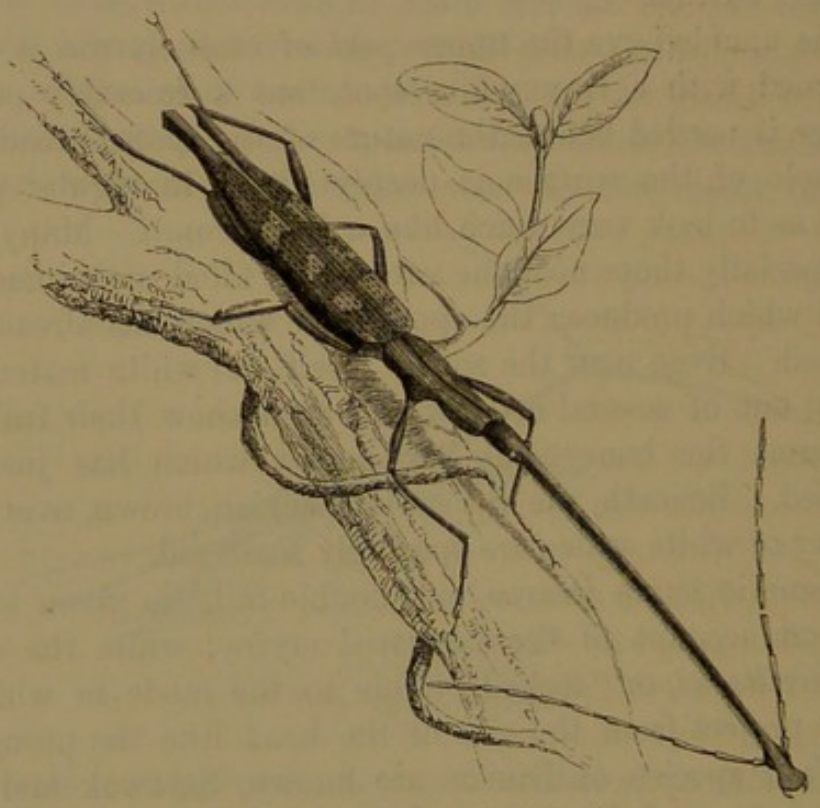


Fig. 98.—Teranıocerus barbicornis.
(Black and chestnut.)

of *barbicornis*, i.e. "bearded horn." The ridge of hair which has just been mentioned is so narrow that it can only be seen when the insect is viewed in profile, being quite invisible when it is seen from above.

The colour of the head is black, and so is that of the thorax, the latter having a deep central groove, and profusely wrinkled, so that it looks something like a black kid-glove that has been crumpled together when wet.

The elytra are much lengthened at the tips, but not so much as those of the preceding insect, and diverge so that their shape somewhat resembles the pincers of a female earwig. The ground

colour of the elytra is black, and upon each of them there are four large chestnut-coloured marks shaped as seen in the illustration, and producing a definite though not conspicuous pattern of chestnut on black. The legs, especially the first pair, are very long and rather powerful, and in all probability the length of the front legs is needful in order to enable the insect to keep its elongated head off the ground.

As in the preceding insect, the head of the female is very much shorter than that of the male, and in consequence, though a curious-looking Beetle, she is not quite so strange and weird in appearance as the male. The elytra are decorated with longitudinal ridges, and in the furrows between each pair of ridges is set a row of circular impressed pits something like those of the Diurus, but not possessing the white substance which distinguishes that insect. This Beetle is quite as variable in point of size as our Stag Beetle, some specimens being scarcely one-third as large as that which I have described.

THE extraordinary insect which is shown in the accompanying illustration has a head longer in proportion to its width and the size of the owner than is the case with any known insect in the world. It is called *Antliarhinus Zamiæ*, and is a native of Southern Africa. On account of the extraordinarily long head, with its peculiar curve, the insect was at first placed in or near the genus Balaninus, of which our common Nut Weevil is so excellent an example.



FIG. 99.—Antliarhinus Zamiæ. (Reddish brown.)

The head is scarcely thicker than a human hair, and is quite three times as long as the body. The antennæ are placed near the base of the head instead of near the end, as in the previous examples of the Brenthidæ, and the mouth is set at the extreme tip. In many Beetles where the mouth is at the end of a long "rostrum," as this peculiarly developed head is called, the tip of the rostrum is widened so as to accommodate the jaws and other

parts of the mouth. But in this Beetle there is no such enlargement, and consequently the mouth is so small, that even with a fairly powerful pocket lens it is no easy task to find it.

In its larval state this Beetle lives on a palm-tree, *Cycas* or *Zamia Caffra*, one of the group which furnishes sago and arrow-root, their trunks containing a large quantity of starch. *Zamia furfuracea*, for example, a West Indian species, affords the finest quality of arrow-root.

On the fruit-clusters of the palms the larva of this Weevil lives, eating not only the nuts themselves, but the red, fleshy envelope which surrounds them. The larva is nearly all white and covered with stiff, white, erect hairs. The head, together with the first segment of the thorax and a patch on the last segment but one, is brown, and there are some slight longitudinal punctured black lines on the body. It has six true legs, and some false legs like those of a caterpillar, set upon the abdomen. The last pair are rather the largest.

The colour of this species is reddish brown. The elytra are slightly hollowed at the sides, and are deeply ridged. The ridges themselves are broken into little knobs, and the spaces between them are finely punctured. There are five species of this genus in the British Museum, one of which, *Antliarhinus Dregei*, is very small, and has its antennæ nearly as long as the head. It is brown, with a black patch in the middle of the elytra. The name *Antliarhinus* is formed from two Greek words, and refers to the long and tube-like form of the head. The first word signifies anything by which water is drawn, and the other signifies "a snout."

We now come to the Entimidæ, a family which contains some of the most splendid Beetles in the world. They are remarkable for their wonderful colouring, which is obtained by the iridescent scales with which their bodies are clothed. The name *Entimidæ* is Greek, and signifies something that is honoured or prized. One of these Beetles, *Entimus splendidus*, a native of Brazil, is shown on Plate III. p. 1. Green, gold, and black are the prevailing colours of this insect. The thorax has a bright green stripe running along its centre, and the sides are green-gold, except the black knobs which project plentifully from it. The elytra are

black, but have a number of oval marks on them. These marks are green-gold, similar to the colour of the thorax, and between several of them are two or three deep circular punctures.

The best known of these insects is the celebrated Diamond Beetle (*Entimus imperialis*), also a native of Brazil. This Beetle, magnificent as it is when the microscope is brought to bear upon it, is not to the unaided eye nearly so beautiful as many insects which are not so splendidly adorned. The elytra of this insect are black, and upon them are many parallel circular spots, each about as large as a pin's prick. To the unaided eye these spots are glittering green, but when the microscope is brought to bear on them their true beauty is disclosed.

Each of these is a shallow, circular pit, set thickly with scales, which are arranged something like the tiles of a house, one projecting over another. These scales are mostly green, but each of them possesses many colours as the light happens to change. One of these scales in the specimen now before me is entirely shining gold, while its immediate neighbour is gold in the centre warming into orange on its tips, and has at the base a patch of crimson on one side and azure on the other. The next scale has the basal half of a rich shining ruddy gold, and the other half deep purple. The next scale is entirely emerald green, so that the little shallow pits look as if studded with leaf-shaped gems, no two being of precisely the same colour.

If even the direction of the light be changed, the colours change with it, the green shifting gradually into gold, blue, purple, orange, and crimson, just like the changing flashes of a good brilliant. Generally, but not always, a small space at the bottom of the pit is devoid of scales, its dead blackness producing a remarkable contrast with the dazzling brilliancy around it. These gem-like scales are but loosely attached to the surface, so that they can be easily removed and examined under a high power of the microscope, either as transparent or opaque objects, the latter being the best plan for bringing out their beauties, provided that a sufficiency of oblique light can be thrown upon them. The whole of the body is adorned with similar scales, though nowhere are they so large or so beautiful as on the elytra.

ANOTHER example of these lovely Beetles is shown in the illustration below. Its name is *Rhigus Schuppellii*, and, like the Diamond Beetle, it is a native of Brazil.

It is much more knobby—if I may use the term—than the preceding insects. On the thorax there are two rows of knobs, and there are eight much larger knobs on the elytra; namely, two rows of three knobs in each row, and one upon each shoulder. The ground colour of the elytra is green, but the knobs are beautiful golden yellow, both colours being produced by scales somewhat similar to those which have been described when treating of the Diamond Beetle. There is a distinct gold edging to the elytra, which are punctated in parallel lines. The legs are green, and the thighs, especially those of the first five, are large and powerful.

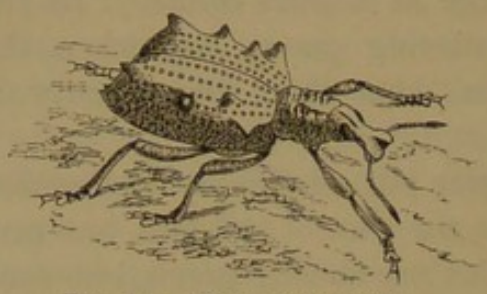


FIG. 100.—Rhigus Schuppellii. (Green, with golden projections.)

This is an exceedingly variable insect in point of colour and in the comparative size of the knobs. There is in the British Museum a curious variety of this Beetle, in which the whole of the colour is pale yellow, and the knobs scarcely project at all from the surface. The reason for the generic name *Rhigus* I cannot see, inasmuch as the word is Greek, signifying "a shivering from cold," a circumstance which is scarcely likely to happen in tropical America, and which seems singularly inappropriate to a Beetle. Perhaps the traveller who captured and named the first specimen took an ague, and commemorated it by the name which he gave to the Beetle.

THE Beetle which is represented on the next page belongs to the family of the Brachyceridæ. This word signifies "short-horned," and is given to the insects because their antennæ are stout and extremely short in proportion to the size of the body. There is plenty of material in them to make long and slender antennæ like those of the Xenocerus, but it is utilized in width instead of length, the antennæ being small at the base, and gradually increasing in diameter to the tip, which is broad and blunt. The insects belonging to this family are mostly African, though some are found on the shores of the Mediterranean.

The present species inhabits Southern Africa, and is perhaps the best example of the whole family.

The colour of the insect is rather dull black, with the exception of some spots on the elytra which will presently be described. The rostrum, or fore part of the head, is thick, stout, and much widened towards the end, and the upper surface is deeply wrinkled. The thorax is rather curiously formed. In the centre and in front there is a projecting portion, something like a horse-shoe, or rather like the under-surface of a horse's foot, even the "frog" being represented with wonderful fidelity. Then come two small pear-shaped projections, side by side, and then a

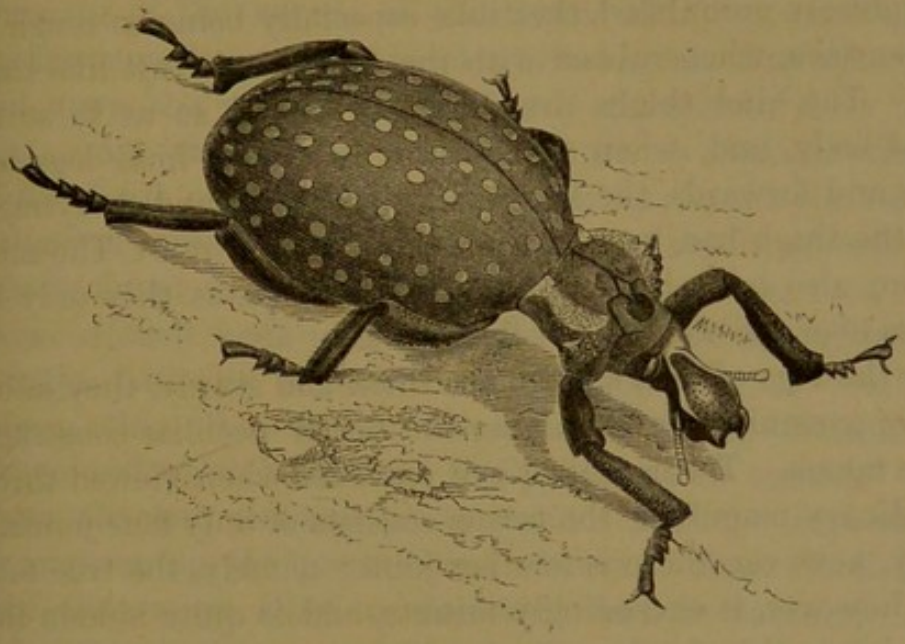


Fig. 101.—Brachycerus imperialis.
(Black, red spots.)

number of little pustules. On either side, the thorax is covered with small rounded projections, one of which is very large and elongated, so as to resemble a sharp horn.

The elytra are rather glossy and covered with very minute pustules, which become greatly larger towards the tips, which are much turned downwards. On each of the elytra there are eight rows of round, reddish spots, slightly depressed. If the insect be placed under a microscope, the reddish colour is seen to be produced by a number of little oval bodies, very much like grains of red corn or rice, which are fixed to the elytra by one end, and lie nearly flat upon each other. They are set much in the same way as the scales of the Diamond Beetle, but

whereas those scales are placed with much regularity, all radiating from a common centre, these seem to be scattered without the least pretence to order. They cling tightly to the surface of the elytra, but, although they are partially protected by being sunk in their shallow pit, there is scarcely a spot in which several of the scales are not missing, and others quite loose and evidently ready to fall.

On the under surface of the abdomen and on the sides of the thorax, similar scales are scattered in patches, making the insect look as if a brush had been dipped in vermilion and dashed carelessly against it. The legs are very strong and thick, and are profusely granulated, the tibiæ especially being so rough that their surface, when rubbed with the finger, feels just like that of a file. The hind thighs are curiously curved, so as to suit the rotund body, and, when the Beetle moves its hind legs backwards and forwards, the leg passes over the rounded elytra, just as if the thigh had been moulded on the elytron. The middle legs are also curved, but not nearly so much, as they only have to pass over the shoulder of the elytra.

As the legs of this species are thick and sturdy, they afford a good opportunity for examining the rather peculiar construction of the tarsus. To the naked eye, and even when viewed through an ordinary magnifier, the tarsus consists of only four joints. In reality, however, there is another joint; namely, the true fourth. This, however, is exceedingly minute, and is quite hidden in the third joint, the front part of which is widened and swollen into two lobes. I mention this fact because it will explain two terms by which these insects have been mentioned. One is Tetramera, *i.e.* "four-jointed," which was given to them because the tarsus was thought by the earlier entomologists to have only four joints. Mr. Westwood, however, when he discovered the existence of the missing joint, very properly altered the name to Pseudo-tetramera, *i.e.* "false four-jointed." The only way of seeing this tiny fourth joint is by taking the tarsus to pieces.

The present species is in great favour with the Bechuana tribe, who use it as an amulet. They pull off the head, legs, and thorax, cut away the lower portion of the abdomen, and remove the whole of the interior, so as to leave only an empty shell. Several of these hollow bodies are then strung on strips of leather, and hung round the necks of children. They are sup-

posed to be very efficacious during the time of teething, and to mitigate the various ills to which juvenile humanity is liable. Deceived by the shape of these amulets, some of the earlier travellers described them as whistles.

There are many species of Brachycerus, differing exceedingly in shape, size, and colour. One of these, called appropriately *Brachycerus obesus*, or the "fat short-horn," is as round and smooth as a black-heart cherry, and very much of the same colour; while another, *Brachycerus ocellatus*, though much resembling it in form, has the whole surface of the elytra adorned with parallel undulating lines of red on a black ground.

On some of the insects of this genus Mr. Westwood has the following remarks:—"The species of the genus Brachycerus are found upon the ground in hot sandy situations, early in the spring. An anonymous writer informs us that *Brachycerus undatus* feeds on the leaves of *Arum arisarum* in October. *Brachycerus barbarus* attacks the medicinal squill, several being generally found at the heart of the leaves near the root. *Brachycerus Algerus* feeds on the leaves of a large lily growing in sea-sand. Latreille informs us, in the appendix to 'Caillaud's Voyages,' that the women in Ethiopia string these insects together, and wear them round their necks as an amulet."

From the last sentence it is evident that the superstitious ideas concerning the preservative virtues of these Beetles have a very wide scope, since we find that both in Southern Africa and in Ethiopia the same insects are used in the same manner and for the same purpose.

Next we come to the family of the Pachyrhyncidæ. This name is formed from two Greek words, signifying "thick-mouthed," and is given to these Beetles because the rostrum is very short, thick, and rounded; so short, in fact, that when the insect is viewed from above, no portion of the rostrum is to be seen, and a profile view is required before the real shape of the head can be made out.

The species which is represented in the first of the illustrations on the next page is called *Pachyrhynchus gemmatus*, because the large green spots with which its metallic body is covered look very much like emeralds set in red gold. It is a native of the Philippines.

The ground colour of this beautiful insect much resembles burnished copper, with a distinct dash of carmine, and has quite a metallic look about it.

On the head, thorax, and abdomen are a number of spots, arranged as shown in the figure. These spots are, like those of the Brachycerus which has already been described, slightly depressed, and their centres are filled with the most brilliant green scales, over which plays a strong iridescence as the light changes. It is rather remarkable, by the way, that while the scale-clad pits of the Diamond Beetle have the centres blank, and the scales set in a sort of broad ring, exactly the opposite arrangement is found in this Pachyrhynchus.



Fig. 102.—Pachyrhynchus gemmatus. (Copper, with green spots.)

The elytra are very large, and are turned far over the sides, which, if possible, are even more gorgeous than the back, the green spots being exceedingly numerous. As the legs are bright metallic red, and as they are seen very conspicuously when the insect is viewed from the side, the profile view of the Beetle has an added splendour.

Another of these insects is here given as an example of the extraordinary varieties of colouring that prevail in this genus.

In this insect the ground colour is black. Upon the thorax is drawn a bright green cross, and the elytra are covered with a network of the same colour, the meshes being largest and fewest on the back, and smallest and most numerous on the sides. The legs are also thick, with a green patch on each. Although the colouring is so simple, being composed of only two hues, it is wonderfully effective, the pattern being as clear and sharp as if traced by the finest crow-quill, and the contrast between the shining jetty-black and the glittering green being almost startling. Even on the under-side, which is

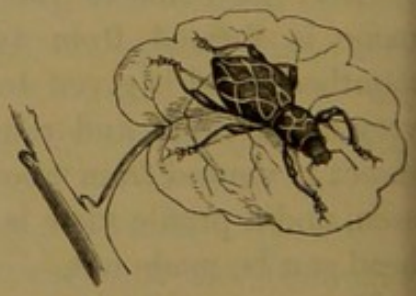


Fig. 103.—Pachyrhynchus reticulatus. (Black, with green network.)

generally comparatively plain in Beetles, the same arrangement of green spots on a coppery ground prevails. This, like the preceding insect, is a native of the Philippines.

Of these Beetles there are very many species, the greater number inhabiting the Philippines, but others being found in Australia, New Guinea, and Polynesia. Many of them have not yet received names or been entered in the catalogue of acknowledged species. There is an infinite variety of colouring among them. Black is the usual ground hue, and green the prevailing colour of the pattern. Next in frequency to green comes red, and then copper, all these colours being produced by scales which are visible with an ordinary pocket magnifier.

THE next family is named Gonatoceri, a term formed from two Greek words signifying "angle-horned," and given to the insect because the antennæ are bent into definite elbows, whereas those of the preceding insects are only curved.

The insect which is here figured is all black, rather shining above and dull below. It is a native of New Holland.

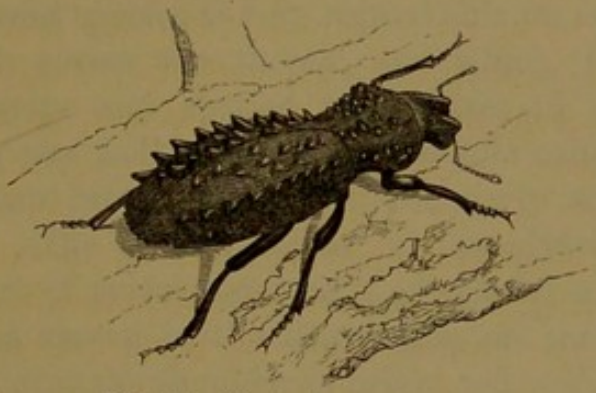


FIG 104. - Gagatophorus Schönherri. (Black.)

There is scarcely any portion of the upper surface of this insect which is quite smooth, those parts which are not knobbed being grooved. The upper part of the head has a wide and rather deep groove. The thorax is rounded and covered with knobs, which are comparatively scanty on the disc, but become very numerous and crowded on the sides. These projections are without any apparent order, but those of the elytra are arranged in three distinct rows. The elytra are very large, and are turned over the sides rather abruptly. On the edge where they are folded, is a row of nine knobs, so long and pointed that they

may well be called spikes. Next comes a row of seven knobs, and next to the suture is a third row of four knobs, these last being placed rather irregularly. The sides are nearly flat, and are quite smooth, so that when the insect is viewed in profile, the smooth, shining side and the back, which is studded with its eight-and-twenty projecting tubercles, are curiously contrasted. The legs are long, black, and deeply wrinkled.

Two species of this genus are known, both of which are in the British Museum. One is the insect which has just been described, and the other is *Gagatophorus Boisduvalii*. In general appearance these two insects are very much alike, but the latter is more slender in proportion to its size.

CHAPTER XV.

RHYNCHOPHORA, OR WEEVILS (continued).

On Plate III. p. 2 may be seen a very curious Beetle, called *Cyphus Linnæi.* This belongs to the family Cyphidæ, which contains more beautifully coloured species than any other family of Beetles, not even excepting the Entimidæ. The name *Cyphus* is Greek, signifying "hunchback," and is given to these Beetles because their shoulders are very high and thick. They are natives of South America, especially the districts within the tropics.

The present species is very remarkable on account of the long hair which covers the thorax, and which, together with the peculiar shape and spotted body, gives to the Beetle an air resembling the well-known wingless ants called Mutillæ. This hair is deep brown, and of a peculiarly soft, chinchilla-like character. The ground colour of the elytra is black, with a velvety sort of surface, and on it are placed a number of spots arranged as shown in the illustration on the next page. The large spot over the shoulder is bright red, and all the others are yellow, so that the insect is an exceedingly handsome one.

The last-mentioned species is of rather an exceptional character, so I have here taken one which is a good example of the ordinary form and colouring of this most splendid genus. Its name is *Cyphus gloriandus.* Viewed with the naked eye, it is a very beautiful insect, the surface being golden yellow, diversified with jetty-black marks. Its full beauty, however, cannot be appreciated without the aid of the microscope, and I shall therefore describe one of these insects as seen with the aid of the half-inch object glass.

If the microscope be directed on the upper surface of the

elytra, those organs are seen to be thickly covered with a profusion of glittering scales, set closely together like those of a golden carp. Their general effect is emerald green, with a little dash of pink and gold; but the best plan is, to take one scale and analyse its colours. Each scale will then be seen to consist of a number of colours, such as yellow, pink, blue, and green, the last hue being generally the most brilliant. Every one of the scales has one portion which is more brightly illuminated than the others, and the colour of this spot changes together with the direction of the light, casting successively every hue of the rainbow.

Should the observer merely look down upon the scales, he will see the general effect of this varied colouring; but if he turns the Beetle so as to get a side view of the scales, he will perceive how that effect is produced. Each scale is covered with a number of very fine parallel ridges, or striæ, the effect of which



FIG. 105.—Cyphus gloriandus.
(Gold-green, with black marks.)

is to break up the light that produces those wonderful opalescent effects which have been described. Indeed, the opal owes its well-known changing tints to a similar cause, the stone having multitudes of the minutest imaginable fractures which produce exactly the same effect as the striæ of the scales. Glass which has been buried for a very long time becomes opalescent from the same cause, as everyone knows who has seen the glass vessels that have been taken out of Egyptian tombs and other sepulchres of ancient date.

The head, thorax, legs, and under surfaces are equally covered with these scales, which in some places take a reddish hue as their ground colour. On the thorax they seem to be rather

larger and to lie flatter than those of the elytra. If the elytra be spread and viewed on the under side, a very remarkable appearance is presented. Even on the upper surface it is evident that the elytra are regularly striated, but on the under surface the striæ are very bold, and marked by rows of round black dots on a shining chestnut ground. These striæ follow the outline of the elytra, being waved in graceful curves and converging towards the tip. Altogether, the under surface of this organ is so handsome that were it transferred to the upper surface the Beetle would be considered a beautiful one.

There are many species of Cyphus, all of them beautiful, and most of them splendid insects, especially when viewed by the aid of the microscope. There is, for example, *Cyphus Germari*, a species which is exceedingly variable, most of the specimens being green, but others a pale purple or violet. Thus one species, which is appropriately named *Cyphus azurea*, is always azure blue, upon which are a number of velvety black spots which contrast beautifully with the brilliant azure of the surrounding scales. There are, it is true, one or two species which do not possess the startlingly brilliant colours of their kin. Such, for example, is the *Cyphus modestus*, which is not only dull brown, but is very small, and therefore inconspicuous. Yet even these soberly clad creatures possess beauties which only require the aid of the microscope and properly adjusted light to show that they are really scarcely less beautiful than those which are adorned with more brilliant colours. The wings of all these species of Cyphus are large and capable of bearing their owners for long distances.

The family which now comes before us is the Cholidæ, of which the *Rhinastus pertusus* is a good example. In these Beetles the antennæ are boldly elbowed, as in the last family, and, especially when the insect is viewed from above, form a characteristic feature in its appearance.

The present species, which is a native of Brazil, is rather a curious insect. The head is developed into a long rostrum, boldly curved downwards. It is black, but upon the surface are a number of yellow scales, formed much like those which have been described when treating of the Cyphus, but without the parallel ridges which give to these scales their wonderful opal-

escence. On the under surface, the rostrum is toothed and furnished with hairs. The eyes are situated close to the base, and the antennæ are set about one-third of its length from the tip.

The thorax is very narrow in front, and swells out rapidly to the shoulders with a bold and graceful curve. It is yellow, but with a shade of black, the reason being that the real colour of the thorax is black, and that upon its surface are scattered a number of yellow scales between which the original colour can be seen. Whether from friction or not I cannot say, but all the specimens which I have examined have the scales much more thinly scattered towards the basal angles of the thorax, so that there the colour is darker than on the disc. The whole thorax is rather flat.

The form of the elytra is very curious. Together, they have a sort of heart-like shape, the sides being rounded, and the tips coming nearly to a point. For about one-third of an inch

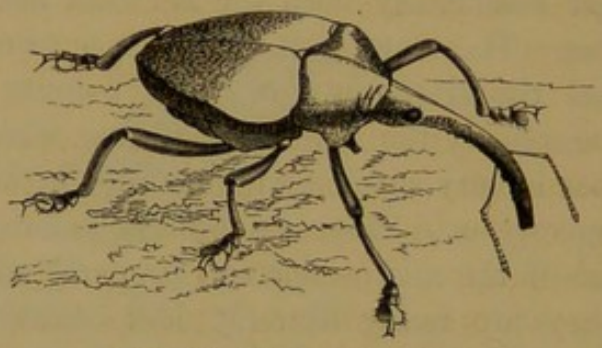


Fig. 106.—Rhinastus pertusus.
(Yellow.)

from the tips the elytra look as if they had been pinched flat while soft, and had then become hardened. The remarkable points in their structure are, however, at their bases. Each of them is so deeply scooped that the basal angles form bold teeth, which project well over the thorax, and are then cut into a doubly waved outline, just like a bracket { in printing.

The surface of the elytra is very flat, so flat, indeed, that the tips do not seem to be very much depressed. Like the thorax, they are covered with yellow scales, but much more thickly, so that the colour is more determined, and looks something like yellow cloth. As is the case with many Weevils, the elytra are very ample, and are bent over the body at the sides so as to cover about half the abdomen. With many of the Weevils the

line where the elytra are folded over is marked in some definite manner; in some, such as the Gagatophorus, being decorated by a row of spikes or knobs, and in others, such as the present species, by an unbroken ridge, which in this instance is highest in the middle, and decreases to a mere point towards the base and tip.

The legs are rather long, and the joints of the tarsus are spread into double lobes and covered with a profusion of hair. Only three species are known. The generic name *Rhinastus* is formed from a Greek work signifying "a snout" (which may be recognised in the familiar name of Rhinoceros), and is given to the insects of this genus in consequence of the great development of the rostrum. The specific name of *pertusus* is Latin, and signifies something that is bored or perforated. It is given to this insect because the peculiar structure of the base of the elytra makes the insect look very much as if a hole had been bored through each shoulder.

Three species of Rhinastus are known, all of which are in the British Museum.

THE name of Cryptorhynchidæ strikes upon the ear of the English entomologist with a familiar sound, inasmuch as more than eighty species of Beetles are known in England which belong to this family. The name of *Cryptorhynchidæ* is formed from two Greek words signifying "hidden-beak," and is not very intelligible unless the insects are seen in a living state.

If the observer merely examines specimens that are "set" and placed in a cabinet, he scarcely sees how the term can be applied to the insects, many of which have the rostrum particularly conspicuous. Should he, however, come across the living insects, the meaning of the word at once becomes apparent. However long the rostrum may be, there is always on the under side of the thorax a cavity which exactly contains it. Now, in common with many other insects, the Cryptorhynchidæ are in the habit of falling to the ground when alarmed, and remaining perfectly motionless until the cause for alarm has passed away.

As most of them have not only long legs, but a long beak, they would find some difficulty in disguising their forms were it not for the groove which has just been mentioned. Legs can be easily folded closely to the body, but a head with a long project-

ing beak is not so easily hidden. If, however, the head be capable of being bent downwards, and there is a deep groove or channel on the under surface of the thorax into which the beak fits, it will be seen that the insect has only to gather its legs closely to its body, and to bend the head well under the thorax, to be transformed in one moment from a long-legged, long-nosed Beetle, into the similitude of a round pebble or a casually fallen seed. One of our best-known species, *Orobites cyaneus*, looks, when thus packed up, so like the little black seed of the wild hyacinth, that even a practised entomologist cannot detect it without a close examination.

We can only take one example of this family, namely, *Cratosomus Roddami*, a native of Brazil. As is the case with several of our own Cryptorhynchidæ, the colours of this species are so arranged that the insect must be very difficult of detection.

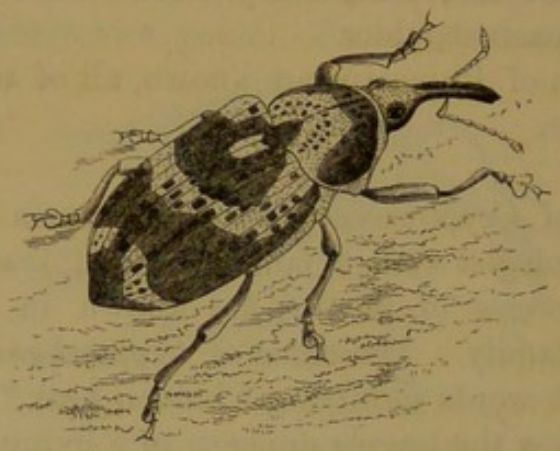


FIG. 107.—Cratosomus Roddami.
(Yellow, with black spots.)

The head is nearly black, and is furnished with a rather long and curved rostrum, the eyes being at the base, and the antennæ set at about the middle. The front of the thorax has a coating of warm down, and the rest is grey, diversified by round spots of jetty black. The elytra are warm yellow and deeply striated. On the striæ are numbers of oval black spots, which, like those of the thorax, look exactly as if they were drops of thick black ink or paint that had been suffered to dry, and in consequence project slightly from the surface of the insect. There is a narrow white edge to the elytra.

The legs are black, and have a number of greenish scales scattered over them. The third joint of the tarsus is spread

into two very wide lobes, and is covered with a dense coating of thick, brush-like hairs. Beneath, the Beetle is black, and upon the surface are a number of long yellowish scales, lying nearly flat upon the surface. These scales are rather interesting on one account; namely, that they form a kind of transitional link between scales and hairs, showing that the latter are only developments of the former.

I may here observe that the transition of scales to hairs may be observed on the wings of many Lepidoptera, specially those of the Plume Moths, our very common White Plume (*Pterophorus pentadactylus*) being an admirable example. In the same way, some of the shark tribe, especially the well-known Saw-fish, exhibit in a singularly beautiful manner the transition from scales to teeth, the change being so gradual that it is quite impossible to say where the scales end and the teeth begin.

Of this genus there are many species, all natives of Brazil. None of them are brilliantly coloured, sober greys and browns being the ground hues, which are either spotted or mottled with dark-brown and black. One curious species is *Cratosomus varicosus*, in which the thorax is very flat, and the elytra have five black knobs which are so prominent that they may almost be called horns.

The last family of the Weevils is the Rhynchophoridæ. This name is formed from two Greek words signifying "snout-bearing," and is given to the Beetles because their head is elongated into a long rostrum, or snout. The first example of these insects is *Rhina barbicornis*, which is shown in the illustration on the next page.

The colour of this Beetle is black, but it is curiously adorned with hairs, ridges, and punctures, so that it is a very striking insect. The head is very long, slender, and at the end is widened, rather flattened, and cut into a sort of fleur-de-lys shape. The antennæ are placed near the middle. For the greater part of its length the head is completely surrounded with a quantity of dense, long hair of a reddish brown colour. The hairs do not lie flat, but radiate boldly from the head, which really bears a strong resemblance to a fox's brush, the similitude being increased by the colour. A quantity of similar hair, but of a yellower hue, is placed beneath the thorax. As is often the case

with insects, this remarkable adornment is restricted to the male sex, the rostrum of the female being quite smooth and hairless.

The thorax is rounded and thickly and deeply granulated. The elytra are regularly and boldly striated, and adorned in a very curious manner. If examined by the unaided eye, the surface is seen to be striated and speckled with white; but if a tolerably powerful magnifier be brought to bear upon it, a very elaborate system of decoration is seen. Along the surface of the elytra run a number of bold rounded ridges, lying parallel to each other, and having a rather broad channel or groove between



Fig. 108.—Rhina barbicornis.
(Black.)

them. The ridges themselves are covered with deep punctures, and in the channels between them are placed a number of circular pits, too large to be called punctures, and nearly as wide as the diameter of the channels, so that there is a single row of pits in each channel.

As we have noticed to be the case with several of the Weevils, these pits are filled with some white substance, so as to produce the effect of a series of white speckles. In most of them the white deposit remains, but in some it is absent, and allows the eye to penetrate to the bottom of the pit. What this white deposit may be, how it gets into the pits, and what may be its office, are mysteries as yet unknown.

The legs of this insect are very long and slender, especially the first pair, which are armed in the tibiæ with a number of slight and sharp teeth. This is a very variable Beetle, some specimens not being half as long as others. The Beetle is a native of Brazil, and specimens have been brought to this country by Mr. Bates. The Greek name *Rhina* signifies "a snout," and the specific name *barbicornis* is Latin, and signifies "bearded-horn," in allusion to the brush of hair which surrounds the elongated head.

THE enormous Weevil which is here shown is a native of Java, and belongs to the same family as the last-mentioned insect.

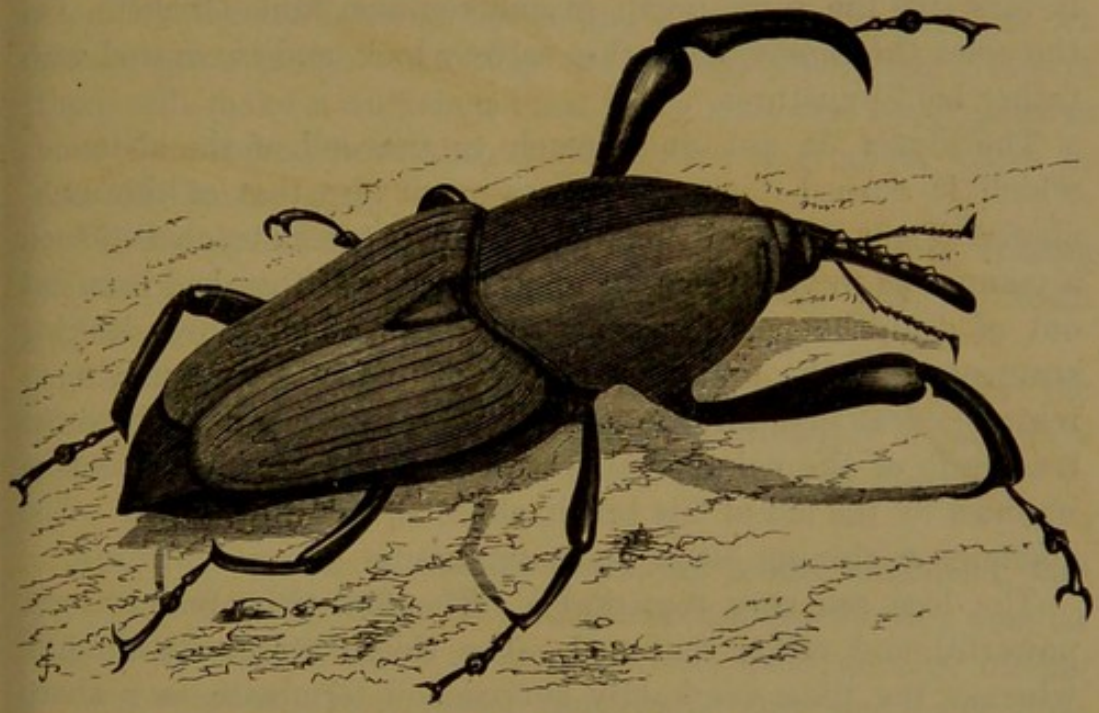


FIG. 109.—Protocerus colossus.
(Black thorax, yellowish elytra.)

Its name is *Protocerus colossus*. The former of these two names is Greek and signifies "principal-horned," in allusion to the manner in which the rostrum is prolonged into a horn-like form. The latter name is given to the insect on account of its dimensions, which are colossal when compared with those of other Weevils. In this country we often complain, and with reason, of the depredations committed by the Weevils, our largest being to the Protocerus what a hare would be to an elephant. Of the habits of this species, nothing has, I believe, been published, but if we may judge from the depredations committed by its

near relation, the Palm Weevil (which will be presently described), it must be capable of doing great damage to those trees on which it feeds.

The long, snout-like head of this Beetle is black, and moulded above into a shallow groove. On either side are five bold knobs, set opposite to each other, and apparently increasing the depth of the groove. The antennæ are set at the base of the head, just by the eyes, and are rather curiously formed, their terminal joint bearing a curious resemblance to a flat-iron. The thorax is nearly black, and on its upper surface has a curious velvety or plush-like aspect, very difficult to describe. Perhaps some of my readers will understand its texture when I say that it is very like the same organ in our common Mole Cricket. On the sides the thorax loses this velvety look, and is covered with rather bold punctures.

The elytra do not quite reach to the end of the abdomen, which is turned downwards very much like that of the cockchafer. Their surface is marked with punctures disposed in such a manner as to give them an appearance as if they had been cut out of deal, the peculiar concentric lines of punctures looking strangely like the grainings of deal. In fact, they much more resemble deal than an ordinary painter's graining resembles the true grain of the oak or maple which he flatters himself that he imitates by the aid of his brush, cloth, and graining comb. The abdomen is shining black, and punctured.

The legs are very remarkable. The first pair are very long, powerful, and rather flattened. The thighs are nearly straight, whereas the tibiæ are boldly curved and terminate in a sharp hook. They are black and shining, and under the tarsus is a good deal of golden yellow hair. This is most conspicuous in the hind legs, the last joint of which is very long and curved, so that the yellow down of the preceding joint shows itself boldly. The wings are very large and ample.

Closely allied to this species, and very much resembling it in size and general appearance, is the Palm Weevil (*Rhina palmarum*) of the West Indies. This insect resembles the preceding in almost every respect. It differs, however, in the structure of the head, which, instead of being grooved and knobbed above, is quite smooth.

This gigantic Weevil is terribly destructive both to palm-trees and sugar-canes. The larva of this species is popularly called "Gru-gru," and is a huge, whitish, fat, soft-bodied grub, curved, and without legs. It burrows into the palm-trees, where it is eagerly sought, not only by negroes, but by the white colonists, to be used as an article of food.

To us the grub of a Beetle appears to be the very last thing that anyone would wish to eat, but those who have tried the Gru-gru mostly go on with it, and ever afterwards look upon it as one of the greatest delicacies which that fertile country can produce. Many persons are so fond of it that they are in the habit of eating the grubs alive, just as we eat oysters, holding them by the hard, horny heads, and so eating the grub as we would eat a radish. As they are of very great size, a few of them will make a sufficient meal for a man, and many persons have been saved from starvation because they knew where to find the Gru-gru grub.

When full fed, this larva makes for itself a cocoon by tearing off strips from the stem of the palm-tree and weaving them together.

When this insect attacks the sugar-cane, it always prefers the plants which have been just planted, being probably attracted by the sweet juice which exudes from the cut ends of the cane.

ANOTHER species is equally damaging to the tamarind, and another, called the Sugar Weevil (*Calandra Sacchari*), a smaller but quite as destructive an insect, works great damage among the sugar-canes. It is rather remarkable that the insect does but little damage to the plant itself, though it utterly ruins the sugar which it secretes. The greater part of the juice is eaten by the grub, and that which is left is so injured that it can never be made into sugar, persisting in remaining as molasses in spite of all exertions on the part of the manufacturer. Mr. King states that "no 'temper' of any kind, whether lime or any more powerful alkali, can produce sugar from it. It might be possible to desiccate it by continued boiling, but the result would be charcoal, and not sugar."

And the worst of this damaged juice is, that if it should be mixed with sound juice the whole is tainted, and all that portion of the crop is wasted. Mr. King thinks that much of the

damage is caused by carelessness with regard to the manure which is used for the ground. In the West Indies, the cattle are littered with cane-tops and leaves; and if these be taken to the fields before they have been thoroughly decomposed, eggs or larvæ of the Sugar Weevil will most probably be taken with them, and so placed in the very best position for damaging the crops.

Vigilant sugar-planters keep a watchful eye on the young plants; and when they see the whorl of terminal leaves beginning to drop, they know at once that the Weevil-grub is there. Such plants are at once pulled up and burned, and their places supplied by healthy plants. Besides this precaution, another is taken, viz. of "trashing" the whole of the plants, *i.e.* removing the lower leaves, which act as a sort of cover for the Weevil. This operation should be performed at least every two months, and oftener if possible, so as to give the Weevil as little chance as possible of penetrating the cane. Loose sugar-cane leaves are known by the popular name of "trash," and hence the term "trashing" is used to express simply the removal of such leaves.

We will now notice a portion of Mr. King's elaborate memoir on the Sugar Weevil, as quoted in Mr. Gosse's "Naturalist's Sojourn in Jamaica:"—

"An egg the size of a small bead, in a considerable degree transparent, is deposited within the succulent vessels of the cane, where the adhering footstalk of the leaf retains the decayed foliage hanging to the germinating joint.

"The egg deposited is hatched at the time when the growing bud, usually called the eye, exhibits the active influences of both heat and moisture. As soon as the maggot is formed, it commences its voracious injuries by worming its way from the verge of the footstalk where it had been hatched, into the very body of the succulent and vegetating shoot, where it grows with its growth, and strengthens with its strength. It then occupies the centre of the plant, making its way upward through the growing cane, but remaining within the sweet and perfected joints, and never ascending to the greener tops to devour the germ and destroy vegetation. It entirely exhausts the saccharine fluid in those joints in which it has lodged—filling the excavation it makes with an excrementitious deposit, extremely injurious to the cane liquor from the mill; deteriorating it rapidly if it remain untempered while running into the pans.

"When the canes are cut, the grub-worm has already arrived at its second transformation. It has enveloped itself within the gallery it has bored, in a shroud of decayed trash wrought with curious neatness; the shreds being plaited and wound together, and so closely fastened at the ends, that the air is excluded; and if exposed to the weather, no weather could injure it. I have watched the grub in the act of making this cerement. It first wraps itself all over with such of the rotting fibres of the cane as are near it. It tears the strips asunder with its forceps, and matting the pieces one within the other, it completely conceals itself within that kind of case usually called a cocoon, where it remains dormant for a little interval of time.

"It has now assumed its third or beetle state, and emerges from the excavated cane a Weevil, bearing a rostrum or snout charged with fracticorn feelers, and wearing a splendid livery, striped yellow and brown—an insect about the size of the nail of one's finger. If the cocoon be opened before this last transformation, the pupa found within is of a dingy brown colour, and its bulky body is well supplied with the usual milky fluid, stored for that final change in which it comes forth from its temporary sleep, to become the parent of a succession of enemies to the planter."

The object of trashing the whole of the plants in the field is here given, together with directions for cleaning damaged juice:—

"The sheathing footstalk is not only a shelter for this Weevil, but it hinders the outer covering of the cane from hardening, and fixing that deposition of white powdery glass which resists the puncture of its proboscis. If with all this care the planter finds himself overwhelmed by the numbers of his assailants, or by the success with which they have established themselves in his fields, nothing remains but destruction by fire.

"But great as is the damage which this insect does in the field, it is a still greater calamity to have it in the mill-house. To mingle the juice of the injured cane with the uninjured, is to ruin a crop. The expedient of tempering the liquor, while running into the pans, may arrest the increase of the evil, but it does not get rid of it.

"If, however, the most painstaking watchfulness has not secured the manager from an occasional bundle of infected canes getting into the mill, and if the pernicious consequences have begun to

tell upon the proceeds of the boiling-house, I would recommend correcting the cold liquor with an alkaline mixture of potash and alum, in equal quantities. These, with the addition of as much boiling water as will hold them in solution, may be added to the temper lime commonly used in plain tempering.

"Such a measure of this mixture should be added to the liquor in the pan as would be deemed sufficient to correct the prevailing acidity. When the liquor has been boiled into what is called first syrup, it should be racked through the cock. By this timely remedy I have secured well-grained sugar which has not deliquesced during the voyage to Europe, even when I had had the misfortune to have ground tainted canes."

CHAPTER XVI.

LONGICORNES, OR LONG-HORNED BEETLES.

The insects which now come before us are mostly characterised by the structure from which they derive their name. The antennæ are mostly long, and are never thickened at the ends. In many of the Longicornes, the antennæ have each joint widened at the end, so as to produce a serrated appearance, the widening being always on the inside. The first, or basal joint, is always large, long, and stout, especially towards the end.

The jaws are always powerful, sharp, and shear-shaped, often being so bent downwards that when the insect is viewed from above, they are hidden beneath the head. The eyes are almost invariably kidney-shaped; but there are some instances where they are absolutely divided by the basal joint of the antennæ, so that the insect appears to have four eyes instead of two. Such is the case with the Beetle called *Tetrops præustus*, which is common in the London district, and has its antennæ set in the very middle of its eyes. The head is generally broad and squared, and is never lengthened so as to form a rostrum, as is the case with the Weevils.

The reader may remember that in the Weevils the elytra are very large, in most instances folding over the sides, and concealing half of the abdomen. This structure is not found in any of the Longicornes, the elytra being comparatively flat and not bent at the sides, so that when the insect is viewed in profile, nearly the whole of the abdomen is visible.

The legs are never short, and in some instances, as for example the Harlequin Beetle, which is drawn on Plate IV., are of very great length, so as to give a very quaint aspect to the insect. The tarsus shows a similar structure to that of the Weevils, the joints being widened into two lobes in front, and the fourth joint

being so small as to be practically absent. The first three joints are always clothed with fur-like hair, which in many species is of a bright golden colour, and exceedingly conspicuous.

In the larval state, the Longicornes are all wood-borers, and to them is appointed the chief part of the task of destroying dead timber. It has long become a mooted question whether any of the Longicorn larvæ attack sound and healthy trees. At all events it is quite certain that, whether they do or not, they infinitely prefer dead timber, and that when a practised entomologist wants to find Longicorn Beetles in their larval or pupal stages, he always goes to dead timber, and not to living trees.

Take, for example, one of our commonest and most beautiful wood-borers, the Musk Beetle. It is very true that the insect may be found in willow-trees which are in full leaf. But the willow, as we all know, is one of those trees which is perfectly content so long as its bark exists entire, and flourishes and increases though the trunk be entirely hollow. And whenever the larva of a Musk Beetle is discovered, it is invariably found in the decaying, and not in the sound wood. So again with our smaller Longicornes. The best specimens are always taken by being dug out of decaying wood,—mostly rotten stumps in which the supply of sap has not quite ceased, but no entomologist would waste his time by looking for them in sound and healthy trees.

The larvæ are white, flattish, soft-bodied, hard-headed grubs, always larger in front than behind, so that they may pass the easier through the tunnels which they gnaw in the wood. The jaws are exceedingly sharp and powerful, made almost exactly like a surgeon's bone-nippers, and the head can be drawn back so that it is almost hidden by the thorax. They possess legs, but do not require to use them, thrusting themselves forwards by means of the rings of the body, which are very deeply cut, and furnished with a sort of hump on the upper surface.

In order to enable the female to deposit her eggs in favourable positions, she is furnished with a long, telescopic ovipositor, which can be protruded to a considerable distance, and is almost as mobile as the proboscis of the elephant or the tail of the Spider Monkey. With this instrument she can push her eggs under the bark, or into crevices, feeling about until she has satisfied herself that the egg is in a safe position.

THE first family of the Longicornes is the Prionidæ, in which are comprised some of the giants of the insect race, one, indeed, being the largest insect in existence, measuring nine inches in length, and being very wide and thick of body. I should very much have liked to have it engraved, but it is so large that by no possibility could space be found for it, even if a whole page were given up to it. The name *Prionidæ* is taken from the Greek, and is very appropriate, signifying "a sawyer," in allusion to the manner in which the larva cuts its way through timber.

Some of the species are said to saw branches in two, by grasping them in their toothed jaws and then flying round and round the tree. The late Mr. Waterton showed me a branch of a tree which fell at his feet, and which had evidently been cut through in some such way. But he did not actually see the insect cut it; and though he was assured by his companions that the Sawyer Beetle really did cut branches in such a fashion, he could not say that the branch in question had actually been severed by the insect.

The particular species which is generally pointed out as the Sawyer is *Prionus cervicornis*, a large flattish Beetle, mostly black and yellow, having the yellow of the elytra formed into an intricate net-like pattern. Its jaws are long, powerful, and have one long tooth in the middle and about sixteen lesser teeth on each side, so that the insect deserves its popular name of *Mouche scieur de long*.

That the perfect insect does eat away the bark in a circular direction is perfectly true, and, as may be expected, the branch dies, so that in the first high wind it is likely to fall. But that it cuts the branch completely across is scarcely credible, nor indeed would there be any object in so doing, as the sap, for which alone the tree is wounded, belongs to the bark, and not to the solid wood. The female is said to use her jaws in biting holes in the bark, so as to make convenient receptacles for her eggs.

The larva of this Beetle is very destructive, penetrating into the branches of trees, and driving tunnels so completely through the wood, that a mere shell of the branch is left in a perfect state, and so, like those that are "girdled" by the perfect insect, the branch is nearly sure to fall to the ground in tempestuous

weather. The mimosa trees are terribly infested with this destructive Beetle.

There is no difficulty in distinguishing the Prionidæ. Their heads are squared and there is no neck, and the thorax is also squared and drawn out into a sharp, tooth-like projection on either side. The elytra are sharp and spine-like at the tips. In England there is only one species of this family,—namely, *Prionus coriarius;* a large, flattish Beetle, with its surface coloured, as is expressed by its specific name, like untanned leather.

The old naturalists had some very wild notions about the Prionus, as is shown in Mouffet's work, reference to which has already been made. "It hath a little broad head, great oxe-eyes, almost three fingers overthwart in length; it hath a forked mouth, gaping and terrible, with two very hard, crooked teeth: with these, while he gnaws the wood (I speak by experience), it doth perfectly grunt aloud like a young pig. Maybe this is the reason why Hesychius hath related that they, bound to a tree, will drive away fig-gnats.

"The shoulders of it are curiously wrought by nature: they seem to be a hilt made of ebony and polished. It hath six feet, distinguished with three little knees; but they are very weak and faint, and altogether unfit for such a burden. These receive help by two horns that grow above their eyes, and are longer than their whole bodies: they are flexible, with nine or ten joynts; not exactly round, but are rough like goat's horns, which, although it can move them every way, yet when it flies it holds them only forth directly; and being wearied with flying, she useth them for feet: for knowing that his legs are weak, he twists his horns about the branch of a tree, and so he hangs at ease, as our *Bruerus* saw in the country about Heidelberg; in that it resembles the Bird of Paradise, which, wanting feet, clings about the boughs with those pendulous nerves, and so, being tired with labour, takes its ease.

"They thrust upon us some German fables, as many so say it flies only, and when it is weary it falls to the earth and presently dies. These that are stories and tales, render this reason just. Terambus, a satyrist, did not abstain from quipping of the Muses, whereupon they transformed him into a Beetle called *Cerambyx*, and that deservedly, to endure a double punishment,

for he hath legs weak that he goes lame, and like a thief he hangs on a tree."

The Beetle which is represented in the accompanying illustration is a native of Java. It is a singularly fine insect, large, boldly outlined, and standing very high on its long legs. In consequence of its generally handsome appearance, it has received



FIG. 110.—Prionocalus Buckleyi.
(Black-brown.)

the generic name of *Prionocalus*, i.e. "beautiful Prionus." The head is boldly scooped in front and on the sides, so as to be shaped very much like the thorax, *i.e.* squared and pointed at the sides. The thorax has three spikes or points on each side and, like the rest of the body, it is nearly black. The elytra are

granulated; there is a flattish edge on the sides, and on either side of the suture is a long and prominent ridge. The long legs are flattened, especially the thighs of the hind legs. Each elytron has a curved and very sharp spike on the shoulder, so that the Beetle has a sufficiently formidable aspect.

The jaws are flat, powerful, strongly curved, and each is armed near the tip with a double tooth. Their colour is black, and the surface is finely granulated.

Most of the Prionidæ are dull-coloured, but there are one or two exceptions. Such, for example, is *Psalidognathus Friendii*, a native of Columbia. This insect is exceedingly variable. Some are brown, others blue, and others deep purple, while many specimens exhibit both colours. They also differ in size, some being one-third less than others, while some of them have their elytra shaped differently from those of their relatives.

When the Prionus larva is full fed, it encloses itself in a cocoon made of little strips of the timber in which it has lived; and, after the manner of all tunnelling insects, it always undergoes its transformation close to the bark of the tree, so that when it assumes its perfect shape, it may find its way out of the tunnel with as little difficulty as possible. For the perfect Beetle is much wider than the larva, and not so flexible, so that, in spite of the very powerful jaws with which it is armed, it would not be able to force its way through the narrow channel which it had formerly occupied.

The large species to which reference has been made is *Prionus giganteus*, a Brazilian Beetle. Its eggs are remarkable for their size, far exceeding in dimensions those of many humming-birds; and indeed, but for their shape, which is much elongated and similar at both ends, they might well be taken for the eggs of a bird, and not of an insect. In order to place their eggs securely, the ovipositor of some of the species is provided with a curious apparatus much resembling two short spears set side by side, each spear-head being furnished with one or more knobs on the outside, apparently for the purpose of fixing the apparatus while the egg slides along it. The larva of one of the large exotic Prionidæ is used for food, and in all probability many such larvæ are edible, though they do not particularly suit our own ideas of delicacies.

THE family of the Pyrodides is entirely American, and a very beautiful family it is, many of the insects being large, and most of them conspicuous in their colouring. They may be known by the sharp horn-like projections on the shoulder of the elytra. The present species, *Pyrodes pictus*, is a native of Brazil, and is here represented of its natural size. The general colour of the Beetle is dark, blackish chocolate, diversified with certain markings. The sides of the thorax are covered with long, almost hair like scales, of a yellow colour, and two lines of similar scales extend from the head over the thorax, meeting on the scutellum.

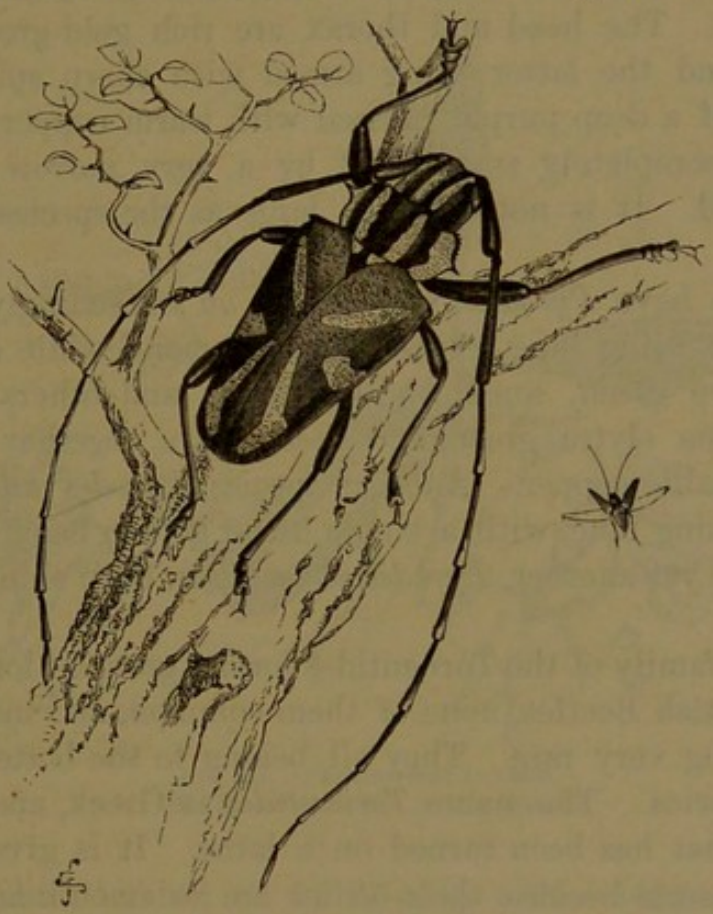


FIG. 111.—Pyrodes pictus.
(Dark chocolate and yellow.)

The deep chocolate brown surface of the elytra is profusely wrinkled and punctured, and is decorated with bold yellow marks, varying greatly in shape, size, and number in different individuals: generally there are three of those marks—a long, pear-shaped one near the base of the elytra, with its narrow end pointing towards the angular shoulder; then a small oblong mark, and lastly a long, sharply bent stripe near the tip. In some specimens, however, the first and second of these marks

are fused together into a single V-shaped stripe, while the third mark is rounded instead of angular.

The spikes of the thorax, the first joint of the antennæ, and the thighs are black, while the rest of the antennæ, and the long, slender tibiæ, are chestnut. Beneath, the thorax is black, with some stripes of yellow hair like that of the upper surface. The teeth are black, very powerful, and so bent downwards as to be invisible when the insect is viewed from above.

I have already mentioned that many of these Beetles are exceedingly beautiful. The handsomest of them is *Pyrodes marginatus*. The head and thorax are rich gold-green, deeply wrinkled, and the latter being armed with sharp spikes. The elytra are of a deep purple, glossed with warm copper, and each elytron is completely surrounded by a very narrow stripe of shining gold. It is not quite so large as the species which is figured.

Then we have *Pyrodes Smithianus*, an exceedingly variable insect, some being blue, glossed with crimson; while others are wholly olive green, some wholly copper, and others have the centre of the elytra green, and their edges, together with the thorax, metallic copper. Another species, *Pyrodes pulcherrimus*, is rich shining blue, with a single broad golden band across the elytra; and yet another, *Pyrodes columbinus*, deep shining blue.

THE sub-family of the Torneutides form a group of long-bodied, narrow, flattish Beetles, none of them common, and most of the species being very rare. They all belong to the hotter parts of South America. The name *Torneutides* is Greek, and signifies anything that has been turned on a lathe. It is given to this group of insects because their bodies are so smooth and regular that they look very much as if they might have been formed on a lathe.

In the genus to which our example, *Phœnicocerus Dejeanii*, belongs, the chief characteristic lies in the antennæ of the males, which are very much like those of the Oxynopterus, which has been already described on page 158. The generic name *Phœnicocerus* signifies "a conspicuous horn," and has been given to these Beetles in recognition of the extraordinary antennæ. As is often the case where the structure of the antennæ is in any way remarkable, the male sex alone possesses it, the

antennæ of the female being quite plain and simple. In consequence of this dissimilarity, the two sexes have such a different aspect that they have been called by separate names, being thought to belong to two distinct species. Even the appearance of the surface differs in the two sexes, that of the female being more boldly punctured than in the opposite sex.

The colour of our present species is black, but the whole upper surface is covered with yellow hair-like scales sprinkled rather sparingly on the thorax, but set so thickly upon the elytra that their real colour is not to be seen except in places where

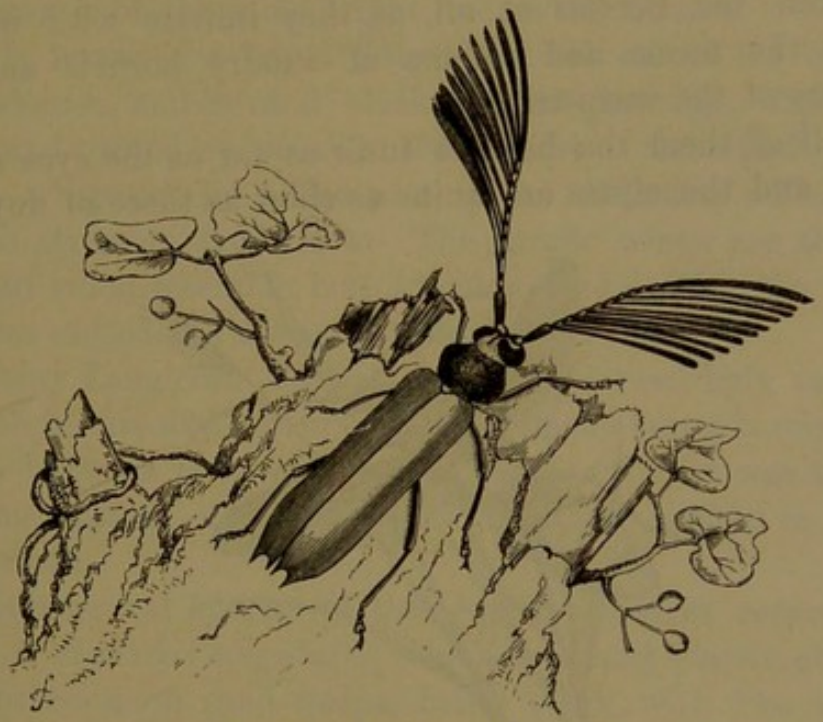


Fig. 112.—Phœnicocerus Dejeanii.
(Black, covered with yellow down.)

they have been rubbed off by ill-usage. The whole of the surface is very deeply punctured, so deeply, indeed, that even through the covering of scales the punctures are plainly visible. The tips of the elytra are boldly scooped. If the antennæ be carefully examined, it will be seen that each of the joints, except that at the base, is furnished with a long, narrow, flattened appendage, so that there are ten of these curious objects on each of the antennæ.

This insect, although perhaps, on the whole, the best example of the Torneutides, is not the largest. This is *Torneutes pallidicornis*, a native of Uruguay, the head and thorax of which are

without scales, so that they show themselves in their original shining blackness, while the elytra are so thickly covered with the scales that not a particle of the black can be seen.

A STARTLINGLY strange group of Beetles now comes before us, namely, the Hesthecidæ, all Australasian insects. When these Beetles are first seen, it is almost impossible to believe that they belong to the Longicorns, being to all appearance neither more nor less than Brachelytra. Indeed, some of them are not only unlike the Longicorns, but by non-entomologists would scarcely be taken for Beetles at all, as they imitate with wondrous fidelity the forms and colours of sundry hornets and other members of the wasp tribe.

In all of them the head is sunk as far as the eyes into the thorax, and the elytra are quite as short as those of any of the

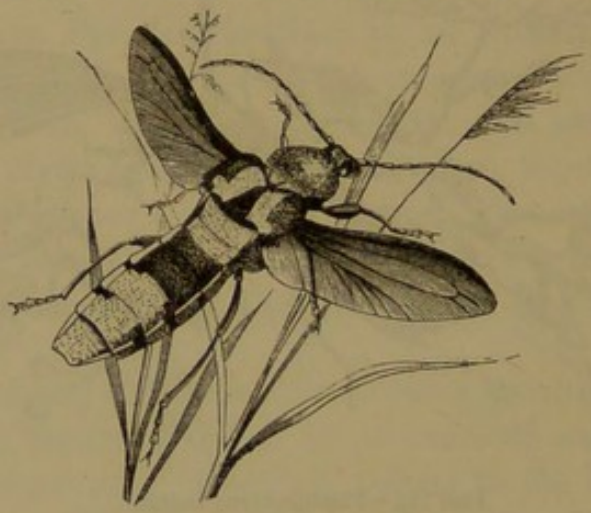


FIG. 113.—Hesthesis ferrugineus.
(Yellow, with black band.)

Rove Beetles; but whereas in those insects the wings are carefully packed up under the elytra, so as to be quite invisible when they are folded, in the Hesthecides they are as exposed as those of a wasp or bee, except just at the base, where they are partially covered by the small elytra. It is worthy of notice that the left wing is always crossed over the right.

Our first example of these Beetles is the largest, handsomest, and most brightly coloured of the whole group, and is called *Hesthesis ferrugineus*. The latter of these terms signifies "iron rust," and is given to the Beetle in allusion to the reddish yellow down with which nearly the entire upper surface is decorated.

Whether with wings spread or closed, this Beetle bears a most singular resemblance to a very large hornet.

The thorax is bright yellow, and when examined by the aid of a magnifier, the colour is seen to be produced by a quantity of hair-like scales which look very much as if they had been twisted into loose ropes, coiled backwards and forwards on the insect, and then pressed flat. The centre of the thorax is always darker than the sides, and in some specimens has well-defined edges like the ace of diamonds turned black. The elytra are covered with similar scales, of a dark chestnut colour, and the greater part of the abdomen is of the same bright hue as the thorax.

There is, however, a broad jetty-black belt across the middle of the abdomen, and several black spots on its sides, which are flattened and turned up, so as to form a sort of flat open box in which the wings can lie. The part of the abdomen which lies under the elytra is also black. The ample wings are shining yellow, and much resemble, both in colour and outline, the wings of a hornet united and spread for flight.

Like many Longicorn Beetles, this is an exceedingly variable insect both in size and colour, some specimens being barely one-fourth as large as that from which the description was taken; while some, instead of bright yellow scales, are clothed in a suit of dull brown.

There are several species of this genus, the most remarkable of which is *Hesthesis cingulatus*, which is almost startlingly like one of our common sand-wasps, being black, with two yellow bars across the abdomen, which is narrowed at the base, then swells out boldly, and then tapers rapidly to a point exactly like that of the sand-wasp. Indeed, anyone not practically acquainted with entomology might be excused for thinking that it was armed with a sting.

With regard to the name of these insects, I accept it because it is given by Lacordaire, whose arrangement is employed in the British Museum. But I only accept it under protest. Had the name of the group been given as *Esthesides*, and that of the genus as *Esthesis*, it would have been perfectly correct. *Esthesis* is a Greek word signifying "clothing," and referring to the dense coat of hair-like scales with which the body is clothed. But there is no aspirate, and the "*c*" in the middle of the word ought to be "*s*," as any of my readers may see by reference to a Greek lexicon.

THERE is a family of Longicorn Beetles in which a portion of the antennæ is covered with prickles, and which are therefore called Batoceridæ, *i.e.* thorny-horned Beetles. On Plate IV. Fig. 2, is shown one of these insects, *Batocera Celebiana*, which, as its name implies, inhabits the Celebes. Being a large species, it shows well the characteristic spikes with which the very long second joint of the antennæ is armed. The usual spikes at the sides of the thorax are well developed, and there is a short sharp spike on each of the shoulders of the elytra.

The general colour of this Beetle is black, but parts of it are covered with a secondary coating of white or red, arranged as may be seen by reference to the plate. On the upper part of the thorax are two large patches of a rust-red, looking indeed very much like splashes of actual rust.

The surface of the elytra is covered with rounded tubercles of various sizes, the tubercles themselves being shining black, and the space between them filled with yellow down. On each of the elytra are four white spots. One large irregularlys-haped spot is on the middle of each elytron, sometimes being nearly oval, and sometimes having a sort of curved tail like a comma. Above it is a small circular spot, below it a similar spot, and near the tip of the elytra another, but much smaller mark. All these marks look, when examined with a low magnifying power, as if they were made of plaster of Paris spread thinly on the surface, and are full of tiny cracks just like those of the plaster when it has been exposed to moisture. When a tolerably high power is brought to bear on these red and white spots, they are seen to be formed by a number of oblong scales laid as regularly as the tiles of a house, instead of being flung loosely over the surface like the hair-like scales of the under parts of the body.

Beneath, the insect is black, thickly sprinkled with yellow down, and on each side of the thorax, just below the elytra, is a broad white stripe, very clearly defined and with jagged edges.

Among the many species of this genus we may mention *Batocera læna* of the Arú Islands. This is a very much larger Beetle than the preceding, and much blacker. The antennæ are remarkable for having the spikes on every joint except the two last, which are very slender and delicate. The whole of the surface of the elytra is covered with tubercles.

One of the most variable species is *Batocera Thomsonii* of

Java. Not only does it vary much in size, some specimens being barely half as large as others, but it has an extraordinary scope of variety in the markings of the elytra. The general colour is brown. Some specimens have only two large white spots, which are placed in the centre of the elytra; others have twelve spots; while in some, the spots, instead of being white are rust-red, like those of the first-mentioned species. *Batocera lineolata* is covered with grey down and white spots, also variable in form, size, and number. But in all the species, however much they may differ from each other, the broad, jagged white stripe along the sides of the thorax is present and is equally conspicuous.

We now come to the group called Callichromides. This is a very appropriate name, as it signifies beautiful colours, and most of the insects which belong to the group are remarkable for the splendour of their hues. It is a very large group, comprising

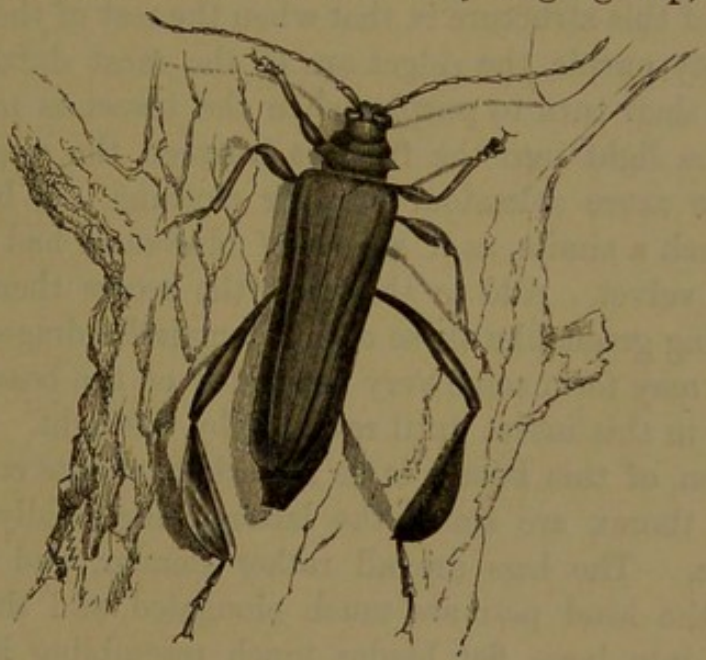


Fig. 114.—Phyllocnema phyllopus.
(Deep velvet-purple.)

some twenty-nine or thirty species, of which only one is known to inhabit Europe. This is Aromia, to which our familiar Musk Beetle belongs—the only British species of this splendid group, but one which very efficiently represents it, not only in the splendour of its colouring, but in its size and the fragrant odour which it diffuses.

The insect which has been selected as a representative of this

group is one which is well worthy of description. It is a native of Brazil. When viewed by a dull light, or when merely seen from above, it looks as if it were dull, dead black. It seems as if it must have crawled down the chimney before it could have attained such a depth of blackness, compared with which the blackest velvet seems quite brilliant.

But let a gleam of sunshine touch its surface, and the insect is at once transformed. Instead of being the dull, sober Beetle that it appeared only a moment ago, it is clothed in robes of imperial purple, so rich, so deep, so piercing, that the eye can scarcely endure its splendour. It is an insect that absolutely fascinates the observer, and one is never tired of shifting it to and fro in the sunbeams, in order to watch the wonderful play of colour over its surface.

As if to add to its beauty, the elytra are furnished with several broad ridges, elevated very slightly above the rest of the surface. The effect of this structure is, that when the rest of the elytron is deep, velvety purple, the ridges are of the most dazzling azure, shifting in their turn to purple when the insect is moved so as to throw the light into the furrows between the ridges, and to develop the azure splendour of their clothing. It looks, if we may use such a simile, as if stripes of blue satin had been sewn on purple velvet. Add to this, that the wings themselves are deep, shining green, like those of our demoiselle dragon-flies, and the reader may form some very faint idea of the beauties which lie hidden in this insect until revealed by the light.

The form of this Beetle is as remarkable as its colour. The head and thorax are small, the latter being boldly spiked at either side. The legs are all rather slender, and moderately long, but the hind pair are much elongated, and the tibia are developed into large flat blades, much resembling in form the head of a racket, having one side much rounded and the other comparatively straight. The similitude is increased by a thickened edge which runs round the flattened portion, like the frame of a racket. Like the elytra, the legs are purple, and have a satiny surface, which is shown by the microscope to be due to a dense clothing of very fine purple down.

The name of the insect is *Phyllocnema phyllopus*. Both words have a similar meaning; the former signifying "leaf-legged," and the latter "leaf-footed."


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This is not the only insect of the genus which possesses the flattened tibiæ. One in particular, *Phyllocnema mirifica*, has them so large that each of the flattened portions would nearly cover the entire body of the insect. Indeed, they are so enormous in proportion to the size of the insect, that it is impossible to avoid a feeling of wonder at their use, and of surprise that the Beetle can walk at all with such apparently unwieldy limbs.

One of the most striking examples of the Longicorn Beetles is the Harlequin Beetle (*Acrocinus longimanus*), which is given on Plate IV., Fig. 1. It belongs to the group Acrocinides. Its colours are black, red, and yellow, disposed in a very singular manner, so that they really do bear some resemblance to the corresponding colours in the tightly-fitting dress of a stage harlequin.

The ground colour is black, of a velvety texture, warmed by the very short but very dense down with which its surface is covered. Upon the whole of the upper surface, head, thorax, and elytra included, is drawn a complicated pattern which is not easily described, but which can be understood by reference to the illustration. The long antennæ are black, and so are the legs, with the exception of a broad scarlet band round the end of each of the thighs.

All the legs are long, but the first pair is enormously developed, covered with very small teeth, and having ten long spines, one at the base of the thighs and the others at the end of the tibiæ, which are so boldly curved near their extremities as to look like hooks.

These very long legs are employed in traversing the branches of the trees among which the insect lives, and those who have seen the Beetle in motion say that its movements, though slow, can almost be called graceful as it swings itself from bough to bough. Indeed, these long fore-limbs very strongly remind the observer of the fore-limbs of the Spider Monkeys which inhabit the same spots as the Harlequin Beetle. On the ground, the inordinate length of limb seems to be very much in the Beetle's way, and accordingly it crawls in a sluggish manner, and, like the sloth on level ground, drags itself along rather than walks.

The Harlequin Beetle is extremely fond of the juice which is secreted by the Bagasse tree (*Bagassa Guianensis*). This juice is white, thick, and, when newly taken from the tree, gives out a strong and penetrating odour, which the Beetles perceive at a considerable distance. The collectors take advantage of this predilection, and, when they go in search of the Harlequin Beetle, they attract it by wounding a Bagasse tree and allowing the sap to flow freely. Negroes, when employed in collecting, are apt, with the usual improvidence of their race, to cut down the trees so as to secure a greater number of Beetles at the time. In consequence of the fondness of the insect for this juice, it is popularly called *Mouche Bagasse*.

The Beetle can fly pretty well, and, like most of its kin, takes to the air in the evening, remaining quiet during the day. The long fore-legs appear to incommode the Harlequin Beetle when flying, for it seems to have but little power of directing its course, and is apt to blunder against any object that may happen to be in the way. When it does so, like our own Stag Beetle, it falls to the ground at once. It has rather a noisy, rustling flight, and, when walking, it makes a sort of creaking sound which betrays it to anyone who knows its customs.

It is an extremely variable insect, both in size and colour. The variation in the latter, however, is often due to the effect of light, the bright scarlet and yellow fading into dull red and dusky ochre if the insect has been kept for any length of time in a case which is exposed to light. Those specimens which are obtained near the coast are said to be much more brilliant than those which are found inland. These are not uncommon insects, and as they are exceedingly handsome and imposing, and look well in show-cases, the negroes who choose to hunt after them can be sure of earning money by capturing them and selling them to the professional collectors, who are always ready to buy up any insects which are likely to have a sale in Europe.

The wood-boring habits of this splendid Beetle are well shown by a specimen in the British Museum. It was fortunately secured before it had escaped from the piece of timber in which it had undergone its change into the perfect state, and there lies, with its long legs packed up in a most wonderful manner, so as to take up a space which is very small in proportion to the size of the insect and the length of its limbs.

THERE is a group of Longicornes whose exact place in the system is very doubtful. They form a well-marked group, and can be at once distinguished by the peculiarity from which they derive their name. The term *Phrissomides* is formed from two Greek words signifying "spiked body," and is applied to these insects because not only the thorax but the whole of the upper surface is thickly covered with sharp spikes. The Phrissomides are natives of Southern Africa.

The present species, *Phrissoma horridum*, is the most conspicuous of the group. Beside the usual spikes on the sides of the thorax, there are two others on the upper surface, so that their points radiate much like those of a dog's spiked collar. On each of the elytra there are three parallel rows of similar but shorter spikes, their bases set closely together; so that when

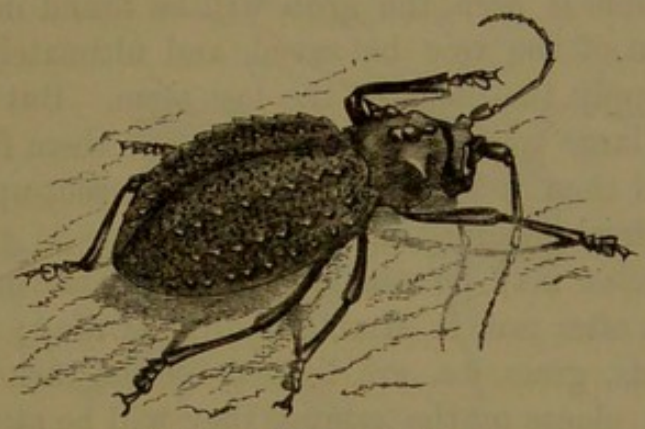


FIG. 115.—Phrissoma horridum.
(Blackish brown.)

the insect is viewed sideways, the spikes look just like the teeth of three saws. Between them the surface is studded with a vast number of smaller spikes, or rather tubercles, their tips being blunt instead of pointed. In fact, the insect appears to be all spikes, and to be a very unpleasant one to handle. The colour of these projections is shining black at the tip, becoming dull, however, at the base.

ALL of my readers who have paid any attention to British entomology must be familiar with the Wasp Beetle (*Clytus arietis*), our best-known example of the Clytides, which is so common in the hedgerows, its black body with its yellow base giving it a very wasp-like air as it slips in and out of the foliage. Neither this Beetle nor any of its relatives does much harm in

this country, the larva merely boring into old posts, rails, and other dead timber. But in those parts of the world where coffee is grown, one of the Wasp Beetles becomes an absolute plague, under the name of "The Borer."

The female gnaws a small hole into the tree, very much like the perforation of a gimlet, and there places her eggs. As soon as they are hatched, the larvæ begin to eat their way through the tree, and often drive so many tunnels, upwards and downwards, that the tree dies. Mr. A. R. W. Lascelles, managing director of the Moyan Coffee Company, makes the following remarks in a little work on coffee-plantations :—

"The part of the tree above their entrance generally gives at once unmistakable indications of their presence; and if these are noticed, and the tree cut off at the place where the perforation is seen, the grub will be found inside and the lower portion of the tree be saved, and ultimately send out a sucker to supply the place of the lost stem. But it frequently occurs that large trees with heavy crops on them fall victims to this pest, and then it becomes necessary to root up the old tree and plant a fresh seedling in its place.

"The Beetles may be observed flying about in numbers in the evenings after rain in March, April, and May; and if bright fires of weeds, grass, &c. are lighted on the various roads and other vacant places on the estates, they will be attracted by the blaze and light, and fly into the fires. This method has been found very efficacious, and is neither expensive nor difficult of execution.

"It may be remembered that the Borer is most abundant in rather dry localities, and is not so troublesome in virgin forest land as in what has been already described as 'bamboo' land."

This "bamboo" land, which is so favourable to the Borer, is described as gentle undulating slopes, sparsely covered with large trees and bamboo thickets; the soil being heavy, deep, hard, and full of weeds. When properly cleared, this land suits the coffee tree admirably, but unfortunately it suits the destroyer as well as the tree.

The Sternacanthides are here represented by one species; namely, *Lophonocerus barbicornis*. The name *Sternacanthides* is Greek, signifying "thorny-breast," and, as the reader will see

by reference to the illustration, it is a very appropriate title. They have six spines on the thorax—namely, four long spines and two shorter—besides two small but bold spines on the collar. They are all natives of South America.

The fine insect which is here represented is an excellent example of the group. In colour it is wholly black and orange, the two hues being arranged so as to form a bold pattern, as seen in the illustration. This pattern is rendered the bolder from the fact that the orange portions are raised and slightly rounded, while the black parts are depressed. The spines upon the thorax are shining black.

Though the vivid colours and well-defined marks of the elytra render the insect a very conspicuous one, they fade into



Fig. 116.—Lophonocerus barbicornis
(Black and orange.)

comparative insignificance before the extraordinary antennæ. The first four joints of these appendages are covered with thick long hairs, pointing slightly forward, but radiating equally on every side like the bristles of a bottle brush. They are black at their bases and orange at their tips, so that they carry out the colours of the elytra. The remaining joints are very slender and of a pale yellow. Both scientific names of this insect refer to the antennæ. The generic name *Lophonocerus* is formed from two Greek words signifying "plume-horned," and the Latin word *barbicornis* signifies "bearded horn." There are very many species of the Sternacanthidæ, of which the present is certainly the best example.

THE extraordinary little Beetle which is represented below belongs to the group called Rhopelophorides. This word signifies "club-bearer," and is given to the Beetles on account of the club-like appearance which is given to the antennæ by a single large tuft of hair with which they are adorned. They are mostly Australasian, and are small insects, our present example being the largest, and one or two very tiny creatures.

The word *Cosmisoma* signifies an adorned or decorated body, and is probably given to these insects on account of the beautiful colour of the body. The hue of the *Cosmisoma scopipes* is either blue or green, the insect being exceeding variable in this respect, and the surface is covered with rather bold punctures. The antennæ are very long and slender, and the fourth joint is furnished towards the end with a large round tuft of long black



FIG. 117.—Cosmisoma scopipes.
(Blue-green, with black hair tufts.)

hairs. The hind legs are equally remarkable. They are chestnut in colour, very long in proportion to the size of the insect, and the end of the thighs is much enlarged. The tibiæ are slender, boldly curved, and from their outer edges radiates a flat brush of black hairs similar to those upon the antennæ.

Another species of the same genus, *Cosmisoma ochraceum*, is very similar to this insect, except that it is smaller and has the hair-tufts yellow. There are many other allied insects which bear tufts on the antennæ. The most remarkable of them is called *Disaulax hirsuticornis*, whose peculiar structure is implied by the specific name, which signifies "hairy horns." In this insect there are no tufts on the legs, but the first four joints of the antennæ are wholly covered with long black hair, which radiates equally round them, so that they appear cylindrical rather than conical, as is the case with the Lophonocerus.

THE Sternotomides are represented by the Beetle called *Zographus oculator*. The name of this group is formed from two Greek words signifying cut, or truncated, thorax, and is given to the insects because the thorax is wide and short, as if it had been abruptly cut off, or like a draughtsman set on its edge. They are all natives of Africa. The projections at the sides of the thorax, instead of being sharp spines, are large thick tubercles, rounded at the tip.

The present species is a really handsome insect. Its colour is black, and across the head and thorax are drawn some very narrow yellow lines, their edges as clearly defined as if they

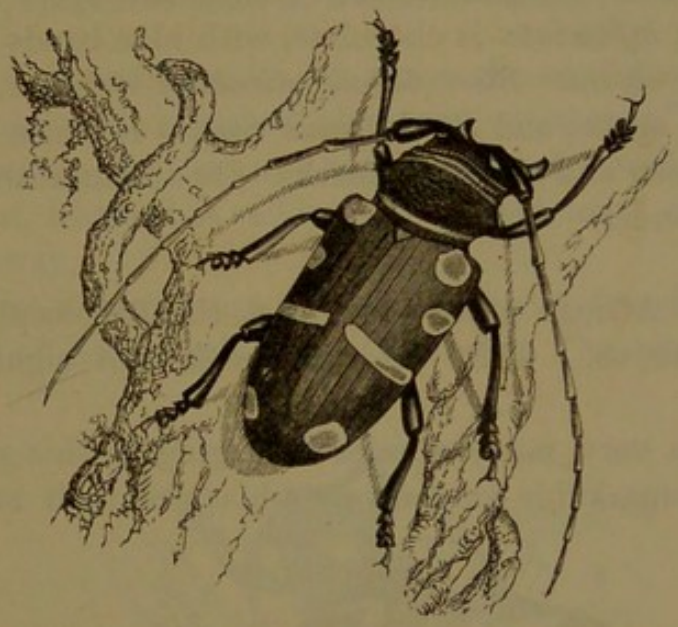


FIG. 118.—Zographus oculator.
(Black, with yellow marks.)

were done with a pen and ink. The elytra are covered with tiny wrinkles, and are marked with bold ridges, boldly armed at the shoulder and running nearly parallel with the suture. Upon each of the elytra are four large yellow marks, deepening into chocolate in the centre. The name *Zographus*, which signifies anything that is painted from life, is given to the insects on account of the lines and spots wherewith they are adorned. The specific name *oculator*, which is formed from the Latin word *oculus*, an eye, refers to the eye-like form of the marks on the elytra.

The antennæ of this insect are extremely variable in different individuals, being in some specimens fully one-third longer than

in others. They are exceedingly beautiful, even if viewed with the naked eye, and much more so when the magnifying glass is brought to bear upon them. Their colour is a soft blue grey, with a sort of a chalky look about the surface. This effect, when the antennæ are examined with a microscope, is seen to be produced by the grey scales with which the entire organ is covered. As if in order to break the uniformity of the antennæ, the end of each joint is jetty black.

There are many species of this group, and many of them are beautifully coloured. Among the more conspicuous insects we may note *Sternotomus Bohemanna*, a Beetle of a shining green colour, covered with a multitude of chocolate spots and stripes. *Sternotomus bifasciata* is chocolate, with blue bands on its head, thorax, and elytra. *Sternotomus mirabilis* is black, with green stripes and spots; and *Sternotomus regalis* is black, with multitudinous green and chocolate marks. Its antennæ are peculiarly long and slender.

ANOTHER African group of Beetles, the Tragocephalides, now comes before us. This word is Greek, and signifies "goat-headed."

There are very many species belonging to this group, all of which are remarkable for the velvet-black of their surface, upon

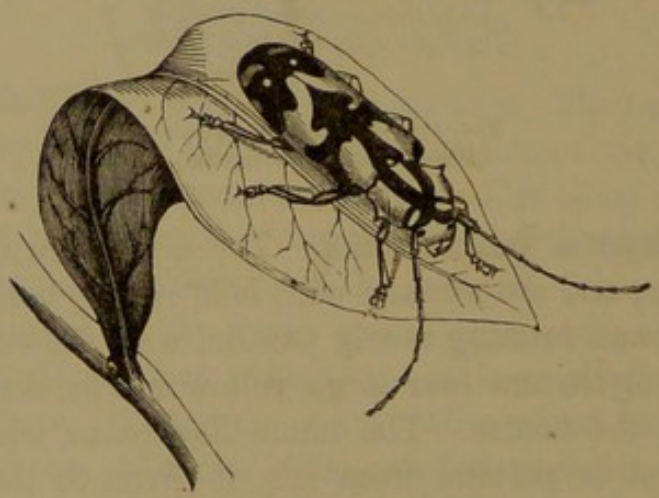


FIG. 119.—Tragocephalus variegatus.
(Velvet-black and orange.)

which are markings of sundry other hues. Our first example, *Tragocephalus variegatus*, has more of the lighter blue than the darker colour, and is bright orange. Two bold, black velvety

stripes run along the upper surface of the thorax, and the spines on either side are also black. Upon the elytra are three bold, black marks, which are much too complicated for description, but which can be understood by reference to the illustration.

Some of the more remarkable insects of this genus are *Tragocephalus pulchella*, which is black, with marks of vivid green and golden yellow; *Tragocephalus gemmaria*, fully deserving its name, its velvet-black surface being studded with little azure spots, just like jewels; *Tragocephalus phosphorus*, which is vivid yellow, with a black heart-shaped mark on the elytra; and lastly, *Tragocephalus nobilis*, which is velvet-black, with a golden yellow band round the thorax, and three belts of a similar colour across the elytra.

THE name Tmesisternides, by which the next group of Longicorn Beetles is distinguished, signifies "cut-thorax," and is given to them because the thorax is narrow behind, broadening rapidly to the front, where it is suddenly truncated, as if a portion had been cut away.

They have a large range of country, being found spread over the whole of Australasia and Polynesia. The present species,

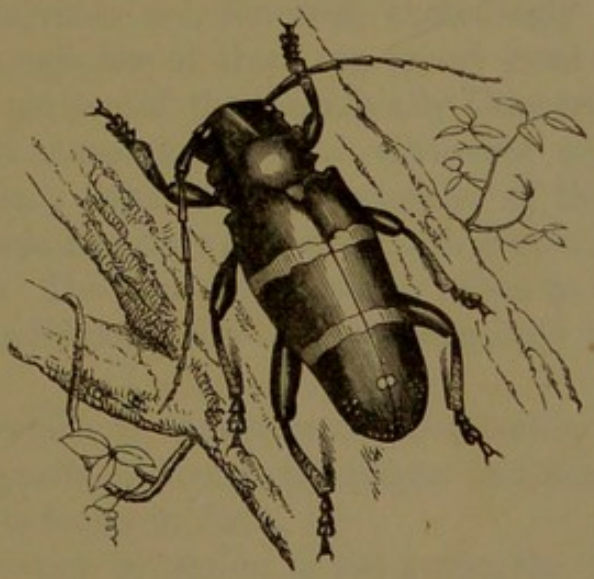


FIG. 120.—Ichthyosoma mirabilis.
(Blue or green, with white marks.)

Ichthyosoma mirabilis, comes from the Arú Islands, and is quite new to science, having only lately been discovered. It is the largest of the whole genus, and is a very conspicuous insect, the colours being very brilliant and boldly contrasted. The colouring of the insect is as follows:—

The upper surface of the head, thorax, and abdomen is shining blue or green, some individuals being of one tint and some of the other. Three bands of pure white are drawn across each of the elytra, two of the bands being continuous, and the last, which is close to the tip, being broken up into several small rounded portions. The legs are rather curiously coloured. The whole of the thigh and about one-quarter of the length of the tibiæ are deep shining blue, while the rest of the tibiæ is yellow. The tarsus is of the same hue as the thigh. The antennæ are entirely blue.

The generic name *Ichthyosoma* is formed from two Greek words, and signifies "fish-bodied." I cannot, however, see any particular appropriateness in the term, as this insect bears no more resemblance to a fish than do the other Longicornes which have already been described.

CHAPTER XVII.

PHYTOPHAGA, OR PLANT-EATERS.

THERE has been, and still is, some difficulty in the arrangement of the Beetles which come next in order. As, however, this is not intended for a work on systematic entomology, there is no need for entering into any such controversies. As may be inferred from their title, these insects feed upon plants, and are mostly found on the leaves.

The first group of these insects, the Sagrides, are almost entirely exotic, being represented in England only by four small inconspicuous Beetles belonging to the genus *Orsodacna*. Many of the exotic Sagrides are, however, exceedingly beautiful in their colours, though few of them run to any great size.

They form a portion of the large family Crioceridæ, of which our well-known Asparagus Beetle (*Crioceris asparagi*) is a familiar example. Other British examples of this family are the lovely Donacia Beetles which stud the leaves of water-flowers like living gems. The Sagrides are nearly allied to the Donacias, though the splendid colouring of the former only belongs to the exotic species.

The species which is shown in the illustration on the next page, *Sagra Buquetii*, is at once the largest and most splendid of the genus. It is found in Java.

In all the species belonging to the genus, the hind legs are greatly developed, and in this species they are absolutely enormous when compared with the body of the insect. The thighs are thick, powerful, boldly curved, and armed with a series of teeth on the inner surface. The tibiæ are correspondingly powerful, and continue the curve of the thighs near their tip; the inner surface is clothed with rather long and thick hair, of a shining golden yellow. The tarsus is so small as to

appear absolutely useless. The other legs are rather small than otherwise.

The colour of this Beetle is singularly beautiful. In the first place the elytra are rich shining green, with the exception of a fiery copper-red stripe in the middle, which is wide at the base and narrows gradually to the tip. The whole surface is thickly granulated. A decided golden gloss tinges both the green and the red, the golden gloss shifting with every change of light. The head and thorax are also green, and so are the legs, the surface of which is granulated like that of the elytra, but not so deeply.

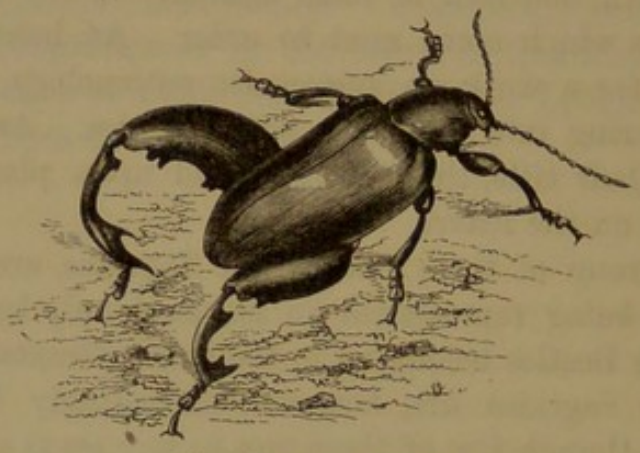


FIG. 121.—Sagra Buquetii.
(Green and coppery red.)

This is an exceedingly variable insect, especially in point of size, some not being one-fourth as large as that which has been figured.

The Sagrides have a very wide geographical range, being found in Australasia, Java, and India. Their colours are exceedingly various, though green of some kind is generally the predominant hue. The present species, for example, is mostly green, and *Sagra chrysochlora* is entirely golden-green. *Sagra empyrea*, however, is almost entirely blue; and *Sagra nigrita*, a small Cingalese species, is dull black.

Now come a vast number of Beetles, with outlines more or less circular. For this reason they have been named Cyclica, this being a Greek word signifying "a circle." None of them are of any great size, the largest barely reaching an inch in length, and on an average being seldom more than one-third of

that length. In beauty of colour, however, they compensate for their small size, for there is scarcely a colour of the rainbow which is not represented in some of the Cyclica. This beauty is not attained by the iridescent hairs with which many Beetles are clothed. but is due to the surface of the body itself.

THE family of the Clythridæ is represented in England by only three little species, which are very seldom found, on account of the locality in which they live. They inhabit ants' nests, and their larvæ contrive to make moveable cases of a tough and leathery nature, in which they conceal the greater part of their bodies. Only the head, thorax, and legs project from the narrow end of the case, the rest of the body being concealed within it.

Whether this covering be intended for a protection against the stings of the ants is a very doubtful point. That it should be supposed to serve such a purpose is natural enough, especially as it would form an effectual protection against the attacks of ants or even stronger enemies than they are. But we must remember that in most instances where Beetles are parasitic upon ants, both parties seem to live in perfect amity; and, indeed, in one case, if the nest be broken open, the ants take as much care of the Beetles as of their own offspring. A somewhat similar case is formed by Beetles belonging to the genus Poropleura, which will presently be described.

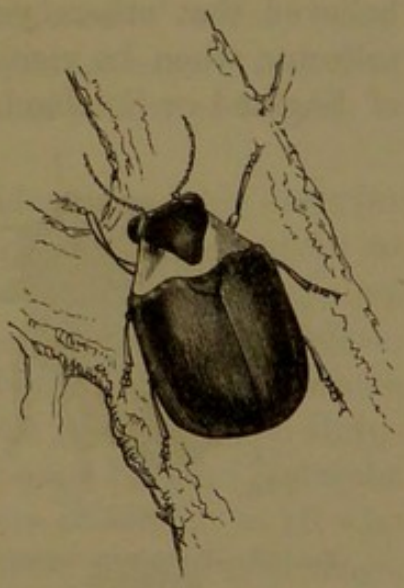


FIG. 122.—Themesia aurisapilla. (Blue and yellow.)

Our example of this family is a very pretty Brazilian Beetle belonging to the genus Themesia, of which there is only one species in the British Museum. The front of the thorax is bright blue, shining and punctated, and the elytra are of the same hue, the latter being sometimes green or even copper. The middle of the thorax is covered with abundant golden yellow hair, not set regularly, as is generally the case with insect hair, but laid in tufts, very like moss pressed flat. The under surface is clothed with similar hairs.

I have no doubt that the specific name *aurisapilla*, which is

absolutely meaningless, is wrongly spelled. Had it been *auri-capilla*, it would have signified "golden-haired," and would have had a direct reference to this yellow down. But as the name is spelled *aurisapilla* in the printed catalogues, it must perforce be retained.

NEXT to the Clythidæ come the Cryptocephalidæ. This rather long name is formed from two Greek words signifying "hidden-head," and is given to the insects because their small heads are almost entirely sunk in the thorax, so that when viewed from above they look, but for the antennæ, as if they had no head at all. The elytra do not quite cover the end of the body, and the entire form is thick, cylindrical, and looks as if it had been abruptly truncated in front. We have in England only one genus, Cryptocephalus, of which about eighteen species are known. They are bright little insects, and may be found on fine summer days basking in the blaze of the hottest sunbeams. Their larvæ inhabit odd moveable cases, which are formed, like the covering of the Cricoeridæ, from the excrement.

Several of the species have been lately discovered, and it is believed that others yet remain for discovery. Indeed, every collector, when he visits a new locality, especially to the North of England or Scotland, is sure to keep a careful watch on the foliage, in hopes of detecting some species of Cryptocephalus at present unknown. And as they are small Beetles, and apt to be exceedingly variable, it is likely that there may be in cabinets more than one species which has not been inserted in any catalogue.

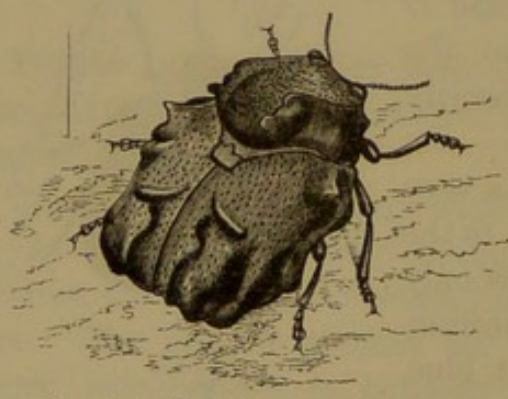


FIG. 123.—Poropleura monstrosa. (Violet.)

In order to show more clearly the extraordinary form of the insect which has been selected as an example of this family, it has been found necessary to magnify it, the length of an ordinary specimen being about half an inch.

This is a most difficult insect to describe. Its colour is a rich, shining violet, with a metallic glitter like that of foil. The whole surface is knobbed, and creased, and wrinkled, and channelled, and

punctured full of holes, so that it really looks as if a piece of violet foil had been loosely rolled between the hands, and then pinched into the rough semblance of a beetle. The generic name *Poropleura*, which signifies "channelled-side," refers to this extraordinary formation. In order to bring out all its peculiar beauty, the insect must be taken into a strong light, examined through a lens, and turned in every direction, so as to allow the light to reveal the multitudinous knobs and grooves and pits with which the surface is covered. To judge by the long series of specimens in the British Museum, there is but little variation, either in size or colour.

Another species, *Poropleura chimæra*, is about the same size and formed in much the same manner, but is green instead of blue; while *Poropleura bacca*, a smaller insect, looks as if made of crimson foil, the edge of each fold and the top of each projection being vivid green. *Poropleura cuprea* looks, as its name implies, as if it were made of copper foil. All the insects are natives of Brazil.

It has been mentioned that the larvæ of the Cryptocephalidæ inhabit moveable cases. In the British Museum are two of the cases made by the larvæ of Poropleura. They are conical and curved, looking like very thick and blunt cows' horns, being hollow at the larger end. Their texture is almost exactly like that of very fine sponge, and the colour is either yellow or brown.

THE splendid family of the Chrysomelides thoroughly deserves its name. The word signifies "golden apples," and is given to the insects on account of their rounded, smooth, and polished bodies, which are often decorated with golden green, crimson, blue, and in fact almost every combination of colouring. None of the species are large, by far the largest of our British Chrysomelides being the well-known Bloody-nose Beetle (*Timarcha tenebricosa*), whose round, indigo bodies are so familar to all who live in the country. They have a very wide geographical range, and, indeed, wherever the climate permits insects to live at all, some of the Chrysomelides may generally be found.

The fine insect which is shown in the illustration on the next page is a native of Brazil. Its name is *Doryphora tessellata*, both of which words are very appropriate, both to the genus and the individual. The generic name *Doryphora* is Greek, and

signifies "spear-bearing." It is given to the insects because the mesosternum, *i.e.* the central portion of the lower side of the thorax, is lengthened into a projecting spike of a spear-like form. The reader may perhaps remember that in the Dyticus a somewhat similar spike, only fork-headed, projects from the metasternum, or third portion of the thorax.

The beautiful species which is here shown is a native of Brazil. Its ground colour is yellow, and across the elytra are drawn five rows of squared black or chestnut spots. The thorax, as is the case with nearly all the species, is plain, dark chestnut.



Fig. 124.—Doryphora tessellata. (Yellow, with black marks.)

Some of the species are worthy of notice for the way in which they are coloured. *Doryphora duodecim-guttata*, which is found in Pará, is shining green, thickly punctated, and having six round yellow spots on each of the elytra. *Doryphora testudo*, of Bolivia, has five similar marks and blue surface, the lowest being heart-shaped. *Doryphora pura* is pale green. *Doryphora æneo-guttata* is green, and has a T-shaped mark upon the elytra, and a spot of the same colour on each shoulder. *Doryphora imperialis*, another Brazilian insect, is yellow, variegated with green or black spots.

Perhaps the most beautiful of them all is the largest of the whole genus, and so called *Doryphora princeps*. The colours of this fine insect are so varied that it is not easily described. The head is yellow, with a deep-blue circular spot on either side. The edges of the thorax are yellow, each having a similar blue spot. On the middle of the thorax is a yellow mark much resembling the ace of spades, and the rest of the thorax is deep shining blue, thickly punctated. On each of the upper inner angles of the elytra there is a large rounded yellow spot, a similar spot is at their tip, a yellow band is drawn across the middle, and the rest of the elytra is deep blue, crossed with many zigzag black lines.

The beautiful insect which is represented in the illustration looks very tame in the plain black and white with which its shape, but not its splendid colour, is shown. In common with most of its genus, it is a native of Brazil.

The colour of this splendid insect is not easily described, because it varies together with the direction of the light. The surface is always brilliantly metallic, but its exact hue seems to depend entirely on the light, so that it may be green, copper, gold, or blue. There is always a narrow bright line along the

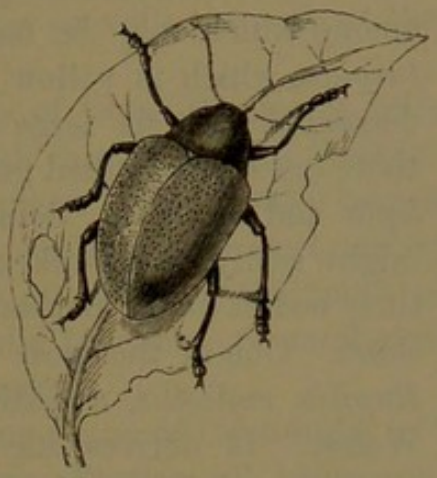


FIG. 125.—Eumolpus fulgidus.
(Metallic copper and green.)

edges of the elytra. There are many species, some being deep indigo blue, some purple, and a few brown.

An allied insect, which inhabits Southern Europe (*Eumolpus vitis*), is very destructive to the vine. It is very small, but exceedingly plentiful. The larva feeds upon the young leaves and twigs, just as they are shooting forth in the spring-time, so that the proper development of the foliage is prevented. But this is not the worst of its ravages; for as soon as the grape-bunches are fairly formed, the insect fastens upon the stems, and gnaws them all round so as to prevent the flow of sap. In form it resembles *Eumolpus fulgidus*.

The word *Eumolpus* has no reference either to the qualities or the appearance of the insect, being only a classical proper name.

THERE is a curious genus of Chrysomelides called Metacycla, from the shape of the insects which belong to it. The name comes from two Greek words signifying any object that is capable of being rolled about. The females of these insects have the head and thorax small, but the abdomen of enormous size, being capable of becoming almost globular. The present species is called *Metacycla Sallei*, and is a native of Mexico. The abdomen of the female is so large, round, black, and shining, that

it looks just like a ripe black currant. The elytra are violet in colour, thickly punctated, very short and rounded, and appear like mere useless excrescences on the back of the insect.

The male Metacycla is quite different in shape, the body being quite twice as long as it is wide, and the elytra reaching to its end. There are several species of this genus, among which may be mentioned *Metacycla turgida*, which is yellow, and has the elytra decorated with six large black spots. Also there are several allied genera, such as *Metalepta* and *Rupilia*. Some of these insects might easily be mistaken for Rove Beetles, their bodies being long and their elytra very short. One of the most notable of them is *Rupilia ruficollis*, a native of New South Wales. It derives its name of *ruficollis*, or "red neck," from the bright ruddy chestnut of its thorax, which hue extends to its head. The elytra are blue in some specimens and green in others, and the abdomen is chestnut, like the thorax.



Fig. 126.—Metacycla Sallei. (Black, with violet elytra.)

We have in England two little Chrysomelidæ which present exactly similar peculiarities. They belong to the genus *Gastrophysa*, i.e. "swollen-belly," and may generally be found in the common dock.



Fig. 127.—Aplosonyx purpurascens. (Yellow and purple.)

The insect which is here represented is an exceedingly variable one, especially in point of size, many specimens being so small as to look by the side of others like dwarfs beside giants. It also varies in colour. The head and thorax are always shining yellow, but the elytra are sometimes green and sometimes black, though, as the name of the insect implies, they are mostly purple.

This is a very large genus, containing some splendidly coloured Beetles. *Aplosonyx basalis*, a species which inhabits Manilla, is curiously and boldly marked, the upper half of the elytra being shining jetty black, and the lower half yellow. Another species,

which has not yet been named, and which comes from Dorey, is black, with a yellow belt; while another, also unnamed, is yellow, with a large oval patch of black on the middle of the elytra, and a round spot on the shoulder. Some species, again, are yellow, with a blue band across the middle of the elytra. Amid all the variety of colouring, the reader will see that yellow is the hue which most prevails throughout the genus.

THE last family of these Beetles is called Cassidiidæ. This name is taken from the Latin word *Cassida*, which signifies "an iron cap," and is given to the Beetles because their shape closely resembles that of the basin-like steel cap which has been in and out of fashion so often. Don Quixote's celebrated Helmet of Mambrino really did bear some resemblance to the peculiar head-covering called Cassida.

We have but one genus of Cassidiidæ in England, namely, the well-known Tortoise Beetles, all belonging to the single genus Cassida. These derive their popular name from the tortoise-like appearance of the body, the resemblance between the insect and the reptile being so close as to be at once apparent. Indeed, suppose that anyone who was wholly ignorant of entomology were shown a number of insects and asked to pick out the Tortoise Beetles, he would do so without ever having seen a Cassida before.

None of our species are remarkable for beauty, their colour being mostly a dull, pale green, which renders them almost invisible when they are clinging, according to their custom, to the surface of some leaf. It is true that one or two species have golden stripes on their elytra, but this colour fades after death even more completely than the green, which, when the insect is perfectly dry, becomes brown or yellow, with scarcely a tinge of green in it. The exotic Cassidas, however, are often so splendid and their colours so permanent, that several of the species, particularly those from South America, are often set in gold and worn as jewels.

The illustration on the next page gives a figure of a fine Brazilian Tortoise Beetle, called *Mesomphalia illustris*. The thorax is very flat and of a deep satiny green hue. It is covered with punctures, and on either side there is a rather deep depression. The elytra are curiously formed. They are rounded

and dome-like in the middle, and very flat round the edges, so that the general shape is very much like that of the Helæus, which is figured on page 187. Their colour is deep green, and they are profusely punctated.

On each elytron there are three rather large spots, exceedingly variable in shape and size. They always, however, occupy the same positions: one, which is more or less oval in shape, at the base, a rounded spot on the middle of the flattened edge, and another near the tip. These spots, contrary to the usual structure of Beetles, are quite as brilliant on the under as on the upper surface of the elytra; and if the elytra be opened and the insect held up to the light, the spots shine out like the red danger-lamp of a railway. The body of the insect is dark blackish green.

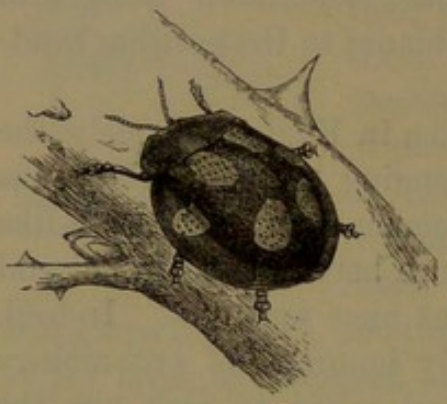


Fig. 128.—Mesomphalia illustris. (Green, with red spots.)

In the British Museum there is a well-preserved specimen of the larva of this species, which admirably shows the very remarkable characteristics of the Cassida larva. It is rather pear-shaped, with a boldly elevated back, and having the whole of the body surrounded by long radiating filaments, just like the blazing rays with which the ancients decorated the head of Apollo when represented in his character of the Sun-god or Helios. The end of the body is turned upwards, an attitude which is natural to it, and for a very singular cause.

It is now well known that leaf-feeding larvæ live in reality upon the juices of the leaf, and that the only object in biting off and swallowing small pieces of the leaf is, that the digestive organs may extract the juices which the mandibles or jaws could not procure in sufficient quantity for the subsistence of the larvæ. As for the pieces of leaf themselves, they pass through the digestive system almost unchanged, and, when ejected, can be easily unrolled by steeping them in warm water, just like tea-leaves. If they be then placed beneath a microscope, it is seen that they have scarcely undergone any perceptible change, and that even the delicate hairs which stud the surface remain in their places. With most leaf-eating larvæ, the ejected portions

fall to the ground, but this is not the case with the larvæ of the Tortoise Beetles and one or two other insects. Each portion as it is ejected is received upon a sort of forked appendage to the tail, which is turned over the body. It rapidly becomes dry, and in its turn is pushed forwards by those that successively follow it. In this way a sort of cover or shield is formed, which completely covers the body, and so disguises its appearance that no one who was not acquainted with its appearance would recognise it. When the cover becomes too heavy and unwieldy, it is thrown off, and another soon takes it place.

There are many species of Mesomphalia, some of which are very curious insects. Such, for example, is *Mesomphalia latevittata*, in which the elytra look exactly as if they were made of the thinnest tortoiseshell, the flattened edge being black. Then there is *Mesomphalia festiva*, a lovely and most variable insect. The whole of the upper surface is covered with a beautiful net-like pattern, which is mostly green, but in some specimens is blue, in others copper, in others purple, and in some is composed of a mixture of these colours. *Mesomphalia discoides* is either green or black, but always has a row of large yellow spots across the middle of the elytra. And lastly, *Mesomphalia dissecta* is pale yellow, but has the elytra traversed by a few narrow red lines which divide them into eight portions, very much like the pieces of a dissected puzzle.

The name *Mesomphalia* is Greek, and refers to the rounded shape of the centre of the elytra. It is formed from two words, one of which signifies "the middle," and the other "a boss" or rounded projection.

THE variety of form which is seen among insects is really endless, and, no matter how deep and practical may be the experience of an entomologist, he is perpetually discovering varieties of form where he least expects them, and for which he cannot even conjecture the use. Such is the case with the singular genus of Tortoise Beetles, one of which is here shown.

As a rule, the elytra of the Tortoise Beetles are quite smooth, but in these insects there is a most singular development of them. Close to the suture, and not very far from the base, each elytron is furnished with a single spike, which runs upwards quite perpendicularly. So upright are these spikes, and so closely

are they set together, that if the insect be viewed from above, especially when seen through the glass of a cabinet drawer, they might easily escape observation in spite of their great development. When, however, the insect is viewed edgewise, the horn-like projections are exceedingly conspicuous, and show out as may be seen by reference to the illustration.

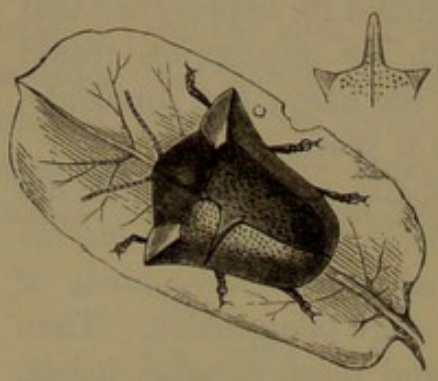


Fig. 129.—Batonota bidens. (Blackish olive.)

There are several species of Batonota, all being Brazilian. The present insect is dark, almost black olive, and the surface is covered with deep punctures. The shape of the elytra is rather remarkable, as they run out on either shoulder into a sharp, elongated point, looking very much like the blade of an Indian dagger. The outline of the elytra is very graceful, forming a succession of bold curves, and very much resembling that of the well-known insects which are popularly called Bishops' Mitres, and which are so troublesome in orchards. The generic name *Batonota* is Greek, and literally signifies "thorn-back," so that it is a very appropriate one.

There is a very remarkable genus of Tortoise Beetles, called by the appropriate name of *Aspidomorpha*, i.e. "shield-shaped," the particular kind of shield to which reference is made being circular and having a boss on the centre, like the target which was formerly used by the Highlanders. They are found in many parts of the world, as we shall presently see, and there are many species, the present example being at once the largest and most conspicuous in point of colouring.



Fig. 130.—Aspidomorpha Sanctæ Crucis. (Pale transparent yellow, with dark brown centre.)

The sides of the elytra and of the thorax are flattened and widened, and are so delicately thin that they look just as if they were made of very pale yellow gelatine, such as is used for the ornamental cases in which *bon-bons* are enclosed. So translucent, indeed, are these flattened portions, that not only the legs

of the Beetle, but even the antennæ, which are very slight and slender, can be easily seen through them. The middle of the thorax and elytra is raised, somewhat like the same portions of the preceding insect, and is of a dark brown. Upon the shoulders of the elytra, and near their tip, are two rounded spots, which at first sight are of the same dark brown as the centre. If, however, a strong side light be directed on them, they are seen to be of a shining metallic green, almost exactly like common green foil, and having almost the same little crumples and wrinkles as the foil.

There are very many species of this genus. The present example comes from India. There is another from New Guinea, and therefore named *Aspidomorpha Novæ-guineensis*, which has the cross-like marks of a deep black, but not reaching each other in the middle of the elytra; and *Aspidomorpha mutata*, of Sierra Leone, which is the palest and most glass-like of all the species, has a black Y-shaped mark instead of the usual cross.

As is often the case with insects, some members of this group are so unlike their companions, that at first sight they appear to have no connection with each other. The Hispides afford a good example of this fact. They belong to the great family of the Cassidiidæ, and yet their bodies, instead of being round and flattened, are oblong, and the head projecting from the thorax instead of being buried in it and hidden under it. Nearly all the Hispides are exotic, and there is not a single species which is acknowledged by modern entomologists as being truly British. Some of the species have the head prolonged into a horn, while others not only have the head horned, but the first joint of the antennæ armed with a spine.

The typical species of the Hispidæ is *Alurnus marginatus*, a native of Brazil. This is one of the largest of the Phytophagus Beetles, and is indeed a very conspicuous insect, owing to the bold contrasts of its colours.

The ground colour appears at first sight to be dark brown, but when illumined by a brilliant light, such as a sunbeam, it manifests itself in its true splendour. It then appears to be dark green, glossed with purple; and if examined with a tolerably powerful magnifying glass, the whole surface will be seen to be covered with wrinkles and punctures, each puncture seeming to

have its own separate hue of sparkling carmine or ultramarine blue, so as to produce the beautiful colouring which has been mentioned. The sides of the thorax are mostly yellow, but sometimes red, and a band of the same colour runs completely round each of the elytra, and also across its middle, so as to form a sort of cross when they are closed. The thighs of all the legs are of the same hue as the edging of the elytra, except at their ends, which are nearly black, as are the tibiæ and tarsi.

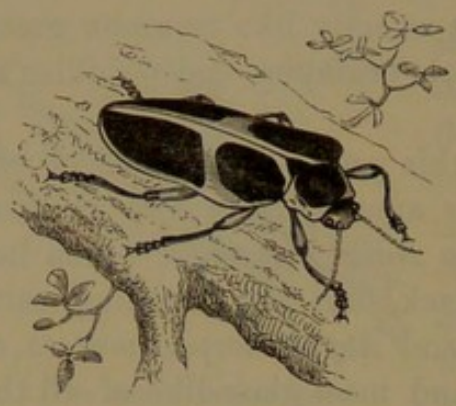


Fig. 131.—Alurnus marginatus.

This is a most variable insect, some being scarcely half the size of others, and the coloured edging varying both in hue and dimensions. In some specimens the colour is bright king's yellow, in others it is vermilion, while in some the cross bar is wanting. All, however, possess the coloured edge of the thorax and elytra and the coloured legs.

A remarkable instance of variation is found in another species of the same genus, *Alurnus thoracicus*. This insect is generally black, with a broad vermilion band across the middle of the elytra. There is, however, a well-selected series in the British Museum, in which the red band is progressively wider and wider, until, in one or two insects, it spreads over the whole of the elytra, leaving only a few little black dots scattered over the surface as an indication of its normal hue.

CHAPTER XVIII.

PSEUDOTRIMERA.

ANOTHER large section of Beetles comes next in order. This is called by the name of Pseudotrimera, or False Three-jointed Beetles, because the tarsi only appear to have three joints. In reality, however, they have four joints, but the third is very minute, and is hidden in the doubly lobed end of the second joint. The whole section is a very miscellaneous one, and receives a great number of Beetles which appear to have but slight relationship with each other. The first family, or rather group, of these insects is called Erotylidæ, of which we have about five species in England, belonging to three genera. They have been also called by the appropriate name of Clavipalpi, or clubbed palpi, because those organs terminate in a large knob-shaped joint. The ends of the antennæ are also clubbed and flattened. Our own species are all inhabitants of fungi, and can be obtained in the autumn by opening the various fungi that are found at that season of the year. The name *Erotylides* is Greek, signifying "little darlings," and has been fancifully given to the insects because they are not large and many of them are exceedingly beautiful. The antennæ have the flattened club formed of three joints. The body of these insects is generally oval, and mostly raised in the middle. The surface is smooth and polished, and is almost invariably more or less covered with clearly defined marks, sometimes black, but often red and yellow.

The first illustration on the next page represents a very conspicuous example of this group, called *Encaustes verticalis*. The name *Encaustes* is Greek, signifying anything that is scorched or burned, as a hot iron burns wood, and is given to the insects on account of their rather peculiar colouring. The present species affords a good type of the genus. Its colour is yellow, in many

specimens inclining to chestnut. The bold markings with which it is thickly covered are deep black, and the general effect is exactly that of lines traced on a board with a red-hot iron. The "poker-drawings" which were so much in vogue some twenty years ago, produced exactly the same rich tints as those of the Encaustes.



Fig. 132.—Encaustes verticalis.
(Yellow and black.)

As is often found in boldly-marked insects, the Encaustes is exceedingly variable, the amount of the black markings being seldom precisely alike in any two specimens, while some specimens are very small indeed, and might be easily taken for different species. This species belongs to Java.

The remarkable Beetle which is here shown also belongs to



Fig. 133.—Erotylus histrio.
(Yellow, black, and red.)

the Erotylides, and is a good instance of the typical genus. Both in shape and colour it differs so greatly from the preceding

insect, that few persons who did not know them would think that they belonged to the same group.

When viewed from above, the shape of the Beetle very much resembles the ace of diamonds, as it is sharp at either end and very broad in the middle. If viewed from the side, it is seen to be quite flat below and with its back forming a sort of hunch in the middle, and altogether slug-like in shape. The front of the flattened thorax is so scooped out as to project in a sort of crescentic horn on either side, and the hinder angles form a somewhat similar, though blunter, horn.

As for describing precisely the colours of this insect, such a feat is all but impossible, inasmuch as the arrangement of the markings is exceedingly variable. Suffice it to say that the ground hue is yellow, and that upon it are drawn a vast number of bold and very complicated black marks, scattered in a promiscuous manner over the whole surface. The only point in which all the specimens agree is, that a broad, jagged band of these black marks runs completely over the middle of the body, and there are three similar but shorter and narrower bands, one above and two below the central band. On each shoulder is a roundish red spot, and a similar spot is on the tips of the elytra.

The name of *histrio*, or "mountebank," is given to this species in consequence of the jagged and irregular markings bearing a fanciful resemblance to the many-coloured dress used by the race of mountebanks, which is nearly extinct in this country. The head and thorax are simply black, flat, and shining.

Many species of Encaustes are known, all differing greatly from each other, but all possessing the characteristic jagged lines. *Erotylus Guerenii*, for example, is jetty-black, and is diversified with one broad yellow band and two red bands. *Erotylus peregrinus* has four narrow belts thus arranged: yellow, red, yellow, yellow. Another has one red and five yellow bands. Another is black, with five yellow bands, each tipped with scarlet, just at the outer edge of the elytra. Some are all vermilion, with a few black bands, and the red has so spread itself as to oust the black as a ground colour; and, on the other hand, one species is all black except one or two little yellow and red spots, the only remains of the coloured bands.

This genus can easily be distinguished by the shape of the

maxillary palpi, *i.e.* those feelers which are attached to the maxillæ, or inner jaws. In all the Erotylidæ they are terminated by a large flattened joint, but in the typical genus this joint is boldy crescentic in its shape.

That the exotic Erotylides are fungus-eaters like our British species, is evident from the observations made upon the larva of *Erotylus surinamensis*. The perfect insects are always to be found about boleti, and within these fungi the larvæ are taken. They are rather large, white, flat-bodied grubs, with short, sharp, sturdy jaws supported on a black head, which can be withdrawn into a cavity in the front of the thorax. It is smooth, but on the first segment of the body there is a soft, fleshy tubercle, from which issues a pale, scented liquid, the object of which is quite unknown.

Mr. Westwood, to whom I am indebted for the above account, gives, in his "Introduction to Entomology," a figure of the larva of an allied species, which in many respects is very much like that of our English Erotylidæ, save that it is much larger.

THE exact position of the family of the Languriidæ, and its relationship to the other families, are matters respecting which

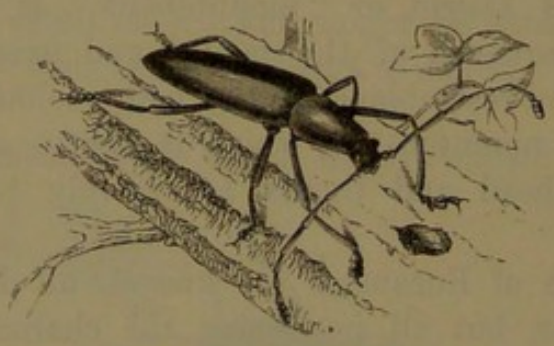


FIG. 134.—Fatua Weidmannii.
(Yellow and black.)

there has been much doubt. As, however, they are placed next to the Erotylidæ in the British Museum, we will accept that arrangement.

This species, *Fatua Weidmannii*, comes from China. The legs are very long, especially the first pair, which have the thighs much elongated and slightly bent, and the tibiæ of moderate dimensions and rather boldly curved. The antennæ are also long, and have little tufts of stiff hair at each joint.

The colour of the head and thorax is yellowish and partly

translucent, so as to give them a horny aspect. They are profusely covered with punctures. The elytra are "puncto-striate," *i.e.* have parallel rows of punctures drawn along them from the base to the tip. In the specimen represented above, the colour is black, but there are several examples in the British Museum which are brown. In size, as well as in colour, this is an exceedingly variable insect, some specimens being so small that they hardly seem to belong to the same species.

THE family of the Coccinellidæ is a very familiar one to us under the popular name of Lady-birds. The name of *Coccinella* is a diminutive of a Latinized Greek word, signifying "a round grain," or "kernel," and is given to these Beetles on account of the rounded shape of their bodies.

They are very useful creatures, and in this country are beyond all price, their larvæ feeding entirely upon the aphides, which occasionally do so much damage to the crops, and would do so much more, but for the Lady-birds.

There is a great similarity between all the Coccinellidæ, so that it is always easy to distinguish them from other Beetles.

In consequence of this similarity I have only selected one exotic species as an example of them all. This is *Synonycha grandis*, an insect which is found in China and Japan. It is exceedingly variable in colour, the ground hue being of any shade between yellow and brown. The marks upon it, which do not vary, are black. A North Indian species, *Synonycha spilota*, is red, with a large black cross-shaped mark and one or two black spots; and *Synonycha duodecim-punctata* is yellow, with six large black spots on each elytron. These marks are so large that they occupy almost the entire surface, and leave only a narrow hexagonal network of yellow.

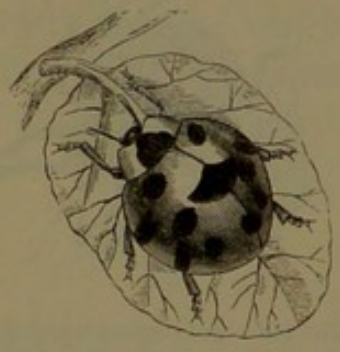


FIG. 135.—Synonycha grandis. (Yellow, with black spots.)

NEXT come the Endomychides, which may easily be distinguished from the Erotylides by the antennæ, which are longer than the head and thorax, and by the shape of the maxillary palpi, which never possess the hatchet-shaped last joint, but are

thread-like throughout. Like the preceding family, they are found on fungi of various kinds. Some of them live under the bark of trees, but even in this case they have the same habits, eating the living fungi which grow in such situations. Not only do they resemble the Erotylidæ in their habits, but in their appearance, so that but for the distinctive character of the maxillary palpi, it is not always easy to pronounce whether an insect belongs to one family or the other.

The name *Endomychidæ* is Greek, signifying "one who inhabits the innermost parts of a dwelling," and is given to the insects on account of their habit of lurking in the interior of fungi and under bark.

We have but four British examples of the Endomychides, the best known of which is *Lycoperdina bovistæ*, an insect which, as its name implies, is found in the interior of the common puff-ball. The difficulty of placing these Beetles in their proper situation may be inferred from the fact that several of them have been placed by some entomologists among the Burying Beetles.

The curious genus, an example of which is here given, has a tolerably wide geographical range. The present species, *Eumorphus marginalis*, is a native of Penang, and others are found in the East Indies and part of America. In all these insects the club of the antennæ is flat and three-jointed, and there is a bold notch in the front of the tibia of the fore-legs. The body is rounded, and the elytra are much expanded, and flattened at the sides so as to form a sort of rim. The species which is now before us affords an excellent example of this remarkable form, which we now see repeated for the third time, namely, in Mormolyce, described on page 39 ; Helæus, described on page 187; and in the present genus. We shall again see a similar structure when we come to the Orthoptera.



Fig. 136.—Eumorphus marginalis. (Purple, with yellow spots.)

The thorax of this insect is much raised in the middle, where it rises to a blunt angle. It is curiously shaped, having a very deep scoop in front, through which the head is seen. It is rounded in front, but each of the hinder angles as lengthened into a slender spine, which projects backwards well over the

shoulders of the elytra. The colour of the thorax is black, and that of the elytra is a lovely rich purple, with a silky or satiny lustre. They are thickly covered with punctures, and on examination with the microscope the purple is seen to be produced by means of the punctures, which are nearly equally crimson and blue, so that the blending of the two hues in the eye has exactly the same effect as if the colours had been mixed and laid on the insect with a brush. The silky gloss is given by the punctures, which are small and set very closely together. On each of the elytra are two large round yellow spots, one near the shoulder and the other near the tip.

There are several species of this genus, among which may be noticed *Eumorphus dilatatus*, which is yellow, with the raised portion of the elytra dark brown; and *Eumorphus bipunctatus*, which has, as its name implies, two large black spots on a yellow ground. This is the largest of all the genus, and is a really handsome insect.

The larva of one species of Endomychus was found by the late Rev. F. W. Hope feeding on fungi under the bark of the willow-tree, and by him given to Mr. Westwood. It exactly looks, but for its colour, like that of the Silpha. The head is rather small, forming a curious contrast to the three segments corresponding with the thorax of the future Beetle, and which in this larva are of enormous comparative size. The remaining segments, which correspond to the abdomen, are rather flattened, and each of them is turned up at the side and produced into a sort of hook.

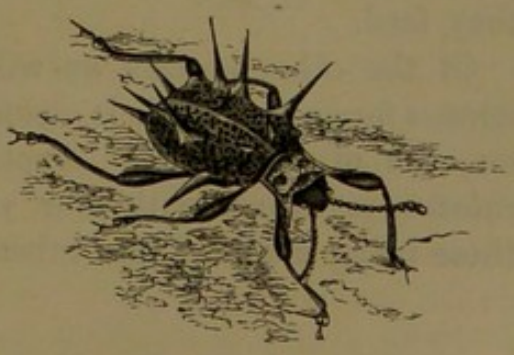


Fig. 137.—Amphisternus Satanas. (Deep violet.)

It seems strange that insects differing so much in appearance as the last-mentioned Beetle, and that which is here shown, could belong to the same group, and yet this is the case.

We have seen examples of several spiky insects, but this is by far the spikiest of them all. Indeed, when it sits with its legs drawn up to the body, it is scarcely possible to distinguish, without some little trouble,

between spikes, legs, and antennæ. Its colour appears to be jetty, shining black, but, when a strong light is directed upon it, is seen to be the deepest purple, something like that of a watch-spring, and having a similar surface.

Each front angle of the thorax is armed with a long, slender spike, straight and sharp as a needle. A similar spike projects from each shoulder of the elytra, a large double, forked spike occupies the disc, and another projects from the top, so that altogether there are ten long spikes, besides two short, sturdy points at the upper angles of the elytra. The whole surface, both of thorax and elytra, is very deeply granulated. Altogether the insect reminds the readers of Bon Gualtier of "Slingsby of the manly chest," the celebrated slayer of the snapping turtle, with his suit of spike-armed mail.

The antennæ are long, and so are the legs, which are rather curiously formed, the thighs being quite slender at their attachment to the body, and then swelling out rapidly into a rounded knob at the tip. The tibiæ are long, slender, and slightly curved, and the whole of the limb is the same shining violet as the body. Altogether there is a very uncanny look about the insect, which almost justifies the very expressive specific name which has been given to it. This species comes from Borneo.

There are many species of this genus, and a more extraordinary set of insects it is not easy to imagine. Being small, they only look grotesque; but if they were about ten times their size, they would appear to be among the most formidable of the Beetle tribe. They are, however, despite their appearance, perfectly harmless, and can only damage the fungi on which they feed.

Of the other species we will mention two. One is *Amphisternus hamatus*, which is deep violet, with six red spots, three on each of the elytra. Another species, *Amphisternus tuberculatus*, is brown, with four yellow spots. It has no spikes, these being modified into tubercles.

EARWIGS.

EARWIGS.

CHAPTER I.

DERMAPTERA, OR EUPLEXOPTERA.

THE position, and even the very name of the insects which now come before us, are by no means settled. We all know what to call a beetle, a bee, a butterfly, or a gnat; but there is no such certainty about an Earwig—some naturalists considering them as forming an order of their own, some as coming at the end of the Beetles, and others as belonging to the Orthopterous insects, and being a link between them and the Beetles.

Van der Hoeven, in his "Handbook of Zoology," makes the following remarks in favour of this arrangement:—"At all events, these insects have greater agreement with the Orthoptera than with the Coleoptera; they differ from the last by their incomplete metamorphosis and by many particulars of internal structure. The great size of the under wings in comparison with the elytra is very common in the Orthoptera (to refer to *Phasma* alone), and the reflexion of the point of the wing also is not wanting in some other Orthoptera."

Then there is a difficulty about their scientific name. By some they are called Dermaptera, *i.e.* "skin-winged," because their elytra are soft and leathery, instead of being hard and stiff, like those of most beetles. By others they are termed Euplexoptera, or "beautifully folded wings," in allusion to the wonderful manner in which their large, gauzy wings are folded beneath the tiny elytra. As if to add to the perplexity, some entomologists have given the name of Dermaptera to the grasshoppers, cockroaches, crickets, and other insects which are better known by the title of Orthoptera. I cannot bring myself to

acknowledge that this last-mentioned arrangement can be correct; and so I shall retain the word Orthoptera as representing the grasshoppers and their kin, and give my readers the choice of Dermaptera or Euplexoptera to represent the Earwigs.

There is even a difficulty about the popular names of these very plentiful insects. It has been suggested, and with much probability, that the English name "Earwig" ought rightly to be "Ear*wing*," because the wings are shaped very much like the human ear. Be this as it may, there is a belief, not only in England but in other countries, that the insect creeps into the ears of sleeping people, and so eats its way into the brain. Anyone who has the slightest acquaintance with the structure of the ear of course detects the utter absurdity of such a notion, but the power of ignorance is so great that this belief prevails in spite of all entomological and anatomical remonstrances.

How deeply rooted is the idea in this country everyone knows, and how the insect is equally feared and hated. In Germany the same notion prevails, as is evident from the popular name *Ohr-würm*, or Ear-worm; and it is expressed as strongly as possible in the French *Perce-oreille*, or Ear-piercer. Such are a few of the discrepancies connected with these insects, and which we need not trouble ourselves to reconcile. We will content ourselves with the usual English name of Earwig, and will follow, as in "Insects at Home," the arrangement which forms them into a separate order under the name of Dermaptera.

It might reasonably be expected that the exotic Earwigs would infinitely surpass our own insects in size, in number of species, in shape, and in extraordinary habits. Such, however, is not the case, and, like the Water Beetles, which have already been described, the foreign Earwigs are almost exactly similar to our own in size, form, and colour. As to their habits, scarcely anything seems to be known about them, so that we are left to conjecture that as they resemble our own species in form and colour, so they do in their manners and customs. So we may safely conclude that, like the English Earwigs, those of other countries are omnivorous, feeding on the petals of flowers when they can get nothing better, and choosing for their special food the larvæ and pupæ of solitary bees.

In the collection of the British Museum are many species, among which there are only three which appear to be worthy of

notice. The first of these is new to science, and I have given it the name of *Forficula Petropolis*, in honour of the spot where it was taken. This is really a curious insect. In colour it resembles our ordinary Earwig, except that the antennæ have a white portion near the end, and the tibiæ are light yellow. The wings are large, and project considerably from beneath the elytra, unlike those of our British species—in which the only projecting point is the end of the principal hinge by means of which the wing is folded.

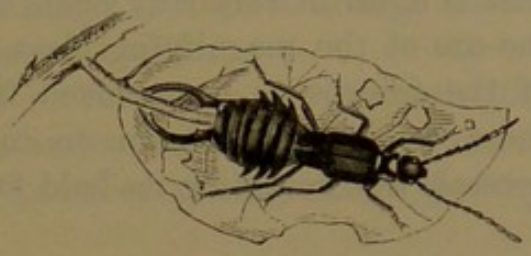


Fig. 138.—Forficula Petropolis. New species. (Reddish brown, with yellow legs.)

The forceps, by means of which the wings are packed under the elytra (and, as some naturalists say, unpacked), are strangely constructed. They are very powerful in comparison with the size of the insect, and, instead of being rounded on the outside edges, are boldly elbowed. They have also a bold tooth near the base, and the tip is widened, flattened, and scooped so as to form a pair of teeth on each side.

The strangest part of the structure, however, lies in the abdomen. This is very wide, much flattened, and the third and two following segments project on either side, so as to form three distinct teeth, slightly curved, and sharp at their tips, like those of a circular saw. This very curious insect was captured in 1857 by Mr. H. Clark, at Petropolis, in South America.

The remarkable insect which is shown in the illustration on page 280 is, like the preceding species, a native of South America. It was captured by Mr. Janson, at Choritales, a place in Nicaragua. In some respects this insect reminds the English entomologist of our Giant Earwig (*Forficesila gigantea*), which was formerly one of our rarest insects, only one specimen having been known for many years. Unlike that insect, it is paler in colour than the generality of Earwigs. This species is nearly black; but in both insects the forceps of the male are of very great proportionate length. As in the Giant Earwig the forceps of the female are comparatively small, we may suppose that the same is the case with the present species.

The forceps are quite as long as the body of the insect, and have but a very slight curve until nearly the tip, where they suddenly curve inwards so as to cross each other when closed. About a quarter of an inch from the base a strong tooth is developed on the inner surface, and between the teeth and the base is a row of very tiny teeth, too small to be detected without the use of the magnifying glass. In fact, supposing the whole of the forceps to be removed from the tip to the large tooth, there would still remain an instrument capable of pinching severely and retaining its hold firmly.

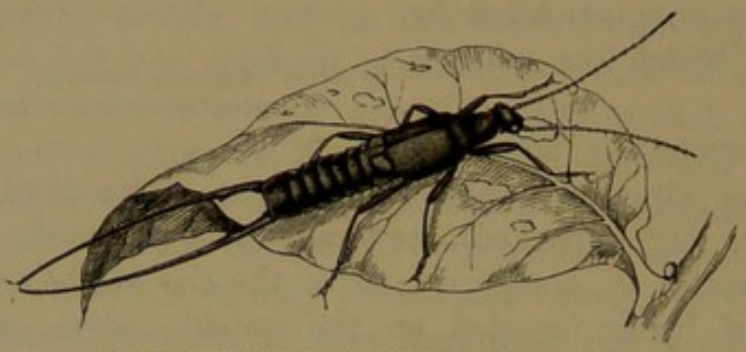


Fig. 139.—Forficesila longissima. New species. (Black-brown.)

The hinges of the wings project rather boldly beyond the elytra; and as they are pale brown, they are easily seen against the shining black of the abdomen and elytra. The upper part of the elytra is covered with bold punctures, and there is a belt of similar punctures across the middle of the body.

Our last example of the Earwigs is the very fine insect called *Forficesila Americana*. There are several specimens in the British Museum, and one of them has fortunately been set with its wings expanded. There is no apparent difference in the structure of the wing when compared with that of our own species, but its great size renders the mode of folding easier of examination than is the case with the smaller species that inhabit England. The peculiar fan-like folds are well seen, together with the slight transverse hinge on which the wings when furled are doubled up so as to lie under the elytra.

Very slender are these hinges, looking to the casual observer merely like a fine continuous nervure running nearly parallel with the edges of the wing; and it is not until a tolerably powerful glass is brought to bear on them that their real cha-

racter is seen. Needs be that they must be so delicate, for the wings to which they are applied are themselves of almost incredible delicacy. They are too delicate even to be called gauzy; and while they have all the lovely prismatic colouring of the soap-bubble, look scarcely less fragile. By far the strongest part of the wing is the principal hinge, as from it diverge all the lesser hinges on which the wings are folded.

In the illustration this part of the wing may be seen just beyond the ends of the elytra, and when the wings are closed the hinge still projects, and, as has been already stated, is very

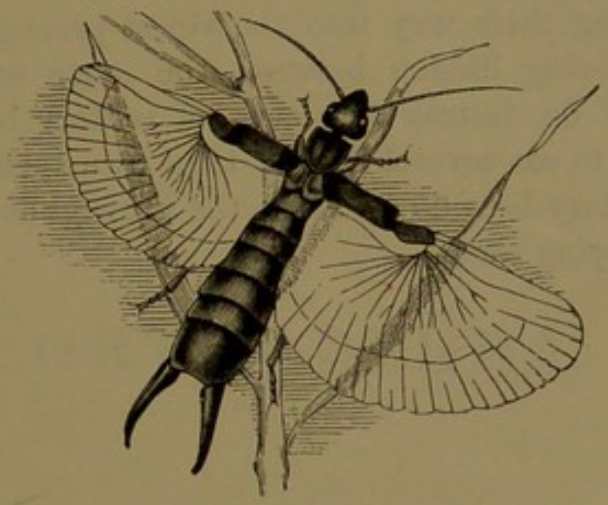


Fig. 140.—Forficesila Americana.
(Dark brown.)

conspicuous. When examined with a lens, the shape of the principal hinge is seen to bear some resemblance to that of a cocked hat turned upside down, the hollow occupying the centre, and apparently forming a cavity in which the ends of the supplementary hinges can meet. This fine insect belongs to South America, and the specimens in the British Museum were brought from Jamaica.

In the British Museum there are many unnamed species of foreign Earwigs. One, which comes from Rio de Janeiro, is long, light brown, and slender, with such long legs that it looks very much like a "Daddy-long-legs" without its wings. Another, a small species which was brought from Tejuca, is entirely black, with the exception of a yellow patch in the middle. Another Tejucan Earwig, much larger than the preceding species, is dark chestnut-brown, with the exception of the wing-hinges,

which are bright yellow, and project well beyond the ends of the elytra. In a moderately-sized Earwig from Petropolis, the whole of the thorax and elytra are yellow, and have a black stripe running down the centre. This is by far the most showy of all the Earwigs in point of colour, though in size it is inferior to several of those which have been already described.

As to the uses of the Earwigs, this is a problem which has never been solved. We know perfectly the harm which they do in civilized lands, but cannot see how that is counterbalanced by any good which they do either in this or other countries. They eat the petals of our best flowers, they have a wonderful knack of forcing their way into the ripest peaches, plums, and apricots, and lying hidden between the stone and the fruit. They certainly do destroy the larvæ of solitary bees, and have been observed to eat several insects, their own species included; but as the solitary bees do no harm, the Earwigs do no particular good by destroying them.

ORTHOPTERA.

ORTHOPTERA.

CHAPTER I.

BLATTIDÆ.

THERE are two orders of insects which have several characteristics in common, and which, in many instances, bear so close an external resemblance to each other, that a beginner in entomology is nearly certain to confuse them together. These are the Orthoptera and the Heteroptera, the Grasshoppers being familiar examples of the former, and the Water Boatmen of the latter. The word Orthoptera, which stands at the head of this chapter, signifies "straight wings," and is given to the insects because the wings are, when closed, laid straight along the body, and, though they must be folded longitudinally to enable them to be packed under the elytra, are not folded transversely as is the case with the Earwigs and Beetles. The elytra, if we may retain the name, are of a parchment-like consistence, and, when closed, cross each other at the tips.

Now, if the structure of the wings were the only mark of distinction, there would be some difficulty in separating the Orthoptera from the Heteroptera. But the structure of the mouth is so radically different in these two orders, that the merest glance is sufficient to prevent any confusion between them. In the latter of these orders the mouth is formed for suction, and the insect is furnished with a sharp proboscis, whereas in the former the mouth is formed for eating, and is furnished with powerful jaws.

It is evident from the name which is given to these insects, that most of them are winged, though there are some species which possess scarcely the least rudiments of wings. In those

cases where the wings are fully developed, they are always very beautiful in form, and often so in colour, having always a more or less shining iridescence, and in some cases being as brilliantly coloured as those of any butterfly.

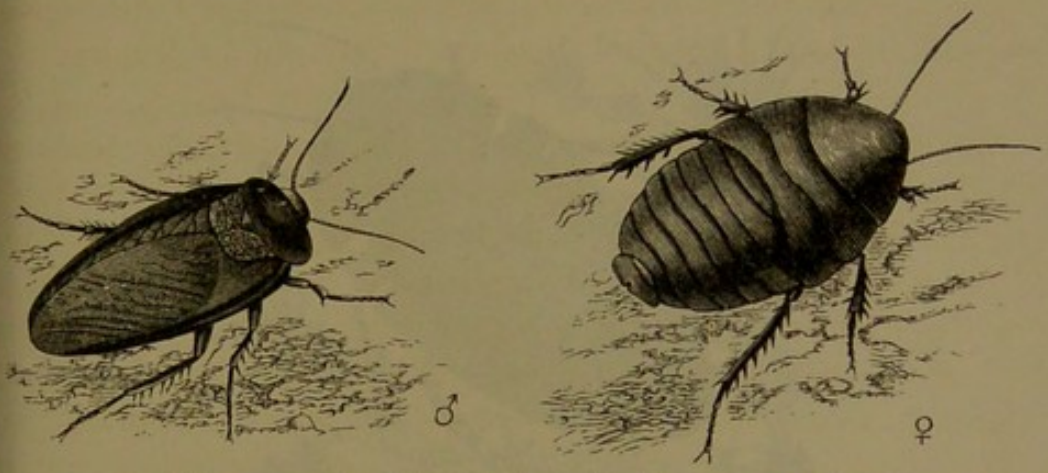
As to the arrangement of the Orthoptera, Mr. Westwood divides them into four sections. The first is the Cursoria, or Runners, so called because their legs are formed for running, and the insects are consequently swift of foot. The too-familiar Cockroach is an example of this section. Next come the Raptoria, or Snatchers, the fore-legs of which are formed for seizing and holding. The Mantis, or Praying Insect, is an example of this order. These are followed by the Ambulatoria, or Walkers, such as the Walking-stick Insects or Phasmas; and last come the Saltatoria, or Jumpers, such as the Grasshopper, whose hind legs are greatly developed and used for leaping.

We will begin with the first section, namely, the Cursoria, which consists of a single family, the Blattidæ, or Cockroaches. Our indigenous Cockroaches are few in number, small, and live in the open air, the singularly unpleasant insect which frequents our dwelling-houses being a comparatively recent importation. In various parts of the world, especially those where the climate is sultry, the Cockroaches are very numerous and often very large. One of these species is well known to sailors for its predilection for ship-life. A ship thus infested is infinitely more disagreeable than a house can be; for, in the first place, the insect is much larger than the *Blatta orientalis* of our houses, and, in the next place, it pervades the whole vessel, especially at night, and causes woful discomfort to the inmates.

Even so experienced a sailor as the late Michael Scott, author of "Tom Cringle's Log," could not bring himself to endure the Cockroach, and writes as follows:—"For the information of those who have never seen this delicious insect, I take leave to mention here, that when full-grown it is a large, dingy-brown beetle, about two inches long, with six legs, and two feelers as long as its body. It has a strong anti-hysterical flavour, something between rotten cheese and assafœtida, and seldom stirs abroad when the sun is up, but lies concealed in the most obscure and obscene crevices it can creep into; so that when it is seen, its wings and body are thickly covered with dust and

dirt of various shades, of which any culprit who chances to fall asleep with his mouth open is sure to reap the benefit, as it has a great propensity to walk into it, partly for the sake of the crumbs adhering to the masticators, and also apparently with a scientific desire to inspect by actual measurement, with the aforesaid antennæ, the state and condition of the whole potato-trap."

It is greatly to the nocturnal and light-hating habits of the insect that its safety and increase are owing. When the Cockroaches are out of their retreat, most insect-destroyers are asleep, except perhaps the hedgehog, which works great havoc among them, and, if servants can only be induced to appreciate and protect it, becomes a most desirable inmate of a house.



Male. FIG. 141.—Polyphaga Ægyptiaca. (Dark brown.) Female.

In Egypt, the Cockroach attains rather formidable dimensions, as may be seen by reference to the accompanying illustration, which represents both sexes of their full size, the female being, as is usually the case among insects, much larger than the male, and being totally destitute of wings. These creatures infest the Nile boats to such an extent that, before a traveller engages a vessel for a trip up the river, he always, if he be an experienced hand, sees that the boat is sunk for several days, so as to drown out the Cockroaches and other insect plagues. Orientals are strangely indifferent to such things, and will rest in perfect contentment where an Englishman would be half distracted with pain and annoyance.

The EGYPTIAN COCKROACH (*Polyphaga Ægyptiaca*) very much resembles our own domesticated species, except that it is much

larger. As with ours, the female has no wings, though the male is provided with those organs, and is much smaller than its mate. This species has a very wide range, and there are specimens in the British Museum taken from Turkey, Malta, Greece, Bagdad, Egypt, Algeria, and Asia Minor. The generic name *Polyphaga* is formed from two Greek words, signifying "a general eater."

THE rather formidable insect which is shown in the accompanying illustration is a native of Australia. There is more colour about it than is generally the case with Cockroaches, dark reddish brown being their usual hue.

The whole surface is finely granulated, and, though at first

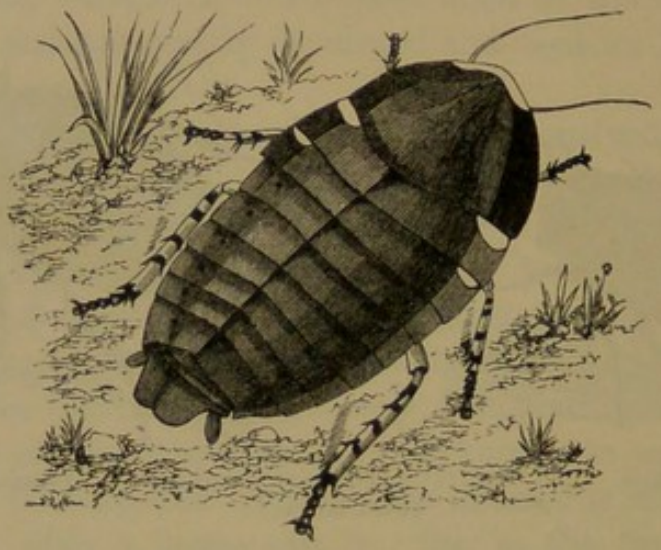


FIG. 142.—Polyzosteria cuprea.
(Copper-brown, with yellow marks.)

sight it appears to be simply brown, a decided coppery wash is seen when it is viewed by a side light. On the front of the thorax is seen a white stripe, and on either side are two similar marks. In the insect itself these marks are bright yellow; and if the creature be elongated, so as to separate the segments, it will be seen to have the front edge of each segment marked with the same colour, though hidden by the segment immediately in front of it. The legs, too, are similarly coloured, being banded alternately with yellow and dark brown. The name *Polyzosteria,* which is a Greek word signifying "many-banded," refers to these alternate belts of different colours.

Plain as are the generality of Cockroaches in respect of hue,

there is one genus, rather widely spread, which has a tolerable amount of colour about it. *Paratropes elegans*, of South America, is black, striped with yellow ; while *Paratropes orientalis* is black, with a yellow edge round the entire body. *Paratropes pica*, a Brazilian species, has a broad black stripe down the centre of the body, a large yellow spot on either side near the middle, and a similar pair of spots near the thorax. All, however, are not equally gifted with colour, *Paratropes melanaria* looking much like our own species, except that it is much blacker, and *Paratropes decipiens*, a native of Brazil, being dark, very small, and more like a beetle than a cockroach, a peculiarity from which it has derived its specific nameof *decipiens*, or "deceptive."

CHAPTER II.

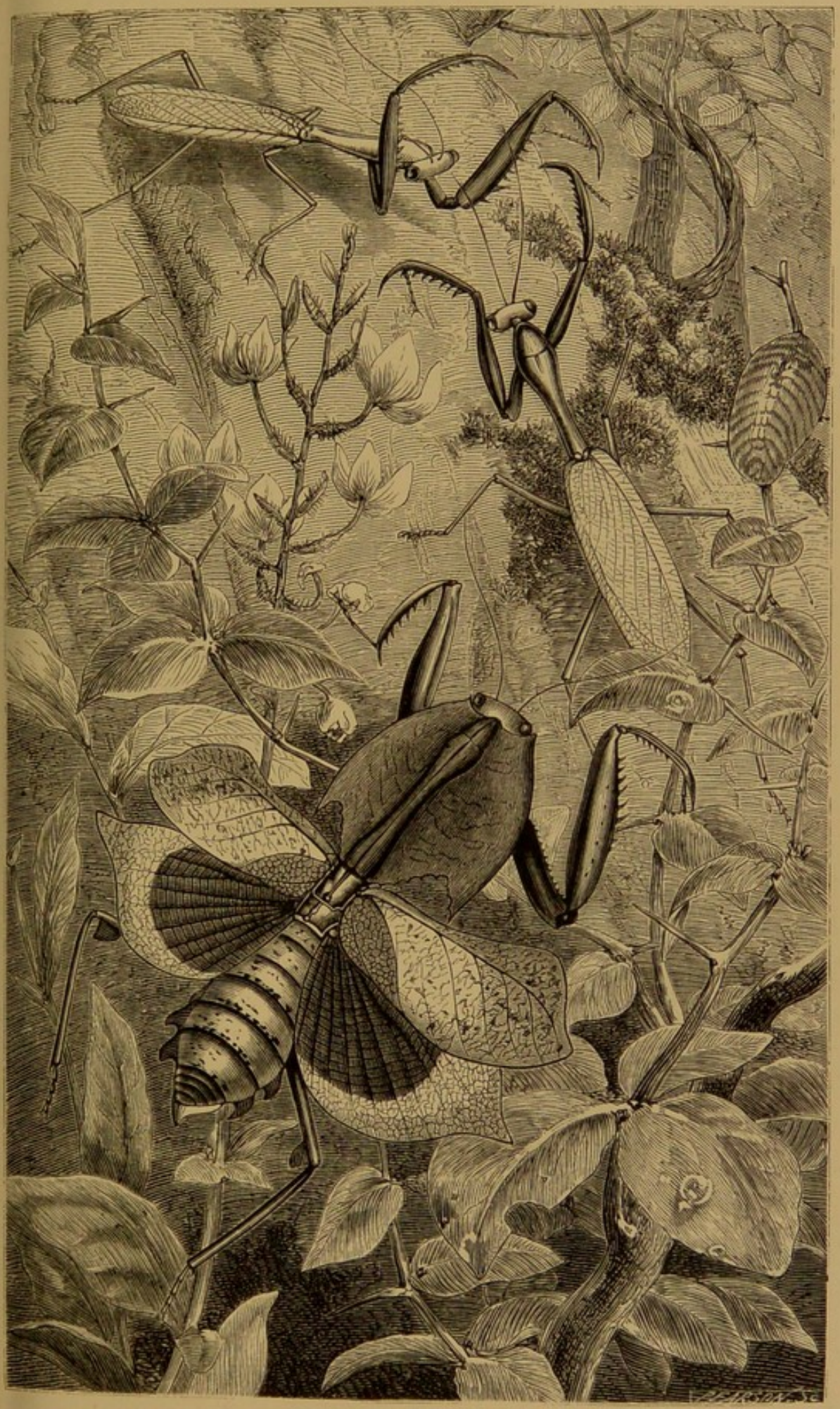
MANTIDÆ.

THE very remarkable insects which now come before us form the whole of the group called Raptoria, or Snatchers. This name is a very appropriate one, as the insects are carnivorous in their habits, and feed almost wholly upon other insects, which they catch by means of the singular structure of their fore-legs. These limbs are very long, and when stretched out at full length project greatly in front.

If the reader will refer to Plate V. he will understand the structure of the fore-legs better than by a mere description. At first sight these legs seem to have an additional joint. This, however, is not the case, the coxa, which is in most insects very short and comparatively insignificant, being so greatly developed as nearly to equal the thigh in size, and so to give to the limb its required length. The thigh is very strong, flattish, slightly curved on the under side, and boldly grooved, the groove having a row of teeth or spikes on either side. Into this groove the tibia can be shut just as the blade of a clasp-knife is shut into its handle, and, as the tibia is flat and armed with spikes like those of the thigh, it is evident that an insect which is seized in so formidable a trap has but little chance of escape.

Being slow of foot, the Mantis is not able to capture its prey by speed, but does so by craft. Holding the two front legs raised above its head in the attitude represented in Plate V. Fig. 1, it steals slowly and gently towards its prey until it is within reach of its stroke, when a sharp and rapid movement of the raptorial legs encloses the hapless insect in their grasp, where it is held until eaten. As in most cases, the colour

PLATE V.



of the body harmonizing with that of the surrounding objects, the intended prey is the less cognizant of its approach.

Like many other predacious creatures, the Mantis will remain motionless for hours, its fore-legs raised over its head, ready to strike at any insect that may come within reach. This attitude has been strangely misconstrued, not only in Europe but in other parts of the world. The attitude, really one of menace, is mistaken for that of prayer, and accordingly one species which inhabits Southern Europe is called the Praying Mantis (*Mantis religiosa*). This insect is called *Prie-Dieu* by the French peasants, and *Louva Dios* by the Portuguese; while, according to Sparrmann, the Hottentots worship the Mantis as a deity, and hold anyone to be a saint on whom one of these insects may alight.

Mouffet, in his "Theatre of Insects," evidently inclines to the belief that the Mantis does possess some supernatural power. "They are called *Mantes*, 'foretellers,' either because by their coming (for they first of all appear) they do shew the Spring to be at hand, so Anacreon the poet sang; or else they foretell death and famine, as Cœlius the scholiast of Theocritus has observed. Or, lastly, because it alwaies holds up its fore feet like hands, praying as it were after the manner of their Diviners, who in that gesture did pour out their supplications to their gods.

"So divine a creature is this esteemed, that if a childe aske the way to such a place, she will stretch out one of her feet and shew him the right way, and seldom or never misse. Her tail is two-forked, armed with two bristly prickles; and as she resembleth those Diviners in the elevation of her hands, so also in likeness of motion; for they do not sport themselves as others do, nor leap, nor play, but walking softly, she retains her modesty, and shewes forth a kind of mature gravity."

The insect seems to have taken a singular hold of the superstitious mind, for there is a well-known monkish legend that St. Francis Xavier, seeing a Mantis moving slowly forward, with its fore-legs raised, assumed it to be engaged in prayer, and ordered it to sing aloud, whereupon the insect immediately chanted a canticle.

Slow as is the gait of the Mantis, the stroke of the raptorial legs is quick and sharp, and given with such force that when

two of them fight, as they are tolerably sure to do if they meet, a successful blow with the flat edge of the leg will cut the unlucky insect in two. In fact, the movements of two of these insects when fighting have been compared with those of men armed with sabres. On Plate V. two specimens of *Mantis tinctipennis* are shown as they appear when engaged in combat. The lower insect has struck its blow and missed, while its antagonist is raising its legs to make its stroke in return.

This species is a native of Ceram, and is a very good typical example of the Mantidæ. The lengthened thorax, which is characteristic of the family, is plainly shown, undisguised by the flattened appendages to the sides which are seen in many species, notably in that which is represented in the lowest figure of Plate V. This lengthened thorax, which resembles a long neck, has gained for the Mantis in some countries the popular name of Camel Cricket.

The raptorial legs are boldly toothed, and if they be closed it will be seen that not only does the tibia sink deeply into the groove of the thigh, but that the sharp teeth with which the lower edges of both these joints are armed, interlock with each other, so as to make the escape of any prey almost a matter of impossibility. As is often the case among insects, the female is larger than the male and has more powerful fore-legs. Being also more quarrelsome, if she be sought by a male, she is much more likely to quarrel with him than to agree with him; and in the former case she is certain to kill him first and eat him afterwards.

The colour of this insect when living is a lovely leaf-green. Unfortunately, the colour is very fugitive, and, in spite of all trouble that may be taken, fades soon after death. It is remarkable that with these insects, which are green so as to resemble the leaves of the tree which they frequent, the colour changes with the season of the year, changing from green to yellow or brown towards the fall of the leaf. The same phenomenon occurs with the Leaf Insect, which will be presently described.

At Fig. 2 on Plate V. is seen a rounded object fastened to a twig. This is an egg-cluster of the Mantis, these insects laying them much after the manner that is so familiar to us in the domestic cockroach, except that the outer envelope which protects them is not of so hard and tough a material, and is applied after the eggs are deposited. Indeed, considering the size and

number of the eggs, it would be absolutely impossible for the insect to deposit them within a single envelope as the cockroach does.

These egg-clusters are really remarkable objects, and worthy of a close examination. I have never been fortunate to obtain one in a recent state, but I have made vertical and transverse sections of a dried cluster. Though made of very thin and slight material, the investing membranes are so tough that much force must be used, and they are so delicate that, unless the knife be very thin and sharp they are broken down and their shape lost. My sections were made with an amputating knife, and by means of a swift drawing-cut, the sections answered admirably, one longitudinally down the centre, another along the side, and a transverse section across the middle. These cuts show that there are four rows of egg-sacs; and if each sac represents a single egg, the group will have consisted of about one hundred and sixty eggs. When the larvæ emerge they are black, long-legged little beings, looking much more like spiders than insects.

The last-mentioned insect is an inhabitant of trees, and therefore the colour is green, so as to harmonize with that of the leaves among which it lives, and to enable it to steal unobserved on its prey. The species which is now before us inhabits sandy spots, and is of a dark yellowish-brown, so exactly resembling the colour of sandy ground, that the insect cannot be detected without some difficulty, in spite of its rather large size. It is a native of Egypt, and some specimens in the British Museum were brought thence by Sir J. G. Wilkinson. The generic name *Eremiaphila* is formed from two Greek words signifying "desert-lover," and is given to the insects in allusion to their habits.

It is an odd-looking creature, the fore-legs being thick and sturdy, while the two remaining pairs are long and very slender. They are of a paler colour than the rest of the body. Both the elytra and wings are thick, short, and rounded, from which the insect derives its specific name of *rotundipennis*, or "round-winged." Even the wings themselves, which in this group of insects are generally translucent, are in this species dark and opaque like the elytra. If, however, the elytra are opened and the insect examined from beneath, a brightly-coloured metallic

spot will be found on the under surface, the only example of bright colour in the entire insect.

The groove on the under side of the fore-legs is exceedingly bold and deep, and the teeth with which each edge of the groove is fringed are very numerous, though not so spike-like as is the case with many species. The movements of the Eremiaphila are very slow.

Dull-coloured as are the Eremiaphilas, there are some insects belonging to an allied genus which are of metallic brilliancy,

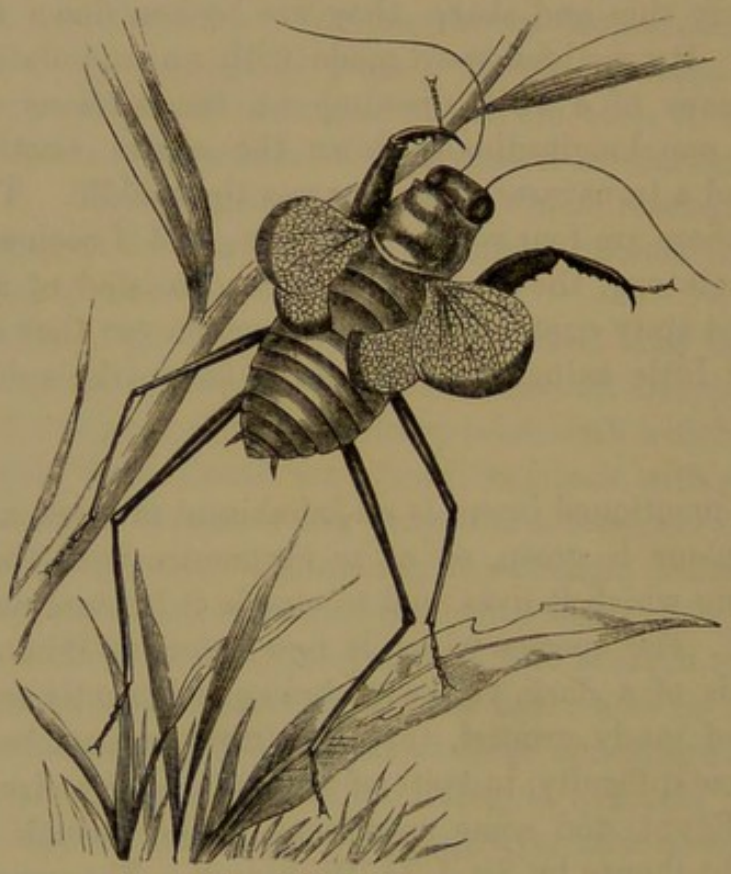


Fig. 143.—Eremiaphila rotundipennis.
(Sandy brown.)

and which have given to the genus the name of *Metalleutica* or *Metallyticus*. One of these insects, *Metalleutica splendida*, which was brought from Borneo by Mr. Wallace, is a really splendid creature. The body is burnished blue or green, according to the light in which it is viewed, the elytra are glossy green washed with gold, and the translucent wings are very pale and delicate brown. The legs are also green, and the raptorial legs are remarkable for the width of the thighs and the great strength of the teeth or spikes with which the thigh and tibia are armed.

THE remarkable insect which is represented in the illustration below is called *Thespis purpurascens*, the latter name being given to it on account of the splendid purple hue with which a portion of the wings is coloured. The specimen in the British Museum is, I believe, unique. It was brought from Ega, in South America, by Mr. Bates.

When the wings are closed, the creature looks much like one of the ordinary "walking-stick" insects, some of which will be presently described; both the elytra and wings lying quite closely to the body, and the latter being only slightly darker than the general hue. The head is set cross-wise, like that of

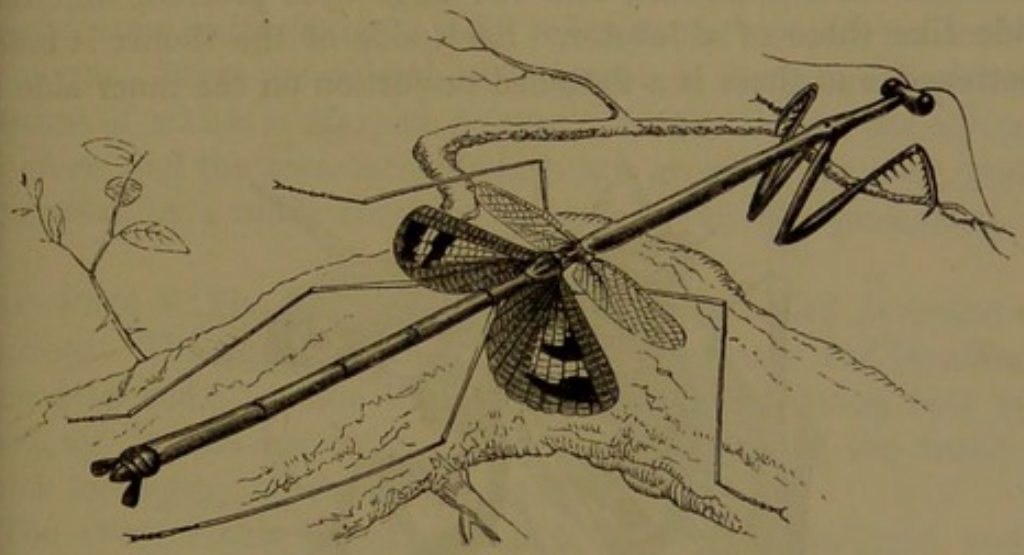


FIG. 144.—Thespis purpurascens.
(Green, with yellow and purple wings.)

the Hammer-headed Shark, or, to use a more familiar example, like the head of our common Demoiselle Dragon-flies.

When the wings are opened and spread, a wonderful store of splendid colouring is displayed. The basal portion of each wing is very pale brown, and is covered with multitudinous tiny pencillings of snowy white. The rest of the wing is bright yellow, on which are two large marks of deep shining purple, rather tending to red on the upper surface and to blue on the lower, which is more brilliant than the upper. All the legs, even the raptorial pair, are very long and slender.

There are several species of Thespis, but this is by far the most beautiful, though not the largest. One species, *Thespis ingens*, is of very great size, but has very small and absolutely useless wings; while *Thespis Bætica*, although not brilliantly

coloured, has very large wings which can be used for flight. One of these insects, *Thespis Xiphias*, is remarkable for having its body nearly flat, and armed down each side with a row of small teeth. The naturalist who named it thought that its body bore some resemblance to the beak of the sword-fish, and accordingly gave it the name of Xiphias.

ANOTHER lovely-winged Mantis is the *Harpax ocellaria*, of Southern Africa.

In this creature we see the germs of the curious flattening which distinguishes the well-known Leaf Insects. The head is flattened in the middle, and the large eyes protrude on either side like those of a lobster. Each side of the thorax is much flattened, and there is a flattened projection on the inner side of

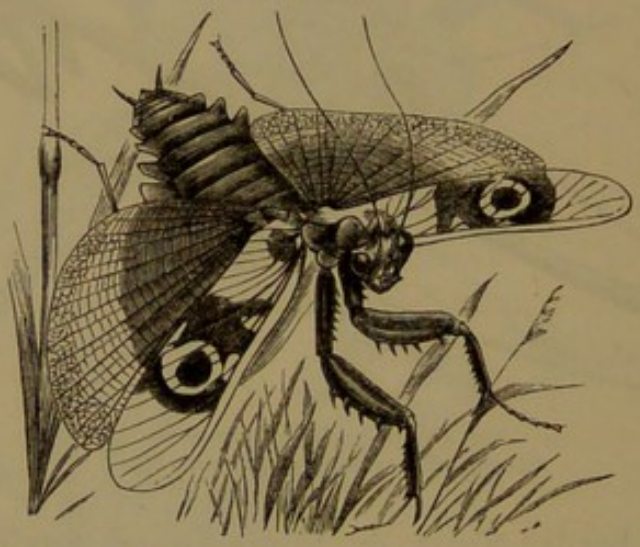


FIG. 145.—Harpax ocellaria.
(Green; elytra with a yellow, black, and green spot.)

the two hinder pairs of legs. The body is also flattened, and three of the segments project at the sides so as to form teeth, almost exactly like those of the earwig figured on page 279.

In this insect both the wings and elytra are nearly of equal beauty. If the reader will refer to the illustration, he will see that the basal half of each wing is rather darker than the rest. This portion of the wing is opaque yellow, much like the "king's yellow" of painters, the rest of the wing being beautifully translucent and of a crystalline clearness. The colour of the elytra is rather more complicated. First comes a patch of green next the base, and then, as far as the edge of the eye-like mark, the colour

is opaque yellow, like that of the wing. The "eye" itself is composed of a black central spot, round which is a ring of yellow, then an interrupted circle of black, and then an outer ring of green. The end of the elytron is translucent.

When the insect sits with its wings closed, these eyes have a very curious effect. The right elytron passes almost but not entirely over the left, so that the eye of the right elytron comes exactly in the middle of the back, the edge of the corresponding eye of the left elytron just showing beneath it. There is much variation in the eyes, in size, colour, and arrangement.

The generic name *Harpax* is Greek, and signifies "a robber," in allusion to the predacious character of the insect; while the specific name *ocellaria*, or "eyed," refers to the eye-like marks of the elytra. There are several other species of Harpax, one of the prettiest of which is *Harpax tricolor*. In this insect the elytra are green, and the translucent wings are green at the edge, and are crossed by a ruddy chestnut stripe followed by a pink band.

On Plate V. Fig. 3 is a most singular insect, called *Deroplatys desiccata*. The former of these two words is Greek, and signifies "broad-backed;" while the latter signifies something that is dried up, in allusion to the general appearance of the insect, which looks very much like a ragged dry leaf.

The eyes of this insect are black and very prominent, and have rather a fierce appearance. The fore-legs, too, are decidedly formidable, not only being large and powerful, but armed with long, sharp, black teeth. The middle and hind pair of legs are very slight in proportion to the rest of the insect, and at the end of the thighs have a flattened, axe-shaped projection.

The thorax has a most singular aspect. In the middle it rises to a rather sharp ridge, and is then suddenly flattened and rounded, on either side. Towards the base, it is cut into a very deep and bold tooth, something like the barb of a spear, and then is finely notched like the edge of a rose-leaf. Several of the segments of the abdomen are flattened and drawn out on either side into tooth-like projections.

Both the elytra and wings are ample, and, as is often the case with these insects, are more beautiful on the lower than on the upper surface. The wings have in their centre a very large patch of dark, shining brown, next to which comes a border of

grey, the rest of the wing being pale brown with a yellowish tinge. On the upper surface the elytra are brown, just like a withered leaf, which they also resemble in the character of the nervures. Below, however, the elytron is boldly and beautifully marked. Its general colour is yellow-brown, but towards the tip it is adorned with a large eye-like spot, the centre of which is black, surrounded by a broad ring of grey, and completed by a semicircular patch of dark brown on the side next the base.

THE extraordinary being called *Phyllonemia paradoxa* is a native of Natal.

Even in the illustration it scarcely looks like an insect, but without the aid of colour it is absolutely impossible to give even an approximate idea of its utterly un-insectlike aspect. Take a dry oak-leaf, rub it between the hands, pinch out little bits from the sides, and there will be a very tolerable representation of *Phyllonemia paradoxa*.

Its colour is just the withered brown of a dry leaf, finely granulated with black, as is a leaf that has for some time been lying on the ground. The end of the head is squared, elongated, and flat; the sides of the thorax are flat, the legs are furnished with sundry flattened projections; while the abdomen is not only flat, but is bent upwards just as a dry leaf is curled by the heat of the sun. There is nothing straight or regular about it, and it is so crumpled, jagged, and twisted, that if it were placed among a number of dried leaves, even the most experienced eye could hardly distinguish the leaf from the insect.



FIG. 146.—Phyllonemia paradoxa. (Brown.)

The generic name of *Phyllonemia* is a very happy one. It is composed of two Greek words, the former signifying "a leaf," and the latter "a fibre or filament," in allusion to the appearance of its body and limbs, which exactly resemble a leaf torn into jagged strips. The word *paradoxa* needs no explanation.

THERE seems to be absolutely no limit to the extraordinary forms which are seen in these insects, each new shape appearing more strange and grotesque than its predecessors. Here is an example, viz., the *Empusa gongyloides* of Ceylon; an insect whose name and appearance are equally grotesque and perfectly suitable to each other.



FIG. 147.—Empusa gongyloides. (Brown.)

Every peculiarity of the Mantidæ seems to be exaggerated in this species. The elongated thorax is drawn out to a wonderful length, so that the fore-legs are at a great distance from the middle pair, and, when the creature is among the branches, look almost as if they belonged to two different insects. The sides of the upper portion of the thorax are flattened and pointed; the raptorial fore-legs look, with their sharp edges and deep grooves, just like a pair of dry beech-nuts armed with sharp thorns; the other legs have circular, flat projections like patches of dry leaf stuck on the ends of the thighs; the elytra look just like two withered but entire leaves, while the sides of the abdomen are flattened, pinched, and torn into a weird resemblance of dead leaves that have been blown about by the wind, and tattered by the thorns and stones among which they have been hurled.

The word *Empusa* is Greek, and is the name of a terrible female goblin that was thought to haunt sleeping infants and suck their blood.

CHAPTER III.

AMBULATORIA, OR WALKING-STICK INSECTS.

THIS group, like the preceding, is composed of a single family, called Phasmidæ. The term is taken from a Greek word signifying a ghost or spectre, and is applied to the insects on account of the spectral appearance which many of them possess.

Formerly, the Phasmidæ were arranged with the Mantidæ, the relationship between the two groups being easily seen. There are, however, distinctions between them which quite justify their separation. In the first place, the Phasmidæ do not possess the armed raptorial legs which are so characteristic of the Mantidæ. The mode of depositing the eggs is quite different; for, whereas the eggs of the Mantidæ are enclosed in a common envelope, such as has already been described, those of the Phasmidæ are laid separately, and are very large and thick-walled when compared with those of the previous group. The eggs of one of the best known species will be presently described at length. From the Crickets and Grasshoppers the Phasmidæ are at once distinguished by their slender hind legs, which are made, not for leaping, but for walking.

Some of the Phasmidæ are of enormous size—veritable giants among insects, and look so formidable, even when dead and dried, that many persons will not venture to touch them without a sort of mental shock.

Many of these insects are entirely wingless, and even when these organs exist, their structure is very curious. The elytra are always very small; and as the wings are broad, ample, and able to sustain the heavy, long-bodied insect in the air, they are utterly useless for protection. Yet the delicate, gauzy wings need some protection, which is afforded by the wing itself. In

all cases where wings are present, these organs are "plicated" longitudinally in a multitude of folds, each fold being very narrow towards the base, and increasing regularly in width towards the edge; so that when the wings are closed, all the folds lie exactly on each other in a single line, precisely like the folds of a fan.

Indeed, it is hardly possible for an entomologist to see a fan without recognising its origin in the wing of a Phasma. Each wing thus lies along the body of the insect, and, in consequence of its neat folds, does not break the continuous outline of the stick-shaped insect. The delicate membrane of the wing, however, needs some protection, and this is found in the outermost fold, which is stiff and stout, and, when the wing is closed, lies over and protects the wing just as the outermost "stick" of a fan protects the delicately-painted folds of the fan itself.

Our first example of the Phasmidæ is represented in the illustration on the next page, and is known to naturalists by the name of *Phibalosoma pythonius*. The former of these two terms is composed of two Greek words signifying "fig-bodied," perhaps because the insect bears some resemblance to the young branch of a fig-tree. The latter of the words is also taken from the Greek, and signifies the gigantic serpent of mythology which was slain by Apollo.

Certainly the creature deserves its name, for it is a "big thing." One of these insects which I have measured is as thick as a man's thumb, and is fifteen inches in length when its legs are stretched out according to its custom when living. So gigantic an insect could not be represented of its full size, and the artist has therefore been obliged to reduce it considerably. But if the reader wishes to form some idea of the size of this enormous insect, let him take a rule, measure a length of fifteen inches, and draw the creature on that scale, taking care to represent the body as thick as the thumb of an ordinary man. It is scarcely possible to get these gigantic creatures into an ordinary entomological drawer; and when, after much doubling up of their legs and folding back of their antennæ, they are compressed within the needful limits, they must be supported by a double row of pins throughout their entire length, and each limb must be separately kept in its place by pins and braces,

lest they should break from their hold, and by their sheer weight destroy the other occupants of the drawer.

This insect is in the habit of assuming an attitude which gives it so exact a resemblance to a green stick, that as it remains motionless it can hardly be detected. The two front legs are held straight in advance of the body, and are either stretched to their full length, or have the tibia doubled back on the thigh. The other legs are pressed closely to the body, the feet clinging tightly to the branch on which the insect is sitting.



FIG. 148.—Phibalosoma pythonius. (Reduced figure.) (Green.)

There is one point about the formation of the fore-legs which is worth mentioning. In order to enable them to project on either side of the head, the inner side of the thigh is deeply scooped towards the base; so that when the legs are stretched forward, the head is almost concealed in the hollow formed by these two grooves.

The figure, which is necessarily very much reduced, represents the female, which is always longer, thicker, and more powerful than the male, which is fully three inches shorter, and has a body

scarcely thicker than a crowquill. The female, however, is wingless, while the male possesses very large and beautiful wings. The wing-cases are green, with a yellow edge, while the wings themselves are greenish at the base, with a yellow line, and the costal area yellowish buff.

There are many species of Phibalosoma in Fiji, discovered, I believe, by Mr. M'Gillivray. In the British Museum are some of the eggs of this species. They are small in comparison with the size of the insect, being scarcely as large as millet seeds, brown, hard-shelled, and rough on the surface.

THE insect which is shown in the accompanying illustration is of necessity much reduced in size, as, if it were drawn of its

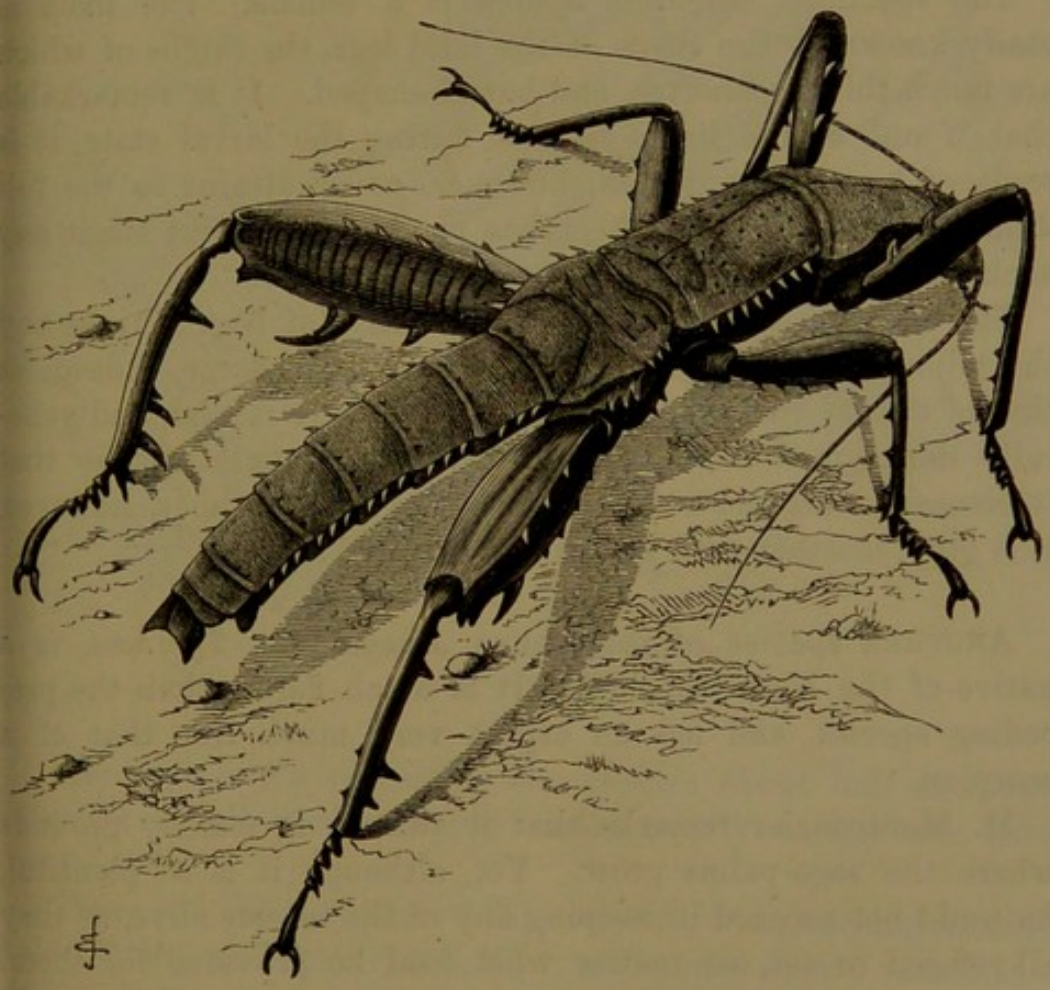


FIG. 149.—Eurycantha horrida. (Reduced figure.)
(Black-brown.)

full dimensions, the entire page would not contain it. The thigh alone of the hind leg is more than an inch and a half in

length, and half an inch in thickness, so that the reader can easily infer how large the insect itself must be.

The generic name *Eurycantha* is Greek, and signifies "thick-thorned"—a very appropriate title, inasmuch as the creature is one of the thorniest of insects. It has thorns on either side of the body, six on each segment, thorns on the upper part of the thorax, and thorns all over its legs. Even when dead, it is not pleasant to the touch, for one or other of the sharp curved spikes is sure to scratch or to prick. When it is alive its captor had better seize it with forceps, or at least with thickly-gloved hands, for it is enormously powerful, and has a way of driving its leg-prickles into the hand and drawing blood.

The specimen which is figured is a female. The male is easily known by the shape of the hind legs, the thighs of which are much thicker, shorter, and barrel-shaped. It is remarkable that if one of the limbs be lost during the larval state, it is replaced by another, which, however, never attains to the full dimensions. After the insect has reached its perfect stage, any such loss is irreparable.

The egg of this species, which is a native of New Guinea and the adjacent islands, is a large one—quite as large, indeed, as that of one of the small humming-birds. It is oval, and generally dark green in colour, covered with granulations, so that it resembles an emeu egg in miniature. Sometimes, however, it is grey, mottled with brown, or entirely brown.

ANOTHER species of this genus, *Eurycantha Tyrrhæa*, is a native of the New Hebrides. It is much flatter than the preceding species, and has an aspect very much like that of a scorpion.

M. Montrouzier remarks that it swarms in marshy grounds where the sago-palms grow. Yet, although it is so plentiful, he could not succeed in keeping any of the insects alive, as they all refused to eat, no matter what food he provided for them. It is a dark-loving insect, always crouching into the shade when set at liberty, and being found mostly hidden under the parasitic vegetation that in that climate grows so thickly on the trunks of old trees. He calls it by the name of *Karabidion*.

For some time he thought that it was only the larval form of

some insect, not even a trace of wings or elytra being discoverable. But, as some of his specimens laid eggs which afterwards were hatched, there was no doubt that the insects had attained their perfect stage. On an average, each female lays about one hundred eggs, and when the young larvæ emerge they are about an inch long, and look like little black threads rather than insects.



Fig. 150.—Eurycantha Tyrrhæa.
(Pale grey-brown.)

The illustration represents the species about half its proper size, as a full-sized drawing would nearly occupy the entire page.

There are many species of this curious genus, varying considerably in size and colour, and they are spread over a considerable portion of the world. There is, for example, *Eurycantha Australis*, which is found on Lord Howe's Island, and which has the barrel-shaped hind legs of the male sex strongly developed. The other species present few points of interest, except that one, *Eurycantha olivacea*, a native of Ceylon, is green instead of brown.

HERE we have an insect, the male of which is not known. Indeed, so dissimilar are often the sexes in the Phasmidæ, that it is rather difficult to avoid the danger of labelling the male and female as belonging to two different species.

This insect has three distinct peculiarities, on account of which it was selected for illustration. In the first place, the sixth segment of the abdomen is much widened and flattened, so as to assume an almost heart-like shape.



FIG. 151.—Pterinoxylus difformipes.
(Brownish, with green elytra.)

Secondly, the two front legs are fringed along the sides with flat, foliated projections, deeply notched, and looking very much like the edges of an oak-leaf. The middle and hind pairs of legs are nearly simple, except that a slight projection near the end of the thigh takes the place of the foliation. It is in allusion to this structure that the species has been named "difformipes," *i.e.* differently formed legs.

Thirdly, the wings themselves have a very curious structure, which is not seen until they are spread. When closed, as seen in the illustration, the wings look very like two sharply-pointed

plates projecting from beneath small, rounded elytra. The generic name of *Pterinoxylus*, or "sharp-winged insect," has been given to it on account of the appearance of the wings when closed. If, however, they be opened and spread widely, a very curious structure is seen. The upper edge of the wing is modified into a green, almond-shaped, flat, horny plate, which covers the gauzy portion of the wing, and is the only part which is visible when the organ is closed.

At the base of the wing, and partly overlapping the horny plate, is an oval mirror-like patch, very smooth, very shining, and having no veins or other markings upon it. As nearly as possible this patch is the same size as the elytra, so that when the wings are closed, as seen in the illustration, it is wholly covered by them. Whatever may be the case with the male insect, the wings of the female are much too small to be of any use for the purpose of flight. The elytra themselves are green, patched with brown.

This remarkable insect inhabits tropical America. It is drawn rather smaller than its actual size, the length from the tail to the claws of the outstretched fore-legs being about seven inches.

As, in the case of several of the preceding insects, the drawing has to be made on a reduced scale, so it is with the species represented on the next page. Its length from head to tail is, in the female, about seven inches; and the fore-legs will add some three inches to this measurement.

The name *Cyphocrania* is formed from two Greek words signifying "bowed-head," and is given to the insects of the genus because the head always droops greatly downwards. The name *Enceladus* is that of one of the giants of mythology, and is applied to the species in consequence of its gigantic size. It is not, however, the largest of its kind, for it is far excelled in dimensions by *Cyphocrania gigas*, which is rather more than eight inches in length from head to tail, and its spread of wing is exactly eight inches in one of the specimens which I measured. This, therefore, may be considered as one of the three or four largest insects of the world; and I should very much like to weigh some of them while they are still living, so as to obtain an approximate idea of the amount of material contained in each.

x 2

In estimating the comparative size of animals, the best plan, next to seeing the creatures themselves, is to draw them to scale. If the reader will enlarge the illustration below, making the spread of wing eight inches, and the length of the body about eight inches and a half, he will form a very correct idea of the enormous size of the insect.

Large as are the wings, they can be folded so closely and laid so neatly along the body, that they scarcely break the outline, and the insect retains its curious resemblance to a stick. When

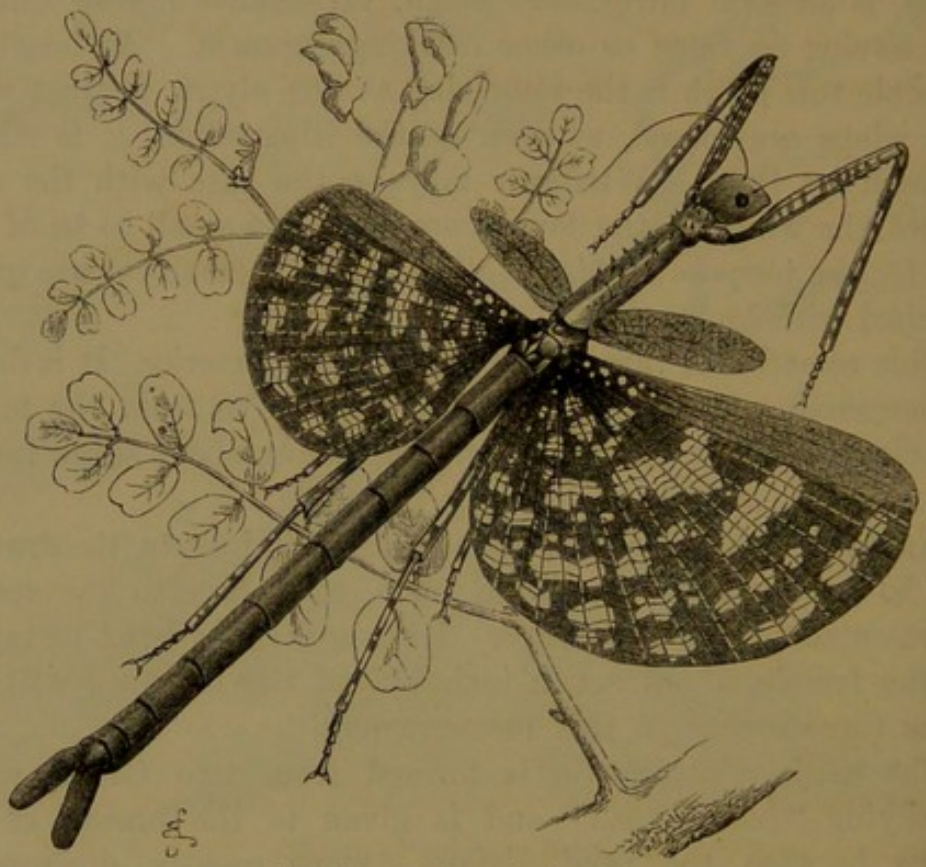


Fig. 152.—Cyphocrania Enceladus.
(Green-brown ; wings brown, spotted with white.)

the great wings, however, are opened from beneath their tiny elytra, the whole aspect of the creature is altered, and it at once exchanges its stick-like appearance for that of an active, flying insect. The wing-cases are merely brown blotched with yellow, but the wings themselves are very delicate and gauzy, and coloured a dark, blackish, shining brown, relieved by a number of pure white spots, varying greatly in shape, number, and size, according to the individual.

The peculiar hollowing of the fore-legs at their bases is very

plain in so enormous an insect; and if the first, or thigh joint, alone be examined, it will be seen to bear a most singular resemblance to a bayonet, even to the groove along the inner surface. With the exception of a few little pointed tubercles on the upper part of the thorax, the insect is entirely unarmed.

Next comes an insect which is a great contrast to the former, especially in the male sex, which is here represented. It is so stick-like in its aspect, that I really wonder how it can have been detected at all among the slender twigs and branches which it resembles so much in shape and colour. All practical entomologists know how difficult it is even for their skilled eyes to

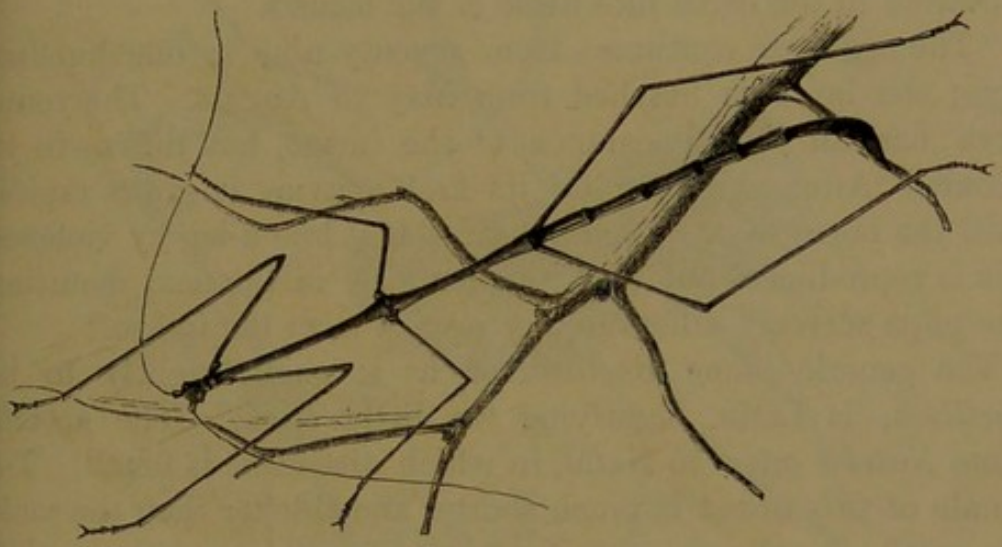


Fig. 153.—Bacillus Natalis.
(Green-brown.)

detect the larvæ of sundry Geometridæ, as they project from the branches in exact resemblance to dried and broken twigs; and, in the case of the Bacillus, I should think that the difficulty must be infinitely increased.

Respecting the habits of this particular species, little or nothing seems to be recorded; but in Mr. Westwood's "Introduction," Vol. I. p. 434, there is an abridgment of a paper by the Rev. L. Guilding on an allied species, *Bacteria cornutum*, a native of the West Indies.

"This is one of the apterous species, and there is a great diversity in the size of the sexes, the male being $3\frac{3}{4}$ inches in length, while the female is $7\frac{1}{3}$. It is very abundant in tropical America and the adjacent islands, feeding by night upon the

leaves, which it greedily consumes. It walks with a very vacillating motion, and, when resting, extends its fore-legs along the head, so as to defend the antennæ. It is tenacious of life. It occurs in the imago state throughout the year.

"The female deposits twenty-two eggs from September to November. These eggs are oval and greatly resemble a leguminous seed, having numerous scattered impressed dots and an elongated chain-like spot. The operculum at one end is distinct, and impressed like a honeycomb. The eggs are retained for a long time in the ovipositor at the extremity of the abdomen before they are relinquished by the parent insect, which rejects them without any attention. According to Stoll, the eggs are deposited in the earth like those of the locusts.

"The egg-state continues from seventy-nine to one hundred days; the larva is hatched from May to August. The young larva has all the appearance of the imago, but differs in its colours. After throwing off its first exuviæ, it grows rapidly until the horns of the head appear. If it lose a leg by violence, this is reproduced, but of a smaller size, in the next moulting. The pupa scarcely differs in any respect from the imago."

The generic name *Bacillus*, or, as it ought rightly to be, *Bacillum*, is Latin, signifying "a little stick." The specific name *Natalis* refers to Natal, in which district it is found. The female of this insect is much shorter and thicker than the male. The colour is yellowish green during life, and there is a white line running along each side of the head, the thorax, and part of the abdomen.

AGAIN we are obliged to employ a reduced figure, though in this case the reduction is not so great as in one or two of the Phasmidæ which have just been described. The present species, *Necroscia Zeuxis*, measures four inches in length from head to tail, so that it is really a large though not a gigantic insect.

The genus is a very large one, comprising about ninety species, and it has rather a large geographical extent, being found in most of the islands of the Indian Ocean, and over India generally. Of this species only one specimen is in the British Museum, and this was taken in Borneo.

Even in its dried state it is a beautiful insect, and when alive must have been lovely. Its beauty depends mostly upon

its wings. The elytra, as may be seen by reference to the illustration, are so small as to be entirely useless by way of protection to the wings, which are very large and beautifully coloured. The ground colour is shining black, but upon the disc of the wing is a large patch of yellow, edged with a number of bright blue spots. The antennæ are of extraordinary length, reminding the observer of the same organs in the familiar Long-horned Moths of England.



Fig. 154.—Necroscia Zeuxis.
(Green; wings marked with blue and yellow.)

Many species of this genus are beautifully coloured, among which may be mentioned *Necroscia roseipennis* of Borneo, in which the hard upper edge of the wing is green, and the rest a beautiful pale pink, just like the hue of a blush rose. Another species, *Necroscia annulipes*, is remarkable for the bands of bright yellow which not only surround the legs, as is implied by the specific name, but even extend to the antennæ, although those organs are scarcely thicker than human hair and run to a very great length. In all these insects the wings when closed lie flat along the back, protected by their hard upper edge; and the contrast between the same insect with its wings closed and open is absolutely startling. I presume that the generic name

Necroscia, which is formed from a Greek word signifying "death," is given to the insects in consequence of their resemblance to dead bits of stick as they sit with their wings closed.

THE difference between the sexes in the Phasmidæ, to which allusion has more than once been made, is very strongly apparent in the insect which now comes before us.

The figure of *Ecstatosoma tiriatum*, which is here given, represents a female. In this sex the body is very large, covered with spikes, especially on the head, which has as it were a crown of spikes; the legs are flattened at the sides into leaf-like appendages, and several segments of the abdomen are developed at the

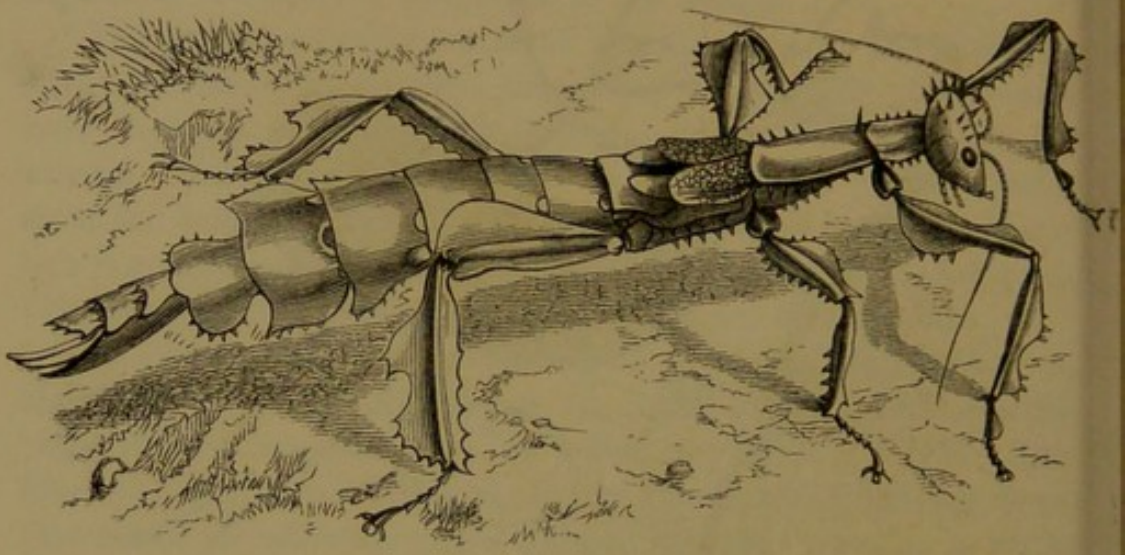


FIG. 155.—Ecstatosoma tiriatum.
(Green.)

sides so as to form projecting teeth. The wings are so small as to be useless for the purposes of flight. The male insect has scarcely one-sixth the bulk of the female, his body is slight and smooth, without the projecting segments, and he is furnished with a pair of exceedingly ample and very delicate wings. Indeed, so totally different are the two sexes, that at first sight it seems scarcely possible to realize the fact that they belong to the same species, particularly when the wings of the male are expanded.

The colour of the insect is emerald green. The egg is more globular than oval, and at one end there is a projecting point which marks the "operculum" or moveable door which permits

the young to escape when hatched. The larva of this insect is quite as different from the perfect male or female, as they are from each other, and bears a curiously close resemblance to the *Phyllonemia paradoxa*, which has been described on page 298. It is a native of Australia.

THE very rare insect which is here shown is a native of Fiji. There is only one specimen in the British Museum. It is about four inches in length, the illustration being drawn half the size of the real insect.



FIG. 156.—Platycrania phelæus.
(Green.)

The generic name *Platycrania*, or "wide-skulled," refers to the shape of the head, which is rather broader than is generally the case with the Phasmidæ. The body is very smooth, and the upper surface of the thorax rises into a bold longitudinal ridge. As is often the case with these insects, the wings are more beautiful than the body—that and the elytra being green, while the gauzy wings are bright yellow.

Several species of Platycrania inhabit India; and there is an eatable species, *Platycrania edulis*, found in Ceram.

THE remarkable being which is shown below is the best known of those creatures which are popularly designated as Leaf Insects, in consequence of the almost exact resemblance which they bear to leaves.

If the reader will imagine that the insect in question is of a bright leaf-green, he will see how close is the resemblance. Indeed, I have found great difficulty in pointing out a living specimen to persons who came on purpose to look at it, so exact

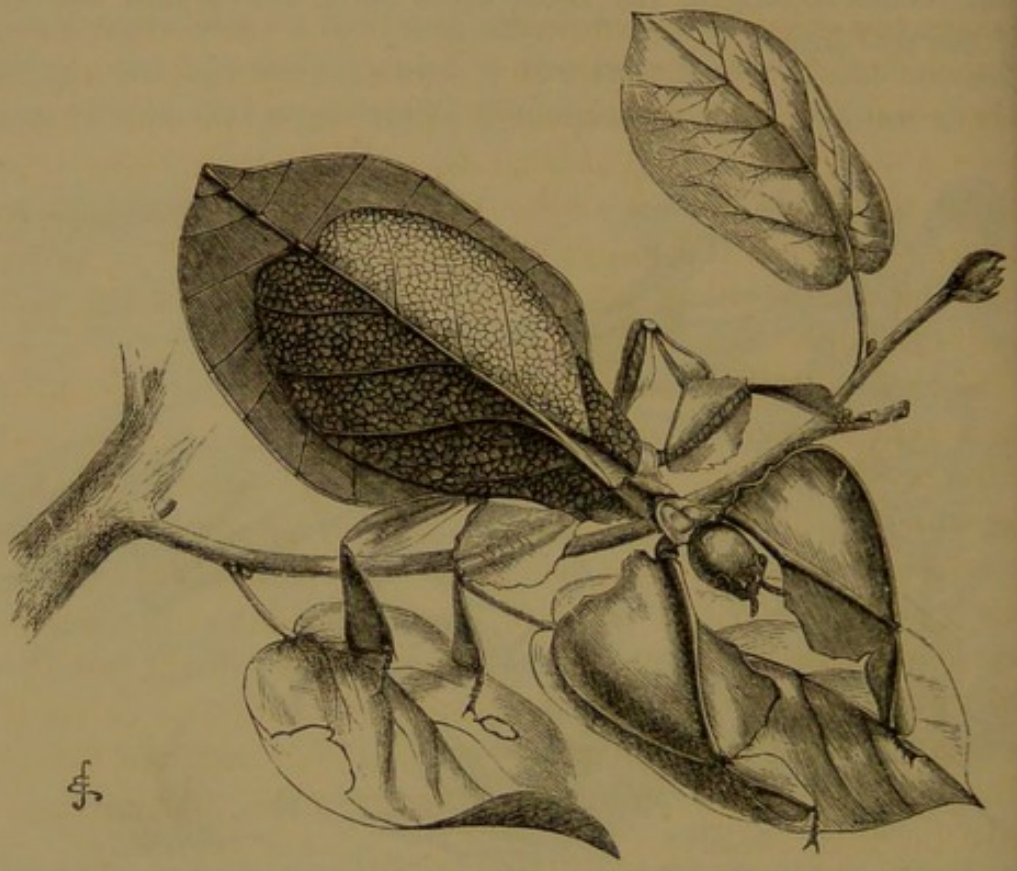


FIG. 157.—Phyllium Scythe.
(Green.)

was the resemblance between the insect and the leaves of the plant on which it was sitting. This resemblance is stronger in the female than in the male, in consequence of the absence of wings and the greater size of the elytra, with their leaf-like nervures. It is a very variable insect in point of size, some being about as large as the figure, and many being very much larger. It is a native of India.

If the elytra be examined against a strong light and with a moderately powerful magnifying-glass, they will be seen to be covered with delicate reticulations very much like the old

childish puzzle called "Rosamond's Bower." Each of the meshes has a green patch in the centre, and a slightly raised yellow edge. Owing to its peculiar form, the insect is very fragile when dried, and, unless it be carefully supported by pins and braces, is sure to lose one or two of its joints before very long.

The egg of the Leaf Insect is of very singular form. If viewed from above, it looks something like a five-rayed star, the rays being very irregularly disposed—three of them tolerably close to each other, and the remaining two wide apart. It is not easy to describe the shape of the egg without a figure, but we may form some idea of it from the following simile. Suppose we take a rather short and stout Stilton cheese, and set it on end. Then let us cut five deep longitudinal scoops, so as to leave five angular walls, and there is a tolerable imitation of the shape of the egg. Now, on the top of the cheese, and in the centre, let us place a conical pat of butter, with the base downwards, and there is the operculum of the egg.

The shell of the egg is very hard and tough, and, if examined with a lens, is seen to be extremely rough on the surface, and furnished with sundry depressions which are evidently intended as openings to the fine channels by which air is admitted to the creature within. If the egg be opened, the interior will be seen to be beautifully smooth, polished, and of a faint pinky white, very much like fine porcelain. There is little doubt that the larva is hatched within this receptacle for some time before it emerges. A most interesting account of the growth and habits of the Leaf Insect is given by Mr. Murray, in the "Transactions of the Linnæan Society."

After showing that in so roomy and well-ventilated an apartment the insect attains a considerable amount of development before emerging, Mr. Murray proceeds as follows:—"After having reached the form of a six-legged jointed insect, it emerges from the egg by pushing off the lid. It comes out middle foremost; that is, its head and tail are packed downwards, so as to meet each other. The back between these first appears, and they are drawn out next; the legs are extricated last.

"The colour of the insect at this stage is a reddish yellow, something of the hue of a half-dried beech leaf; for it is to be observed that although the colour of the insect varies at different periods of its life, it always more or less resembles a leaf in some

stages. When it has once settled down to eat the leaves on which it is placed, the body speedily becomes bright green.

"Among the leaves of the common myrtle it cannot be distinguished by the colour of the body (the legs are, however), and the habit of carrying itself adds to the deception. It bears its tail generally curled up a little, just about as much bent as the myrtle leaf. As it bends its tail up, however, the arch would be the wrong way unless the insect walked back downward, which, in fact, is its constant habit—adhering to the under side of the leaves.

"This habit brings to light another beautiful contrivance for still farther heightening its resemblance to a leaf. The upper surface is opaque green, the under surface glossy glittering green, just the reverse of the myrtle or guava leaf, so that by reversing its position it brings the glossy side up and the dull side down. This peculiarity is much more distinctly seen in the young state and living insect, than in the dried specimen."

I possess a few eggs of the Leaf Insect, which I have placed in a hothouse, and which I hope may be hatched in some two months or six weeks after this account was written. Fortunately there is plenty of myrtle in the neighbourhood, so that if the young Leaf Insects should emerge from the egg, there will be abundance of food for them. Specimens which have been hatched in England have passed into their perfect state and lived for some eighteen months, so that the sight of a living Leaf Insect will not be so wonderful as it was a few years ago.

CHAPTER IV.

SALTATORIA, OR CRICKETS, GRASSHOPPERS, AND LOCUSTS.

ONCE more we are on familiar ground. Not a single example of the Mantidæ or the Phasmidæ is known in this country, but the Saltatoria are plentiful enough—some of them too plentiful in the eyes of agriculturists and housekeepers. They are well known by the structure of the hind legs, which are very long and powerful, and, when the insect is at rest or only walking, project considerably above the body. The antennæ are slender, and in some species are of a very great length.

The first family is that of the Gryllidæ, or Crickets. The popular name of these insects is evidently derived from the sound produced by the male insect. The instrument by which the cry is made is found in the elytra, which are furnished with a ridged apparatus, the friction of which produces the shrill grating sound with which we are so familiar. A detailed description of this apparatus is given in my "Insects at Home," and need not be repeated here. The elytra lie horizontally in repose, and in many species the wings, when folded, project from under the elytra. In some of the Gryllidæ they are very greatly elongated. The fore-legs are more or less fossorial, *i.e.* suited for digging, and the feet, or tarsi, have three joints.

An admirable example of the elongated wings is seen in *Acheta monstrosa*, called by some entomologists *Schizodactylus monstrosus*. The reasons for this second title we shall soon learn. In this insect, the ends of the wings are not only of very great length, but are rolled up in spiral coils, so as to avoid interference with locomotion. The elytra, as well as the wings, have this remarkable structure. On reference to the illustration, the reader will see that there is a sort of a chequered look on the elytra. This is caused by their delicacy and transparency,

which permit the nervures of the lower wing to show through the substance of the upper.

This is the largest known species of Cricket; and if its powers of producing sound be as much stronger than those of our domestic insect as its body is larger, it must be a singularly noisy neighbour. The antennæ are slender and of very great length, so long indeed that the artist could not manage to introduce their entire length into the figure. Each of these organs has two hundred and forty joints.

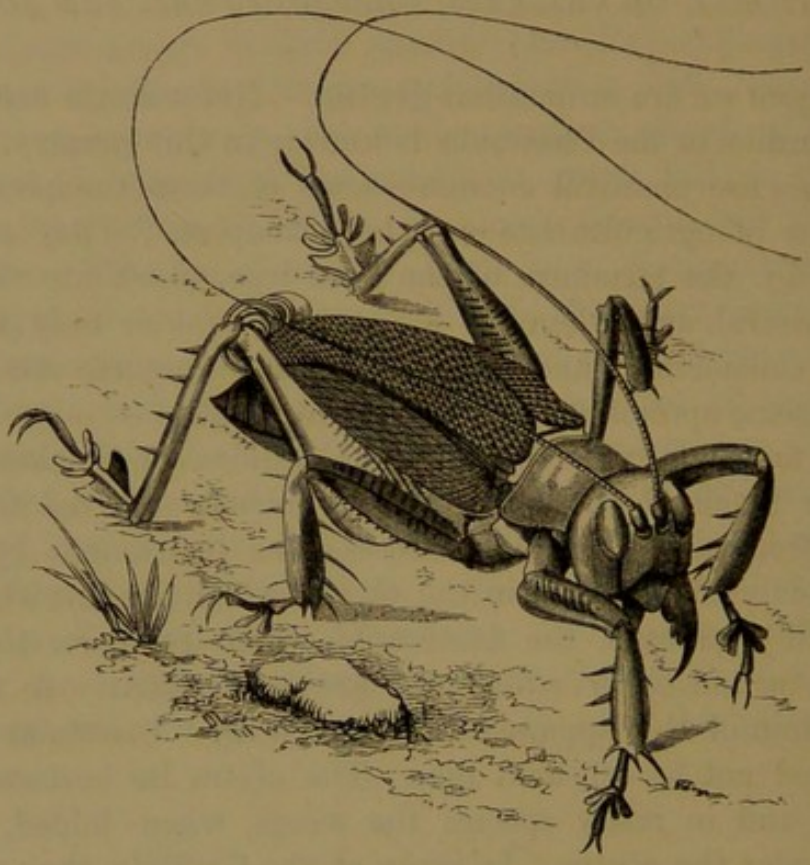


Fig. 158.—Acheta [or Schizodactylus] monstrosa.
(Pale brown.)

This insect, which is a native of India, has many of the habits of our well-known Field Cricket, and, like that insect, resides in burrows, which it sometimes sinks to the depth of three feet. It is nocturnal, never being seen outside its burrow in the daytime.

The generic name *Schizodactylus*, which has already been mentioned, refers to the structure of the feet, and is formed from two Greek words, the former signifying anything that is cleft or divided, and the latter a toe, or finger. If the reader will look

at the tarsus, or foot as it is popularly called, he will see that it is very curiously constructed. The first joint is very long, and in the hind pair of legs is furnished on either side with a triangular flattened plate. Then come two short joints, each of them with a long, flat projection on either side; and then comes the fourth, or last joint, which is long and rather powerful. Besides these appendages, there are six little plates of similar form on the end of the tibia, three on either side.

To my mind the most extraordinary of the Crickets is a species called *Cylindrodes Campbellii*, which inhabits Australia. At a hasty glance it is almost impossible to believe that it belongs to the Crickets at all, looking, as it does, wonderfully like the larva of some wood-boring insect. It is about as thick as an ordinary artist's pencil, and, as its generic name implies, almost as cylindrical as the pencil.

It has but rudiments of wings, and the two hinder pairs of legs are very small, and pressed closely against the body. The thorax is also cylindrical and shining, and the two front legs, which are very much like those of our common Mole Cricket, are very flat, and, like the other legs, pressed closely against the sides, which are sculptured into cavities. Thus, there is scarcely any break in the outline of the body when the insect presses all its legs against its sides. Its structure shows that the creature must be one of the borers, and accordingly it is found to inhabit timber,—a very strange residence for one of the Gryllidæ.

Many of the insects which have been recently described have been of such large dimensions that the figures were necessarily diminished, so as to get them within the limits of our pages. Just the contrary is the case with the *Rhipipteryx marginatus*, which is drawn of exactly double the linear dimensions of the real insect.

The thorax of this insect is shining black, but it has in the middle two oval yellow marks, and it is surrounded with a narrow yellow band, whence comes its specific name of *marginatus*. These markings are not quite the same in all specimens, the yellow spots varying in size and the band in thickness. Sometimes the two spots are merged into one, but in all speci-

mens the band exists, and is very conspicuous. The thorax is covered with a coating of very fine down. The elytra are very narrow, and of a pale brown colour, with a black stripe along the centre.

The chief beauty of the insect is not seen until it expands its wings, which are extremely delicate, and of very great size when compared with the dimensions of the insect. Indeed, so small are the elytra, and so large are the spread wings, that the insect bears a most curious resemblance to an earwig, as may be seen by comparing the figure of the Rhipipteryx with that of *Forficesila Americana*, on page 281. The name *Rhipipteryx* refers to the size and shape of the wing, being formed of two Greek words, the former of which signifies "a fan," and the other "a wing."

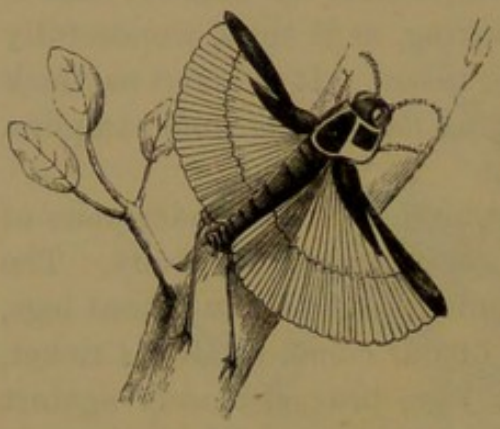


Fig. 159.—Rhipipteryx marginatus. (Brown yellow, and black thorax.)

This species is a native of Mexico. Small as it is, there are others very much smaller; one of them, an inhabitant of Ceylon, being no larger than a common gnat, for which it might easily be mistaken. Its name is *Rhipipteryx* (or *Tridactylus*) *nigro-æneus*. Writing of the strange shapes assumed by foreign Achetidæ, Mr. Westwood makes the following remarks:—"I possess several very curious minute species belonging to this family, which singularly represent Coleopterous insects. Of these, a Brazilian species has all the appearance and even colours of a Cicindela; whilst a small Mauritian species has the wing-cases thick and glossy, oval, convex, and meeting with a straight suture, exactly like elytra (of beetles)."

The next family is the Locustidæ. The insects belonging to this family may be known by their elytra, which are "so deflexed" when at rest, *i.e.* turned down on either side of the body, that the general shape of the insect much resembles that of a gabled roof. The antennæ are slender, but moderate in length, and all the tarsi have three joints. The two latter characteristics are useful in separating this family from that which immediately

follows. It is rather remarkable, by the way, that the insects which are popularly called Locusts do not belong to this family.

THE formidable-looking insect which is called *Cerberodon viridis* is quite as formidable as it appears to be, and fully deserves its generic name, which will be presently explained. It is a native of Brazil. As the specific name imports, the colour of the insect is green.

It is chiefly remarkable for two points, the first of which is the structure of the legs. All the limbs are furnished with thorn-like spikes, but the front pair are most powerfully armed in this



FIG. 160.—Cerberodon viridis.
(Green.)

respect, the tibia having ten long curved spikes, five on each side, arranged as seen in the illustration. The thigh is also armed, but the spikes are not nearly so long and so powerful as those of the tibia.

The second characteristic lies in the jaws, which are really gigantic in proportion to the rest of the body. They are long, stout, curved, and furnished with teeth on the inner surface. In this genus, the left jaw is much larger than the right, and is prolonged into a sickle-like point. The name *Cerberodon* refers to this peculiarity. It is formed from two Greek words, one signifying "a tooth," and the other Cerberus, the three-headed dog of

mythology, who guarded the gates of the infernal regions, and prevented the imprisoned souls from escaping.

There are several allied species, the most remarkable of which is *Phœophilacris funesta*, of Sierra Leone. This insect looks wonderfully like a huge spider, its legs being very long and slender, and its body short, stout, and rounded.

THE strange-looking insect shown in the accompanying illustration is a tolerably common one, and is found throughout the

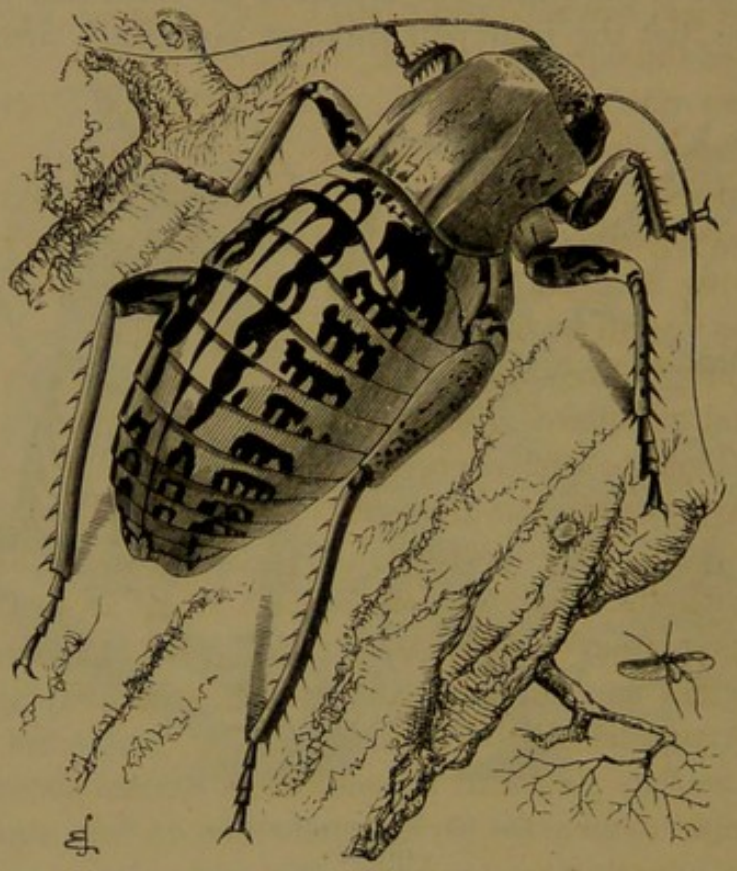


FIG. 161.—Callimenus oniscus.
(Green; red abdomen, spotted with black.)

warmer parts of Europe, Greece and Turkey seeming to be favoured localities for it. There are several species belonging to this genus, of which the present is the largest that is known.

All the insects of this genus are strange, awkward, ungainly-looking beings, having rather the appearance of larvæ or pupæ than of perfect insects. The name *oniscus*, which signifies "a wood-louse," is given to the insect in consequence of its extraordinary shape. Generally, among Orthoptera, even if the females

are without wings, the male possesses those organs; but here is one of the exceptional examples to which allusion has already been made, where neither sex possesses wings. In order to show more fully that this is the case, the illustration has been drawn from a male insect. The female is very much like the male, but is at once known by the short, broad, sharp-pointed, sabre-shaped ovipositor, the blades of which have a strong tendency to separate after the death of the insect.

The insect is a curious, but not a pretty one. The squared thorax is green, bright during life, but becoming dull yellowish green after death. The thick, rounded abdomen is almost entirely dull red, upon which are a number of black patches, placed as seen in the illustration. These black patches are slightly raised above the rest of the surface, and are thus much more prominent. Towards the end of the abdomen there are a number of green patches, so that the ungainly form is in some way compensated by the variety of colour.

One species, *Callimenus dasypus*, of Hungary, is entirely black, shining, and granulated like very rough sand-paper. It has a number of large tubercles along the back. There are some most extraordinary insects allied to the Callimenes, of which *Lesina lutescens* is perhaps the most singular. It is a little, flat, yellow creature, with its head developed into a sharp projecting spike, and its long thorax furnished with three distinct sets of jagged spikes, laid flat on the back, each set looking very much like some of the ancient battle-axes.

Another is *Vates latifolium*, which bears, as its name imports, a singular resemblance to a leaf. It has no spikes like the preceding insect, but its body is flat, and shaped much like that of the Phyllonemia, which has already been described, except that it is, if possible, rather flatter, while the legs are furnished with flattened, ragged-edged appendages, that look exactly like scraps of torn and jagged leaves. Instead of the bold spikes of Lesina, it has a number of fine, needle-shaped prickles on the thorax, which look exactly like the hairy edges of a leaf-stem, so that when the creature is alive and green, the resemblance to a leaf is wonderfully exact.

On pp. 324 and 325 are depicted two figures of the same insect, showing the difference of appearance which sometimes

exists between the sexes. The name of the insect is *Acripeza reticulata*, and it is a native of Tasmania.

The female is without wings, but she possesses large elytra, which are thick, convex, and opaque. Their colour is dark brown, mottled with black; and when they are closed, the insect has a very curious appearance, looking very much like our common Bloody-nose Beetle (*Timarcha tenebricosa*), greatly magnified, and turned brown. The abdomen is large, thick, and rounded,

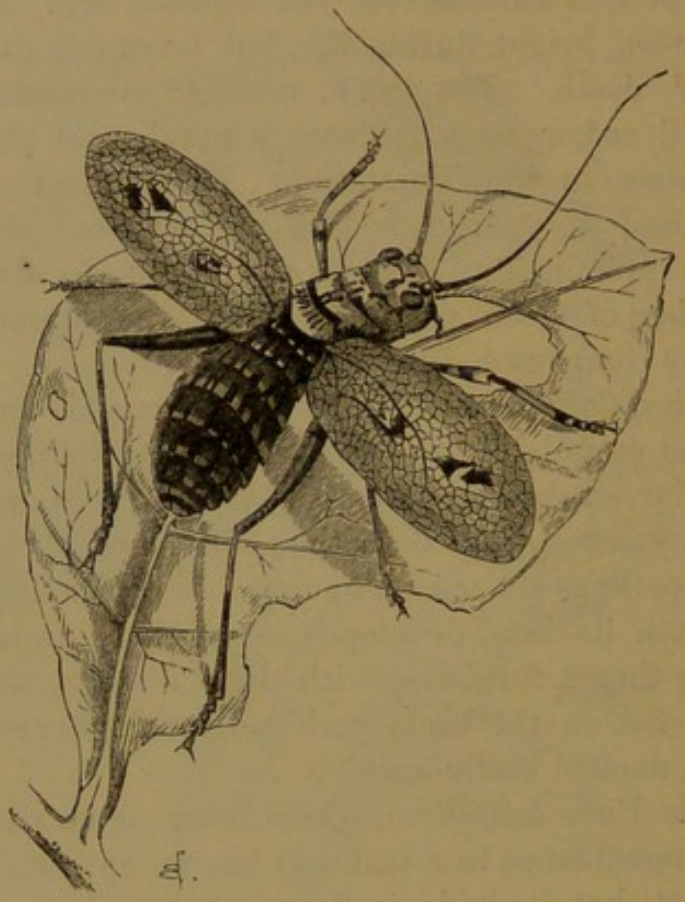


Fig. 162.—Acripeza reticulata. Female.
(Green-brown, mottled with black.)

dark in colour, with a row of white spots on the edge of each segment. The legs are banded after a similar fashion. There is no ovipositor in this species, although it exists in several insects which are closely allied to it.

The male Acripeza is so different from the female, that the two insects scarcely seem to belong to the same species. His body, instead of being large and rounded, is slightly made, and not one quarter as large as that of his mate. The elytra are very large and long, and the wings of corresponding dimensions;

PLATE VI



so that when they are opened, the insect seems to be all wing and no body.

It has just been mentioned that although the Acripeza has no ovipositor, there are allied insects which do possess that organ. These belong mostly to the genera Ephippiger, Nabrus, and Odontura. The last-mentioned insect inhabits many parts of Europe,

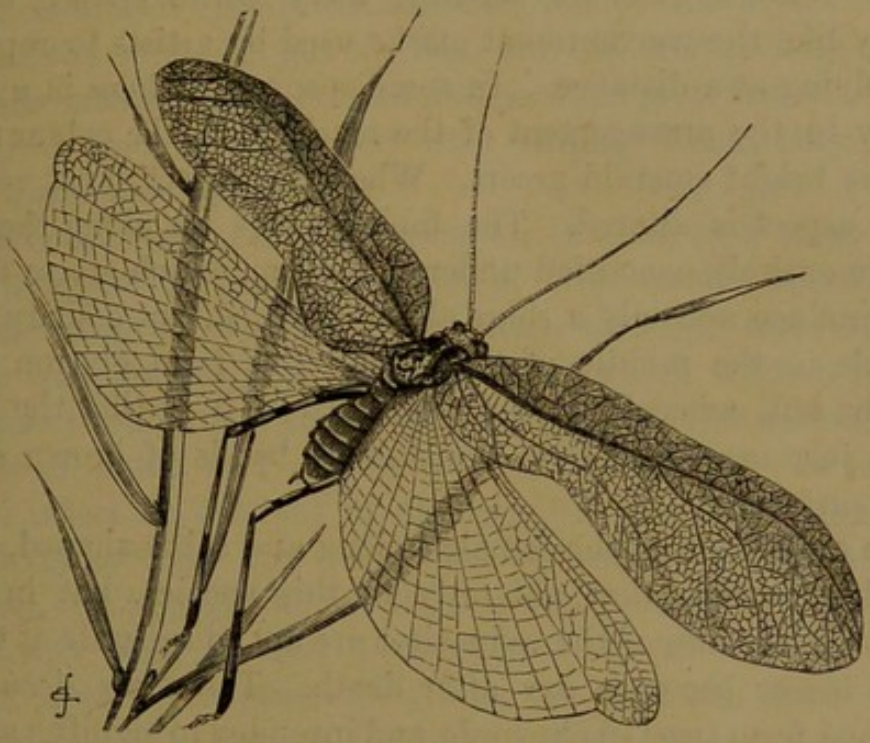


Fig. 163.—Acripeza reticulata. Male.
(Brown, mottled with black.)

such as Sardinia, Germany, and Spain, and is also found in Algeria. The female has a short, boldly-curved ovipositor, both edges of which are deeply notched like the edge of a saw. The name *Odontura*, i.e. "tooth-tailed," refers to this structure.

On Plate VI. may be seen two very beautiful examples of these insects. The upper figure represents *Acridoxena Hawaiiana*, which, as its name implies, is a native of Hawaii. Whether its wings be opened or closed, it presents a very striking appearance, as we shall presently see. The illustration represents it as in the act of flying, in which attitude we will first describe it.

The general colour of the body, including the thorax, is green, with a tinge of yellow, the head being very much darker, and, indeed, almost black. The elytra are decorated after a very elaborate manner. Their outer portion is ruddy chestnut,

mottled with bold streaks of black and four semi-oval marks of pale yellow. The inner portion is yellowish green, with three bold patches of very dark and very soft brown, and the end of the elytra is the same colour, with the exception of an indistinct bar of ashen grey, which runs diagonally through it.

The wings themselves are voluminous, and are covered with a vast number of short, narrow, wavy white stripes, shaped exactly like the conventional marks used by artists to represent birds flying at a distance. In some specimens there is a slight variety in the arrangement of the marks, and the colour of the body is bright emerald green. When the insect is at rest, its whole aspect is altered. The folded wings lie along the body and are entirely concealed under the elytra, which are so formed as to produce not only a ridge along the back, but a sharp hump or gable in the middle of the back. The right elytron passes over the left, concealing about one-third of it, so that the brown marks just meet, and form continuous bands of brown on the green surface.

The ovipositor of the female is long and sabre-shaped, and it is rather curious that not only in this species, but in other insects, the blades of the ovipositor are apt to separate at the tip as the insect becomes dry after death. The name *Acridoxena* is formed from two Greek words, and intended to signify a strange grasshopper. The name, however, is open to the same objection as that of *Xenoceros*, which has already been mentioned on p. 197.

THE lower figure represents a very singular insect, of which there is but one species in the British Museum. Its name is *Sanaa* (or *Acanthodes*) *imperialis*, and it was taken at Silhet, in Northern Hindostan.

The whole aspect of this creature exactly resembles that of withered foliage. It is pale yellow-brown in colour, and is all crumply and spiky, like a withered branch of some thorny plant. The thigh and tibia of the fore-legs are flattened and notched like dried oak-leaves, and the long hind legs are furnished with thorn-like spikes down to the feet. On the upper part of the thorax is a crown-like patch of spikes, and there are two large spikes at the end of the abdomen, just at the base of the ovipositor. The abdomen is much raised along the centre, so as to form a decided ridge.

The elytra are exactly like withered leaves, even to their nervures, and are curiously shaped, each of them having a very deep notch near the inner angle. On each of the elytra are three round spots of a greyish hue, just like the fungus-marks that are so common on decaying leaves. The wings are very dark, except a broad band round their edges, in which the colour is almost exactly the same as that of the elytra. When spread, the wings do not lie flat, but are crumpled in a most singular manner towards their bases. The jaws are enormously powerful, and being tipped with shining black, they have a very formidable appearance.

There are several allied insects which deserve a short notice. One is *Megalodon ensifer*, a native of Hindostan. It derives its generic name of *Megalodon*, i.e. "large-toothed," from the enormous comparative size of its jaws, in which respect it rivals the insect which has just been described. The specific name *ensifer* is Latin, and signifies "a sword-bearer." It is given to the insect on account of the gigantic size of the ovipositor, which is so long that it cannot be carried after the usual fashion, but takes a sudden turn upwards close to the abdomen. It is very wide as well as long, so that the female of this insect is very conspicuous. Along the back are three tufts of spikes, similar to that on the thorax of the *Sanaa imperialis*.

Another species, *Storniza pallicornis*, of Bogota, is bright green in colour, and in shape very much resembles the common spider-crab, even to the shape of the head, which is produced into a sharp point. The spikiest of them all, however, is *Panacanthus varius*, of Quito. This very remarkable insect fully deserves its name of *Panacanthus*, which is formed from two Greek words, and signifies something that is all thorns. The last of these remarkable insects which will be here mentioned is *Copiophora cuspidata*, of Brazil. Just as the Storniza resembles a spider-crab in shape, so does the Copiophora resemble a shrimp, and, so close is the likeness, that at the first glance at the drawer in which it is preserved it is hardly possible to avoid the idea that a shrimp has by accident been placed among the insects.

THE illustration on the next page represents the male *Pterochroza ocellata*. The female differs little from the male, except that her body is shorter and thicker, and at the end of the abdomen there

is a long, flat ovipositor, boldly curved upwards, like the blade of an Indian tulwar or sabre. It is a native of Pará, and is one of the many beautiful and strangely-formed insects that were brought from South America by Mr. Bates.

Like several other insects of the same group, it bears a wonderfully strong resemblance to withered leaves, especially when its wings are closed. The nervures of the elytra are, as may be seen by reference to the illustration, exactly like those of a leaf, and the similitude is increased by the colour, which is reddish

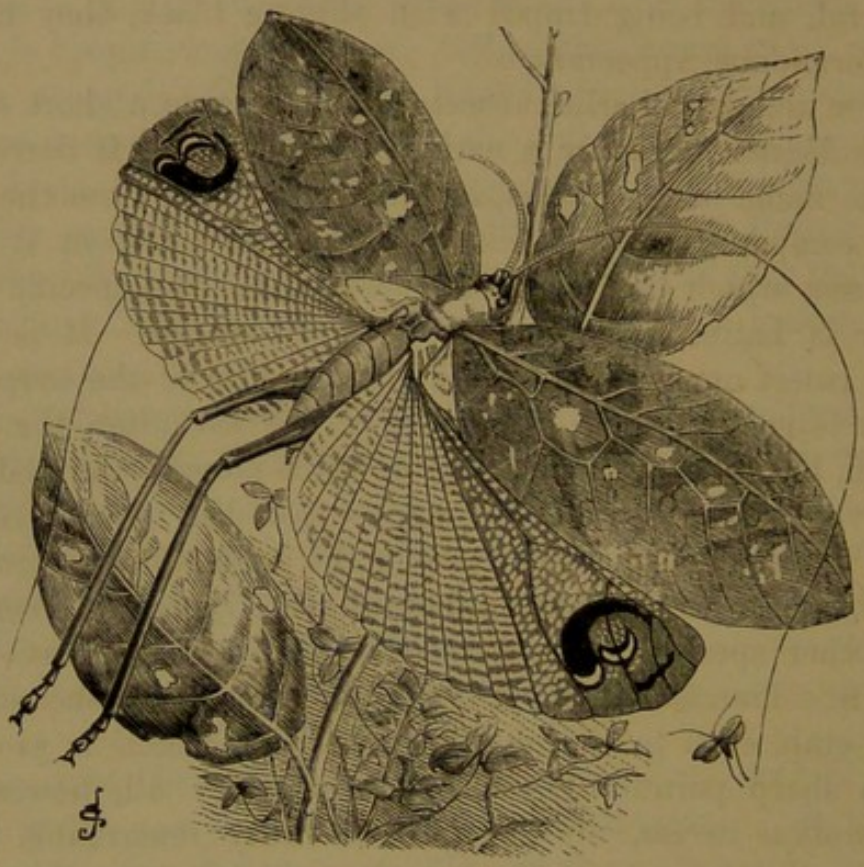


Fig. 164.—Pterochroza ocellata.
(Brown, wings with eye-like marks.)

brown. The lighter spots which are seen on the elytra are dull white. This colouring belongs only to the upper surface of the elytron, that of the lower under surface being for the present reserved.

The true wings are very large, and are beautifully mottled with yellow streaks, disposed as is shown in the figure. Near the tip of each wing is a large eye-shaped spot, almost exactly resembling the "eyes" on the wings of our familiar Peacock Butterfly. There is some variation in the colours of the eye and

their arrangement, but the colours are generally as follows. The half of the eye nearest to the base of the wing is rich ruddy chestnut, while the remainder is dark brown. In the middle of the eye are two crescent-shaped marks of pure white, the points of the upper crescent being turned towards the tip of the wing, and those of the lower crescent to the lower edge of the wing.

Altogether, the body seems so small, and the spread of wing so great, that we almost wonder why so little a body should require such enormous wings. It must be remembered, however, that much of this space is taken up by the elytra, which are not only useless for flight, but are absolutely so much additional weight which the wings have to support.

We will now return to the elytra. As in one or two other insects, though this is seldom the case, the under surface is much more beautiful than the upper. Viewed from above, the elytra are simple reddish brown; but when seen from below, they are bright pink, diversified with bold mottlings of black.

This curious disposition of colour has led to several attempts at fraud, one or two examples of which are kept in the British Museum as warnings to those who purchase insects without the exercise of due discretion. There is as much "jockeying" in insects as in horses, dogs, or pigeons, and the blacklegs of the turf are quite equalled by those of the cabinet. "Doctored" insects are as common as Birmingham antiquities, and the renowned Flint Jack himself was not a more successful impostor than are many entomological forgers. One of the most ingenious entomological impostures that I have seen was not intended for sale, but merely as a hoax by way of a practical joke. The fabricated insect was mostly made up of parts taken from other insects, but the ingenuity lay in the manner in which six spider-legs were substituted for the original limbs, and each joint nicely coloured so as to carry off the eye from the fabrication. The head was altogether a fiction, being very neatly cut out of cork, and painted so as to give it an almost exact resemblance to a real head.

Parts of one insect are substituted for those of another, and in those cases where mimicry of form prevails, as in the Clear-wing Moths and the Bombylidæ, the deception is not easily detected. In the fraudulent specimens above mentioned, the insect forger has displayed an astuteness which almost

amounts to genius. Knowing that at the British Museum any attempt to substitute a portion of one insect for that of another would be detected, he has removed the elytra, and replaced them with the greatest neatness, *only with the under surface upwards.* The effect on the appearance of the insect is really wonderful. There is nothing obtrusive about it, but the splendid colouring of the elytra harmonizes so well with the wings and the rest of the body, that none but an accomplished entomologist, apt to suspect and keen to unmask imposture, would think that the insects in question were not genuine specimens. The ingenuity of the procedure was further enhanced by the fact that several specimens were offered for sale together. A single specimen might have aroused suspicion, but three or four, all exactly alike, were calculated to lull it.

The Philippine Islands produce the beautiful insect which is known under the name of *Gryllacris signifera.* It is represented

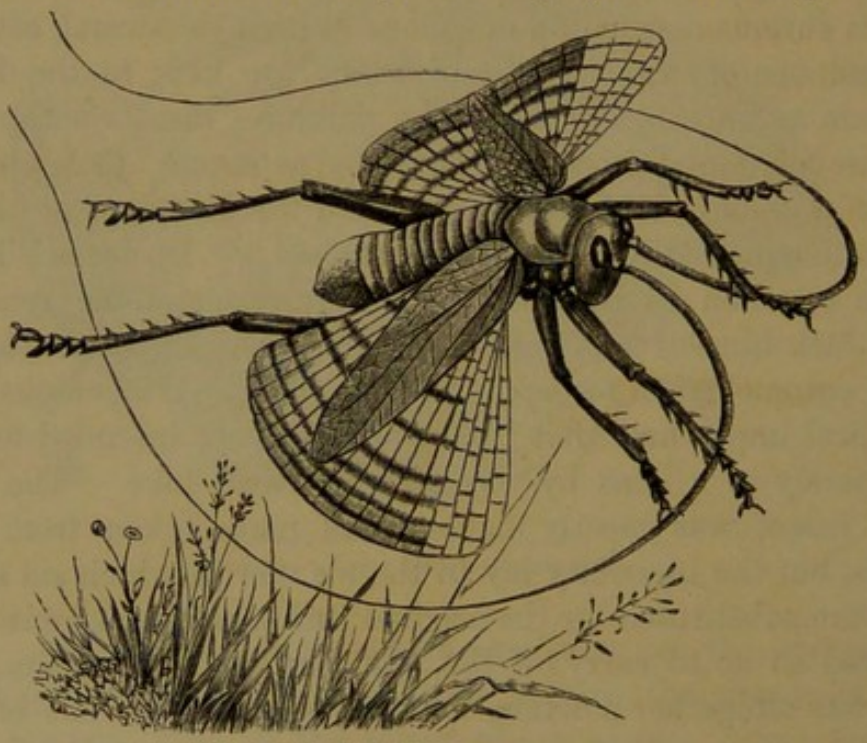


Fig. 165.—Gryllacris signifera.
(Green. Wings with alternate dark stripes.)

of the natural size. The chief point of interest in this insect lies in the wings, which are very large and marked with alternate dark stripes.

There are several species belonging to this genus, one of which, *Gryllacris spurcata,* from Java, is remarkable for the enormous

size and beautiful colouring of the wings. When the insect opens its wings for flight, they spread out on either side in a fan-like form, very much resembling the pectoral fins of the Flying Gurnard, the resemblance being increased by their dark, shining surface. The generic name *Gryllacris* is Greek, signifying "cricket-locust;" and the specific name *signifera* is Latin, and means "a standard-bearer."

THE next family is called *Acrididæ*, from a Greek word signifying "a grasshopper." The Acrididæ resemble the Locustidæ in the arrangement of their elytra, which are boldly deflexed. They may, however, be distinguished by their antennæ, which are very slender and hair-like, after running to a wonderful length, and sometimes having more than two hundred joints. They also differ from the Locustidæ in the structure of the feet, which have four joints instead of three. There are very many species comprised in this family, and it is therefore necessary to select a few examples of those species which present the most striking characteristics.

THE first and perhaps the most important of these insects is the Migratory Locust, so familiar to us by its frequent mention

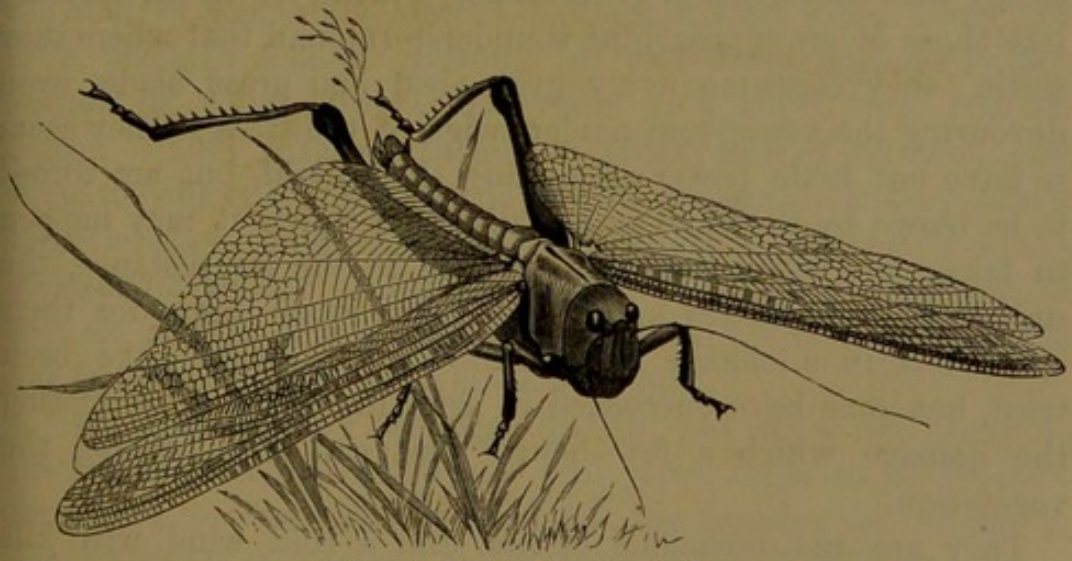


FIG. 166.—Pachytylus migratorius.
(Green, mottled with dark brown.)

in Holy Writ. The elytra of this insect are green-brown, mottled with a darker hue, the colour being much more brilliant during the life of the insect than after its death. Some of these

mottlings extend to the head, where they assume shapes bearing some resemblance to Arabic letters. In his "Thalaba" Southey makes an ingenious use of these marks:—

"The admiring girl surveyed
His outspread sails of green,
His gauzy underwings,
One closely to the grass-green body furled,
One ruffled in the fall and half unclosed.
She viewed his jet-orbed eyes,
His glossy gorget bright
Green glittering in the sun;
His plumy, pliant horns,
That, nearer as she gazed,
Bent tremblingly before her breath.
She marked his yellow-circled front
With lines mysterious veined;
And 'Knowest thou what is here inscribed,
My father?' said the maid.
'Look, Thalaba, perchance these lines
Are in the letters of the Ring,
Nature's own language written there.'"

The vast masses in which these insects appear have been too often described to need more than a passing allusion. Suffice it to say that they come in great clouds, which look in the distance like those of an approaching thunderstorm, and that where they settle, they consume every green leaf and grass blade, even devouring the young and tender twigs of the trees. They seem to have but little power of guiding their flight, but are forced to be blown by the wind in any direction which it may happen to take; and when a swarm is seen in the far distance, the unhappy agriculturists know that there is no hope for their crops but in a change of wind. Various means have been tried, but none have succeeded in arresting or even mitigating the damage which a few hours' visit can work among the vegetation.

They are not tenacious of life, and a cold wind will kill them almost at once, while myriads upon myriads perish should they be blown out to sea. In such a case, their bodies have been known to form a continuous wall along the sea-shore, extending for several miles in length, and giving out an absolutely intolerable odour.

The eggs of the Migratory Locust are small, long, and oval, about the size and shape of rice-grains. They are gathered together in rounded groups of some forty in number, the eggs projecting like almonds from a pudding. A quaint and simple account of the growth and habits of the Locust is given by Mouffet in his "Theatre of Insects."

"Now the female bringeth forth (as *Aristot.* saith), the little stem that grows to her tail being stuck in the ground, and thus layeth all her burden together in the same place, which scattering up and down, look as it were like a honey-comb. Hence proceeds a kind of little worm in the likeness of an egge, included in a little earthly thin membrane, the which being forced open, out come the locusts and fly abroad. But (by the favour of so great a philosopher) they lay eggs indeed at the beginning of autumn, though not of the fashion of eggs, as I have seen with my eyes and have had them in my hands. The which feture is so tender, that with the least touch it is bruised to pieces.

"Neither is it laid upon the superficies of the earth, but somewhat deeper, and in the winter underground: where in the winter they being perfected by concoction, in the subsequent year, almost at the latter end of spring, they come forth out of the shell or membrane aforesaid, wherein they were, being yet little blackish locusts creeping up and down without either shanks or wings, which afterwards in a short time become bigger. They bring forth at the latter end of summer, and when they have so done they forthwith die, certain little vermine breeding about their necks (as it happeneth to the beetle) which do strangle them. These dying after such foolish fashion as they do, are yet able at their pleasure, any one of them, if it do but fasten on his chaps, to kill a serpent.

"In a wet spring the eggs perish, but in a dry there is great increase of them. Some will have them to be brought forth and to dye twice a year (in the number of whom is Willichius,) that is to say, at the rising of the Pleiades they come forth, and dye at the setting of the Dog-star, then others to be brought forth. Some say at the setting of Arcturus. In mountainous places, and of a thin air, there breed no locusts, but in plains and places full of clifts and chaps; nor do they lay their eggs upon the superficies, but in the chinks and caverns of

the earth, both that they may be the better concocted, or else better preserved from cold and rains.

"That they should be generated of the carkasse of a mule or asse (as Plutarch reports in the life of Cleonides) by putrefaction, I cannot with philosophers determine: first because it was permitted by the Jews to feed on them; secondly, because no man was ever yet an eye-witness of such a putrid and ignoble generation of locusts."

THE insect which is here represented is another of the destructive creatures which are known by the general name of Locusts. All the insects belonging to this genus have the thorax exceedingly prolonged, so as to form a sort of neck.

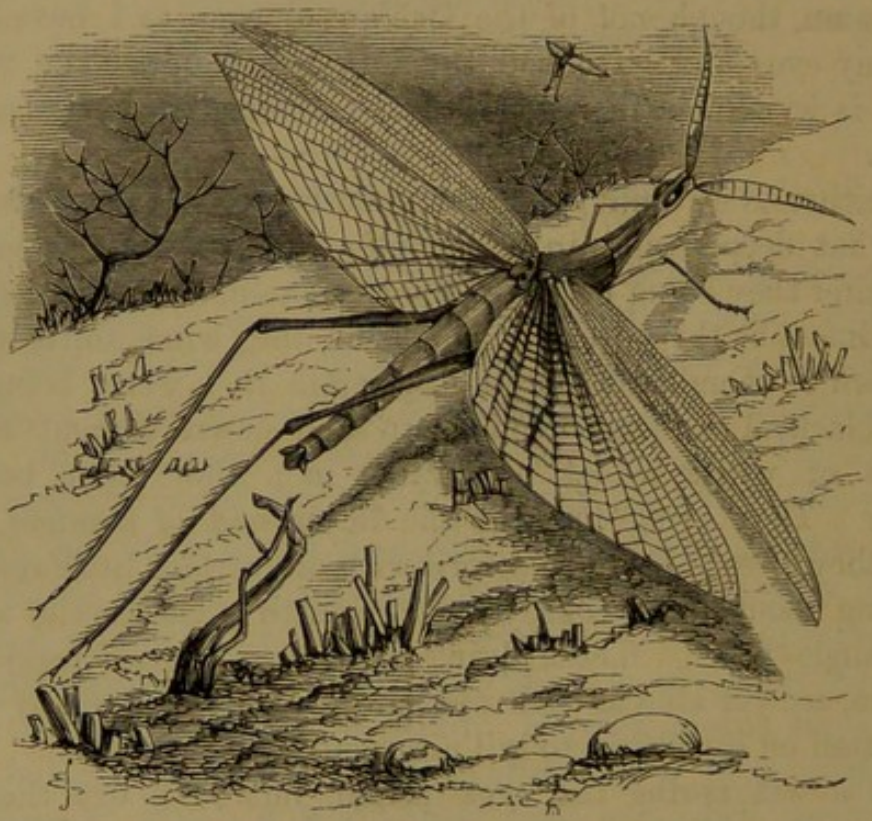


FIG. 167.—Tryxalis inguiculata.
(Red-brown, with coloured wings.)

If the reader will refer to the illustration, he will see that the antennæ are constructed after a very curious fashion. In most of the Orthoptera these organs are very long and slender, consisting, as we have already seen, of more than two hundred joints. In this genus, however, the material which might have served for

the usual long and slender antennæ is formed into two short, flat, few-jointed antennæ, narrow at the base, then widening rapidly, and at last coming to a sharp point, very much like the antennæ of several moths.

This is really a beautiful creature, though its beauties cannot be seen until it spreads its wings. As it sits at rest, or merely crawls after the fashion of its kind when not alarmed, it is a simple, plain-bodied insect, in no way more remarkable than one of our own grasshoppers; but as soon as it takes to the air, it displays a wondrous amount of hidden beauties. The upper edge of the wing is dark brown, through which runs a stripe of snowy white. The base of the wing is azure blue, followed by bright pink, which fades gradually until the wing appears of a crystalline clearness. There is also a patch of green just beyond the blue mark. This is the usual arrangement of colour, but the insect is a very variable one both in size and hue.

There are many species of Tryxalis, the genus being spread widely over the world, even Japan and New Guinea possessing representatives of it. As an example of the wide range of these insects, I will mention one species, *Tryxalis nasuta*, specimens of which, now in the British Museum, have been taken in the following localities:—Switzerland, Marseilles, Leghorn, Galilee, Nubia, Sierra Leone, Gambia, South Africa, interior of South Africa, North Hindostan, Ceylon, Cambodia, New South Wales, and Sandwich Islands.

Some time ago I was at a singularly interesting *conversazione* at the Albert Hall, into which electric wires were brought from various parts of the world: among others, there was one communicating with Kurrachee, in India. Having ascertained that an operator was on duty at the Indian end of the wire, our operator asked if anything was then going on. The answer came back in a few minutes, that a vast swarm of locusts was passing over Scinde. And I have little doubt that the locusts in question belonged mostly to the very species which has just been mentioned.

In Hardwicke's "Science Gossip" for April 1871, there is a very interesting paper on Locusts, by Mr. C. Horne. As far as I can gather from his description, the insects belonged to the genus Tryxalis:—

"I had been more than twenty years in the country before I saw

a locust, and, strangely enough, the first flight visited my station when Dr. Jerdon, who had been very many more years than I had been a resident, was staying with me, and he too had never witnessed a visit of these insects. It was on September 13, 1863, when just after luncheon it suddenly became quite dark, and the servants coming in, told us that the locusts had arrived, and so we went out to see them.

"The whole sky, as far as the eye could reach, in every direction, was full of them. They flew from the north-east at a great pace, with a strange rustling, filling the air with sound, which seemed to come from every point, and were much scattered in their flight, which ranged from thirty to two hundred feet from the ground. The wind at the time was blowing from the north-east, and they were borne along upon it. . . . . Presently we noticed them returning, having been turned by a storm of wind and rain which was coming up from the south-west, and which advanced to within a quarter of a mile of the place where we were standing. They faced round, and every-one they met turned with them and hurried towards the north-east, as did those which had alighted in the trees.

"About ten minutes or a quarter of an hour after this, there came up a heavy storm of wind and rain from the north-east, with a little thunder and lightning. This again turned them, and they were floating rapidly past, when a terrific downpour of rain obscured all from our view, and caused them to settle on every tree in which they could find shelter.

"One *emli*, or tamarind tree, standing in the middle of a large field, was so covered with them, that at a little distance, instead of the brillant green for which this tree is noted, it appeared of a dull red. Next morning there was not a leaf left, only bare twigs, while under the tree there must have been half an inch deep of excreta. . . . About 10 A.M. many thousands were flying about, and I expected great damage. The sun however came out, and with dried wings they all departed. They first rose into the air like pigeons, gyrated a little, and then went straight off to the north-west. The whole of this flight, from a careful examination we made, appeared to have been young males.

"On the 16th September there were three more large flights, extending for miles, but a very few settled; little harm was done to the crops. The appearance of a flight on the horizon

is curious. It is like a thin, dark streak, which increases in density every moment till it has arrived. Any computation of the number of insects of which such a swarm consists, would be quite impossible.

"What strikes everyone, as they approach, is the strange rustling of millions on millions of crisp wings. Often after this there were flights, but it was impossible to trace their direction, nor is it certainly known where they generally breed. Many swarms settled in the Punjaub, where they laid their eggs in the ground, and thousands of men, women, and children collected these, and they were destroyed. Still, many remained, and the young wingless larvæ crawled over the ground, creating far greater havoc than their winged parents.

"When they come, everyone turns out with pots, kettles, and pans, and makes as much noise as he can. This certainly prevents them from settling, and I thus twice saved my garden, and trust never to see them again.

"In the evening I had asked two gentlemen to dinner to meet the doctor, and I gave them a curry and croquêt of locusts. They passed as Cabul shrimps, which in flavour they much resembled, but the cook having inadvertently left a hind leg in a croquêt, they were found out, to the infinite disgust of one of the party, and the amusement of the others. Here is a receipt for cooking them, taken from the *Akhbar*, a native Algerine journal, under date August 1866:—'*Criquets à la Benoiton.*—Take the locust gently between the finger and thumb of the left hand; cut it in two with a knife, and pour into the animal's inside a small quantity of good rum; let it stand two days, and then cover it with a fritter paste and fry them. Then sprinkle with sugar, and pour into the dish a small quantity of Burgundy.' I never tried it.

"The bodies were as tough as leather in the curry, and quite uneatable; but the croquêts, in which they were well broken up after having been deprived of their legs, heads, wings, and wing-cases, were very fair; and if thoroughly sun-dried, with a little salt, I can fancy, when ground and mixed with other food, they would be very tasty. Our Mahommedan servants ate them, and they told us how that in many parts they were extensively used, being dried and kept in sacks. All animals, such as cattle and camels, are said to like them; and amongst

birds, the only ones that did not touch them were the doves and parakeets, both vegetable feeders."

The bear appears to be especially fond of locusts. Mr. Shaw mentions that in 1863, when vast multitudes of these insects perished on a glacier, the bears came by dozens to feed on the dead bodies, which in some places filled the crevasses ten or twelve feet deep. The animals were so occupied with their feast, that they scarcely noticed the presence of travellers, and allowed them to pass without taking any notice.

LIKE many of its kin, the *Rhomalea centurio* loses much of its beauties soon after death, its bright green hues, in particular,

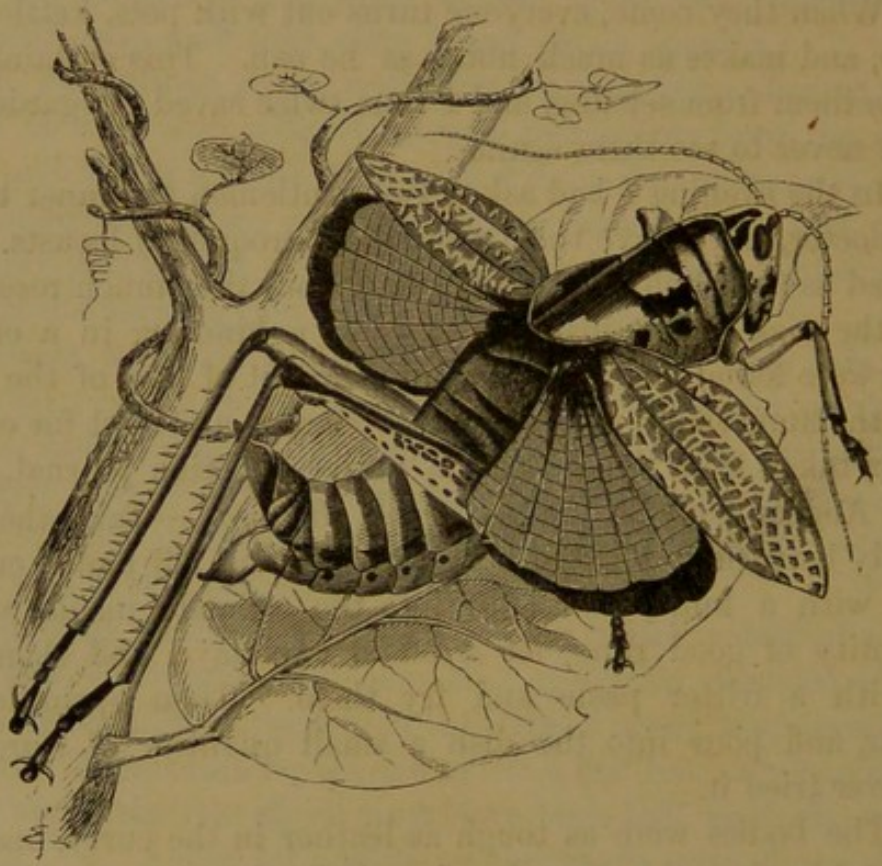


FIG. 168.—Rhomalea centurio.
(Bright green, with scarlet wings.)

becoming dull yellow, brown, or even black. Many insects can be guarded against loss of colour by being kept in absolute darkness, the action of light causing them to fade. But with these creatures, though the light is quite as destructive of colour as in others, the drying up of the juices produces a similar

effect, and sooner or later the lovely hues vanish, no matter whether the insect be kept in a light or a dark place.

The general colour of this insect is bright green, mottled with black. The elytra are pink, covered with a fine black network, and even the very legs are of the same brilliant green and black as the body. The chief beauty, however, lies in the wings themselves, which are almost wholly of a blazing scarlet, the only exception being an edging of deep black, widest in front, and rapidly narrowing as it proceeds towards the base. In order to see the insect to its full advantage, its wings and elytra should be spread, and it should then be held up against a strong light. And, if the magnifying glass be also employed, the exquisite structures of the wings and elytra will well repay the trouble of examination.

This insect is a native of South America. The generic name *Rhomalea* is taken from a Greek word signifying "strength;" and the specific name *centurio* is probably given to it on account of the brilliant scarlet of the wings, which gives to the insect a sort of military air.

THE insect which now comes before us has an equally strange look, whether its wings be closed or open. Its name is *Teratodes monticollis*. It is a native of Hindostan.

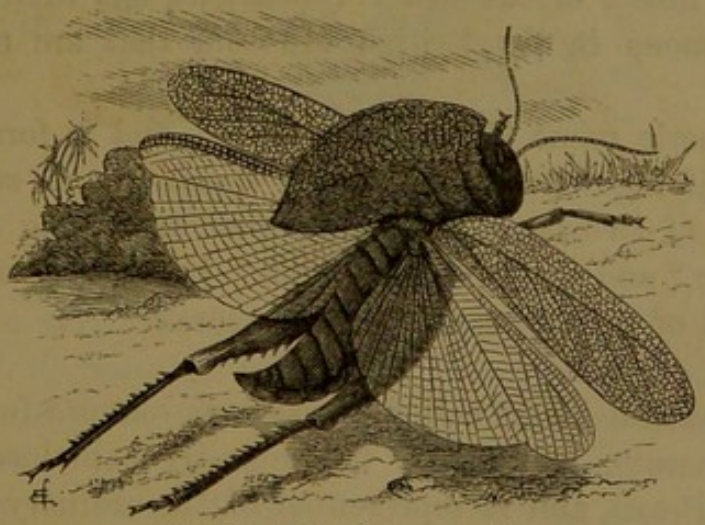


FIG. 169.—Teratodes monticollis. (Green.)

In the structure of this creature the most conspicuous point is the singular development of the thorax. We have seen many

examples where the thorax has been widened and even furnished with flattened appendages at the sides. Here, however, the case is quite different. The thorax is narrowed, very much raised, and shaped very much like the head of an axe with the edge upwards. The resemblance to an axe is increased by the fact that a narrow and highly polished ridge runs along the upper edge of the thorax, giving it an appearance as if it had been ground and sharpened.

The colour of the thorax is green, with a yellowish tint. It is very rough on the surface, the roughness being produced by a vast number of tiny elevations surrounded with a sort of network, such as has been described in connection with several beetles. On each side of the thorax, and nearly in the middle, is a round, sunken spot, of a much darker hue than the rest of the thorax. The head is shaped so as to suit the thorax, and is sunk rather deeply in it. It is also furnished with a row of slight notches over the top and front.

The elytra are covered with extremely fine network, and the wings are translucent and gauzy, adorned with a number of very fine black lines, each line only running across a single fold. These lines are set alternately, like those of bricks in a building, and really produce a very pretty effect. The body is green, as are the legs, which are very long and slender. The figure represents the insect of the usual dimensions, but there are one or two specimens in the British Museum that are considerably larger.

The generic name *Teratodes* is Greek, and is formed from a word signifying "wonderful." The specific name *monticollis* is composed of two Latin words, the first signifying a "hill" or "mountain," and the second a "neck." It is given to the species on account of the strangely elevated thorax.

THE beautiful insect called *Chromacris colorata* fully deserves both its names, which will be presently explained. It is a native of Brazil, and is represented of the ordinary size. It is, however, extremely variable in this respect, some specimens being very much smaller than the figure, though few, if any, are larger.

The general colour of the insect is dark opaque green, but upon the head, thorax, and abdomen there are a number of spots

which are of a very brilliant green. The elytra are also dull green, so that when they are closed there is nothing remarkable about the insect's appearance. Towards the end of each elytron there are a number of squared reddish brown spots, arranged with perfect regularity at a little distance from each other, so that when examined with a magnifying glass the end of the elytron looks as if it were a network of square green meshes, each mesh having a chestnut centre.

The wings themselves are shining black, but each wing has a large patch of bright yellow extending in a fan-like shape from the base nearly to the edge, and just beyond this patch are two large oval spots of a similar hue. Indeed, the two colours are so equally divided, that it is not easy to say definitely whether the black or the yellow be the ground hue of the wing. The reader will see, by looking at the figure, and remembering the



Fig. 170.—Chromacris colorata.
(Green; wings black, with yellow marks.)

colours, how very different must be the aspect of the insect when flying, with its beautiful black and yellow wings expanded, and when at rest, with those wings folded away under the dull green elytra.

The generic name *Chromacris* is Greek, and signifies "a coloured grasshopper," and the Latin specific title of *colorata* carries its own interpretation. Some allied species have the colouring of the wings arranged after a similar fashion, except that the yellow is replaced by scarlet.

THE insect which is appropriately called *Cystocœlia immaculata* is one of the oddest of its kind, though its oddness cannot be expressed by the plain black and white of the printer's ink. The illustration can but represent a large-bodied flying insect. It cannot represent that the large, rotund, smooth body is quite hollow.

If a very ripe and very large green gooseberry were taken from the bush, the contents removed, and the empty skin inflated and attached to the thorax of a grasshopper, some idea may be formed of the extraordinary appearance of the insect. In fact, the creature has come to be called the "Flying Gooseberry," by way of a popular name. The inflated abdomen is quite transparent, so that if held up to the light and the finger be passed across it, the shape of the finger can be plainly seen through the body of the insect. Inspection conducted in this



FIG. 171.—Cystocœlia immaculata.
(Pale green; abdomen hollow and transparent.)

manner shows that the whole of the vital organs live in a small band occupying the centre of the under surface of the abdomen, the whole interior of the abdomen being, with this exception,

absolutely as empty as a blown bladder. The object of this singular structure is at present unknown.

The rest of the insect differs little from the ordinary structure of the Saltatoria. The thorax rises very high in the middle, and if the insect be viewed sidewise, it will be seen that the thorax is drawn out into a point behind, and projects over the first few segments of the abdomen. Its colour is opaque green, except that along the ridge which crowns its summit is a slender line of light scarlet.

The genus is distributed rather widely through the world, and is found in most of the hot countries. Of the habits of this particular species, which belongs to Southern Africa, nothing has been recorded; but Mr. A. W. Scott has taken some very interesting notes respecting an allied insect, *Cystocœlia Saundersii*, which inhabits Ash Island, situated in Hunter's River, New South Wales:—

"These insects are extremely numerous on Ash Island, principally inhabiting an orange grove of about 1,200 trees, and we scarcely ever remember seeing one beyond a few rods of the limits of this garden, nor have we ever heard of or discovered a single specimen elsewhere, with the exception of the few brought by Sir Thomas Mitchell from the interior.

"During the short twilights of this country, the male commences and ends his song, which resembles a loud, deep guttural *R*, continued incessantly and with vibrations. So loud, indeed, is this sound, that when near to several insects it becomes painful to the ear. It is, moreover, very unlike the shriller and harsher notes uttered by the common Cicada.

"In this brief period after sunset the males and females occasionally fly from tree to tree, their flight being slow and steady, particularly that of the former. The only other time these insects are heard is immediately, in hot and sultry weather, before a thunderstorm, and then only at broken intervals. This habit was particularly noticed on our placing the males on a bunch of flowers in the drawing-room, where every evening they regaled us with their short-lived song, and at other periods occasionally predicted the coming storm.

"The larvæ live underground on the roots of plants, and in their habits and transformations closely approximate to those of the common Cicada.

"The perfect insects appear early in September, and are to be found until about February. They are extremely easily captured, the females being taken when in flight by a common butterfly-net, and the males by going to the spot from where their voices proceed and suddenly shaking the bough, which causes them to drop to the ground, when they may be picked up."

THYSANOPTERA.

THYSANOPTERA.

CHAPTER I.

THRIPIDÆ.

THE rather long name which is given at the head of this chapter is formed from two Greek words, and signifies "tassel-winged," because the wings of the insects are furnished with long tassel-like hairs. They have no network-like pattern upon them, and are laid flat upon the back when the insect is at rest, one wing lying almost completely over the other.

The exact position of these insects is not easily decided. It is true that they are very small, but then the microscope has abolished all difficulties in that direction, while the discovery of certain foreign species, such as that which is here figured, has rendered examination comparatively easy. The structure of the mouth forms the principal obstacle to the systematic arrangement of these insects. They have mandibles, but these organs are modified into a pair of slightly curved and very slender bristles, technically called "setiform," from the Latin word *seta*, a bristle.

Mr. Westwood, who was the first to describe the parts of the mouth, sums up the description in the following words:—"The relations of this order are very difficult. The nature of the metamorphoses would unite it with the Orthoptera or Hemiptera, while the structure of the wings and mouth removes it from both these orders. The mouth, indeed, seems to be of a character almost intermediate between the Mandibulata and the Haustellata; the setiform mandibles are very like those of the Hemiptera, whilst the general disposition of the other parts of the mouth are more like those of a mandibulated insect. It appears

doubtful to me, however, whether the action, even of the maxillæ, can be transverse, or whether the insect can be said to bite its food."

Without exception our English species of the Thripidæ are exceedingly small, some so minute as to be scarcely recognisable as insects. Take the finest of fine-pointed steel pens, draw with it the lightest possible line as long as the letter "i" (without the dot), and that will give a tolerable idea of the average English Thrips. Small as they are, they are both directly and indirectly injurious to man. They are directly injurious by their inveterate habit of getting into the eye and causing severe pain, the tasseled end of the wings being highly



Fig. 172.—Idolothrips spectrum. (Black.)

irritant. This habit they share with the smaller Rove Beetles, whose turned-up tails are as painful to the eye as the wings of the Thrips.

They are indirectly injurious in consequence of the mischief which they do among plants, especially in greenhouses and hothouses, where the leaves of the plants are often quite blackened by the numbers of these tiny creatures. They infest the garden and field as well as the greenhouse; the vegetable marrow, French beans, and other plants being subject to their attacks. They even damage the wheat, getting between the flower and the grain and depriving the future seed of its moisture. Both on the Continent and in England the wheat has suffered so severely from the inroads of the Thrips, that nearly one-third of the crop has been rendered useless.

The species which is shown in the illustration is a native of

New Holland, and is by far the largest of its kind. Indeed, it bears about the same relation to the ordinary Thripidæ that an elephant bears to a cat, being more than one-third of an inch in length. The figure is slightly magnified, in order to show the structure more clearly, the exact length being indicated by the line in the upper part of the illustration. The antennæ are moderately long and very slender, and the head is long and narrow. On each side of the abdomen are seven tooth-like appendages, and the insect is also armed with long, sharp, bristly spines.

The larvæ of the Thripidæ are active, and somewhat resembling the perfect insect. There is but little change of form in the pupa, except that the rudimentary wings are very plain, and the limbs are rather hampered by a filmy covering, so that the creature is sluggish in its movements.

NEUROPTERA.

NEUROPTERA.

CHAPTER I.

LIBELLULIDÆ.

THE next order of insects is appropriately named Neuroptera, *i.e.* Nerve-winged Insects. It comprises the Dragon Flies, Ant Lions, Lace-winged Flies, May Flies, and the insects which are popularly, though wrongly, called White Ants. In this order the wings are four in number, the upper being used for flight, and not employed as a protection for the lower pair. They are divided into a vast number of cellular spaces by means of bold nervures, thus giving to the insects the name of Neuroptera. No other order of insects has the wings divided into so many cells as is the case with the Neuroptera.

As a rule the wings are of the same size, but in many cases the hinder pair are very much narrowed, in some species being little more than narrow threads. Sometimes the hind wings are absent altogether, and in some species both pairs of wings are absent. Indeed, although there is little difficulty in referring insects to this order, the characteristics are so variable that, as Mr. Westwood very justly remarks, there is scarcely one which does not meet with an exception.

THE best known group of the order is the Libellulidæ, popularly known by the name of Dragon Flies, in consequence of the swiftness and voracity displayed by these insects.

In England they are often known as Horse-stingers, from an absurd idea that they possess stings. This notion has evidently arisen from the facility with which a Dragon Fly can bend its long abdomen, the movement bearing some resemblance to that

of the wasps, bees, and other sting-bearing insects. The very prevalent idea respecting their habit of stinging horses has probably arisen from the fact that they live entirely upon insects, which they capture on the wing. As various flies do persecute horses greatly in the summer months, and often follow them in swarms, the Dragon Fly finds an ample supply of prey near the horse, and is, in fact, the protector rather than the persecutor of the animal.

In the larval and pupal stages of their life they are inhabitants of the water, and are quite as predacious under water as they are in the air when they obtain their wings. There is but little difference of shape in the larva and pupa, except that in the latter the rudimental wings are seen on the back, in the form of four thick, leather-like plates, giving little promise of the ample, gauzy, shining wings which are concealed beneath them.

Both the larvæ and pupæ of the Dragon Flies possess a most curious development of the lower lip, technically named the "mask," because, when it is not in active use, it covers the face of the insect exactly as a mask would do. The mask cannot be exactly described without the use of diagrams. Suffice it to say that it forms a curiously jointed weapon, armed at the end with a pair of toothed jaws. It can be darted out with very great quickness, and when the prey has been caught, the mask is folded back, and thus brings the captured insect into the mouth of its destroyer.

As both the larvæ and pupæ of the Dragon Flies are plentiful in any of our ponds or ditches, the reader can easily capture some specimens, and watch their habits, which are very interesting. The creatures almost always lie under the shelter of weeds and close to the bank, so that they may be caught by passing a net closely along the bank where the weeds lie thickest. They are very fond of the shelter of the common duck-weed, and I have taken three or four specimens in such spots with a single sweep of a net only five inches in diameter.

As a rule these larvæ and pupæ feed upon subaquatic creatures which are sufficiently active to escape in case they were alarmed by the movements of their foe. In order therefore to enable them to dart quickly through the water without causing much disturbance, the Dragon Fly larvæ are furnished with a

very singular mechanism. There is a large hollow in the body, extending nearly through the entire length of the abdomen, and having an opening at the end of the tail.

The primary object of this cavity is respiration, for the gills of the larva open into it, and when the creature is at rest the cavity is gently filled with and emptied of water, so as to keep the gills constantly supplied. If, however, the larva be alarmed, or desirous of darting rapidly on its prey, the enclosed water is suddenly and violently ejected, so that, by its reaction, the insect is driven forward on exactly the same principle as that by which a rocket is driven through the air. It can fill and discharge this chamber with much celerity, so that it traverses the distance of a yard or so with very great speed. It seldom, however, uses this mode of progression if it wishes to travel to a distance, but prefers its legs. As a rule the larva does not discharge the water-chamber more than three or four times in succession.

The appearance presented by the undeveloped wings of the pupa has already been mentioned. When the pupa has finished feeding and is about to pass into the perfect state, it crawls out of the water by means of a reed or other aquatic plant, or, in cases where no convenient plants exist, ascends the bank. When in the air it climbs to some little height, mostly above a foot, and then clings tightly to the object on which it has fixed itself. The skin soon dries, and as the creature bends itself backwards and forwards, splits along the back, and allows the perfect Dragon Fly to emerge. As is the case with the butterflies and moths, the wings are small, thick, and damp, but are rapidly expanded by having air driven through the vessels with which they are thickly permeated, and by being constantly shaken in the breeze. As soon as they are dry, the insect darts off in search of prey, and renews in the air the predacious habits which it possessed in the water.

As all the Dragon Flies are very similar in their habits, there is little to be said respecting each species. I have therefore selected only a few examples of these insects, so as to show the different groups into which they have been arranged. Without going deeply into systematic entomology, it will be sufficient to state that the Dragon Flies fall naturally into two groups, which are at once distinguished by the shape of the head. In the first

group, called Libellulidæ, the head is rounded, and in the other, called Agrionidæ, it is very much wider than long, almost cylindrical, and set on the body like the head of a hammer on its handle.

We will begin with the former group. On Plate VII. Fig. 1 is represented *Palpopleura marginata.*

This is a small, boldly-coloured, exceedingly variable insect. Except that the ends of the wings are always colourless, it is not easy to describe the distribution of the hues, so varied are they in different individuals. As a rule the ground colour of the wings is shining yellow, which in many cases forms a sort of edge to the wings, thus giving to the insect the specific title of *marginata.* The rest of the wing is covered with rich brown, in some specimens being almost black and covering nearly the entire wing, while in others it is very pale, and only occupies a few patches set at distant intervals from each other.

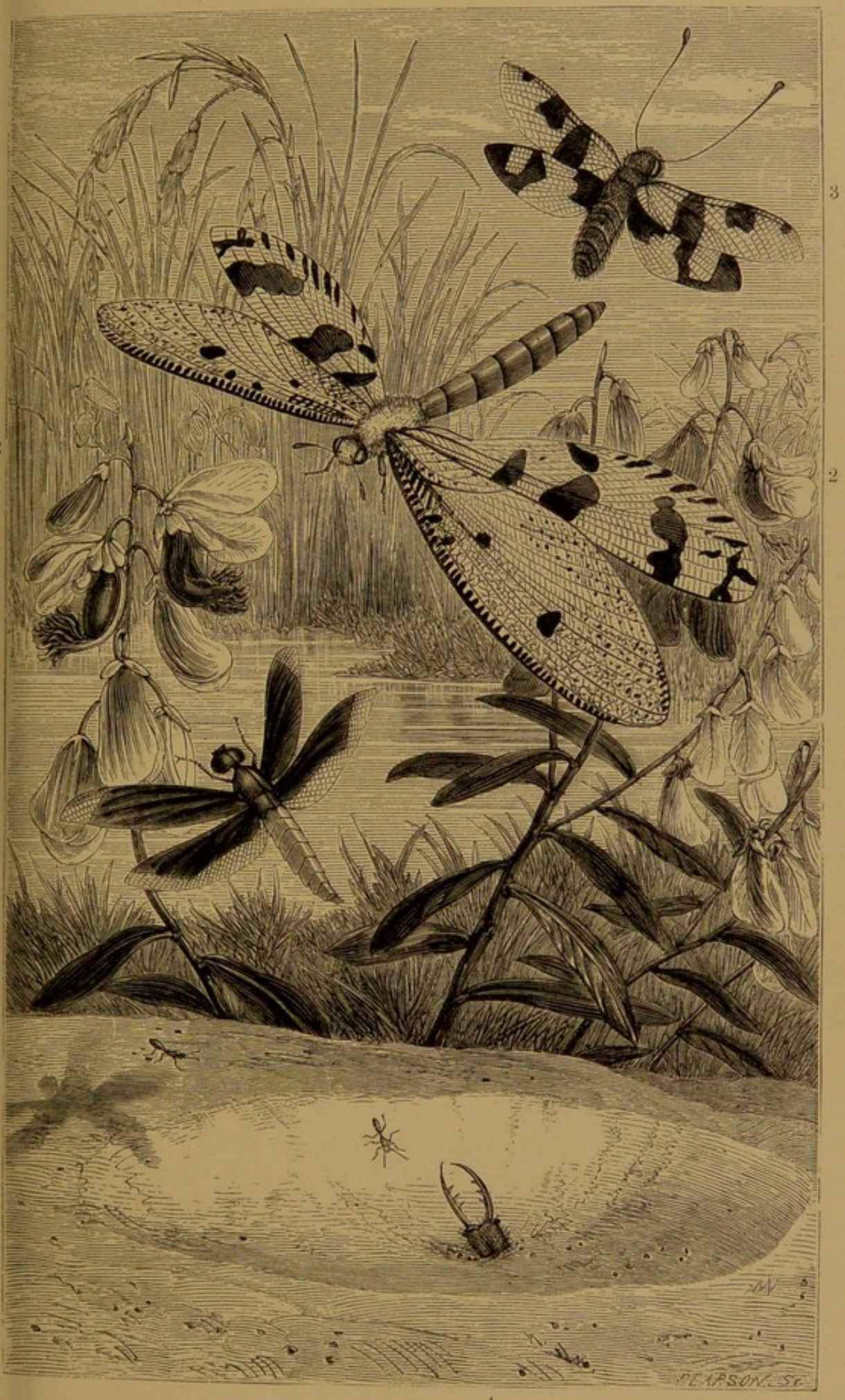
The handsomest of this genus in point of colour is *Palpopleura fasciata.* It is really a most lovely insect, its wings glittering with iridescent hues of metallic purple, green, blue, and gold, these colours being brighter at the base than towards the extremity of the wings.

The illustration on the next page represents an insect belonging to the typical genus. It is a native of Southern Africa (the specimens in the British Museum having been taken in the neighbourhood of Natal), and its name is *Libellula variegata.*

During life the body of this insect is bright red, but after death the colour fades so completely that only an experienced eye can detect the least trace of the hue that was formerly so conspicuous. All entomologists know that our own Dragon Flies are similarly disposed to lose their colour, and have lamented that the brilliant hues which decked the insects when they were taken must inevitably fade into dirty browns and blacks. There is no help for it, as far as our present knowledge goes. It is possible, by dissection and paint applied internally, to retain the colours of the abdomen, but no art has yet been discovered by which those of the thorax and head can be preserved.

And even if all these colours could be made durable, nothing can replace the wondrous brilliancy of the eyes. In the living

PLATE VII.



insect, the play of light and colour through the eyes is like that of an opal, supposing the opal to be translucent. Nothing of the kind exists after death. By means of the magnifying glass the multitudinous lenses of the eyes can be seen, but the light, the life, and the glory have departed from them for ever.

So, in this species, it is just possible in the dried specimen to see that the colour of the body has once been red, though that hue has faded into dusky brown. The upper wings are dark



Fig. 173.—Libellula variegata.
(Body red, wings marbled with brown.)

brown at the base, and this colour exists as far as the middle of the wing, the rest being transparent. The lower wings are almost entirely brown, darkening towards the base, and having a few transparent patches.

There are few insects in which there is so much tendency towards variation as in the Dragon Flies. Even in our own species this peculiarity is very noticeable, but it is especially conspicuous in those which come from other parts of the world.

The insect which is shown in Fig. 174 affords a good example of variation, as, out of a collection of many specimens, there are scarcely two that are exactly alike. There is one characteristic

in which they all agree, namely, that each wing has three spots, but in the shape, size, colour, and even the exact position of the spots, there is more variety than might have been thought



Fig. 174.—Libellula pulchella.
(Wings with three dark spots.)

possible with such simple materials. This species is found in the Delaware district.

The Carolina Dragon Fly, which is shown in the illustration on the next page, inhabits Florida, and is rather a conspicuous insect. There is nothing worthy of special remark in the upper wings, but the lower pair has a very large patch of rich brown at the base, this patch occupying about one-third of the wing, and having a boldly-toothed outline. The light-coloured patches at the base are bright yellow, and contrast admirably with the dark brown.

In looking at the Dragon Flies in a cabinet, or at their portraits in a book, scarcely anyone would see anything to denote a power of concealment by means of resemblance to surrounding objects. Yet many of the Dragon Flies possess this power in a very remarkable degree, and I suppose that it is shared by all On the wing, scarcely any insect is so conspicuous as a large Dragon Fly, and yet I have often noticed that when at rest, and on the watch for prey, scarcely any insect can escape the eye more effectually.

It might be thought that the large shining wings, which are often decked with bold and conspicuous markings, must make

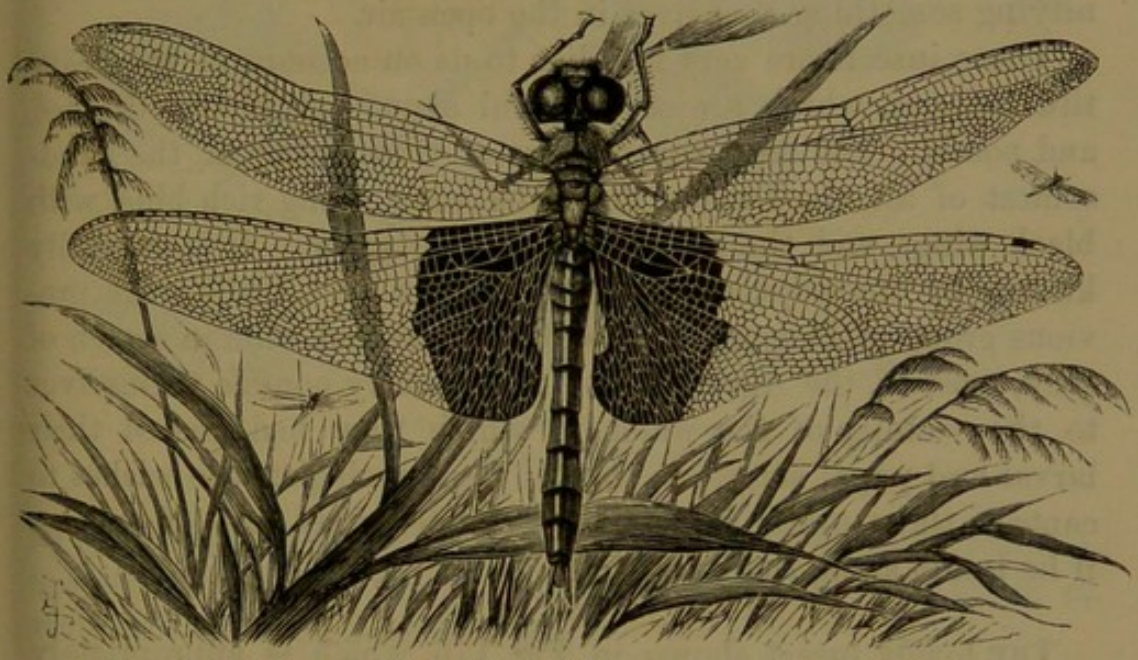


Fig. 175.—Libellula Carolina.
(Wings with brown patch at base.)

the insect visible wherever it may settle. Yet, to judge by our own species, these very characteristics aid the Dragon Fly in its temporary and rapid concealment. When engaged in the search for prey, the insect always manages to settle upon some object with which its wings will harmonize in colour and general outline, a bunch of leaves being a favourite resting-place. There it will sit with its legs all drawn together so as to be as little conspicuous as possible, and with its motionless wings so completely merged into the surrounding objects, that, when the insect suddenly dashes into the air, it seems to have started out of space into existence.

There is another peculiarity which is worthy of remark. The Dragon Flies prefer for their sport sunshiny days with frequent gusts of wind. The warm sunshine attracts into the open air the insects on which Dragon Flies feed, and the gusts of wind render them an easy prey to their pursuer. Many insects are almost helpless in the wind, especially if it should come on by fits and starts, while the firm, strong pinions of the Dragon Fly render it almost independent of wind, and give it a tremendous advantage over its weaker-winged prey.

We now come to the second group of Dragon Flies, namely, the Agrionidæ. This name is formed from a Greek word signifying something that lives in the open air.

These insects are very familiar to us on account of the beautiful species which are so plentiful about our brooks, ditches, and ponds. The most conspicuous of them is one of the handsomest of all the Dragon Flies, the male being rich blue, with black wings, and the female all shining green. It is generally known by the popular name of Demoiselle. Unlike the previous group of Dragon Flies, which fly far and wide in search of prey, most of the Agrionidæ of this country confine themselves to the vicinity of the water in which they had passed their larval and pupal stages, so that any entomologist who wishes to capture these pretty insects may feel tolerably sure of success if he hunts along the water-side.

The lovely insect shown in Fig. 176, which is appropriately called *Euphœa splendens*, is a native of India. The generic name *Euphœa* is composed of two Greek words signifying something that is beautiful in appearance, and the Latin specific name *splendens* explains itself.

At first sight, if viewed directly from above, the insect appears to be entirely brown, and requires a rather strong side-light to bring out all its beauties. When so viewed, the upper wings still retain their brown hue, but the lower pair flash out into vivid metallic green. The brilliancy of this colour is increased by the structure of the wing, the surface of which is formed into innumerable parallel ridges that break up the light, and give a singular richness of effect to the green hue. All the wings are transparent and colourless at their bases.

Several other species of this genus are remarkable for their beauty. There is, for example, *Euphœa tricolor*, of Borneo, in which the wings are crimson, blue, and green, according to the light in which they are viewed. Then, *Euphœa refulgens* is of

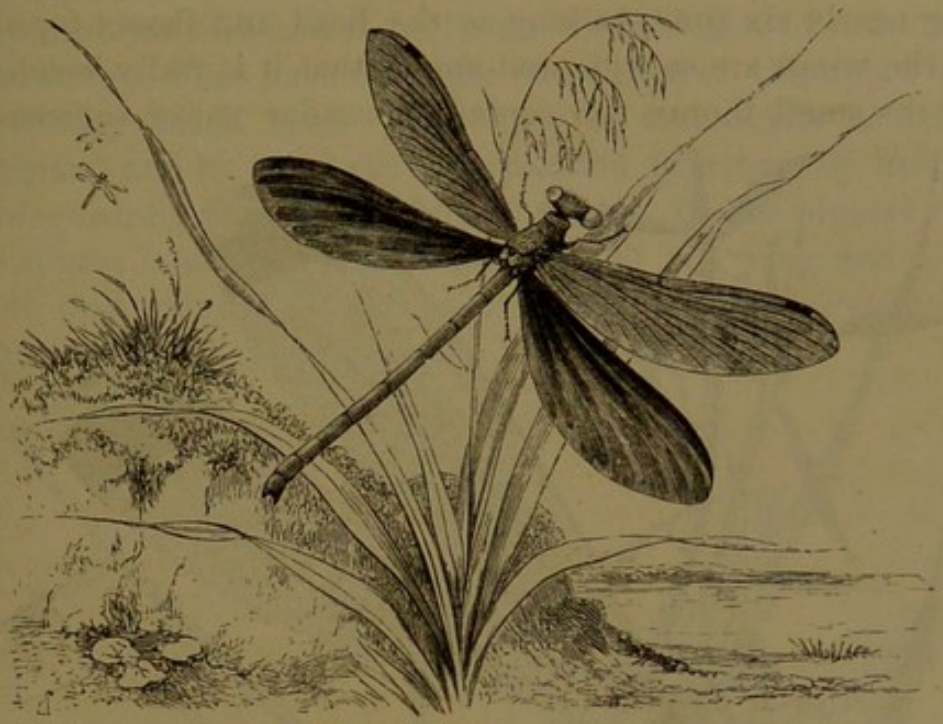


Fig. 176.—Euphœa splendens.
(Lower wings metallic green.)

equal though more delicate beauty, the wings being shining, opalescent, and looking exactly as if they had been made of very thin flakes of mother-of-pearl.

Both names of the insect whose portrait is given on the next page are very appropriate, though not altogether classical.

The generic name *Megaloprepus* is formed from two Greek words, the former signifying "greatness," and the latter "conspicuousness." As may be seen from the illustration, in which, for want of space, only one side of the insect is fully drawn, this is a very large creature, or rather it spreads over a very large space. No more material is used in its structure than in that of the Dragon Flies, which have been already described. But that material is so attenuated, both in length and width, that the insect which is formed from it is really a large and important one.

A more conspicuous insect can hardly be imagined. Its head

and thorax are of no great size, and if those portions of the body alone were seen, anyone would attribute them to a Dragon Fly of ordinary size, scarcely larger than our own blue and green Demoiselle.

But the abdomen is drawn out to such a wonderful length, being nearly six times as long as the head and thorax together, and the wings are so wide and ample, that it is really wonderful how the small thorax can contain muscular power sufficient to



FIG. 177.—Megaloprepus brevistigma.
(Dark brown patch on the wings.)

work these enormous wings, to sustain the leverage of the long abdomen, to control the powerful and tightly-clinging legs, and yet to afford sufficient space for the all-permeating air-vessels, the gullet—which is in constant requisition—and the great nerve-centres which supply all the body with sensation and motive power. No one who has not been in the habit of dissecting insects can appreciate even the mechanical difficulties

which are here overcome; and the best mechanician that the world has known must stand humbly amazed before such an astonishing application of mechanics to a mere insect.

The wings are translucent, with the exception of a broad waving band of dark brown near the tip. Perhaps the reader may have noticed, and if he be an entomologist he must know, that Dragon Flies have upon the outer edge of the upper wings an oblong black spot. This spot is technically called the "stigma," and by its shape and position is extremely useful in distinguishing one species from another. In the present insect the stigma is situated almost at the tip of the wing, and is very short, thus gaining for the species the name of *brevistigma*, or "short stigma." The insect is a native of Bogota.



FIG. 178.—Mecistogaster ornatus.
(Wings tinged with yellow at tips.)

THE insect whose portrait is here given was brought by Mr. Bates from Parà, on the Amazon River.

During life the general hue is yellow, and even after death the yellow stripes upon the thorax are plainly visible. The wings are coloured after a rather curious fashion. They are translucent for nearly two-thirds of their length, and then become gradually tinged with yellow. Across the tips runs a bold dark line, and the extreme tip of the wing beyond this dark line is opaque chrome yellow.

The specific name *ornatus*, or "ornamented," refers to the coloured wings, while the generic name *Mecistogaster* signifies a very long abdomen, and is given to the insect in allusion to the structure of that part of the body.

CHAPTER II.

MYRMELEONIDÆ, SIALIDÆ, MANTISIDÆ, AND TERMITIDÆ.

We now come to a family of insects which has many points of resemblance to the Dragon Flies, though those resemblances are rather apparent than real. This family comprises those insects which are popularly known as Ant Lions, and scientifically as Myrmeleonidæ, this word literally signifying "Ant Lion." None of these insects have been found alive in England.

Bearing some external resemblance to the Dragon Flies, these insects have, nevertheless, very many points in which they differ. In the first place they possess antennæ, which is not the case with the Dragon Flies, and in the next they pass their larval and pupal state on land, breathing atmospheric air by means of tracheæ or air-tubes, whereas the Dragon Flies undergo those changes in the water, and breathe by means of gills.

In habits the perfect insect differs greatly from the Dragon Flies. As everyone knows, the Dragon Flies are essentially creatures of the day, exulting in the sunshine, and always making their appearance in the bright summer weather. The Ant Lions, on the contrary, are creatures of the dusk, scarcely ever being seen on the wing by day, and resting during the hours of light among the thickest foliage, where their sombre colouring renders them perfectly secure from detection.

The chief interest of these insects lies in their larval state, and it is in this stage of development only that the name of Ant Lion is rightly applicable to the creature. On Plate VII. Fig. 4 is a figure of one of these remarkable larvæ. It is flat, wide-bodied, and is very sluggish in its movements, the slender legs only serving to push it slowly backwards. Indeed, M. Réaumur found that if the legs were cut off, the larva could move nearly as fast as when it possessed all its limbs, the rings of the abdomen forming the chief motive power.

Were the creature a vegetable feeder, such an inability to move would not interfere with its capability of obtaining nourishment, for many well-known larvæ, especially the mud-feeders, have no locomotive power, nor do they require it, their food being at their mouths. The Ant Lion larva, however, is carnivorous and predacious, feeding entirely upon living insects, and unless we knew its habits, we should not be able to understand how it could obtain its food. Its mode of life, however, has been so completely investigated by M. Réaumur and other observers, that its peculiar structure is seen to be exactly what is required for the capture of living and active insects. In fact, Réaumur has done for the Ant Lion larva exactly what Waterton did for the sloth, and has shown that so far from being a bungled performance of Nature, as some foolish persons designated it, the whole of its structure is admirably adapted to its peculiar position in the world.

Being, as has been said, incapable of movement, except backwards, and then very slowly, it is evident that the creature cannot catch its prey by running after it, but must wait for insects to come within its reach. Now, there are few square inches of ground over which many insects do not run in the course of the day, so that the problem is not the bringing of the insects to the vicinity of the Ant Lion, but of rendering them incapable of escaping from it. This problem is solved in the following manner :—

Choosing some portion of ground that is covered with fine dry sand, the Ant Lion begins to push itself backwards in a circular direction, so as to make a shallow furrow. By means of making a succession of these furrows, or rather by excavating one spiral furrow, and throwing out the sand with its broad head, the larva makes a conical pit of no great depth, but with very loose sides. When this pit is finished, the Ant Lion buries itself in the sand at the bottom, leaving nothing but its enormous jaws exposed. Should a luckless insect approach the edge of the pit, the loose sand gives way, and down goes the insect with a small avalanche of sand, into the very jaws of the expectant Ant Lion.

The jaws are very curiously constructed. The reader is probably aware that in insects there are two sets of jaws, the outer being called "mandibles," and the inner "maxillæ."

These can be very well seen in any of our large beetles, especially the Tiger or the Ground Beetles. In the Ant Lion larva the mandibles are sickle-shaped, and rather deeply grooved on the inner edge. Within this groove the maxillæ play, so that when an insect is seized with the mandibles, the maxillæ set to work at extracting its juices. A short time generally suffices to suck an insect as dry as a squeezed orange, and when this is done, the emptied carcase is flung out of the pit by a jerk of the head, and the interior of the pitfall having been cleared of the falling sand in a similar manner, the trap is ready-set for more victims.

It has been said that if an insect should elude the murderous jaws and try to escape by scrambling up the sides of the pit, the Ant Lion brings it down again by throwing showers of sand on it. This I believe to be somewhat of an exaggeration, as it is not likely that the larva would be able to fling the sand with any definite aim. I am rather inclined to think that as the captive insect, in its attempts to escape, must cause some of the sand to fall into the pit, the Ant Lion instinctively flings it out, so that some of it may accidentally fall on the insect, and in that case would certainly bring it within reach of the jaws.

Mr. Westwood remarks that the Ant Lion larva is capable of existing without food for a long time, one of his specimens having lived for six months without any nourishment whatever. This is to be expected, as the supply of nourishment must necessarily be very precarious; so that on a fine, still, hot day, for example, a considerable number of insects may fall into the pit, while, during a succession of wet or windy days, not one insect will come out of their hiding-places.

The following account of a West Indian species of Ant Lion is taken from Mr. Gosse's "Naturalist's Sojourn in Jamaica:"—

"One of the old buildings, now fast going to decay, on Bluefields Estate, was, in the time of sugar cultivation, the mill-house. The wheel was turned by water power—a stream from the upper part of the rivulet having been led through a long aqueduct into the mill, and passing off through a deep and narrow trench to the lower course of the river. Through this winding trench, cut to a depth of fifteen or twenty feet, but not more than a yard wide, and now so entirely choked up and overgrown with rank vegetation as to be quite dark, access is with some difficulty

obtained to the basal floor of the mill, which is covered with a layer of impalpable sand—the residuum, no doubt, of the water that shot upon it when the wheel was in operation. The flooring planks of the upper level have been removed, leaving only the rafters; and the walls of the mill consist now of scarcely more than the posts and beams, so that sufficient light descends to the lower level notwithstanding its depth.

"Here I found many little conical pits in the fine sand, which upon examination proved to be the traps formed by the grubs of a species of Ant Lion (*Myrmeleon*) and inhabited by them. The appearance of the crafty insect, its motionless vigilance at the bottom of its den, the curved tubular jaws expanded to their utmost stretch, and the broad body concealed in the sand; the alertness displayed when an unfortunate ant slipped over the edge, the struggles of the prey to escape, the reiterated showers of sand vigorously cast up from the head of the expectant Giant Grim, and falling on the miserable victim; and the slow but sure sliding down of the latter, until the formidable jaws closed upon it—I observed with intense pleasure, not only for the interest attached to so curious an example of insect cunning, but also for that of repeating observations long ago made in a distant part of the world, and, no doubt, on another species. The manners of these Jamaican Ant Lions agreed minutely with those of the *Myrmeleon formicarius* of the South of France, as recorded by the accurate Réaumur.

"The singularity of the spot chosen in this case for the exhibition of the stratagem strikes one at first sight: but, on reflection, we perceive that this very circumstance is but a further display of unerring instinct; for the frail pits on which the insect's success depends would be filled up and effaced by a breath of wind, spoiled by a shower of rain, and destroyed, with their ingenious architects, by a passing footstep of man or beast. The depth of this locality was a protection against the first contingency, its inaccessibility precluded the last, while rain was kept off by the remaining roof of the building!

"How inexhaustible are the resources of Divine wisdom, when the outgoings of it in the meanest insects are so wonderful!

"I took two or three of the grubs into the house, and put them into a small box partially filled with sand, hoping to witness the construction of the pitfall. They soon began to

work, proceeding backward, and shovelling the sand exactly as described, but only in irregular lines, leaving one after it had proceeded for some distance, and beginning another; so that they did not make even one complete circle. I was called to a distance, however, and the insects were thrown away. The species was probably *M. Leachii*, of which I have taken a single specimen near Bluefields—the only one I ever met with in a perfect state.

"This rarity of the imago, contrasting with the abundance of the larva, of this insect, has been noticed by Guilding in St. Vincent's. He observes that not a single perfect insect had been found by him in a state of liberty, though the larvæ swarm under every rock or shed calculated to protect their pitfalls from the rain and wind."

In this genus the antennæ are extremely fine and are knobbed at their tips, so as to bear a close resemblance to the antennæ of butterflies. When the insect is at rest it assumes a very singular attitude, depressing the wings and elevating the abdomen at a considerable angle, so as to harmonize in outline with the twigs among which it sits.

When the Ant Lion larva is full-fed, it encloses itself in a beautifully made cocoon formed from sand-grains fastened to each other with fine silken threads. The walls of the cocoon are very slight, and the interior is lined with silk. Considering the size of the perfect insect, the length of its abdomen, and the wide spread of its wings, the dimensions of the cocoon are very small, the diameter rarely exceeding half an inch. As, however, is the case with insects in general, the wings are not expanded until they have been exposed to the open air; they are easily contained in the diminutive cocoon.

Still, though we can thus account for the wings, we cannot for the dimensions of the body, which is about an inch and a half in length when the insect is fully developed. The wonder is not decreased if the cocoon be opened, for the enclosed pupa will be then seen to be very small, scarcely half an inch in length, the legs and immature wings folded on the breast. In order to understand the manner in which this curious problem is solved, we must watch the creature as it escapes from the cocoon.

The pupa is furnished with a pair of broad, short, stout, saw-edged mandibles, not the least like the sickle-shaped jaws of the

larva, or the tooth-like jaws of the perfect insect. With these weapons it gnaws a hole in the side of the cocoon, and shortly afterwards the pupal skin splits along the back. The insect then forces itself through the aperture, leaving the cast skin inside the cocoon; and as soon as it has fully extricated itself, the soft abdomen rapidly extends to some three times its former length, after which the skin becomes hardened, and the abdomen is as straight and firm as that of a dragon fly.

From this brief account the reader will observe that we have in the Ant Lion pupa the curious phenomenon of a pair of extremely powerful jaws, made simply for the purpose of gnawing through the sand-wall of the cocoon, and being used once and once only in the creature's life, and then cast aside.

THE central figure on Plate VII. represents a very fine insect, called *Palpares Caffer*, which, as its specific name denotes, is a native of Southern Africa.

This is a very variable insect in point of colour, and I will therefore describe only the specimen from which the illustration was drawn. The general colour is pale brown, but on either side of the front edge of the thorax there is a patch of bright yellow, and the abdomen has a ring of the same colour on the lower edge of each segment. On the upper part of the abdomen are a number of long, fine hairs, pale brown in colour, and all pointing backwards.

Both pairs of wings are spotted and blotched with brown, but the lower pair have the spots much larger, and more decided in outline, and darker than the upper wings; and in all specimens the large spots are three in number. Over the rest of the wing a number of smaller and paler spots are placed somewhat at random, and in some specimens the upper wings have a decided golden yellow tinge.

There are many species of this genus, found in different parts of the world. They all have a very strong family likeness; and as they are exceedingly variable in the shape, number, and colour of the spots which variegate the wings, it is no easy business to discriminate between the species. Two species, however, call for a brief notice. One of them is *Palpares immensus*, also a South African insect, being found in Damara Land. Its upper wings are most beautifully pencilled with a delicate zigzag

pattern of black on a ground of shining white slightly tinged with yellow. *Palpares tigroides*, of India, is a very fine insect, one of the largest of the family, and having the wings adorned with a number of pale brown stripes, from which it derives its specific name of *tigroides*, or "tiger-like."

In this genus there are some very extraordinary insects. Such, for example, is *Ascalaphus imperatrix*, of Western Africa, which is shown in the accompanying illustration.

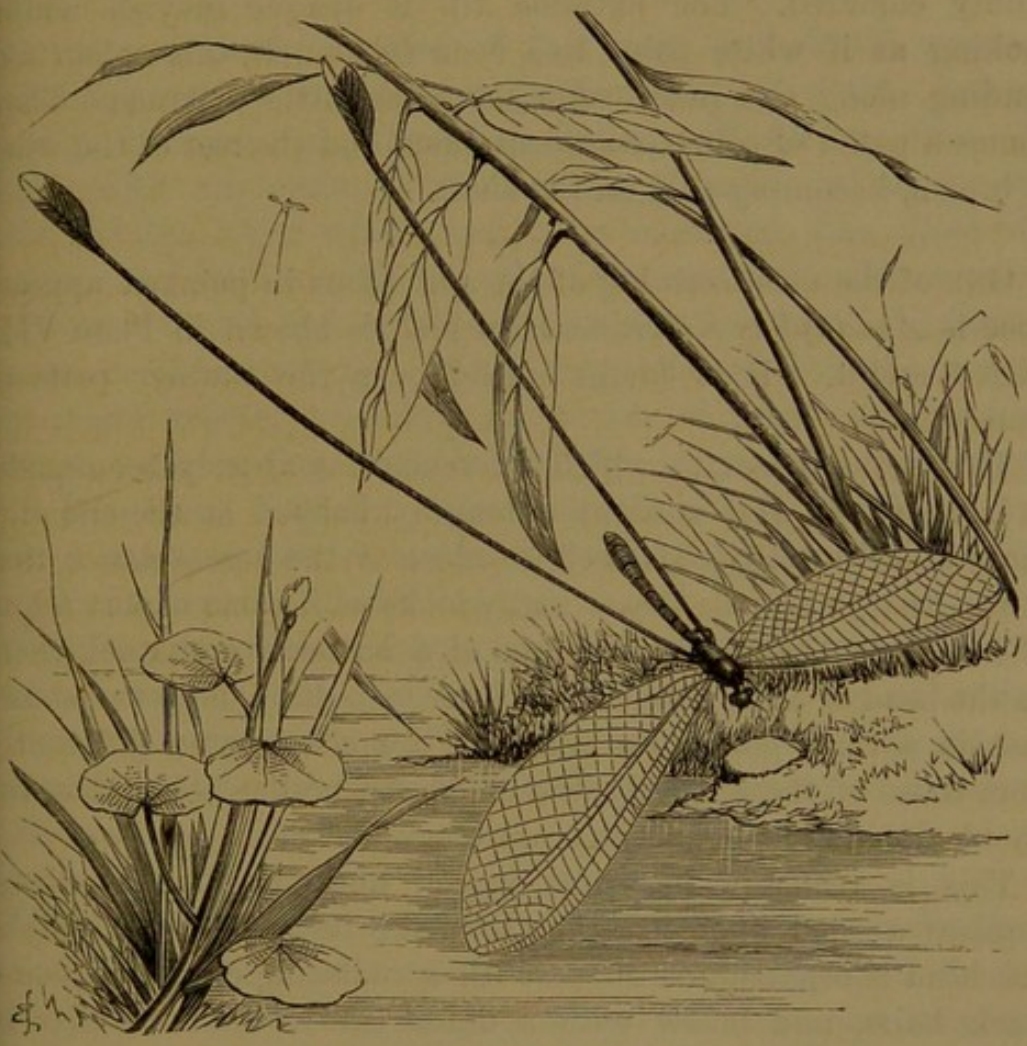


Fig. 179.—Ascalaphus imperatrix.
(Wings iridescent.)

The greater part of the bulk of this insect consists of the wings. The male, which is here portrayed, is scarcely larger in body than our common Daddy Longlegs, and not much unlike that insect in shape. The upper wings are very beautiful. They are translucent, but iridescent in the highest degree, glittering with every colour of the rainbow as the light plays over them.

This iridescence is specially brilliant along the outer edge of the wing, where a golden hue mixed with crimson seems to predominate over the other colours.

The chief peculiarity of the insect, however, lies in the lower wings, which are elongated like two spears with slender shafts and broad heads. If examined with a magnifying-glass, the general character of the wing is seen to exist even in the very narrowest portion of the shaft, the nervures and cells being plainly apparent. The widened tips of the wings are rather boldly coloured. The extreme tip is opaque greyish white, looking as if white paint had been laid on it, this colour extending along the inner edge for some little distance. Then comes a patch of colourless membranes, and the rest of the wing is brown, becoming pale on the shaft.

One of the most striking of the Ant Lions in point of appearance is *Ascalaphus Kolyranensis*, which is shown in Plate VII., Figs. 3 and 4. It is found spread over the warmer parts of Europe.

This is the insect to which reference has already been made, as having long and straight antennæ, knobbed at the end like those of a butterfly. Indeed, so close is the resemblance, that at the first glance the insect really looks as if some expert forger of insects had taken the antennæ of a butterfly and stuck them on the head of an Ant Lion. A closer inspection, however, shows that in several points the antennæ are constructed differently from those of the butterfly, the chief distinction being that the knobbed ends of the antennæ are black and flat.

This is really a beautiful insect, and, like many others, requires a good light in order to make its splendours visible. The head is ornamented above with a radiating circlet of dense black hairs, and below with a dense tuft of hairs similar in length and quality, but bright golden yellow, and having a silken lustre. The thorax and abdomen are of a very deep purple, so deep as to look black unless viewed by a strong light.

The upper wings are mostly translucent, but are adorned with varied colours. At the base there is a black spot, and then comes a large patch of bright yellow. Beyond this is a square mark of very dark brown, and on the upper edge of the wing is another, but smaller, patch of pale brown. The lower wings are

more beautiful than the upper pair, as is often the case with insects. The base of the wing is deep shining purple, followed by a broad wavy band of yellow. The rest of the wing is pale brown, except a nearly circular spot of yellow near the tip. If the wings be viewed on the under surface, they will be seen to be very glossy and iridescent, with a decided purple gloss extending over the whole wing. There is some variation in the size and shape of the spots, but the general appearance is the same in all specimens.

THERE are many species of this very remarkable genus, extending over a considerable portion of the world; being found in Europe, Asia, the West Indies, and Africa. One of them, called appropriately *Ascalaphus filipennis*, a native of India, has the lower wings even more narrowed than those of the preceding species. The wings, in fact, are reduced to a pair of delicate thread-like appendages, which have not the least appearance of being wings. Were they removed from the insect they might readily be taken for a pair of long and slender antennæ, and, as they trail behind the body, they look very much like legs. Indeed, as the insect is a very small one, it bears a most curious resemblance to a gnat, the thread-like wings imitating the hinder legs.

Why the name of Ascalaphus was given to this genus of insects I cannot imagine. It is a name which was given by Aristotle in his "History of Animals" to some bird which is thought to be an owl, and is therefore singularly inappropriate as a name for an insect.

WE now come to another family of Neuroptera; namely, the Sialidæ. We have several species of Sialidæ inhabiting England. They always frequent the neighbourhood of water, and may be seen in numbers clinging to the trees or foliage near the water-side. They are brown in colour, and are generally mistaken for moths by non-entomologists. Anglers always welcome them, as the fat-bodied female Sialis forms an excellent bait for various fish, the trout being specially fond of them.

If placed in the water, these insects swim wonderfully well, closing their wings and scuttling along at a great pace, leaving quite a long wake behind them. In my boyish days, moth-

races, as we called them, used to be a recognised amusement during the short time that the Sialis was visible. It is true that the race was often spoiled by the intervention of a fish, who would quietly rise to the surface of the water and absorb one of the competitors; but this was looked upon as a recognised part of the amusement.

None of the English Sialidæ are of any great size, and we have nothing that even approaches the gigantic insect which is



Fig. 180.—Corydalis armata.
(Pale brown.)

called *Corydalis armata*, the largest species at present known to entomologists. It is a native of Columbia. The specimen which is here shown is a male, and in this sex the principal feature is the structure of the jaws. The mandibles of the male Corydalis are so long, sharp, powerful, and sickle-shaped, that they look as if the creature were an Ant Lion, and had retained its larval jaws. As may be seen by reference to the illustration,

when the jaws are expanded they look very much like a second pair of antennæ, and when they are closed they cross each other at about one-third of their length from the tips. In the specimens which I have examined, the left jaw is uppermost when they are closed and crossed. In the female the jaws are short and stout, and there is as much difference in this respect between the sexes as there is between the male and female Stag Beetle.

All the Sialidæ pass their earlier stages of existence in the water. The female lays her eggs upon aquatic plants, and the larva is a brown, flattish, long-bodied, strong-jawed grub, with a number of filamentary gills along the sides, and swimming with an undulatory motion. It is very plentiful, and it is easy to take some thirty or forty specimens in a single sweep of the net among the weeds.

Of the curious family of Mantispidæ no British species are as yet known. We have the well-known Snake Flies, or Raphi-



Fig. 181.—Mantispa grandis.
(Brown.)

diidæ, which bear some resemblance to the Mantispidæ, especially in the prehensile form of the first pair of legs. As may be inferred from the name, the Mantispidæ bear a close resemblance

to the Mantidæ, and indeed there are several of the smaller Mantidæ which so exactly resemble the Mantispidæ, that none but a practical entomologist would detect the difference between them.

That they are predacious is clearly shown by the structure of the mouth and the fore-legs. They are found mostly on trees, the oak being a special favourite. Although none of this family inhabit England, the Mantispidæ have a very wide range, being found in almost every portion of the world, and certainly in all the continents. They are all dull-coloured, and rather small insects, that which is above given being a giant among its fellows. It is pale brown in colour, and the wings are translucent, with the exception of a broad band along the upper edge, which is dark brownish yellow. The raptorial legs are very boldly developed, and the others are long and slender. It is a native of South Africa, and is taken in the Natal district.

Now comes that most important family of Neuroptera the Termitidæ; popularly, though wrongly, called White Ants. There are many species of Termes, but all are very much alike in their habits. I have therefore selected one species, *Termes dirus*, or the Common White Ant, to serve as an example of them all.

These insects are spread over most of the warmer parts of the world, and are useful or the reverse according to the amount of population. In uninhabited districts the White Ants are valuable beyond price, as, together with the wood-boring beetles, they aid greatly in developing the forest-growths. Though they can feed upon many substances, they are essentially eaters of dead wood, and their powers in this respect are almost incredible. Hating light, they always begin their work by boring a hole into the object which they are about to attack, and then devour the whole of the interior. They never break through the exterior, but leave a shell scarcely thicker than ordinary paper, so that nothing on the exterior indicates the vacuum within.

When they get into a house, and attack the woodwork, this habit of theirs is more than unpleasant, as no one knows whether the wood be sound and solid, or hollow and rotten, from one day's end to another. It may look sound enough, but if struck or pressed the thin shell gives way, and the havoc

within is disclosed. In the British Museum is an example of the ravages of the Termites, which is so remarkable that it is here given to the reader. The piece of timber in question formed the lintel of a door in the Government offices at Jamestown.

It was originally a large square beam, but the Termites made their way into it, and reduced it to the singular condition which is here shown. The manner in which the insects have set to work is very curious. After boring a hole into the beam, they began to eat the softer portions of the wood, avoiding for the present all the knots, so as to leave them projecting exactly as they grew in the tree. Having done this, they had begun to destroy the knots themselves, by boring tunnels into them, so that there is scarcely a knot without one or two holes in it. When they had proceeded thus far, the mischief was discovered and the damaged lintel removed and sent to England, as an example of the havoc which Termites can work.

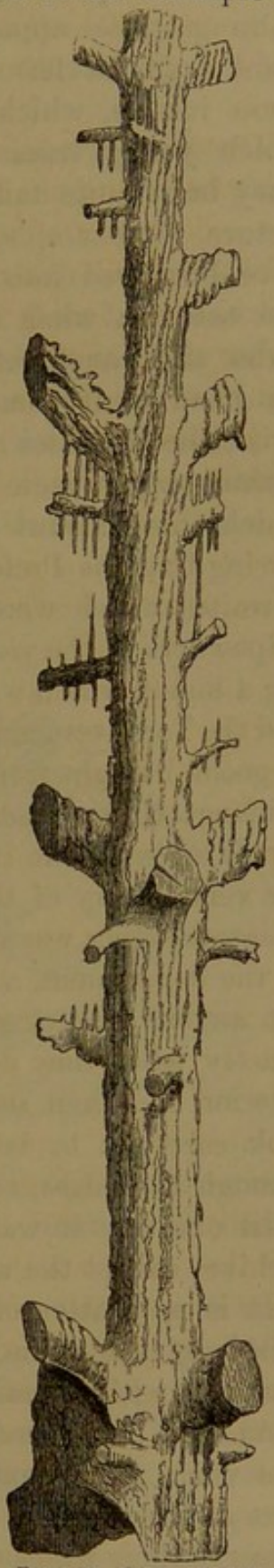


FIG. 182.—Lintel of Door, eaten by Termites.

Even furniture is not safe, especially if it be left undisturbed for a few days. Suppose, for example, that these insects have found their way into a house, and a table has been negligently left without having its feet placed in saucers of water. The Termites will begin by boring a hole through the planking of the floor, and into the leg of the table. They will then hollow out that table so completely, that if a weight be placed upon it there is a crash and a smash, and nothing remains of the table but a heap of splinters and a cloud of dust.

Several species of Termites exist in

the warmer parts of Europe, and at La Rochelle they have quite got the upper hand of the inhabitants. Not even a plank can be left for two days without being riddled by these insects, which attack the wooden fences, the stakes to which young trees are tied, and even the trees themselves. They have quite taken possession of the houses. In the Prefecture, for example, they have done terrible mischief. They have burrowed into the woodwork to such an extent that on one occasion when a clerk stumbled as he was going down stairs, and caught at one of the oak posts of the balustrades, his hand went completely into it and was buried up to the wrist, the Termites having eaten out all the interior, and left nothing but a mere shell scarcely thicker than the paper on which this account is printed. There is every reason for believing that the Prefecture was the original head-quarters of the Termites which were brought from St. Domingo by some rich shipowners in the year 1780. Some men were engaged in building a house, which was afterwards converted into the Prefecture, and the Termites gained admission by having got into some bales of goods brought from St. Domingo. But, great as is the inconvenience thus caused by these insects, it is as nothing when compared with the irreparable damage which they have done to the very history of the place. They contrived to reach in their silent, darkling ways, the office in which were kept the archives of the department, and every single paper was destroyed without anyone knowing it. They did with the bundles of paper exactly what they do with timber. They first bored into the interior, and then set to work to eat all the paper. But they took care not to bore through the upper sheets, nor to cut through the edges, so no indication of the mischief was given until one day it was discovered that nothing was left of the archives except the upper sheets and the edges of the leaves.

It is no matter of surprise that the Termites are popularly called by the name of ants, for they really do possess many analogies with the ants, and have many habits in common with them. In both insects only the perfect males and females possess wings; the neuters, or undeveloped insects, never having even a semblance of wings. Then, even those which are winged preserve their wings on a very frail tenure, only use them for a short time, and of their own accord pull them off after they have

achieved the one brief flight of their lives. They live in large communities, of which a single female is the centre, and are accustomed to act in concert, according to certain signs which they all understand.

Our limited space will not permit more than a mere outline of Termite history, but the following are the most salient points to be observed in their economy:—

When the perfect insects have matured their wings, they issue into the open air for the first time in their lives, and take to flight in such multitudes that the numbers of their milky-white wings have been compared to flakes of snow during a heavy storm. Myriads upon myriads perish, so numerous are the enemies that are in wait for them and the dangers through which they have to pass. The insect-eating birds hold high revel on them, and man himself is one of the most inveterate destroyers of the Termite, not because they do him mischief, but because they are so good to eat. Not only do the aborigines eat the Termites, but travellers or colonists who have once persuaded themselves to try them as an article of diet are sure to reckon these insects among the best luxuries of the table.



Fig. 183.—Termes dirus. Male. (Pale brown.)

Putting aside those which perish, we will follow the career of a couple who have managed to evade their enemies and become the founders of a new colony.

When they issue into the air, they are ant-like, pale brown insects, with two pairs of very large wings, which, when closed, cross each other over the abdomen. The above illustration represents the male of the common Termite, *Termes dirus*, and the female is almost exactly like him, except that she is rather larger and plumper in the body. Supposing a pair of these insects to have met while they are on the wing, which is the object of these aërial excursions, they descend to the ground,

when they both fling off their wings, jerking them forward with a javelin-sort of twitching movement. Then they move off to some sheltered locality; and if they can find a spot where there is some moist earth, they immediately begin to burrow in it.

Thus is begun the new colony, and in a short time the foundress attains the most enormous dimensions. Her head, thorax, and legs remain unchanged, but the abdomen swells to such a size that the creature looks very much as if the head and limbs of a Termite had been attached to the end of a hen's egg. So large an insect requires a dwelling of corresponding size, and accordingly she is enclosed in a cell made of clay, the interior of

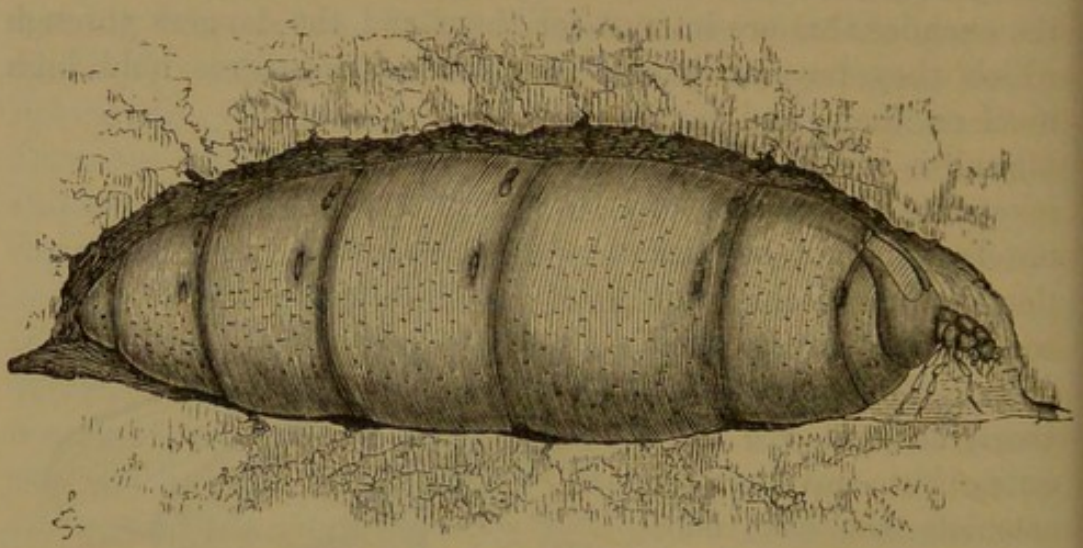


Fig. 184.—Termes dirus. Female.
(Pale brown, with grey-white abdomen.)

which is widened by degrees in order to accommodate her increasing dimensions. It may seem somewhat of a hardship that she should be thus left a prisoner, but in fact there is no hardship at all, for her body is so enormous that her legs could not move it even if she were at perfect liberty.

She, like the queen-bee, has but one business in life; namely, to lay eggs, which she does perpetually, their numbers being counted not only by tens of thousands, but by millions. It is evident that, as she cannot move, she is unable to do what the queen-bee does; namely, deposit the eggs in the spots where they are wanted. It is also evident that she cannot go in search of food, and must therefore be dependent on others. Now, the Termite colony consists of various ranks, if one may so term

them, which may be roughly divided into three distinct sets. First come the queen and her consort, and all those which are destined to become perfect males and females. Then comes a body of Termites with enormous heads, armed with strong and sickle-like jaws. Lastly come the workers; very much smaller and slighter insects, without any weapons of offence. I need hardly say that, as the Termites belong to the Neuropterous insects, none of them have a sting.

As is implied by the name, the chief labour of the colony is carried on by the workers, who outnumber the others many times over. It is the workers who feed the queen, and also carry off the eggs as fast as they are laid, so as to deposit them in spots fit for hatching them. In order to enable them to gain access to the queen, the royal cell is pierced all round with a number of holes, which look exactly as if they had been bored with a bradawl; and, if a section of the nest be carefully made, each of these holes will be seen to communicate directly with the central hollow.

Thus the queen is not only tended, but guarded with the care which her office demands: for the whole of the nest, of whatever form it may be, is made of carefully-tempered clay, which when dry is nearly as hard as stone, and in the very depths of that nest, the royal cell, in itself a strong fort, is situated. So important indeed is the queen, that if a Termite colony should prove so noxious that it must be destroyed, an experienced Termite-killer does not in the least trouble himself to destroy in detail the vast army of workers and soldiers. It would, indeed, be of little use to do so, for the queen lays such vast numbers of eggs that even if some twenty or thirty thousand Termites were killed, the loss would soon be made good. Knowing the habits of the insects, the Termite-hunter breaks into the nest, searches for the royal cell, and carries it off. From that moment the life of the community begins to flag, and in a short time the nest, with its multitudinous ramifications, becomes deserted, just as does a hive from which the actual and possible queens are taken.

Now for the third kind of Termite; namely, the Soldier. One of these soldiers is represented in the illustration on page 382. The soldiers take on themselves the defence of the nest and the direction of the workers. If a breach be made in the nest, out

rushes a body of soldiers, with widely-opened jaws, all eager to attack the foe, and absolutely incapable of fear. Then other soldiers muster long lines of labourers, each carrying a piece of clay, and in a wonderfully short time the breach is repaired. It is very strange that both the workers and soldiers should be absolutely without eyes, and yet able to construct the complicated edifices for which they are so celebrated. Still, such is the case—blind soldiers directing the blind workers by some system of signalling which we cannot understand. In proportion to the labourers the soldiers are very few in number, scarcely more than 1 per cent.

In my collection are some of the specimens from which the illustrations were drawn. The enormous head is brown-black, hard, horny, and not with the strongest light and the best glass can the least indication of eyes be seen upon any part of the head. The large and powerful jaws are shining black, and, in order to allow of free movement, are set in a very deep transverse groove in front of the head.

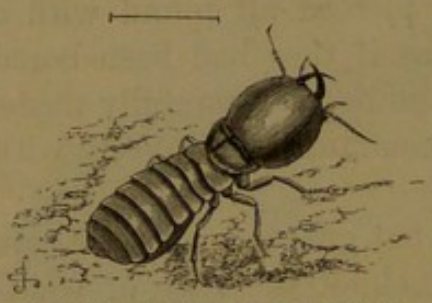


Fig. 185.—Termes dirus Soldier. (Pale brown.)

The power of these jaws is manifest, even in a dead and dry specimen, by viewing it on the under-side. Along the centre there is a narrow horny ridge, which contains the muscles for moving the secondary pair of jaws, or maxillæ. But, on either side of the ridge, the head swells out into two pear-shaped lobes, each of them nearly as large as the thorax and abdomen together. These lobes contain and give support to the muscles which move the mandibles, or first pair of jaws, whose size and power can be far better seen on the under than on the upper surface, where a considerable portion of the base is hidden by the projecting front of the head. Compared with the enormous head, the legs are quite slender and feeble, and the abdomen, even in a fresh state, is comparatively insignificant.

HYMENOPTERA.

HYMENOPTERA.

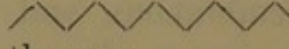
CHAPTER I.

SAW FLIES.

This order of insects is easily known by the structure of the wings. These organs are four in number, membranous, and without either scales or hairs. The second pair are always smaller than the first, and have not nearly so many veins. During flight these two pairs of wings are connected together by a series of little hooks, so that they practically form one single pair. The mouth is furnished with horny jaws, and the females possess an ovipositor, which either takes the form of a saw-like instrument, as in the Saw Flies, or a sting, as in the bees, wasps, and ichneumon flies. In some cases, as in the ants, the wings are not present in all the individuals, and the reader will remember that the same is the case with the Termites, which have just been described.

Their number is absolutely enormous, and even in our own country from three to four thousand species of Hymenoptera are known. In this land they do not attain any great size, our largest Hymenopterous insect being the well-known Humble Bee, but in various parts of the world some species grow to a considerable size, as we shall presently see.

We begin our account of the Hymenoptera with the Saw Flies, so called from the curious structure of the ovipositor. This organ is intended for the deposition of eggs in slits which are cut in the bark or the leaf-stems of various trees and plants, and is made in a very beautiful manner. There are scarcely any two genera of Saw Flies in which the ovipositor is made in exactly the same manner, so we must content ourselves with a general description.

At the end of the abdomen, and on the under side, is a pair of horny plates, each edged with teeth like those of a saw. The plates curve slightly upwards, and each slides backwards and forwards in a groove sunk in another horny plate, which thus serves both as a support and a guide. As the saw has to be employed in cutting green wood, it cannot be made simply by a flat plate edged with teeth, like the saws with which dry timber is cut. Each saw is rather thick, and the teeth are arranged very much like those on the back of a sapper's sword. On a closer examination with the microscope the teeth are seen to be further elaborated, each separate tooth being a conical cutting instrument with some eight or ten sharp edges. And in order to secure a wide groove, or "kerf" as carpenters call it, the edges of the saws are furnished with a sharp zigzag projection, something resembling a knife-blade that has been folded in this form,  , and fixed with its back against the side of the saw.

When used the saws are worked alternately, so that a wide groove is cut in a very short time. Having thus performed the office of the saw, they then assume that of the ovipositor, the blades diverging so as to permit the passage of an egg, which is then placed in the groove. A small drop of some irritant fluid follows the egg, and causes the edges of the groove to swell, and so enclose the egg firmly between them. Here it is kept until the time for hatching, when the young grub crawls out, and betakes itself to the leaves for its subsistence. In our own country these insects are often very injurious, the worst of them all being the dreaded Turnip Fly (*Athalia centifoliæ*), whose grey-black grubs are so well known under the name of Niggers.

We will take a few specimens of these curious insects, and mention a few of their peculiarities as we proceed. The species which is shown on the next page is found in the neighbourhood of Hudson's Bay, and derives its specific name from the shape of the clypeus, which is triangular in the male sex. The head is black and shining, and the thorax and base of the abdomen are also black, but covered with short grey hairs. The rest of the abdomen is dark chestnut with a yellowish tinge. The thighs are black, and the rest of the legs yellow, and the wings are all yellow and glossy.

This is a very large genus, and in the British Museum are a

vast number of species, one of the most remarkable of which is *Cimbex variabilis*, also found near Hudson's Bay. This insect is so exceedingly variable that its definition as a species must have been most difficult. Some specimens are black, with the abdomen white, except a black stripe along the centre. Others are coloured after the same fashion, excepting that mahogany brown takes the place of the black. Others are almost wholly white, while some are black, with white or yellow stripes along the sides.

The larvæ belonging to this genus have twenty-two feet; namely, six on the thorax, fourteen on the abdomen, and two on the last segment. When touched they have the power of



FIG. 186.—Cimbex triangulum.
(Black, last portion of the abdomen chestnut.)

spurting from little holes along their sides a greenish fluid, probably acting as a defence against enemies. Some allied species have this secretion so abundant and so viscid that it perpetually exudes, and when the creature is at rest makes it look just like a lump of slime.

These larvæ are found on the upper surface of the leaves. When they have finished feeding, they spin an oval cocoon of very tough and parchment-like material, in which they pass through the pupal stage. This stage is a very brief one, but that of the larva is very long, the creature retaining its larval form for a considerable period after it has completed the cocoon.

As is the case with many insects, there is a considerable distinction in the antennæ of the two sexes in the genus of which an example is given on the next page. It is a native of

Australia, and is a very beautiful insect. The head, thorax, and upper part of the abdomen are shining blue, like the surface of a watch-spring; and the middle of the body, the scutellum, and a small patch on either side in front of the wings, are bright, shining yellow. In the male insect the antennæ take the beautiful form which is here shown. There are about twenty joints, and each joint is furnished with an appendage, longest in the middle of the antennæ, and shortening gradually towards the tip. As the light shifts about, the shadows play backwards and forwards along the antennæ in a very beautiful manner. A very similar structure of the antennæ is seen in the Rhipidocera, which has been described on page 168. This beautiful structure exists only in the male, the antennæ of the female being quite simple and thread-like.



Fig. 187.—Pterygophorus interruptus. (Shining blue and yellow.)

One species, *Pterygophorus cyaneus*, is all blue, just like a blue-bottle fly.

The insect which is here drawn is new to science, and is one



Fig. 188.—Tenthredo coccinocerus. (New species.) (Green and blue.)

of a great number of unnamed species of Tenthredo now in the British Museum. It is a native of Darjeeling, in India.

This is a really splendid insect. The head and thorax are metallic green, just like green foil, and the abdomen is burnished blue, glossed with green. The legs are of the same colour as the abdomen, and the antennæ are purple, for which reason I have given it the specific name of *coccinocerus*, or "purple-horn." The wings are brownish, but glossed with green.

Our last example of the Saw Flies is the *Derecyrta pictipennis*. The example which is here drawn is in the British Museum, and was brought from Ega, in the Amazons, by Mr. Bates.

It is a pretty though not a splendid insect, and derives its beauty quite as much from the wings as from the body. The head is shining and black, looking very much like a little black

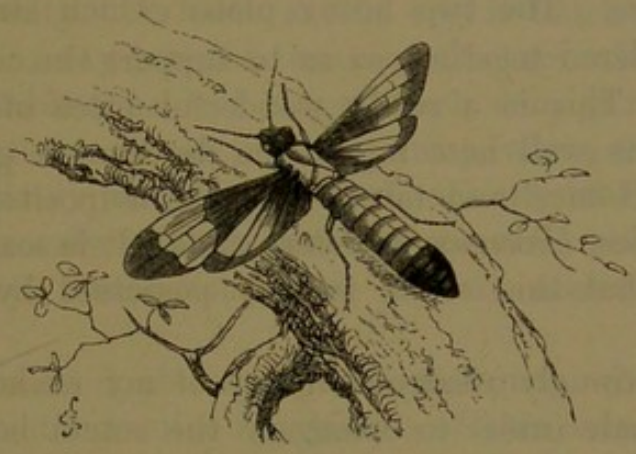


Fig. 189.—Derecyrta pictipennis.
(Yellow and brown.)

glass bead. The thorax is yellow, and so is the abdomen, with the exception of a black tip. The wings are mostly brown, but there is a broad yellow patch across the centre, and another, of a similar colour, near the base. The lower wings are coloured in a very similar manner, except that they are more translucent than the upper pair.

Another group now comes before us, namely, the Uroceridæ. This word literally signifies "horn-tailed," and is given to the insects because the ovipositor projects from the end of the abdomen like a short stout horn. At first sight no organs appear to be more unlike each other than the ovipositor of the Uroceridæ and that of the Saw Flies. A careful examination,

however, shows that not only are they identical in their parts, though the structure of those parts is modified, but that the double saw of the Saw Flies, the horn-like projection of the Uroceridæ, the long hair-like ovipositor of the ichneumon flies, and the envenomed sting of the bees and wasps, are but slightly modified variations of the same organ.

It is impossible to give a full description of so complex and beautifully-made a structure as the ovipositor of the Hymenoptera without the aid of many illustrations, and I must therefore only mention the salient points.

As the insects are not required to cut notches into soft wood, as is the case with the Saw Flies, the powerful saws are not needed, and are modified into two small spiculæ, in which the notches or teeth are still preserved, though they are too small for actual use. The two horny plates which strengthen the saws are soldered together, so as to support the central boring instrument. This is a really wonderful piece of mechanism, and I may as well here repeat the description given in my "Insects at Home," and taken from the ovipositor of our fine English species, *Urocerus* (or *Sirex*) *gigas*. It is scarcely needful to observe that this organ is only possessed by the female insect.

"I very strongly recommend any of my readers who may obtain a female insect to disengage the actual borer from its two-bladed sheath, and examine it with the aid of a microscope. A half-inch object-glass will give quite sufficient power. It is straight and stiff, but elastic, as if made of steel, and, if bent, will spring back to its proper form with the elasticity of a Toledo rapier. In form it somewhat resembles the instrument known technically as a 'rymer,' except that the edges are rounded, and not square. But the borer possesses an auxiliary cutting apparatus which places it far above the rymer in point of efficacy.

"Even with an ordinary magnifying lens, it is easy to see that the end of the borer is developed into a sharp head very much resembling that of a boarding-pike, and that the outline of the shaft is broken into a series of notches. The half-inch glass, however, discloses a marvellous example of mechanical excellence. The head of the borer is then seen to be armed with long sharp teeth, slightly curved inwards, and acting just as does the carpenter's ordinary centre-bit.

"So much for the head of the borer: we will now turn to the shaft. It appears that in order to make a clean-cut hole for the reception of the egg, the shaft of the borer has to finish the task which the head begins. Accordingly, it is armed on each of its sides with a series of hard sharp-edged ridges, running diagonally across it, and acting exactly as do the sharp ridges of a coffee-mill. A more effective implement could not have been invented, and the various boring instruments of modern days, however novel they may appear to be, are in reality formed on exactly the same principle as the borer of the Sirex, though perhaps they may not carry out their object with such perfection."

The Uroceridæ all deposit their eggs in trees, the ovipositor first boring a tolerably deep hole, and then placing an egg at its further extremity. As soon as the egg is hatched, the young larva makes its way into the trunk of the tree, where it resides for a considerable time, and causes much damage to the timber by its perforations. Even in this country, where the Uroceridæ are comparatively scarce, whole plantations of fir-trees have been very seriously injured, and in some cases the timber was so filled with perforations that it was useless except for firewood.

There is much doubt among entomologists whether any of the Uroceridæ are genuine inhabitants of this country. A vast amount of fir timber is annually imported, and in that timber great numbers of the larvæ have been known to exist. Consequently, when they emerge in the perfect state and fly into the open air, they instinctively search for growing fir-trees, and proceed to deposit their eggs upon them. Another doubt exists, or rather has existed, respecting these insects, some entomologists thinking that the larvæ do not feed upon the wood, but upon the larvæ of wood-eating beetles that had taken possession of the tree. This conjecture is now considered to be groundless, and it is certain that the structure of the head and jaws is exactly such as would be required by a wood-boring insect. Indeed, the larva of this insect looks almost exactly like that of a wood-eating beetle.

There is a curious point in the structure of the larval jaws. Both are strong, horny, rather square in form, and armed with several teeth and a large horny lobe. But one is compressed

and the other depressed, *i.e.* one is flattened as if pinched sideways, and the other as if pressed downwards, so that their mode of action must be very remarkable.

The fine insect which is given as an example of this group of Hymenoptera is a native of North America. It is not only conspicuous on account of its size, but for the beauty of its colouring. The wings are brown glossed with blue, and the abdomen is bright golden yellow, over which are drawn five bands of purple, so deep that it looks black unless a strong light is brought to bear upon it. The head and thorax are yellowish brown, very much granulated, the colour being darker in the middle of the thorax than on the sides. The under surface is black, and the legs are yellow.

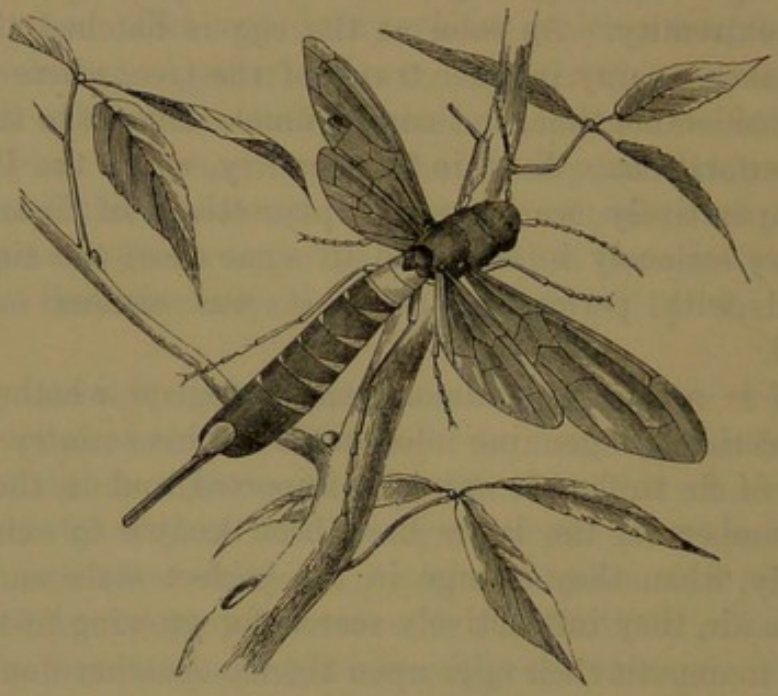


FIG. 190.—Tremex Columba.
(Purple and yellow.)

As is the case with the British species, this is a most variable insect in point of size, some specimens being not much more than half the length of the others, the difference in size being exactly that of a stout man of six feet high and a weazened dwarf of three feet. In the collection of the British Museum are great numbers of allied species, not differing materially from those of our own country.

CHAPTER II.

ENTOMOPHAGA, OR ICHNEUMONS AND GALL FLIES.

The large group of Hymenoptera which comes next in order is almost wholly parasitic in its character—most of the species feeding, while in the larval state, on the bodies of other insects. There are, however, many which obtain their subsistence from plants, which are wounded by the mother insect and are developed into the curious growths which are popularly called galls. The arrangement of these insects is singularly intricate, and in many points still affords objects of controversy to systematic entomologists. We will therefore content ourselves with a general rather than a detailed view of those remarkable insects, and place them under the comprehensive name of Ichneumonidæ.

Many of these insects deposit their eggs within the bodies of larvæ that are buried either in wood or in the earth. Anyone would think that the grub of a wood-boring beetle, or the caterpillar of a wood-boring moth, would be quite safe from any external enemies, so long as it remained concealed within the timber. The Ichneumon Flies, however, are able, by some mysterious instinct, not only to discover the exact locality of the hidden larva, but in spite of all obstacles to deposit their eggs within it. Slight and delicate as is the ovipositor in many species, the actual borer being scarcely thicker than a hair, it can make its way even through thick wood, and thus act as a channel through which the egg is conveyed to its destination. The movement by which this operation is conducted is exactly that which is employed by a carpenter when using a brad-awl.

Without going further into details, we will proceed to the examination of the insects which have been selected as typical examples of this vast group.

AUSTRALIA possesses many remarkable species of Ichneumon Flies, one of which is the *Megalyra Shuckardi*, which is here shown of the natural size.

The general colour of this insect is black. The head and thorax are deeply pitted or granulated, very much like the end of a lady's thimble, and are variegated here and there by little patches of short white hairs, the most conspicuous of which are on the two lower angles of the thorax. The abdomen is smooth, shining black, with the exception of the tufts of white hairs which project from beneath the segments on each side, and are

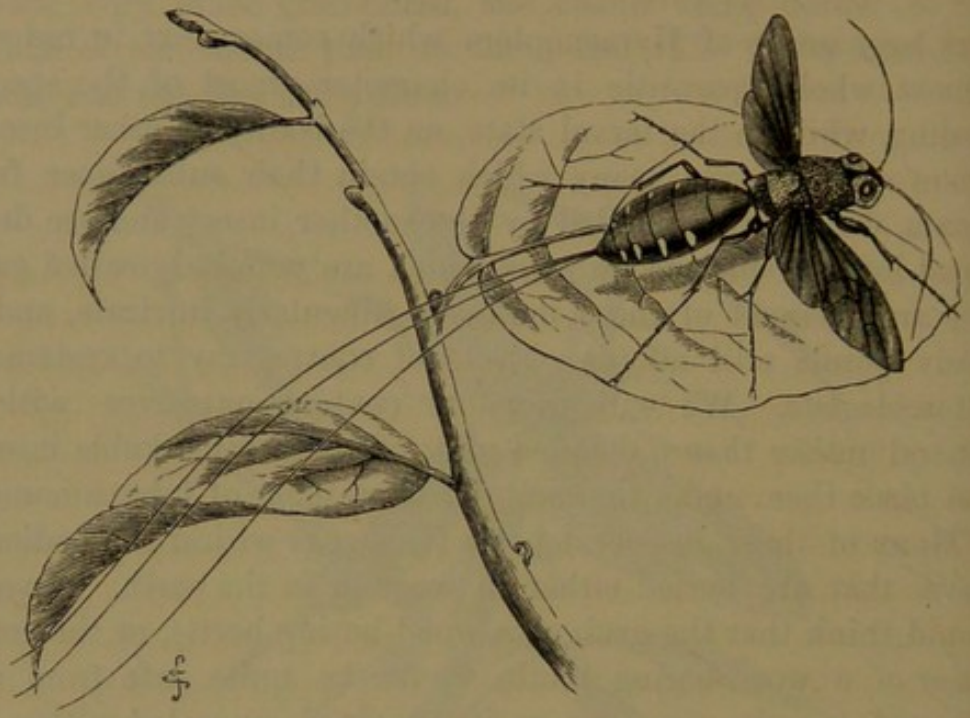


FIG. 191.—Megalyra Shuckardi.
(Black, with patches of white hair.)

exceedingly conspicuous. The wings are dark brown in the middle, and become rather paler towards the edges.

The ovipositor of the female insect is exceedingly long, and is composed of three distinct parts; namely, the actual borer, which occupies the centre, and a pair of sheaths which serve to protect it when not in use. The colour of the borer is pale brown, and that of the sheaths nearly black. Long as they are, they are so slender that the three together are scarcely so thick as a single horsehair. When the insect has been dead for some little time, the parts of the ovipositor are apt to separate and to fall into a lyre-like form; and it is in consequence of this

propensity that Mr. Westwood gave to the genus the name of *Megalyra*, or "large lyre."

Formidable as this instrument looks, it is really quite harmless, and, though it can pierce through living timber, cannot produce any injurious effect upon the human skin. Unlike the sting of the bee or wasp, it is not connected with any reservoir of poison, its only use being to introduce the egg into the body of the hidden larva. Many of these insects will, when seized, bend the abdomen and bring the end of the ovipositor against the hand. The movement is, however, nothing more than a menace, and the worst that the insect can do is that a slight prick may be felt. Acting on a similar principle, our common ringed snake will strike at an assailant as fiercely as if it were armed with venomous fangs, and wear so threatening an aspect that even those who know its harmless character cannot avoid a momentary shock.

The male of this species is a very curious creature. Of course he does not possess the ovipositor, but the strangest thing is that he hardly possesses any wings. This is quite a reversal of the usual system. All who have even a slight acquaintance with entomology are aware that in many insects the male possesses wings while the female is wingless.

The reason for this variation of structure is clearly shown by Mr. Westwood :—"An exceedingly interesting species has been communicated to me by M. Audouin, which he discovered to be parasitic in the provisioned nests of Odynerus, Anthophora, and Osmia. The male has most singular antennæ, and minute rudiments of wings, so that it does not quit the cell; but the female is enabled, by means of her full-sized wings, to seek other cells for her progeny. Mr. F. Smith pointed out to me that the nervures of the wings are arranged somewhat differently in the two sexes, the rudimental wings of the male possessing a petiolated cell which does not exist in the fully developed wing of the female."

Another species, *Megalyra fascipennis*, also an Australian insect, is much of the same size and colour, except that there are no patches of white hairs, and that the wings are pale, with a broad dark bar across the middle.

In the insects belonging to the genus Pelecinus, a very singular structure will be observed. Instead of having a short

abdomen and a long ovipositor, the abdomen is exceedingly long, and the ovipositor short. The abdomen, indeed, is lengthened so greatly, that at a hasty glance the insect looks exactly like a Dragon Fly. In this respect it bears a singular contrast to the Evanias, which seem to be all thorax and hind-legs, the abdomen being a mere insignificant little appendage to the large thorax. The insects inhabit North America, and in some districts are exceedingly common. The specimen which is here figured was brought from Trenter Falls, New York, by Mr. Doubleday.

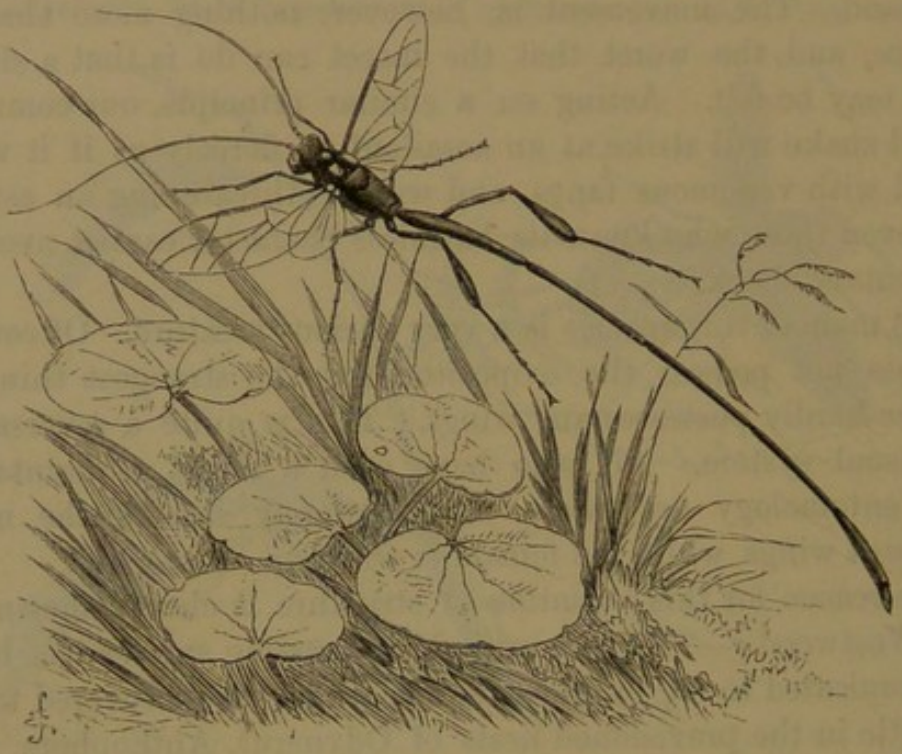


Fig. 192.—Pelecinus polyturator.
(Shining black.)

On looking at any of these insects, it is evident that the long abdomen answers the same purpose as the long ovipositor, and that it enables the insect to deposit its eggs in the body of some larva which it could not otherwise reach. A visitor to the British Museum lately said that in the pine forests of Canada the Pelecini absolutely swarmed, and that hundreds of them might be found on the trunks of the trees dead and stiff, with their abdomen thrust deeply into the burrow made by some wood-boring insect. In some places they were so numerous that a dozen or so could be swept off by a single stroke of the hand down the tree-trunk. This characteristic anecdote at once

establishes the exceeding value of the Pelecini in saving the pine forests from insect destroyers, and shows how wonderfully the balance of Nature is preserved as long as man does not interfere.

The colour of the insect is shining black, and the wings are generally translucent, though in some specimens a few dark blotches are seen, varying exceedingly in depth of colour, size, and position. The very remarkable hind-legs must not pass unnoticed, the tibia swelling into a pear-like form, and the whole limb being exceedingly long if contrasted with the head and thorax, though short when compared with the abdomen. The name *Pelecinus* literally means "a pelican," and why it should be applied to the insect is more than I can understand.

One more point must be mentioned. Everything in Nature has its uses. The female Megalyra has a long ovipositor because she is needed to lay eggs in deeply hidden larvæ. The male performs no such task, and consequently has no ovipositor. In the present instance, the greatly elongated abdomen only belongs to the female, that of the male being short and club-shaped.

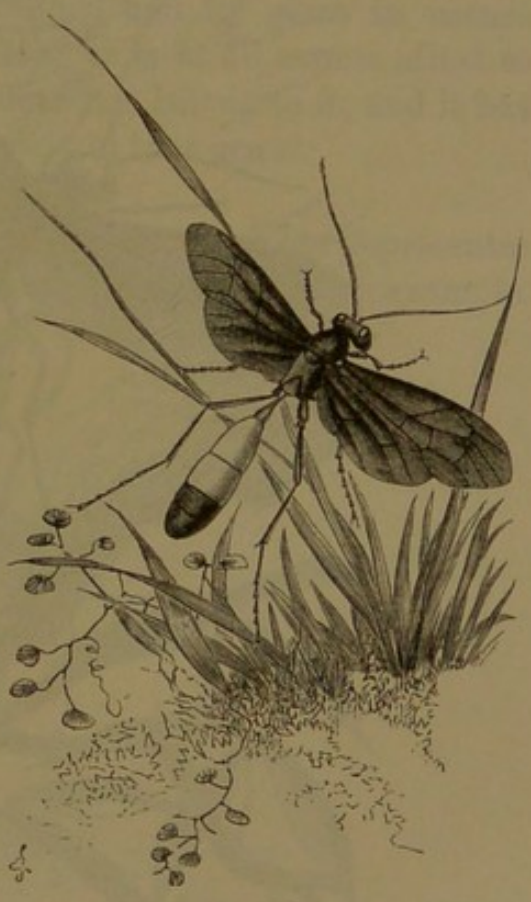


Fig. 193.—Ichneumon arrogator. (Black and yellow.)

As to the typical genus Ichneumon, it is so vast, and contains such multitudes of species, that the mere sight of the creatures is enough to make anyone recoil in despair from them. Take, for example, the collection at the British Museum. A positive army of Ichneumons is already arranged, while there are multitudes awaiting their turn for being named and classified. None are large, while some are exceedingly minute —being so small that they are fixed on cardboard, the finest pin being too coarse for their tiny bodies.

The species selected for illustration is on account of its being one of the largest of the group, and so gives a good idea of the general form and structure of these insects. Its colour is almost entirely black, but the basal part of the abdomen is yellow, this colour extending to some two-thirds of its length. The wings are dark brown and rather shining. It is remarkable that, although this genus is so enormous, there is scarcely any range of colour, the hues being nothing but black, grey, and yellow; and even the last mentioned hue being of a dull nature.

The present species is a native of Albania.

THE fine insect from which the accompanying illustration was drawn is in the British Museum, and, as far as is known, is an unique specimen. It was brought from Natal.



FIG. 194.—Scolobates (?).
(Black; wings glossed with purple.)

Independent of its size, which is quite gigantic for one of the Ichneumons, it is a singularly handsome insect. The head and

body are black, and so is the abdomen, the latter being clothed with a coat of short, soft, dense pile, which makes it look exactly as if it had been cut out of the finest black silk velvet. The legs are black, with the exception of the tibia, which are pale brown.

The chief beauty of the insect, however, lies in the wings, which are ample, very shining, and, when viewed from above, seem to be simply brown. When, however, a strong side-light is thrown upon them, they flash out into the most brilliant purple, as if they had been made of purple mother-of-pearl. The ovipositor is exceedingly long, and much stouter than is generally the case, the two portions which form the sheath being each of them as thick as the entire ovipositor of the Megalyra.

The reader will perceive that a note of interrogation is placed after the generic name *Scolobates*. This is done because the insect has not as yet been examined and its place in nature settled. All that is known is, that it is at all events allied to the genus Scolobates, even if it does not belong to it, and it has therefore been provisionally attached to that genus.

THE well-known genus Pimpla has many foreign representatives, of which the species here figured is a conspicuous example.

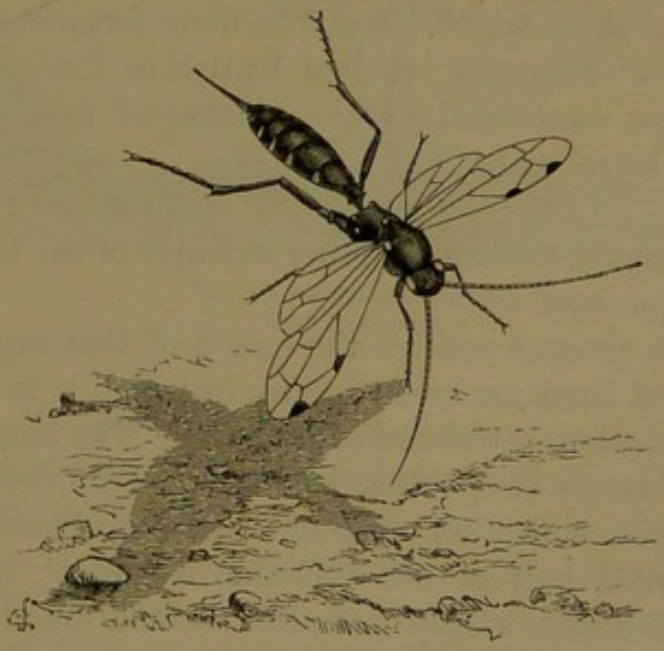


FIG. 195.—Pimpla intricatoria.
(Black, with yellow spots.)

It is very simple in colouring, the body and abdomen being shining black, with a few short streaks of bright yellow upon

the sides of the abdomen, and some spots of the same colour on the thorax. The wings are quite translucent, except that on the top of the upper wings there are two black spots, as shown in the illustration. It inhabits Australia.

All the Ichneumonidæ are liable to great variation in point of size, and in none of them is this variation so extreme as in the genus Pimpla. Even in the present species, the variation is so great that none but an entomologist would think that insects so apparently distinct could possibly belong to the same species.

The reason for this difference is simple enough. In its larval stage the young Ichneumon feeds upon the larva of some other insect, the victim not being visible to the mother Ichneumon, and therefore permitting no choice. It may be that she happens to hit upon a large and well-fed larva, in which the young one finds ample nourishment, and is enabled to reach the fullest development of which the species admits. But she may happen to hit upon the larva of some small insect, and in that case it is evident that the amount of nourishment must be circumscribed.

Now, it always happens with insects, that even though they are stinted of food while larvæ, they are not debarred from attaining the perfect form, although in such cases they are not half as large as those which have been more fortunate. In fact, I believe that with insects, whether British or foreign, all variations in size are occasioned by the amount of food which they obtain in the larval state.

On the next page we have another example of the Ichneumons with long ovipositors.

Even in the present species the length of that organ is very remarkable, but there are some species in which it is very much longer in proportion to the size of its owner. The most astonishing of these insects is one that has not yet been described, and which is in the collection of the British Museum. In this species the basal half of the abdomen is yellow, and the rest black. Mr. F. Smith kindly measured it, and found that while the length of the insect from the head to the end of the tail is barely one inch, that of the ovipositor is six inches and a half. I wish that I could have introduced a portrait of this most remarkable insect, but, inasmuch as the illustration must

have been at least eight inches in length, of which six and a half are occupied by three hair-like lines, such an illustration would have been nothing but a waste of the space which we can so ill afford.

This insect was brought from Bogotá, and has not yet been named.

The present species has only recently found a place among the arrangements of the British Museum. It was brought from the

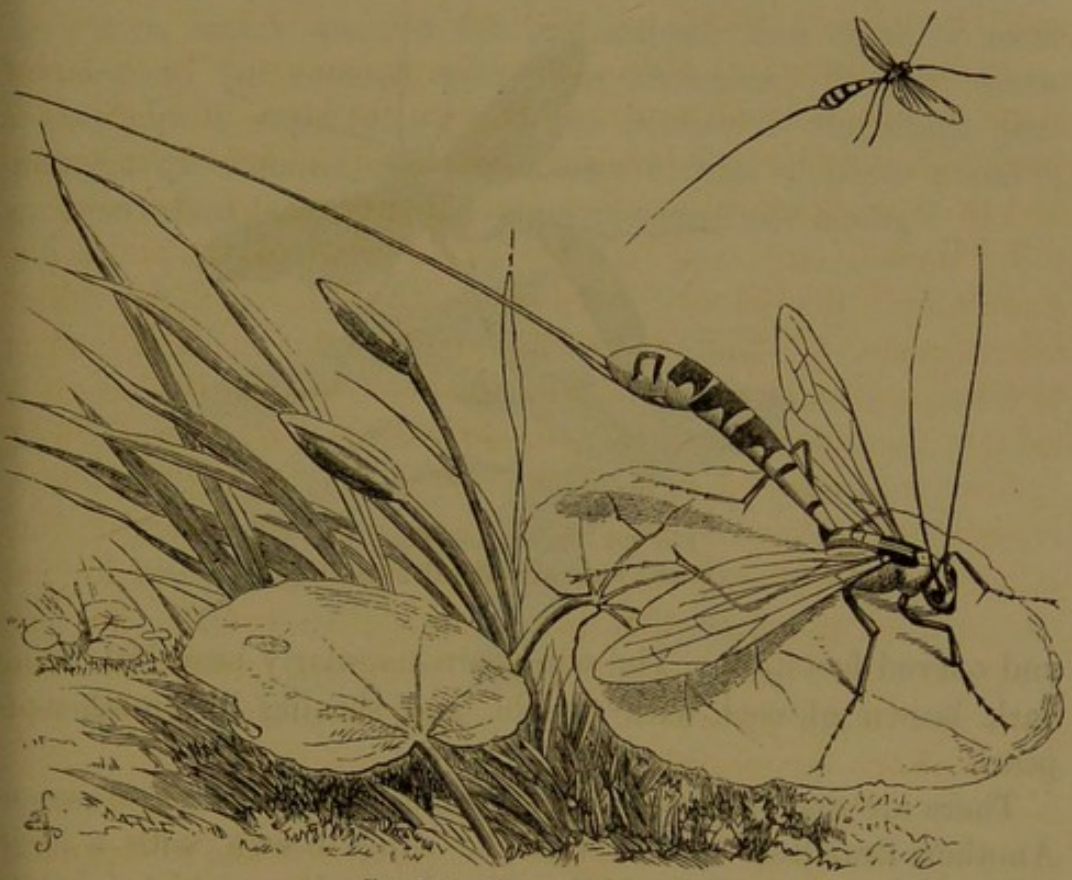


Fig. 196.—Rhyssa nobilitator.
(Black and yellow.)

Celebes by Mr. Wallace, who has done so much toward enriching our collections. Its colour is light yellow and shining black, arranged in the peculiar pattern shown in the illustration. There are some species of Rhyssa inhabiting China. They much resemble the Celebes insect, except that chestnut has taken the place of black. Another species, *Rhyssa lunator*, is well known in Canada. It is about as large as *Rhyssa nobilitator*, but is paler in colour and has the ovipositor half as long again.

THE genus Thyreodon extends over a considerable portion of the globe.

The fine insect which is here shown is a native of Brazil, and is one of the largest as well as the most beautiful of the genus. The head is black, and the thorax appears at first to be of the same colour, but is in reality of the richest and deepest purple, with a velvet-like surface. The abdomen is black. It is much compressed, and is attached to the thorax by a curiously long

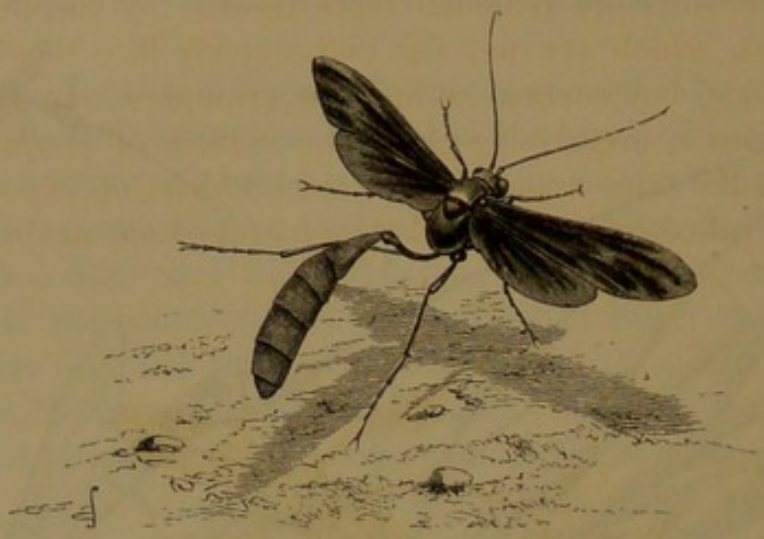


FIG. 197.—Thyreodon cyaneus.
(Black; wings glossed with purple.)

and curved footstalk. The wings are singularly beautiful, being dark brown glossed with purple, and shining like mother-of-pearl.

There are many species of Thyreodon in the British Museum. Another Brazilian species has the wings brown, with a large pale yellow spot in the middle of each; and one which inhabits China has the wings glossed with a beautiful golden yellow.

AMONG all the larger Ichneumon Flies there are none that surpass in beauty the species which is figured on the next page, and very few that even approach it.

There is nothing very remarkable about the body, which is black, as are the head and thorax. The legs are also black, except the basal half of the tibia, which is yellow. The chief beauty of the insect lies in its wings, which are coloured in a most gorgeous fashion. As is the case with so many of these insects, the wings appear to be plain brown when viewed with

a direct and not very strong light; but when the light is allowed to fall upon them sideways, they flash out into all sorts of colours. So great, indeed, is the variety of colour, that it is almost impossible to fix on any one here as predominating. Perhaps a ruddy copper may be considered as the ground colour, and upon it are patches of crimson, azure, purple, and gold, each patch shifting its colour together with the direction of the light.

These colours are rendered more intense by the structure of the wings, which are not flat and smooth like those of most Ichneumons, but covered with little crumples. In fact, when viewed with a magnifying-glass, the surface of the wings presents just the same appearance as does a sheet of paper when it has been rolled into a ball and then flattened out again.

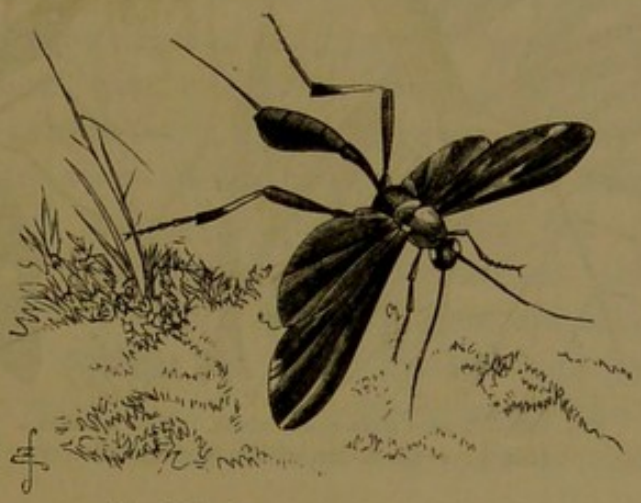


Fig. 198.—Osprynchotus objurgator.
(Black; wings many-coloured.)

This species comes from the Congo, and fortunately some of its habits are known. It is parasitic upon the solitary bee called *Eumenes tinctor*, one of the burrowing bees. In the British Museum there is a fine group of these nests, the burrows being sunk into a piece of clay. And from that group of nests was hatched the specimen whose portrait is given above.

The remarkable insect which is shown on page 404 has not been described, although the authorities of the British Museum have placed it in its proper genus.

The body is shining black, with a few white marks on the edges of the abdomen near the base. The wings are brown,

diversified with some white spots, arranged as shown in the illustration. The large spot, however, on the upper edge of the wing is not white, but rich golden yellow, for which reason



Fig. 199.—Bracon aureomaculatum. (New species.)
(Black; wings brown with yellow spots.)

I have given to the insect the specific name of *aureomaculatum*, *i.e.* "spotted with gold." The ovipositor is of enormous length.

All who have lived in the country and used their eyes must be familiar with the curious excrescences called galls, which appear upon the leaves, branches, and even roots of trees. These galls are produced by a group of insects called, scientifically, Cynipidæ, and popularly known as Gall Flies.

The process is almost exactly like that by which the Ichneumon Flies deposit their eggs in the bodies of other insects. The mother Gall Fly pierces with her ovipositor the leaf, twig, or bark, inserts the egg, and injects at the same time a small drop of a fluid which produces very extraordinary effects. That portion of the plant which comes in contact with the liquid is

forced into an abnormal growth, and rapidly encloses the egg. Sometimes, especially on leaves, the galls are quite spherical, and of about the same consistence as a green gooseberry. Other leaf-galls are quite flat, like so many small coins stuck on the leaf; while others hang by strings like bunches of currants. Some are covered with leaf-like appendages, and look like miniature artichokes; while others, like the well-known bedeguar of the rose, are clothed with a dense mass of long, soft filaments.

In the midst of the gall lies the young larva, which feeds upon the soft centre of the gall, and by continually eating makes for itself a little cell, which increases in proportion to the size of its body. It is evident that all locomotion is denied to the larva, and that all it can do is to turn round and round in its cell. Consequently it has no legs, and is only able to move itself about by the edges of the rings or segments of its body.

As a general rule, the larva remains in the gall until it assumes the perfect form, and then gnaws its way into the open air. There are some species, however, which wriggle their way out of the gall before they become pupæ, fall to the ground, burrow in it, and there undergo their changes. Generally there is only one larva in each gall, but there are several species in which a great number are found in the same gall, each larva occupying its separate cell. The bedeguar of the rose and the oak-root gall are familiar British examples of these compound galls.

Even in England there are many species of Gall Flies, while the foreign species seem to be without number. In the collection of the British Museum, besides a vast number of species that have been named, described, and arranged, there are whole drawers full of species that have as yet received no name. They are all little insects, the species which is drawn on page 405 being one of the largest. The figure is magnified two and a half diameters. It is one of the American insects, the specimen which is figured having been taken in Massachusetts. As is the case with most of the genus, the colour is dark, being simply shining black. The wings are translucent, with the exception of the spot, which is black, fading into brown.

These insects are examples of the uses that lie hidden in Nature. Many thousands of years had the Gall Flies been making

their wonderful cells before anyone discovered that the galls which disfigured the oak could be of any service to man. Yet, within the gall lay the principal element of the ink which has had as important a part to play in civilization as has the press itself, the latter depending almost wholly on the former. Scarcely larger than average-sized hazel-nuts, the galls absolutely crowd the branches of an oak which grows plentifully in the Levant, and so it is to these insignificant insects that we owe one of the most absolute necessities of modern existence. The galls are to be procured at most chemists' shops; and anyone who wishes to procure the insect can do so by selecting those galls which have no holes in them. On cutting them open, the insect will generally be found inside. Such specimens are technically



Fig. 200.—Cynips confluens.
(Black.)

called "green" galls, "blue" galls, or "black" galls, and are thought to make better ink than the "white" galls, from which the insects have escaped.

As a general rule, the species which made any particular gall can be identified by keeping the specimen until the insects are hatched out. All rules, however, have exceptions, and such is the case with the galls. Sometimes, although the specimen has been kept in a box by itself, two distinct species of insects will be hatched from it, or a single species which is clearly not a Gall Fly at all. The fact is that there are certain Ichneumon Flies, called Evanias, which are parasitic upon the larvæ of the Gall Flies; and the consequence is, that in a compound gall both the true Gall Flies and Evanias are hatched, while in single galls the Evania takes the place of the Gall Fly.

The next illustration represents an insect called *Scleroderma dux*. This genus has, until lately, been placed among the

Scoliadæ, a group of insects which will presently be described, but has now been shifted to its present position.

The whole of the species belonging to this genus, of which there are great numbers, are parasitic upon the larvæ and pupæ of moths. They are little creatures, and the present species, which is among the largest, has been magnified two diameters, so as to enable its real form to be seen. It is a native of Pará, and its colour is pale yellow. The reader will doubtless have noticed the curiously swollen thigh of the hind leg. It is armed on the lower edge with a row of short teeth, and when the curved tibia are closed upon it, the insect looks as if it were one of the jumpers.

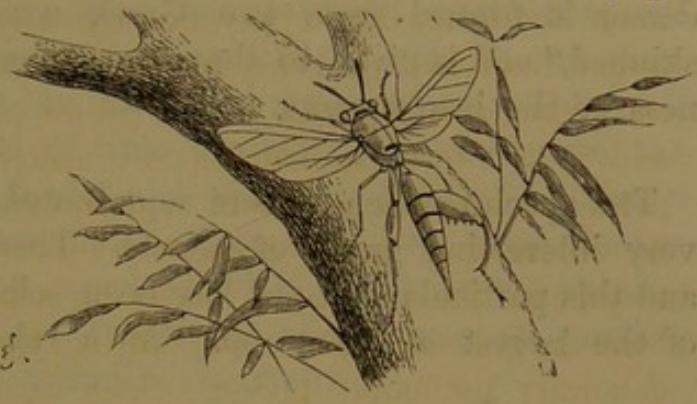


FIG. 201.—Scleroderma dux.
(Pale yellow.)

MEMBERS of the genus Scleroderma are spread over a great portion of the world. The curious little insect which is here shown is a native of Albania. It is very small, as may be seen



Male. FIG. 202.—Scleroderma cylindrica. Female.
(Reddish brown.)

by the line on the right of the illustration, which represents the real length of the female. The male is very much smaller than his mate—so small, indeed, that it cannot be examined

without the aid of a tolerably powerful magnifying-glass. The body of an ordinary specimen is very much the same size as the letter *i*; and if an *o* be placed at either side of the *i*, they will be about as large as the wings. The generic name of *Scleroderma* is formed from two Greek words signifying "hard-skinned," and is given to these insects on account of the hardness of the integuments.

THE species which is here represented is one of a large and very interesting group of insects. There are many of them, and this particular species has been selected because it is one of the largest of the group. As a rule they are very small,



FIG. 203.—Leucospis Aruera.
(Black, with yellow marks.)

and the insects of this genus are absolute giants among pigmies when compared with their relatives.

Their habits are rather remarkable. They are parasitic upon various Hymenoptera, especially upon the Mason Bees. The mode in which the female deposits her eggs is very curious. The ovipositor is very long, and when at rest is turned over the back, its point passing over the thorax of the insect. On account of this structure it was thought by some entomologists that the Leucospis was obliged to attack its victim from behind. According, however, to an account given to Mr. Westwood by an eye-witness, this is not the case, and the insect proceeds as follows:—

Mason Bees always choose for their building-place a hole in an old wall. In this hole they deposit an egg, together with a supply of food for the young larva, and then close it up.

The Leucospis hunts over the walls until she has discovered a Mason Bee's nest, and then settles by it. Raising herself as high as possible on her tarsi, she slowly brings the ovipositor from the upper to the under side of the body, the point projecting beyond the head. She then carefully works the ovipositor into the nest until she has fairly buried it, and then, passing an egg between the blades of the instrument, leaves it in the nest. In course of time the egg is hatched, and the larva eats not only the food which was intended for the Mason Bee larva, but the larva itself. Here, then, we have another example of the difficulty which is often found in determining a species by hatching the insect out of the nest—a parasite taking the place of the rightful inhabitant.

The specimen which is given in the illustration is a male, this being known by the absence of the ovipositor and the form of the abdomen, which has only three joints, or segments, that of the female having five. Its colour is black, varied with golden patches and spots. The wings are yellowish brown. The genus has a very wide range, and in the British Museum there are specimens from Europe, Asia, and nearly the whole of America. This species inhabits Arú, whence its specific name of *Aruera*.

By referring to the illustration, the reader will see that the two preceding insects are remarkable for the thickening of the thigh of the hind legs. This thickening is carried out to a much greater extent in the remarkable insect which is here shown, and which is called *Phasganophora*, or "blade-bearer," because the thigh is modified into a broad, flat, blade-like shape.

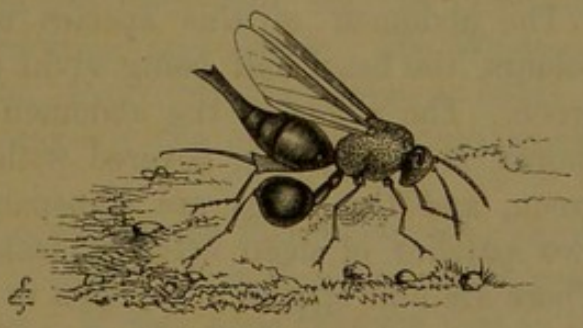


Fig. 204.—Phasganophora signator. (Black.)

In the female insect the ovipositor is very conspicuous, the instrument itself being black, and the sheaths broad, triangular, and of a bright yellow colour. This apparatus is shown just above the flattened portion of the hind leg. The wings are transparent, and the whole of the body of the insect is black, the abdomen being polished and shining, and the thorax and

head dull and granulated. This species is a native of Java. In order to show the peculiar structure of the hind leg and the ovipositor, the figure has been drawn rather larger than the insect.

In the very unpretending form of *Lycisca Romandi* we have one of the most splendid insects that the earth produces. As is the case with many insects which have already been described, the colours are so exceedingly rich that they can hardly be seen except in a brilliant light. When placed in a drawer with other insects, the Lycisca might easily be passed over as one of no greater beauty than those which surround it; but when a gleam of light darts across it, the sudden flash of emerald-green and crimson at once catches the eye.



Fig. 205.—Lycisca Romandi.
(Green, crimson, and black.)

The abdomen of this species is divided boldly into two colours, the basal half being vivid crimson and the rest shining green. The whole of the abdomen has a metallic polish. The thorax is deep black, covered with bars and dots of emerald-green, and the wings are transparent, the upper pair having two patches of deep velvety black. It is a Brazilian insect. There are four species of Lycisca in the collection of the British Museum, and this species is much the largest of the four.

The curiously shaped insect which is shown in the next illustration is a very small one—barely one-third of an inch in length, and the figure, therefore, has been magnified three diameters larger than the insect itself.

It has a singularly ant-like appearance, and to an ordinary observer is so exactly like a yellow ant with long legs, that he would probably set it down as belonging to those insects. Its colour is pale yellow.

The insect belongs to the family of the Proctotrupidæ, a group of Hymenoptera which has a very large range. The present species is a native of the Celebes Islands, but others are found spread over the greater part of the world. Even our own country produces *Gonatopus pedestris*. This little insect frequents hot, sandy places, and, where the sand is white and fine, can be captured on account of its habit of falling into deep footprints and other hollows in the sand, into which it rolls much after the same manner that the victims of the Ant Lion are caught. Mr. E. A. Smith tells me that he has often taken it at Lowestoft and Bournemouth; and Mr. Westwood mentions Yarmouth as a favourite locality for this insect.

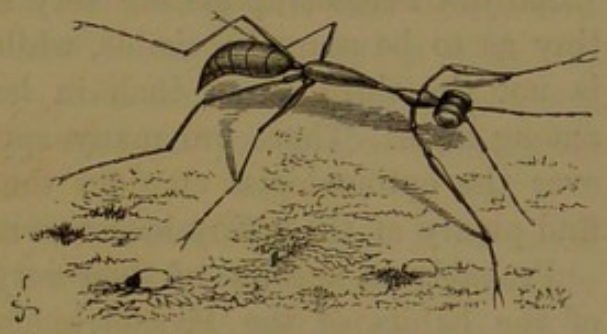


Fig. 206.—Gonatopus Celebicus. (Pale yellow.)

The resemblance to an ant is in this species so singularly close, that none but a practised entomologist would take it for anything but a little ant running about with great speed. They are all very active insects, as indeed might be inferred from the length and structure of the legs. Some can even leap, but the generality content themselves with running and flying. Mr. Westwood remarks that some of the Proctotrupidæ have a habit of alternately raising and depressing the abdomen while resting on hot sunny banks.

The reader will have noticed that the insect which is shown in the figure has no wings. In the genus Gonatopus this peculiarity belongs to the females. It was once thought that in the wingless specimens of Proctotrupidæ the wings had been intentionally broken off, as is done by the ants. This, however, is not the case; for even where the rudiments of the wings are seen, the edges are quite smooth, and not jagged as they are when they have been broken away. In the present genus, the hind pair of wings of the male are lobed.

In all the Proctotrupidæ the wings have either very few nervures, or none at all. There is a very singular little insect belonging to this group, *Mymar pulchellus*, in which the hind pair of wings are reduced to two delicate hair-like projections, and the fore-wings are shaped just like battledores—the expanded portion being edged with hairs. The antennæ of this insect are of enormous length when compared with the body, but all things are measured by comparison; and when it is remembered that the insect, with its wings expanded, is scarcely larger than the dot over the letter *i*, the word enormous seems rather absurd. One species has been called by the specific name of *punctum*, and another by that of *atomos*, in allusion to their minute dimensions.

All the Proctotrupidæ are very small insects, some being so tiny as to be scarcely visible, while the present species, which is not the third of an inch in length, appears quite a giant among them. There are many species in England, and whenever the entomologist employs the "sweep-net" he is sure to find plenty of these tiny insects within it.

Probably on account of their very minute size, little is known of the habits of the Proctotrupidæ. As, however, those who have been successfully watched are known to be parasitic, it is inferred that all are of a similar nature. Several species are known to deposit their eggs in those of other insects, especially Lepidoptera; others live within the bodies of Aphides, and others upon those mischievous little gnat-like insects which do so much damage to the wheat, and are known by the scientific name of Cecidomyia.

Others capture small larvæ and bury them as provision for the future young; and this brings us to a peculiarity in the structure of the female Gonatopus. Not only are all the legs long and powerful, but the tarsi of the first pair of legs are armed with large double claws, aptly compared by Mr. Westwood to the claws of a lobster. This structure is supposed to be for the purpose of enabling the mother insect to capture her prey and drag it to the cell where it is to lie. The word *Gonatopus* is Greek, and literally signifies "jointed foot." The ovipositor has a very close resemblance to a sting.

Now we come to a very remarkable group of Hymenoptera called Chrysididæ. This is a Greek word signifying "gilded," and is given to the insects on account of the brilliant colours with which they are adorned. Several species of Chrysididæ are inhabitants of our own country, and are popularly known by the name of Ruby-tailed Flies.

If a female Ruby-tail be carefully examined, the abdomen will be seen to consist of only three segments, each being of considerable size. Should the specimen be dry, it will not be easy to find out what has become of the missing segments; but if it be fresh, there will be no great difficulty in finding them. If the abdomen be carefully pressed, there will issue from it a long telescopic tube, which will be found to be formed from the other segments. At the end of this tube is the ovipositor, which is very short and looks much like a sting. It can even be used for defence, and can give a tolerably sharp prick; but as there is no poison-gland connected with it, no real harm is done.

The object of this structure is evident. The insect is parasitic, the eggs being deposited in the nests of other insects, generally solitary bees. The egg of the Chrysis is hatched before that of the real owner, and in consequence the larva eats up all the food which was prepared for its unintentional host. It will be seen, therefore, that the telescopic ovipositor is needed in order to enable the Chrysis to deposit its egg at the bottom of the nest, and yet to do so without disturbing the work of the insect whose offspring is to be supplanted.

In the early spring, specimens of the Chrysis may often be found in holes which were originally intended for other insects. Near my house is a park fence which has recently been mended with a number of pine slabs, the bark being still on them. The bark has been pierced by holes, apparently those of the Sirex, and advantage has been taken of them by sundry small solitary bees. One day, while examining the fence, on which the sun was shining brightly, I caught a sudden flash of crimson in one of the holes, and, on carefully cutting away the wood, found a fine Chrysis quite perfect and ready to emerge when the year should be sufficiently advanced.

On following up the investigation I found great numbers of Ruby-tails similarly situated. They were all curled up after

their peculiar fashion, so that they were as round as balls. They are enabled to assume this attitude by means of the structure of the body. In the first place, the abdomen is attached to the thorax by a short foot-stalk; and in the next, its under surface is hollowed. The insect, therefore, can bring the abdomen completely forward, when the thorax and closed legs fit into the hollow of the abdomen, and, the head being bent downwards, the Ruby-tail is rolled up as completely as a hedgehog.

There are numbers of species belonging to this splendid group, and, on account of their insect-destroying habits, many of them are extremely useful to agriculturists, as they feed not on the food laid up for the larvæ, but on the larvæ themselves. For example, we have already seen that the larvæ of certain Saw Flies pass the chief part of their larval state upon the plant on which the eggs have been laid, and then, when they are full-fed, leave the plant and burrow into the ground, where they pass through their changes into pupa and perfect insect. Such is the case with the well-known Saw Fly which infests the gooseberry; and the services rendered by the Chrysis in thinning the numbers of these troublesome insects, are thus described by M. St. Fargeau.

He remarks that after the larvæ of the Saw Fly had burrowed into the ground, he saw a female Chrysis make its way to the burrows, bend her abdomen forward, and thrust the tubular ovipositor into the holes and deposit an egg in each, the whole operation occupying barely a second of time. In the following year he witnessed a wonderful sight at the same spot. At least a hundred males as well as many females had been hatched, and were traversing in all directions the ground in which the Saw Fly larvæ had burrowed. As they ran backwards and forwards in the sunbeams, their glittering bodies flashed like jewels, and this beautiful scene was repeated for many days.

The insects always made their appearance from ten to twelve in the morning, after which time they dispersed; and M. St. Fargeau thinks that when they had once left the spot they did not return, but that those which appeared on each successive morning were merely hatched out of the cells of the Saw Flies which they had supplanted.

As is often the case with insects, the two sexes differ much in their colouring, so that the males and females of the same species

have been described and catalogued as belonging to two different species. It is curious to see how analogies hold good in zoology. The Ruby-tails have been aptly compared to the Humming Birds, and the rule holds good with the insects as with the birds, namely, that the two sexes are so differently coloured that they may readily be taken for distinct species.

As our British Chrysididæ are tolerably numerous and are so brilliant in colour, it is but natural to conclude that the foreign Chrysididæ—especially those within the tropical belt—would be many in number and exceed our own species in point of beauty. This however is not the case, for there are but few exotic Chrysididæ, and scarcely any of them exceed our own lovely Ruby-tails in size or brilliancy of colour. Even in tropical America, whence come so many of the most dazzling insects in the world, scarcely any Chrysididæ have been discovered. I have, therefore, only selected two species as types of foreign Chrysididæ.

Of course there may be yet undiscovered species, for, as we have seen from M. St. Fargeau's interesting account, hundreds of Ruby-tails may be assembled within a few square feet at 10 A.M., and at noon not one will be seen on the very spot which was but a short time before a blaze of living jewels.

THE insect which is here represented belongs to the genus Stilbum. This word is formed from the Greek, and signifies "polished," or "glittering."

Just a hundred years ago Fabricius described the splendid insect which is here figured, mentioning it under the title of *Chrysis splendida*. It is an Australian insect, and is remarkable not only for its size but its beauty, which fully deserves the name of splendid. The head is emerald-green, as is the thorax, and both are washed with a tinge of azure. The abdomen is of the richest blue, glossed with green and purple; and the whole of the head, thorax, and body is covered with bold and

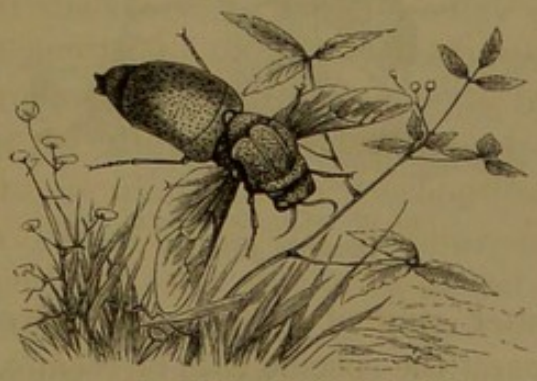


FIG. 207.—Stilbum splendidum. (Azure, glossed with green.)

deep punctures which increase the rich depth of colour. One specimen in the British Museum has the abdomen green. The abdomen is tipped with a horny plate cut deeply into four bold teeth.

Besides the Australian specimens there are many others from different parts of the world, such as Ceylon, China, the Eastern Archipelago, Madagascar, Brazil, Southern Africa, &c. These are smaller than the Australian specimens, and, as a rule, the abdomen is green instead of blue. The Australian specimens are much larger than any other of the Chrysididæ, and it is just possible that they may prove to be a distinct species. As to the prey of this insect, little if anything seems to be known about it. But it is always difficult to identify the particular species of insect on which any particular Chrysis is parasitic—the latter seldom restricting itself to any one species, and being at one time parasitic on a bee, and at another on a wasp. Mr. F. Smith suggests that the reason for this indifference is that the larva of the Chrysis always feeds upon some other larva, and that there is little distinction between the larva of a bee and that of a wasp.

THE insect called *Chrysis oculata* is also described by Fabricius. It is an Asiatic species, and is subject to great variation of colour—some specimens being wholly green, while others are entirely blue; and in either case the surface has a gloss of the second colour, green being glossed with blue, and blue with green. On either side of the abdomen is a single eye-like spot of glowing, ruddy gold, redder in the middle, and with an outer ring of yellow. This eye-like spot has gained for the insect the specific title of *oculata*. The abdomen is tipped with six teeth.



FIG. 208.—Chrysis oculata. (Emerald green.)

CHAPTER III.

ACULEATA.—MUTILLAS AND SCOLIAS.

In the preceding insects the ovipositor is so formed as to serve only its primary purpose; namely, the deposition of the eggs. In those creatures, however, which will now be described, the ovipositor is used as a weapon, and is connected with a poison-gland by means of which a venomous fluid is injected into any wound which is made by the sting, as this modified ovipositor is called. In the social Hymenoptera, such as certain ants, bees, wasps, &c., there is always a great proportion of undeveloped females, called neuters, or workers. These insects do not lay eggs, but they notwithstanding possess the sting, which is employed solely as a weapon of offence. This group of insects is technically called *Aculeata*, from a Latin word signifying "a sting."

The first group of Aculeata is called Mutillidæ, and the insects which compose it are popularly known by the name of Solitary Ants. As the latter name implies, they do not live in communities as do most of the true ants, and therefore no neuters or workers are required. There is, indeed, one genus, Dorylus, in which males and neuters have been discovered, but no females. Probably because of the existence of the neuter insect, several practical entomologists are disposed to consider that Dorylus ought by rights to be placed among the true ants, and not among the Mutillas. A species of Dorylus will be described presently. The females are wingless, and are armed with stings. No insect seems to be so venomous in proportion to its size as the female Mutilla; and in the case of one of our own species, *Mutilla Europæa*, the sting is scarcely less to be dreaded than that of the hornet itself.

One foreign species, *Mutilla coccinea*, of North America, is

said to possess so venomous a sting that a person who was stung by one of these insects became insensible in a few minutes, and very nearly lost his life.

So unlike are the males and females of these insects, that the two sexes have more than once been catalogued not only as different species, but as belonging to different genera.

THE accompanying illustration represents a species from Bahia, bearing the specific name of *cerbera*, in allusion to the legendary dog which guarded the portals of Hades. As may be seen by the figure, it bears a curious resemblance to our well-known



FIG. 209.—Mutilla cerbera.
(Black and white.)

hunting spider. Its colours are very simple, being only black and white—the latter being of a peculiar dull, dead character that is very difficult to express. The insect looks indeed as if it had been originally black, and that a pattern had been drawn on it with white paint. It is thickly covered with hair, as is the case with most of the Mutillas, though in this species the hair is not so long as in many others.

THE really fine insect called *Mutilla occidentalis* belongs to North America.

This is a very hairy species, and is most splendidly coloured

with black and scarlet. In the male the head and a large patch upon the thorax are scarlet. The abdomen is black, but is adorned with a number of scarlet rings, of exactly the same hue as that upon the thorax. The wings are brown. The wingless female is also black and scarlet, though the colours are differently arranged. In this sex the whole of the insect is scarlet except a single chevron-shaped bar of black across the middle of the abdomen. Seeing that the difference in colour is so great, it is really no wonder that the two sexes may have been thought to belong to separate species.



Fig. 210.—Mutilla occidentalis.
(Scarlet and black.)

There are several hundred species of Mutilla in the British Museum, many of which have not as yet been described. Among those that have received names I will briefly mention three. First is *Mutilla Klugii*, of Mexico, a very strange looking insect. Its head and thorax are black and covered with short hairs, while its abdomen is thickly covered with very long yellow hairs, so long and so thick that they make the insect look like a yellow brush with a black handle.

Mutilla cephalotes, i.e. the Big-headed Mutilla, is very rightly named. It has a head of enormous size in proportion to the body, and looking exactly as if it had been covered with black

silk velvet. The thorax and abdomen are also black, but upon the middle of the latter is a large patch of orange, and beneath it the abdomen is crossed by several bright yellow bars. This insect is a native of Brazil. Another of the large-headed Mutillas is one named *Mutilla capitata*, of Mexico. This insect is coloured almost exactly like our common wasp, and might be taken for a wasp were it not for its very large head.

An idea of the general appearance presented by the large-headed Mutilla may be obtained by inspecting the accompanying illustration, which represents *Mutilla armata*, a Brazilian



Fig. 211.—Mutilla armata.
(Black and yellow.)

insect. The ground colour of this species is black, and the light-coloured marks are white, taking a greyish hue on the head and thorax.

Now comes the remarkable genus Dorylus, to which a reference has already been made. The species which is here represented comes from Java. In this genus the abdomen is long and almost cylindrical, not in the least resembling that of Mutilla.

Members of the genus Dorylus are found in various parts of the world; and in the British Museum are very many species, some from Africa, some from New Guinea, some from Ceylon, and some from Palestine. Several specimens were taken at Ramoth-gilead. None of them have any brilliancy of colouring, the usual hues being brown, black, and dull yellow.

Although one of the largest of all the genus, the present species is in no way conspicuous, and presents no attractions

except to the entomologist. Its colour is brown-yellow, and the wings are transparent, but clouded with brown. The first of the two figures represents the winged male. Both in Africa and Java the male Doryli are known to be nocturnal in their habits, and, like many of our English insects, fly into houses at night, immediately making their way towards the lamp or candle which attracted them. The worker is very small in proportion to the male, as may be seen by reference to the line on the right of the illustration, which represents the average length of the worker. Its colour is nothing but brown, and



Male. FIG. 212.—Dorylus longicornis. Worker.
(Brownish yellow.)

only the peculiarly shaped head indicates its relationship to the Mutillas.

It is a very strange thing that the male should be quite a familiar insect, the worker tolerably plentiful, and not a female to be found anywhere. This difficulty probably arises from the great dissimilarity between the sexes, a phenomenon which is very common in the Mutillas. It is conjectured that the real female of this species may be an odd-looking creature which has been called *Dichthadia glaberrima*. This is a flattish, grub-like creature, about half as long again as the male insect, and having its tail curiously forked, something like the tail of a fish. Indeed, the whole creature looks very much like one of those mother-of-pearl fishes made in China and used as card-markers or counters. The name *Dichthadia*, which signifies something which is cleft or split in two, refers to this form of the tail; and

the word *glaberrima*, which signifies "very smooth," is given to it on account of the glossy and polished surface of the body.

Many systematic entomologists have formed the insects of which the *Thynnus Australis* is an example into a separate family under the name of Thynnidæ.

Why this name should be given to the insect, or indeed to any insect at all, is more than I can understand, inasmuch as the word *Thynnus* signifies the tunny fish, and ought never to have been foisted upon an insect. In this genus the male and female are so distinct that they have been described as two



Fig. 213.—Thynnus Australis. Male.
(Black and yellow.)

distinct species—the one as Thynnus, and the other as Myrmecoda. Indeed, had it not been for an opportune discovery by Mr. Lewis, the identity of the two insects would not even have been suspected. It is rather curious that another so-called Myrmecoda has turned out to be nothing but the female of a Scotæna.

The genus Thynnus appears to be exclusively Australian, and all of them have a very wasp-like look about them. The present species almost exactly resembles our common hornet, except that the dark portions are black instead of deep chestnut. They are all parasitic insects, feeding on the subterranean larvæ and

pupæ of certain moths. One species, *Thynnus Wallisii*, is most curiously coloured. The male is plain yellow-brown, but the female is covered with a tracery of fine black lines exactly resembling that heraldic bearing termed "vairy."

To judge from analogy, the sting of the female Thynnus must be really terrible. There is a little British species allied to Thynnus, and known as *Methoca ichneumonoides*. Mr. F. Smith has described and figured this insect in his "British Fossorial Hymenoptera," in which a minute and detailed description may be seen. He tells me that he has taken both sexes on the sands in several parts of our southern shores. It prefers the hottest part of the day for action, and the female runs about rapidly over the sands in a very ant-like fashion. If incautiously handled she uses her sting, and the effect has been likened to a red-hot needle piercing the hand. So, if so tiny an insect can inflict real pain, the sting of the comparatively gigantic must be even dangerous to life.



Fig. 214.—Thynnus Australis. Female. (Black and yellow.)

Mr. Westwood says that when touched or alarmed, the Methoca acts after the fashion of the Chrysis, and rolls itself into a ball, the abdomen being bent upon the thorax, and the head drooping downwards. Here, again, the two sexes are so different that they have been described as separate insects, the female retaining the name of Methoca, and the male being placed in the genus Tengyra, one of the Scolia group. It is no wonder that such a mistake should have been made, for no two insects can seem more dissimilar than the wingless and ant-like female which runs about on the sand, and the male which flies above her in the air. The female has short antennæ, a pear-shaped abdomen, and the thorax formed into three knots, just as if strings had been tied round it when soft. The male, on the contrary, is slender, long-bodied, has very long antennæ, and his thorax is continuous and not broken up into knots.

NEXT comes a small group of Hymenoptera called Scoliidæ. These insects are chiefly found in the hottest parts of the world, and the warmer the temperature the more plentiful are the Scoliidæ. In some of the genera which belong to this group, the females are without wings, like those of the Mutillas which have just been described. Two examples of the typical genus will be briefly described.

The first of these insects is called *Scolia flavifrons*, and inhabits the warmer parts of Europe. Its colour is black, diversified with four bold yellow patches on the abdomen. The front of the head is also yellow—a fact which has gained for the insect the specific name of *flavifrons*, i.e. having a yellow forehead.

As the habits of this species are very well known, they will be described as an example of the entire genus.



FIG. 215.—Scolia flavifrons.
(Black and yellow.)

When the female is about to prepare for a future brood, she begins by seeking some dry, sandy spot, and there digging a hole which is of considerable depth. There is one species, *Scolia bicincta*, which makes a hole at least eighteen inches deep. The hole being dug, the Scolia goes off in search of prey, and soon returns with a large larva, mostly that of a lamellicorn beetle. This she places at the bottom of the hole, and then lays an egg close to it.

The egg is soon hatched, and the young larva at once begins to devour the beetle-grub which has been placed there as food. The grub is always large enough to last the Scolia larva throughout its first stage of existence. When the larva has eaten the whole of its food, it prepares for its next change by spinning an

oval cocoon, in which it passes to the pupal and afterwards to the perfect state. This cocoon is a long oval in shape, tolerably alike at each end, but having at the upper end a sort of lid, which is pushed open by the newly-developed insect when it makes its way into the open air. Any of my readers who would wish to see these curious objects, can do so by visiting the Nest Room in the British Museum, where is a fine series of cocoons brought from Florence, most of them being cut open so as to show the method in which the inhabitant is packed up within them.

I believe that each species of Scolia chooses some particular insect as the food for its young, or at all events that it selects insects that are closely allied. The *Scolia bicincta*, for example, places a single large locust at the bottom of its cell; and some entomologists think that several species of this group do not dig burrows, but place their eggs in the nest of some Solitary Bee.

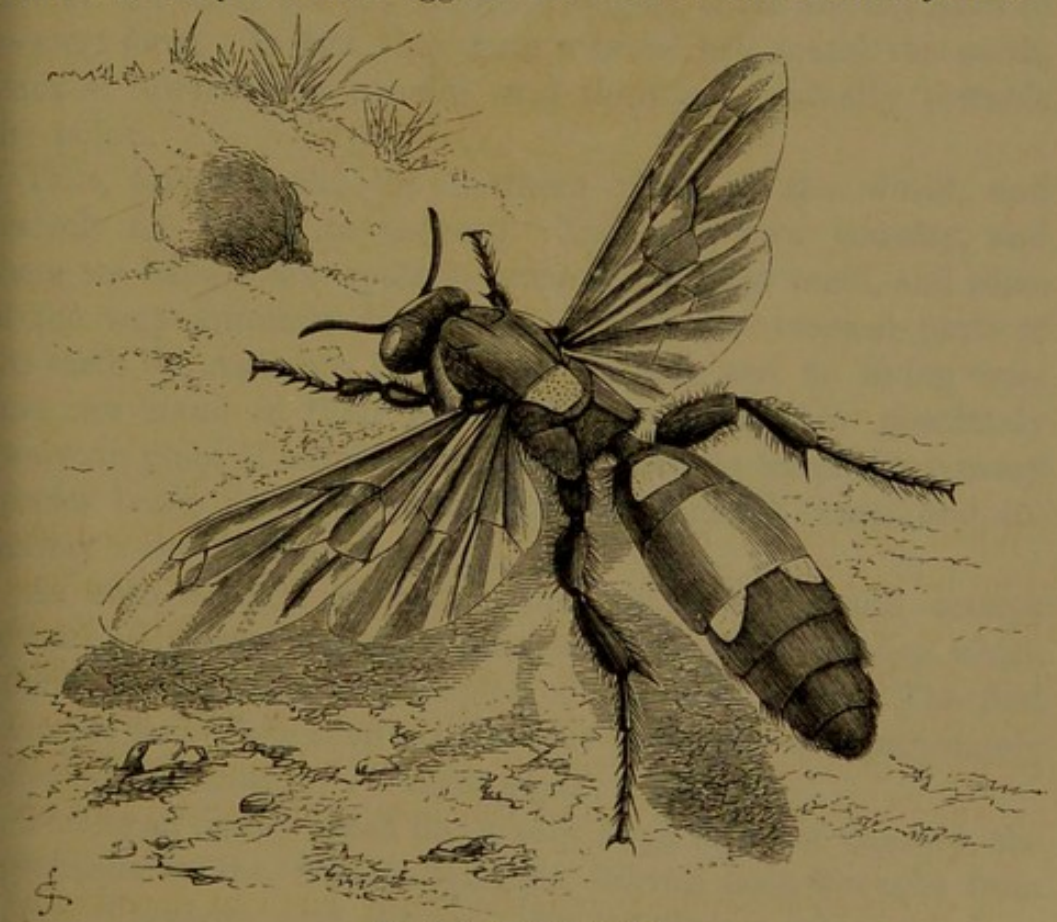


Fig. 216.—Scolia procera.
(Black and yellow.)

Many of the Scoliidæ are large insects, and the species which is shown in the above illustration is one of the giants of the

Hymenoptera. Indeed, its specific name, *procera*, which signifies something which is very much elongated, refers to its great size. It is drawn of its proper dimensions.

Even independent of its size, this is a really handsome insect. The body is black, with some patches of yellow arranged as shown in the illustration, and the bold and ample wings are rich shining black, glossed with dark and almost metallic green. The body is thickly clothed with dense furry hair.

CHAPTER IV.

FORMICIDÆ, OR ANTS.

THE wonderful insects which are known by the popular name of Ants are essentially creatures of the sun, even though, as in many cases, they are unable not only to endure his direct beams, but even to bear the ordinary light of day. Wherever on the face of the earth the sun shines strongest, there are the Ants in greatest force. In fact, they form a broad belt round the earth, thickest towards the equator, and thinning gradually towards the poles.

Take, for example, the northern parts of the world, and scarcely an Ant is to be seen. Take our own country, and there we have a few species—none large, most small, and some of the very minutest dimensions. But in the tropical parts of the earth the Ants are masters of the soil, and no living creature can stand in their path. Not only do they absolutely swarm in point of numbers, but they attain no small size—many species being as large as the common English wasp, and infinitely more formidable.

As even a slight sketch of the Ant tribes would occupy several volumes, it is necessary to select those species which afford the most salient examples of this vast group. The first example is the largest of all the Ant tribe, and is appropriately called *Componotus* (or *Formica*) *gigas*.

This is an insect which has a very large range of country, the specimens in the British Museum having been brought from India, Singapore, and Borneo. As the figures which are here given are drawn from measurement, the reader will easily see that the insect is a most formidable creature. It is distributed over a considerable part of the world, the specimens in the

British Museum having been brought from India, Singapore, and Borneo.

The three illustrations represent three of the forms of the perfect insect. The first is the winged male. The thorax is black and the abdomen brown, and in this, as in the female, the legs are slender and very long in proportion to the body. The second figure represents the winged female, which is very much larger than her mate, and has a much stouter and more rounded body. As is the case with our English Ants, the winged specimens only retain their wings for a very short time, breaking them off close to the body when they are about to settle down in life.



Fig 217.—Componotus gigas. Male. (Blackish-brown.)

The third figure represents the Soldier. This is nearly as



Fig. 218.—Componotus gigas. Female. (Blackish-brown.)

large as the female. The abdomen, it is true, is smaller, but this is compensated by the head, which is squared, and of

enormous relative size. This development of the head is necessary in order to afford attachment to the muscles which work the formidable jaws. A good idea of these weapons can be formed by inspecting the illustration, but their real power cannot

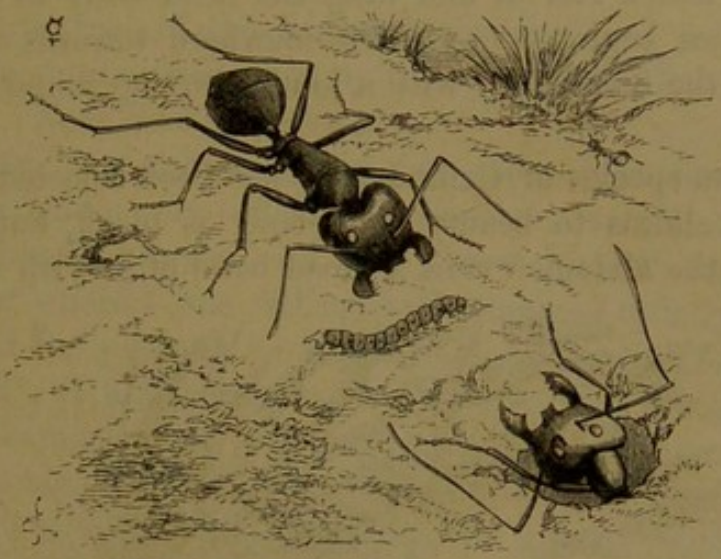


Fig. 219.—Componotus gigas. Soldier.
(Blackish-brown.)

be appreciated without the aid of a magnifying glass. They are flattened, and on their inner edge are covered with teeth, one long and sharp tooth projecting from the middle. The edges are yellow in all the sexes, and in the Soldier are exceedingly conspicuous.

There are many species of this genus, and all seem to possess similar habits. There is, for example, *Componotus compressus*, so called on account of the shape of the body, which is rather flattened. Respecting this insect, Mr. F. Smith gives me the following information :—

It is much smaller than the preceding species, and lives underground. It is one of the commonest of insects, and indeed is more plentiful than welcome in inhabited places. The workers act very much like those of our common Wood Ant, and are perpetually ascending and descending trees.

The soldiers are wonderfully combative in their nature, and fight so constantly and so fiercely, that an entomologist finds great difficulty in capturing a specimen which has not been more or less mutilated in battle. Indeed, it seems that two soldiers can hardly meet without having a single combat, when

a certain code of rules is as strictly observed as in the prize-ring of our own country. It often happens that one of the combatants kills the other, and in that case the body is at once seized by a number of little Ants belonging to the genus Myrmica, which run in and drag the dead body to their nests. This species begins to swarm somewhere towards the end of May, and the females fly with a loud whirring sound.

ANOTHER species of Componotus has been selected because it has some claims to beauty. Its body is black, but across the middle of the abdomen runs a broad band of greyish white hairs

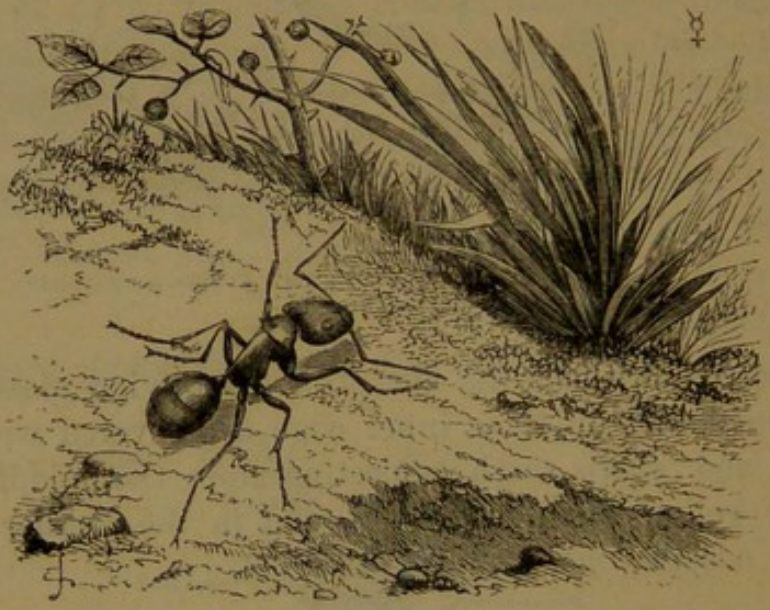


FIG. 220.—Componotus sericeiventris.
(Black, with white band on abdomen.)

having a peculiar silken sheen, which has earned for the insect the specific name of *sericeiventris*, or "silver-belly."

IN the various accounts of Ant life which have been narrated by observers, there is often an absolutely startling resemblance to the conduct of human beings. We have heard of Ants which make regular slave-hunting expeditions into the territory of less powerful Ants, carry off their captives, and make them their servants. We know of Ants which build walls and domed roofs, as if they had been taught by an architect. We know of Ants which have their milch kine, and which tend and guard them as carefully as any dairyman tends his cows. We know of Ants which cultivate the ground, keep it clear of weeds, sow the

future crop, and, when the harvest has come to maturity, get it in, just like human beings. In the history which now follows, a new and unexpected phase of human life is found to exist among Ants; namely, funeral honours paid to the dead, and burial in the earth.

In the "Journal of the Linnæan Society," vol. v. p. 217, is a singularly interesting communication by Mrs. Lewis Hutton, of Sydney, New South Wales:—

"One very hot and cloudless day, when not a breath of air stirred the leaves, my eldest boy (four years old), coming up from the beach fatigued and hot, threw himself on a grassy mound near where I was sitting, and remained quietly enjoying the rest and the pleasure he would have in showing to his sister the pretty shells and corals he had found. I was startled by a sudden scream, such as one only gives when in terrible pain. A snake was my first thought, and in horror I went to the child, but was at once reassured by seeing him covered with 'Soldier Ants,' on whose nest he had unwittingly laid down. Some of the insects still clung on with their forceps and stung my poor boy, who roared with pain at every fresh attack, while I killed them as fast as I could, assisted by the nurse. At length all were removed, about twenty being left dead on the ground.

"Going to see the little fellow bathed with something to ease the pain, I was absent about half-an-hour, and then returned to the same place, when I saw a number of the Ants surrounding the dead ones. Being fond of natural history, and having read much concerning the instinct of Ants, I determined to watch them closely. At last, four ran off very quickly, and I followed them until I saw them enter a hillock containing an ants' nest, which we had in vain tried to get rid of on account of the annoyance caused by their close vicinity to our sitting tent.

"They remained here about five minutes, when a number more came out two by two and proceeded slowly to the place where their dead companions lay. Here they seemed to wait for something, and presently we saw coming from the other side near the creek, a number surpassing those I had followed, and halting at the same place. Then two Ants took up one of the dead ones and marched off, followed by two others as mourners; then two others entered the procession with a second dead Ant, succeeded in the same way by another pair, and so on until

all the dead were taken up; a number of, I should think, two hundred bringing up the rear.

"Following the train, I found that the two empty-handed followers relieved their fellows in advance, the latter following behind in the place of those who relieved them, and thus continuing to alternate from time to time. They had now gone a considerable distance towards the seaside, when they stopped at a sandy hillock, where those who marched in the rear of the procession commenced operations by making holes; but I soon observed that only about half the number took part in this employment.

"When a sufficient number of graves had been dug, the dead bodies were laid in them, and I found that those Ants which had hitherto stood idle were deputed to cover them in. About six would not stir from their places, and on these the others fell and killed them, whereupon they made a single large pit at a distance from the other graves, into which all the six were put and duly covered up. The Ants then all paired off, and marched back to the scene of slaughter, where they remained together for a few minutes, when each company left for their own habitation.

"The observation of this curious proceeding gave me great pleasure, and I had frequent opportunities afterwards of seeing the insects act much in the same way. If one of the workers, however (who are much smaller than the rest), were killed, it was buried where it fell, and no friends attended the funeral."

The almost human aspects of Ant life are well known to entomologists. We have seen the rules of single combat strictly observed, and the still more remarkable fact that Ants bury the bodies of their comrades and attend the funeral. Another phase of humanity is to be found among those most remarkable insects,—namely, the power of utilizing other Ants to do their work for them; in fact, keeping domestic servants. And, as is the case with primitive civilization, these servants are slaves, yet are happy and devoted to the masters who stole them from their own homes. Not that they ever saw the home which was theirs by rights, for they are captured while still in the pupal state, and therefore know no other home than that of their masters.

The latter insects depend entirely on the slaves, and are

absolutely helpless without them. Those who have observed the manners and customs of these Ants say that the relative behaviour of the two species is most curious. The masters can scarcely even feed themselves, much less go in search of food. The experiment has been made of putting into a glass case a number of the master Ants, together with a portion of the nest, with food and all needful requisites. The Ants were ludicrously helpless, running about in a purposeless sort of manner, and not having the least idea what to do. After their incapacity had been proved, a single slave was admitted, when the whole state of things was changed. The slave—a mere dwarf among giants—treated the master Ants as a nurse would treat a number of children, fed them, and then began to rebuild the damaged nest.

The accompanying illustration depicts one of these slave-making species, *Polyergus rufescens*, one of the Ants being shown as carrying in its jaws the pupa of a slave. The relative size of master and servant is thus shown, the slave being scarcely larger than our common Red Ant. It is a European species, and is common in France. The jaws of this species are very slight and feeble, so that the insect is physically incapable of doing the work which generally falls to the lot of Ants who have to make their own nest, find their own food, and nurse their own young. Mr. Darwin makes much use of this phenomenon in his well-known work on the "Origin of Species."



FIG. 221.—Polyergus rufescens. (Red-brown.)

The following account of a slave-making Ant is contributed by Mr. W. H. Dale to the "American Naturalist," and is valuable both as showing that division of labour is employed among Ants, and that the slaves can be sent from one place to another by the order of their masters :—

"It was growing rather dark in the dense thicket, and I retraced my steps towards the beach. On my way I added

several other interesting birds (Momoti) to my collection, and one—a dark-coloured, sad-looking bird, which proved the greatest prize of all—being a new species, afterwards described by Mr. Lawrence as *Spermophila badiiventris*. Reaching the edge of the wood, I found a small brook between me and the sand. The banks, being low, were covered for several rods on the farther side with a succulent plant of the order Portulacacæ, with round leaves about half an inch in diameter. I noticed little well-beaten paths, about one inch wide, running all through this bed of green, and stopped to discover if possible what made them.

"Some were wider than others, and on one of these I soon discovered a foraging party of Ants. They were of two species, one being a rather small black Ant with weak jaws or nippers, and the other nearly twice the size, each bearing a formidable pair of prolonged mandibles of jaws; and as near as I could see there were no two with jaws exactly the same size or shape. The small ones were evidently slaves. They were marched between two rows of scouts, and if a slave attempted to pass the line, he was speedily seized and put back, not very gently, into his place. I watched their motions with a great deal of interest. The 'soldiers,' after searching till satisfied for a rich succulent leaf, bit it off and gave it to a slave, who immediately marched off with it in a contrary direction to the main body. Following the train for a rod or two, I came to the brook just where it had made an abrupt bend, with an eddy in it. Here the banks were rather high; a moderately brisk sea-breeze was coming from the shore, and just here a small tree about two inches in diameter had fallen across the brook. On this pole were myriads of Ants going in different directions.

"Those above, each with a leaf in his mouth, were crossing to the wooded side; those on the under-side were empty-handed (or mouthed) and were coming from the woods. Here I noticed a curious thing—the leaf, being larger by far than its bearer, acted as a sort of sail to catch the wind; and I saw many an unfortunate slave-ant, after struggling with all its might to save its precious load, finally let it go in self-defence, and immediately join the excursionists on the lower side of the pole, going back for another leaf. In the eddy before mentioned there was at least a bushel of leaves which had been blown from their bearers."

It is worthy of notice that in their slave-hunting raids the

master Ants always select the pupæ of the worker slaves. The slaves are not always of the same species, for the master Ant, which has been taken as an example, takes indifferently the pupa of *Formica fusca* and *Formica cunicularia*.

THE very curious nest which is shown below is drawn of its natural size, and is the work of an insect called *Polyrachis textor*, a native of Malacca.

The nest looks exactly as if it were made of coarse hair, and is of so open a texture that the inmates may be seen through the walls. Although the workers are tolerably common, the males are hardly ever to be seen, and the females are comparatively rare. The colour of the insect is black.



FIG. 222.—Polyrachis textor.
(Black.)

There are many species of this genus in different parts of the world. The generic name *Polyrachis* signifies "many-ridged," and is given to the insects on account of the projections which appear on various parts of their bodies. Perhaps the most remarkable species in this respect is *Polyrachis bihamata*, an insect which is found both in India and Borneo. The name *bihamata* signifies "double-backed," and is very appropriate. Upon the upper surface of the thorax are set two hooks, sharply pointed, curved backwards, and sloped almost exactly like the horns of the chamois. These are long and conspicuous, but are far surpassed by two other hooks which rise from the centre of the footstalk which connects the abdomen with the thorax.

These hooks are of enormous comparative size, each of them, if straightened, being about half as long as the entire body.

There are many species of Polyrachis, nearly all of which are black. There is, however, an exception in one of the species from Sarawak, which has the thorax and abdomen banded with yellow.

UNTIL lately it was thought that the only honey-makers were the bees, and no one would have been bold enough to say that honey could be obtained from any other insects. Yet we now know that there are honey-making wasps, building cells which are as capable of holding the liquid sweets as those of the bee; and here we have an example of an Ant, which not only makes honey, but stores it in a way which I believe to be unique. The bee and the wasp store the honey in cells composed of materials which will resist its action, but the Ants actually store the honey in their own bodies. This is done in a very remarkable manner.



FIG. 223.—Myrmecocystus Mexicanus. (Reddish brown.)

Certain of the workers are set aside for this purpose, and are bitten at the end of the abdomen. The bite causes an inflammation, the result of which is that the passages of the body are entirely closed. These insects are then perpetually fed with honey, none of which can escape, and the result is that their bodies swell to an enormous extent, assuming the shape which is shown in the illustration. This form is caused by the distension of the membrane between the segments. How great is the distension may be seen by reference to the illustration, the dark portions representing the segments, and the remainder the membrane.

These Ants are natives of Mexico, where they are very common, being popularly known either as "hormigas miêleras,"

i.e. honey-ants, or "hormigas mochileras," *i.e.* pouch-ants. They are in great request, and are sold by measure. One of the principal uses to which they are put is the manufacture of a sort of mead, the Ants being first pressed so as to squeeze the honey out of them. There is a bottle full of these strange insects in the British Museum.

The colour is like that of the common burrowing Ant, being reddish brown on the thorax, and darker on the abdomen. The honey-pot insects have a most curious look, the membrane of the abdomen being so thin and transparent that the honey can be plainly seen within the body. The generic name *Myrmecocystus* is formed from two Greek words, the one signifying an ant, and the other a bag or pouch.

THE insect which is here shown, although not quite the largest of the Ant tribe, is among the giants of the group. It is an inhabitant of tropical America, and is tolerably common.

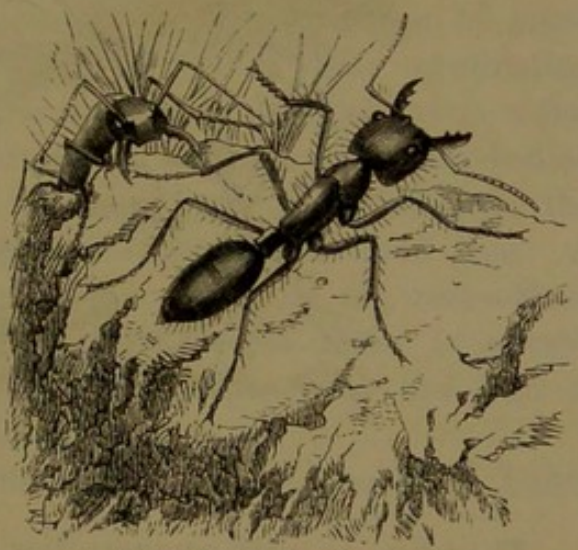


FIG. 224.—Dinoponera grandis. (Black.)

It is by no means a prepossessing insect in appearance, being of a dull, dead black in colour, and slow and sluggish in its movements. It lives in very small colonies, consisting of some six or seven individuals only, and the inhabitants of each colony do not seem to have any idea of working in concert. Their nest is generally under a stone.

Both the females and neuters possess stings, and the venom with which their weapons are armed causes such excruciating pain that the name *Dinoponera* is very appropriate. This name is formed from two Greek words, the former signifying "terrible" and the latter "wicked." In consequence of the virulent character of the poison, the Macoushie Indians employ the Ant in the manufacture of their celebrated Wourali poison. I do not believe that it has the least effect on the poison, the active part of which is purely vegetable. The body of this Ant

is nearly bare, only a few short hairs being scattered over it. The description is taken from a fine specimen in my collection, presented to me by the Rev. J. H. Bernau.

An allied species, *Ponera contracta*, has been discovered in England. It is widely spread, though not very plentiful. It is a very tiny insect, but yet has many of the habits of its gigantic relative, living under stones in small communities and not working in concert. The nest, like that of the Dinoponera, is found under stones or at the roots of plants.

THE insect which is here shown belongs to a group of insects which are popularly called Foraging Ants, on account of their singular habits.

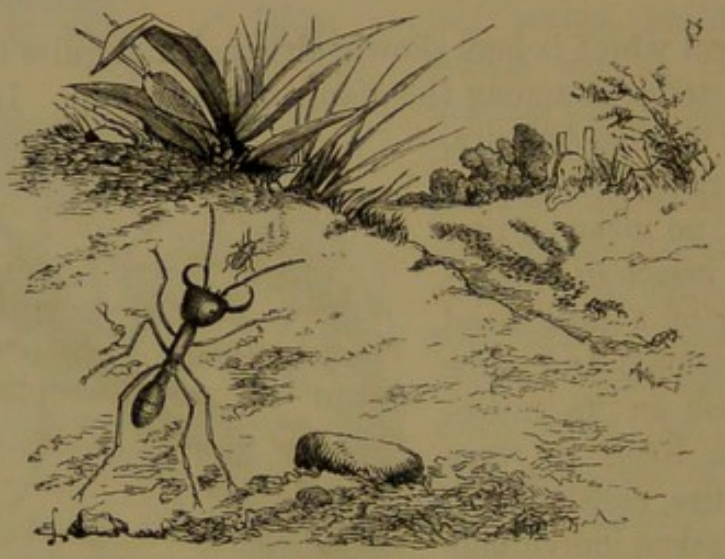


FIG. 225.—Eciton hamata.
(Reddish brown.)

They live in vast communities, and sally out in large armies in search of food. They are marshalled as regularly as if they were soldiers, and, as is the case with human soldiers, are commanded by officers. These officers are the large-headed neuters, one of which is shown in the illustration. Their legs are long and active, their bodies are slender, but their heads are of enormous comparative size, each side of the head being swollen into a semi-globular form. The jaws with which the head is armed are exceedingly formidable. Each jaw is nearly half as long as the body, is very sharply pointed, and is curved into a hook-like shape both inwards and downwards. Mr. F. Smith was kind enough to present me with a good series of these insects.

varying in size from the largest soldier to the smallest worker, which is no larger than our Red Ant.

Mr. Bates gives a very graphic account of this insect and its predatory excursions. He states that a column of Foraging Ants is of very great length. One column that he saw must have been at least a hundred yards in length, because the portion that was visible was from sixty to seventy yards in length, and neither end of the column could be seen.

"The large-headed individuals were in proportion of about five in one hundred to the small individuals, but not one of them carried anything in its mandibles; they were all trotting along outside the column, and distributed in regular proportions throughout the whole line of army, their globular white heads rendering them very conspicuous among the rest, bobbing up and down as they traversed the inequalities of the road.

"The progress of these Ants is not in one simple line when on a foraging expedition, but a line with many branches; a column is occasionally pushed out in the direction of some promising locality. I once observed one of these terminating at a decayed fallen tree. The Ants were busy about it, a few having seized some large Formicidæ, and also some soft-bodied wasps. These they tore in pieces and divided the load; the whole party then retired, and re-entered the main line. A branch column is not a party separated from the rest—there is no break in the lines of the Ants—but there is always a number passing and re-passing, keeping up the line of communication."

Mr. Bates gives also an account of another species, *Eciton prædator*:—

"This species of Eciton differs from all the others in its habits: instead of foraging in narrow columns, it hunts in dense masses of myriads of individuals. Nothing in entomology is more curious than to watch the vast compact body moving rapidly along; when they pass, all the rest of the insect world is in agitation and alarm. They stream along the ground, and climb to the summit of all the lower trees, searching every leaf to its apex. When they come to a mass of decaying vegetable matter, they cover it with a living crowd, penetrating every chink and cranny; then leave it, and rapidly move on.

"All apterous insects, especially fat spiders and larvæ of

Blattæ, which latter are excessively numerous about the fallen foliage, scamper off before the rapidly moving mass in quite a ridiculous manner. The smaller larvæ of Lepidoptera and Diptera fall an easy prey to them, as well as some of the large obese species of the genus Formica.

"The phalanx altogether, when passing over a tract of open ground, occupies a space of from six to ten square yards. On examining them closely, they are seen to move not altogether in one uniform direction, but in variously spreading dense columns, now separating a little from the general mass, now re-uniting with it. The margins of the phalanx spread out at times, like a cloud of skirmishers from the vast army."

The Ecitons do not restrict themselves to the open air, but penetrate into houses, where they exterminate every living thing. My brother has had much experience of these visitations, and the following passage is an extract from one of his letters:—

"You mention what I told you in relation to the Ants and cockroaches. The time when I wrote to you on the subject was my first experience of the Ant, but since then I have seen the same game every year since I have lived in this country. The performance always takes place just before the commencement of the rainy season, at which time the Travelling Ants commence their marches. Wherever they make their appearance, every living thing bolts (not that they are frightened, but that their business engagements carry them elsewhere in a hurry) as fast as the number of legs given them will permit.

"The first sign of the approach of the Ants is a peculiar rustling, which sounds like a few dead leaves in an eddy of wind. Then a big cockroach, in size and colour like a large date, scuttles across the floor, and about a yard behind him comes one little Ant about a sixth of an inch in length. One's first impression is that the cockroach is a great coward, but his conduct is soon explained, for from every hole and crevice on all sides of the house pour continuous streams of Ants, until the whole floor is black with them.

"Then our friend's fate is sealed. It is no avail to him that he is many hundred times bigger than his enemies; they fasten on him in a body, and in a few minutes no sign of a cockroach is visible. As a rule, these Ants go through every part of a

house; and when they leave it, which is in one or two hours after their first appearance, no vermin of any description remain in the house. Rats, snakes, cockroaches, spiders, scorpions, and even fleas, all are gone, and for a month or two there is peace in the house."

These Ants not only devour the insects that go by the popular name of vermin, but attack every insect that may come in their way. They have been seen to capture the nests of the large and formidable wasp which hangs its nest from the Brazilian trees; and once Mr. Bates saw a column of Ecitons deliberately attack a nest of a great burrowing Ant, sink a shaft into it, and then pour into it by thousands. They tore out the inhabitants from their home, and were so fierce and bold that when Mr. Bates tried to catch some of the burrowing Ants for his collection, the Ecitons tried to pull them out of his fingers. This species was *Eciton legionis*, which always forms in a broad column when on the march, and not in a long narrow column.

Although the insect which is scientifically termed *Atta cephalotes* looks even more formidable than the Ecitons, it is not to be



Fig. 226.—Atta cephalotes.
(Reddish brown.)

dreaded as a foe. As we shall presently see, it is a most annoying insect, and often does great damage to the property of man, if not to his person. The native name of this insect is Saüba, and it is popularly known by the name of Umbrella or Parasol Ant, on account of a curious habit which it has of carrying

pieces of leaves in its mouth. Whole columns of the Saüba Ant march deliberately along, each with its leaf held over its head like Malcolm's soldiers at the wood of Dunsinane. These leaves are employed in house-building, and are used after a very curious manner.

The nest of the Saüba is partly above ground, though the greatest portion of it, including all the tunnels, is below the surface of the earth. The visible part of the nest consists of a dome, seldom more than two feet in height, but often reaching forty feet in diameter. This dome is really formed of the leaves, the superincumbent earth being of slight thickness. It is a curious fact that the workers who fetch the leaves do not build with them, but merely lay them down and go off for more. In fact they are to the real nest-builders exactly what labourers are to bricklayers. Two figures of the Umbrella Ant are given in the illustration, one showing the front of the head, and the other the entire insect. The latter figure is a portrait of a specimen in the British Museum, which has preferred to die rather than loosen its hold of the leaf.

Large as the nest is, the dome forms but an inconsiderable portion of it. Vast tunnels radiate from it in all directions, and are carried to distances that seem almost incredible. The Ants work away underground, leaving no signs of their passage, and have a way of suddenly coming to the surface when least expected. My brother has sent me an account of a serious damage that was done to a gold-mine by the Travelling Ant, as he calls it. In mines where the gold is extracted from quartz-rock, the ore is obtained by driving galleries which are nearly horizontal. These galleries are supported by timber both at the sides and on the roof, and a tramway runs along the floor for the purpose of conveying the ore to the stamps. Last year (1872), during the wet season, the mine was suddenly flooded in spite of all the precautions that had been taken, a torrent of water pouring through the galleries with such force that the supporting timbers gave way, and the sides closed in so much that the cars could not pass over the tram.

On examination it was found that this misfortune was caused by the Saüba Ant, which had driven one of its tunnels completely into the gallery, and so diverted a large amount of surface drainage into the mine. A professional ant-killer was

sent for from a considerable distance, and the extirpation of the nest decreed. It may seem strange that there should be such a profession, but the local circumstances make it needful.

The process of extermination is a very curious one. In the first place, the ant-killer has to find the nest itself—a task which requires the greatest knowledge of the subject. Having found the dome which has been already mentioned, he builds round it a sort of large vaulted edifice, something like the snow hut of an Esquimaux. This oven is then filled with charcoal, sulphur, capsicum, and wood, both dry and green, through an opening at the top of the dome. The oven is then finally closed, with the exception of several small apertures which are made around it.

Fire is then introduced, and a number of negroes are set to work, each with a large pair of bellows, the nozzles of which are thrust into the apertures already mentioned. They never cease from blowing night or day, and on an average the operation is not complete until they have laboured for four days and as many nights. Meanwhile, the ant-killer is on the watch for smoke escaping from the ground, and wherever he sees this he knows that he has come upon one of the galleries. The place is at once marked and the aperture stopped with clay. In the present instance the nest was found upwards of eighty yards from the mine.

After the four days' work the negroes cease their labour, the oven is taken down, and the nest opened. Guided by the marks which he has made, the ant-killer lays open the whole of the tunnels, and, after taking care that not a living creature remains in them, he fills them as well as the nest with clay, which is well stamped down and left to harden in the sun. Then, and not until then, is the place considered safe.

It will now be seen how detrimental a neighbour the Umbrella Ant may be, even though it does not attack man personally. Here is a case where a mine was thrown out of work for many days, the whole of the timbering had to be replaced at no small expense, and the ant-killer paid very highly for his trouble. I have heard of another instance where the Saüba Ant drove its tunnel through the bank of a reservoir and let out all the water.

The sizes of the insects belonging to the same nest vary greatly, some being nearly as large as our common wasp,

while others are scarcely as large as the common Red Ant of our garden. There are two distinct kinds of the large-headed neuters, one with smooth and the other with hairy heads. These latter insects seldom make their appearance in the open air, and the only way to evoke them is to break a hole in the dome and push a stick down the hole as far as possible. In a few minutes a few of these creatures will come slowly up, looking, as Mr. Bates says, like Cyclops, with their big head and the eye in the middle of the forehead. Why they should make their appearance is not very evident, for they seem to have no connection with or control over the workers. Neither do they fight, for Mr. Bates found no difficulty in securing several of them with his fingers.

The general colour of the Saüba is reddish brown, the colour being brightest on the head and dullest on the abdomen, where it is obscured by a coat of dull brown hairs. The wings of the perfect male and female are very much like those of the hornet, being firm, transparent, shining, and of a reddish brown, fading to yellow towards the tips. There are very few nervures.

We are all familiar with the passage—

"Go to the ant, thou sluggard; consider her ways, and be wise: which having no guide, overseer, or ruler, provideth her meat in the summer, and gathereth her food in the harvest."—Prov. vi. 6—8.

Many a time have we heard it said that Solomon was entirely wrong, and that the Ants, being essentially carnivorous, lay up no store for the winter, but become torpid until the same weather comes round again. Now this is all very true as regards the Ants of our own climate, but it is not true of Ants belonging to other countries. At the date of this book, at least nineteen species of Harvesting Ants have been discovered, some of which inhabit Palestine. I believe that no English Ant has been known to lay up seeds. The Black Ant was once seen to carry some fresh violet seeds into the nest, but they were all ejected on the following day.

The history of the present species has been admirably given by Mr. J. T. Moggridge, and for nearly all of the information here given I am indebted to his most interesting work on Ants and Trapdoor Spiders.

This species is spread largely over the world, and is well known at Mentone. It gathers seeds of various kinds and takes them to its subterranean treasure-houses. The burrows run to a considerable depth, sometimes passing even through sandstone rock, and at intervals are placed the granaries, which are about as large as a gentleman's watch. They vary in point of depth from the surface, some being fully thirteen inches deep, and others barely two inches. Among the seeds which the Mentone Ants take into their granaries are those of the oat, nettle, speedwell, goosefoot, calaminth, chickweed, amaranth, and shepherd's purse. They even take the green seed-vessels of the last-mentioned plant, twisting them off neatly with their jaws.



Fig. 227.—Aphenogaster barbata. (Black.)

They are very fastidious as to the quality of the seeds which are brought. A worker, which was evidently but a young one, was seen to bring in some rubbish instead of the proper seed, and was at once sent back. Mr. Moggridge played a trick upon them by placing little beads in their way; at first they took them for seeds and carried them into their nests, but they soon found out their error, and never touched them again.

With regard to the condition of the seeds, Mr. Moggridge has the following remarks:—

"It is extremely rare to find other than sound and intact seeds in the granaries, and we must conclude that the Ants exercise some mysterious power over them which checks the tendency to germinate.

"Apparently, it is not that moisture or warmth or the influence of atmospheric air is denied to the seeds, for we find them in damp soil, in genial weather, and often but a trifling distance below the surface of the ground, and I have proved that the vitality of the seeds is not affected, by having raised

crops of young plants, such as fumitory, pellitory, *Polygonum aviculare*, and grasses, from seeds taken out of granaries.

"I have frequently remarked that it is the seeds last collected before a fall of rain which are brought out in a sprouting condition from the nest; for I have observed that it is these which are carried out from the nest and placed to dry after a wet night. And so, in the case of a nest which I kept in captivity, when a variety of different seeds had been successively supplied to the Ants, it was the cabbage, lettuce, and chicory seeds given the day before the nest was watered, that reappeared after being carried below, and not the hemp, canary, and mixed seeds of wild plants previously strewed on the nest.

"It seems possible that the process, whatever it may be, to which the Ants submit the seeds which are to remain dormant, may require some time, and the construction of the granary chambers is doubtless a long affair; so that when unusually large supplies of grain, &c., are brought in by the workers, some part of them may not find the necessary accommodation and attention.

"When the seeds do germinate in the nests—and it is my belief that they are usually softened and made to sprout before they are consumed by the Ants—it is very curious to see how the growth is checked in its earliest stage, and how, after the rudicle or fibril—the first growing root of dicotyledonous and monocotyledonous seeds—has been gnawed off, they are brought out from the nest and placed in the sun to dry, and then, after a sufficient exposure, carried below into the nest.

"The seeds are thus in effect *malted*, the starch being changed into sugar; and I have myself witnessed the avidity with which the contents of seeds thus treated are devoured by the Ants."

It seems almost a pity that creatures possessing such excellent qualities should be thieves, but thieves they are—robbing not only the nests of other insects, but those of their own species. In the course of these raids there are always severe combats, often terminating with loss of life. The antennæ being the most sensitive portion of the Ant, each combatant uses its utmost endeavours to seize one of the antennæ of the opponent, and when that is done the enemy always succumbs. Should, however, both parties succeed in evading the fatal grasp, they fight

until one or the other is killed. They are not at all particular as to their food, eating grasshoppers, flies, bees, wasps, and even lizards when they can assemble in sufficient numbers. Mr. Moggridge gives an interesting account of a struggle between the Harvesting Ants and a caterpillar :—

"I was once a witness of a singular contest between a soft-bodied, smooth, greyish caterpillar, about an inch in length, and two medium-sized *barbara* Ants. The Ants were mere pigmies in comparison with their prey, for as such I believe they regarded the caterpillar, but they gripped its body with set mandibles, showing the most savage determination not to lose their hold.

"When I first discovered the group, the war was being waged in a tuft of grass over one of the entrances to the Ants' nest, and the caterpillar was striding along the leaves, and thrusting itself between the culms in the hope to shake off or brush away its little persecutors. From time to time the caterpillar would turn viciously round and endeavour to pluck away its assailants ; but though it actually succeeded in stripping, by means of fore-legs and mouth, five of the six legs of one of the Ants, which was within its reach, they never loosened their hold.

"At length, a chance movement of mine shook the grass-leaf on which they were, and Ants and caterpillars rolled together down a steep and rocky slope to about four feet distant. They tumbled over and over several times, but still the Ants gripped their prey as firmly as ever.

"The last endeavour of the giant victim was to rub off the Ants by burrowing into the soil ; but on uncovering its retreat I saw that their position was still the same. After watching this struggle for twenty minutes, time failed me, and I returned home, carrying with me, however, the combatants. When on my return I opened the box in which they were imprisoned, these bull-dog Ants were clinging with mandibles locked as firmly as ever ; and now as I write, in death they are clinging still, drowned in a sea of spirits of wine."

From the observations of Mr. C. Horne, it appears that an Indian species of Ant, *Podomyrma rufonigra*, has a similar habit of storing up grain, carefully removing the husks. The grain is called by the natives *jarroon*, or sweepings ; and it is stored in such quantities that in time of famine the granaries of the Ants

are ransacked, and both the grain and the husks ground together into a coarse meal.

THE fine Ant which is here shown was first described by Mr. F. Smith, of the British Museum, in 1858. As may be seen, it is almost equal in size to *Componotus gigas*, the wings being ample and the body thick and rounded. The head is small in proportion to the rest of the body. The colour is shining black,



FIG. 228.—Carebara dux.
(Black.)

the polish being especially conspicuous in a broad belt round the abdomen. It is a native of Southern Africa.

WE have already seen that the Ants partake of many human characteristics,—how they make war with duly officered armies, take captives, employ slaves, fight single combats by rule, gather grain and harvest it. We have now to deal with an Ant that possesses another characteristic of humanity, and that is, the power of agriculture. Scientifically the insect is known as *Myrmica barbata*, and popularly as the Agricultural Ant of Texas. The habits of this wonderful insect have been carefully watched by Dr. Lincecum, who has recorded them in a paper read before the Linnæan Society in 1861.

The insect begins by digging a hole in the ground, by way of a wicket-gate or entrance, and around this hole it raises a mound, generally about five or six inches in height, and from six to eight feet in diameter. Sometimes, if the nest be made on low ground, where there is a probability of inundation, the Ant

raises the mound to a height of fifteen or twenty inches, and in any case gives the surface a slight slope from the centre to the circumference. Around this mound the Ant clears the earth from stones and weeds, so as to make a perfectly smooth belt of a foot or two in breadth.



Fig. 229.—Myrmica barbata. Male. (Yellowish brown.)

Within this space the Ants plant the seeds of a peculiar grass, and tend them as carefully as any human agriculturist could do, cutting down every weed that may make its appearance, and watching it until the seed is matured. When ripe, the grain is small, white, and very hard. The Ants then cut it down, and carry it into the subterranean galleries, where it is separated from the husks, which are thrown outside till cultivated anew. Sometimes when the rainy season has been more than usually long, the grain becomes damp, and in that case the Ants take advantage of the first fine day, carry the seed into the open air, and spread it to dry in the sunbeams. When dry it is taken back to the granaries; but those seeds which have sprouted are rejected, and thrown away among the husks.

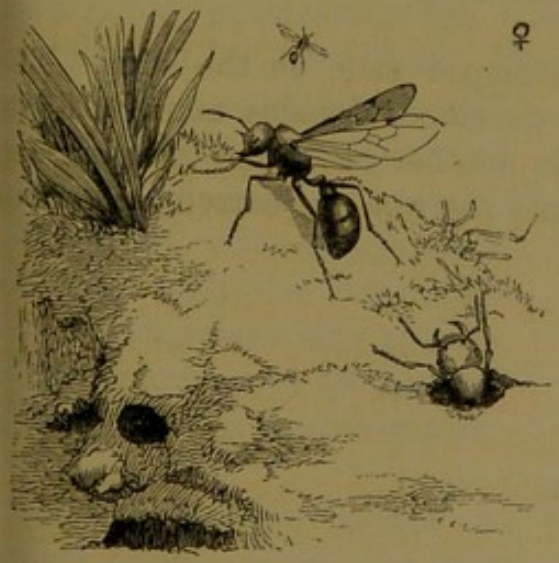


Fig. 230.—Myrmica barbata. Female. (Yellowish brown.)

Dr. Lincecum watched these Ants for more than twelve years, and never saw them plant any seed except that which has been mentioned. He also records another curious instance of instinct, or, perhaps, of reason. At first the nests were made freely

within an orchard. But after a while the orchard was opened to cattle, who naturally ate the succulent grass-grain which the Ants had planted. Finding this to be the case, the Ants abandoned the orchard, and took to making their plantation in the garden and other spots where the cattle could not disturb them. The crops generally spring up about the beginning of November.

There are many specimens of these Ants in the British Museum. Their colour is yellowish brown. The first of the illus-



Fig. 231.—Myrmica barbata. Workers. (Yellowish brown.)

trations represents a fully developed male on the wing. The second shows one of the fully developed females taking a flight at their swarming-time, while another is leaving the burrow. The third illustration represents the workers carrying seeds to the granary.

CHAPTER V.

POMPILIDÆ, SPHEGIDÆ, AND BEMBECIDÆ.

The insects which are placed under the titles which are at the head of this chapter are popularly known under the general title of Sand Wasps. They are so called because the females dig holes in any earth, generally of a sandy nature, and place therein the insects on which their future young are to be fed. We have plenty of them in this country; and any observer of Nature must have seen and admired their industrious energy as they pursue the task which is the one object of their lives.

The Pompilidæ are among the very fiercest of insects, and have among them some of the largest of the Hymenoptera. I have not the least idea why this name should be given to insects, as it rightly belongs to a fish which follows ships, probably the "rudder-fish" of the sailors. The word literally signifies "an escort," whence our word "pomp," on account of the number of attendants required by a person of high rank when on a journey of state. All the Pompilidæ have the legs very long and the abdomen oval and attached to the thorax by a short footstalk.

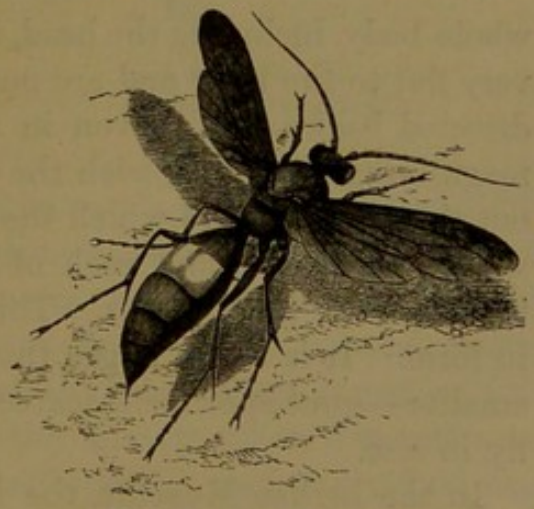


Fig. 232.—Pompilus atrox.
(Black, with orange patch on abdomen.)

The fine insect which is called *Pompilus atrox* has long been known to be a native of North America, but specimens have lately been discovered in Japan. The colour of the head, thorax, and abdomen is shining black, but towards the base of the abdomen there is a bold

patch of orange. The wings are brown, firm, and with a highly polished surface. Formerly, this insect was called by the specific name of *tropicus*, but it is now known that this name belongs rightly to a smaller species also from North America.

In all insects there is a very great difference between good and bad specimens, and sometimes the difference is so great that they hardly seem to belong to the same species. This is peculiarly the case with the insect which is called *Pompilus Gravesii*. A specimen in bad condition betrays no beauty of colour, but looks simply of a dull yellow brown, with a few spots of a golden hue when the light shines upon the more projecting portions. But a specimen in really good condition is a splendid insect, looking just as if it had been cut out of pure gold. Mr. F. Smith tells me that the late Mr. Cuming had some thirty specimens, and their appearance as they were massed together in the box was simply gorgeous.

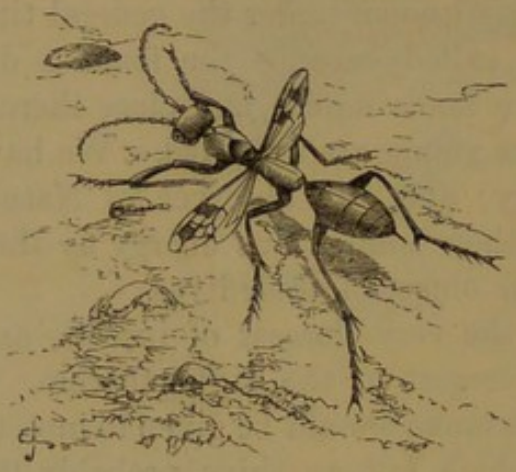


Fig. 233.—Pompilus Gravesii. (Shining gold.)

This golden lustre is given by the hairs with which the whole body, including the head, is thickly covered. The hairs lie very flat to the body and are nearly parallel, all the points being directed backwards. Even in the imperfect specimens a good magnifying glass will, with the assistance of a strong light, bring out the golden lustre which the unaided eye cannot detect. The wings are yellow, and each of the upper pair is marked with two squared black spots. This insect is exceedingly variable in form. It is never larger than the figure, but is often much smaller—some specimens scarcely exceeding the common house-fly in size.

In the British Museum the insect appears under the generic name of Parapompilus, Mr. F. Smith having comprised under that title all the short-winged Pompili. The name *Gravesii* is rather an unfortunate one, because it expresses nothing of the characteristics of the insect. The name *speciosus* had been

suggested, but in the meanwhile the insect had been described under the name of *Gravesii* in honour of the name of the captain of the ship in which the insects were brought to England.

BEFORE the discovery of the last-mentioned insect, *Pompilus nobilis* was by far the most beautiful of the family, and, just as that insect glitters with gold, so does this one shine with silver. A good specimen looks, indeed, just as if silver leaf had been laid upon it and rubbed smooth with a burnishing tool. This silvery gloss is produced by a coating of very fine silvery hairs, set like the pile of velvet, and therefore called "pile" to distinguish it from ordinary hair.

There is scarcely any insect which shows so plainly the distinction between a specimen in good condition and one that is damaged or has suffered by careless handling. There are several specimens in the British Museum, and of them all only one shows the silvery surface perfectly, the rest looking almost black, with a faint silvery patch here and there. It is astonishing how easily the beauty of a specimen may be marred. One very fertile source of damage is re-setting. When an insect has been badly set or not set at all, it is necessary to relax the stiffened joints by damp, and then to place the wings and limbs in their proper position. Sometimes too much moisture is used, and then the surface of an insect is often damaged. Hairy insects suffer most in this respect, as the hairs become matted together and so lose their lustre. In such an insect as this, therefore, where the whole of the silvery sheen depends upon the way in which the light is reflected by each individual hair, it is evident that the least undue amount of moisture must do very great injury, and in all probability destroy the lustre for ever. Perhaps the sheen might be restored by soaking the insect completely in spirits of wine, and then drying it by

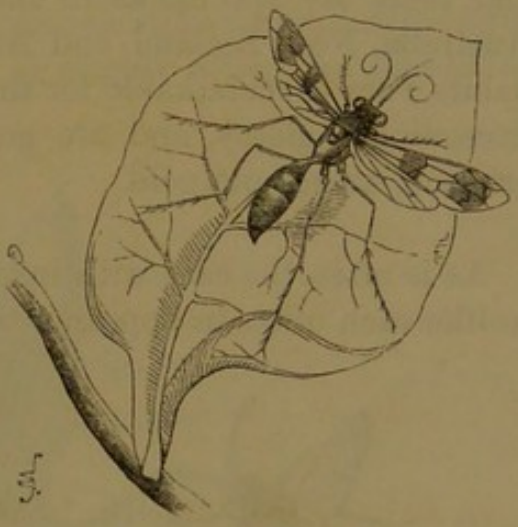


FIG. 234.—Pompilus nobilis. (Black, silver-glossed.)

means of a strong current of air directed against the set of the hairs. In this way I have succeeded in restoring the beautiful downy softness of our Goat Moth, and the furry richness of the humble-bees and similarly adorned insects. In the British Museum insects are relaxed by placing them in a closed earthenware vessel containing about half an inch in depth of damp sand; and the late Mr. Doubleday used to attain the same object by placing the insects in a large flower-pot sunk into the ground.

The wings of this species are very much like those of the Ant Lion in colour, being firm, shining, and transparent, with two patches of dark brown on the upper pair and two similar patches of very pale brown on the lower pair.

This genus is spread over a very large portion of the world, and there are specimens in the British Museum from Europe, Australia, New Zealand, and America. One species which inhabits Pará is remarkable for the beauty of its wings, which are exceedingly glossy, and are gorgeous with the most brilliant crimson, azure, and gold.

As is often the case with insects, the sexes of this genus are so unlike each other in appearance that they might easily be taken for two distinct species. The chief difference lies in the antennæ, which in the female are simple, long, and boldly curved at the ends. Those of the male, however, one of which is drawn in the illustration, are nearly straight and most elaborately formed, each joint looking very much like the head of a trident. Indeed, if we take the conventional Neptune's trident with its spear-headed point, and cut away three-fourths of the central prong, we shall have a very good idea of a single joint of Ctenocerus.



Fig. 235.—Ctenocerus ramosus. (Black; wings yellow, edged with brown.)

Each prong, so to speak, is slightly bent downwards, and they are so arranged that when the antenna is seen sideways it looks like a flattened strip of yellow horn, covered with an embossed pattern and pierced with a double row of holes, the holes being

in fact the spaces left between the successive joints, the prongs being so long that the point of one would be nearly three-fourths of the length of the one immediately above it. Both names of this insect are very appropriate. *Ctenocerus* is formed from two Greek words, and signifies "comb-horned;" while *ramosus* is Latin, and signifies "branched."

The wings of this species are shining yellow, edged with a dark brown band, which is wide at the tips, and narrows rapidly towards the base. The body and wings are quite black, and on the thorax there is a dense covering of thick black hairs. There are three species in the British Museum, and this, which comes from Southern Africa, is by far the handsomest and largest. The antennæ of the male are much yellower than those of the female.

THE fine insect which goes by the scientific name of *Mygnimia avicula* comes from Java, and is closely allied to *Mygnimia*



FIG. 236.—Mygnimia avicula.
(Black; wings with a silvery white spot.)

ducalis, a native of Penang and India. It is shown of the natural size, and probably derives its name of *avicula*, or "little

bird," from its great size. The colour of the head, thorax, abdomen, and legs is dead black, with a slight scattering of white like hoar-frost. The wings are also black, and in the upper pair there is a large white spot with a silvery lustre when viewed by a side light. The lower wings are not of so deep a black as the upper pair, and they have no spot.

The reader will notice the structure of the claws, each of which has a bold tooth-like projection in the midst of the inner side. It has been suggested that this tooth is intended to aid the Mygnimia in catching its prey; I can, however, scarcely accept this theory, because the Pompilidæ do not seize their prey by the claws, but by clasping it in their legs, and so holding it while the sting is brought to bear. The wounded insects are also carried off in the clasped legs, and are never grasped by the claw itself, which is comparatively feeble.

Another species of the same genus, *Mygnimia aspasia*, has derived its specific title from its beauty, the name of Aspasia



Fig. 237.—Mygnimia aspasia.
(Black, glossed with blue.)

being that of the very beautiful but not at all moral lady who taught eloquence at Athens and numbered Socrates among her pupils. This species has been found in Dory, Amboyna, Arú, and one or two other localities.

Though not so large as the preceding insect, it is a handsome species, for whereas the former species is entirely black with a single spot of white on each wing, the present species is strongly glossed with blue. This effect is obtained by means of a soft, velvet-like pile, which even extends to the head. The wings are transparent and yellow, while the nervures are rust-red, becoming black at the base. There is a slight pale brown border to the wings. The legs, especially the hind pair, are armed with a number of bold tooth-like spines, thereby contrasting with those of the previous species, which are unarmed.

THE magnificent insect which is here shown is one of the largest of the Hymenoptera, and is very handsome, not only

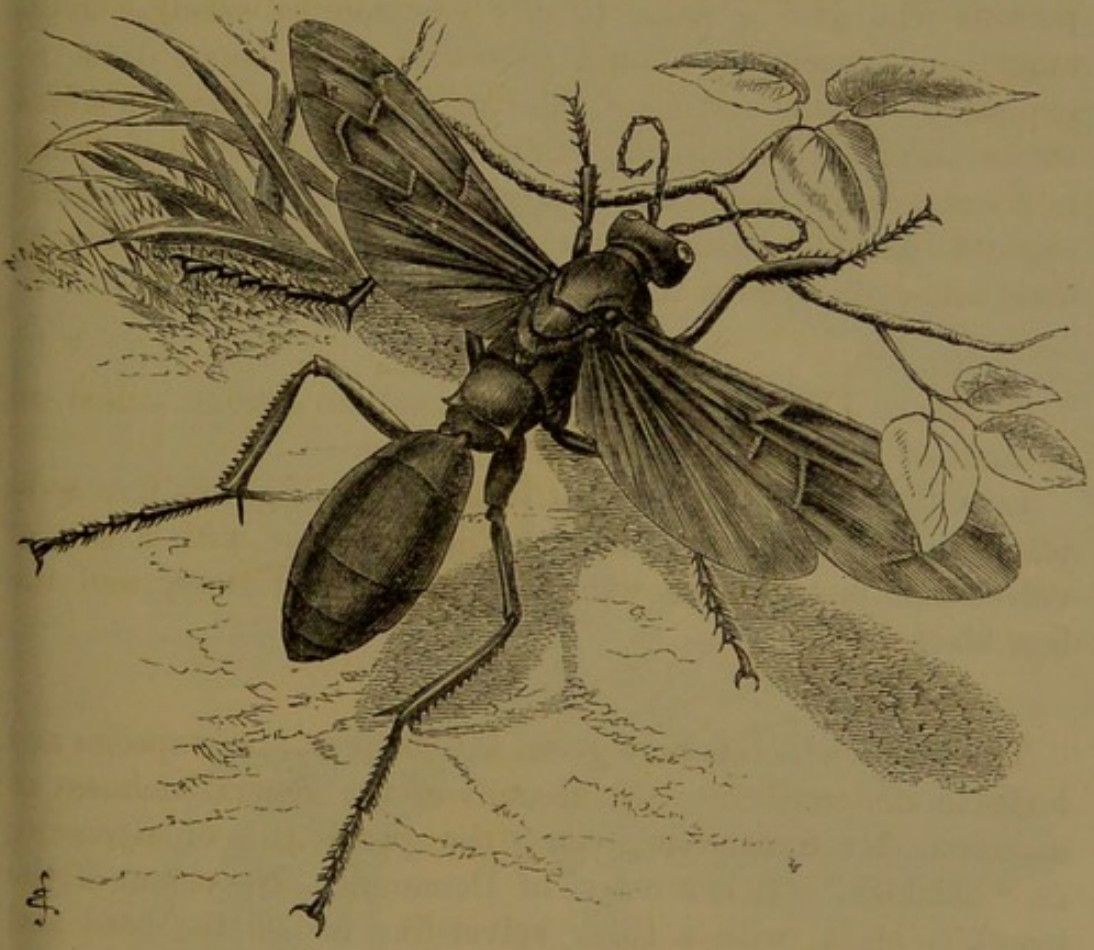


FIG. 238.—Pepsis elevata.
(Black-green.)

on account of its size, but by reason of its splendid colouring. Like many insects, the colouring is so deep that a very strong light is required in order to bring out its beauties, and, if the

light be insufficient, the whole of he tissues appear to be dull velvety black. In point of fact, the eal colour of the head, thorax, abdomen, and legs is Prussian green, so deep and rich that at first sight the insect will probably be set down as a black one. The wings are shining brown, and the antennæ are black for half their length, and yellow for the remainder.

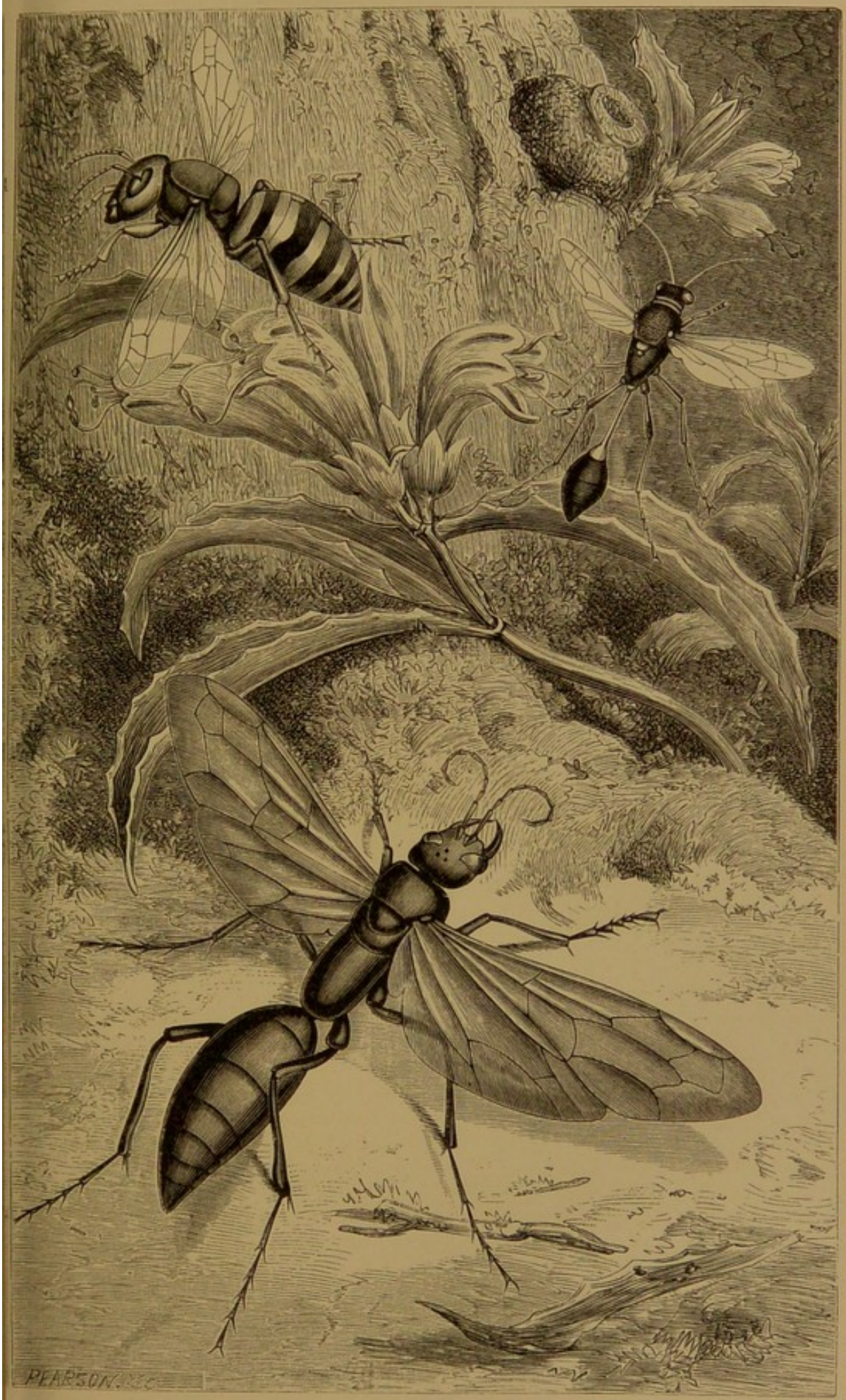
The reason for giving the name of Pepsis to these insects is to me one of the many insoluble mysteries in connection with insect nomenclature. The word *Pepsis* is Greek, and primarily signifies "digestion" or "concoction," and when used in reference to wine it signifies "fermentation." The term is familiar to most persons in forming part of the word "dyspeptic," *i.e.* difficult digestion. I very much wish that all persons who give a name to any new species, whether it be animal or vegetable, should be bound at the same time to explain that name and state their reasons for giving it; and I should like to abolish, once and for all, the custom of giving to a new species the name of any human being. Every name ought to designate some characteristic, and that can never be done under the system that is so largely followed.

On Plate IX. Fig. 1 is shown a Brazilian species, called, on account of its size and strength, *Pepsis heros*.

Like the preceding insect, it looks at first sight as if it were black, the colour being in fact the deepest blue, with a sort of velvet-like lustre. The wings are brown and glossy, and the legs black.

The insect which is here given is, I believe, a new species and hitherto undescribed. On account of the general richness of its colour, Mr. Smith has given it the specific title of *nigrescens*, *i.e.* "blackish." It is a native of Demerara. The colour of the insect is black, with a thick velvet-like fur on the head and thorax. The legs are long, and without spines. The reader will notice that the tibiæ of the hind legs are much flattened, this being a peculiarity common to the male sex throughout the whole genus. The wings are very beautiful. Their general colour is black, but they are adorned with many bold

PLATE IX.



streaks of steely blue, each streak having a narrow edge of purple.

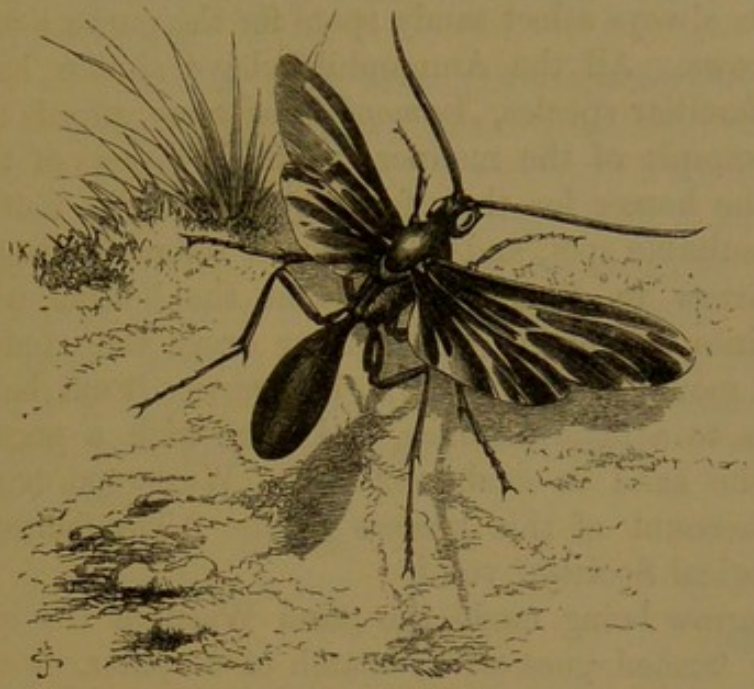


FIG. 239.—Pepsis nigrescens. (New species.)
(Black; wings streaked with blue and purple.)

With this insect we end the Pompilidæ, and now proceed to the next group.

THE Sphegidæ are at once known by the shape of the abdomen. This is attached to the thorax by a long footstalk, composed of the first segment of the abdomen greatly elongated, just



FIG. 240.—Ammophila melanaria
(Black.)

as a thin wire is drawn from a thick bar. Sometimes a portion of the second segment is included in the footstalk.

Some species have this footstalk wonderfully elongated,

especially in the genus Ammophila. This word is formed from the Greek, and literally signifies "sand-lover," because the insects always select sandy spots for the purpose of forming their burrows. All the Ammophiles have similar habits, and our own familiar species, *Ammophila sabulosa*, affords a very excellent example of the manner in which insects of this genus prepare the homes for their future young. The mother insect selects a suitable spot, and then digs a tolerably deep burrow, rather narrow in diameter, except at the bottom, where it is widened into a chamber. She never drops the excavated soil near the mouth of the burrow, but carries it out between the jaws, flies to a little distance, and then, with a peculiar jerk, scatters the sand in a shower. Mr. Westwood has given a detailed account of this process in the "Transactions of the Entomological Society," vol. i.

The burrow being made, the Sand Wasp, as the creature is popularly termed, goes off in search of a spider, or caterpillar, or an insect of some kind, which is destined to serve as food for the future young. The prey is seized firmly in the grasp of the long legs, and is at once disabled by the sting, which, however, does not kill it at once, but paralyses it and prevents its escape. She then drags the disabled prey towards the burrow, her wings buzzing loudly and her whole movements full of fiery energy. Having reached the burrow, she transfers the insect to her jaws, and begins to descend the burrow backwards, dragging the insect after her.

Now comes the use of the enlarged chamber. Were the burrow to be of the same size throughout, the Sand Wasp would not be able to get out again, but the chamber allows space for her to walk round the insect, when she deposits an egg. Sometimes she goes off and fetches more insects, but this depends entirely upon the size of the prey which she at first brought in. I very much doubt whether the Ammophila restricts herself to one kind of victim, and think that she will take either spider or caterpillar, as may be most convenient at the time. Thus she proceeds until she has deposited her whole stock of eggs, when she dies, the labour of her life being over.

The larva is a white, footless grub, with small head, armed with strong teeth, and generally bent in a double curve, like the letter S. When it is full fed it spins a double cocoon, the outer

one being white, and looking something like paper, while the second or inner cocoon is made of similar material, but has a dark, smooth lining.

Our first example of these insects, *Ammophila melanaria*, is a native of Brazil. The head is rather small and rounded, and the jaws are long, sharply pointed, curved in a sickle-like form, and are armed with a boldly projecting tooth in the middle of the inner margin. This structure enables the insect to grasp its prey firmly, as it drags it into the narrow tunnel. The wings are transparent, and the colour of the head, thorax, and abdomen is black, as is shown by the specific name, *melanaria*, which is formed from the Greek, and signifies "blackish." The footstalk of the abdomen is very long and slender, being, indeed, scarcely thicker than a fine pin.

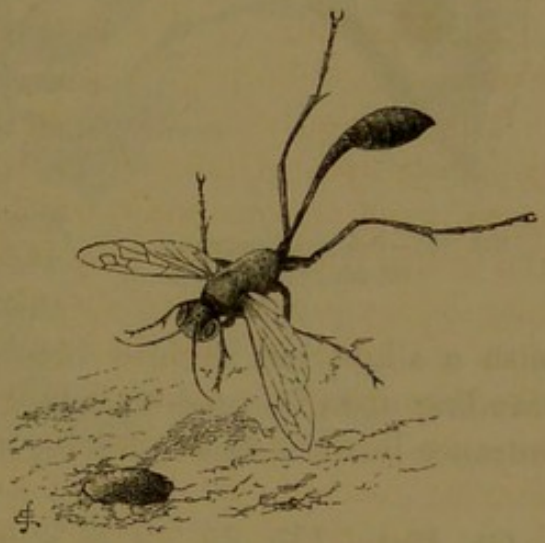


Fig. 241.—Ammophila opulenta. (Black.)

Our second species of Ammophila is a native of Pará. Like the preceding species, it is black, but its tarsi are armed with long spikes, which is not the case with its Brazilian relative. The jaws are very powerful, toothed, and remarkable for a narrow line of long curved hairs along their outer edge. There are great numbers of insects belonging to this genus in the British Museum, and it is remarkable that among that large and varied collection there is not one single specimen which is not dull-coloured.

Scarcely any of the genus Pelopæus are known to exist except in the warmest portions of the earth. Their generic name is taken from a Greek word signifying "mud," and is given to them because they make their nests of sand; it is very finely worked and kneaded, and then left to dry in the heated air. The nest is generally composed of a series of cells, each being closed as it is completed, and the entrance being always from beneath. The Pelopæi store their nests with various insects

mostly caterpillars, but they often employ caterpillars, just like the Sand Wasps of our own land.

It has been said that the Pelopæus not only places a disabled insect in the cell occupied by its offspring, but continually adds fresh insects as those which are already within are devoured. Mr. Westwood, however, totally dissents from this opinion, on the ground that none but the social Hymenoptera feed the young larvæ.



Fig. 242.—Pelopæus chalybeus. (Shining blue.)

The accompanying illustration depicts a South African species, *Pelopæus chalybeus*. The specific name, which signifies "blue," is given to it because its whole body is of a deep rich blue, very much like that of the blue-bottle fly. The whole of the head, thorax, and abdomen are thickly and deeply punctured, which gives additional richness to the colouring. The wings are dark, with a slight but decided blue gloss. The insect is shown as standing upon its mud-built nest, the aperture which serves as entrance into the last cell being seen towards the bottom.

On Plate IX. Fig. 2 is seen the figure of an Australian species, called *Pelopæus lætus*, flying towards the nest, which is placed on the trunk of a tree.

Although not so brilliant a species as the last, it is boldly and prettily coloured. The general hue of the body is black, as far as the end of the thorax, in the middle of which is a bold oblong patch of yellow. From the end of the thorax to the middle of the abdomen the colour is yellow. Then comes a broad band of black, and the rest of the abdomen is yellow. The antennæ are also yellow, and there is a collar of the same colour on the neck.

It has been discovered that some species of the Pelopæus are parasitic creatures, affecting the nests of a solitary bee called Eumenes. That this is the fact has been proved by finding in the nests of the Eumenes the cocoons of the Pelopæus, which are almost exactly like those of the Ammophila which have been already described.

We now come to the typical genus of the Sphegidæ, an example of which is the beautiful *Sphex argentata*, so called from the broad silvery band which encircles the middle of the abdomen. There is a peculiarity about this silvery band. It is very conspicuous, and yet, when examined closely, it disappears. This effect is produced by the very short and fine silvery pile which exists upon that part of the abdomen, and

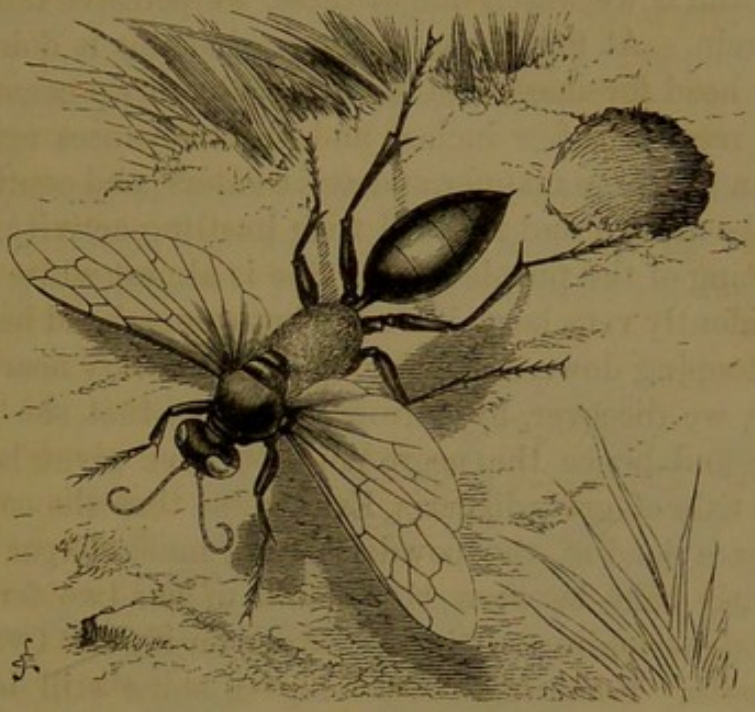


Fig. 243.—Sphex argentata.
(Black, with silver belt on abdomen.)

sometimes extends to the metathorax. The rest of the insect is black, and the wings are transparent.

Few insects have so great a range as this, specimens having been brought from India, Sumatra, Java, Celebes, Ceram, and many parts of Africa and Europe.

A very graphic account of the proceedings of a Jamaican species of Sphex is given by Mr. Gosse in his "Naturalist's Sojourn in Jamaica":—

"On the earthen floor of the building, formerly used as the boiling-house on Bluefields Estate, but now dilapidated and partially unroofed, where twine-like roots depend from the rafters, and elegant ferns spring out of the crevices of the crumbling walls, a good many large wasp-like flies may be observed in the

hottest part of the day, briskly flying to and fro. It is a species of Sphex, closely allied to *S. ichneumonea*, but with the abdomen wholly rufous. On closer examination we discover numerous holes entering diagonally into the dry and dusty ground, into which some of these bright-coloured flies are crawling, and from which others are emerging.

"From some of the holes proceeds a shrill, but intermitted, buzzing; and if we watch one of these, we perceive the Sphex at work therein. At first we cannot see what she is doing, for she crawls in head foremost, and in a second or two comes out tail foremost, recedes a few inches, and then advances again, again emerges in the same manner, and again enters; and continues thus to crawl backward and forward with bustling activity, and with much flirting of the purple wings. She is almost white with dust, and is evidently very busy, if we can but comprehend her motions.

"On stooping down and bringing our face very near the scene of labour, we discover, by narrow watching, that she is digging the hole; and hence the negro children have given her the appropriate title of gravedigger. Every time that she comes forth, she brings a load of the powdery earth, much larger than her head, tightly held between the shanks of her two fore-feet, her breast, and her chin, and this she drops an inch or two from the cave's mouth. Sometimes she brings a stone still larger, and this is grasped in the jaws, and dragged to the distance of four or five inches, for fear it should roll in again. I have seen her bring two stones together, one grasped beneath the chin, the other in the jaws. Each time she has dropped the load, she never fails, as she advances, to keep the road clear by scraping with the fore shanks, throwing the dust behind her. But for this, the earth brought out would soon accumulate in a heap, and roll back. If a dry leaf or small stick happen to drop against the mouth of the hole, she seizes it with her curved jaws and carries it to a safe distance.

"I observed one filling up a hole. No doubt she had deposited her egg at the bottom, and stored sufficient provision (caterpillars or spiders, disabled but not killed, according to the custom of these interesting insects) to last the young grub, when hatched, until its maturity, 'haud ignara ac non incauta futuri.' With her tail towards the hole, she scraped back a little heap of dust; then turned, and with her head moved it about, that it

might fall to the bottom. Then she turned again and did the like, repeating this procedure several times in succession. At length no more earth would go down, for the hole was full; she then rammed it two or three times with her head, and flew away, leaving still, however, the situation of the orifice obvious enough.

"These insects work very fast in the soft dusty earth, for they are indefatigable in their exertions. The bee is the recognised symbol of industry, but the labour of the bee is play compared with the efforts of the grave-digging Sphex."

THE rare and very remarkable insect which is here shown is a native of South America, and was captured by Mr. T. P. G Smith at Pernambuco. Two specimens, male and female, are in

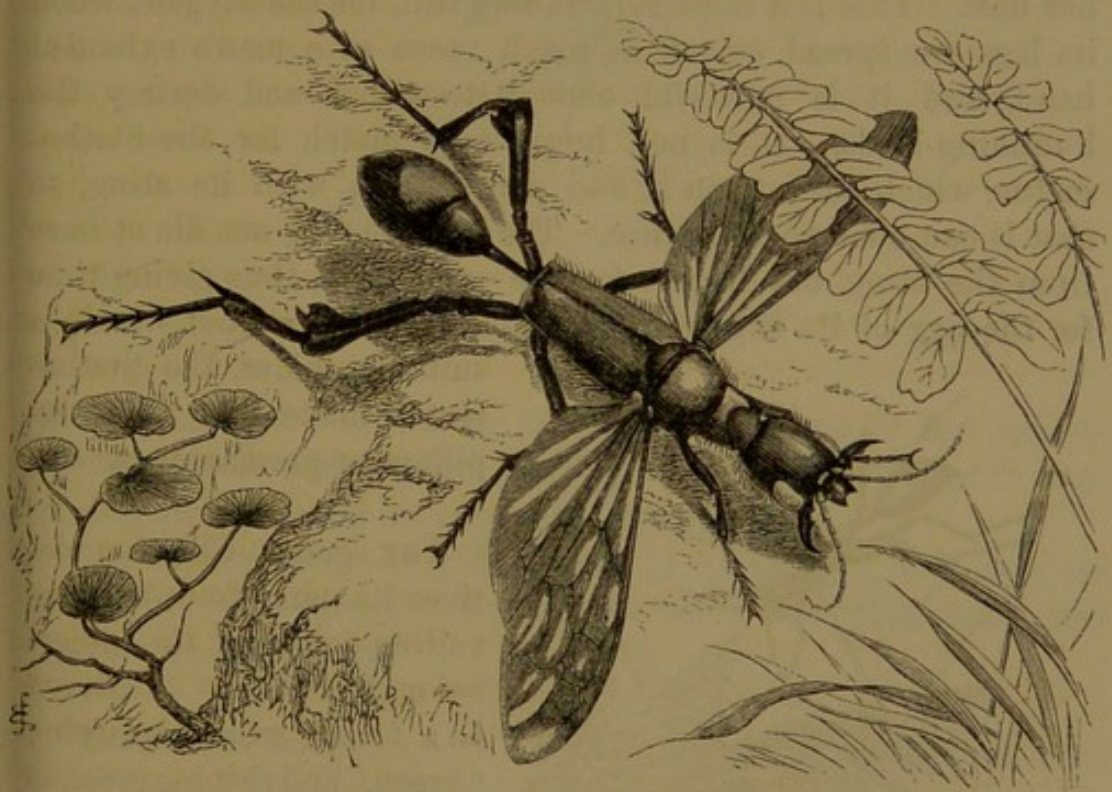


FIG. 244.—Stethorectus ingens.
(Shining black.)

the British Museum, and I believe that they are unique. The illustration represents the male. There is a full and detailed description of the insect by Mr. F. Smith, in the "Annals and Magazine of Natural History," vol. xx. p. 394.

The chief characteristic of this species is the enormous length of the thorax, which is rounded in front and cut off abruptly

behind. It is covered with a moderately thick coating of long hairs. The abdomen is quite small, and is joined to the thorax by a rather short and very slender footstalk. The head is large, and carries a pair of very powerful jaws, jetty black and shining. The legs are long and spiny, and in the male the end of the thigh is thickened into a knob, which is curiously bent inwards, and armed with several strong but blunt teeth. The name *Stethorectus*, which signifies "lengthened breast," is given to the insect in consequence of the great length of the thorax. The wings are shining brown, glossed with blue, and are singularly beautiful.

The female Stethorectus feeds her young upon spiders of various kinds, and so fierce and powerful is she that she will even attack the enormous Mygale, or Bird Spider, and carry it off to her nest. This is a most remarkable feat, for the Mygale, when its legs are spread, covers as much space as a man's extended hand, and it is powerful enough to attack and destroy the humming-birds. It is not, however, a match for the Stethorectus, which darts upon it and paralyzes it with its sting, so that it can offer no resistance. The Mygale does not die at once from the sting, but lingers for five or six days, thus giving time for the egg of its captor to be hatched. If it cannot obtain a suitable spider, the Stethorectus makes use of caterpillars or grasshoppers.



Fig. 245.—Chlorion lobatum. Male. (Shining green.)

The genus Chlorion derives its name from the prevailing colour of the insects belonging to it. *Chlorion* is a Greek word, signifying "green," and shining green is the colour of nearly all the species. There are several blue species, but even in them there is a decided gloss of green.

The species which is here represented is an Asiatic insect, and is spread throughout India and China. It is a very pretty insect, the body being always polished and shining, and mostly

of a brilliant emerald green. Some specimens, however, are entirely blue, sometimes the thorax is half blue and half green, and in a few specimens the colour is so vague that it is impossible to decide whether the real colour be blue or green. The wings are yellow and shining, and in most instances those of the female

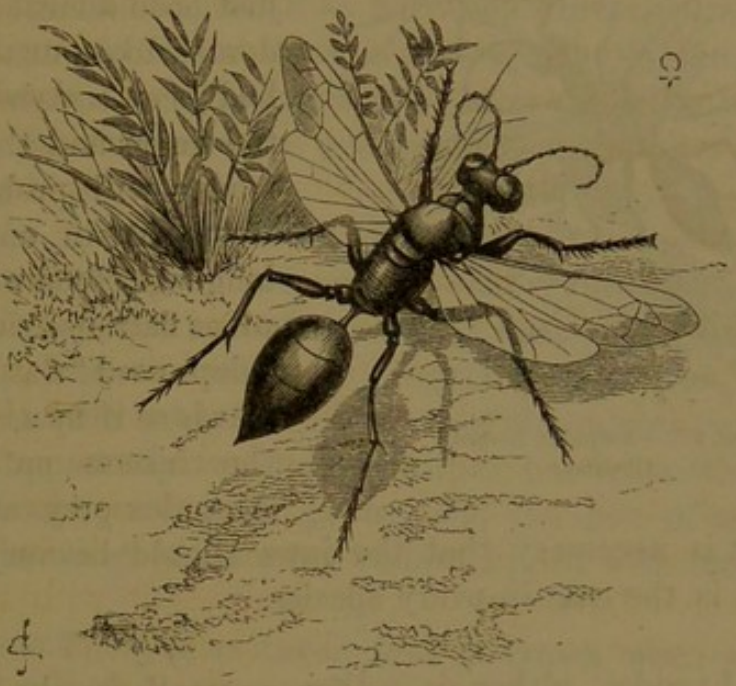


FIG. 246.—Chlorion lobatum. Female.
(Shining green.)

are clouded with brown at the tips. It is one of the spider-eating species, and displays great powers of perseverance in capturing and dragging its prey to the burrow.

The two sexes are very dissimilar in appearance, and both are therefore represented, the small specimen being the male, and the larger the female.

THE genus Ampulex is a very large one, and is spread over the warmer portions of the world. There are in the British Museum specimens from India, China, the Celebes, Africa, and tropical America. The present species comes from Borneo, and there is only a single specimen in the British Museum.

The commonest species is *Ampulex compressa*, a native of China. This is a very brightly coloured insect. The head, thorax, and abdomen are rich shining purple, and the wings are pale brown. The legs are bright blue, except the thighs, which are red. All the species belonging to this genus stock their

burrows with large insects, preferring for this purpose the field cockroaches, one of which is shown in the illustration. In all the species the abdomen is much compressed, but in the Chinese species which has just been mentioned the abdomen looks exactly as if it had been squeezed between the finger and thumb. The reader will probably recollect that in entomological language, "compressed" signifies flattened sideways, and "depressed" flattened downwards as if by a weight. As the insects on which the Ampulex preys are large and strong, it is necessary that the jaws should be very powerful, and this is the case in every species.

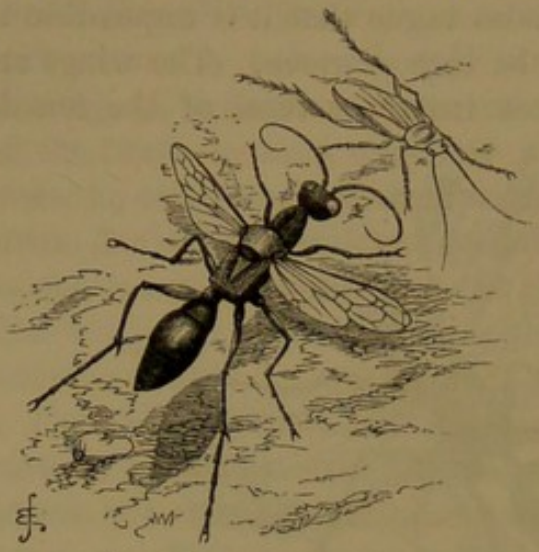


Fig. 247.—Ampulex hospes (Purple.)

The Larridæ, although rather a small family, are spread widely over the world, and in the British Museum there are examples of the genus Larrada taken not only from Europe,

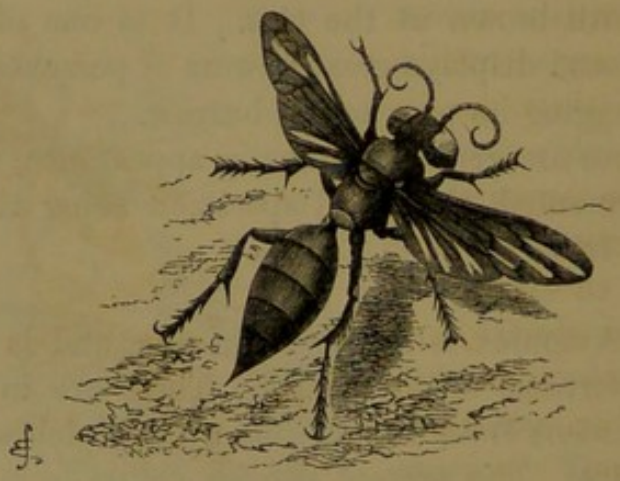


Fig. 248.—Larrada ducalis. (Black, with blue wings.)

Asia, Africa, and Australia, but both from North and South America. The present species is found in Java and the Celebes. Only two specimens are in the Museum.

This species was called *ducalis* by Mr. F. Smith, on account

of its size, which is very much greater than that of any other species. At first sight it is not a very handsome insect, but a careful inspection shows beauties, which do not appear at first. The whole of the body is black, but each segment of the abdomen is marked by a slight edging of very short silvery pile, looking as if a fine line of silver had been drawn round it. The eyes are large, and round them is drawn a line of short hairs of a rich golden lustre. There is also a patch of similar hair in the front of the face, between the eyes. The wings are brown, with a very strong blue gloss.

Of all the species, I think that *Larrada hæmorrhoidalis* of Australia is by far the handsomest. The golden pile, which in the preceding species is confined to the head, is spread over the entire body, and the effect is singularly beautiful, the play of light and shade being just like that of the richest velvet. The thorax has apparently two brown stripes, but when the light is changed the stripes become golden, and the rest of the thorax brown. The wings are shining yellow, tipped with brown.

THE name *Tachytes* is taken from a Greek word signifying "rapidity," and is given to the insects of the genus on account of their exceeding swiftness both on the ground and in the air, and their constant restlessness. There is a British species, *Tachytes unicolor*, which is so swift that it can hardly be captured.



FIG. 249.—Tachytes Sinensis (Dark brown.)

As its name imports, the present species inhabits China. It is the largest of all the known species, and is coloured very much like our hive bee, except that a fine line of silvery pile grows on the edges of the segments of the abdomen. The wings are pale yellow. It is a very large genus, and, like Larrada, extends over all parts of the world. All the species of whose life-history anything is known have very similar habits. They make burrows in the ground, lay their eggs in them, and

stock them with insects as food for the future young. They seem to prefer grasshoppers, or at all events Orthoptera, to any other insects, though they sometimes take caterpillars, if they can get nothing better. The British species, *Tachytes pompiliformis*, almost invariably stocks its nest with grasshoppers, having previously deprived them of life, or at all events of motion, by the sting. Yet, Mr. Shuckard has seen the insect engaged in the capture of green caterpillars, possibly because it could find no grasshoppers.

On Plate VIII., Fig. 2 is shown an insect that is rather insignificant in appearance, though it is very interesting in its habits. Its name is *Parapison rufipes*, and it is one of a number of insects that were brought from India by Mr. C. Horne, and described by Mr. F. Smith. Its colour is very simple, being nearly brown, with a sprinkling of silvery down. Attached to the flower-stem in the lower corner of the plate is seen a group of its curious cells, the construction of which is thus described by Mr. Horne:—

"It constructs a wall of loosely-arranged cells of earth attached to some hanging object, such as a creeper, tendril, or pendent straw, or even a curled dry leaf. The interior of the cell is strengthened by a very fine glutinous silky-looking substance, and this is the more necessary as the least damp would otherwise destroy the whole fabric.

"I believe the insect to apply some kind of gluten, while the pupa secures its safety by spinning a very slight silken web within its abode. The cells are very globular, and are filled with the smallest spiders, of which I counted eighteen in two chambers. These are generally of a pale green colour, and their plumpness is curious. Sometimes, however, it builds a wall with more or less regularity. The pellets used in construction are, comparatively with the size of the insect, very large, and loosely attached to one another: very little smoothing is effected exteriorly, and were it not for the interior binding together of the particles, the wall would apparently fall to pieces of itself.

"The earth brought is prepared by water, as is the case with all clay-building insects which I have observed; and the insect affects the vicinity of water, and hence, probably, is seldom found far from wells. It builds in September and October, and

the perfect insect sometimes emerges early, though it often delays its appearance until the spring (viz. March or April) of the following year, when the heat sets in.

"A small Pemphredon, or another even smaller species, often takes possession of the cells of this insect, rendering the identification of the pupa very difficult. The chrysalis is more ovate in form than that of Pemphredon. I have no drawing of the grub." In another part of his paper Mr. Horne mentions that a hymenopterous insect belonging to another family, namely *Trypoxylon intrudens*, was hatched from cells made by the Parapison, the former insect having taken possession of the cells made by the latter.

THE next family is that of the Bembecidæ, in which the tongue is often so long that it resembles the same organ in the hive bee. The name is Greek, signifying "a humming-top," and



FIG. 250.—Bembex rostrata.
(Black, with greenish yellow bars.)

is given to the insects on account of their quick, fussy movements, and the buzzing sound which they produce when on the wing.

As far as is yet known, no species of the genus Bembex is an inhabitant of England, though this species extends throughout the greater part of Europe, and is even found in Northern Africa. It is nearly, though not quite, the largest species belonging to the genus, and is rather prettily coloured, the greenish yellow bands contrasting well with the black which forms the ground hue.

The habits of this insect are much like those which have already been mentioned. The female digs deep burrows in the sand, using her fore-feet just as a terrier scratches at a rat-hole,

and working with wonderful speed and activity. She then catches flies of various kinds, and places them in the burrow for the use of the future young. She is so active that she can even catch the swift-winged Hoverer Flies (*Syrphidæ*), pouncing on them during flight, just as a falcon swoops on a partridge. Having stocked the nest with a sufficient quantity of flies, she closes the entrance with earth, and leaves the eggs to be hatched in their own time.

It is rather remarkable that so fierce and active an insect should itself be the victim of another insect, but such is the case. The gorgeous Ruby-tail Fly, called *Stilbum splendidum*, and described on page 415, haunts the burrows of the Bembex, crawls into them during the absence of the real owner, and surreptitiously deposits its eggs there. As the egg of the Stilbum is hatched before that of the Bembex, it naturally happens that the former not only eats the flies, but the Bembex larva itself.

In the generic name of the present insect there is another of those curious, not to say inexcusable, confusions in nomenclature which have been more than once mentioned. The word is Latin, and is used by Ovid to signify "a jackdaw," so that it clearly ought not to be used as a name for a genus of insects, especially as it is anticipated in the scientific name of the jackdaw, *Corvus monedula*.



Fig. 251.—Monedula heros. (Black and yellow.)

This is altogether a South American genus, and a good description of the manner in which the insects dig their burrows and stock them with flies may be found in Mr. Bates' well-known book on the Amazons River.

This is one of the largest of the genus, and is a really fine insect. The colour of the head, thorax, and abdomen is velvety black, while on each side are five patches of brilliant yellow. There are also some yellow marks on the thorax, as shown in the illustration. The legs are black, covered with a greyish down.

The two colours of black and yellow run through the genus, and it is on account of their pied appearance that the name of Monedula has been given to the insects. The colour is, however, very differently arranged in the various species. One of them, *Monedula magnifica*, of Brazil, has the ground colour velvet-black, while at each side of the base of the abdomen there is a large patch of deep orange, and an interrupted band about the middle. Perhaps the most curiously marked species is one in which the body is shining black, and has on the abdomen four rows of circular greenish yellow spots arranged with curious regularity.

THE family of the Nyssonidæ, which comes next in order, derives its name from a Greek word signifying "something that pricks or goads," and is given to the insects on account of the power of their stings. In none of those insects is the abdomen attached to the thorax by a foot-stalk.



FIG. 252.—Stizus speciosus. Male.
(Black and yellow.)

The name *Stizus* is taken from the Greek, and signifies "a point," in allusion to the sharp points which arm the end of the abdomen in the male. The colour of *Stizus speciosus* is nearly the same as that of the Monedula. The abdomen is shining black, diversified with patches of bright yellow, arranged as shown in the illustration. The shape and size of

these marks are somewhat variable. The thorax is round, with a beautifully rich pile like dark brown velvet.

Mr. Walsh gives a curious account of this insect, which is a North American species. It usually stocks its burrows with grasshoppers, and is called by the name of the Digger Wasp. A correspondent, however, who sent him specimens of the Digger Wasp, states that the insect is known in Texas as the Horse Guard, because it is always flying about the horses,



Fig. 253.—Stizus speciosus. Female.
(Black and yellow.)

seizing upon the flies that annoy them, and carrying them off to the burrow. Mr. Walsh thinks that there may be some error in this account, and that the insect which really does catch and store up the horse-flies is a species of Bembex which much resembles the Stizus.

Six species of Stizus are found in America, one of which, *Stizus grandis*, stocks its burrows with Cicadæ instead of grasshoppers.

Our last example of the Nyssonidæ is *Exeirus lateritus*, a fine insect from Australia. This was first described by Mr. Shuckard in 1836, and the whole account may be found in the Transactions of the Entomological Society for that year. The general colour of the insect is black, but the head is yellowish red, sprinkled

with silvery down. The thorax is black and very hairy, and the middle of the abdomen is red. The legs are black, except the tibiæ, which are light red. They are of great proportionate length, and have given rise to the generic name *Exeirus*, which is formed from a Greek word signifying to "stretch out," or "elongate."

There is considerable difference in the sexes. The male is smaller than the female, and the end of the abdomen, instead of



Fig. 254.—Exeirus lateritus.
(Black and red.)

being long and pointed, is short, blunt, and rounded. Moreover, the male has one more joint in the antennæ than the female, he having thirteen joints, and she only twelve.

Of the Crabronidæ we have many examples in our own country, there being some forty species of the one genus Crabro. They are all burrowers, most of our own species preferring decayed wood for that purpose. It has been remarked by Mr. Shuckard that there is a difference in the mode in which the various burrowing wasps carry their prey. Oxybelus conveys it by means of the hind legs, Pompilus and Ammophila seize it in their jaws and drag it backwards; while all, if not nearly all the others grasp it in their jaws, hold it with their fore-legs, and so laden fly to their nests.

Mr. Westwood has successfully watched the development of several species of Crabro, and has noticed that while burrowing in wood the insect bites off small splinters with its teeth, passes them under its body by the first and second pairs of legs, and then kicks them out of the burrow with the hind pair. The strong spines with which the tibiæ of the hind legs are armed assist the insect in propelling the fragments well out of the burrow. The burrow is stocked with insects, varying according to the species of Crabro, and when the larva is full fed it spins for itself a silken cocoon of a reddish brown colour. As the silken threads of which the cocoon is formed are of a viscid nature when first spun, the wings and other *débris* of the flies on which the larva had fed are sure to adhere to the exterior and so give the cocoon a very singular aspect.



Fig. 255.—Crabro subterraneus. (Black and yellow.)

The species which is given as our example of this genus is an inhabitant of Southern Europe, and is rather prettily coloured, the general hue being black, and the abdomen marked with interrupted bands of greenish yellow, arranged as shown in the illustration.

On Plate VIII. Fig. 1 is shown a pretty insect of Northern India, called *Trypoxylon rejector*.

The generic name is formed from two Greek words, and signifies "a wood-borer." As may be inferred from that name the generality of the insects belonging to this genus bore holes in wood. Several species of Trypoxylon inhabit England, and have been noticed to enter the burrows of other insects. Mr. Westwood, having seen this done several times, naturally thought that the insect was a parasitic one. Afterwards, however, he found that the only object was to save itself trouble, and that the Trypoxylon merely enlarged the burrows and then lined them with sand. One species makes a number of successive cells

PLATE VIII.



in each burrow, placing a single egg in every cell, and accompanying it with spiders, more or less in number according to their size.

One small species, *Trypoxylon alternatum*, may often be found in the dead and broken stems of roses and brambles, the insect boring away the soft pith and constructing a series of cells, each separated from its neighbour by a wall of sand. The cells are stocked with small spiders, and if the stem be carefully cut open, the cocoons may be seen all in a row, each cocoon filling as exactly as possible the cell in which the larva has been reared.

Whatever may be the case with the British species, it is evident that some of the foreign Trypoxylons are parasitic upon other insects, or at all events that they take possession of their nests in order to avoid the trouble of making burrows for themselves. The reader will remember that in the account of *Parapison rufipes* Mr. Horne mentioned that he had bred from it specimens of *Trypoxylon intrudens*. The same observer states that although *Trypoxylon rejector* builds cells of its own, it is in the habit of appropriating those of other insects. In Plate VIII. the elongated cells in the nests of the illustration are those of the Trypoxylon. This is Mr. Horne's account of the insect as given in the Transactions of the Zoological Society, vol. vii. part 3 :—

"This curious little insect, when first hatched from the delicate little Serpularia-like cells, was taken by me for some parasite allied to the Ichneumonidæ, in consequence of my having often observed it hovering at the mouths of the cells of the smaller cell-building insects in my verandah. I found, however, that it brought mud and worked for itself, as well as appropriated the cells of other insects which it found ready to its hand.

"I have nowhere found recorded its habits ; but I think I have seen it carrying minute green spiders wherewith to fill its cells. It certainly does not feed its young, but stores food ; for it closes its cells directly they are ready, which none of the Vespidæ do.

"The construction of these is very curious ; and the pellets of earth used appear of a sandy character, which gives to the structure great delicacy and fragility. At the same time the

interior of the cell is lined with some glutinous ejection which binds it together.

"The specimens of cells figured (the originals of which are now all in England) show how strongly this cementing fluid acts.

"The nests are extremely difficult to find, being small, and many straws hanging in the places where they are usually constructed, such as under a thatch of coarse grass.

"As might have been expected, they remain a very short time in the pupa state; and the month of September is their favourite season of construction, although they continue to build in October.

"I have often watched them as I sat in my thatched summer-house at Mainpurí; and the rapidity with which they came and went was surprising. I know of no other special peculiarity which calls for remark, excepting that all the cells I have found have been under cover."

The general colour of this insect is black, but the second and third segments of the abdomen are red.

Some systematic entomologists have formed a family called Philanthidæ, but there seems to be no need for it, the Crabronidæ being quite comprehensive enough One species, *Philanthus triangulum*, is tolerably common on the Continent, but very rare in England. Mr. Shuckard predicted, some years ago, that when its metropolis was discovered, it would prove to be plentiful though very local, and therefore rare except in its own peculiar home. Mr. F. Smith discovered the metropolis of this insect at Sandown, Isle of Wight, and so Mr. Shuckard's prophecy was fulfilled.



Fig. 256.—Philanthus coronatus. (Black and yellow.)

The insects were in considerable numbers, burrowing into the sand, and flying about with great activity. Their strength and boldness may be inferred from the fact that they provision their nests with the hive bee, an insect nearly twice as large

as the Philanthus, and armed with a sting which even man fears to meet. Some preyed upon Andrena bees, and Mr. Smith tells me that the choice of prey seemed to depend very much on locality, the Andrena being preferred where it was plentiful, and the hive bee taken when Andrenas are scarce. On the Continent this Philanthus is said to do great harm to apiarians, each female making on an average five cells, and depositing a bee in each.

Although so bold, strong, and active, and possessing a sting which is venomous enough to disable even the hive bee, the Philanthus is curiously averse to using its sting except for the purpose of securing its prey. Mr. Smith found that he absolutely could not provoke the insects to use their stings, even though he held them in the bare hand.

The species which is represented in the illustration is a native of Southern Europe. Its colour is black, with yellow marks on the abdomen and thorax, as shown in the illustration. Round the head there is a radiating fringe of yellow hair, which has earned for the species the name of *coronata*, or "crowned." The name *Philanthus* is formed from two words signifying "a lover of flowers," and is given to the insects because they are fond of haunting the wild flowers when they are not forced by resistless instinct to dig their burrows and search for prey. In order to show the peculiar markings, the figure is enlarged about one-third.

We now come to a great group of Hymenoptera in which the wings are folded longitudinally throughout their length when at rest. Anyone can see this peculiar structure by looking at a common wasp. Both sexes have wings, and so have the neuters.

The first family in this group is the Eumenidæ, which comprise the solitary species, and which may be known at once by their double claws. We have in England one species of the typical genus, *Eumenes coarctata*, which is a local insect, but tolerably common in those districts which suit it. Sandy ground well covered with heather seems to be its favourite locality. It makes a curious vase-shaped nest, forming it of sand, fastening it to a heather spray, and then provisioning it with little caterpillars after it has deposited an egg. I may here mention that the name Eumenidæ has been appropriately, if somewhat fanci-

fully, given to these insects on account of the havoc which they work among sundry larvæ, spiders, &c. The Eumenides were the furies of the Greek classics, the ministers of vengeance appointed by the greater gods to inflict punishment on offending mankind.

The present species derives its name of *xanthura*, or "yellow tail," from its colour. The head and abdomen are black, except that a considerable portion of the end of the abdomen is ruddy chestnut. The thorax is also chestnut, but on its upper surface is a large patch of deep brown. The abdomen has a soft velvet look, on account of the deep punctures with which it is perfectly covered. The wings are shining, and yellowish in colour. It is an Indian insect. Closely allied to it is another Indian species, *Eumenes petiolata*, which very much resembles it in form, but may be distinguished by a single broad bar of yellow across the middle of the abdomen. This insect makes a large nest of mud, about the size of a pigeon's egg, and affixes it under some projection, probably for the sake of sheltering it from the rain. An egg is placed in each nest, which is then well stored with caterpillars. Sometimes, in a favourable position, a whole row of these nests may be seen, set side by side. The insect builds them in all kinds of places; and in a paper in the Transactions of the Entomological Society it is stated that in one case a keyhole was chosen as a locality for the nest, and in another, the interior of a disused flute.

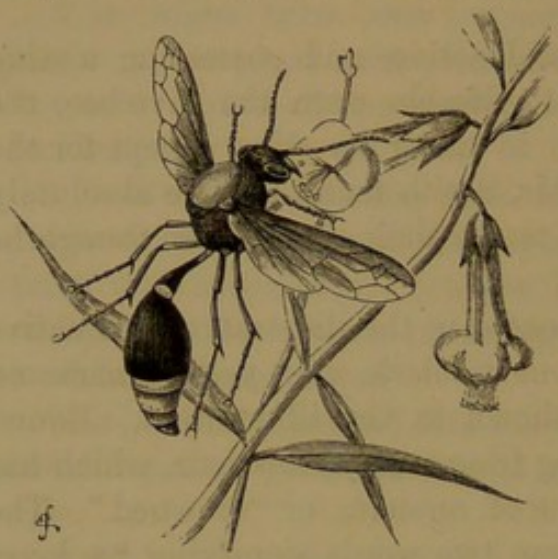


Fig. 257.—Eumenes xanthura. (Black and yellow.)

On Plate VIII. Fig 3 is drawn a beautiful species from Northern India, called *Eumenes esuriens*. In his paper on the Indian Hymenoptera, Mr. Horne observes that the insect has a habit of choosing doors and posts as localities for its nest, which, like that of any Eumenes, is always made with an

opening having a recurved lip. As a rule, the insect manages to preserve the spherical form of its nest, no matter what may be the exigencies of the locality. The nest is stocked with caterpillars, mostly belonging to the Geometridæ, and almost invariably green in colour.

As is often the case with solitary wasps and bees, the Eumenes is liable to the attacks of parasites, of which the ubiquitous Ruby-tail (*Chrysis*) is sure to be one. Mr. Horne mentions one very remarkable instance of parasitic development. From a single cell of *Eumenes esuriens* the insect was hatched in due course of time. But there was also hatched a beetle belonging to the genus Emanadia. This insect is allied to our *Sitaris muralis*, which is so well known to entomologists as being parasitic on various solitary bees. Besides this, a fly, apparently belonging to the genus Anthrax, was hatched from the same nest. Now, the wonder is, how all these insects contrived to obtain sufficient food when packed within so narrow a compass, especially as the fly is not a small one, and the beetle is fully three-quarters of an inch in length. Had the beetle or the fly appeared instead of the Eumenes, there would have been nothing strange; but that all these should appear, and be fully developed, is an absolute mystery.

The Anthrax, by the way, is a very troublesome insect to the Eumenes, as well as to other solitary Hymenoptera. Generally, after a cell is closed it is tolerably safe, but the Anthrax contrives to pierce through the covering of the cell, and so to deposit an egg. The reader will therefore understand how difficult is the task of identifying the builder of a nest when, instead of an Eumenes or Pelopæus, an Anthrax, a Chrysis, or an Emanadia may emerge, and sometimes two or three at once.

Mr. Horne further remarks that it is very rare to find a nest from which the Eumenes has escaped, unless it be perfectly empty and affording no clue as to the habits of the occupant. This is due to the ants, who swarm in India and are ever restless in search of food. As long as the mud-nest of the Eumenes is closed, the ants cannot touch it, but no sooner does the newly developed Eumenes leave its nest, than the ants pour into it and carry off everything in it, not only the unconsumed caterpillars if there should be any, but the skins of those that have

been eaten by the Eumenes larva, and the cast larval and pupal skins of the Eumenes itself. Just below the figure of the insect on Plate VIII. is shown a small group of the nests.

Another species, *Eumenes conica*, builds a very delicate cell, always using a wall or beam for one side of it, so that the most skilful workman can scarcely remove the nest without breaking it. Owing to the thinness of the cell-wall, the larva is very liable to be attacked by parasites, Mr. Horne having found that out of five cells only two produced the rightful Eumenes. The colour of the insect is rather curious. The head and thorax are nearly black, but the footstalk and the basal portion of the abdomen are orange. Then comes an interrupted black bar, and beyond this bar the abdomen is pale yellow and highly polished.



Fig. 258.—Eumenes arcuata. (Black and yellow.)

The preceding insects being Indian, we have here a species from Australia, called *Eumenes arcuata*. The latter name signifies something that is bent like a bow, and refers to the outline of the insect when seen in profile. The wings are pale yellow and polished, and the body is black, smooth, and shining, the black being relieved by sundry spots, streaks, and patches of vivid yellow, arranged as seen in the illustration.

Here is a strange being indeed! A hymenopterous insect with jaws just like those of a stag beetle! Had the insect been unknown, no entomologist would have dared to say that such a form could be possible.

This is the most striking of a large genus of Hymenoptera, in all of which the males have exceptionally large jaws. In none, however, is the jaw so enormously developed as in the present species.

As is the case with many insects (for example, our own stag beetle), the jaws of the female are comparatively small, and show no signs of the enormous development which is found in the

male. The use of these jaws is at present problematical, for the male Synagris does not use them for labour, the whole of that business devolving on the female. Neither would they serve the purpose of weapons. Even the male stag beetles, who really do fight when urged by jealousy, do very little harm to each other, the result of a battle being very much like that of a duel between two ironclads, neither of which can penetrate the armour of the other. Some entomologists think that they are used in detaining the female in case she should prove coy, but as the greater bulk of male insects have feeble jaws, and many have no jaws at all, this theory cannot be maintained. Perhaps, when we know the use of a man's beard, a lion's mane, or a turkey's wattles, we shall learn the object of these enormous jaws.

As to the name Synagris, it is utterly absurd when applied to an insect. It is a name employed by Aristotle in his "History

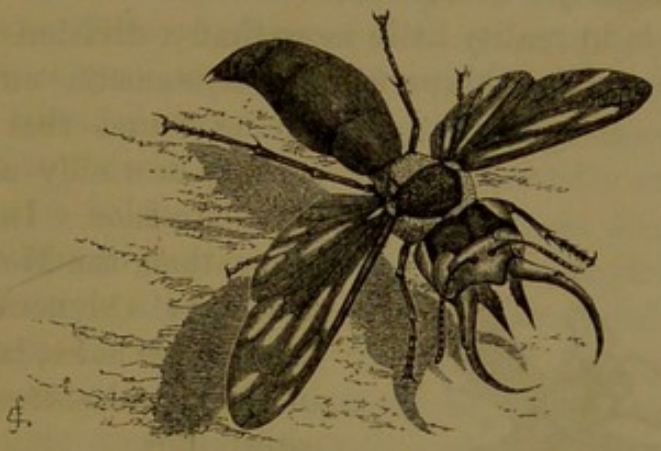


FIG. 259.—Synagris cornuta
(Brownish yellow.)

of Animals" to designate some marine fish, and why it should now be transferred to a terrestrial insect is more than I can understand.

This species is a native of Southern Africa, which is the great home of these curious insects. Its general colour is black, but the thorax is yellowish brown, with the exception of a large black patch in the centre; and its wings are also brown, with a decided glossy surface. The enormous jaws of the male are yellow in colour, and not only are they very large, sickle-shaped, and sharply pointed, but they each throw out a large horn or tooth near the base, the horn being large enough to make half a dozen ordinary jaws. There is also a blunt tooth on the outer

edge of each jaw, placed about midway between the base and the tip. When the jaws are closed, the points cross each other boldly, while the two lower teeth are pressed tightly together.

There are many African species of this extraordinary genus. *Synagris mirabilis* is a native of Abyssinia, and is a really handsome insect, its body being black, the end of the abdomen white, and the wings glossed with a shining blue. *Synagris analis* would look exactly like the preceding insect if drawn in plain black and white, but in this species the end of the abdomen is red, and not white. In all these insects the head is large and squared, this structure being needful in order to give support to the powerful muscles which move the enormous jaws.

THE next genus, Monobia, is so called on account of the solitary habit of the insects. The name is formed from two Greek words which signify "living alone."

This genus is in reality little more than a division of the great and intricate genus Odynerus, the systematic entomologists having found that genus becoming unwieldy and capable of subdivision. In all probability, then, the Monobia act as does the Odynerus, *i.e.*, the female digs holes, lays her eggs in them, and stores them with caterpillars.



FIG. 260.—Monobia quadridens. (Black and yellow.)

The species is a North American one, and is rather striking to the eye. The head and thorax are black and profusely punctated, and the abdomen is also black, but of a velvety texture, owing to the short and thick pile with which it is covered. On the base of the abdomen there is a broad band of bright yellow, and some streaks of the same colour are seen on the thorax. The wings are yellow and shining.

ON Plate VIII. Fig. 4 is shown the figure of an insect called *Rhynchium nitidulum*. Like the last insect, this is

one of the many that were formerly included in the genus Odynerus.

Several species of these insects inhabit India, and Mr. Horne has described the habits of three of them, showing that there are considerable differences in their modes of building. One of them, *Rhynchium carnaticum*, inhabits the interior of small hollow bamboos. A nest which Mr. Horne found was constructed in a very singular manner, the insect having taken possession of a bamboo which had been previously occupied by one of the solitary bees, *Megachile lanata*, and in which two cells had already been formed. The Rhynchium did not try to eject the original occupant, but simply built it in.

"It first built over the cells of the Megachile a floor, which was constructed of mud, very finely worked, stout at the edges and thinner in the middle. It then left a space empty and made another floor, after which it commenced its breeding cells. In these it stored caterpillars of many colours, and it finished off with an empty spare cell, which it covered with a heavy mass of pellets. The clay is kneaded very finely, and, although there are no sides to be made to the cell, the cap is most carefully constructed."

There seems to be more than instinct in this proceeding. As the Rhynchium is much slower than the Megachile in undergoing its changes, the latter would be developed first, and so break through all the cells of the former in trying to make its escape. So, first the Rhynchium begins by shutting off the Megachile with a strong clay wall, and then, in order to guard against the possibility of one of the insects breaking through this wall, it takes the precaution to leave a clear space, and then to build a second wall, before it proceeds to form its cells. I have noticed that all insects which have to break through obstacles before they reach the open air have sufficient strength to do so, and a little to spare besides. But the amount of strength is not much in excess of the work to be done with it, and there is no insect with which I am acquainted which would not perish before it could break through two obstacles of equal strength.

I should much like to present the reader with an illustration of this remarkable nest, but as the nest, or rather the series of cells, is half as long again as the page, and would not bear reduction, it cannot be done. The colour of the insect is ruddy brown.

Then there is *Rhynchium brunneum*, which is capable of boring holes for itself, though it prefers to take possession of those that are ready made. Mr. Horne remarks of this species, that its body is so flexible that it is almost impossible to hold the insect without being stung by it.

Lastly comes the species which is figured in the plate. In colour it is very simple, being merely greyish black. Mr. Horne's account is as follows:—

"This extremely interesting insect constructs cells of exceeding strength, mostly upon timber. The clay is very finely worked with water and some kind of gum—not only viscid ejection being employed, but also the juices of the 'Peepul' (*Ficus religiosa*), birdlime in fact, and the gum of the acacia, catechu, and other trees. Hence there is no need of thickness, and we accordingly find the walls of the chambers very thin, whilst their tenacity is so great that the portion of the hard wood on which the series of cells was fixed I have cut out with a chisel and hammer without in any way injuring the structure. One pair of insects does not usually make more than three cells; but it must be remembered that they take a much longer time in making them than does the rapid, rough-working Megachile.

"The food stored consists of caterpillars; and I have not yet succeeded in hatching a parasite from one of their nests, which are strong enough to resist all ordinary attacks. Until completed, either one or the other of the insects appears to remain at home; and hence parasites have no opportunity of effecting an entrance before the cell is closed over. The covering, though thin, is very tough, so tough that I doubt the power of a parasite to pierce it. In the figure it will be observed that six cells have been built one on another, only *one* being affixed to the door. This one was attached to a smoothly plane surface of 'Sal wood' (*Shorea robusta*), so that the cementing gum must have possessed great strength to allow me to cut it out with a hammer and chisel, as before alluded to.

"These insects build on roof-beams, so that their nests generally escape notice; besides which they are far from common. They are externally of a rich brown colour, glistening with gum."

In the plate, the nests of this species are seen just above the insect.

The very fine insect which is here represented belongs to Australia. The colour of the species is principally black, and of a beautiful velvet-like richness. The rest of the insect is bright yellow, also soft and velvety, and the arrangement of the colours



Fig. 261.—Abispa splendida.
(Velvety black and yellow.)

can easily be seen by reference to the illustration, the dark portions being black, and the light portions yellow. The genus to which this insect belongs is an offshoot of the great genus Odynerus, and shares in the habits of its relatives.

The Wasps which have hitherto been described are of the solitary kind, and there are, in consequence, no neuters. We now come to those Wasps which construct more than one cell, and, when the number is considerable, the greater part of the architecture is performed by neuters. Our common Wasp or Hornet affords a perfect example of the Social Wasps. In England we have but few examples of the Social Wasps, and their nests are of three kinds, *i.e.*, pensile, such as that of the Tree Wasp; subterranean, like that of the common Wasp; or made under shelter of some kind, such as that of the Hornet. Abroad, however, there is a vast variety of Social Wasps, and the modes in which they form their nests are wonderfully varied, the same species often constructing its nest in different ways according to surrounding conditions.

The insect which is here given is a native of Africa, the specimens in the British Museum having been brought both from Congo and Abyssinia. Its general colour is brown, but

the whole of the body is covered with a short ashen pile, which makes it look in some lights as if it were grey instead of brown. There is a slight reddish tinge upon the head. In the British Museum there are eight species, all of which are African with the exception of one which comes from India, and is accordingly called *Belonogaster Indicus*. They are all dull coloured, the wings and body being equally brown.



Fig. 262.—Belonogaster junceus.
(Brown, with ashen pile.)

The name *Belonogaster* is constructed from two Greek words signifying "a pointed belly," and is given to the insects because the abdomen terminates in a sharp point.

In general form the *Mischocyttarus labiatus* bears a close resemblance to the preceding insect, and is coloured in almost exactly the same manner, being brown covered with grey down. It is a Brazilian insect.

The reader will see that the structure of the nest is very different from that of any nest or cell which we have hitherto seen. It is constructed of vegetable fibre torn off and masticated by the wasp, so as to form a sort of coarse paper. In fact, the wasps are the earliest paper-makers in the world, and utilize for that purpose a great variety of material, so long as it be a vegetable fibre.



Fig. 263.—Mischocyttarus labiatus
(Brown, with grey pile.)

This nest consists of three distinct portions. First there is

the cell-group, all the cells having their mouths downwards. Above the cells comes the pent-house, by which the rain or any falling substance is warded off the cells; and, lastly, comes the footstalk, by which the entire nest is suspended. The footstalk itself is very hard and tough, but is notwithstanding composed of the same material as the cells, except that the fibres are closely pressed together, instead of being spread out in flakes. The reader may find examples of such footstalks in any English wasp's nest, the successive layers of cells being supported, or rather suspended, by a number of short footstalks constructed in exactly the same manner.

This long and slender footstalk gives the name to the genus. The name *Mischocyttarus* is formed from two Greek words, the first of which signifies a stem or stalk, and the latter a cell.

The form of nest which is here given is that which is usually found, but there are cases where the insect has built two, or even three layers of cells, one above another, and all hanging by the same stalk. Whenever this is the case, the central layer always seems to be the largest.

It is not very easy to describe the insect which is here shown, so exceedingly variable is it. In fact, out of the six specimens in the British Museum, although the colours are the same, no two have them arranged in the same manner. The specimen which has been selected for the illustration is black, with a rust-red belt round the centre of the abdomen; while another has this colouring exactly reversed, and the others have the black and red distributed in various modes. The specific name, *ferruginea*, i.e. "made of iron," refers to the rust-red of the body.



Fig. 264—Icaria ferruginea. (Black and rust-red.)

As may be seen by the illustration, the cell-group, like that of the *Mischocyttarus*, hangs by a single footstalk, but the cells are very differently arranged. In the former case they are placed somewhat symmetrically around the first cell, but in

this case the second cell is fastened to one side of the first, and so in a series of pairs until the group is completed.

Wherever the Icarias take a fancy to some spot, the nests are very numerous. There is a very curious example in the British Museum, where a number of nests have been fixed to the footstalk of a leaf, and a number more to the mid-rib of the same leaf.

The genus extends through all the warmer parts of the globe; and there are in the British Museum specimens from Africa and Madagascar, the Celebes, New Guinea and Australia, India, China, Burmah, Borneo, the Philippines, &c.

The habits of the Icarias are well shown by Mr. Horne in his essay upon the Hymenoptera of North-western India :—

"This pretty little insect lives in small communities, and builds an elegant nest of paper prepared by itself, which is very tough, and attached to leaves, stalks, &c., by thin but strong pedicles. It frequents flowers, and appears to feed on pollen. The posterior segments of the body are very retractile, causing the abdomen to assume a curious truncated appearance. In the example figured on a stalk, the cell-mouths are all upwards, which is strange, as the young grubs, the mouths of whose cells are open to the weather, must need some protection. The same was in a great measure the case with the cells on the mango leaf.

"The cells are beautifully regular, being perfect hexagons; and the strength with which the footstalk is fastened is surprising. There appears to be used for this portion of the work some kind of gum, with which they cover their plaster; and this much resembles varnish in appearance. It is probably derived from the babool or mango tree, both of which abound near Benares, where these nests were found.

"On one occasion I found a group of these little series of cells hanging in a covered tomb; they were attached to a stone slab, and all, of course, face downwards. Unfortunately they were old nests and quite empty. They consisted of a series of combs, and the number of cells in each averaged sixteen only. In this case shelter had evidently been sought, and in the two cases formerly noted, the insects were in a measure shielded from the direct influence of the rain by the thickness of the foliage of the mango tree above them; for the habit of this Icaria is, as a rule, to build under shelter.

"In their disposition like the rest of the Vespidæ, they fly with one accord to attack the intruder; although their sting was not very sharp, and nearly resembled the prick of a fine pin, and was in a great measure deficient in the burning feeling experienced when stung by their brethren the Polistidæ."

The reader will doubtless notice the remark made in the second paragraph, namely, that the cells are beautifully regular, being perfect hexagons. This one fact entirely disposes of two theories which at one time were generally entertained respecting the hexagonal form of the bee-cell. One theory was, that the cells were originally cylindrical and became hexagonal by mutual pressure; and the other, that they were made nearly solid at first, and were scooped out so as to assume the hexagonal form. In the case of the Icaria, however, neither mutual pressure nor scooping is possible, and yet we find the cells as perfect hexagons as those of the bee, or the common wasp, or the hornet.

Regarding the species which is represented in the illustration, Mr. Horne writes as follows:—

"This insect in its habits resembles *Icaria variegata*. It feeds its larvæ with ejected juices; hence one never finds anything but the egg slightly attached to the bottom of the cell, or the more matured grub, which spins itself a silken cocoon over its cell with which to change to a perfect insect. It associates in very large parties, and is extremely vicious when disturbed, and flies at the party interfering with it, hardly ever failing to sting him. The pain of the sting resembles burning; and in one case of my taking a nest, when I was severely stung, the pain lasted for four days. I mention this, as it is curious to observe the different degree of virulence of the poison of the various small insects of this class.

"The cells extend in masses of great size, and are placed in the midst and amongst the twigs of thick garden bushes. I also believe, from what I have seen, that the comb of one season is *not* used in another; perhaps it becomes weather-worn and incapable of proper repair. This insect also has, like the *Icaria variegata*, a retractile body, and its cells are beautifully regular hexagons. It is much molested by a small class of moths (Tineidæ), and also by an Anthrax. In fact, the nest lies very open to the attacks of parasites, who, as a rule, care nothing for the sharpest stings.

"The grubs, which I found in abundance and in all stages of growth in October, have rather a singular shape—being almost conical. The perfect insects are much plagued with a species of Stylops, the females of which lie under the scales of the abdomen. I found one piece of comb nearly one foot across each way; but generally the combs are only one-half or two-thirds of this size."

THE great genus Polistes well deserves its name, which is Greek, and signifies "the builder of a city." Species belonging



FIG. 265.—Polistes Tasmaniensis.
(Rust-red.)

to this genus are found in various parts of the world; and in the British Museum there are specimens from Australia, North and South America, and Vancouver's Island. They are all dull coloured, *Polistes Tasmaniensis* being one of the brightest. The thorax is chestnut, the abdomen is rust-red, and the wings are pale brown. One species, *Polistes gallica*, affords some exception to the general rule, being banded with black and yellow, and looking like a very little wasp.

The nests of the Polistes are exceedingly variable in shape. That of the present species is very much like the nest of the common tree wasp of England without its cover, though the material is stronger and of closer texture than that of the wasp. The nests of other species are, however, arranged very differently,

as may be seen by the accompanying illustration, which is taken from my "Homes without Hands." On the right hand is the pendent nest of *Polistes aterrima*, the latter name being given to the insect on account of its black colour. On the left is a triple nest group, made by a Polistes whose species is not yet identified. It is suspended by a single footstalk like that of the Icaria, but the cells, instead of being arranged side by side, are placed in a tolerably straight line and set alternately, the mouth of each being rather lower than that of its predecessor. In order to suit the exigencies of space, the figure is very much

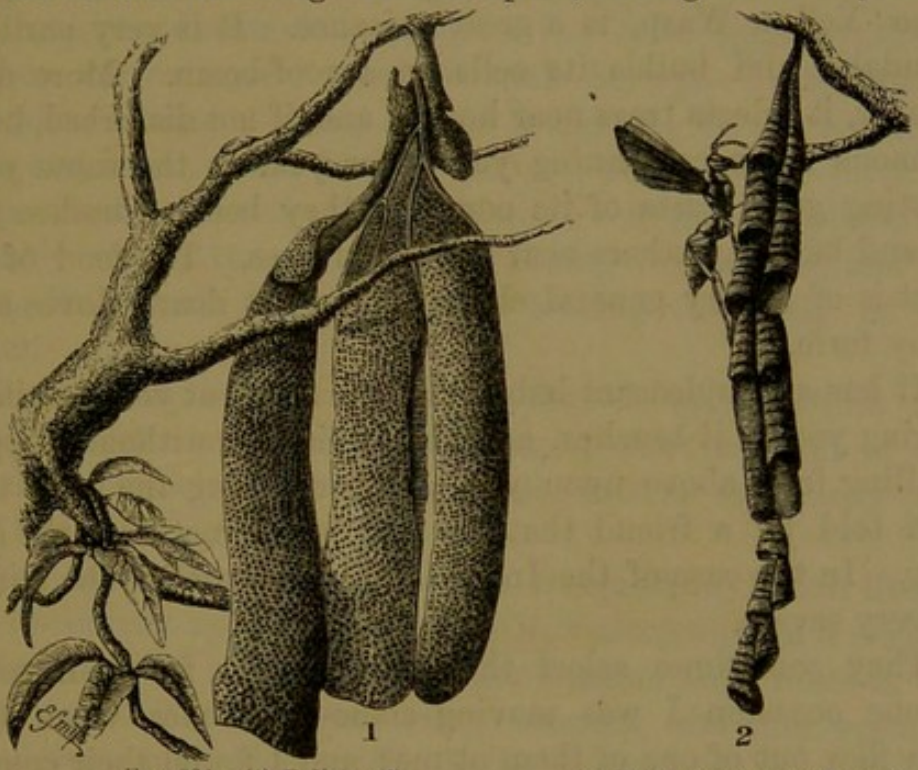


Fig. 266.—(1) Polistes (?) (2) Polistes aterrima (Black.)

reduced, the cells being nearly as large as those of *Polistes aterrima*. Strength combined with lightness is obtained by the way in which the upper part of the nest is formed into folds very much like corrugated iron.

Sometimes a totally different structure is employed, the insect seeking for shelter. In the British Museum there is a piece of wood, apparently a part of a tamarind tree, in which a large tunnel has been driven by one of the great wood-boring bees called Xylocopa. A species of Polistes, however, has taken possession of the tunnel, and has made its nest therein.

Although the Polistes is essentially an exotic genus, specimens have been taken in England, and in every case they were close

to shipping. One was taken in a house at Penzance, and traced to a ship which had just come from Brazil. The captain said that great numbers of the "flies" had appeared on board, and annoyed the sailors by their stings. Another specimen was taken in the docks at Liverpool, and all the specimens were sent to Mr. F. Smith, in whose collection they now are. This species is *Polistes biguttatus*.

The following account of an Indian species, *Polistes Hebræus*, is given by Mr. Horne:—

"This insect, which is generally known to residents in India as the 'Yellow Wasp,' is a great nuisance. It is very partial to verandahs, and builds its cells on a roof-beam. More often, however, it selects trees near houses, and, if not disturbed, builds enormous nests, continuing year after year in the same place, deserting great parts of its comb as they become useless from age, and building others near to the old ones. The food of this insect is of a very general character, and it dearly loves sugar in any form.

"It has an unpleasant habit of either flying at you if irritated, stinging you as it touches, and then flying on without stopping, or falling from above upon you and performing the same trick. I am told by a friend that the English hornet does the same thing. In the case of the Indian Polistes, however, the sting is not very severe.

"They sometimes select the oddest places for their combs. On one occasion I was moving some tin boxes, when about thirty flew out of one of them at me; and I found their comb in a corner *inside*. They had obtained access through the open window of the store-room. I have often observed the commencement of a comb.

"In the month of November the females newly hatched sit out on sunny days on the tops of venetian doors and similar situations, and buzz for males. Nor do they wait long; for at this season the whole verandah swarms with these Polistes, and I have had thousands of them killed in a morning. Having met with a suitable partner, the ova appear to be impregnated; and not long after, the queen, fully prepared, sets to and builds a single cell on a stout footstalk, lays an egg in it, and proceeds to build three or four more around it, in each of which she lays an egg.

"The young grow very fast, especially at first, when so few have to be fed; and thus in a short time there is a well-peopled colony, in which there will be a few males and workers of every size.

"The tops of the cells of the queen wasps are much elongated with silk; and these insects use some species of gluten wherewith to temper the paper of which the cells are constructed, as well as to solidify the silken cell coverings.

"They are in the habit of seizing insects and sucking out their juices, wherewith they again feed the voracious young grubs, who are always clamouring for food with open mouths.

"They are extremely troubled with Stylops—every fifth or sixth taken having a female of one under one of the segments of the abdomen; and I have sometimes seen two or three on one specimen. I have often tried to breed these Stylops, but invariably failed, the male Stylops being very scarce, and the female, Mr. Smith tells me, never leaving the body of the Polistes.

"This species is so well known that I do not think any further remarks are needed, excepting a short account of the method by which these troublesome insects are easily got rid of:—

"There is a yellow ant (*Œcophylla smaragdina*) which lives a social life chiefly upon trees, drawing leaves together in a curious manner with silk, and making in this manner large nests in the mango trees. These insects sting severely, and they seem to have a great antipathy to the Polistes, who are very fond of feeding on their poorly-protected juicy young grubs. If, therefore, you cut off a bough with a nest of these ants upon it, tie it to a long bamboo, and put it very near to the nest of the Polistes, there will be a general attack by the former upon the latter. An ant will seize upon a wasp and bite and sting him, others also coming up to help. They will together fall to the ground, when the Polistes dies, and the ant (*Œcophylla smaragdina*), having taken a sip of his blood and juices, runs up again to his nest by a string always left hanging down from the bamboo near to the nest for this purpose. They will also attack hornets. Their native name is "Mātā," and they are used by all classes for this purpose.

"No heat is too great for the Polistes, and in the hottest

weather they may be found sitting in large parties by water, evidently enjoying the season."

It has been already mentioned that the name *Polistes* signifies "a builder of a city," and has been given to a genus of insects in allusion to the character of their nests. For a similar reason the name *Apoica*, which signifies a "colony," has been given to another genus of nest-builders, one of which, together with a cell-group, is here shown. The specific name of *pallida* has been given to it on account of the very pale yellow brown which constitutes its only colouring. The only attempt at variation of colour is in a narrow stripe of rather darker brown, which is drawn upon the outer edge of the upper wings. The usual shape of the nest is given in the illustration, and it is impossible to look at one of these nests without being reminded of the remarkable compound nests built by the sociable weaver-bird of Africa.

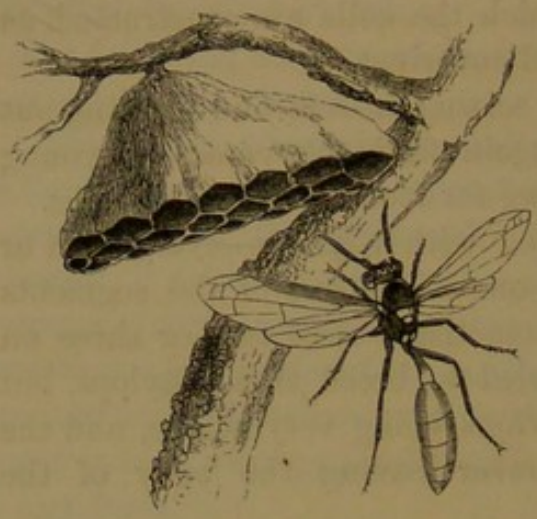


Fig. 267.—Apoica pallida. (Very pale yellow.)

In the British Museum there are a number of nests made by this species, which are not only curious, but really valuable in an entomological point of view. Not only are the cells themselves hexagonal, but the nest masses themselves are hexagons, the six sides being as regular, and the angles as true, as if they had been drawn with rule and compass. How this result is attained is at present an absolute mystery, and it is evident that neither the sculpture nor the mutual pressure theory can be brought to bear on these nests. These nests are of various sizes, so that the insects have evidently started with the idea of making the structure hexagonal, and have adhered to the same principle throughout. The hexagonal form is not adhered to in all instances, for some nests are entirely circular, while in others the hexagonal idea is but slightly indicated. These nests sometimes attain a diameter of eleven or twelve inches. A number of these nests are shown in my "Homes without Hands," p. 585.

THE insect which is here shown is called *Trigonalys compressus*, and is a native of tropical America. The following account of its mode of development is given by Mr. F. Smith:—

"John Macgillivray, Esq., Naturalist to her Majesty's ship *Rattlesnake*, lately presented to the British Museum the nest of a South American species of Polistes, which he says is very abundant at St. Salvador, where even in the street it attaches its nest under the eaves of houses; this species is the *Polistes lanio* of Fabricius, and in all probability the *Vespa Canadensis* of Linnæus; a specimen of the species is preserved in the Banksian Cabinet.

"On examining the nest, I found it consisted as usual of a single comb of cells, having in the centre, at the back, a small footstalk, by which the nests are attached in their position; the



FIG. 268.—Trigonalys compressus.
(Black.)

comb contained sixty-five cells, the outer ones being in an unfinished state, whilst twenty-two of the central ones had remains of exuviæ in them, and one or two closed ones contained perfect insects in them ready to emerge. About half a dozen of the wasps had the anterior portion of their bodies buried in the cells, in the manner in which these insects are said to repose.

"In one cell I observed the head of an insect evidently of a different species, it being black and shining. On extricating it I discovered it to be a species of Trigonalys; I subsequently carefully expanded the insect, and it proved to be the *Trigonalys*

bipustulatus, described by myself in the "Ann. and Mag. of Natural History," vol. vii., Second Series, 1851, from a specimen captured at Pará by Mr. Bates, now in the possession of William Wilson Saunders, Esq. The insect was not enveloped in any pellicle, nor had the cell been closed in any way; the wings were crumpled at its side, as is usual in Hymenopterous insects which have not expanded them, proving satisfactorily that it had never quitted the cell, and that Trigonalys is the parasite of Polistes.

"This discovery is one of much interest, proving the relationship of the insect to be amongst the pupivora—to which family it had been previously assigned by Mr. Westwood. (See vol. iii. Ent. Trans., p. 270.) The specimen is seven lines in length, entirely black, the head shining, the thorax and abdomen opaque, and having two white maculæ touching the apical margin of the basal segment above; the wings are smoky, the antennæ broken off. Of one of them I found subsequently seventeen joints—the perfect insect in the possession of Mr. Saunders having twenty joints."

The specific name of *bipustulatus*, or "two-spotted," has been given to the insect on account of the two white spots on the base of the abdomen, but its original name of *compressus*, as given to it by De Geer, is now allowed to stand.

THE figure which is here given represents the neuter of the splendid Chinese Wasp, which is appropriately called *Vespa*



FIG. 269.—Vespa mandarinia.
(Orange and dark brown.)

mandarinia. The female is shown on Plate IX., Fig. 3. This

fine insect is found throughout China and Japan. It is coloured very much like our common hornet, but is much richer in appearance, owing to the very broad and ample head, and the amount of bright yellow upon it. The colours are rich dark brown, banded, striped, and marked profusely with "king's" yellow. The jaws are enormously powerful. The wings are yellow, darker at the base, and becoming lighter towards the tips.

THE species which is represented in the accompanying illustration is a native of Asia, and is spread over a very large tract

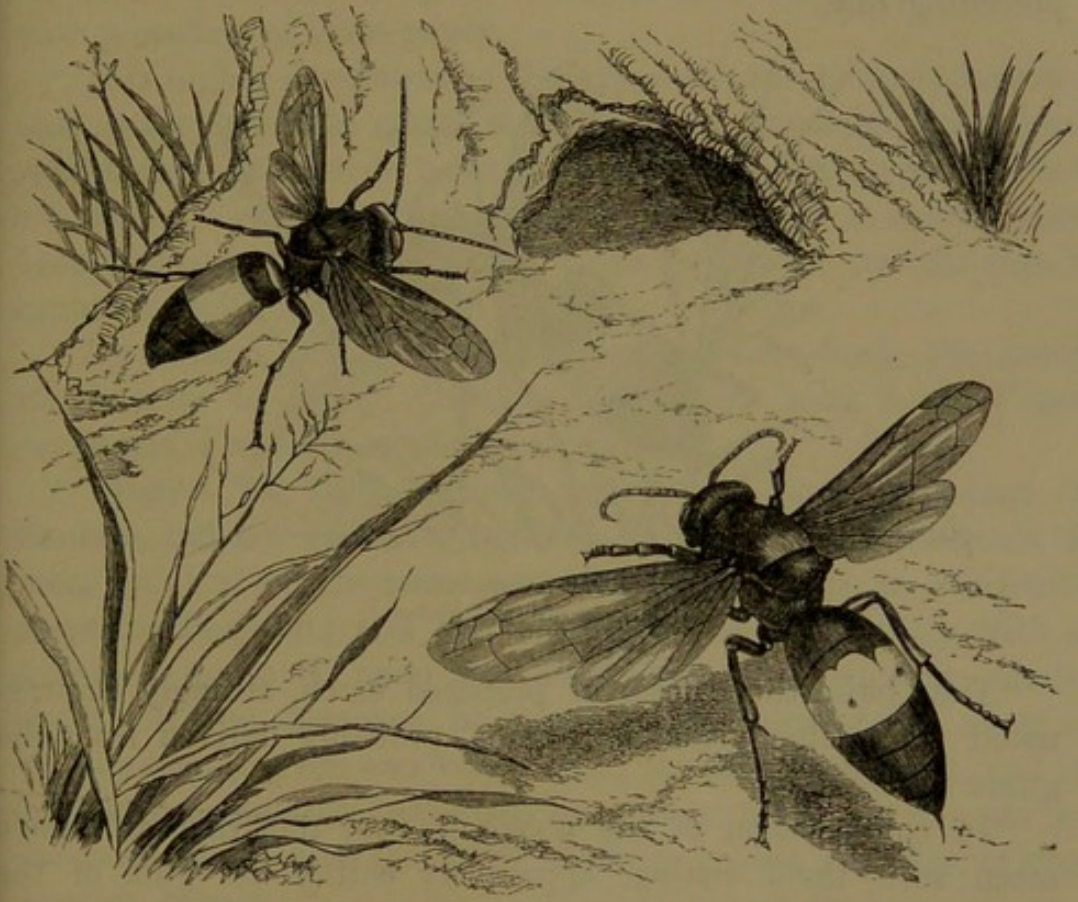


FIG. 270.—Vespa cincta.
(Dark brown and yellow.)

of country. There are several Asiatic species of Vespa which are almost exactly similar in their habits, and this may safely be taken as the typical species. The head and thorax of *Vespa cincta* are dark brown, covered with a moderately thick grey down, and the abdomen is very dark brown, crossed with a bold band of bright yellow, whence is derived the specific name of *cincta*, or "banded."

In the accompanying illustration, the upper and smaller figure represents the male, and the lower figure the perfect female. The single figure represents the neuter, or worker wasp.

The habits of this wasp are admirably described by Mr. Horne in the essay to which reference has so often been made. In this account Mr. Horne seems to have some doubt as to the truth of the report that horses have been stung to death by these wasps. I think it very likely to be true. Some years ago I saw, only a few miles from my house, a wasp's nest, the inmates of which had actually killed a carriage-horse on the preceding day.



Fig. 271.—Vespa cincta.
(Dark brown and yellow.)

"They build their nests of prepared earth, strongly impregnated with some viscid substance, probably derived from the gums of trees.

"In confirmation of the above, I may remark that I have often seen them sitting, apparently eating the gum of the Acacia (*Catechu*), and also the flowing juice of the Peepul-tree (*Ficus Indica*), and as they are in general carnivorous, it must have been for some such purpose. At the same time there appears to be some woody, or at least vegetable fibre, mixed with the earth.

"The cells are regular hexagons, and built from an hexagonal *ground-plan*—a fact which confirms Mr. Smith's observations to the same effect—and the whole structure often assumes a large size. One found by me was $10'' \times 9'' \times 9''$, in the centre of a wall composed of sunburnt bricks, in a hollow which had been

originally excavated by Termites, and afterwards enlarged by the 'hornets,' as they are popularly called.

"I have often seen these insects pounce on a sitting fly, just as a hawk would do on a small bird; and they are also very fond of ripe fruit, such as peaches, grapes, and apples. The *Vespa velutina* also indulges in these luxuries, and is especially fond of the hill apricot.

"The stings of four or five of these insects are said to be sufficiently powerful to kill a child, but, as in all such cases, much must depend on the circumstances.

"The outside of the nests is, as is usual with wasps, covered with a coating of loose paper.

"It is highly dangerous to disturb a colony of these insects; and, as they work in gangs at night, it is somewhat hazardous even then to take their nests. As, however, they greatly affect outhouses, it is most necessary to destroy them, as horses have been said to have been stung to death by them; but for this I cannot vouch.

"I will here quote *in extenso* from my note-book, the notes which refer to Indian 'hornets,' by which term both *Vespa cincta* and *Vespa Orientalis* are designated.

"'*August* 15, 1863.—These insects are very abundant at Benares, but not generally spiteful. One may see hundreds of them flying about the sweetmeat stalls, like wasps in the fruit-shops in England; and the vendor drives them away with a whisk—a piece of palm-leaf in a cloth—and is very rarely stung. If one, however, be incautiously touched, the sting is very suddenly given and very sharp; its pain is intense, and it induces considerable inflammation. They make their nests in the mud walls, and the form of these is just like that of the English hornet.

"'Yesterday I was drying some sugar in the sun, and this attracted a large number of them. My man killed many, throwing down their bodies on the spot, when the ants appeared to carry off the carcases; but not only did the ants so employ themselves, for the hornets also alighted and carried off their dead brethren as food. The ants (*Œcophylla smaragdina*) appear to be naturally very destructive to these insects. These ants live both in the ground and in nests made of leaves of trees drawn together.

"'I have seen the hornets trying to carry off their tiny tormentors. Again and again have they darted at them; but it invariably ended either in the hornet quietly sitting down among his enemies to be bitten or stung to death, and then carried off in triumph to be eaten by them, or in his falling to the ground with two or three ants hanging on, when his fate was equally certain.

"'One of these insects stung me on the thumb, but by sucking the place for about a quarter of an hour, I drew out the poison, and the pain and swelling were afterwards very slight.'

"'*August* 20, 1863.—This evening, having prepared two large squibs filled with damp gunpowder, I proceeded to take two nests, one of *Vespa Orientalis* and one of *Vespa cincta*, both in similar situations. Having lighted the touch-paper, the end was placed at the mouth of the hole, and wet clay was plastered around. The dense smoke and intense heat thus killed every perfect insect in the nest, which I shortly dug out for the purpose of examination. One nest was buried forthwith in a hole previously prepared, and the one taken to be set up was that of *Vespa Orientalis*, to which all the succeeding remarks will refer.

"'Both nests were constructed of earth tempered with water, and I could trace no sign of gluten of any kind in them. In the nest prepared by me were seven ranges of cells, and at the time of taking it from 400 to 500 hornets were at home. Although I took out every perfect insect, there were from forty to fifty nearly hatched by 5 A.M. next morning, showing with what enormous rapidity they increase. The nest was placed under a large wire dish-cover, and a nest of the Yellow Ant before referred to was placed with them, so that every young hornet was destroyed as soon as born.'

"'*July* 1, 1864. Benares.—As a boy, when in England, I have watched a hornet carry off a fly sitting on a door-handle, and to-day I saw one pounce on a small honey-bee deep in the pollen of a flower, and, taking him off, sit down and eat him quietly, and, from the number hovering about flowers, this would seem to be a favourite food.'

"'*July* 19, 1864. Benares.—Watched hornets catching and eating the workers of Termites, whose galleries I had just destroyed on the bark of a tree, when, in consequence, the blind insects were running wildly about.'

"'*August* 19, 1864.—Watched them more narrowly and carefully. Saw that one caught at least ten Termites, one after the other, and made them all up into a ball with its jaws, when the said ball was taken away, evidently to feed the young larvæ with a rich and juicy morsel, which, however, would be strongly tinctured with acid.'"

This very interesting history requires, in order to make it thoroughly intelligible, the account of the Yellow Ant (*Œcophylla smaragdina*), to which several allusions have been made, and whose exploits will be remembered in connection with the fiercely-stinging Polistes.

LIKE the generic name of *Polistes* and *Apoica*, that of *Synœca* is given on account of the mode of nest-building. The term is composed of two Greek words, and literally signifies an assemblage of persons living under the same roof.

There is rather a peculiarity about the nests of the Synœcas. They are not suspended by footstalks, but are affixed throughout their whole length to a branch, a tree-trunk, or similar object, and have the entrance below. The mouth of one of these nests is shown in the illustration.



FIG. 272.—Synœca cœrulea. (Blue.)

The outer shell, or covering of the nests, is exceedingly thin —scarcely thicker indeed than the paper on which this account is printed, and yet is quite strong enough to resist the weather. Within the nest the combs are placed in regular layers, like those of the common wasp, and the shell is so thin that the edges of each successive layer is distinctly marked on the exterior. In consequence of this peculiar surface, added to the dark brown of the paper covering, the nest bears so close a resemblance to the bark of the tree or branch to which it is fastened, that a very quick eye is needed in order to discover it. As is the case with most of the Social Wasps, the nest is

begun on a small scale, and gradually enlarged in order to accommodate the increasing population. There are many specimens of Syncœca nests in the British Museum, the largest of which is rather more than two feet in length.

The colour of the present species is blue, even the head having a slight gloss of the same colour. The wings are brown. The handsomest of all the species is perhaps *Syncœca cyanea*, in which the blue is exceedingly vivid. All the Syncœcas are Brazilian insects.

THE last of the Wasp tribe which will be described is that which is represented in the accompanying illustration. It is

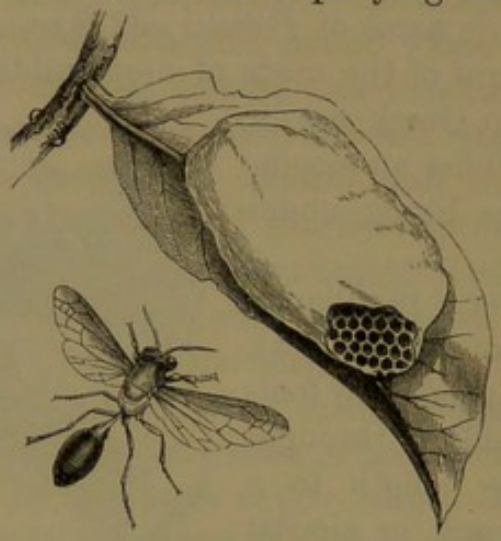


FIG. 273.—Polybia sericea.
(Reddish brown.)

called *Polybia sericea*, both of which names are appropriate. The generic name, *Polybia*, signifies "sociality," and the specific term, *sericea*, or "silken," is applied to the insect in consequence of the silken down which is spread profusely over the thorax. Most of the Polybias are South American insects, though there are some which come from the Celebes, and a few from New Guinea and Borneo.

The mode in which these insects make their nests is very remarkable. Choosing a tolerably flat surface, mostly that of a leaf, the little wasp begins by laying the foundation of a number of hexagonal cells, sometimes as many as thirty or forty in number. She then deposits an egg in each cell, and proceeds to make some more. As the larvæ are hatched and

increase in size, the Wasp builds up the walls of the cells, so as to accommodate them, and then places over them a covering of thin paper. Scarcely has she done this than she proceeds to place another layer of cells upon the cover, and, as the worker wasps are hatched, they build cells at such a rate that layer after layer may be seen in one nest, each being placed on the cover of the preceding layer.

The Polybia does not seem to be very particular as to the material on which it supports its nest, though a large leaf is generally a favourite locality. There are numbers of these curious habitations in the "Nest Room" of the British Museum, and very variable they are. One of them looks just like a huge brown sausage, round which a series of strings had been tied about an inch apart. These represent the layers of combs which are placed regularly inside the protecting cover. It is remarkable, by the way, that some of the large wasps called *Chartergus*, which hang their nests to the branches of trees, act in a very similar manner.

CHAPTER VI.

SOLITARY AND SOCIAL BEES.

THE next great group of the Hymenoptera may be summed up in the words which head this chapter. Just as there are Solitary and Social Wasps, so there are Solitary and Social Bees. The habits of these creatures are curiously similar, the Solitary Bees placing their eggs in burrows which they stock with food for the future young, and the Social Bees forming a number of cells in which the young larvæ are hatched, and tending them until they are full-fed. The chief distinction is that, whereas the Solitary Wasps store their burrows with insects as food for the future young, the Solitary Bees empty the pollen of various plants. Most of them, as well as the Social Bees, procure the pollen for themselves, and for this purpose are furnished with a development of the hind-legs, technically called the "basket." Some species, however, do not possess the basket, and are therefore unable to carry the pollen. Consequently, they are forced to make use of the stores collected by other bees, and treat them exactly as do the parasitic wasps which have already been described. In the different genera of pollen-carrying bees there is great variety of form in the structure of the basket, but the general principle is the same in all.

The Solitary Bees begin with the great family of Andrenidæ, which are spread over all the insect-producing parts of the world. There are many species in England, so that their habits can be easily watched. Putting aside those that are parasitic, the habits of all the species are tolerably alike. They make burrows, mostly in the ground, and deposit therein a quantity of pollen mixed with honey, technically called "bee-bread." Upon this they place an egg, and thus protect it with a cover. Upon this first cell a second is made, and so the bee proceeds, until it has nearly

filled the burrow with its cells. Having thus completed its labours, the bee closes the burrow with a stout cover of earth.

Of the genus to which *Halictus quadristrigatus* belongs, there are many English species, Mr. F. Smith having described twenty-six species, one of which is the smallest species of bee that is found in this country. As the habits of all the British species are alike, it may be inferred that the life history of the genus is tolerably similar all over the world. The present species inhabits the warmer parts of Europe, but has never been seen in England.



Fig. 274.—Halictus quadristrigatus. (Black and yellow.)

Mr. Smith found that in the spring the females appeared, and abounded until midsummer, not a single male being seen. In the autumn the males began to appear, and a week or two afterwards a second brood of females succeeded the males, immediately setting about their tunnels. Each burrow had several others running into it, all being reached by the one common entrance. In each of these burrows was placed a little ball of pollen and a single egg, and the larva was full-fed in some ten or twelve days.

The colour of this species is black, and there are four narrow bands of yellow on the abdomen. The specific name *quadristrigatus*, or four-striped, refers to this colouring.

The history of the genus *Andrena* is a very remarkable one, not so much on account of the labours of the bee, but of the persecution which it endures from other insects. In his Catalogue of British Bees, Mr. F. Smith has worked out this branch of the subject exhaustively, though briefly. After remarking upon the various hymenopterous parasites which attack the Andrenas, he refers to the extraordinary parasitic beetle called *Stylops*, which was first discovered by Mr. Kirby upon an

Andrena bee. Mr. Smith's description of these singular parasites is very interesting:—

"These insects are diminutive in size, the largest known species not exceeding a quarter of an inch in length. We are now speaking of the winged males, the females being apterous, grub-like insects, which never leave the bodies of the bees. If the abdomens of a number of Andrenidæ be examined, it is most probable that the female of Stylops will be found. Her presence is known by the protrusion of her head, and a portion of the thorax between the abdominal segments on their superior surface resembling the point of a small bud of a brown colour, or rather, a flattened scale.

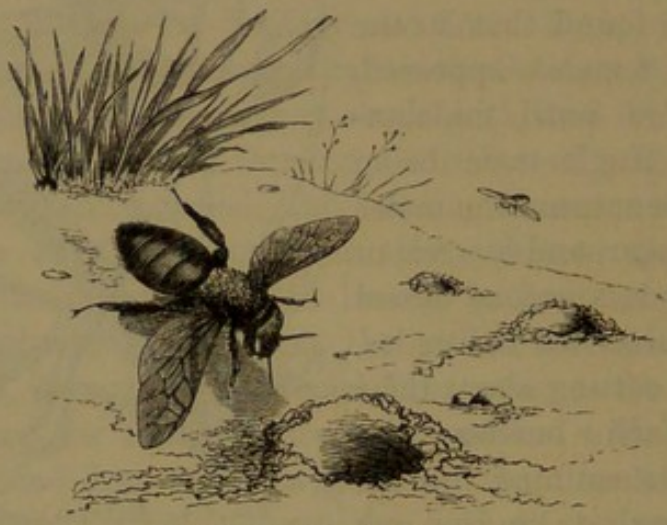


FIG. 275.—Andrena holomelana.
(Shining black.)

"I have several times bred the larvæ of the Stylops in the following manner:—On finding a bee infested as described, place her in a box five or six inches square, cover it with gauze, and supply the bee with fresh flowers such as the Andrenidæ frequent. Examine the bee every day, and it is most likely that in eight or ten days she will appear as if her abdomen were covered with dust. Examine it, and in all probability she will be found to be covered with an innumerable quantity of exceedingly minute animals; these are the larvæ of Stylops.

"By the aid of a magnifying-glass they may be seen to issue from the transverse aperture on the thorax. When the bee re-enters the cell, or settles upon flowers, these diminutive creatures will of course be deposited, and by these means, when other

bees visit the flowers, they attach themselves to them, and are carried to their nests.

"Judging from the multitude of larvæ produced by each female Stylops, amounting to many hundreds in each case, and the rarity of the perfect insect, the majority must perish, probably in their larval condition. From the fact of seldom more than two Stylops being found to infest the same bee, we may suppose that to be the largest number which infests one larva of an Andrena. They undergo their changes in the body of the bee, the male on its final transformation becoming an active winged insect, the female remaining a mere apod, attached for life to the bee which nourished it."

Besides the Stylops, there are several other parasites which infest this much-enduring bee, the curious little orange-coloured larva of the Meloë being perhaps the most remarkable. A full description of this larva and its development is given in my "Insects at Home," p. 154.

The specific name *Holomelana* is formed from two Greek words signifying "wholly black," and is given to the species because its colour is entirely shining black.

THE strange-looking bee which is shown in the illustration has been selected on account of its beauty. It is an European species, but has never been found in England, where only one representative of the genus is known, namely, *Dasypoda hirtipes*, which Mr. Smith describes as being perhaps the most beautiful bee found in this country.



FIG. 276.—Dasypoda plumipes. (Black, with golden hair.)

In all the species belonging to this genus the hind-legs are clothed with very long downy hair. Both names refer to this peculiarity, the generic name being taken from the Greek, and signifying "hairy-footed," while the specific name is Latin, and signifies "plumed-foot."

This is a very beautiful bee. The original colour is black, but the thorax is covered with a thick coat of silken hair, shining as if spun from gold. The long hairs which fringe the legs are bright

yellow, and the abdomen is black, and deeply fringed with golden hair. As is the case with many of the bee-tribe, this beautiful adornment can only be seen in perfection when the insect has been newly developed, for the beautiful plumage cannot endure rough work, and suffers so much from contact with the world, that a bee of a day old and one which has lived for three or four weeks would hardly be recognized as the same species, even though they may have issued from the same nest. Seven species of this genus are in the British Museum.

All entomologists are aware of the singular resemblances that occur between certain lepidoptera and hymenoptera, the "clear-wing" moths of our own country being excellent examples. Curious as is the shape of this bee, it is exactly imitated by a beautiful Assamese moth, called *Trochilium Ashtaroth*. The colours are different, but the resemblance of form is so perfect, that if the outline of either were drawn, it would not be easy to determine the insect which it was meant to represent; even the deeply-plumed hind-legs are represented in the moth.

Of all the Solitary Bees, the genus *Osmia* is the most interesting, on account of the singular variety of its architecture. Some ten species are known to inhabit England. However the different species of Osmia may vary in detail of architecture, they all agree in the habit of making cells and stocking them with food for the future young. Several species make their cells in the dead stems of the blackberry, the rose, and similar shrubs, digging out the pith, and so making a series of cells, end to end. They are, however, very much given to saving themselves needless labour, and are in the habit of taking advantage of any tubes that they may find. The straws of thatched roofs are favourite localities with some species, but they will sometimes make use of the most singular and unexpected objects as dwelling-places.

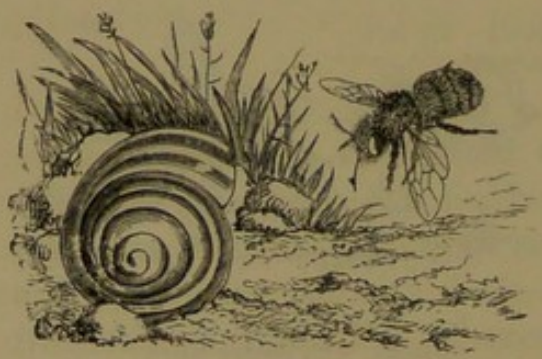


Fig. 277.—Osmia bicolor. (Black, barred with orange.)

Any hole or empty tube serves to be adapted to the purposes

of the Osmia, which will even enter into houses in search of a suitable locality. Some years ago I was at a sale at Lee, and purchased for a very small sum a band-box full of miscellaneous articles. Among them was a flute, which was quite choked up, apparently as if some mischievous child had been stuffing it with paper. On unscrewing the flute, I found it to be occupied with the cells of the Osmia, the insect having evidently entered by the mouth-hole and gradually filled the instrument with its cells. The mother-bee must have found its way into the disused rooms in which the band-box had been lying, and so contrived to discover the flute. The flute is now in the British Museum.

Empty snail-shells are favourite localities with the Osmias, and in the British Museum is a very curious specimen. The shell happened to be a very large one, so that several cells could be made in it. The bee began as usual by making a single cell far within the shell. She then placed two more cells horizontally side by side, and then, the shell being very much wider, built two more cells, also side by side, but transversely; thus showing that she possessed no small reasoning powers.

The present species is an inhabitant of Southern Europe, and has been found in England, though it is very local. Kent seems to be its favourite county. It is a very pretty insect, the colour being black, banded with orange. Generally, it does not reach half an inch in length, but a few specimens have been taken which were three-quarters of an inch in length.

One species of Osmia does not build in tubes, but makes its simple nest under the shelter of flat stones and in similar localities. This is a northern species, and its name is *Osmia parietana*. Instead of boring tunnels, or making cocoons in tubes, it merely selects the under surface of some flat stone, and to it attaches a number of balls of pollen, each ball accompanied by an egg. After the larva is full-fed, it spins a cocoon, which it affixes to the stone in the same place which the pollen-ball previously occupied. The number of these cocoons is something great. On a piece of stone only ten inches by six, no less than two hundred and thirty cocoons were found. These were placed in the hands of Mr. F. Smith, who found that the insects were developed in three distinct batches, one in 1849, another in 1850, and the third in 1851.

THE insect which is here represented is an European species, but at present is not known to be British.

There is a considerable difference in appearance, as well as size, between the sexes. The female, which is drawn in the illustration, is very black, and her wings are brown. The male is a much smaller, but handsomer insect, being covered with a dense coating of long silken hairs, either golden or pale yellow. The generic name, which is formed from a Greek word, signifying "brass," is given to it on account of this peculiarity. Hair of a similar character is to be found in the males of most species, but it is not seen unless the specimen is in the very best order.

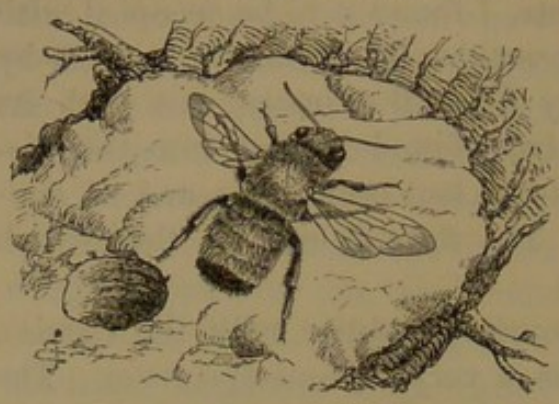


FIG. 278.—Chalicodoma muraria. (Black.)

This insect is very liable to the attacks of a species of Clerus, a parasitic genus which infests not only the nests of the wild bees, but even the hives of the domestic bee. All the species are brightly coloured, and, were they large, they would rank among the handsomest of their order.

THE generic name of *Megachile* is formed from two Greek words, which literally signify "large-muzzled," and is given to certain bees in consequence of their large jaws. The species which is taken as an example of the genus has been selected principally because it well shows the generic peculiarity. It is a native of Australia, and is beautifully coloured, the greater part of the body being of the richest purple very deeply punctured, and relieved by a quantity of snowy white down, arranged as shown in the illustration. The wings are brown, and have a purple gloss.

This genus is spread all over the world, and has long been celebrated for the beautiful nests which are made by the different species. Nine British species are known, and are popularly called "Leaf-cutter Bees," because they cut up leaves for the purpose of forming their singular nests. The rose is the plant which is generally employed, though the leaves of several other plants are also brought into requisition.

Even the same species is very variable in the position of its nest. Mr. F. Smith remarks that our best known species, *Megachile centuncularis*, sometimes burrows in decaying wood, sometimes in the soft mortar of an old wall, and sometimes in the ground. Within these burrows it makes its cells, which are formed from the cut leaves, and look very much like a number of green thimbles stuck into each other. There is now before me a specimen which was not made in a tunnel at all, the bee having made its way into an outhouse, and placed its nest on a high shelf. It has generally been supposed that the cells were made by bending the leaves and allowing them to press by their own elasticity against the side of the burrow. But the existence of this nest shows that the bee can make its cells independently



FIG. 279.—Megachile monstrosus.
(Deep purple and white.)

of the burrow, and that it can bend and fasten together the leaves by its own unaided efforts.

In Mr. Horne's paper on the Indian hymenoptera, there is a very interesting account of the manner in which various species of this genus build their nests. One species, *Megachile fasciculata*, consrtucted its leaf-cells in the hollow handle of a large garden vase, a number of the nests being built closely together. Another species, *Megachile disjuncta*, uses mud instead of leaves, and makes two earthen tubes, side by side, sometimes giving each of them a curious twist in the middle. *Megachile lanata* is also a mud-builder, and works in a variety of ways. The following is Mr. Horne's account of this insect:—

"This insect is found in almost every house in the North-

West Provinces, and, next to the black and yellow *Pelopæus* (*madraspatanus*) is the one which attracts most notice.

"The season in which it builds its cells is from March to November; but July and August (*i.e.* during the rainy season) are its favourite months. These cells are placed in every conceivable situation; and it is curious, when sitting quietly writing, to watch the insect coming and going with his material. He or she is so deeply interested in the work that all fear is forgotten, and they will work within a foot of your writing-desk. The mud is carried, so to speak, under the head, and in part supported by the fore-legs, and it is not so finely worked up as that of the *Pelopæus;* hence we find the work much rougher exteriorly, although the inside of the cell is carefully smoothed. I have had a newspaper lying on the table and heard them working inside the folds; in short, there is no position too strange for the nest.

"The following are a few of the positions in which I have found them:—

"1. Between folds of paper; 2. in the back of a book which had been left lying open; 3. on the handle of a tea-cup; 4. in the key-hole of a door; 5. in the barrel of a gun; 6. under a fan on the table; 7. in the hollow of a bolt of a window, where three times the whole structure was crushed by the use of the said bolt in the absence of the insect; 8. on a signet-ring from which the stone had fallen out; 9. on the frill of a large fan or punka, which was kept in motion ten or twelve hours out of the twenty-four.

"I will now proceed with the method of working. Both sexes appear to labour; for I have sometimes caught a worker, and found that the work was immediately continued, which was not the case with the *Pelopæus.* They come and go incessantly, with a loud buzzing; and whilst they are tempering the clay they keep up the motion, thereby advertising the locality where they are working, although often the *exact* spot is even then difficult to find. The tenacity with which the clay adheres to substances is very curious (although the cells of the insects of the genus *Rhynchium* afford a better instance); and I believe that when the clay, having been first prepared at the water, is brought into use, it is inspissated by some glutinous substance ejected by the insect. It is certainly very carefully kneaded

again by many of the clay-cell-builders. The cells are built side by side with very little cohesion, and are stocked with bee-bread and closed by three or four pellets of mud, united in such a manner as to leave thin edges next to the lips or upper edges, and thus enable the insect easily to escape. The outside is in general rough, and adapted to the situation in which it is built. It is scarcely ever truly circular on the outside, even if built free from obstruction.

"Amongst the figures will be observed a solitary cell built in a signet-ring. The power of instinct shown here is very great; for to keep the cell secure the clay has been made larger at the base, where it projects interiorly in the ring.

"This insect is very annoying from the manner it chokes up small openings, such as barrels of fire-arms and locks of drawers, in the latter case entering by the key-hole.

"I watched the construction of four cells in June 1863; and the perfect insects were matured August 12, 14, 15, and 16 respectively. This would show, what is really the case, that the cells take about a day each to construct. In fact, in one case noted by me, a cell was commenced, finished, stored with food, and closed, certainly within ten hours, which is quite possible if both sexes work, as I believe to be the case.

"Sometimes, however, a hollow bamboo is the situation selected by this insect. If it be tolerably thick there is room for several cells; and they are built from the bottom of the hollow upwards, either in a straight line or spirally. In either case I believe the single series to be constructed, and the second series commenced from the very bottom on the completion of the first. In some cases there are as many as eight or ten cells in each hive; and probably more than one pair of insects are concerned in this double series."

THE bees belonging to the genus *Anthidium* are remarkable for two peculiarities. In the first place, they exactly reverse the usual structure of bees, the male being very much larger and stronger than the female.

Their matrimonial customs are very curious, and quite unlike those of insects in general. Both sexes are fond of hovering over flowers, a habit which has earned for them the generic name of *Anthidium*, *i.e.* "a creature that frequents flowers."

The females remain on or close to the flowers, while the more powerful male hovers above, like a hawk watching its prey. Mr. F. Smith tells me that he has seen the male of our only English species, *Anthidium manicatum*, suddenly swoop down, just as a hawk stoops upon its quarry, pounce on one of the females and carry her off.

The second peculiarity in these bees is the method in which they construct their nests. Although they build in holes, it is believed that they do not burrow, but that they usually make use of any convenient hole that can be found, mostly in a burrow made by some large wood-boring insect. Having selected a suitable burrow, the mother-bee goes off in search of some woolly plant, from which she strips the hair, running along the stem and shaving off the down as she goes. The well-known "White of Selborne" was the first to notice this habit in the English species, and he compares the action of the bee to that of a hoop-shaver. The garden campion was the plant frequented by the bees which he watched. There are some foreign species which do not build in burrows, but make their nests in the pure air, placing them on branches.



Fig. 280.—Anthidium Florentinum. (Black and yellow.)

The present species inhabits Southern Europe, and has a curiously waspish aspect.



Fig. 281.—Nomada sexfasciata. (Black and yellow.)

In the *Nomada sexfasciata* we have a good example of the group of insects called Wasp Bees, because, though they are really bees, they bear a very strong external resemblance to wasps.

They are all parasitic, preying upon the nests of other bees.

This species is known to be parasitic upon *Eucera longicornis*, Mr. F. Smith having had specimens from the nests of that insect. He believes that although this species is rare, it may be found wherever the *Eucera* makes its nest.

As its name imports, its black abdomen is marked with six bands of yellow, the three next the tip extending completely across the body, and those towards the base only about half way. This insect is spread over a very large portion of the globe.

THE generic name of the insect which is here figured is formed from two Greek words, signifying "sharp-belly," and is given to the insects because the abdomen narrows rapidly



FIG. 282.—Cœlioxys Ducalis.
(Black.)

towards the end, especially in the female. The abdomen of the male is toothed at the extremity. It is a parasitic genus, and in England has been bred from the nest of the active and beautiful Megachile and Saropoda.

The present species is African, and is extremely rare. Mr. F. Smith was indebted for his specimen to Mr. W. W. L. Walcott, who brought it from Africa. The colour of the abdomen is black, and the thorax is thickly covered with warm dun-coloured hair. The wings have a decided purple gloss when viewed by a side light.

Mr. Smith remarks concerning the bees of this genus, that the species are exceedingly difficult of identification, owing to

the variety of form which prevails. "We must not forget that a species is not, as it were, cast in a mould, but admits a degree of variety, still, however, retaining intact the broad and distinguishing characteristics." If this maxim had been more generally appreciated by systematic zoologists, we should have been spared much of the confused nomenclature under which we at present suffer.

PLATE X. represents a group of Brazilian bees, the first of which is called *Chrysantheda frontalis*. It is marked No. 1, and is the upper of the two insects which are shown as inserting their long tongues into the blossom. The singularly beautiful flower which is depicted is the *Passiflora kermesiana*.

This is one of the parasitic bees, and is supposed to infest the dwellings of the great wood-boring bee, which is seen immediately above it. It is a very beautiful insect, its body being shining green, very thickly punctured, and its wings brown, with a decided blue gloss. The hind legs are furnished on the inside with a coating of thick brown hair, but on the outside are of the same shining green as the body.

ANOTHER of these beautiful parasitic bees is shown in the

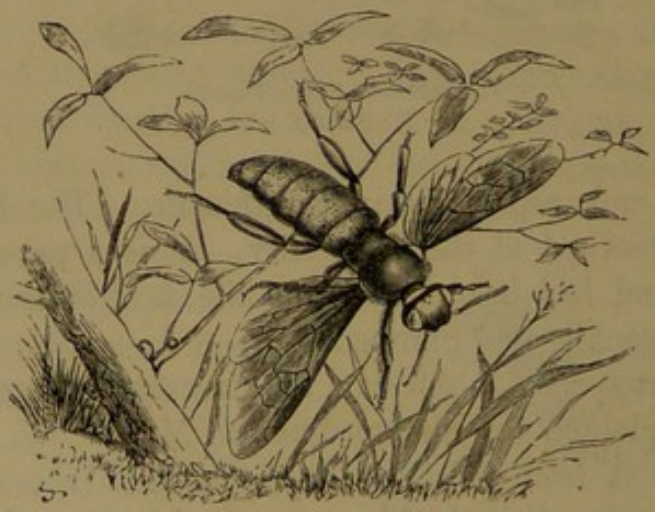


FIG. 283.—Aglaë cærulea.
(Shining blue.)

accompanying illustration. Its colour is shining blue, with a gloss of green in a side light. The wings are brown.

PLATE X.



On Plate X., Fig. 3, is shown a very handsome Brazilian bee, named *Centris denudans.*

The abdomen of this insect is velvet black, and the thorax is covered with dense orange hair. The wings are glossed with blue, and the hind legs are clothed with very long black hair. There is a British genus named *Melecta,* which is closely allied to Centris. The *Melecta* is a parasite insect, and Mr. F. Smith has bred numbers of them from the nests of the well-known Anthophora.

Another species of the same genus, *Centris flavopicta,* is



Fig. 284.—Centris flavopicta. (Brown and yellow.) Euglossa dimidiata. (Black and white.)

shown in the accompanying illustration. The abdomen is yellow, crossed with bars of dark brown, and the thorax is dark brown, relieved by a greyish white pile. The brushes of the hind pair of legs are yellow.

The name *Xylocopa* literally signifies a "wood-cutter," and is

given to a genus of bees in consequence of their power of burrowing into wood. They are spread over all the warmer portions of the earth, but no species has as yet been found to inhabit England. The present example is a native of Southern Africa, and, as is often the case among insects, the colours of the two sexes are very different. The male is covered with yellowish orange hair, and has transparent wings, while the female is black, varied with whitish grey hair, and her wings are black, with a blue gloss. In the illustration the upper figure represents the male, and the lower the female.



FIG. 285.—Xylocopa nigrita.
(Male, orange; Female, black.)

Between the two specimens is seen the entrance to the tunnel which these insects make. By means of their very powerful jaws, which look much like wire-nippers, a large hole is made in the side of a tree, and carried on horizontally for a few inches. It then turns almost at an angle, so as to follow the grain of the wood. A vast number of chips are of course made, and, instead of being thrown away, are stored up in a safe place until wanted.

The burrow being completed, the insect places a quantity of pollen at the extremity of the tunnel, and deposits an egg upon it. She then goes off to her store of wooden chips, and with them constructs a flat ceiling over the pollen, so as to form a cell. The ceiling is quite flat, and is made in concentric rings, just like a slice cut through the middle of an onion. More pollen and another egg are then deposited on this ceiling, which becomes the floor of a second cell, and so the insect proceeds until it has filled the burrow with its cells.

In the Nest Room of the British Museum there are many specimens of *Xylocopa* burrows, in which the whole process is easily to be seen. One of the largest is *Xylocopa trepida,* a singularly fine insect, with blue-glossed wings. The nest of this bee, is also in the Museum. One of the handsomest species is *Xylocopa caffra,* which is, as its name imports, an inhabitant of Southern Africa. The male is entirely greenish yellow, while the female is black, with a broad band of golden hair at the junction of the thorax and abdomen. The front of the thorax is black and blue.

Another fine species, *Xylocopa morio,* is seen—Plate X., Fig. 2. It is a Brazilian insect. It is shining black, with a fringe of black hair upon the abdomen. The wings are brown.

On the same plate, Fig. 4, is shown another of the parasitic bee, named *Euglossa romandi,* which is shown as inserting its long tongue in the flower of the *Passiflora.*

It is a very handsome insect, the abdomen being green, with the exception of the base, which is purple. The thorax is also purple, and the head green like the abdomen. The green has always a gloss of gold, and in some specimens it extends over the whole of the abdomen, the purple band being wanting. As may be seen by reference to the illustration, the tongue is of very great length, and in one specimen in the collection of the British Museum it is separated into its several parts. The name *Euglossa,* or "beautiful tongue," refers to the length of the proboscis.

Another species of the same genus, called *Euglossa dimidiata,* is drawn on the same block as the *Centris flavopicta,* page 519. It is a Brazilian insect.

It is handsomely coloured. The ground colour of the abdo-

men is black, and across it are drawn several bands of light-coloured hair, the two upper bands being either white or pale yellow, and the remainder deep orange, so that the whole insect has very much the appearance of a humble bee. The wings are nearly brown, but become transparent towards their tips. It is remarkable that there is a large dipterous insect belonging to the genus *Asilus*, which so closely resembles this Euglossa, that when the two are placed side by side, they look like two specimens of the same insect.

THE two insects which are shown in the next illustration belong to the same genus as our familiar Humble Bees.

The general habits of all the species are very similar, though they may vary somewhat in detail. They are social insects, living together in nests constructed either in or on the ground. Their cells are made of a very coarse brown wax, and are oval in shape, so that they cannot be arranged with the beautiful accuracy which distinguishes the cells of the hive bee, or even those of the common wasp. Indeed, except that they stand tolerably upright, they seem to be tossed about very much at random, the bees having apparently made the cells wherever they could find room.

Contrary to the custom of the hive bee, males, females, and neuters live socially together, the females taking part in cell-making and honey-collecting, and there being no single queen who will allow no rival to the throne. The males, however, when once they have left their nests, seldom return to them. They are all big-bodied, heavy-flying insects, and, when on the wing, they emit a deep humming sound, which has earned for them the popular title of Humble, *i.e.* Humming Bees.

There are few insects in which such variation of colour exists, as among the Humble Bees. In the first place, every species is liable to very great variation; and in the next place the colours of the long hairy clothing are so evanescent, that after a few days' exposure to light and air, they fade into the very shadows of their former beauty. With these insects, as with the Andrenas, the only mode of preserving them in their full beauty is by taking them almost as soon as they have issued from their cocoons, and then keeping them in a perfectly dark drawer.

As is the case with the wasp, the greater number of Humble

Bees perish during the cold months, only a few females surviving. These insects hide themselves in some convenient spot until the following year; and it is a remarkable fact, that instead of availing themselves of the nest in which they had lived, they invariably desert it and go to some sheltered crevice, where they spend the winter alone.

As a rule, the Humble Bees favour the more northern parts of the world; and, as Mr. F. Smith remarks, New Zealand and

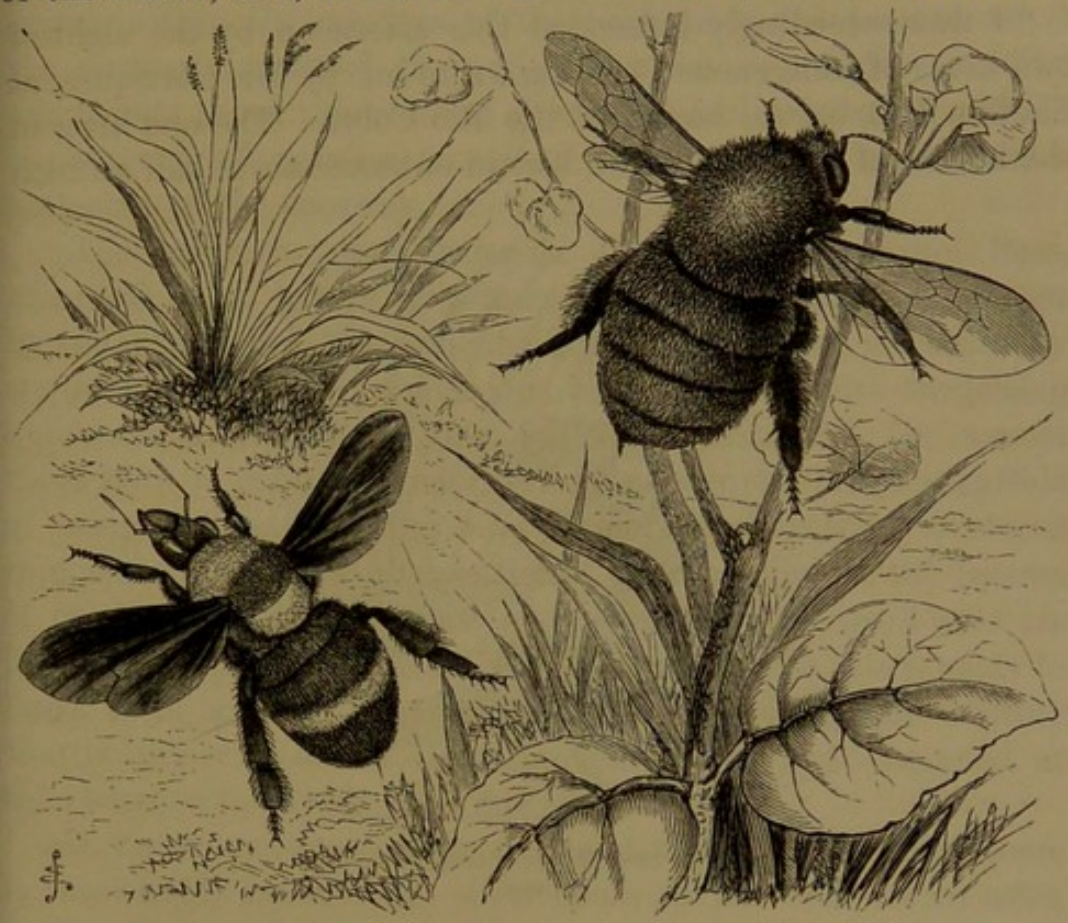


FIG. 286.—Bombus cajanensis. (Black and yellow.) Bombus eximius. (Black, with ruddy belts.)

Australia seem to be without them. The two insects which are represented in the accompanying illustration have been selected as examples of southern Humble Bees. The figure on the left represents *Bombus cajanensis*, which is, as its name implies, a native of Cayenne. Its colours are very simple, being merely black, banded with bright yellow. The other figure represents *Bombus eximius*, a native of Silhet. It is covered with long, dense, black, velvet-like hair, and the segments of the abdomen are edged with fringes of long, ruddy chestnut hair.

Passing by the common Hive Bee, we take an insect which according to Mr. Bates, is in tropical America the representative of our well-known Hive Bee. As Mr. Gorse and Mr. Bates have both given public descriptions of the Melipona and its habits, I cannot do better than allow them to speak for themselves.

In his work on Jamaican Natural History, the former author writes as follows:—

"I was exceedingly interested this afternoon by the sight of two hives of indigenous Bees, shown to me by Mr. Garriques, at Shelton Pen, on the banks of the Rio Cobre. The one hive, in the hollow of a calabash tree, had an entrance about half an inch



Fig. 287.—Melipona fasciculata.
(Brown.)

wide at midway up the trunk, the cavity being supposed to descend some four feet down. The other was in a cordia cherry tree, and was laid bare by a considerable portion of the tree being cut away. The cutting just disclosed the uppermost of the broad cells, but nothing of the sacklets that contained the honey. I take our Bees to be similar to, if not the same with, the Bee of Mexico, a Melipona or Trigona, called by the Spaniards *Angelitos* (*i.e.* little angels), from having no stings. They settled upon us, and we handled them; but they did no injury to us, though it was perceptible that they were excited, for they pursued the hand, and clustered on it, when portions of the brood cells were taken up.

"The black ants that infest forest trees had tracked the hive in the calabash tree, and had congregated around the entrance-hole, making an effort to gain access. A sentinel Bee, which was every now and then relieved from his guard, stood in a state of restless watchfulness, assisted at his post by two Bees behind. The Bees behind stood reversed, head downward; and, clinging to the upper arch of the entrance, they gazed upward, and watched several ants clustered above, in some two or three little groups within the crevices of the bark, prepared to rush in if the sentinels remitted their vigilance for one moment. The active ants paced upward and downward in lines, but found no opportunity of gaining a nearer access than a rapid reconnoitering of the doorway.

"The entrance, when occupied by the three sentinel Bees, admitted of no access by comers and goers of the hive, except by the centre Bee, that guarded the hole in front, momentarily stepping aside. This movement he performed with surprising quickness, as often as a Bee came in or went out. The wax of these Bees is very unctuous and dark-coloured, but susceptible of being whitened somewhat by bleaching. The honey is stored in clusters of cups, about the size of pigeons' eggs, at the bottom of the hive, and away from the brood cells. The brood cells are hexagonal, they are not deep, and the young ones, when ready to burst their cerement, just fill the whole cavity. The Mother Bee is lighter in colour than the other Bees, and elongated at the abdomen to double their length."

Mr. Bates's account of the habits of this and other Meliponæ is exceedingly interesting. It is given in his well-known work on the Amazon River:—

"But the most numerous and interesting of the clay-artificers are the workers of a species of social Bee, the *Melipona fasciculata*. The Meliponæ in tropical America take the place of the true Apides, to which the European Hive Bee belongs, and which are here unknown; they are generally much smaller insects than the Hive Bee, and have no sting. The *M. fasciculata* is about a third shorter than the *Apis mellifica:* its colonies are composed of an immense number of individuals; the workers are generally seen collecting pollen in the same way as other bees, but great numbers are employed in gathering clay.

"The rapidity and precision of their movements while thus

engaged are wonderful. They first scrape the clay with their mandibles; the small portions gathered are then cleared by the anterior paws and passed to the second pair of feet, which in their turn convey them to the large foliated expansions of the hind shanks which are adapted normally in Bees, as everyone knows, for the collection of pollen. The middle feet put the growing pellets of mortar on the hind legs to keep them in a compact shape as the particles are successively added. The little hodsmen soon have as much as they can carry, and they then fly off.

"I was for some time puzzled to know what the Bees did with the clay; but I had afterwards plenty of opportunity for ascertaining. They construct their combs in any suitable crevice in trunks of trees or perpendicular banks, and the clay is required to build up a wall so as to close the gap, with the exception of a small orifice for their own entrance and exit. Most kinds of Melipona are in this respect masons, as well as workers in wax and pollen-gatherers. One little species (undescribed) not more than two lines long, builds a neat tubular gallery of clay, kneaded with some viscid substance, outside the entrance to its hive, besides blocking up the crevice in which it is situated. The mouth of the tube is trumpet-shaped, and at the entrance a number of the pigmy Bees are always stationed, apparently acting as sentinels.

"It is remarkable that none of the American Bees have attained that high degree of architectural skill in the construction of their cells which is shown by the European Hive Bee. The wax cells of the Meliponæ are generally oblong, showing only an approximation to the hexagonal shape in places where several of them are built in contact. It would appear that the Old World has produced in Bees, as well as in other families of animals, far more advanced forms than the tropics of the New World. A hive of the *Melipona fasciculata*, which I saw opened, contained about two quarts of pleasantly-tasted liquid honey. The Bees, as already remarked, have no sting, but they bite furiously when their colonies are disturbed. The Indian who plundered the hive was completely covered by them; they took a particular fancy to the hair of his head, and fastened on it by hundreds.

"I found forty-five species of these Bees in different parts of

the country; the largest was half an inch in size, the smallest were extremely minute, some kinds being not more than one-twelfth of an inch in size. These tiny fellows are often very troublesome on account of their familiarity; they settle on one's face and hands, and in crawling about get into the eyes and mouth, or up the nostrils."

We see from this history that the title of "Angelitos" is not so very well deserved, for the insects do mischief to the extent of their ability. Being venomless, they cannot sting, but they can at all events bite, and, as we have seen, do so very fiercely.

THE last of the Bees which will be described in this work belong to the genus *Trigona*. The following account of an



FIG. 288.—Trigona ruficrus.
(Shining black, with red thighs.)

Indian species of *Trigona* is taken from Mr. Horne's monograph:—

"This is one of the smallest Honey-bees I have ever met with, and its habits are curious. I noticed it under the following circumstances, and I never again met with its nest, although the natives all know it. One evening at Benares (April 4th, 1863) as I was standing at my door, I saw a swarm of from 400 to 500 of what I took to be midges, rapidly flying about in a mazy kind of dance, occupying a space of five or six feet, and being about ten feet from the ground. I brought out my insect-

net and caught about a hundred in one sweep, when, to my surprise, they proved to be Bees. On watching them, I observed that they went in and out of a little hole in the wall close by under a beam where there was a hollow, and that many of their thighs were laden with pollen.

"The insects seemed quite harmless, walking about my hand and not attempting to sting. Digging out some bricks with care, I came on a portion of their nest. The space it occupied appeared to have been originally eaten out by Termites. It was coated on all sides with a layer of black wax, and in it was stored their honey. The waxen cells were of a dark brown colour, and very globular, pendent side by side from the roof, and not, as far as I could see, arranged hexagonally.

"The honey was very dark in colour, but excellent in flavour; and I was told by the natives that it possessed medicinal qualities. It had a slight astringency; and, considering the size of the insect, the quantity stored was very large. I was also told that these insects commonly use hollow trees, in which they store astonishing quantities of honey, which is diligently sought for and prized. They call them "Bhonga," which appears to me to be a generic name for *all* Bees in the North-west Provinces. Large bricks prevented my digging further, so that I cannot describe their breeding-cells.

"The Bees continued to fly in the manner before described till dark, and did not desert their nest."

The species which is figured in the illustration is a Brazilian insect. Its colour is shining black, with the exception of the thighs of the hind pair of legs, which are bright red. It is a very common insect, and is generally to be found in sandbanks in the virgin forest.

I HAVE had some doubt as to the place in which I should treat of the insect which will presently be described; and, after consideration, have determined to place them at the end of the Hymenoptera, and not among the Ichneumon Flies.

If there be in the world insects which look like anything but insects, such are the extraordinary beings, one of which is shown in the accompanying illustration. So strange are they that although a practised entomologist would at once detect them to be insects, he would need careful investigation before he could

even determine the order to which they belonged. They are found in the middle of a wild fig, called *Ficus terragena*, the fruit of which is unfit for food.

That certain insects frequented the fig, and perhaps exercised some influence on the fertility of the fruit, was well known to the old naturalists, who designated their office by the name of "caprification." This belief is mentioned by Mouffet in his work on insects: "It is called *Culex ficarius*, i.e. *Fig-gnat*, not because it comes indeed of the fig-tree, but because it is fed and sustained by its fruit. For it is sprung of a certain worm that breeds in the Figs, which when Nature cannot make her perfect work upon, nor bring to the sweetness and perfection of other Figs, lest she should make something in vain, by a certain quickening vertue, out of the grains of them, being rotten and putrified, she produceth these Gnats.

"Yet not so as that the Gnat is the *parergon*, as besides the intentions of Nature (so Scaliger hath learnedly observed); or if it be, the truth is, the work by the bye is of more dignity than the main. Nature did propose to itself the perfection of a wilde Fig, a thing not so much to be esteemed of: this she not being able to bring to passe, turns herself from so common a work to an enterprise of greater weight and produceth a *Gnat*, which she effecteth.

"Concerning these Gnats, *Pliny* hath these words: the wilde Fig-tree brings forth Gnats, these being defrauded of the nourishment they should have received from their mother, being turned to rottenness they go to the neighbouring Fig-tree, and with the often biting of the same Fig-tree and greedily feeding upon it, they let in the sun withall and set free a door for plenty of air to enter in at. Anon after they destroy the milky moisture and infancy of the fruit, which is done very easily, and as it were of its own accord: and for that cause the wild fig-tree is alwaies set before the fig-trees, that the wind, when the Gnats fly out of them may carry them among the fig-trees, who, as soon as they come into them, the figs swell and, ripening of a sudden, grow very big and full.

"But what time these Gnats pass from the wilde fig to the fig-tree, they do it in such haste that many of them leave either a foot or a wing behind them. Now that they generated of the grains of the unripe fig may be evident in that the wilde fig is left void of grains."

That the ancient entomologists had detected these remarkable beings in the interior of the wild fig is very clear, though the inferences which they drew are not correct.

According to Mr. Walker, these insects are Hymenoptera, belonging to the family Agaonidæ, in the great group of Chalcidicæ, several species of which are the "gnats" which have been used for caprification.

They were found in the Mauritius, and in company with them were great numbers of another species, which he termed *Chalcis* or *Idarnes explorator*, from their habit of flitting constantly about the figs, and seeming to explore them. Whether or not they are parasites upon the insects within the fig is a matter of doubt.

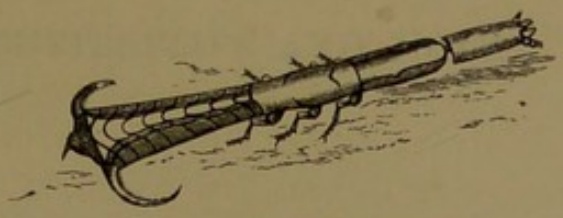
As for these latter insects, they always live in darkness, and, needing no eyes, have none. Not only are they devoid of eyes, but they have no ocelli (*i.e.* the little simple eyes possessed by Hymenoptera), no palpi, and no maxillæ. Mandibles, or principal jaws, they do possess, and these of considerable size in proportion to the dimensions of the insect. Perhaps the fact that these darkling creatures are able to do without maxillæ or palpi may throw some light on the real office of those organs. When removed from the interior of the fruit, or when merely disturbed by the laying open of the figs, the insects make no attempt at escape, but roll themselves up and lie motionless.

Many other allied insects are now known to be dwellers in figs, but the complete history of these wonderful beings is yet to be written.

In the notice of these Hymenoptera in the *Entomologist*, from which part of this description is condensed, the editor makes the following suggestive remarks:—"It seems almost impossible to overrate the interest which attaches to this subject of fig-dwellers. The circumstance that these creatures are without the means of vision or locomotion does not, indeed, seem extraordinary, seeing they are condemned to perpetual darkness and perpetual imprisonment. Of what use would eyes or wings be to them? Then, again, of what sex are they? Is there any relationship—I mean consanguinity—between the prisoners and the winged atoms flying from fig to fig? And there are females, invariably females, with long ovipositors, that could communicate with the imprisoned. We have winged

males and apterous females in Lepidoptera. Can we have winged females and apterous males in Hymenoptera?"

The name *Apocrypta* s ignifies "hidden," and is given to the insects in allusion to their custom of lying concealed within the fruit. Another genus of Fig-gnats is called *Sycocrypta,* which signifies "something that is hidden in figs." Several species are known, all differing greatly in shape, but the present species is a good example of their general aspect. They are very tiny, the length of this insect being about equal to that of the letter "l." There is a full description of them in the *Entomologist* for October 1871.



Apocrypta paradoxa.

LEPIDOPTERA;

OR,

BUTTERFLIES AND MOTHS.

LEPIDOPTERA;

OR,

BUTTERFLIES AND MOTHS.

CHAPTER I.

PAPILIONIDÆ.

THE great order of insects which now comes before us is easily to be distinguished from any other. A beetle may be mistaken for a Heteropterous insect, or a Hymenopterous insect for one of the Diptera. But there is no such likelihood of mistake with regard to the Lepidoptera, or scale-wing insects, the feathery scales with which their wings are covered being a distinction that is at once recognized.

These scales are arranged just like the slates on the roof of a house, and as there are many species in which the scales are squared at the ends, the resemblance is curiously exact. They vary very greatly in form and size, some being rounded at the ends, some deeply toothed in notches, some short and square, and some long and almost hair-like. If placed under the microscope, their surface is seen to be adorned with exquisite sculpturings and markings, so that each scale is quite as worthy of examination as the insect it adorns. Minute as are the scales, the microscope shows that they are composed of three distinct layers, and nothing is more common than to see the upper or under layer torn, and the ragged piece looking just like a "snuff-box" torn in a dress.

The mouths of the Lepidoptera are made for suction, the mandibles, or outer jaws, being very minute and practically needless,

and the maxillæ lengthened into the organ which is scientifically known as the proboscis, and popularly as the trunk. The females are generally larger than the males, but are duller in hue, and in many cases the two sexes are so different in appearance that they have been described as distinct species. Even Linnæus fell into the error of confounding the sexes, and actually placed the male in one section and the female in another.

Their transformations from the egg to the perfect insect are known better than those of any other of the insect race, and many practical entomologists are in the habit of rearing their best specimens from the egg. As to the eggs themselves, there is more diversity in them than in those of the birds. The latter eggs, however they may differ in colour, are tolerably alike in shape, whereas the variety of form among Lepidopterous eggs is quite wonderful, and is so marked that a good entomologist on seeing an egg can be tolerably sure of naming the insect which laid it. Unfortunately their shape cannot well be preserved, as they are nearly sure to collapse after a time, even if they be not hatched, and broken by the young larva.

Many of these eggs, even of our own British species, are so exceedingly beautiful in their outlines, that they would serve as exquisitely beautiful models for jugs and vases. Indeed, some years ago I happened to deliver a lecture on the transformation of insects, and a porcelain manufacturer who was present was so struck with the drawing of an egg that he asked for a copy of it, and made a number of jars in exact imitation of it.

The larvæ of the Lepidoptera are as different as the perfect insects, both in appearance and habits. Most of them live on trees and plants, but there are many which pass almost, if not all, their larval existence beneath the surface of the earth. At present, no Lepidopterous larva is known to inhabit the water.

WITHOUT going more into scientific details, we will proceed to the examination of the foreign Butterflies.

The reader will remember that some English groups of insects are quite as numerous, as large, and as handsome as their foreign relatives. This is not the case with the Butterflies, which are comparatively few and insignificant in England. For example, of the first group, the Papilionidæ, we have but one representa-

tive, the well-known Swallow-tail, and this is quite a rarity except in one or two very limited spots.

The genus Papilio (which is the Latin for Butterfly) has all the legs fit for walking, short palpi, the club of the antennæ elongated and never hooked, and the "discoidal cell" closed. This, by the way, is the cell formed in the middle of the wing by the juncture of the principal nervures. All the insects of this genus are extremely handsome, and, with very few exceptions, can be accepted as the most beautiful of all the Butterflies. Linnæus was so struck with their splendour, that he called them by the classical name of *Equites*, or "knights," dividing them into two sections, Trojans and Greeks. To each insect he gave the name of some personage mentioned either by Homer or Virgil.

Some systematic entomologists form a number of these insects into a group called Ornithoptera, *i.e.* "bird-winged," because their wings are so large and ample that they somewhat resemble birds when flying. The larvæ of these insects are very odd-looking creatures, each segment being furnished with a number of thick, fleshy spikes that radiate in all directions. In common with other members of the group, the larva has at the neck a curious apparatus, consisting of a double tentacle that can be projected or withdrawn at will through a small aperture. This tentacle can easily be seen in the larva of our Swallow-tail Butterfly. It gives out a powerful odour, which in one species resembles that of fennel.

The pupa has some remnants of the fleshy spikes, they of course existing in the segments near the tail. The pupa is oddly shaped, being curved almost like the letter S. It is suspended by the tail, and kept from swinging about by a couple of short and stout silken cables. In our country we have many pupæ which support themselves by means of a cable which completely surrounds them, but in the present case there are two distinct cables, each being fastened to one side of the body.

We will now proceed to the various species of this group.

THE fine insect which is here represented is a native of Queensland. It is a large species, the expanse of wing being nearly two inches and a half. The longitudinal bands seen on

the upper wings are green, with a coppery gloss in certain lights, which gloss also extends over the whole of the lower wings. On the under surface of the upper wings there is a row of large, rounded, black spots.



FIG. 289.—Ornithoptera Cassandra
(Black, green, and yellow.)

The thorax is covered with dense hair of a jetty black, relieved by some spots of bright crimson at the junction of the wings. The abdomen is deep yellow.

A brief reference has already been made to the larvæ of the Ornithoptera. A figure of one of these remarkable larvæ is here

given, and was drawn from a specimen in the East India Museum. The pupa is also drawn, so as to show the method by which it



Fig. 290.—Larva and pupa of Ornithoptera.

attaches itself to plants by means of a tuft of silken cords at the tail and a pair of bands at the sides.

The three figures which here follow represent one species, *Papilio pronomus*, and serve to show the great difference that exists between the sexes. The first illustration shows the upper surface of the male insect. The upper pair of wings are velvet black and emerald green, the colours being disposed as shown in the illustration. The green is more or less speckled with black, which appearance is shown by the microscope to be due to missing scales. The ornithological reader will probably remember that the black spots which are so often found on the breasts of humming-birds are produced in a similar manner, the

feather being either altogether missing or tucked under its neighbours. The lower wings are mostly green, with a decided golden gloss, and on the inner edge they have a fringe of very long, pale brown, soft hairs, which are, in fact, nothing but lengthened scales.

The under surface, as shown in the second illustration, is also green and black, the former colour taking a blue tint in the middle of the wing. The abdomen is bright "king's" yellow, looking just as if it had been painted in body colour. The thorax



Fig. 291.—Papilio pronomus. Male. Upper side.
(Black and green.)

is velvet black, but upon each shoulder there is a large tuft of brilliant crimson hairs, that produce a wonderfully fine contrast with the black and green of the wings.

The third figure represents the under surface of the female, and the reader can easily see how the two sexes can be mistaken for different species. The female is very much larger than her mate, and coloured after a totally different fashion. The wings are mostly black, but not of the rich velvet-like hue which dis-

tinguishes the male, and the light-coloured marks upon the upper wings are white. The lower pair of wings are also dull black, relieved by large yellow marks, which are apt to fade into yellowish grey. The abdomen is yellow, but not nearly so bright as in the male. Almost the only point of resemblance between

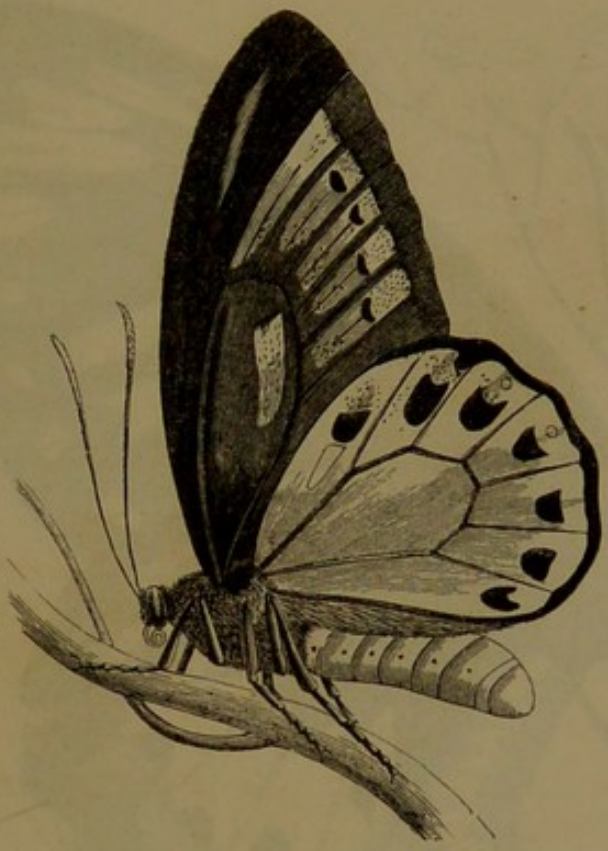


Fig. 292.—Papilio pronomus. Male. Under side.
(Black, green, and crimson.)

the two sexes is the crimson tuft on the shoulders, which is as brilliant in the female as in the male.

Even from this single instance the reader will see that there was much excuse for the mistakes which Linnæus made when arranging these insects. Two of them are rather remarkable, on account of a phenomenon which sometimes occurs to insects, and is well known to practical entomologists. It sometimes happens that one side of an insect is male and the other side female. Thus Linnæus had described *Papilio Polycaön* as a Greek and *Papilio Laodocus* as a Trojan. Yet a specimen was found which had on the right the wings of *Polycaön* and on the left that of *Laodocus*, thus proving that they were both the

two sexes of one species. A similar occurrence took place with *Ulysses* and *Diomedes*, both being, as their names denote, Greeks.

The present species is a native of Northern Australia.



Fig. 293.—Papilio pronomus. Female. Under side.
(Black, yellow, and white.)

As is often the case with Butterflies, the under surface of *Papilio Emathion* gives no indication of the colours which adorn the lower surface.

Above, the wings are black, with narrow lines of grey following the nervures, and widening gradually towards the edges. The under surface of the upper pair of wings is coloured much after the same manner, but that of the lower pair is almost startlingly different from the plain black and grey of the upper surface. The greater part of the wing is velvet black, and round

PLATE XI.



its edges are some large markings of brilliant scarlet. A patch of scarlet also exists at the base, and extends partially over the

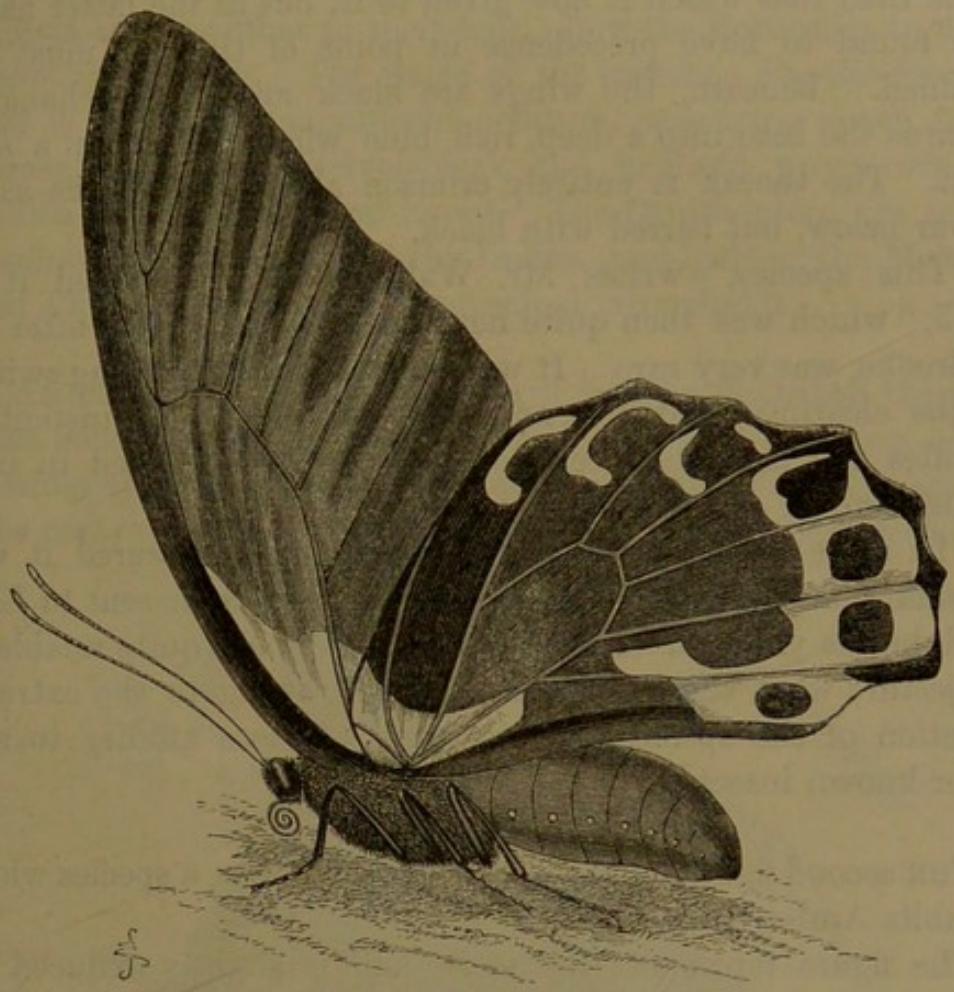


Fig. 294.— Papilio Emathion.
(Black and scarlet.)

base of the upper pair. The body is black, striped and spotted with yellow.

This beautiful Butterfly inhabits the Philippine Islands.

Two more of the Ornithoptera are seen on Plate XI.

The upper figure represents *Papilio Brookeanus*. This, as its specific name implies, is a Bornean insect, and has been named after the late Rajah Brooke of Sarâwak. As the full size of the insect is six inches and a half in spread of wing, it has been found necessary to diminish the figure.

This is a most magnificent insect. The upper surface of the wings is velvet black, and upon them are drawn a number of pointed stripes of golden green. Both in shape and colour these

stripes so closely resemble the plumage of the trogon, that the Butterfly was named *Papilio trogon*. This is a much better name than that which is now given to it, but as the latter name was found to have precedence in point of time, it must be retained. Beneath, the wings are black and green, changing towards the base into a deep, rich blue when viewed by a side light. The thorax is entirely crimson above, and of the same colour below, but barred with black.

"This species," writes Mr. Wallace, who discovered it in 1855, "which was then quite new, and which I named after Sir J. Brooke, was very rare. It was seen occasionally flying swiftly in the clearings, and now and then settling for an instant at puddles and muddy places, so that I only succeeded in capturing two or three specimens.

"In some other parts of the country I was assured it was abundant, and a good many specimens have been sent to England, but as yet all have been males, and we are quite unable to conjecture what the female may be like, owing to the extreme isolation of the species, and its want of close affinity to any other known insect."

THE second figure represents *Papilio Panthŏus*, a species which inhabits Amboyna and Ceram.

The figure represents the male, and is slightly reduced on account of the exigency of space. The female is very much larger, her extended wings sometimes measuring more than eight inches from tip to tip.

The upper surface of the wings is shining black with grey streaks, and the under surface of the upper pair of wings is coloured in much the same manner, except that the black and the grey are both dull. The lower wings are brilliantly coloured. A stripe of black begins at the base and runs round two-thirds of the wing. It is very broad at the base, and narrows with the anal angle, where it terminates. On the stripe there are six large yellow marks, arranged as shown in the illustration, those towards the base of the wing being orange and the other golden yellow. The centre of the wing is pearly white in the male, and duller in the female, with several large oval black spots.

The thorax is velvety black, and the abdomen is of the same colour, but adorned with several large spots of orange.

One fine species of the Ornithoptera inhabits Darnley Island, and is put to a singular use by the natives. They catch several Butterflies, and, attaching one end of a very delicate fibre to the insects and the other to their hair, allow the Butterflies to flutter about their heads. The name of the insect is *Papilio Poseidon*, and it is a most magnificent creature, measuring seven inches across, and having velvet-black and brilliant green wings, a golden body, and crimson breast. The Ornithoptera are mostly confined to the islands of the Indian Archipelago, the Moluccas and Philippines being their principal strongholds.

About the two insects which will now be described there has been some difficulty. Some entomologists consider them as two distinct species, and others as merely varieties of a single species. The controversy is not yet decided, and I shall therefore accept



Fig. 295.—Papilio patros.
(Black and red.)

that opinion which is at present more generally acknowledged. The insect is found at Ega, and is one of the many species which were brought home by Mr. Bates after his travels in the region of the Amazons. On the upper surface the wings are dark, blackish brown at the base, becoming paler towards the tip. The lower pair are velvet black, relieved by three large oblong

spots near the middle. These are, in fact, one very large spot, divided by the black nervures which run through it.

THE two next illustrations represent the male and female of *Papilio caudius*. The latter of these names is formed from a Latin word signifying "a tail," and is given to the insect on account of the long, narrow appendages to the lower wings.



FIG. 296.—Papilio caudius. Male.
(Black, white, and red.)

There is much technical information respecting this insect in Mr. Horsfield's "Catalogue of the Lepidopterous Insects belonging to the East India Company." In that work some excellent advice is given to entomologists who wish to trace the transformations. Whenever a new larva was found, it was placed in a separate cage, to which a number was attached. It was then carefully drawn in colours, and its food-plants noted, a similar number being affixed to the drawing. When it underwent its first change the pupa was drawn, also in colours, and the same when the perfect insect appeared; all the drawings having the

same number as that which was affixed to the cage in which the larva was bred. This system being stringently carried out, mistakes were evidently impossible, and thus a vast number of indisputable facts were added to our stores of Natural History.

In addition to the instructions thus given, I should be disposed to add a further suggestion. No provision is here made for preserving the insect for dissection. So, if several specimens of a larva could be found, I should suggest that a larva, pupa, perfect insect, and if possible some of the eggs, should be placed in spirits for the use of dissectors, the bottles being of course numbered like the drawings.



Fig. 297.—Papilio caudius. Female.
(Black, white, and red.)

The insect now before us is a native of Java. The upper surface of the wings is black, and upon them is a large white spot, flanked on either side by a grey spot. The lower wings are marked with red very much like those of *Papilio patros*.

The female is coloured much like the male, though she is not so bright, and there are slight differences of marking. The under surface of the upper pair of wings is entirely brown, but the lower wings are decorated with two large oval spots, set side by

side and surrounded by five smaller spots. These marks are very prettily coloured, being pink round their edges and white in the middle, so as to give them a sort of eye-like appearance.

THE beautiful insect which is here shown is a native of Mexico.

The reader will observe that the "tail" of the lower wings is not rounded at the end as is generally the case, but is very



FIG. 298.—Papilio aconophos.
(Black, white, and crimson.)

long, and narrows to a point. On account of this structure, the insect has received the specific name of *aconophos*, which is formed from a Greek word signifying a javelin or spike.

Above, the colour is deep blackish brown, fading to pale brown at the tips. The lower wings are velvet-black, and on each of them are six brick-red marks of a somewhat crescentic or arched shape. Below, the upper wings are of a glossy sepia, without any marks. The lower wings are of the same hue, but have a number of marks upon their edges, disposed as shown in the illustration. Those towards the outer edge are white, but

those of the inner edge are white above and bright crimson below. There are also some small patches of crimson on the base of the wing, and a very narrow crimson streak runs along its outer edge. The long narrow tail is quite black.

THE fashion which Linnæus set of employing classical nomenclature as specific names for the genus Papilio has been followed as far as possible by his successors. Owing, however, to the rapidly increasing number of species, it was impossible to find



FIG. 259.—Papilio Mezentius.
(Black, white, and crimson.)

names in the Iliad and the Æneid, and it was necessary therefore to draw upon the large stock of names furnished by classic writers in general. One of these names is Mezentius, the celebrated king of the Tyrrhenians, who was accustomed to torture men to death by binding them to dead corpses and so leaving them.

This is a rare species from the western coast of America, and at present there is but one specimen in the British Museum. It is remarkable for having almost the same colouring on both

sides of its wings—a very rare phenomenon among Butterflies, especially when the colours are dark and boldly contrasted. The upper surface of the upper wings is black, across which is drawn a single bold white band. The lower wings are also black, but have a number of bright crimson marks along their edges, arranged as shown in the illustration.

The under surface of the wings is almost exactly like that of the upper, the chief distinction being that a second bar of white, but very narrow, runs nearly parallel with the edge.

ANOTHER of the beautiful Butterflies which haunt the district of the Amazons is called *Papilio Ergeteles*.



FIG. 300.—Papilio Ergeteles.
(Black and scarlet.)

Above, the upper wings are black, darkest at the base, and have a large scarlet spot near the middle. The lower wings are also black, and have a large crimson spot, which is divided by black nervures into four oblong marks. Beneath, the colours are very similar, except that the spots are pale pink instead of scarlet or crimson. On each shoulder there is a large tuft of

long scarlet hairs, forming a fine contrast to the jetty black plumage which surrounds it. There is only a single specimen in the British Museum.

Another species, *Papilio Æneas*, inhabiting Demerara, so closely resembles the Ergeteles that the two species can only be distinguished by practised eyes.

ALTHOUGH not so large, or at first sight so imposing, as many of the species which have been described, *Papilio Hierocles* is



FIG. 301.—Papilio Hierocles.
(Purple and crimson.)

really one of the most splendid of the Butterflies. Its beauties, however, cannot be seen unless it be exposed to a strong light and turned in all manner of ways.

The upper wings are black on the upper surface, with the exception of a patch in the middle, which is green in the male and whitish in the female. The illustration is drawn from a male specimen. Its chief beauty lies in the upper surface of the lower wings. Even when the insect is in a cabinet, and partly sheltered from the light by the sides of the drawer, it is a very handsome creature, the lower wings looking as if they were velvet black, crossed by a row of vivid crimson spots. If, however, it be removed from the drawer, placed in a strong

light, and turned slowly round, its real splendour shows itself. The crimson spots retain their colour, but the apparent black background glows with the richest imaginable purple, which merges gradually at the base into deep azure, this colour passing over the wing as the insect is turned about. About the middle of the wing, and just above the crimson spots, the blue takes a decided green gloss. The best view of this species is obtained when the head is turned towards the light.

So much for the upper surface. Below, the upper pair of wings are sooty black, with one white spot. The under wings are also black, but have a row of crimson spots across the centre. The body is black, adorned with spots of the same crimson as that of the wings. This splendid insect is a native of Pará.

In the case of the insect which is next shown no classical appellation has been given, but the specific name is expressive



Fig. 302.—Papilio Erythalion.
(Black, crimson, and white.)

of its appearance. The name *Erythalion* is formed from two Greek words, one signifying "red," and the other "a blossom." This name has been given because the broad crimson band that crosses the under wings of the male looks somewhat like the petals of a crimson flower.

There is considerable difference in the colour of the sexes. The upper wings are black above, and on them there is a light-coloured mark. In the male this mark takes the form of a pale triangle, in which are two white spots, whereas in the female it is wholly white. The under wings are also black, crossed in the male by a broad belt of deep crimson, and in the female by a similarly shaped band of pink, darker at the edges than in the centre. The illustration is taken from a female specimen. In both sexes the bar is crossed by several black nervures, so as to divide it into a number of parallel markings.

The body and abdomen are black, diversified with scarlet spots, more vivid than the hue on the bars of the lower wings. The insect was taken at Santa Fé de Bogotá.

To describe the splendid insect which is known as *Papilio Krishna* is a very difficult task, owing to the variety and com-

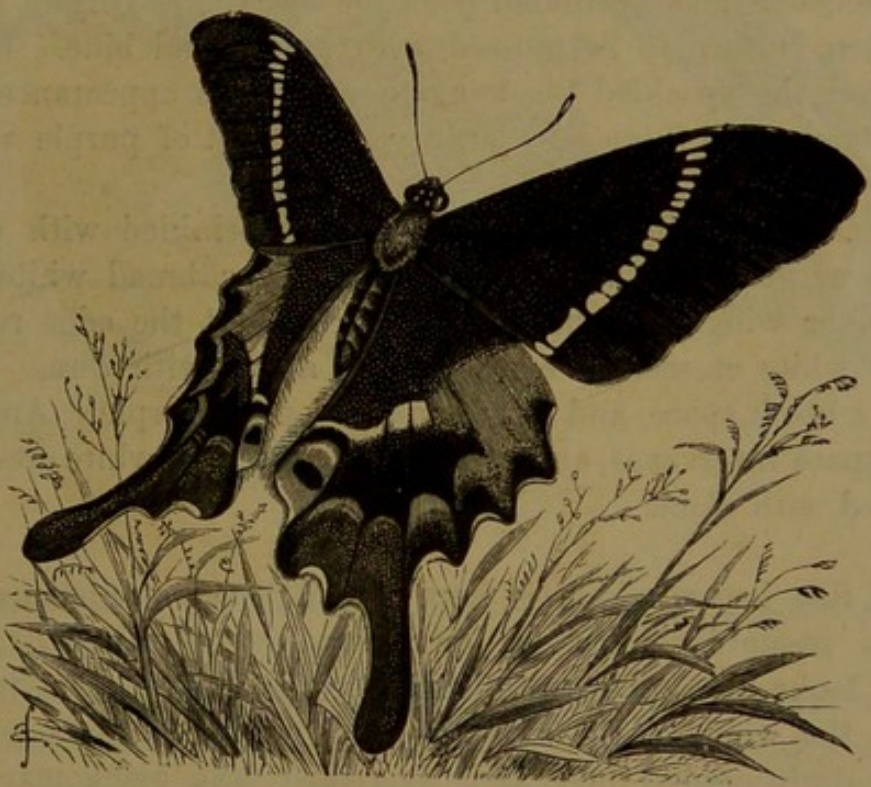


Fig. 303.—Papilio Krishna.)
(Black and green.)

plication of the colours. The two specimens in the British Museum came from Bhotan, in India, and the name of *Krishna* has been given to it as a recognition of its Indian origin. As

this is a large insect, the female measuring fully five inches in spread of wing, the figure has been necessarily diminished nearly one-half.

Above, the upper wings are deep black, speckled profusely with gold-green dots that look just as if emerald-dust had been sprinkled regularly over them. The magnifying glass soon shows that each of these green specks is a single green scale. Across the middle of the wing runs a narrow golden yellow bar, interrupted by the nervures, which retain their black hue, and break up the bar into a succession of contiguous yellow spots.

The under wings are much more complicated in colouring. At the base is a large triangular patch of the same green-speckled black as that of the upper wings, and just below the black is an irregularly shaped patch which is entirely emerald-green, being composed of the same scales as those which have been mentioned as sprinkled over the black. In certain lights the green is seen to be glossed with purple and blue. Below the green, the speckled black again makes its appearance, and at the anal angle there is a large eye-like spot of purple with a black centre.

Beneath, the upper wings are black, sprinkled with white instead of green specks, and is crossed by a broad white bar. The under wings are curiously coloured. At the edge runs a row of white crescentic marks, edged above with dun. Then comes a black space, and then is a crescent of purple. Another black space intervenes, and above the purple is a white crescent, speckled with black.

THE fine insect which is here shown bears at first sight a curious resemblance to our own Swallow-tail Butterfly, and almost looks like an exceptionally fine specimen of that insect. Above, the whole of the surface of the upper wings is yellow, with a slight orange tinge, and diversified with black markings as shown in the illustration. The yellow has rather a coarse aspect, the microscope showing this effect to be produced by the large size of the scales, which are squared at their tips.

The under wings are also yellow, but have a series of red crescent-shaped marks running round the margin. Near the inner edge is a small semilunar mark of red, above which is a

patch of tiny blue specks that look something like a nebula when seen through a telescope, and above the blue specks is another red mark. The body is bright yellow, but along the upper surface of the abdomen is drawn a bold black streak,



Fig. 304.—Papilio Œbalus.
(Black and yellow.)

rather wide in the middle, and diminishing to a point at either end.

Below, the under wings have a row of six narrow blue crescents, and above each of these is a semilunar mark of brick-red. This insect is a native of Mexico.

In the insect which is depicted on page 556 we have an example of the effects which can be produced by the arrangement of only two colours. There are few handsomer Butterflies than *Papilio Palinurus*, in which black and green are the only colours on the upper surface.

Taking the upper wings first, the basal third is occupied with a large triangular patch of velvety black, profusely powdered with green specks, and very much like those of the Krishna Butterfly of India, which has been already described. Next comes a broad belt of verditer green, and the rest of the wing is velvet-black, sprinkled with green towards its edge.



FIG. 305.—Papilio Palinurus
(Black and green.)

The under wings are somewhat similarly marked, but with additions. At the base there is a similar black patch sprinkled with green, and then comes the green verditer band, which in the lower wings is very glossy, and has a pearly sort of surface. The black border also is on the edge of the lower wings, but near the margin are six crescentic marks of a brilliant metallic green, that sparkle so as to be visible at a considerable distance.

PLATE XII.



As is often the case with insects, the metallic splendour of these marks is not perceptible except by a strong light.

The reader will probably have remarked that the colours are so arranged that when the wings are spread they show a pattern extending over both pairs. The name *Palinurus* is that of the well-known pilot of Æneas' ship. I rather think that the name was given in consequence of the broad pearly-green band across the wings, which bears some fanciful resemblance to a wave of the sea.

The under surface presents an almost startling contrast to the upper. The place of the speckled black mark at the base of the wings is taken by a sepia-coloured patch sprinkled with pale green, the general colour much resembling that of the English moth known by the popular name of "Old Lady." There are four ruddy, eye-like spots, much resembling those of the common English Buff-tip Moth. Mr. A. Butler is of opinion that this dulness of colour is intended for the purpose of protection, the hues being very much like those of a withered leaf. Our own familiar "Red Admiral" and "Peacock" Butterflies are often indebted for safety to the dull colouring of the under surface.

A SINGULARLY handsome Butterfly is shown in the accompanying illustration, and is known by the name of *Papilio Ulysses*. Its upper surface has nearly the same colours as those of the preceding insect, but they are disposed in a very different manner. In the male insect the tips and edges of the wings are black, very slightly sprinkled with green. The whole of the centre is the richest azure in some lights, and green in others. In the female the colour is much paler, and has a faded look.

Below, the basal half of the upper wings is blackish brown, and the rest grey-brown. The lower wings are also grey-brown, and round their edges are seven rather large eye-like spots. The lower half of each spot is buff, then comes a curved streak of black, and the upper edge is white. The insect is a native of Amboyna.

ON Plate XII. Fig. 1 is seen an insect which very much resembles the preceding species, but was shown by Mr. A. Butler to be perfectly distinct. Its name is *Papilio Joësa*, and

it is a native of Queensland. The black margins on the upper surface of the wings are not so deeply toothed, and on the under surface the eye-like spots are much paler.

Another species, *Papilio Philippus*, which was brought by Mr. Wallace from Sumatra, is coloured after a similar fashion, except that the centre of the wings is green instead of blue, and each spot has upon it a streak of metallic green-blue.



Fig. 306.—Papilio Ulysses.
(Black and green.)

On the same Plate, at Fig. 2, is drawn a New Guinea Butterfly, called *Papilio Euchenor*. The figure is considerably reduced, as the insect itself measures five inches and a half across the out-

spread wings. It is, however, so conspicuous an insect that it cannot be omitted from the present work.

It is one of the very few Butterflies that have the upper and under surfaces of the wing almost alike. The aid of colour is not so much needed in this as in many other insects, because, if the reader will imagine that all the light portions of the insect are bright yellow, and the dark portions are jetty black, he can exactly appreciate its real appearance. As has already been stated, the under surface of the wings is very similar to the upper. The yellow, however, is paler, and occupies more of the wing. There are also some orange spots near the margins of the lower wings.

THE insect which is here represented is a native of Northern China, and its rather peculiar characteristics are well shown in



FIG. 307.—Papilio Memcius.
(Brown and crimson.)

the illustration. One of the remarkable points in this insect is the really grand outline presented by the wings, whether they be open or closed; the bold curves of the lower wings, and their long, broad tails, being in singular contrast with the firm and

almost unbroken outline of the upper pair. As may be seen by the form of the abdomen, the specimen whose portrait is here given was a female.

Above, the colour of both pairs of wings is brown, each of the lower wings having five ruddy crescents along the margin. If held up to the light, the upper wings are seen to be almost transparent. Below, the upper wings are brown, and the lower pair are velvet-black, their opacity being thus accounted for. The light-coloured marks along the margin are crimson. The male is similar to the female, but is smaller, and is darker coloured.

THE general outline of the wings in *Papilio Jophon* is very similar to that of the preceding species. The colouring, however, is wholly different.



FIG. 308.—Papilio Jophon.
(Black and scarlet.)

The upper surface of the wings is sooty black, the nervures being accompanied with stripes of silvery grey. Beneath, the colours are still black grey, but on the margin of the lower

wings there are seven crescent-shaped spots of bright vermilion-scarlet. The abdomen is black, diversified with scarlet spots and patches, very much resembling the colours of our own Cinnabar Moth. The insect is a native of Ceylon.

THE two illustrations which now follow represent a Butterfly called *Papilio Memnon*. It has a very wide range of habitat, being found in Borneo, Penang, Java, China, and India.



FIG. 309.—Papilio Memnon. Male.
(Black, white, and buff.)

This is a strangely variable insect, no less than ten distinct varieties being described in Dr. Horsfield's Catalogue. The general colouring is as follows:—The upper surface is velvet-black, streaked and speckled with green, and in some specimens

there is a narrow scarlet line on the outer edge of the upper wings. Beneath, it is sooty black, with a large scarlet spot on the base of the upper wings, and three similar but smaller spots at the base of the lower wings.

The second figure represents a "tailed" female of the same insect. It is a most singular fact that the female should be so



FIG. 310.—Papilio Memnon. **Female.**
(Black, white, and buff.)

very different from the male, especially in so important a point as the appendages to the lower wings. It is, however, a fact that the females sometimes have tails, as is here shown, and sometimes have the hind wings merely rounded, like those of

the male. Respecting this peculiarity, Mr. Wallace, in his "Eastern Archipelago," makes the following remarks:—

"The first is the handsome *Papilio Memnon*, a splendid Butterfly of a deep black colour, dotted over with lines and groups of scales of a clear ashy blue. Its wings are five inches in expanse, and the hind wings are rounded, with scalloped edges. This applies to the males; but the females are very different, and vary so much that they were once supposed to form several distinct species. They may be divided into two groups —those which resemble the male in shape, and those which differ entirely from him in the outline of the wings.

"The first vary much in colour, being often nearly white, with dusky yellow and red markings; but such differences often occur in Butterflies. The second group are much more extraordinary, and would never be supposed to be the same insect, since the hind wings are lengthened out into large spoon-shaped tails, no rudiment of which is ever to be perceived in the males or in the ordinary form of females. These tailed females are never of the dark and blue-glossed tints which prevail in the male and often occur in the females of the same form, but are invariably ornamented with stripes and patches of white or buff, occupying the larger part of the surface of the hind wings. This peculiarity of colouring led me to discover that this extraordinary female closely resembles (when flying) another Butterfly of the same genus but of a different group (*Papilio Coön*), and that we have here a case of mimicry similar to those so well illustrated and explained by Mr. Bates.

"That the resemblance is not accidental is sufficiently proved by the fact that in the North of India, where *Papilio Coön* is replaced by an allied form (*Papilio Doubledayi*) having red spots in place of yellow, a closely allied species or variety of *Papilio Memnon* (*P. androgeus*) has the tailed female also red spotted. The use and reason of this resemblance appears to be that the Butterflies imitated belong to a section of the genus Papilio, which, from some cause or other, are not attacked by birds, and by so closely resembling these in form and colour, the female of Memnon and its ally also escape persecution. Two other species of this same section (*Papilio Antiphus* and *Papilio Polyphontes*) are so closely imitated by two female forms of *Papilio Theseus* (which comes in the same section with Memnon) that they com-

pletely deceived the Dutch entomologist De Haan, and he accordingly classed them as the same species!

"But the most curious fact connected with these distinct forms is, that they are both the offspring of either form. A single brood of larvæ were bred in Java by a Dutch entomologist, and produced males as well as tailed and tailless females, and there is every reason to believe that this is always the case, and that forms intermediate in character never occur.

"To illustrate these phenomena, let us suppose a roaming Englishman in some remote island to have two wives—one a black-haired, red-skinned Indian, the other a woolly-headed sooty-skinned negress; and that, instead of the children being mulattoes of brown or dusky tints, mingling the characteristics of each parent in varying degrees, all the boys should be as fair-skinned and blue-eyed as their father, while the girls should altogether resemble their mothers. This would be thought strange enough, but the case of these Butterflies is yet more extraordinary, for each mother is capable not only of producing male offspring like the father, and female like herself, but also other females like her fellow-wife, and altogether differing from herself."

This is certainly one of the most remarkable points in the history of Butterflies, and why some females should so closely imitate the male form is a problem not easy of solution.

The larva of the Memnon is a large dark-green caterpillar, much humped on the shoulder, and being marked with some pale-brown bands, and a red streak just in front of the hump. It tapers gradually from the hump to the tail, and rapidly from the hump to the head, so that it has very much the aspect of a caterpillar of some Hawk Moth.

The pupa is pale green, patched and streaked with yellow, and is suspended to a twig by a ligature at the tail and a belt surrounding the body.

Like many other insects, the Memnon is subject to considerable variations in colour. There is one very curious example of a tailed female in the British Museum. The upper wings are brown, on which a pattern is traced by the black nervures. The lower wings are black, with white oval patches on the base, and buff spots on the inner margin.

On this illustration is given the insect to which reference was made in Wallace's description of *Papilio Memnon.*

The resemblance between the two species does not appear in the illustration to be as close as it is in reality, because the size of the illustration is necessarily reduced, the full span of wing being about four inches and a half. The upper wings are pale brown, marked with dark brown as shown in the figure. The lower wings are jet black, with a sort of velvety lustre, and having a very slight bluish gloss in a side light. They are



Fig. 311.—Papilio Coön.
(Black, white, and yellow.)

adorned with a series of large spots, those towards the base of the wing being white, and those at the tip being yellow.

The body is chrome yellow, variegated with black. The colours are nearly alike on the upper and under surface, except that in the latter the markings are not quite so bright as those of the upper surface. There is a variety of this insect which is found in Assam, and in which all the yellow parts, including the body, are changed into scarlet.

Mr. Wallace remarks that it has a habit of fluttering slowly

along shady pathways through woods. It is found throughout Java, and in many parts of India.

The very handsome *Papilio Victorinus* is a native of Mexico, and the specimens in the British Museum were obtained in the well-known voyage of the *Novara*. It is a very large insect, the spread of wings being four inches and a half.

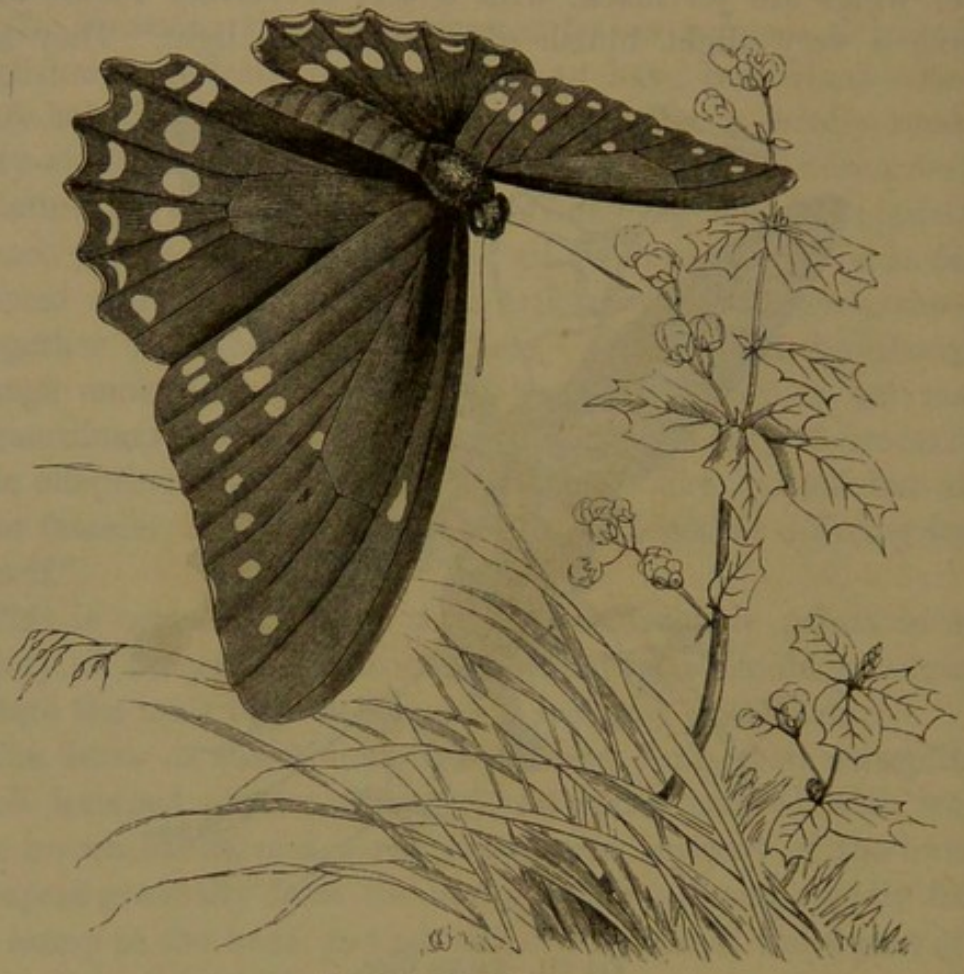


Fig. 312.—Papilio Victorinus.
(Black, with yellow spots.)

There are but few colours in this Butterfly, but they are so boldly contrasted that they produce a very fine effect. The upper surface is velvet-black, diversified with bright yellow spots shaped and disposed as shown in the illustration. Along the inner edge of the upper wings there is a fringe of very long silken hairs of a rich black-brown, which produce a singularly soft and beautiful effect. The body is black.

The under surface is soft brown with a dash of chocolate.

The upper wings are crossed by one complete row of yellow spots, and another row of similar spots extends about half across the wing. On the lower wings are two rows of crimson spots, shaped and arranged very much like the yellow spots of the upper surface. The inner spot of the upper row is rather remarkable, being oblong, and having one half crimson and the other half yellow.

In *Papilio Leonidas* we have another extremely variable insect. This fine Butterfly is a native of Africa, the specimen which is here figured having been procured from Sierra Leone,



Fig. 313.—Papilio Leonidas.
(Black and pale green.)

and some having been brought from Ashanti and other part of Western Africa. There are six specimens in the British Museum, of which no two are exactly alike. I have therefore selected a specimen from Sierra Leone, which appears to afford the best type of the insect.

Above, the wings are nearly black, and at the base of the lower pair there is a large irregular patch of pale green with

a sort of nacreous polish. There are a number of little white spots on both pairs of wings. Below, the wings are rich, deep brown, speckled with white, the patch at the base of the lower pair being of a very much paler green than above. There is one peculiarity about the upper wings which does not at first show itself. This is a streak of very deep scarlet along the under surface of the upper edge. It is widest at the base of the wings, and tapers gradually to the tip. As is often the case with insects, the colour is so deep that it cannot be seen at all except by the aid of a strong and properly directed light. Along the inner edge of the lower wings there is a fringe of very long deep brown hair, much resembling the same portion of the last-mentioned species.

The conspicuous Sarpedon Butterfly is very common, and is found plentifully throughout Australia, the Sandwich Islands, Borneo, and in many parts of Asia.



Fig. 314.—Papilio Sarpedon.
(Black and green.)

The upper surface of the wings is rich chestnut-brown, and both pairs are crossed by a band of pearly shining green, widest

in the middle, and tapering gradually to the ends. Round the margin of the lower wings there is a row of small crimson crescents. The green band assumes a somewhat bluish hue towards the middle. Below, it is similarly, but not so brilliantly coloured, and there is a streak of crimson near the base of the lower wings.

The Butterfly makes it appearance early in May, and remains until the end of the rains in September. It is one of the high-flying insects, frequenting the tops of the oaks, and having a curious jerking or jumping sort of flight, so that it is not easily captured. It has, however, one habit by means of which it can be betrayed into the entomologist's net. It makes regular circuits in its flight, so that if an insect-hunter strikes at a Sarpedon and misses it, he only waits for a time, knowing that the insect will be sure to come back again after completing its round.

The larva of the Sarpedon is a curious dark-green caterpillar, with the segments very strongly marked, and having the singular power of thrusting out a number of stout projections from all parts of its body. In this way it can alter its shape so completely as to be almost unrecognizable. The body diminishes rather suddenly in thickness near the tail. In Ceylon it is known to feed on the cinnamon and sour-sop. The pupa is an oddly-shaped, angular, curved chrysalis, coloured green and yellow, and having a bold ridge down each side. It is bound to the branches by a ligature at the tail and another round the body.

The Indian Butterfly, *Papilio Cloanthus*, bears a remarkable similitude to this species, but may be distinguished by the long tail of the lower wings, and the delicate transparency of the green portions of both pairs of wings.

The colouring of *Papilio Anticrates* is remarkable for its simplicity and beauty, the boldly contrasting hues being so disposed, that when the wings are opened a sharply defined pattern is formed upon both pairs. The colours are white, with a tinge of creamy yellow, edged and streaked with black in the manner shown in the illustration. Both the colour and markings are liable to slight variations.

The under surface of this Butterfly is much more handsome than the upper. The ground hue is the same, and the markings

are very similar, except that the colour is pale brown instead of deep black. The most conspicuous part of the colouring is the second bar from the base of the wing. On the upper surface this forms a nearly continuous bar across both wings, slightly



Fig. 315.—Papilio Anticrates.
(Cream-white, and black.)

broken at their junction. But on the under surface the place of this bar is taken by a row of red crescent-shaped spots, each spot being edged with a narrow line of black.

This is one of the Indian insects, and the specimen from which the portrait was taken was brought from Silhet.

Here is another of the foreign Butterflies which are coloured alike on both surfaces, the only difference being that the under surface is not so bright as the upper. In England we very seldom find this to be the case in the Lepidoptera, our well-known Cinnabar Moth being almost the only example. Abroad, however, there are very many such instances, and in several of them there is scarcely any perceptible difference even in the depth of colour.

In this insect there is but little variety of colouring. The ground hue of the wings is very pale yellow, having almost a washed-out appearance, and they are adorned with a number of dark brown bands, so arranged that when the wings are spread they form a continuous pattern. The eye-like spots at the tips of the lower wings are edged with yellow. This is a native of Australia, and is very rare, only a single specimen being in the British Museum.



FIG. 316.—Papilio parmatus.
(Pale yellow and dark brown.)

The specific name *parmatus* is taken from a Latin word signifying "a shield," but I cannot see where its significance lies, the insect bearing no resemblance whatever to a shield, either in shape or colouring.

CURIOUSLY like the preceding insect are the two species which are shown in the accompanying illustration. Only one of them, *Papilio Alebion*, will be here described, the *Serecinus* coming afterwards with others of its genus. They are, how-

ever, placed together in order to show the singular resemblance that sometimes exists between insects of different genera.

The only specimen of this Butterfly in the British Museum was brought from Northern China. Like the last-mentioned insect, it has a sort of faded look about it, and is coloured in almost exactly the same manner on both sides. The ground colour is yellowish white, and the stripes are of a dark brown.



Fig. 317.—Serecinus Telamon. Papilio Alebion.
(White and dark brown.)

Four of them are so arranged that they extend over both wings, while the others are quite short.

Near the tip of the lower wings is a large patch of bright yellow, and beyond this patch is a group of five eye-like spots, the chief portion of which is black, the centre being sprinkled with some tiny azure specks. The long tail of the lower wings is yellow, with a black line running through its centre. In the middle of both pairs of wings the pale yellow is partly translucent.

We now come to another group of Butterflies, called Pierinæ, familiar to us through our "Whites," Orange-tip, Brimstone, &c. Another example of insect mimicry is here given, the insect being a curiously exact copy of another Butterfly named *Thyridia Psidii*. A figure and description of this insect will be found on page 588.

This is a large and handsome genus, a number of species having been brought from tropical America by Mr. Bates. The present species is the largest at present known, and is very scarce, only a single specimen being in the British Museum. It was brought from Tapajos. The colouring is very simple,



Fig. 318.—Dismorphia orise.
(Black and pale yellow.)

the dark portions of the wing being black, and the rest a very pale yellow, and rather translucent. The body is black, with very narrow white rings on the edges of the segments, and the antennæ are black, except their tips, which are yellow. The wings are similarly coloured on both sides.

Red and yellow are the hues which predominate in Dismorphia, and when a number of them are placed together they have a most gorgeous aspect. The handsomest of them is certainly *Dismorphia Spio*, an inhabitant of St. Domingo. The general colour of this insect is as follows. The upper wings are black, with three large

vermilion stripes. The lower pair are also black, marked with one broad band of orange, and another of greenish yellow. It is, however, a singularly variable insect in point of colour, for there are several specimens in the British Museum which have the bands of the upper wings green instead of red.

THE insect which is here shown is a native of the Celebes, and is an example of mimicry, not of another insect, but of vegetable



FIG. 319.—Appias Zarinda.
(Orange red.)

life. The colour of the wings is a ruddy orange, exactly the hue of the Virginian Creeper leaf in the middle of autumn. The long pointed shape of the wings adds to the resemblance, which is so close that, if one of these insects were to settle on a Virginian Creeper, the keenest-sighted entomologist would have very great difficulty in distinguishing it from the leaves among which it had alighted. It is slightly variable in its hue, some specimens having rather more of the yellow and less of the red than the generality. These are probably females.

Like Dismorphia, this is a very large genus, containing species of very different colours, some of them so closely resembling our

well-known "Whites" that they can scarcely be distinguished from them without careful observation. One of the most curiously coloured is *Appias placidia*, of Amboyna. Above, this insect is entirely brown, with the exception of a slight edging of white round the wings. Behind, it is also brown, but looks as if it had been thickly dusted with some grey flour.

In colour the *Callidryas Thalestris* much resembles our well-known "Orange-tip" Butterfly, although the colours are distributed differently. The ground colour of the wings is king's



Fig. 320.—Callidryas Thalestris.
(Yellow and orange.

yellow, and near the middle of each of the upper pair is a large oval patch of bright orange. Above this orange patch is a small diamond-shaped mark of jetty black. The abdomen is yellow, the thorax is black, with a fringe of very long bright yellow

hairs. It will be seen from this brief description how appropriate is the name Callidryas, *i.e.* "Beautiful Wood-Nymph."

Below, it is dull yellow, like that of a withered leaf, and the surface is covered with a number of large greyish-brown blotches that look exactly like the fungus marks so often seen on decaying leaves. This colouring is evidently intended for the purpose of concealment, as, if the insect were to settle among dying leaves, it would certainly escape the observation which its gaily-coloured upper surface would be sure to attract. These colours are those of the male. The female is coloured in a similar manner below, and above is dull yellow, profusely covered with blotches like those of the under surface. This is probably for the sake of protection, as it certainly causes the female to be much less conspicuous than her mate.

This species is a native of St. Domingo, but the genus is a very large one, and is spread over a considerable portion of the hotter parts of the earth. The general colours are the same throughout the genus, but in some species the orange patch is much larger than that of Thalestris, while in one or two it is spread nearly over the entire wing.

THE gaily-coloured *Ixias Mariamna* is a native of various parts of India.

The colouring of the specimen from which the drawing was taken is as follows:—The upper wings have a brown edge, widest at the tip. Then comes a large scarlet patch occupying the greater part of the wing, with the exception of an irregular black bar which crosses its centre. When the wings are spread, this bar is continued to the lower wings, and runs round their edges so as to form a bold black band, shaped as shown in the illustration. The rest of the wings is white. Below, it is yellow. The upper wings have a patch of yellow immediately under the red of the upper surface, and there is a large black spot near the middle. The lower wings have a row of pale brown spots near their tips.

This is a singularly variable species, the most curious of which is a specimen that was brought from the Punjaub. On the right upper wing of this insect there is a large black spot near the middle, while the corresponding wing of the left side has no spot at all. There is also a similar spot on each of the lower wings.

Many species are yellow, red, and black, distributed in various ways, and in some the male is very gaily coloured, while the female is plain black, white, and grey.



Fig. 321.—Ixias Marianna.
(Red, white, black, and brown.)

The insect which is shown on the next page is a native of Boura, one of the islands near Borneo.

The figure which is there given represents the male, there being a marked contrast in colour between the sexes. The upper wings are edged with a band of black, broadest at the tip. The centre of the wing is red, and the rest is bright yellow. The lower wings are entirely yellow, except two angular black spots. The female is quite unlike the male, being simply black and grey, and so dissimilar are the sexes that even an accomplished practical entomologist like Mr. Wallace had some difficulty in determining the identity of the species.

Mr. Wallace has given, in the "Journal of Entomology," a brief but graphic description of the habits of these Butterflies:—"The species of Iphias are all large and handsome Butterflies,

frequenting the skirts of forests and the margins of streams in forest districts.

"The males often settle on the ground in damp and muddy places, in company with many Papilionidæ and Pieridæ. When thus resting, with wings erect, they are at once distinguishable from all around them by the peculiar attitude they assume, the upper wings being depressed between the lower pair, so that its basal



Fig. 322.—Hebomoia (or Iphias) leucogynia.
(Red, yellow, and black.)

half is completely hidden by them. As probably a consequence of this, we find that this basal half of the upper wings is always pale in colour on the under side, and devoid of the characteristic markings of the exposed portions. The females fly rather low, in woods and thickets, and, seldom coming out into the open grounds, are therefore less easily captured.

"I found the female of this interesting species flying among dense thickets in the island of Borneo, and was completely

puzzled by its appearance, till I one day caught a glimpse of the underside of its wings, when I knew it must be an Iphias. I afterwards obtained a few males, but it was never abundant."

The specific name, *leucogynia*, is formed from two Greek words signifying "a white female," and is given to the insect on account of the pale colour of the female.

ANOTHER species of this genus is represented in the accompanying illustration. It has a large range of country, specimens



FIG. 323.—Hebomoia Glaucippe.
(Cream-white, red, and black.)

in the British Museum having been found in Java, China, Nepâl, Silhet, Ceylon, and the Celebes. The greater part of the upper surface of both wings is a creamy white, and round them runs a deep band of black, with deep, tooth-like projections on the upper pair, and detached, diamond-shaped marks on the lower pair. There is also on the upper pair a rather narrow, waving band of

red. The under surface, although not so gaily coloured as the upper, is still very beautiful. The upper wings are white at the base and pale chestnut at the tip, the two colours merging gradually into each other. The lower wings are creamy white, covered with multitudinous wavy pencillings of pale brown, each looking as if executed with the finest possible crowquill pen.

THE genus Teracolas is remarkable for the beauty of colouring displayed by the different species, and the exceeding boldness of



FIG. 324.—Teracolas Ione.
(White and magenta.)

the marking. As for the present species, it is fortunate that in late years the dye called "Magenta" has been invented, for, before that celebrated battle had been fought, and the dye discovered, it would have been a task of no small difficulty to describe this beautiful insect.

The upper surface of the male is white, just like that of our White Butterflies, and the upper wings have on the outer edge a bar of the deepest black, narrowest at the anal angle, and widening at the tip to one-third the breadth of the wing. In

the broadest part of the band there are three large spots, which in some specimens are red, and in others magenta. In either case the colour is of the most glowing brilliancy, and flashes like jewels in a setting of jet. The lower wings are white, with a very slight edging of black. Below, it is plain white, and in the female there is neither magenta nor red in the upper wings.

This species is a native of the Natal district. Another species, *Teracolas Phlegyas*, which is found near the White Nile, bears some resemblance to the preceding insect, except that the whole of the band on the edge of the upper wings is magenta; and another, *Teracolas Hewitsonii*, has none of the brillant colours which are usually found in members of this genus, but is dun, crossed with streaks of black.

We now leave the Pierinæ, and take a few examples of the next group, the Papilioninæ.

The first of these is *Parnassius Charltonius*. This genus is tolerably familiar to English entomologists, because the Apollo



Fig. 325.—Parnassius Charltonius.
(White and grey, with blue and red spots.)

Butterfly belongs to it. It is very dubious whether this insect can really be considered as English. Many years ago, however, I found in a drawer in the Ashmolean Museum at Oxford an Apollo Butterfly, which was said to have been caught by a

lady and given to the Museum. There was certainly internal evidence that this might have been the case. It had not been captured by an entomologist, for it was pierced all on one side by a darning-needle instead of a pin, and had never been set. I relaxed the wings, replaced the needle with a pin, set the specimen properly, and returned it to the collection.

The larvæ of this genus are odd-looking creatures, very much resembling the caterpillar of a large moth. They have a tentacle in the neck similar to that of Papilio larva. The pupa is enclosed in a large, rude cocoon, made of leaves loosely fastened together.

Most, if not all, the Parnassians are inhabitants of mountainous districts, the present species being a native of the Caucasus. The ground colour of the wings is white. On the upper pair there are three pale grey-black bands, one on the edge and



Fig. 326.– Parnassius Hardwickii.
(Black, white, and red.)

the others crossing the wing. Then come two short black stripes, and towards the base there is a large patch of grey speckles. On the lower wings there is a curved band of black, with blue eye-like spots, and above them are two curved marks of red. The

body is black. There is only one specimen in the British Museum.

ANOTHER species of this genus, *Parnassius Hardwickii*, is a native of Nepaul and Chinese Tartary. Its colouring is rather complicated and not easily described, especially as it is an exceedingly variable species, but may be briefly given as follows:—

The upper surface is almost entirely black and white, but on the upper wings there are four patches of red near the upper edge. The insect has a sort of translucent look about it, and is very glossy. Scarcely any two specimens are exactly alike, the chief variation taking place in the red spots on the upper wings. In some specimens they are so much enlarged as to form one patch of considerable size, while in others they are barely half the size of those which are shown in the illustration.

One of these insects, *Parnassius Stubbendorfii*, is entirely white with the exception of the nervures, which are black, so that it bears a very close resemblance to our "Black-veined White" Butterfly.

THE curious genus Serecinus now comes before us. These insects have very long tails to the lower wings, and bear a close resemblance to some of the Papilionidæ. This resemblance is well shown in *Serecinus Telamon*, which may be seen figured on page 572, this being the lower figure of the two. It is a native of Northern China.

The colouring is very simple, the ground colour being white, on which are placed a number of dark brown marks, arranged as shown in the illustration. On the lower wings there is a large black patch occupying the space between the anal angle and the tail, and extending into a black stripe along the lower edge. In this patch there are three round spots, which are powdered with a blue dust. The abdomen is cream-coloured, with some black spots.

The female resembles the male, but the colours are duller, and there is a larger proportion of brown.

ANOTHER fine example of this genus is seen in *Serecinus Montela*, also a native of Northern China. The illustration

represents a male, which is coloured as follows. The ground hue is yellowish white, upon which are drawn a number of dark brown stripes and marks. There is a large scarlet patch at the anal angle of the lower wings, and the tail is slightly powdered with blue. Below, the colour is much the same, except that the patch on the lower wings is black, and has only a slight streak of red running through its middle.

In order to show the contrast which often exists between the colour of the two sexes, the female of the same species is given on the opposite page. In this sex the colours are quite



Fig. 327.—Serecinus Montela. Male.
(White, brown, and scarlet.)

as conspicuous as those of the male, though there is about them that almost indefinable dimness which is generally to be found in female Lepidoptera.

The upper wings are brown, and are marked with three distinct rows of yellow spots running in a line with the outer edge, several streaks of the same hue being between the third row and the base of the wing. The lower wings are coloured after the same fashion near the base, but at the anal angle there is an interrupted band of blue, above which is a row of crimson marks. The tails are black, and there is a patch of bright yellow at the base.

PLATE XIII.



There is but little difference in the colours of the under surface of the wings, except that the yellow, blue, and crimson are not quite so brilliant, and the spots are less sharply defined.



FIG. 328.—Serecinus Montela. Female.
(Brown, yellow, and crimson.)

WE now pass to another group of Butterflies, called the Danainæ, several examples of which will be figured, and others will be mentioned or briefly described.

On Plate XIII. Fig. 1 is shown a large Butterfly called *Hestia Idea*. This genus is rather a large one, and as all the species are of very similar colouring, and there is a great tendency to variation, it is not at all easy to distinguish between the species. Mr. Westwood has figured several Hestias in his "Oriental Entomology," and comments upon the difficulty of distinguishing between a species and a variety. Speaking of *Hestia Jasonia*, a Cingalese insect, he makes the following remarks, which are well worthy of notice:—

"How far this may be a good specific character must be left for time (or, more properly speaking, the possession of an extensive series of specimens of these insects from different localities)

to determine. It is doubtless in some degree dependent on the form of the apical angle of the wing, and this form of the wing cannot at present, I believe, be fully relied upon. That the form of the wing varies in some Butterflies according to the localities of the individuals, is unquestionable; and if this should be ascertained to be the case here, I think it may possibly be followed by the discovery that all the supposed species of Hestia are only so many local or geographical sub-species of one real species."

This is a very simply coloured Butterfly, the ground colour being white and the markings dark brown. Still, although it has no brilliancy, it is really a handsome insect, owing partly to its size and partly to the bold contrast between the two hues. The abdomen is white, with a narrow black stripe down the middle.



Fig. 329.—Danais insolata.
(White and dark brown.)

Although the colours of this Butterfly are by no means brilliant, it is a very pretty insect, the hues being soft and well contrasted.

In the male the basal half of the upper wings is dark brown,

with a rather peculiar silken gloss. The other half is pure white, the outline having a tendency to run into tooth-like projections. The colours of the lower wings are similar, but are arranged in a different manner, the brown and white forming a series of radiating teeth round the edge of the wings. In the female the brown is much lighter than in the male. This species is a native of the Solomon Islands.

There are many species of Danais, their predominating colours being rich brown, orange, white, and black. It is rather remarkable that in all the species there is a tendency for the colours to be arranged in streaks or dashes radiating from the thorax.

THE genus Euplœa is a very interesting one, containing many species which are notable for their beauty, and one, at least, which is remarkable for the use to which it is put.



FIG. 330.—Euplœa imitata.
(Brown and white.)

The species which is here given is a native of the Solomon Islands. Above, the upper wings are brown at the base, becoming white at the tip, the outline being waved as shown in

the illustration. The lower wings are smoky grey-brown. Below, the colour is very much paler, and there are three white spots on the upper wings and five on the lower.

One Australian species, *Euplœa hamata*, is remarkable for being used as food by the natives, who know the insect by the name of Bugong. In certain seasons the Bugongs arrive in vast swarms, just as do locusts in many parts of the world. They

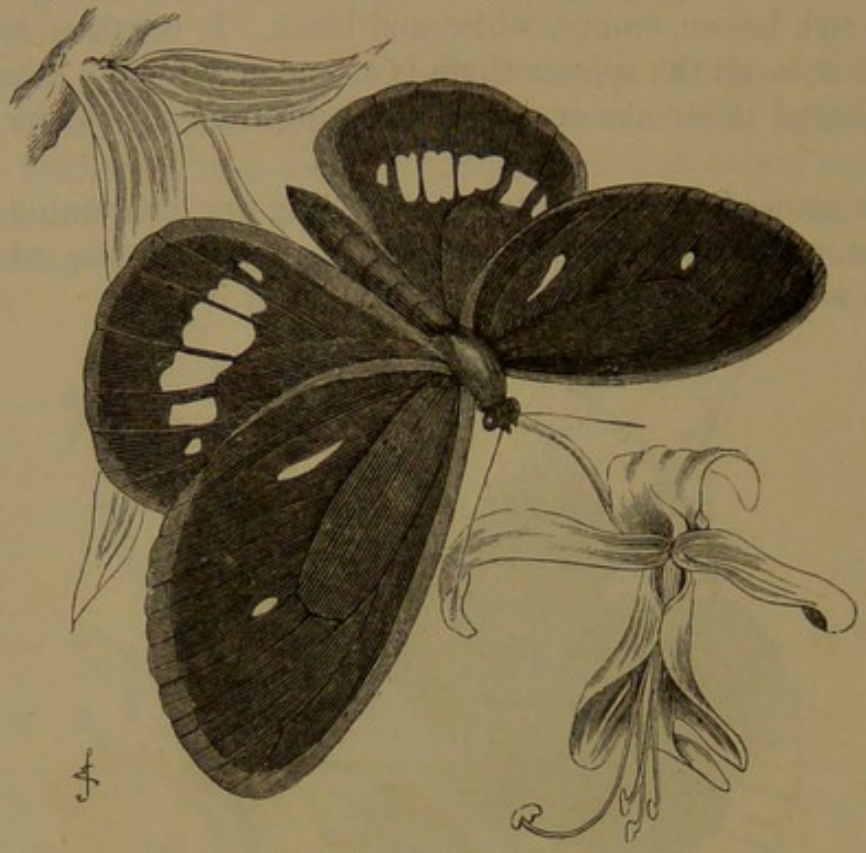


Fig. 331.—Euplœa Lorenzo.
(Brown and white.)

settle upon the rocks, and the natives then light fires so as to smother them with the smoke, when they are swept into baskets. Large fires are then lighted on the rocky ground, and the "moths," as they are called, thrown on the heated ground and stirred about until they are cooked and the wings and legs separated from the bodies. They are then pounded into lumps and are fit to be eaten. Mr. Bennett describes the flavour as resembling that of a sweet nut.

The natives become exceedingly fat upon this curious diet, though at first it always disagrees with them. Birds, as well as men, feed upon the Bugong, and there is a species of crow called

Arabul that is so fond of the Bugong as to dash at it while the natives are cooking it. For this audacity, however, the bird mostly pays with its life, a club being flung at it with the unerring aim of the savage. The popular name of "moth" is probably given to this insect because the body is very stout. The colour of the Bugong is brown, with two round black spots on the upper wings.

THE Lorenzo (given on opposite page) is a native of the Solomon Islands, and appears to be scarce, as there is only one specimen in the British Museum. The colour is brown, with two little white patches on the upper wings, and an interrupted band of white on the lower wings. Both sides are coloured alike.

Although the Euplœas are mostly clad in sober colours, some of them are really handsome insects. There is, for example, *Euplœa Diocletia*, of the Philippines, a really beautiful Butterfly, its wings glowing with changing purple, just like those of our Purple Emperor. Another rather striking insect is *Euplœa Palla*, of Arú, which is quite black except a single row of round white spots upon the edges of the wings.

HERE is the insect to which reference was made in the description of *Dismorphia orise*, page 573. The resemblance between

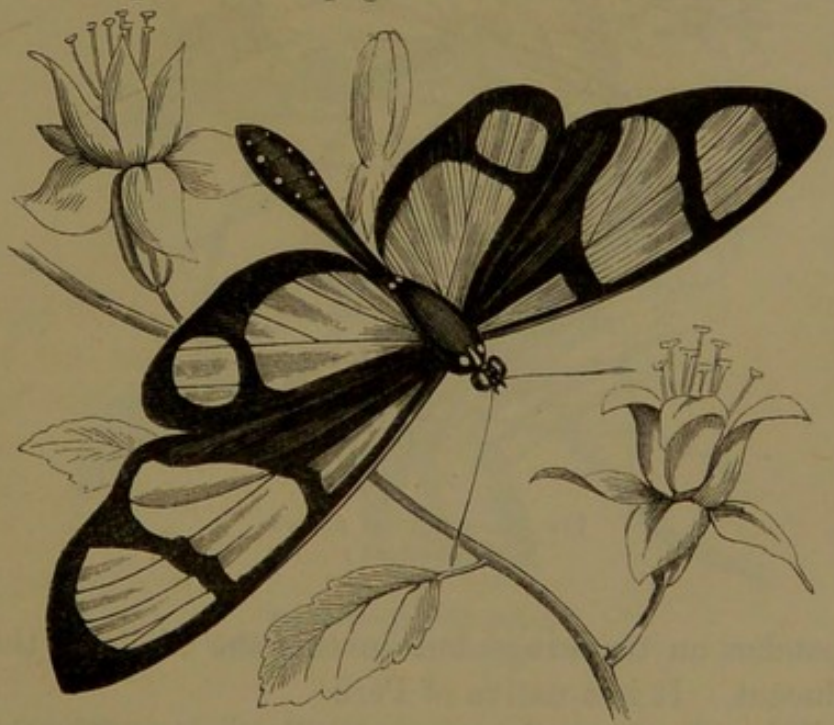


FIG. 332.—Thyridia [or Methona] Psidii.
(Black and pale yellow.)

them can easily be seen by reference to the illustration on that page.

This insect is a native of Guiana. The long, narrow wings are black, and upon each wing are two large patches of pale greyish yellow, these portions being partially translucent. The generic name of *Thyridia*, or "little window," is given to the insect on account of these window-like patches on the black wings. The body is dark brown, with the exception of some round white spots.

There are several species of Thyridia, all coloured very much alike. One of the most remarkable is *Thyridia Ædesia*, in which the translucent parts of the wings are ruddy chestnut instead of pale yellow. The larva of this species is smooth.

Of the group called Satyrinæ a single example will suffice.

The insect which is called *Callitæra Aurora* is a very remarkable one. In the last-mentioned Butterfly there are large trans-



Fig. 333.—Callitæra Aurora.
(Translucent.)

lucent patches on the wings, but in this the whole of the wing is translucent. It is a native of Peru.

As may be seen by a glance at the illustration, the wings are so translucent that objects can be seen through them quite

clearly. They have quite a glassy appearance, with the slightest possible haziness about them. The only markings are a couple of eye-like spots, one near the tip of each hind wing. The outer ring of the eye is greyish black, then comes a ring of white. Inside the white is an oval patch of black, and in the centre of the black is a tiny spot of white. The wings are edged with a very narrow band of brown.

There are many species of Callitæra, all much resembling each other, and all natives of tropical America. Some of them have the wings covered with most delicate pencillings and mottlings of light brown, and all of them have the eye-like spot on the lower wings.

ANOTHER group of Butterflies, the Morphinæ, will be represented by one example, *Drusilla mylæcha*. This insect is a native of Louisiade, one of the Solomon group.

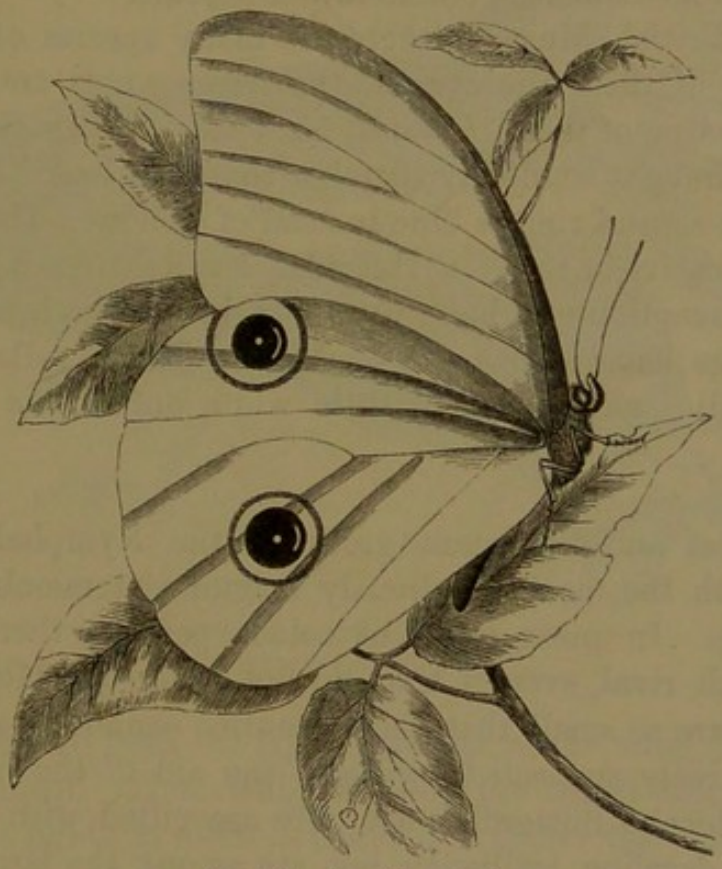


FIG. 334.—Drusilla mylæcha.
(White above ; four large eyes below.)

The colouring of the Butterfly is very remarkable. The upper surface is perfectly white, except a narrow black edging to the

upper wing. The under surface is also white, but the upper edge of each wing has a black band, which is widest at the base and narrowest at the tip. The remarkable point in this insect is the marking of the lower wings. These are white, but upon them are two large circular eye-like spots. The outer ring of these spots is blackish brown, and within it is a broad ring of yellow. Then comes a large circular patch of black, and in its centre is a little round spot of white. These rings are so exactly circular that they look just like miniature targets. The wings are rather translucent, so that when viewed from the upper surface the eyes can be seen through them.

The specific name of *mylæcha*, or, as it ought to be spelled, *mylæca*, is a very curious one to be given to this Butterfly. It is a name compounded by Pliny from two Greek words signifying anything which inhabits a mill. Pliny used it to indicate some little worm which was found in mills, but its connection with a Butterfly from Louisiade seems rather obscure.

In the British Museum there are many species of Drusilla, and in all of them the eyes of the lower wings are very conspicuous. One of them, *Drusilla bioculata*, of New Guinea, has the spots brought so closely together that they look like a figure of 8. The second ring is blue instead of yellow. The *Drusilla Phorcas*, a native of the New Hebrides, has its wings dark brown, with the exception of a large patch of white on both pairs. The lower wings have each a single circular eye of yellow, with a black middle, and the usual little white dot in the centre of the black.

THE great and important group of the Nymphalinæ commences with the most wondrously magnificent members of the insect race. In mere point of colour perhaps there may be many which rival, even if they do not excel, the Morphos, but then they are so small that their beauties cannot be seen—and, indeed, scarcely suspected—without the aid of the microscope. But the Morpho Butterflies not only are gifted with colours of absolutely dazzling brilliancy, but are among the largest of the insect race. They are all inhabitants of tropical America. Two examples will be here given, the one to illustrate the upper and the other the under surface of the wings.

Our first example of these wonderful Butterflies is *Morpho*

Cypris, an insect which was brought from the emerald mines of Muso, in North Granada, and which seems to partake with the gems the full glory of colour. It is scarcely possible to conceive of a living creature that can surpass this insect in absolute magnificence of colour. The upper surface is radiant azure, as if composed of a sheet of thin mother-of-pearl.

When the light falls in the right direction, the colour is so intense that the eye can scarcely endure its radiance. Yet, with a cross light, the dazzling azure becomes dull blue, and if the



FIG. 335.—Morpho Cypris.
(Azure and yellow.)

light be directed from the tip to the base of the wing, the surface becomes brown. Thus, while holding the insect and turning it in different lights, it often happens that either the entire surface is dull blue, or that one wing is glowing azure, while the other is dark brown. The cause of this change of colour is shown by the microscope. The scales are nearly square, and, as they overlap one another, they are slightly curved in the middle.

It will be seen, therefore, that this curve causes a shadow to be thrown on one side of the scales, while the full light is admitted on the other. It is rather remarkable that if the insect be held up to the light all colour goes out of it, and it becomes of a plain greyish brown colour.

The upper surface is not wholly blue, but is relieved by an interrupted bar of yellow across the centre of both wings, and a number of spots of the same colour, that run nearly parallel to the outer edges. Below, it is pale brown and white, with three large eye-like spots on the upper wings and five on the lower, the two nearest the anal angle being united.

ANOTHER of these splendid insects, called *Morpho Peleides*, is a native of Bogotá. In the illustration the under surface of the



FIG. 336.—Morpho Peleides.
(Opaline blue.)

male insect is shown, so as to display its peculiar and beautiful markings. The upper surface of this Butterfly is rich, shining,

PLATE XIV.



2

1

opaline blue, with a decided dash of green in some lights. The wings are edged with a broad band of black, in which is a row of little white spots. The female is coloured in a somewhat similar fashion, but the blue is less brilliant, and the black belt is replaced by a very broad brown band. In this band are a number of spots, white on the upper wings and red on the lower.

Below, its colouring is equally bold, and so intricate that a minute description would be quite out of place. Described generally, the ground colour is chocolate-brown, and upon the upper wing there are three bold eyes, situated in an irregular belt of grey. The outer ring of these eyes is black, followed by a ring of yellow. Then comes a circular patch of black, and in its centre is a purple spot. A band of pale red runs parallel to the edge of both pairs of wings. The lower wings are likewise chocolate-brown, and have upon them four large circular rings of grey, each ring having a very narrow black line running through it.

THE magnificent insect which is drawn on Plate XIV. is a native of South America. Two views of it are given in order to show the difference between the upper and under surfaces. The former appears at first sight to be plain chocolate-brown, but in certain lights it is seen to be glossed with blue and olive-green. The latter is dun, mottled near the base of the lower wings with white. The lower wings are also dun, covered with profuse mottlings and scribblings of dark brown. In the centre is a single large oval eye-like spot. At the upper end is a semi-lunar line of black, followed by an oval ring of ruddy chestnut. Inside this is another ring of yellow, and the centre is filled with a large oval spot of black, crossed with a few white spots.

When the wings are expanded, the insect bears a startling resemblance to the face of an owl; the oval marks representing the eyes, the body of the butterfly the beak, and the open wings resembling in outline the two great feather-discs that surround the eyes. On account of this peculiarity it is popularly called the OWL BUTTERFLY. I would have had it drawn so as to show the resemblance, but the insect is so large that there would not have been sufficient space on the page.

ALL the species belonging to the genus Heliconius are of a very peculiar shape. Their wings are long and narrow, so that when they are spread the insect is very much wider than it is long. There is a peculiarity in the colouring as well as in the shape of the wings, the clothing of scales being so slight and thin as to make them partially translucent. There are many species of Heliconius, and they are all inhabitants of tropical America and the West India islands.

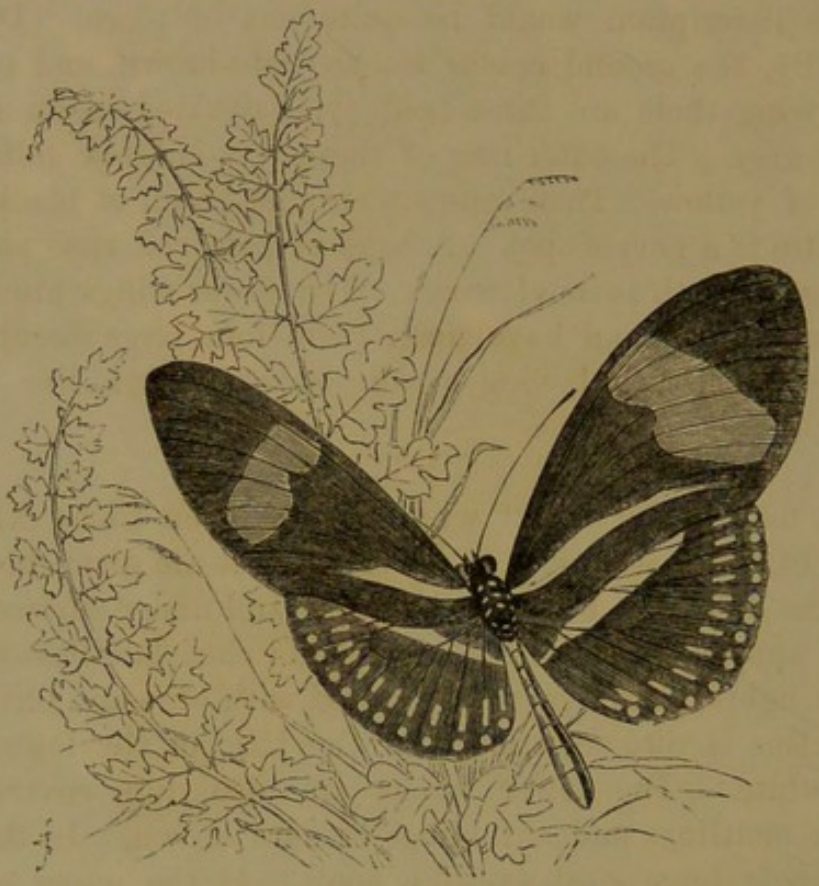


FIG. 337.—Heliconius Hermathena.
(Black, yellow, and orange.)

Two species will be given as representatives of the genus; the first of which inhabits Brazil, and is called *Heliconius Hermathena*. The ground colour of the wings is deep black-brown, and near the middle of the upper pair runs a broad belt of bright orange with a dash of brown in it. A long narrow streak of bright yellow runs nearly parallel with the inner edge of the wing, its width being greatest in the middle, and diminishing almost to a point at either end. The lower wings are of the same blackish brown as the upper pair, and upon each of them there is a yellow streak running diagonally from near the

base to the tip, together with two rows of spots near the edge, the outer row nearly circular, and the inner rather oblong.

THE second species, *Heliconius Hecalesia*, is a native of Bogotá, and is one of the many rare insects that Mr. Bates brought from South America. There is only one specimen in the British Museum. Its ground colour is velvet black, and near the outer edge of both pairs of wings are some large spots of



FIG. 338.—Heliconius Hecalesia.
(Velvet black and greenish yellow.)

greenish yellow. At the base of the lower wings is a large patch of bright chestnut. Below, the colours are the same, but rather duller than on the upper surface.

This insect almost exactly imitates another Butterfly of the same district, called *Tithorea Hecalesina*. The two insects fly together in company—perhaps for the purpose of protection. Mimicry is very common among the species of this large genus, and, as is remarked by Dr. Horsfield, the South American genus Heliconius is represented in Asia by the genera Euplœa and Idea. The larvæ of Heliconius feed on the Passifloræ.

CHAPTER II.

BUTTERFLIES (*concluded*).

THE large genus *Junonia* is here represented by *Junonia crebrene*, an African species. On the upper surface the ground colour of the wings is black. On the upper pair is a broad



FIG. 339.—Junonia crebrene.
(Black, chestnut, and yellow.)

waving band of yellow, deepening gradually into chestnut. There is a yellow spot near the tip of the wing, and close to the edge is a narrow line of chestnut. The lower wings are more gaily coloured than the upper. They are black near the base, but have at the tips a patch of yellow deepening into dun. This

patch is so large that it occupies almost one-third of the wing. In the British Museum there is a specimen from Plettenberg Bay, which has two dark spots on the yellow patch. Near the base of the wing is an oval patch of blue, which in some specimens takes a purple cast. Beneath, the colour of the insect very closely resembles that of our Meadow Brown Butterfly, and there is a large eye-like spot on the upper wings.

This genus has a very wide range of residence. There is, for example, one species, *Junonia Orithyia*, which is found in Northern Australia, the Celebes, China, Japan, Northern India, West of the Nile, and East Africa. This insect has a greenish tinge, glossed with blue on the lower wings. On the lower pair there are two large eyes, and on the upper, one large and one small eye.

THE two very remarkable insects which are here shown are so well described by Mr. Wallace, in his "Malay Archipelago,"

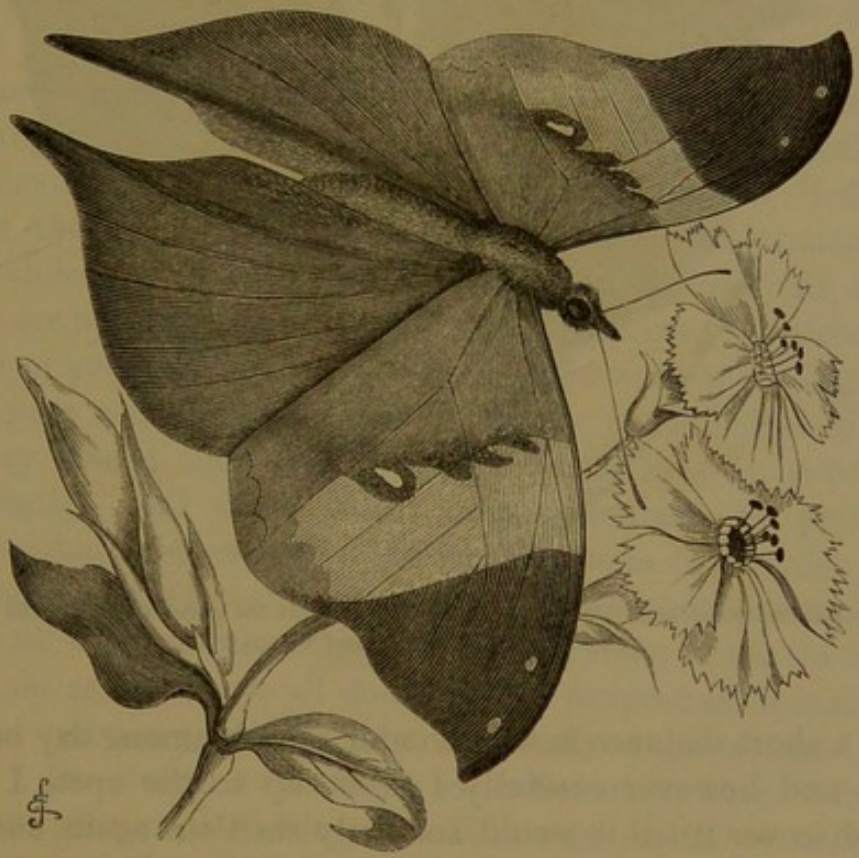


FIG. 340.—Kallima Inachis.
(Brown, black, and orange.)

that I cannot do better than transfer his description to these pages. There are many species of Kallima, most of which are

remarkable for the manner in which the colouring, as well as the shape of the closed wings, resembles that of a leaf. The upper surface of the *Kallima Inachis* is mostly brown, the tips of the upper wings being black, and orange-dun bands running diagonally across them.

The following extract is taken from Mr. Wallace's work :—

"This species was not uncommon in dry woods and thickets, and I often endeavoured to capture it without success, for after



Fig. 341.—Kallima paralekta. The left-hand figure represents the under surface of the butterfly at rest. (Brown, black, and orange.)

flying a short distance it would enter a bush among dry or dead leaves, and however carefully I crept up to the spot, I could never discover it till it would suddenly start out again, and then disappear in a similar place. At length I was fortunate enough to see the exact spot where the butterfly settled, and though I lost sight of it for some time, I at length discovered that it was close before my eyes, but that in its position of repose it so closely

resembled a dead leaf attached to a twig, as almost certain to deceive the eye, even when gazing full upon it. I captured several specimens on the wing, and was able fully to understand the way in which this wonderful resemblance is produced.

"The ends of the upper wings terminate in a fine point, just as the leaves of many tropical shrubs and trees are pointed, while the lower wings are somewhat more obtuse, and are lengthened out into a short thick tail. Between these two points there runs a dark curved line, exactly representing the midrib of a leaf, and from this radiate on each side a few oblique marks, which well imitate the lateral veins. These marks are more clearly seen on the outer portion of the base of the wings and on the inner side towards the middle and apex, and they are produced by striæ and markings which are very common in allied species, but which are here modified and strengthened so as to imitate more exactly the venation of a leaf.

"The tint of the under surface varies much, but it is always some brown or ashy colour, which matches with those of dead leaves. The habit of the species is always to rest on a dead twig and among dead or dried leaves, and in this position, with the wings closely pressed together, their outline is exactly that of a moderately sized leaf, slightly curved or shrivelled. The tail of the hind wing forms a perfect stalk, and touches the stick while the insect is supported by the middle pair of legs, which are not noticed among the twigs and fibres that surround it. The head and antennæ are drawn back between the wings, so as to be quite concealed, and there is a little notch hollowed out at the very base of the wings, which allows the head to be retracted sufficiently. All these varied details combine to produce a disguise that is so complete and marvellous as to astonish everyone who observes it; and the habits of the insects are such as to utilize all these peculiarities, and render them available in such a manner as to remove all doubt of the purpose of this singular case of mimicry, which is undoubtedly a protection to the insect. Its strong swift flight is sufficient to save it from its enemies when on the wing, but if it were equally conspicuous when at rest, it could not long escape extinction, owing to the attacks of the insectivorous birds and reptiles that abound in the tropical forests. A very closely allied species, *Kallima Inachis*, inhabits India, where it is very common, and specimens

are sent in every collection from the Himalayas. On examining a number of these, it will be seen that no two are alike, but are the variations corresponding to those of dead leaves. Every tint of yellow, ash, brown, and red is found here, and in many specimens there occur patches and spots formed of small black dots, so closely resembling the way in which minute fungi grow on leaves, that it is almost impossible at first not to believe that fungi have grown on the butterflies themselves!

"If such an extraordinary adaptation as this stood alone, it would be very difficult to offer any explanation of it; but although it is perhaps the most perfect case of protective imitation known, there are hundreds of similar resemblances in nature, and from these it is possible to deduce a general theory of the manner in which they have been slowly brought about."

THE genus Eubagis is South American, and contains a great number of species. The present example is a native of St. Paulo, and is one of the many that were taken by Mr. Bates. There is at present only one specimen in the British Museum.



FIG. 342.—Eubagis Sara. (Black, blue, and white.)

Above, the upper wings are black, with a definite gloss of blue in a side light, and variegated with white spots, disposed as shown in the illustration. The lower wings are glossed with blue, and have three black stripes, one running along the outer edge, and two others nearly parallel to it. On the under surface the upper wings are brown, with some large white spots, and four dashes of blue. The lower wings are much paler, and have two horizontal strips of dark brown.

Of the other species we may notice two, both brought from Ega by Mr. Bates. One is *Eubagis Ines*, the upper surface of which is shining green, edged with black, and the under surface white, mottled with brown. The second is *Eubagis Mæon*, which is white, edged with black on the lower wings, and azure on the

upper pair. The azure only belongs to the male, the female being simply black and white.

THE genus Catagramma is easily distinguished by the peculiarity from which it derives its name, which is composed of two Greek words, signifying something that is painted or written upon. It is applied to these insects because the under surface of the lower wings is always covered with a boldly delineated pattern of contrasting colours. All these Butterflies are natives of the New World. The painting of the lower wings is very much alike in

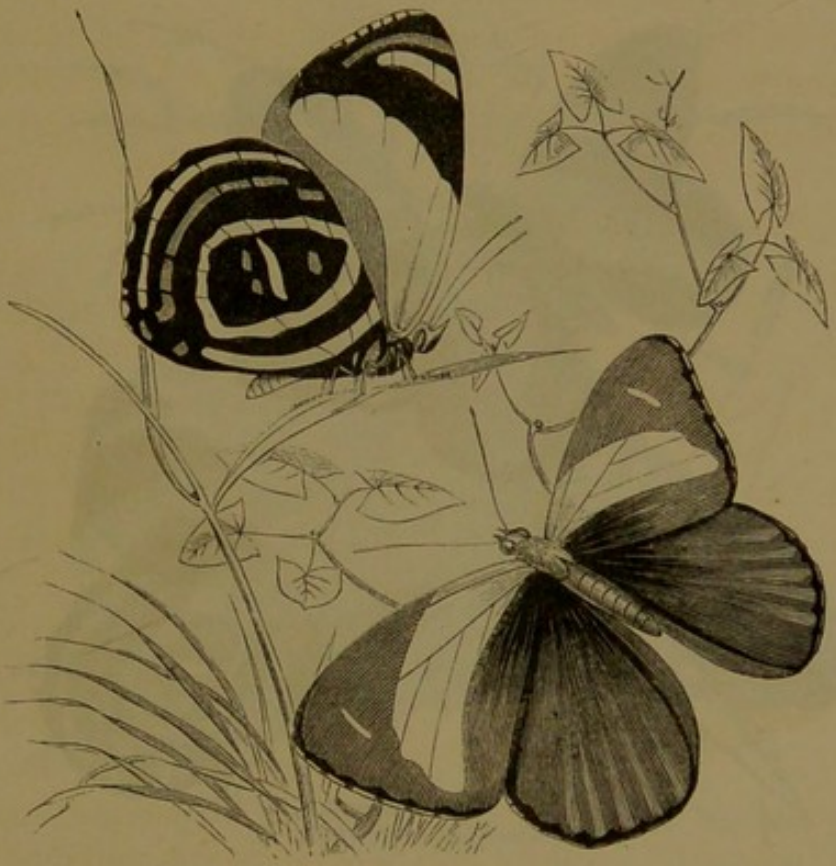


FIG. 343.—Catagramma excelsior.
(Above, black and orange.)

most of the species, but the upper surface varies very considerably, especially in the upper wings. None of the Catagrammas are large insects, those which are here given being of the average size.

There is only one specimen of *Catagramma excelsior* in the British Museum. It is a native of the Amazons district. Above, the upper wings are black, with a broad band of orange reaching from the base nearly as far as the outer edge, and near the tip is a slight dash of the same colour. The lower wings are

also black, but not so deep as the hue of the upper pair. Below, the colour of the lower wings is very beautiful. The ground colour is black. Near the outer edge is a long streak of yellow, and then comes a broken line of blue. Next comes a large oval yellow ring, and in the middle is a horizontal blue dash between three spots of yellow.

The second species comes from Spirito Santo, in Brazil.

Above, the ground colour of both wings is black, with a gloss of purple in a side light. Near the base is a tringualar patch of



Fig. 344.—Catagramma Astarte.
(Black and scarlet.)

scarlet, then a bar of the same colour runs across the middle of the wings, and then comes a slight dash of the same hue near the tip. The lower wings have a single broad and rather wavy bar of the same scarlet, passing from the base almost to the outer edge. Below, the first two-thirds of the upper wings are red, with a bar of black. The rest of the wing is black, with a blue dash close to the tip, and a small yellow bar next to it. The colouring of the lower wings is like that of the previous species.

Generally, the colours of this genus are black and red of some shade. In some, however, a vivid green is substituted for the red. *Catagramma Mionina*, an insect from New Granada, has an orange patch on the upper wings and a shining emerald patch on the lower pair; while one species in the British Museum, as yet without a name, has the patch on the lower wings blue instead of green.

THE extremely rare insect which is here figured is not in the British Museum. It was captured by Mr. Bates, who named



FIG. 345.—Ageronia Alicia. Upper side.
(Slaty green and black.)

it after his daughter. The following is his description of the Butterfly and its habits:—

"Slaty green, silky. Fore wings, above, with many black or dusky variously shaped spots, nearly all of which are margined with a paler hue. Besides these dark spots, there are ten or twelve pale brown spots, one or two between each of the longitudinal nervures. Margins of the wings black.

"Hind wings with a row of black eyes running parallel with the margin and edged with green—some of them have slaty green pupils.

"Beneath, the fore wing ochreous at base, the rest of the wing dark brown, with three belts of white spots. Hind wing, clear saffron yellow; outer margin black, with ochreous spots between.

"This fine and large species was met with only at S. Paulo, Upper Amazons. It has the same habits as its congeners, but it

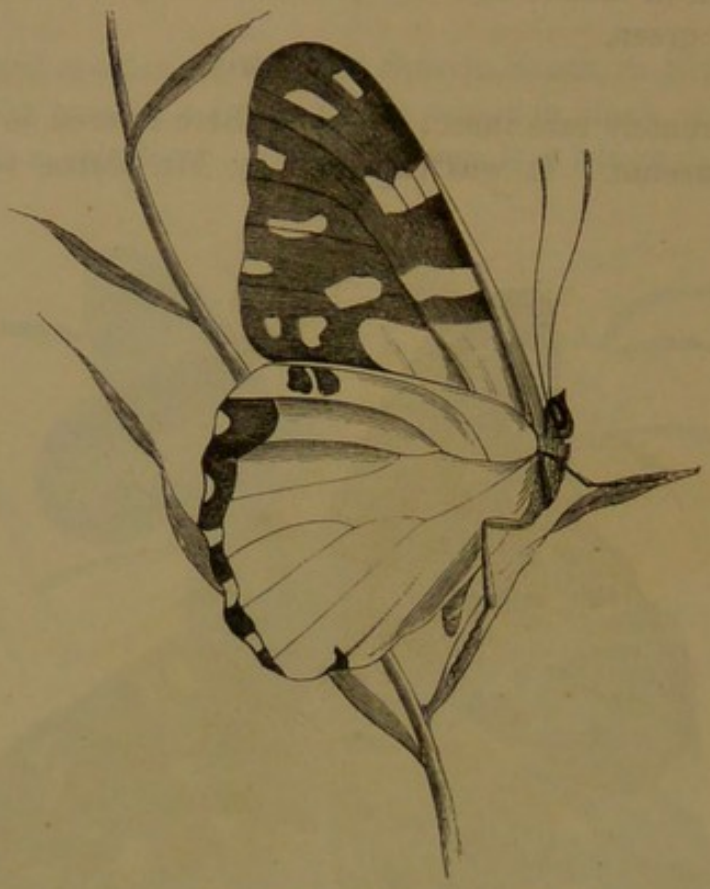


Fig. 346.—Ageronia Alicia. Under surface.
(Slaty green and black.)

is much swifter in flight. Although I saw several, I was able to capture only one example." The expanse of wing is three inches and three-quarters.

Another of the Butterflies brought by Mr. Bates from the Amazons is here given. Its name is *Timetes Egina*. The figure represents the male insect. This rare and curiously coloured insect is marked as follows.

Above, both the wings are tawny brown, darkening into black-brown towards the tip, and having several whitish grey spots on the upper pair. Both wings have a number of narrow streaks of dark black brown, looking as if they had been drawn with a

pen, the streaks being short on the upper and long on the lower wings. Beneath, both wings are pearly white, with a dash of pinky lilac, very much like the colour of a newly-caught smelt. On the wings are drawn a number of pale brown streaks, one of which is darker than the others and crosses both pairs of wings. The female resembles the male in most respects, but is paler, and has five spots on the upper wings.

It is found in the district of the Upper Amazons. The expanse of the wings is not much more than two inches, so that its length is much greater than its width.

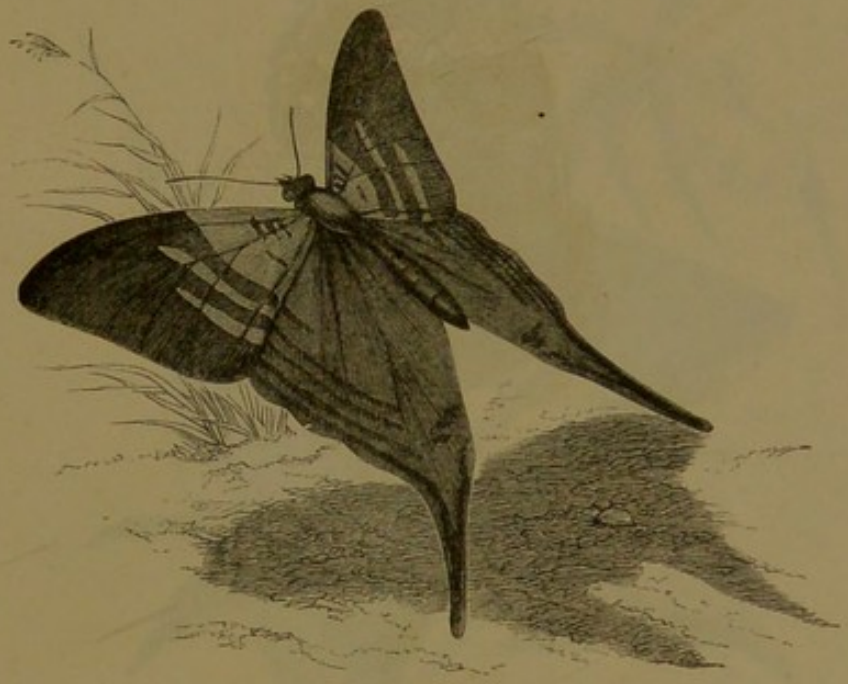


Fig. 347.—Timetes Egina.
(Brown and black.)

There are many species of this genus, and the British Museum possesses a fine series of them. One, *Timetes Crethron*, is brown, covered with bold white stripes. Another, *Timetes Corinna*, has the upper wings black, with an orange bar, and the lower wings blue, edged with black and orange. The name *Timetes* is taken from a Greek word signifying "honourable," and is given to the insects on account of their remarkable form.

The extremely variable insect which is called *Diadema Bolina* has a very large range of residence. The specimen which is figured in the illustration was brought from the South Seas by

Mr. Brenchley, and is remarkable for the exceeding paleness of its colouring.

Generally, the upper wings are velvet brown-black, with a small patch of blue on the upper wings and a large patch on the lower pair. In some specimens, however, the upper patch is white, or has a white centre. It is rather curious that whatever may be the variations in the colouring of the upper surface, that



Fig. 348.—Diadema Bolina.
(Brown and black.)

of the under surface is always the same. The general colour is brown, with a white bar on the upper wings, and several dark brown spots with white centres. The lower wings have a white bar and a row of white spots running parallel to the outer margin.

The large genus Adolias is represented by two species, and the distinction which exists between the sexes is shown by a figure of the female as well as of the male.

The first species, *Adolias Kesava,* is a native of Northern India, the specimens which are here figured having been taken

at Silhet. The male is olive-brown above, with indistinct broad stripes of very dark brown on the upper wings, and a narrow stripe of the same hue on the lower pair. Below, it is dun, with two light brown bars, and the surface is covered with narrow black streaks, looking as if they were scribbled at random with a pen.

The female is considerably larger than the male, and is very different in colour. The upper surface is chocolate-brown, with some dark marks and rings, and a broad, wavy, pale grey-brown

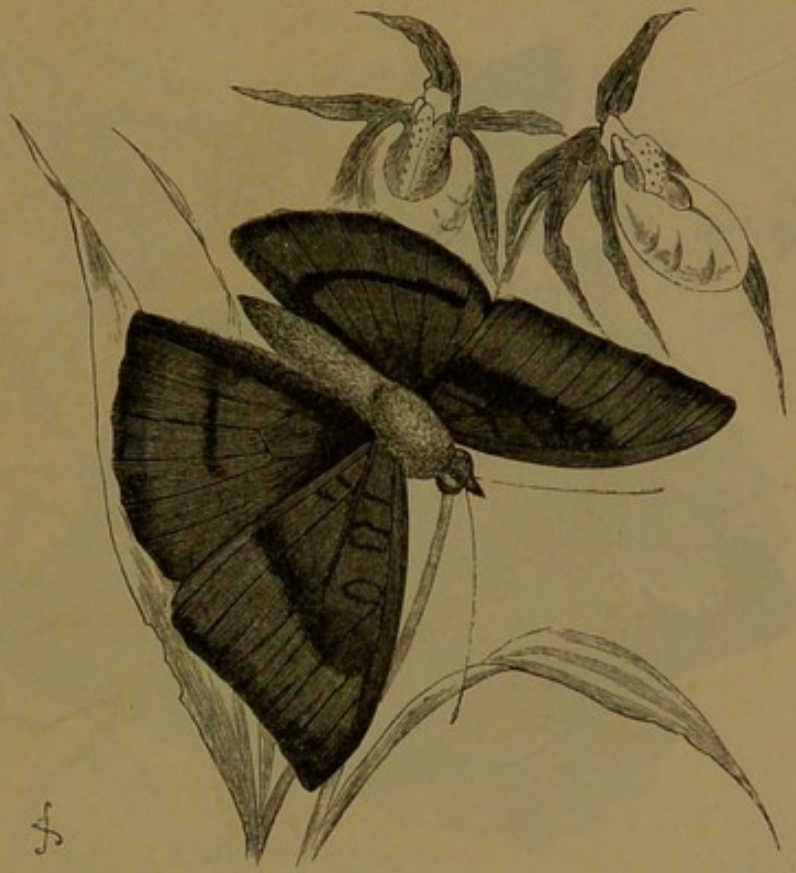


Fig. 349.—Adolias Kesava. Male.
(Olive brown.)

bar across the upper pair. Below, it is pale, mottled with a darker brown.

There is a specimen in the British Museum which at first looks like a variety, on account of a large dark brown patch at the base of the wings. This patch, however, is nothing more than some glue which has been employed for the purpose of fastening the wings to the body, and has been used with too liberal a hand.

Very great changes in the appearance of an insect may thus be made. The reader may remember that in the course of

this work the tricks of dealers have several times been mentioned, and it is as well to know that artificial colouring is one of them. The dealers treat the insects very much as foolish ladies treat their hair when they wish to change its colour. They first begin by discharging the original hue, and when the wings are dry, paint them with any coloured dye that they may think suitable. The insect is carefully dried in a strong current of air, so that the delicate hairs of the body may not adhere together so as to betray the deception.



FIG. 350.—Adolias Kesoma. Female.
(Chocolate-brown and grey.)

Mr. A. H. Butler, of the British Museum, has quite a collection of such Butterflies. They were dyed by himself, just to show the amount of imposition which can be practised by skilful and unscrupulous dealers. These, it must be understood, are never the owners of the naturalists' shops, who are always thoroughly honourable and trustworthy. But there are itinerant dealers, who are as great in insect forgeries as "Flint Jack" was in antiquities, and who go about with their insect boxes from one collector to another all over the country.

ANOTHER species of this genus, *Adolias Sahadeva*, is here given. As its name imports, it is a native of India, the specimen which is here figured coming from Nepaul. The colour of the upper surface is deep brown, with a distinct wash of olive, and mottled with black. A number of pale dun spots are so arranged as to form a single interrupted bar crossing both wings, and two short bars on the upper pair, near the upper margin. These are edged with black. The under surface is pale green, covered with black scribblings and dun mottlings.



FIG. 351.—Adolias Sahadeva.
(Brown, black, and dun.)

This is a very large genus, and some of them deserve a brief description. *Adolias Anosia* is brown, but is curiously blotched with yellowish grey, so that it has a sort of unwholesome look about it, as if covered with lichen. *Adolias Phemius* is brown, with a pale blue bar at the tip of the lower wings. In *Adolias Ramada* the male is dark blackish brown, with its lower wings edged with pale blue. The female is very differently coloured, being very pale brown mottled with white. *Adolias Durga* is deep olive-brown, with a bold white bar across the wings, just

like that of our "White Admiral." The lower wings are washed with blue. Lastly, *Adolias Epiona* is also olive-brown, but has the bar yellow instead of white.

THE insect which is here given was formerly placed in the preceding genus, but has now been transferred to the genus Tanœcia. It is an Indian insect.

The colouring of this species is very simple. The ground hue of the wings is brown, and both pairs have a broad white band running parallel to the outer edge, and only broken by the dark nervures. On the outer side this band is edged by a jagged line



FIG. 352.—Tanœcia Pulasara.
(Brown, white, and black.)

of black. A small patch of white is on the upper wings, as is a patch of black near the tip, and there are a few black marks and scribblings on both pairs. The insect is similarly coloured both on the upper and under surfaces, except that the latter is rather paler than the former.

The genus Tanœcia has a tolerably wide range, and in the British Museum there are specimens from India, Sumatra, Sarawak, and Singapore. Among them may be noticed *Tanœcia Vikrama*, a Sumatran species. This is pale brown, covered with black arch-like marks and a multitude of black dashes. Then, there is *Tanœcia calliphorus*, of Luzon. This is a very conspicuous insect, being dark brown, with a green stripe crossing the

wings diagonally, almost exactly like that of *Papilio Sarpedon*, which has already been described and figured.

THE genus to which belongs the magnificent insect which is here given is familiar to English entomologists on account of the only British species, the well-known "Purple Emperor," *Apatura Iris*. The whole genus is a very splendid one, and is remarkable for the prevalence of rich blue in the males, the females being comparatively plain, and having no hues more brilliant than brown and chestnut.



FIG. 353.—Apatura Lavinia.
(Azure, purple, chestnut, and black.

Of all the Apaturas this is undoubtedly the most gorgeous. In the male insect the upper surface of the wings is dazzling azure, changing to purple in some lights, and having a decided gloss of green in others. A broad band of warm chestnut runs through the centre of both wings, so as to form a continuous band when they are spread, and the wings are edged with a double row of semilunar black marks. The upper wings are edged with black, and have besides three short black bars on the upper margin.

Below, like our own species, it is comparatively plain, being simply buff, with profuse mottlings and blotches of brown and dun. The female is plain, and very much resembles that of our own species.

This is not only the most magnificent, but one of the very rarest of the Apaturas. There are only two specimens in the British Museum, fortunately one of either sex, and for more than twenty years no specimen has been added to the collection. So unrivalled is it in its beauty, that as soon as the drawer is opened its dazzling hues flash on the eye in spite of its splendid congeners around. It is a native of Peru.

THE accompanying illustration represents another of these splendid insects, called *Apatura Laura*. It is a native of Nicaragua.



FIG. 354.—Apatura Laura.
(Purple-brown and dun.)

Although not so fiercely brilliant as the preceding insect, it is a most beautiful creature. At the base of the upper wings it is brown, edged with a streak of black. Then comes a rather broad band of dun, tending to yellow on the lower wings, and the outer edge of both wings is rich blue or purple, according to the light in which the insect is viewed. The base of the lower

wings is also blue. Below, it almost exactly resembles *Apatura Lavinia*, except that there is a shining silvery gloss over both wings, and, like that insect, the female is quite plain, without one particle of the brilliant colours that adorn her mate.

There are many species belonging to this genus, all of which are tolerably alike. There are two, however, which are worthy of a brief notice. *Apatura Agathina* is remarkable on account of the bold difference of the sexes as regards colour. The male is very deep purple, while the female is white, speckled with black. Indeed, were it not for the under surface of the wings, no one would think that they could be only the two sexes of the same insect. A curious variation in colour is found in *Apatura Cherubina*, a native of Bogotá. In almost all the Apaturas the wings of the male are either blue or purple, but in this insect they are shining green.

THE beautiful insect which is here figured is a native of Columbia.



FIG. 355.—Prepona demodice.
(Purple-black and green.)

The greater part of both wings is the very deepest purple, so deep, indeed, that except when viewed with a strong light, it appears to be velvety black. Across both wings runs a bar of

green, narrowest on the upper wings, and becoming so wide on the lower pair as to occupy one-half of the surface. In a side light the green takes a blue gloss, and the purple base and edging are much deeper on the lower than on the upper wings. Beneath, it is prettily though not brilliantly coloured. The ground colour is the palest pearly grey, pencilled profusely with black, and on the lower wings are two brown eye-like marks.

The genus is a tolerably large one, and all the species are much alike.

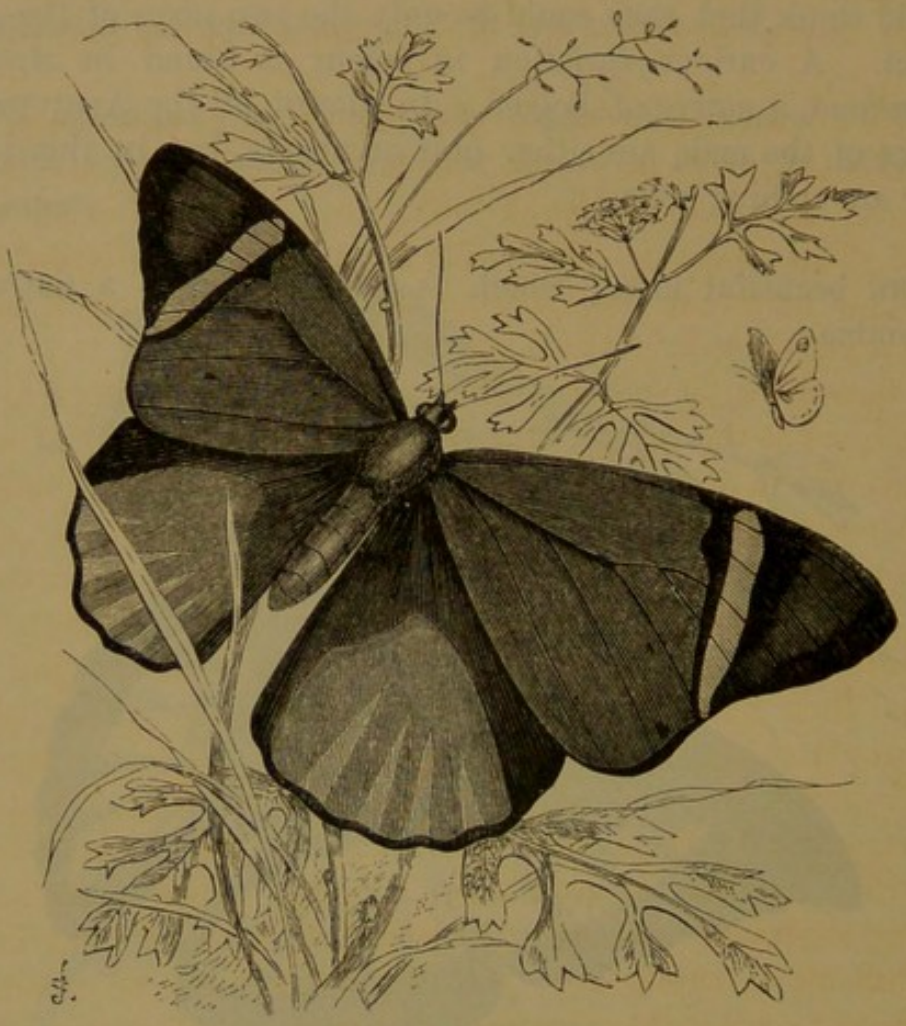


Fig. 356.—Agrias Sardanapalus.
(Crimson, blue, and black.)

In *Agrias Sardanapalus* we have an insect whose gorgeous splendour quite suits the Assyrian monarch whose name it bears. Lacking the dazzling azure and purple of the Apaturas, it is really startling in its bold contrasts of colour. The upper wings are rich crimson from the base to more than half of their

surface. Then comes a velvet-black bar extending completely across the wing, and being wider on the upper than on the outer edge. Next is a bar of dark blue, edged with black; and the rest of the wing is brown, except a black edging. The lower wings are brown-black at the base and on the margin, while the centre is occupied with a large patch of bright blue. Beneath, the upper wings are crimson, black, blue, and brown, but not so bright as on the upper surface. The lower wings are mottled very much like the skin of the jaguar, the spots being olive-black with bluish centres.

This species is a native of the Amazons district, and is very rare.

There are several curious insects belonging to this genus, one of which is *Agrias Phalcidon*, which has the base of the wings very deep blue, followed by a broad band of olive and then by black. This insect is remarkable for a pair of brush-like tufts of yellow hair that project from the base of the lower wings. Concerning these tufts there is a small story.

It sometimes, though not often, happens that visitors to the insect room at the British Museum are utterly ignorant of entomology, and in consequence are very troublesome to the officers. Of course only the most showy insects are selected for exhibition to such persons, who are politely got out of the room as soon as possible. Once, however, two young ladies overpassed the well-tried patience of the officer who was showing the insects, their chief idea of butterflies being the effect which they would produce if worn as ornaments. At last, when the Agrias drawer was opened, their guide gravely pointed out this species, and told them that it was called the Shaving-brush Butterfly, because it used these brushes every morning in shaving itself. Furthermore, he said that it was a swift insect and difficult to catch, but that it could always be taken by putting out over-night a basin of soap-suds, which attracted the butterflies and enabled the collector to catch as many as he wanted. And they believed him.

There is only a single specimen of *Agrias Sardanapalus* in the British Museum.

Mr. Bates has the following remarks on the genus:—"Agrias, I think, is the most magnificent group of the Nymphalidæ in South America. They are very bold, strong, rapid fliers, not at

all like the Catagrammas. They fly for a short distance with inconceivable rapidity, and then settle on a leaf high up in a tree; on the trunk of a tree where sugary sap is oozing, or on filth of some kind on the ground, with their wings erect, and are not very easily scared away."

On Plate XIII. Fig. 2 is shown an insect called *Charaxes Eudamippus*, a native of Silhet and Assam. In this genus each of the hind wings has two projections, and one species, *Charaxes Jasius*, which inhabits the warmer part of Europe, is popularly called the "Pasha of two tails."

Above, the colour of this species is yellow and black, the tails of the hind wings being olive-green. Beneath, it is pale, nearly white, with the exception of a black streak, looking just like a twig with a forked end, and a pale brown band which crosses both pairs of wings. The wings are edged with the same colour.

There are many species of this genus, and in all the colours of yellow, brown, and black predominate. One of the most striking is *Charaxes Nitebis*, of the Celebes, in which the base of the wings is dark yellow-green and the rest black.

The caterpillar of *Charaxes Jasius* is a very curious creature, having its head armed with four yellow horns tipped with red. It is a nocturnal feeder, remaining by day quite motionless among the leaves of its food-plant, which it so closely resembles in colour that it can scarcely be detected. There are two broods in the year, one in June and the other in September.

The rarest of these insects is *Charaxes Kadenii*, popularly known as the "Calliper Butterfly," because the tails of the lower wings are curved towards each other like the legs of a pair of callipers. A short account of the capture of this insect is given by Mr. Wallace in his "Malay Archipelago":—

"One day, a boy brought me a butterfly between his fingers perfectly unhurt. He had caught it as it was sitting with wings erect, sucking up the liquid from a muddy spot by the roadside. Many of the finest tropical butterflies have this habit, and they are generally so intent upon their meal that

they can be easily approached and captured. It proved to be the rare and curious *Charaxes Kadenii*, remarkable for having on each wing two curved tails like a pair of callipers. It was the only specimen I ever saw, and it is still the only representative of its kind in English collections."

The colour of this species is creamy white above, adorned with sundry streaks and spots, arranged as seen in the illustration. The under surface is similarly marked, but the ground-colour is silvery white instead of cream white.

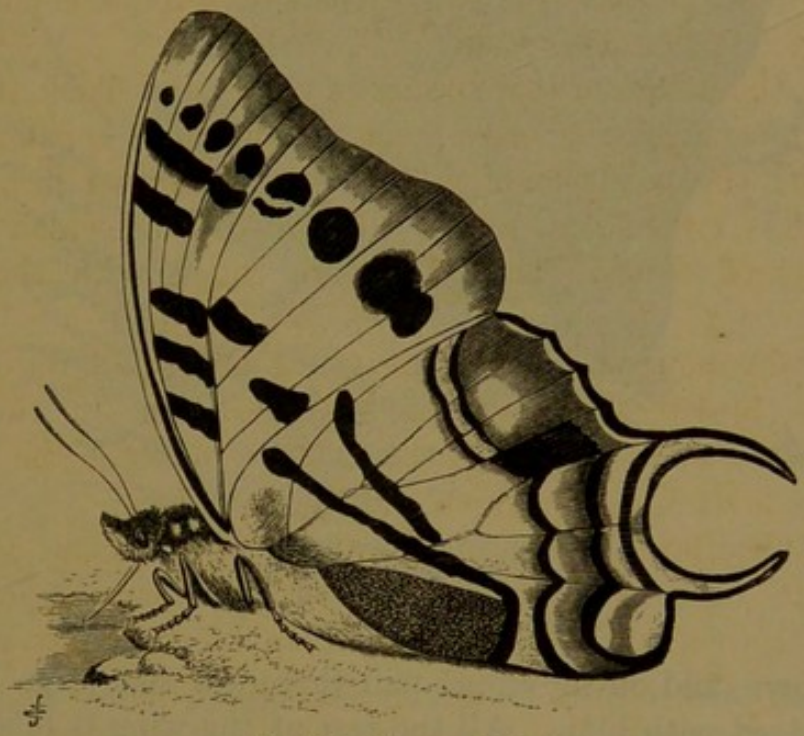


FIG. 357.—Charaxes Kadenii
(Yellow, white, and brown.)

The late General Sir J. Hearsey, who was a good practical entomologist, states that he usually took the Indian species, *Charaxes Fabius*, on wounded apple-trees, the insect feeding eagerly on the sap as it exuded from the tree. They are all strong-winged, and swift of flight.

THE genus Paphia belongs to South America, and the present species was taken by Mr. Bates in the Amazons district. There is only a single specimen in the British Museum.

Above, the colour of this insect is simply Prussian green, glossy, but not vivid. Beneath, it is very prettily marked, being

rather pale brown, with multitudinous pencillings of black. On the hind wings there are two whitish spots near the base, and four bright green spots near the tip.

One of the most striking examples of this genus is *Paphia Nessus*, from New Grenada. This insect has the lower wings

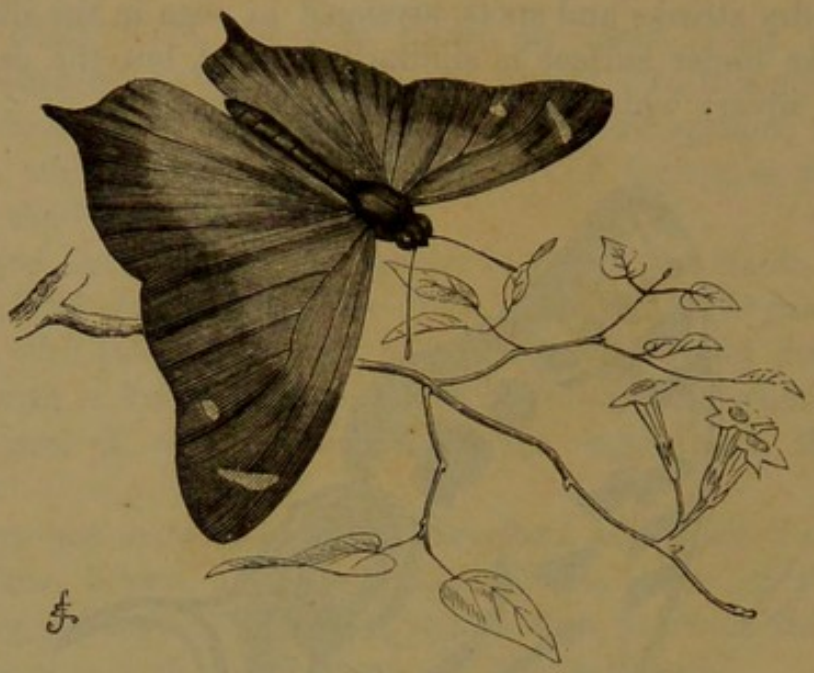


Fig. 358.—Paphia Glauce.
(Shining green.)

dark brown, and on the upper pair there are two large patches of red edged with blue. All the rest of the wing is black.

The splendid insect called *Siderone Thebias* is a native of Bogotá. The upper wings are dark crimson at the base, and a black bar with slightly waved sides runs across the centre of the wing. Then comes a bar of crimson extending nearly across the wing, and the remainder is black. The lower wings are black, tending to brown at the tips, and a bar of crimson passes about half across the wing. Beneath, it is of a dead-leaf brown, much blotched with dark brown, especially at the base of the wings.

Another species, *Siderone Isidora*, of South America, has its wings of a dead-leaf yellow, becoming brown at the tips. *Siderone Archidona*, of Mexico, has its upper wings rather long

and boldly hooked at the tip. Above, their colour is pale brown, with some patches that shine as if they were burnished silver.



Fig. 359.—Siderone Thebias.
(Crimson and black.)

We now come to another group of Butterflies, called the Erycinidæ. In these insects the two front legs of the male are rudimental, while those of the female are fully developed. Some of these species are singularly beautiful in colouring as well as in form, and many of them have the hind wings prolonged into small tails. They are quick of flight, and have a habit of resting on the under surface of leaves with their wings extended. Both the larva and pupa are very short.

The insect which is given as the first example of the Erycinidæ is a native of Bogotá, and is very rare, only one specimen being in the British Museum.

The upper surface is deep velvet-black, with an interrupted band of shining blue across the middle, followed by another of rich crimson near the base. Both bands are narrow at the

top and widen by degrees, and they are so formed that when the wings are extended they form two continuous bands across both pairs of wings. Beneath, it is quite as handsome as above. The upper wings have an azure glossy surface, traversed by



Fig. 360.—Necyra manco.
(Black, blue, and crimson.)

black nervures, and having a single crimson patch at the inner edge. The lower wings have a single broad crimson stripe.

The specimen which is shown in the illustration was captured in 1871.

Three examples of the typical genus Erycina will now be given.

The first is called *Erycina ocollo*, and is a native of New Grenada. It is very nearly two inches in expanse of wing.

It is a very beautiful species, and, though distinct from any other, given to variation. The specimen from which the illustration was drawn is coloured as follows. The head, antennæ, and body are black, and the upper wings are black, with a single broad bar of bright orange passing diagonally across them. The hind wings are very much lengthened at the tips, so as to form two tails, which diverge boldly from each other. Like the upper pair they are black, but are more variegated as regards colour. On the centre of the wing is a yellow band, and a

broad patch of bright blue crossed with black nervures occupies the surface of the wing between the white spots on the outer margin and the yellow band.



Fig. 361.—Erycina ocollo.
(Black, yellow, and blue.)

The insect on the left of the illustration, on page 624, is a very rare species, called *Erycina Atahualpa*. It was brought from New Grenada, and the specimen is now in Mr. Hewitson's collection. The upper wings are much pointed. Their colour is black, and across them runs diagonally a single narrow streak of crimson. Parallel with the outer edge is a row of blue spots. The lower wings are lengthened at the tips into a short and rather rounded tail, the two diverging from each other. Their ground colour is black, and across them runs a band of crimson which joins that of the upper pair when the wings are spread. Parallel with and close to the outer edge is a band of dark blue, and just within it is a similar band of paler blue. There is a row of little white spots on the edge of the wing.

The second species is a native of the Amazons district, and is called *Erycina Calphurnia*. The illustration represents the male. The upper wings are brown, with a white band drawn across the centre, and a blue band on the lower half of the outer edge. The lower wings are elongated so as to form two diverging tails, and are beautifully and elaborately coloured. A white

band passes over the middle like that of the upper wings, but as it descends it changes gradually to blue, and maintains that colour to the end of the tail. The outer edge of the wing is



Fig. 362.

Erycina Atahualpa. (Black, crimson, and blue.) Erycina Calphurnia. (Brown, blue, crimson, and white.)

also blue. From the base of the wing a broad crimson band runs parallel to the white band, and the inner edge is brown. The head, thorax, and abdomen are brown.

For our knowledge of the beautiful genus Zeonia we are almost wholly indebted to the researches of Mr. Bates. The following remarks on the genus are from a letter from Mr. Bates to Adam White, dated Ega, May 2, 1857, published in *Trans. Ent. Soc.* vol. v.:—

"The beautiful Zeonia, of which I sent you a large series last July, I met with in a part of the forest near Ega, which I had traversed and examined before, many times, in all seasons. The

first specimen I found was a straggler in a different part of the forest. On July the 21st, after a month of unusually dry and hot weather, in ascending a slope in the forest by a broad pathway mounting from a moist hollow, choked up with monstrous arums and other marsh plants, I was delighted to see another of what had always been so exceedingly rare a group of butterflies; it crossed the path in a series of rapid jerks, and settled on a leaf close before me. Before I had secured it I saw another, and then shortly after a third. I mounted to the summit of the slope, followed a branch pathway which led along the brow of the ridge, without seeing any more, but returned again to examine well the exact spot where I had captured the three, for it very often happens that a species is confined to a few square yards of space in the vast forest, which to our perceptions offers no difference throughout its millions of acres to account for the preference. I entered the thicket from the pathway, and a few yards therein found a small sunny opening, where many of the Zeonia were flitting about from one leaf to another, meeting one another, gambolling, and fighting; their blue transparent tinge, brilliant crimson patch, and long tails, all very visible in the momentary intervals between the jerks in their flight. I was very busy, you may imagine, at first in securing a supply of specimens; I caught perhaps 150, two-thirds of which fell to pieces in the bottom of the net, so fragile is their texture. I then paused to look around the locality, and endeavoured to find the larvæ and pupæ.

"I walked through the thicket in all directions, and found the space peopled by the species was not more than from twenty to thirty square yards in extent: so far as the eye could reach, the leaves were peopled with them; it is possible the brood belonged to some one tree. The only two pupæ I could find, it is true, were on two distinct kinds of trees, but this is no proof that the larvæ may not have fed on one tree only. I was disappointed at not finding the larvæ, although I searched well during this and the three following days. On the second day the butterflies were still coming out; on the third they were much fewer, and nearly all worn; and on the fourth day I did not see a single perfect specimen, and not a dozen altogether. During all the time I worked in the neighbourhood of the city of Pará I found but one specimen of a Zeonia. This was in 1848. The next time I saw the genus was at Altar do Chao,

where I took a few of a very small long-tailed species at flowers. At Ega, a few miles up the Teffi, I took one of another very handsome species at flowers, very distinct from all the others."

The colours of this large genus are very similar throughout, and are generally black, scarlet, and white, the scarlet in some species giving way to yellow.

Our first example, *Zeonia Faunus*, has the greater part of both wings nearly transparent. The upper wings are entirely



FIG. 363.—Zeonia Faunus
(Black, scarlet, and white.)

surrounded with a band of black, powdered with tiny grey specks, and a rather jagged bar of the same hue runs through the middle. The upper part of the lower wings is edged with jetty black, and the lower part with black, powdered like the upper wings. In the midst of the black are two spots of scarlet, with a slight tint of orange—something like that lovely but too fugitive "pure scarlet" of the colour-makers—one of the spots being large and oval, and the other small and circular. The colours are nearly identical on the upper and under surface of the wing.

There is only one specimen in the British Museum.

ON the accompanying illustration are given the two sexes of *Zeonia Batesii*, in order to show the curious difference of shape as well as colour between the males and females. The colours are arranged in much the same manner as those of the preceding

species, the edges of the wings being black, the centre transparent, and a scarlet patch on the lower wings, which in this species is followed by two little white spots. At the extremity of the tails of the lower wings there is a short streak of yellowish white. The reader will probably have noticed that,



Fig. 364.—Zeonia Batesii.
(Black, white, and scarlet.)

whereas in the males the projections of the lower wings are tolerably straight, in the females they diverge considerably, and turn a bold curve. Both these insects are natives of the Amazons district.

Now we come to the Lycænidæ, a group of Butterflies which is familiar to English entomologists on account of the well-known "Copper," "Blue," and "Hair-streak" Butterflies. They are small and slightly made, have the fore-legs fully developed in both sexes, and very tiny claws. The larvæ bear a singular resemblance to woodlice.

Only a few examples can here be given, the first of which is *Chalybs coronata*, a native of Bogotá. The whole genus is a singularly splendid one, the upper surface being metallic blue,

green, or gold, and often two or all of these colours. This metallic aspect has earned for the insect the generic name of *Chalybs*, a Greek word signifying "steel."

The species which is here represented is very rare, and there is only a single specimen in the British Museum. The upper surface is metallic blue or green, according to the direction of the light; the green predominating near the base, and the blue towards the tip. Both pairs of wings are surrounded with a



FIG. 365.—Chalybs coronata.
(Blue-green, black, and orange.)

black edge, which merges almost imperceptibly into the blue of the centre. The double tail of the hind wings are jetty black, and above each of them is a large spot of orange.

Beneath, it is even handsomer than above. In both pairs of wings the base is dark green, edged with glittering emerald. Then comes a band of ruddy mahogany. In the upper pair is a stripe of pale brown, while in the lower the colour is pink, speckled with green, and then followed by rich green. On both surfaces the tails are black.

All the species of this genus are remarkable for their exceeding

beauty, and the singular fact that, although their upper surface is magnificently coloured, their under surface is even more beautiful. For example, there is *Chalybs Actæon*, the upper surface of which is metallic blue and black, while below the upper wings are emerald powdered with tiny black specks, and the lower are green pencilled with black. Then there is *Chalybs Pholcus*, the upper surface of the male being very dark metallic blue, bordered and edged with black, while the under surface is black, barred with green. The female is very different in colour, being brown on both surfaces, with yellowish green and white spots on the under wings.

All the species are natives of tropical America.

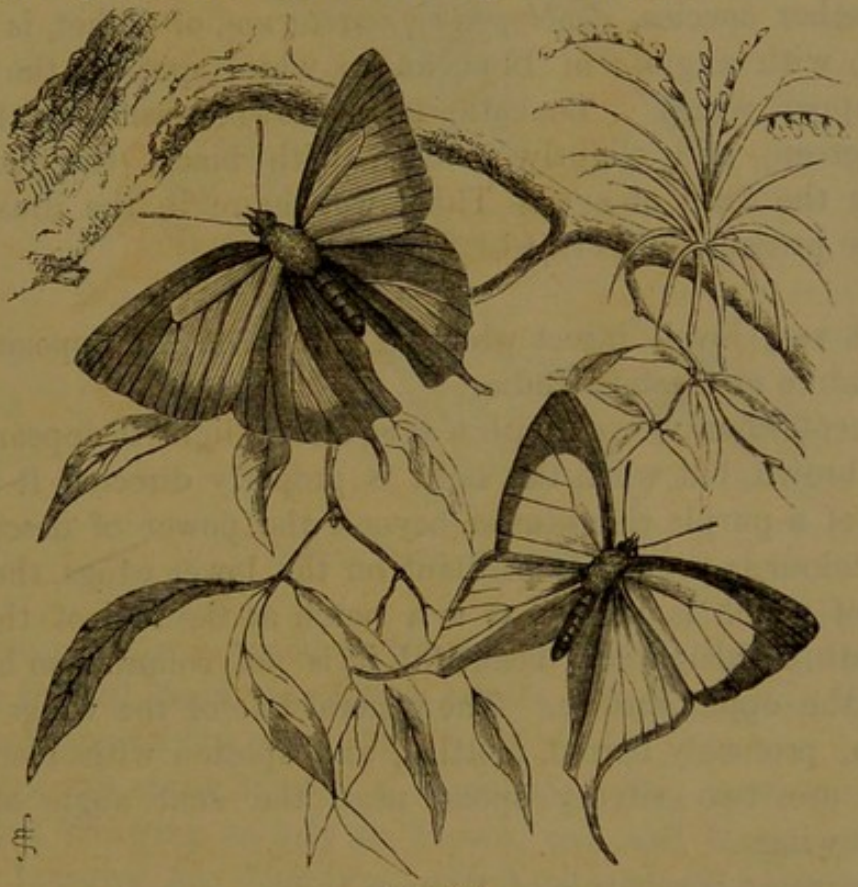


FIG. 366.

Amblypodum quercetorum. (Blue and brown.)

Loxura Surya. (Pale red and black.)

THE genus Amblypoda derives its name from the structure of the feet, the word signifying blunt or rounded feet.

THE insect which is here represented is a native of Northern India, being taken at Silhet and Darjeeling. In expanse of wing it measures very nearly two inches and a half.

The upper surface is violet-blue, fading to white in the centre. Near the tip of the upper wing, and at the end of the discoidal cell (*i.e.* the space enclosed by nervures in the centre of the wing), is a large dark spot divided by nervures so as to look like several distinct spots. The wings are edged with dark brown, and at the anal angle of the lower wings there is a short tuft of the same colour.

Beneath, it is buff-brown, the upper wings having a series of seven oval and semilunar spots across the wing and parallel with the outer margin. The lower wings have five black spots near the base. The illustration represents the male insect, the colours of which are more intense than in the female.

Another species, *Amblypoda quercetorum*, of Silhet, is brown above, with a gloss of blue, and a white spot on the tip of the upper wings. Beneath, it is brown, washed with dark olive-green, and slightly mottled with black, the mottlings taking the form of eyes. The lower figure in the illustration will be presently described.

THE very lovely insect which is shown on the opposite page is a native of Eastern India.

Except when viewed with a very strong light, it appears to be dark brown, but when the light is properly directed, it is seen to be of a purple rich almost beyond the power of description. This colour is peculiarly brilliant on the lower wings, the inner edge of which is yellow, as is a patch at the end of the tails. Beneath, although very beautiful, it is not coloured so brightly as on the upper surface. The general hue of the wings is pale brown, profusely barred, mottled, and spotted with black, and there are two silvery spots near the anal angle of each lower wing.

The insect is a native of Eastern India.

THE lower figure of the illustration on page 629 represents our last example of the Lycænidæ.

As its specific name imports, the *Loxura Surya* is a native of India.

Above, the colour of the upper wings is rich, warm dun, edged with dark, blackish brown, which extends quite to the base of the wing. The lower wings have a patch of dark brown

near the base, and the interior edge is lighter brown. Beneath, it is entirely dark ochreous yellow. The lower wings are developed at their tips into two long curved tails, which diverge widely from each other in a diagonal line with the upper wings.



Fig. 367.—Myrina Phocides.
(Purple, brown, and yellow.)

This peculiarity is noted in the generic name, the term *Loxura* being formed from two Greek words, one signifying diagonal, or slanting, and the other "a tail."

There are many species of *Loxura*, varying much in colour, but yet adhering mostly to brown, red, and black. Some of them, however, are deep blue, edged with black or brown; and one species, *Loxura Atymnus*, is red and black above, and yellow-brown beneath.

CHAPTER III.

MOTHS.

THE Lepidoptera fall naturally into two great divisions, namely, the Butterflies and the Moths. As a general rule, these may easily be distinguished from each other by two points. First is the shape of the antennæ, which in the Butterflies are straight, inflexible, and terminated by a knob; and in the Moths are often curved, flexible, and end in a point. Many of the Moths have the end of the antennæ swollen into a sort of club, but even in this case the club ends in a point, and is much longer than the rounded club of the butterfly's antenna. There are, however, exceptions to nearly every rule, and this is the case in the present instance. A Georgian Moth, called *Castnia Yucca*, has the antennæ quite straight, and terminated by a knob as bold as that of any butterfly. It has, however, the flexible abdomen, and in this way we are able to decide which it is.

As a rule, the Moths are nocturnal in their habits, but there are many that prefer the dusk or twilight for coming abroad, while there are some, such as the Uranias, which fly in the brightest noon-day, and have the habits as well as the appearance of butterflies.

WE begin with the swift-winged Hawk Moth, of which a singularly beautiful example is here given. This rare and splendid insect is a native of India, the specimen in the British Museum having been brought from Silhet. It imitates the humming birds in the brilliancy of its plumage, and, as Mr. Westwood remarks, possesses even the tufted legs which distinguish many species of these birds. The wings are gold-green, and in the middle of the upper pair is a long patch of gold and crimson,

the two colours alternating most beautifully as the insect is moved about. The lower wings do not possess the crimson patch, but are shining green and gold, slightly glossed with blue. The whole of the thorax and abdomen are green, except the front of the thorax, which is fiery copper. Even in the abdomen, however, a coppery gloss is visible in certain lights. The hind legs are remarkable for the long tufts with which they are adorned, and which are composed of much elongated scales. The colour of these tufts is brown.

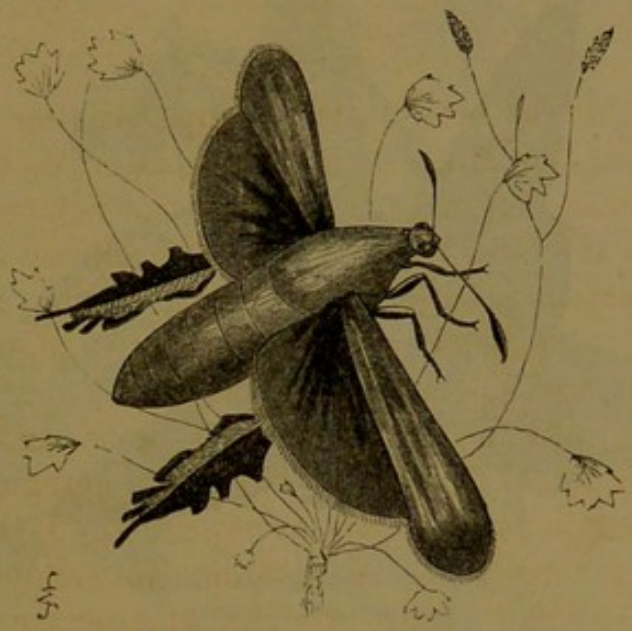


FIG. 368.—Lenyra Ashtaroth.
(Green, gold, and crimson.)

Of this genus only one species is at present known, but there is an allied genus, called Melitta, which very much resembles it, and of which there are many species. Like Lenyra, the hind legs are heavily tufted. The members of this genus are spread over a large portion of the world, specimens having been brought from many parts of Africa, Asia, and Southern America. One of the prettiest is *Melitta pulchipes*, of Venezuela, in which the upper wings are edged with crimson, and the lower are transparent. Generally, bright colours prevail throughout this genus, but there is a curious exception in *Melitta Eurytion*, of Northern India, in which the colours are simply black and white.

THE genus Macroglossa is familiar to English entomologists on account of the well-known Humming-bird Hawk Moth,

whose habits make it so attractive to all who are fond of studying the ways of insects.

Of this genus there are very many foreign species, and as a rule they are all of the same sober brown, grey, and black, in which our species is clad. But the present species, which comes from Northern India, presents a bold contrast to its kinsfolk, being adorned with bright and conspicuous colouring.



Fig. 369.—Macroglossa triopus.
(Brown and crimson.)

The upper wings are brown, mottled with black, and upon each of them is a square white spot, looking just as if a piece of talc had been let into the wing. The lower wings are black, with a large patch of white on the upper edge, and a rose-red border on the inner margin. The abdomen is splendid rose-red, banded with black, and the under surface of the lower wings is rose-red, like that of the abdomen, but not quite so brilliant. The head and thorax are brown, and upon the latter are some obscure whitish streaks.

Although not possessing the bright colours of the preceding species, *Thyreus Abbati* is a pretty, and even a conspicuous insect when its wings are spread. It is a native of the United States, and the specimen from which the drawing was taken was captured near New York.

Both pairs of wings are olive-brown, changing to olive-green

in some lights, and the upper pair are traversed by numerous wavy bands of black. The lower wings are nearly plain, but along their upper margin runs a broad stripe of bright yellow, which is very visible when the wings are spread. There are many species of this genus; one of the most remarkable is *Thyreus Nessus*, also of New York. This insect is smaller in size, has the abdomen banded with white, and the yellow streak



FIG. 370.—Thyreus Abbati.
(Olive-brown, with a yellow streak.)

is replaced by one of blood-red, to which the insect owes its specific name. The classical reader will scarcely need to be reminded that the centaur Nessus was pierced to the heart by the arrow of Hercules, and that his flowing blood is fancifully supposed to be represented by the crimson streak of the lower wings. The generic name *Thyreus* is Greek, signifying "a shield," and is probably given to the insects in allusion to their shape when their wings are closed.

THE genus Deilephila is well known to English entomologists on account of the rare and valuable Spurge Hawk Moth, which

is so seldom taken in its perfect state. The generic name is formed from two Greek words, signifying "something that loves the afternoon," this name being given in consequence of the habits of the Moths.

There are very many species of this genus, of which the present is certainly one of the handsomest. The colours of this insect are so complicated that a description is not an easy task. Beginning with the upper wings, the ground colour is a



FIG. 371.—Deilephila daucus.
(Brown, red, yellow, and white.)

very dark, rich, chocolate-brown. From the base of the wing to the tip runs a bold streak of pale dun, and a border of yellow runs round the entire wing. On the middle of the upper edge there is a small but conspicuous patch of white, and a number of very narrow white lines run diagonally across the wing. These lines, together with a mark on the caterpillar, have earned for it the specific name of *lineata*, or "streaked," which has been bestowed on it by some authors.

As to the lower wings, their ground colour is red. Two broad

black bands cross the wings, and they are edged with yellow. The thorax is pale brown, with a grey-white streak running down it; and the antennæ are brown, except the tips, which are white. The abdomen is rose-red, barred with black and diversified with white marks.

This is a West Indian species, the examples in the British Museum having been brought from New York, Canada, Mexico, and Jamaica.

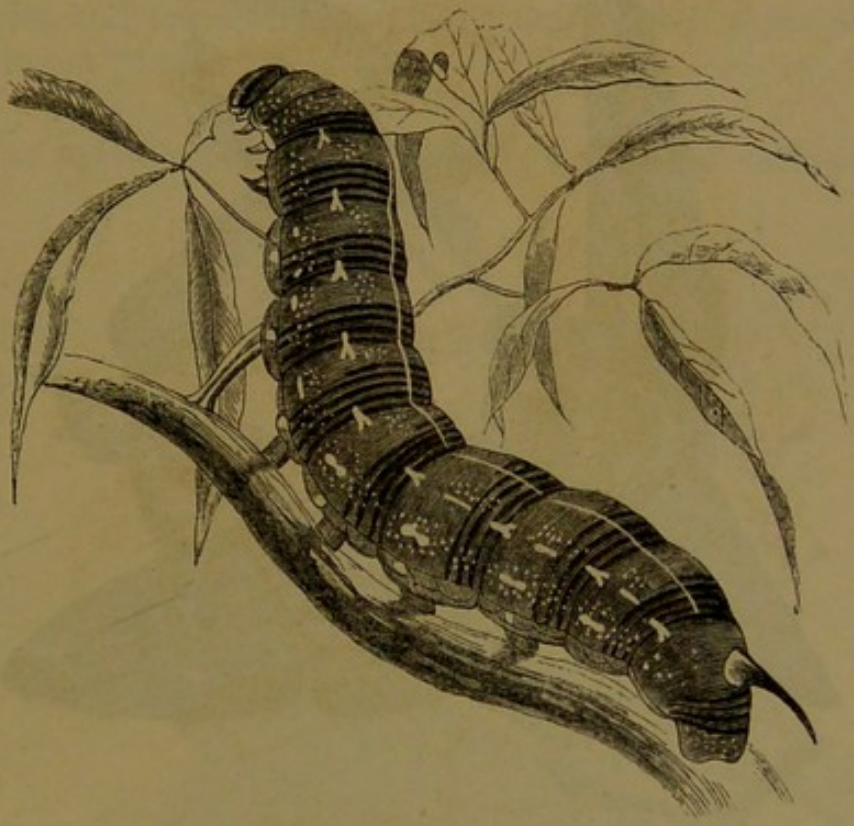


Fig. 372.—Deilephila daucus. Larva.

The peculiar form of the Hawk Moth larva is well shown by the accompanying illustration, which represents the caterpillar of this species. The reader will notice the narrow white line along the back, which has already been mentioned as earning for the insect the specific name of *lineata*.

The Elephant Hawk Moths are so called because the larva has the power of elongating or contracting the head and first three segments of the body in a way that bears some resemblance to the mobility of an elephant's "proboscis." The generic name *Chærocampa* signifies "swine-caterpillar," and is

given to the insect on account of the resemblance in form to the snout of a pig.

The present species has a very wide range of locality, specimens having been brought from Natal, Sierra Leone, Italy, Greece, and Ceylon. It is a handsome insect, the ground colour of the upper wings being pink, on which are a number of black mottlings and grey-white specks. Just at the base of the wings there is a large square mark of very dark olive green.

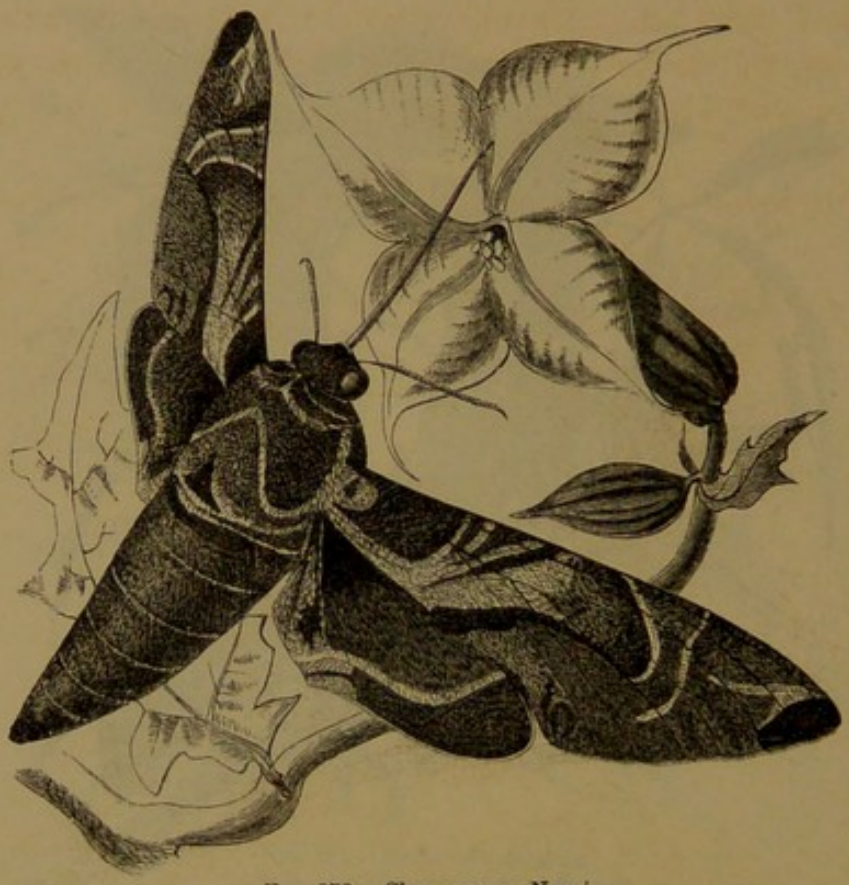


Fig. 373.—Chærocampa Nerei.
(Brown, green, and pink.)

The lower wings are brown, glossed with green. The thorax and abdomen are brown, with some grey marks on the former, and the margins of the segments edged with white in the latter; the whole body having a pretty silken appearance. Altogether it bears no small resemblance to our Oleander Moth.

It is a very variable insect, both in size and colour, and in some specimens there is little except brown. In all, the colours merge so gradually with each other that it is not easy to define any line at which one colour ends and the other begins.

In the Museum there is an empty pupa-case with the cast larval skin still adhering to it. The original label is preserved, written by the person who reared the insect. It runs as follows: "Oleander Moth: Caterpillar and skin and moth-bread." When I first read the label I was puzzled, knowing bee-bread well enough, but never having heard of "moth-bread." However, it was soon apparent that the writer meant to express that the Moth had been bred from the skins in question.

This specimen came from Sierra Leone, and it is much to be wished that other travellers would take the trouble to rear insects, and to preserve the larvæ and perfect skins as well as the insect "bread" from them.

THE insect which is here given is a native of various portions



FIG. 374.—Sphinx quinque-maculata.
(Grey, brown, and yellow.)

of the United States, and it is a very pretty one, having much the appearance of our common Puss Moth.

The ground colour is a pale silver-grey, beautifully mottled with chocolate-brown and black; and if the light be favourable,

a slight pinkish tinge is seen to be spread over the surface of the lower wings. The abdomen is also pale grey, but a black line runs down the centre; each segment is edged with a thin line of black, and along each side are five large oval patches of yellow, edged with black, and each having a little white spot immediately above it.

The *Sphinx satellita* is here given because it is an insect very plentiful in North America, and is apt to do harm to the grape-vine, on which it feeds, unless its numbers are kept down by hand-picking. The following extract is a digest of an article in the "American Entomologist":—



Fig. 375.—Sphinx satellita.
(Olive-grey and dark olive-green.)

"It occurs in almost every State in the Union. The larva has five cream-coloured spots on each side, and in the month of September is full-grown. The eggs are glued firmly and singly to the leaves of the plant. When just hatched, and for some time afterwards, the larva is green, with a tinge of pink along

the sides, and with an immensely long pink horn at the tail. This horn soon begins to shorten, and finally curls round like a dog's tail. As the larva grows older, it changes to a reddish brown, and by the third month it entirely loses the caudal horn.

When about to enter the chrysalis state, it enters a short distance into the ground, and soon works off the larval skin, becoming a pupa of a dark brown colour. The moth generally makes its appearance in the June of the following year, though it has been known to issue in the same year, and in these instances it doubtless becomes barren, as is the case with other insects under similar circumstances. The colour of the perfect insect is olive-grey, variegated with dark olive-green, as seen in the illustration.

The reader will note that very curious point in the history of this larva, namely, the gradual change in shape, and lastly, the disappearance of the horn at the end of its tail. The object of these horns, which are common to the Hawk Moth larvæ, is very problematical. The creature never uses them in self-defence, they are not venomous, not very sharp, and in some insects, such as our Death's-head Moth, are blunt and rounded at the tips. Nor is it likely that birds would be afraid of them, for the instinct of birds tells them whether or not an insect be fit for their food. And here we have an instance where, when the larva is very small and inconspicuous, the horn is very long. When it becomes larger and more easily seen, the horn curls up so as to lose all offensive aspect, and when it becomes a large and conspicuous larva, the horn disappears altogether, and leaves the creature defenceless. That the horn must serve some needful purpose is evident by the fact of its existence, but what that purpose may be is at present a complete mystery.

Owing to the exigencies of space, I am reluctantly compelled to have the figure of *Macrosila cruentus* much reduced.

It is a very giant among Hawk Moths, being so large that the specimen in the British Museum can only just be got into a drawer, its tail touching the head of the drawer, and the tip of its enormous proboscis reaching to the foot. The measurement of its expanded wings is rather more than seven inches, the proboscis alone measures nine inches and a quarter, and the total length

of the insect is rather more than a foot, thus evidently exceeding the length of our page. The insect is a native of Brazil.

The general colour of the wings is very much like that of our Death's-head Moth, with the exception of a bold yellow patch at the base of the lower pair. The whole of the body is pale grey, powdered with tiny black specks, and each segment is edged with black, while along the sides are five bold patches of orange. The enormous proboscis is very wide and flat at the base, and tapers with a most beautiful gradation to the tip, where it is comparatively small.

I have not been able to obtain any information as to the habits of this rare and splendid insect, but I think, judging by the length of the proboscis, that it must feed on the wing, and obtain its nourishment by thrusting the proboscis into the nectars of some long-belled flower, which could not be reached by the proboscis of any ordinary insect.



Fig. 376.—Macrosila cruentus. (Brown, chocolate, and yellow.)

The name of Smerinthus is very familiar to English entomologists, by reason of the very pretty Lime Hawk Moth, which belongs to this genus, and which is so difficult to see as it hangs among the leaves with its wings drooping just like the foliage on which it rests.

The word is Greek, and literally signifies a fishing-line, or a cable.

The insect which is given as the representative of the genus is an inhabitant of Natal, and is a very handsome species, looking, indeed, very much like our own insect greatly magnified. The colours are so mixed with each other that they are not easily described, but they may be briefly taken as follows. In the upper wings there is a large patch of grey-brown, slightly



FIG. 377.—Smerinthus Dumolinii.
(Chocolate, grey, and black.)

mottled and having a narrow bar of darker brown upon it. Then comes a large patch of dark chocolate-brown, in which are two marks of pure white, one nearly round, and the other having a sort of anchor shape. This chocolate patch is interrupted by a jagged bar of the lighter colour, which runs completely through it as far as the upper edge of the wing, where it spreads so as nearly to reach the tip.

The lower wings are grey, and towards the tip of each there is a faintly-marked crescent of pale brown. The body is pale, the edges of the segments being marked with white, and the head and thorax having some large tufts of very long and jetty black hairs.

On Plate XV. Fig. 1 is shown that rather striking insect called *Cœquosa Australasiæ*, which, as its specific name implies, is a native of Australia.

Its colouring is very simple, and yet exceedingly bold and beautiful. The shape of the upper wings is rather remarkable, on account of the peculiarly bold curved edge where they overlap the under wings. Their colour is pinkish near the base, and the rest is brown, with the exception of a large, nearly triangular patch across the middle of the wing, one side of the triangle resting on the upper edge. The under wings are brown, but have at the lower edge a large patch of red extending along the whole edge of the wing, and widening gradually from the tip. This patch is edged with black, and has a most singular effect, strongly reminding the observer of the redstart as it appears with extended wings.

The body is smooth, shining, silken grey, the segments being edged with pink, and a dark chocolate stripe passing along the centre of the thorax.

We now come to those beautiful Moths the Uranias. They look very much more like butterflies than moths, and, indeed, were until quite lately classed among the former insects. Not only do they look like butterflies, but they possess all the habits of butterflies, being diurnal, and flying quite high in the full rays of the sun. There are very many species of Urania, spread over a considerable portion of the globe. The generic name of *Urania* signifies "heavenly," and is given to these insects partly on account of their high-flying habits, and partly by reason of their splendid colouring, which places them among the most magnificent of all the Moth tribes.

I will briefly describe the colours of the two species which have been selected as examples.

The insect which is here shown really looks too gorgeous for a Moth, the brilliant colours which adorn its wings being of

PLATE XV.



metallic brilliance, and shifting about with every change of light. The ground colour of the wings is velvet-black, variegated with glittering emerald-green marks disposed as seen in the illustration. The lower wings are also velvet-black, but they are crossed in the centre by a broad bar of singularly bright

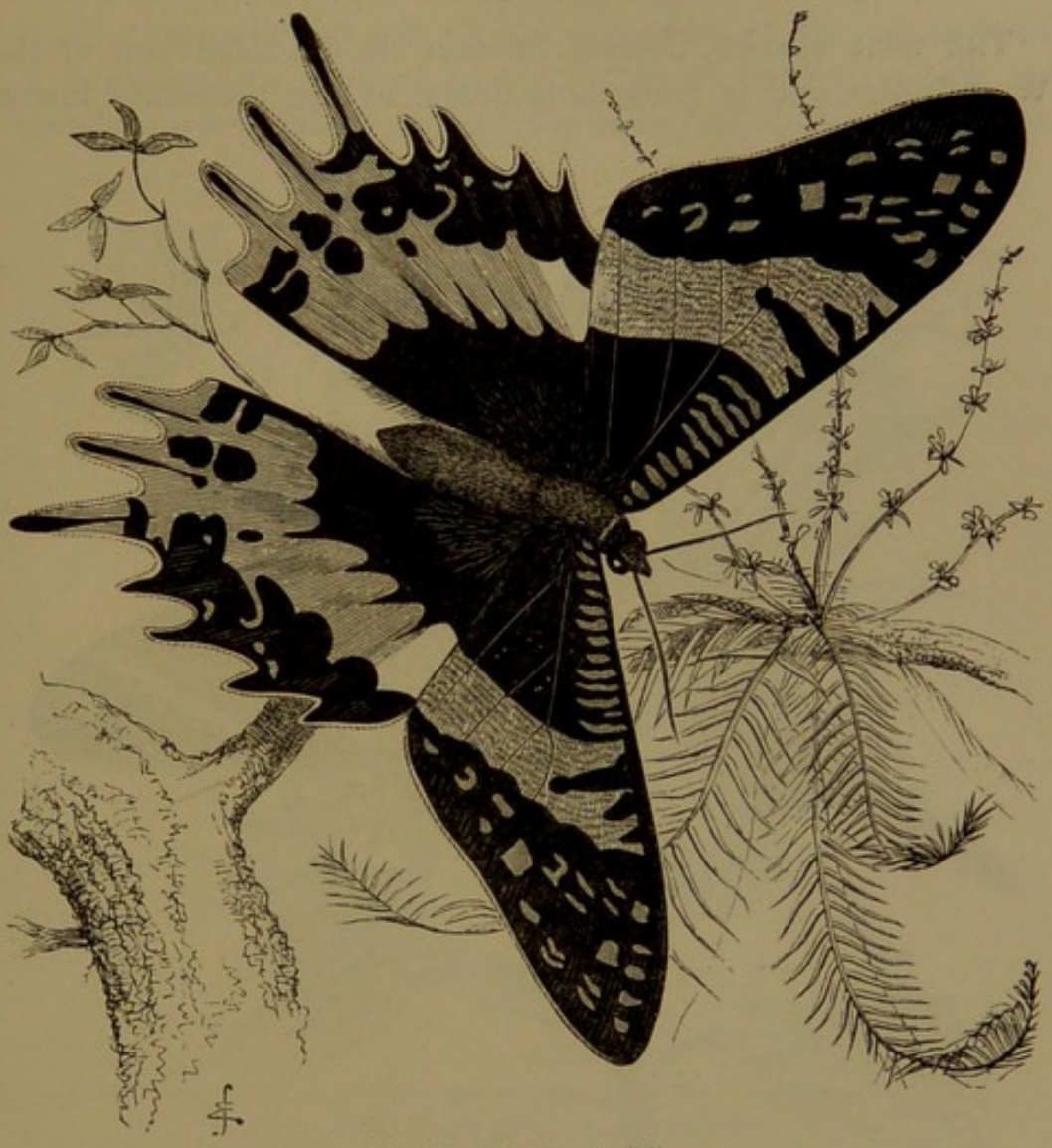


Fig. 378.—Urania orientalis.
(Black, emerald, and crimson.)

colouring. First it is bright blue, which changes to green in the middle of the wing, and that again to crimson. At the anal angle of the wing there is in recent specimens a large eye-like patch of fiery crimson, but unfortunately the colour is as evanescent as it is splendid, and a specimen with this crimson patch in good condition is very rarely seen.

Below, it is quite as handsome as on the upper surface, the colour being metallic blue-green, crossed with transverse black bars. The under wings are copper-red in the centre, the rest being emerald variegated with velvet-black spots.

The insect is a native of Madagascar.

THE next species, *Urania Sloanus*, is an inhabitant of the West Indies, and is quite as beautiful as the preceding insect.



FIG. 379.—Urania Sloanus.
(Black, emerald, gold, and crimson.)

The upper wings are velvet-black, and next the base come five narrow emerald bars. Then comes a broad bar of ruddy gold extending across the centre of the wing, then a narrow bar of the same colour, and lastly, a short stripe of emerald near the tip. The lower wings are crimson glossed with gold and spotted with black, while the tips are emerald-green.

A long and admirable description of this Moth and its habits is given by Mr. Gosse in his work on Jamaica, but want of space prohibits it from being inserted here.

In describing this beautiful insect, the want of adequate means to express colour becomes more and more apparent. Even as it appears in the sober black and white of the printer's ink, it is evidently a striking insect, but in its natural colours it is simply superb. There is but little colouring in the wings, which

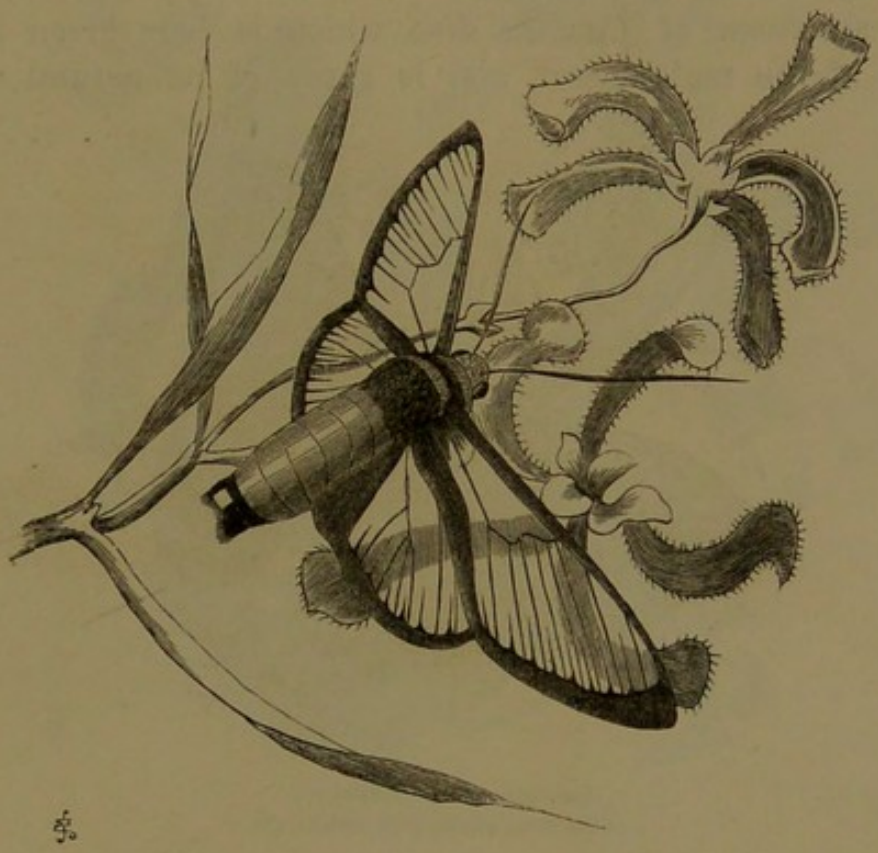


Fig. 380.—Cocytia Durvilii
Wings transparent. Body blue-green.)

are quite transparent and edged with a bold black line, the only exception to which is an orange patch at the base.

It is in the body that the chief beauty lies. The thorax is deep black, and so is the tip of the tail, with the exception of a little patch of gold-coloured hair. The rest of the abdomen is the most brilliant blue, glossed with green, and having a satin-like sheen about it. This beautiful insect is a native of New Guinea.

We now come to the typical genus of the large group called Castniidæ. I may here remark that the best systematic entomologists have long entertained doubts as to the right arrangement, not only of the Moths, but of Butterflies, and that, as I have already mentioned with regard to the Hymenoptera, an entirely new arrangement seems to be imminent. Even as it is, a month scarcely passes over without some alteration in the relative positions of insects. I have not therefore in this work insisted strongly on any one system, because in a few years it may be superseded by another.

The specimen of *Castnia diva* which is here given is a portrait of the male insect, and is given of its natural size.



Fig. 381.—Castnia diva.
(Brown, black, and red.)

The female is twice as large as her mate, and not quite so deeply coloured. The upper wings are of the peculiar brown of a withered leaf, and have a few greyish white spots scattered over them, as shown in the illustration. The lower wings are black, with the exception of a rust-red edging. Behind, the colour is ruddy chestnut.

The specimen which is here figured was taken at Chortales, in Nicaragua.

The figure of the second species is necessarily reduced to half its size, the insect being among the largest of the Castnias,

some of which are so large that they look like bats rather than moths.

As is the case with most of these insects, the colouring of *Castnia Zerinthia* is very simple. The ground colour of the upper wings is pale brown mingled with a little white, and a bold black stripe about the middle. The lower wings have a little more colour, the basal half being white, and the rest black mingled

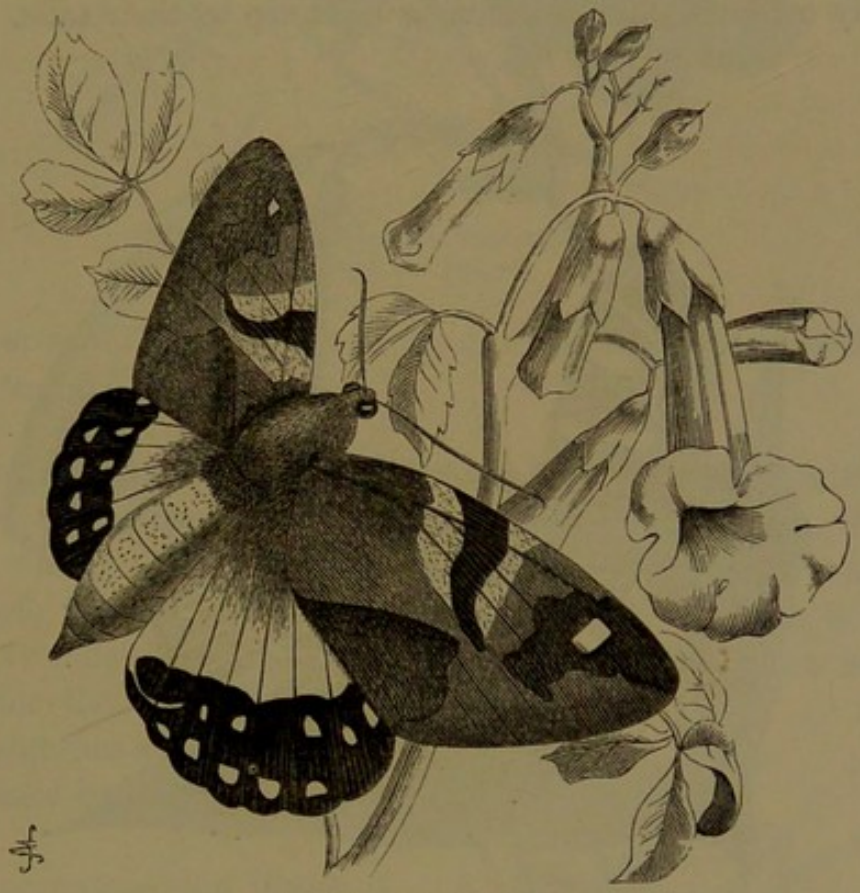


FIG. 382.—Castnia Zerinthia.
(Pale brown, yellow, and white.)

with yellow spots. The thorax is dark brown, and the abdomen white with a number of tiny brown specks. The insect is a native of Brazil.

A SMALL group called the Agaristidæ is illustrated by two species.

The first is an Australian insect called *Agarista contorta*, and is rather a conspicuous one on account of the boldly contrasted hues of its colouring.

The ground colour of the wings is deep black, and upon them are several bold spots and lines of bright yellow, as seen in the

illustration, one deeply curved line running through both wings, and gaining for the insect the specific name of *contorta*. The base of the abdomen is black, and the tip red. It is rather pretty below, the colour being black, and the legs clothed with long crimson down.

This is a native of Australia, and all the insects of the genus, which is a very large one, are Australian. Most of them are brightly coloured, and all have a light tip to their tails. As a



Fig. 383.—Agarista contorta.
(Black and yellow.)

rule, the Agaristas are black and yellow, but there are exceptions, such as *Agarista agricola*, which is black, with spots of emerald-green, yellow, blue, and scarlet.

Of the genus Alypia only two species are known, both of them belonging to North America.

The generic name is Greek, signifying "harmlessness;" but its application to the insect is not very easy to see unless it refers to the larva. The colour of this insect, like that of the preceding, is very simple, being entirely yellow and black. The former colour is deeper on the upper than on the lower wings,

and is arranged in symmetrical spots, two on each wing, which have given to the insect the specific name of *octomaculata*, or



FIG. 384.—Alypia octomaculata.
(Black and yellow.)

"eight-spotted." There is a stripe of similar yellow on each side of the thorax.

THE group of Moths called the Zygænidæ is familiar to English entomologists on account of the well-known Burnet Moths, which, although not large, are among the most beautiful of British insects. Why such a name should be given to these Moths, or indeed to any insect at all, is more than I can understand, for the word, which is Greek, signifies a kind of shark, and is used by Aristotle in that sense.

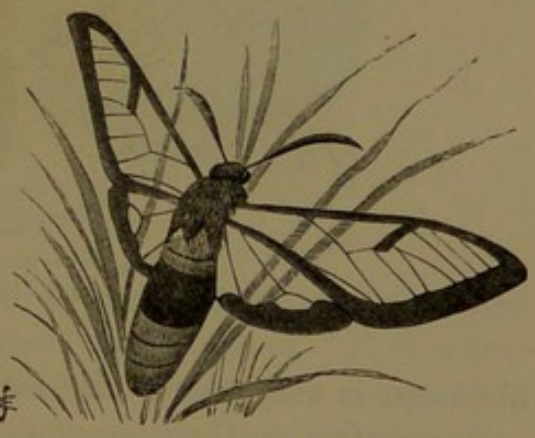


FIG. 385.—Eunomia hæmorrhoidalis.
(Scarlet and black.)

The accompanying insect is a beautiful example of the Zygænidæ, and loses none of the prestige of its family. The wings are transparent, but are edged with black. The head, part of the thorax, and the middle of the abdomen are black, and the rest of the abdomen is rich scarlet, this colour gaining for the insect the specific name of *hæmorrhoidalis*, or "blood-stained." The end of the abdomen has a peculiarly soft, velvet-like appearance. The insect is a native of Brazil.

ALTHOUGH not so brilliantly splendid as the preceding species, the insect which is here given is a very handsome one. The

ground colour of the upper wings is glossy olive-green, crossed by the nervures, which are black. On each wing there are two patches of black, one near the base and the other near the tip. Each of these patches is marked with several spots of clear white. The lower wings are blackish brown, with three white spots, and near the anal angle there is a large patch of blue, not very distinctly marked, and likely to escape notice unless the insect be held in a favourable light. The thorax is black, with a white streak on either side, and some white spots. The

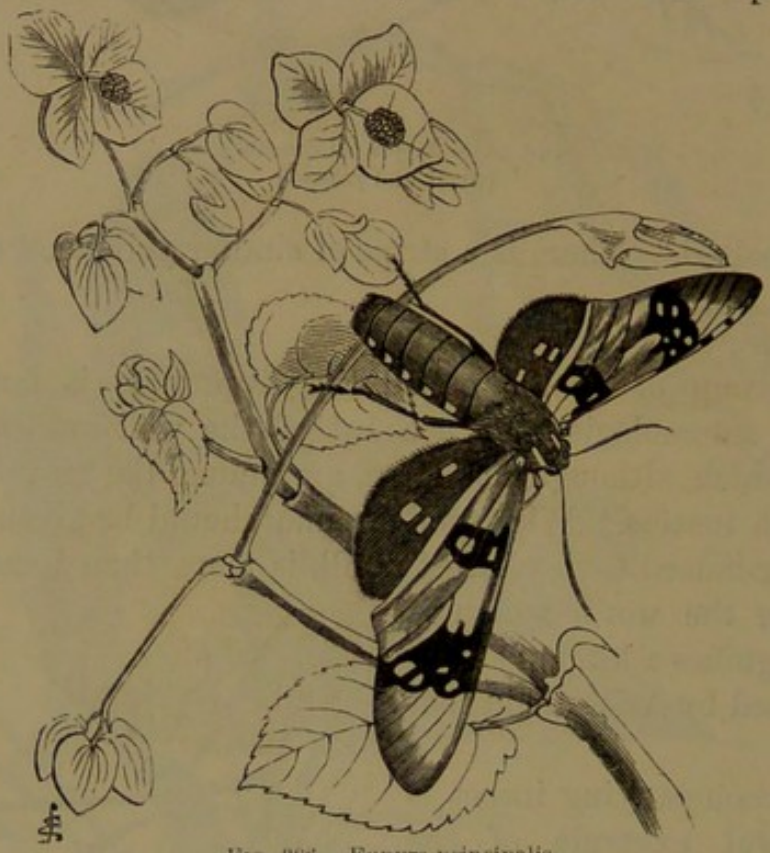


Fig. 386.—Eupyra principalis.
(Olive-green, black, and white.)

abdomen is very beautifully marked, being black, with a gold-coloured ring on the edge of each segment, and a row of snowy white spots along each side.

The insect is a native of Mexico.

The beautiful though simply coloured insect which now comes before us is a native of Venezuela.

It has a very peculiar aspect, owing, as far as I can make out, to the shape of the wing-scales. At first sight the wings look

as if they were transparent, but a closer examination shows that, although they are not so opaque as the wings of Moths usually are, they are yet not sufficiently transparent to allow anything to be seen through them.

The colour is a rather dull but pure and very soft white, with a kind of downy look about it. The wings are edged with

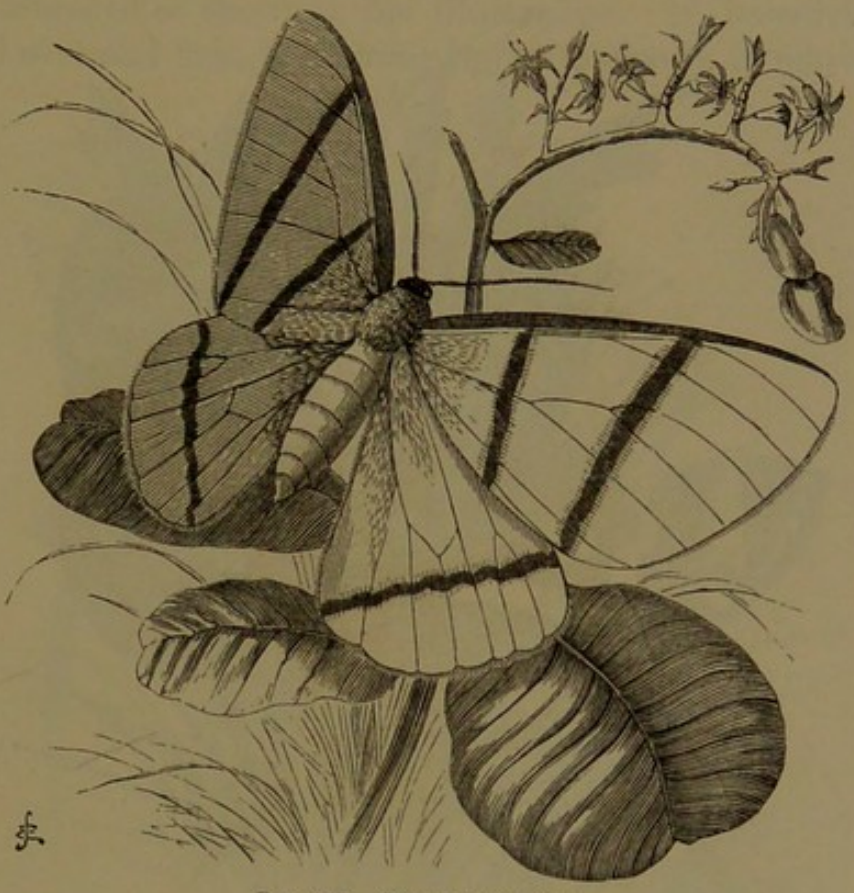


Fig. 387.—Carpella districta.
(White and brown.)

pale brown, and are covered with rather indistinctly marked bars of the same colour, as shown in the figure. It is rather remarkable that a Moth called *Genussa celerenaria*, a native of Pará, is exactly like the Carpella except that it is very small—not being larger than our common "Orange-tip."

The reader will probably have noticed how widely the phenomena of imitation prevails among insects, and how close is the resemblance, not only in form but in colour, and generally in manners. Take for example a recent instance, *Eunomia hæmorrhoidalis*, and see how closely it resembles the Clear-wing Hawk Moths, and how closely they in their turn imitate bees

hornets, wasps, gnats, and other insects; the resemblance extending to their habits and even their movements, as well as to shape and colour. The family of Pericopidæ, which belongs to the great group of Bombycidæ, is remarkable for the closeness with which its members imitate the Heliconias, just as the Uranias imitate the tailed Papilios. They are all West Indian insects.



Fig. 588.—Pericopis angulosa.
(Deep brown and yellow.)

The species which is here figured is a native of Venezuela, and, as will be seen, resembles the Heliconias in colour as well as in form. The ground colour of the wings is very dark blackish brown, with a dash of chocolate in it. The lighter portions of the wings are warm chestnut, with the exception of the spots at the tip of the upper wings, the bar and spot which immediately follow, and the upper part of the bar that crosses the middle of the wing. All these are bright yellow.

The insect which comes next on our list was taken at Waigiou, an island of the Eastern Archipelago, and is one of the species that was brought to England by Mr. Wallace.

On the upper surface it is a handsome and boldly-coloured insect, but on the lower surface its beauty is an absolute surprise. The ground colour of the upper wings is deep velvety black, with a tapering bar of crimson across the centre, and a large triangular patch of the same colour at the base, shading off into yellow. The lower wings are black and orange, the colours being arranged as shown in the illustration. If, however, it be turned over and held in a strong light, its beauty is marvellous.



Fig. 389.—Bizarda optima.
(Black, crimson, and yellow.)

At first sight it seems to be coloured as above, but when a side light falls upon it, both pairs of wings are seen to be of the most brilliant metallic blue as far as their centre, the colour being quite as splendid as that of any of the Morpho Butterflies. Even the legs are of the same splendid blue. An allied species, *Bizarda clarissima*, of Ara, is black and white except the base of the wings and the whole of the head and body, which are rich blue-green.

A BEAUTIFUL Brazilian insect is here given, both of its names being more appropriate than is generally the case. Its colour, though very simple, is very bold, and makes it quite a conspicuous insect. The only colours are yellow and black, and, as may be seen by reference to the illustration, are so equally divided that it is not easy to decide which is the ground colour.

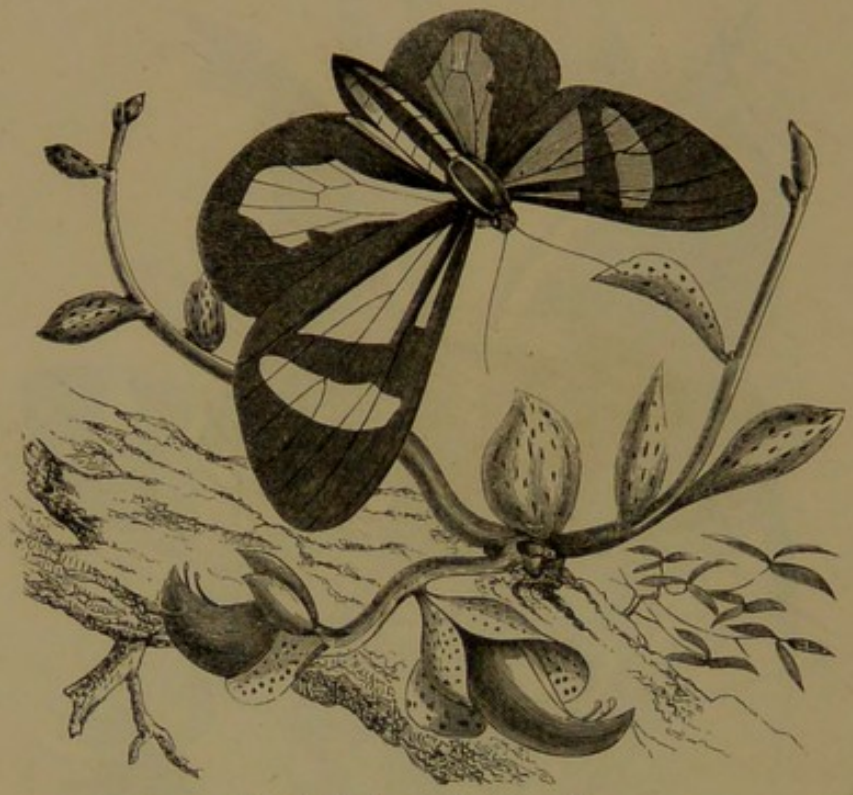


FIG. 390.—Eucyanë melaxantha.
(Black and yellow.)

The generic name *Eucyanë* is formed from two Greek words, one signifying "beauty," and the other any dark colour, especially one which has a dash of blue in it. The specific name *melaxantha* is also formed from two words signifying "black and yellow." For my part I should like to see all generic names formed from the Greek, and all specific names from the Latin; and in this case the name would have been *Eucyanë nigroflava*, or *flavopicta*, which would have been a prettier title than *melaxantha*, and quite as descriptive.

THE insect which is known as *Eucyanë glauca* is a very remarkable one, on account of the striking variation to which

it is subject. Of the series of specimens in the British Museum, all but one are coloured as follows :—

The ground colour of the wings is black, the basal portions of both wings being gold-green glossed with blue, the colours changing their relative positions in a strong light. In the centre of each wing is a slightly-curved bar of rich crimson. The body is of the same splendid colour as the base of the wings, except that the abdomen is banded with black.



Fig. 391.—Eucyané glauca.
(Black, green, and crimson.)

But there is one specimen which has the band across the wings white instead of crimson. When I first saw this, I naturally took it for a variety, but was informed by Mr. A. H. Butler—who, like most of the officers of the Museum, is most liberal of information to those who wish for it—that the specimen in question was really the typical insect, and that either the others must be varieties, or that they must be separated into two distinct species. The difference of appearance is singularly striking, the white-banded specimen having quite a plebeian look among its companions, the blue and green of the base of the wings not being set off by their complementary colour, which enhances the brilliancy of both.

The specific name *glauca* refers to the green colour which has been mentioned. There are seven species of this genus in the British Museum, and all are natives of South America.

In the Moth which now comes before us, we have an example of the kind of nomenclature to which I have just referred. The generic name *Euschema* is formed from two Greek words signifying a beautiful form or outline, and is given to the insect on account of the bold and graceful outline of its wings. The specific name *flavata* is Latin, and signifies something that is coloured with yellow but is not wholly yellow.

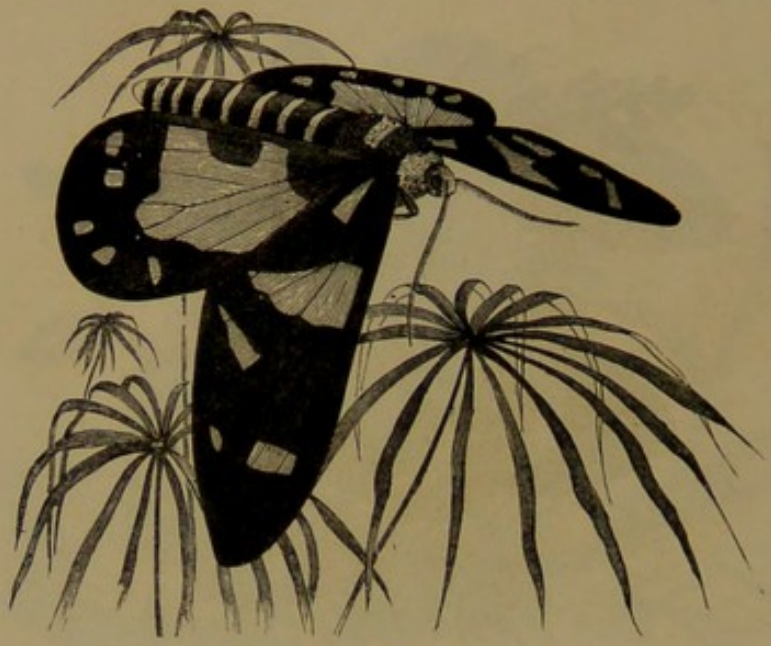


Fig. 392.—Euschema flavata.
(Black, white, and yellow.)

The ground colour of both pairs of wings is black, which in a strong light is seen to be glossed with purple. The large light patches at the base and near the tip of the upper wings, and in the middle of the lower wings, are nearly white and partly translucent. The remainder of the spots are yellow. The body is black, banded with the same colour, and the front of the thorax is also yellow, so that the name of *flavata* is a very appropriate one. There are many species belonging to this genus, and the present one is a native of Timor.

In nearly all the members of this genus, purple, more or less vivid, asserts itself as the ground colour.

In most of these it is of so deep a hue that it appears to be black, except in a favourable light; and also, as a general rule, the lighter portions of the wing are yellow. There are, however, some, as in the present case, where the purple is sufficiently

vivid to show itself with a moderate light. The rest of the wing is nearly white, except in the middle, where it is yellow.



Fig. 393.—Euschema Bellona.
(Purple, white, and yellow.)

Still, even in this species, the characteristic purple and yellow are the leading colours.

This is a very widely spread species, being found distributed over the greater part of India and the neighbouring parts.

There is a great variety of colouring displayed in the Moth called *Præsos Mariana*.

Its name, by the way, is as bad as that of *Euschema flavata* is good, simply because it conveys no idea to the mind of the reader. Anyone who was absolutely unacquainted with the latter insect, and who had a slight acquaintance with Greek and Latin, would gather at once from the two names that it was gracefully formed, and that there was a good deal of yellow about it. But no idea whatever is conveyed in the present insect. In the first place, the generic name *Præsos* is—at least to me—a sound without meaning. *Præsos* signifies "a presi-

dent," and the word might perhaps have some occult meaning; while the name *Mariana* might as well be any other name.

The ground colour of the wings is black. In the upper wings there is a narrow waved line of pale green near the base, another of similar form just beyond the large central patch, and all the other markings are white. The black has a slight gloss of green



Fig. 394.—Præsos Mariana.
(Black, white, yellow, and pale green.)

in a favourable light. The lower wings are deep yellow, marked with black, similar to that of the upper wings. The thorax and base of the abdomen are black, and the rest of the abdomen is yellow, banded with a narrow band of light brown at each segment. It is an Australian insect, and at present is the only species known of its genus.

The handsome insect which is here shown fully deserves its title of *pulchella*, or "beautiful." It is a native of Northern India, and the specimen which is here figured was taken at Silhet.

It is one of the insects which are difficult to describe, because its colouring is not only gorgeous but intricate, and the effect

when the insect is at rest is so different from its aspect with outspread wings, that when two specimens are placed alongside of each other, one "set" as if flying, and the other with closed wings, they would scarcely be recognized as belonging to the same species.

We will begin with the upper wings. The ground colour is velvet-black, crossed with a number of narrow streaks of shining, glittering, emerald green. On the wing are a number of white stripes and patches, and there is one point which requires



FIG. 395.—Erasmia pulchella.
(Black, green, orange, and yellow.)

special notice. I have already mentioned the conspicuous difference between the appearance of the insect in two different attitudes. This is partly due to the general outline of the insect, which is heart-shaped when the wings are closed, but chiefly to the shape and colour of one of the markings on the upper pair of wings. If the reader will refer to the figure, he will see that at the base of the wing there is a white patch, followed by a grey stripe, and then by a curved bar of a light colour. Now this bar is bright orange, and when the wings are closed, these bars form a continuous collar-like mark, and have a singularly conspicuous effect.

The lower wings are brightly coloured. At the base they are

green, which presently gives place to yellow, and then to black on the edge ; the nervures retaining their green colour and giving a series of green lines to the very edge of the wing.

On Plate XV. Fig. 2 is pictured an insect which, even under the exigencies of printer's ink, shows itself to be a conspicuous one. Its very appropriate name is *Cyclosia sanguifera*, and it is a native of Northern India.

The ground colour of the wings is glossy black, and upon the upper pair near the base are a number of circular spots of yellow and blue. On the rest of the wing is drawn a complicated pattern of stripes, looking just as if they had been painted with blood. The lower wings are black from the base to two-thirds of their length, and are adorned with circular spots of vivid blue. A broad band of the same blue occupies the edge of the wing, and on it is a row of white spots.

The generic name *Cyclosia* is formed from a Greek word signifying "a circle," and is given to the insect on account of the many circular spots upon its wings. The specific name *sanguifera* is a Latin word signifying "blood-bearing," and refers to the red stripes on the upper wing. When the insect is at rest its outline assumes a beautiful shape. The under wings are completely covered by the upper, the spots and streaks forming a most singular and striking pattern.

In the British Museum are two empty cocoons of an allied species, *Cyclosia subcyaneus*. They are of slight material, rust-red, and from their angular shape have evidently been attached to a branch.

There are many species of the genus Hypsa, and in most of them the chief colours are yellow and grey.

The present species is remarkable for the difference in appearance between the sexes. The figure represents the female, which is coloured as follows. Both pairs of wings are from the base to two-thirds of their length pale yellow, edged with white and sprinkled with black spots. On the edge of the wings is a band of pale brown, very broad at the tips of the upper pair, and narrowing gradually to the angle of the lower pair. This band is traversed by narrow grey streaks, showing the course of the nervures. The male has the yellow part of the wing much

smaller than the female, and on the lower wings is a large and



Fig. 396.—Hypsa orbicularis. Female.
(Pale brown, yellow, and black.)

nearly circular patch of greyish brown. This mark has earned for the insect the specific name *orbicularis*, or "circular." The insect is a native of the East Indies.

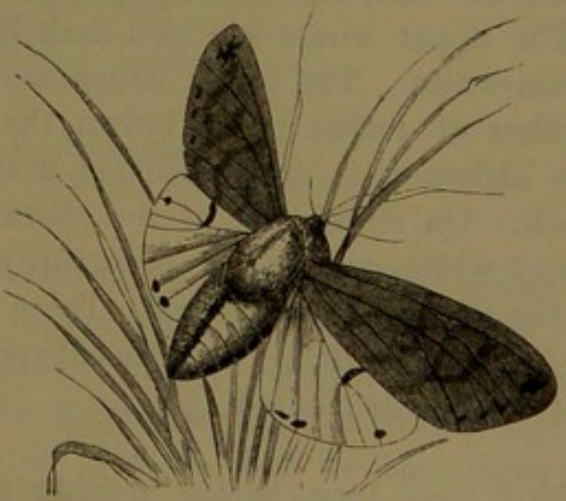


Fig. 397.—Arctia Isabella.
(Pale brown.)

There is nothing very remarkable in the Moth which is called *Arctia Isabella*, the insect being small, and soberly coloured. The upper wings are pale brown, with a few indistinct dark spots, and the lower wings are greyish yellow, with some dark spots, and nearly transparent. The legs are red, and the abdomen yellow,

spotted with black. The larva, however, which is here shown, is very remarkable. The larvæ of all the Arctias are thickly covered with hair, as we know from the larva of our common Tiger Moth, which goes by the popular name of Woolly Bear. In this species the larva bears such a resemblance to a hedgehog, that the perfect insect has been popularly named the Hedgehog Moth. I may here remark that the generic name *Arctia* signifies "a bear," and that the specific name *Isabella* refers to one of the bears which goes by that name. It is a native of Georgia.



Fig. 398.—Larva of Arctia Isabella.

In the British Museum there is a specimen of the larva of *Arctia hyperborea*, the hairs of which are so long that the insect might well be called the Porcupine Moth.

The fine insect which is next shown is a native of the Himalayas, and fully deserves its specific title of *imperial*.

The upper wings are rich dark brown, boldly streaked with cream-white. The lower wings are deep yellow, marked with patches of rather paler brown than that of the upper pair. The abdomen is scarlet ringed with black, and the thorax is black. On either side of the thorax is a large pointed tuft of snowy white, contrasting beautifully with the black and scarlet of the thorax and abdomen. There is a little black spot in the centre of the tuft. The genus Hypercampa is a very large one, and widely distributed.

Not very long before writing this account I was in the British Museum, when a great sensation was caused by the arrival of a new and beautiful insect allied to the Tiger Moths. It was so remarkable that an alteration was at once made in

my list, and the new insect inserted. It was found to belong to the genus *Anaxita*, and Mr. A. H. Butler conferred upon it the appropriate specific name of *Sannionis*, i.e. "harlequin," the colours of the insect being exactly those of a harlequin's dress. The insect is a native of Mexico.

So complicated a pattern and such varied colours are not easy of description, except in technical language which would not be understood by the general reader. I will try, however, to make them intelligible. The ground colour of the upper wings is



Fig. 399.—Hypercampa imperialis.
(Brown, white, and yellow. Body scarlet.)

scarlet, changing gradually through orange in the centre to yellow at the base. At the upper edge of the wing there is a large and well-defined patch of bright yellow. The curious pattern at the base and the stripes which run to the edge of the wing are green edged with blue, so that we have here the red, green, gold, and blue of the harlequin's dress.

The lower wings are scarlet and black, very much like the colours of our well-known Cinnabar Moth. On either side of the thorax there is a very long tuft of hair, yellow at the top;

and the abdomen is scarlet above and black beneath, with a line of black running along the centre of the upper surface.

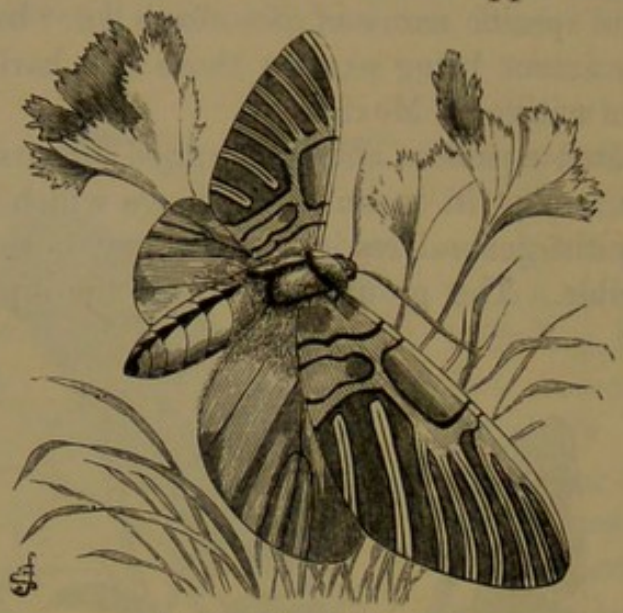


Fig. 400.—Anaxita Sannionis.
(Red, yellow, green, and blue.)

The only other known is called *Anaxita decorata*, of somewhat similar colours, but much paler, and there is more yellow about it.

As may be conjectured from the specific name of the insect

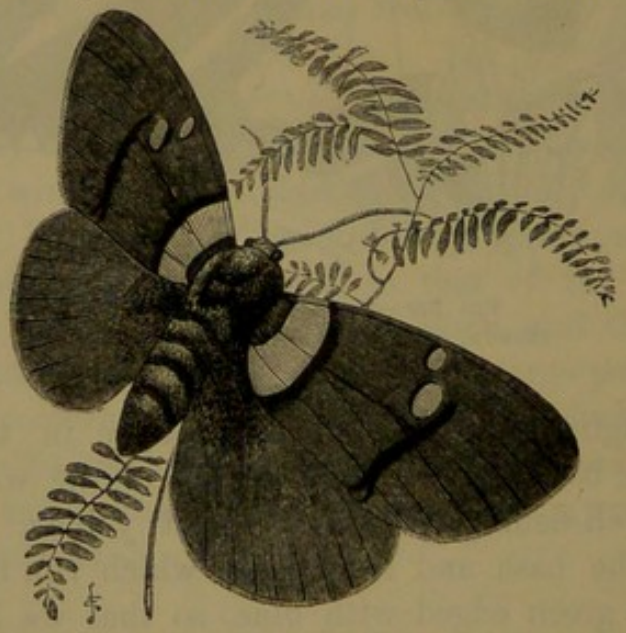


Fig. 401.—Egybolia Vaillantina.
(Olive-green and orange.)

here represented, it is a native of Southern Africa, being named in honour of the traveller Le Vaillant.

There are but few colours in the insect, but they are boldly contrasted; and it is a very handsome though small Moth. The colour of the upper wings is glossy olive-green, darkening into black towards the base. Just beyond the base of each wing there is a broad curved bar of bright orange. The head and antennæ are of the same colour. The lower wings are also dark olive-green, but with a favourable light a decided gloss of blue is perceptible.

Both names of the insect called *Asthenia machaonaria* are very appropriate. The generic name is formed from a Greek word signifying "weakness," and is given to the insect on account

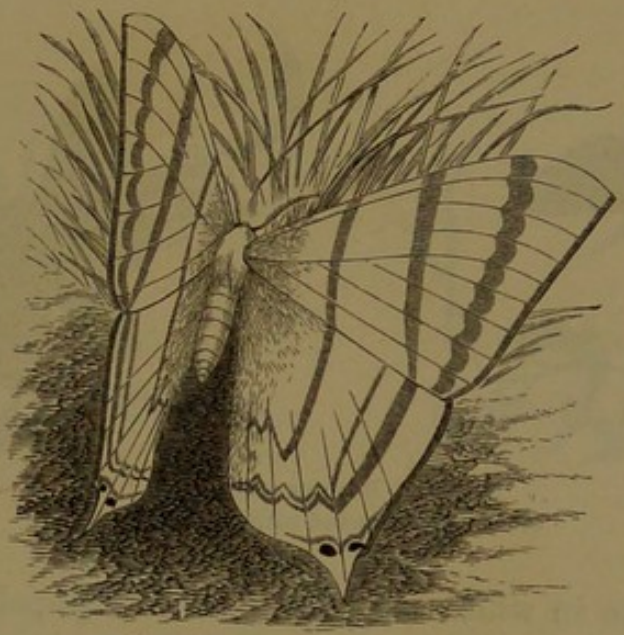


Fig. 402.—Asthenia machaonaria.
(Satiny-white and pale brown.)

of the pale and feeble hue of its colouring. The name *machaonaria* is given to it in consequence of its resemblance to our familiar Swallow-tail Butterfly, *Papilio machaon*. Perhaps the title would have been still more appropriate if it had referred to the Podalirius, in which the markings are paler than in the Machaon, and arranged much like those of the present insect.

The ground colour of the wings is very pale, soft, greyish white, with a satin-like gloss on the surface, and over them are drawn several bars of very pale brown, arranged as shown in the illustration. The edges of the wings are marked with a very narrow band of darker brown, and the spots at the tips of

the lower wings are dark brown, approaching to black. The insect is a native of Pará.

THE two figures here given represent the male and female of the Processionary Moth, an insect which, happily for us, has not taken up its residence in England. The smaller figure represents the male and the larger the female. The colour is pale brown, with markings of a darker brown, and the female is altogether darker as well as larger than her mate.

The insect derives its name from the singular habits of the caterpillars, which, when full-fed, set off in company to seek a

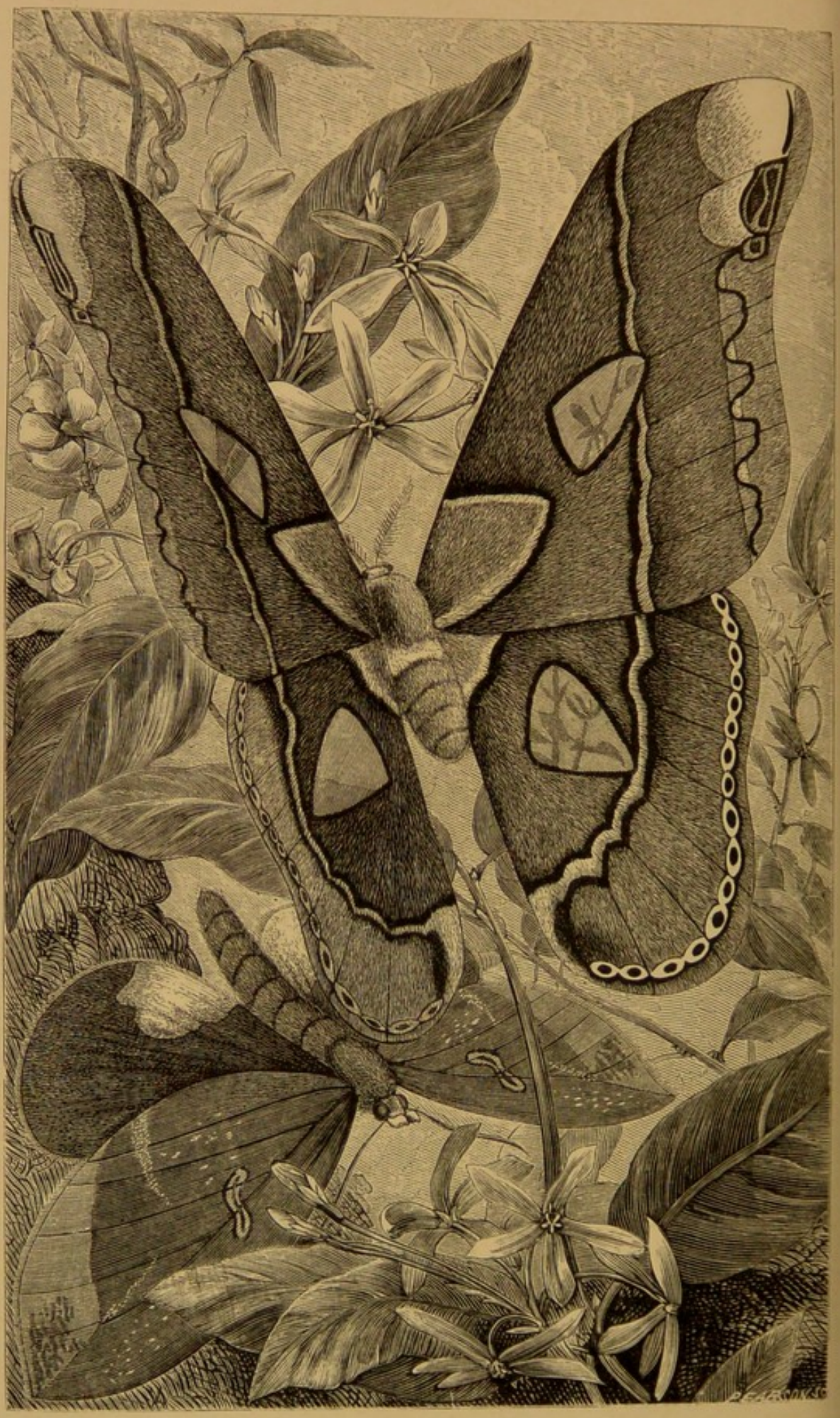


FIG. 403.—Bombyx processionea.
(Pale brown, marked with dark brown.)

place of repose in which they can pass their pupal state. This journey they accomplish in single file, one taking the lead, the next burying his head in the hairy tail of his predecessor, and so on until a long and continuous line is formed. A sympathetic feeling exists between them, for, if the leader should halt even for a moment, the whole line also halts ; while, if one of them be pushed aside, the one next in order moves up in double-quick time, followed by its successors, so as to leave the line unbroken.

These caterpillars are doubly disliked by the people. In the first place they are terribly destructive to vegetation, and in the next, their hairs, like those of several British caterpillars, have a horribly irritating quality, and are said to penetrate through the clothes and so to enter the skin. Some persons aver that they make their way even through thick boots, but this I take

PLATE XVI.



to be an exaggeration. This irritating power remains even in those hairs which adhere to the pupa after it has buried itself in the earth and shed its larval skin.

In its larval state it spins large webs for its protection, just as our Little Ermine Moth does, and even fir-trees are so cut to pieces by these larvæ, that they seem to be nothing but bundles of sticks and webs.

The larvæ of the group of Moths called Saturniidæ also spin webs, but, instead of doing harm, the webs are utilized—some of the best silks being made from them. I need hardly mention the familiar names of Eria, Arrindy, and Tussore silks, all of which are made by insects of this group.

On Plate XVI. Fig. 1 is given a figure of one of these Moths, called *Attacus Jorulla*, a native of Orizaba, in Mexico. As is the case with most of its kind, it possesses soft and rich, though not brilliant hues, and the general impression caused by it is that of a soft, downy, pinkish brown. Taking this as the ground colour, we find at the base of the upper wings a well-defined patch of which the centre is dun, surrounded first by a line of white and then by a narrow boundary line of black. Through the middle of the wing runs a waved white bar edged with black. Then comes a faintly-defined and very irregular line, the space between which and the edge of the wing is decidedly pink, and towards the tip of the wing is a bold patch of dark brown. The lower wings are coloured in much the same manner, except that a row of dark brown marks takes the place of the narrow waved line. The abdomen is pale brown, and the thorax nearly white.

One point has yet to be noticed, namely, the transparent patch in the middle of each wing, the object of which no one knows. The two young ladies who have been mentioned on page 617 asked that question, which was really a sensible one, and perhaps deserved a better answer than they got, *i.e.* that they were windows through which the insect could see the approach of a foe. But much allowance must be made for the feelings of a scientific man interrupted in his work.

A North American species of this group is given. Its colours are much the same as those of the preceding insect, but

seem to be more compressed, if I may use that term. The ground colour is rather pale warm brown, slightly speckled with yellow. In the middle of each wing is a kidney-shaped mark of dun with a white centre, followed by a whitish grey band running across the wing. Near the tip of the upper wings is a



FIG. 404.—Samia Cecropia.
(Pink-brown, yellow, and white.)

bold oval mark of dark brown, followed by a pink bar which extends irregularly to the angle of the wing. The thorax is rich warm chestnut, with a pointed brush of hairs diverging boldly on either side, and the abdomen is of the same hue, but the edge of each segment is marked with white.

IN consequence of the exigencies of space, the figure of *Samia Calleta* is only half the size of the insect itself. However, the

reader can form a good idea of the appearance of the insect by doubling in his eye the distance between the tips of the wings, and then tracing an imaginary outline of the Moth. The insect is a native of Mexico.

In colour this has darker and deeper hues than the preceding insect. Taking dark brown as the ground colour, we



Fig. 405.—Samia Calleta.
(Dark-brown, grey, dun, and white.)

find near the base of the upper wings an angular stripe of greyish dun, followed by a triangular spot of grey. A narrow and slightly waving bar of pale dun traverses the whole wing, and then becomes of a much lighter brown, warming to chestnut towards the edge. Both pairs of wings are coloured in much the same way, except that the waving bar which in the upper wings is pale dun, becomes nearly white in the lower wings.

It is to be supposed that the specific name of *Polyphemus* was given to the accompanying insect on account of the eye-shaped marks on its wings. The Polyphemus of mythology, however, had but one eye, whereas the Moth has four, so that the only

mode of accounting for the nomenclature is to consider that one eye is reckoned with each wing. The insect has rather a large range of locality, being found both in North and South America.

The figure represents the male insect, in which the colours are more distinctly shown than in the female, and the marks more closely resemble eyes. I take the description from a specimen in my collection. The upper wings are reddish brown, becoming rather pinkish on the outer edge, and having a narrow pink line running parallel with the edge. A waved mark of a similar hue is near the base of the wing, and near the centre is

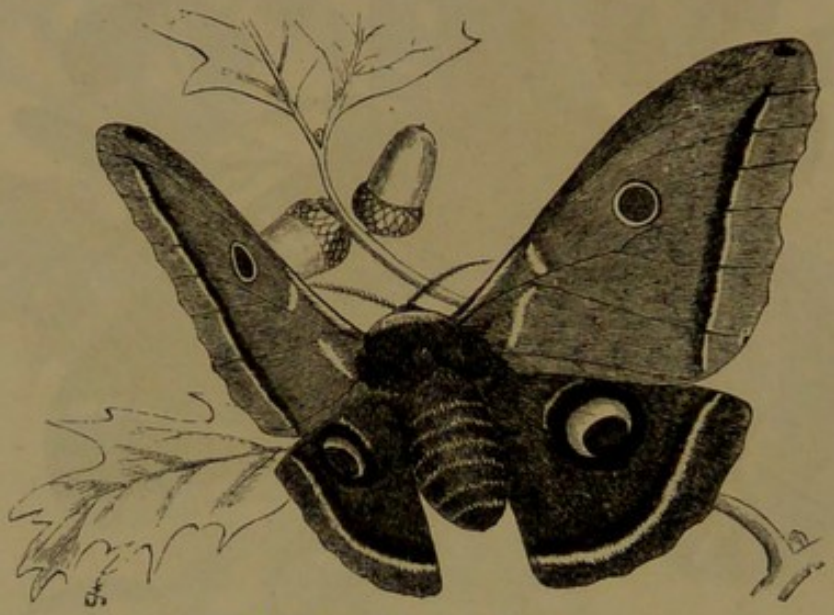


FIG. 406.—Telea Polyphemus.
(Pale brown, pink, and yellow.)

a transparent eye-like spot. The lower wings are of a darker colour, and the pink stripe is accompanied by one of a blackish hue. The transparent eye-like spot is about the size of that of the upper wings, but is so surrounded with yellow and black as to bear a singular resemblance to a human eye with dark eyebrows.

The body is of the same colour as the upper wings, and the thorax is clothed with long hairs, which in the male project in two long tufts over the base of the wings. The insect being a very large one, the figure is little more than half its real size.

THE two following illustrations represent an insect very beautiful both in form and colour, the *Attacus* [or *Telea*] *luna* of North

America. This Moth has been bred in England, and might perhaps take its place among the insects which supply silk for commerce. The description is taken from a specimen in my collection. In consequence of the size of the insect, my specimen measuring seven inches across the wings, the figure is necessarily reduced.

The general colour is pale green, with two narrow bars of a darker hue in the upper pair, one being much lighter than the



Fig. 407.—Attacus luna.
(Pale green.)

other. A single bar of the same colour is on the lower wings. A very decided effect is given to the outlines of the upper wings by a stripe of dark chocolate which runs along the edge. It is narrow at the tip, and becomes wider at the base. It also crosses the front of the white thorax, so as to produce a very bold effect. The legs are of the same dark chocolate, and so is the narrow line which represents the eyebrow, if it may so be

called, of the eye-like spots. These are the only dark parts of the insect.

In this species the transparent part of the eyes is reduced to a scarcely perceptible stripe, and the ground colouring of the eyes may be briefly described as follows. First comes the dark chocolate eyebrow, through which runs a line of pure white, then comes the little transparent streak, and then a patch of dun, separated from the pale green of the wing by a narrow line



Fig. 408.—Larva of Attacus luna.

of darker green. The body is covered with thick, long, white down, which extends over the bases of both wings, and runs along the inner edge of the lower wings for nearly half their length. The tails are of a yellower green than the body of the wing, and the outer edges of both pairs are marked by a very narrow line of orange. Both the upper and under surfaces are coloured in the same manner. The cocoon is about as large as a pigeon's egg, and of a very dark brown.

A SLIGHTLY reduced figure is given on page 675 of another of these silk-producing Moths called *Antherea Pernyi*. The figure

represents the female, as may be seen by the shape of the antennæ, which in the male are doubly feathered, and are singularly beautiful.

The general colour of this insect is dun-brown, with a few light and dark streaks arranged as shown in the illustration. As is the case with many of these insects, the outer edge of the wings takes a pinkish hue, and is separated from the rest of the wing by a dark bar. The upper edge is marked by a blackish streak, as shown in the illustration.



Fig. 409.—Antherea Pernyi.
(Brown.)

The eyes of both pairs are very similar, except that in the upper pair the transparent portion is larger and more decidedly circular than in the lower pair. The colouring of the under surface is rather lighter than that of the upper, and the place of the dark streaks is taken by a row of dark spots.

The cocoon differs little in colour from the body, and the silk which it furnishes is smooth and strong. I possess specimens of the Moth, the cocoon, and the silk, and the descriptions have been taken from my specimens, which are Chinese.

We have seen many examples of tailed insects, but few in which the tails run to such an extraordinary length as in the *Tropæa Leto*, figured at No. 1, Plate XVII. The insect is a native of the East Indies. This is not the largest species, as it is much exceeded by *Tropæa Mænas* of Northern India.

The colour is very simple, the light parts being greenish yellow, and the dark parts pinkish brown. On the lower wings there is a rather large spot of orange, and near the middle of the upper pair is a large eye-like spot, the upper part of which is dark brown, followed by a black curved stripe, and then by a partly translucent spot. The tails are pink brown, and their widened ends are yellow.

On the same Plate, Fig. 2, is shown a South African Moth called *Ginanisa Isis*.

Though not brilliant, it is a pretty insect, having a soft owl-like aspect, and its colours being almost every possible mixture of brown, black, and grey, the last colour being most predominant at the base and near the outer edge. On the upper wing there is a spot of black, followed by a transparent spot, and on the lower wings there is a large and complicated eye, the colours of which are arranged as follows. In the middle is a transparent spot surrounded with black, and that again by a larger circle of the same hue. Then comes a rather wide circle of yellow, followed by another of pink, both being bounded by black lines. The outer edge of the wings is dark brown.

I presume that my readers are acquainted with that pretty little bird the common Creeper. One of its scientific names is *Certhia*, and the accompanying insect has been named after it in consequence of the similarity of colouring.

In the Moth as well as the bird, brown is the leading colour, but it is so varied and broken up with grey, black, and yellow, that it is impossible to state what is really the ground colour. The outer edge of the wing is yellowish, and the two light patches near the tip are yellow. The series of angular marks are white, and look just as if they had been painted with Chinese white. The base of the upper wings is very dark brown. The insect is a native of Northern India.

The genus Hyperchirea is a very large one, and is spread

PLATE XVII.



over the whole of the West Indies. The species which is represented on page 678 is a native of Guatemala.

As may be inferred from the specific name *rubescens*, or "ruddy," a reddish tint is spread over the wings, and is more conspicuous on the upper than on the lower pairs. The general hue is pale yellow, washed with red, and two pinkish brown lines traverse the upper wings, one nearly straight running from



FIG. 410.—Brahmæa certhia.
(Brown, black, and grey.)

the tip to the inner edge, and the other, a curved line, being near the base.

The lower wings are marked more definitely than the upper pair. The most conspicuous mark is a large circular eye. The spot in the middle is white upon an olive ground; then comes a rather wide circle of black and another of yellow, divided from the brown of the wing by a narrow black line. Of the three curved lines which run parallel to the top of the wing, the outer

is pinkish yellow, the next yellow, and the last and innermost dark olive-green. One species, *Hyperchirea lineosa*, is very



Fig. 411.—Hyperchirea rubescens.
(Pink-brown and yellow.)

curiously and prettily coloured, the wings being brown, and marked with lines by the yellow nervures, a peculiarity which has gained for it the specific name of *lineosa*.

Among the Moths, examples of imitations seem to be endless. Already we have seen some imitations of the Heliconia butterflies, and here we have one which actually outdoes them in the transparency of its wings. It is a native of Spirito Santo.

It is a most ethereal looking creature, for, as may be seen by reference to the illustration, objects are almost as visible through its wings as if they were made of glass or talc. The colour of the wings is the palest imaginable yellow, becoming rather darker towards the base. Towards the edges some tiny black specks are seen, and similar specks are scattered very sparingly over the whole surface of the wing. They have rather a curious

look about them, which, on examination with a magnifier, is shown to be owing to the fact that each speck is a single black scale, very long in proportion to its width. There is a slight yellow line marking the edges of both pairs of wings. I need



Fig. 412.—Heliconisa impar.
(Transparent, black-speckled.)

scarcely say that the colour is exactly the same on both sides. Even the body has a very butterfly-like aspect, as if to increase the resemblance. The thorax has a tuft of long, pale brown down, and the abdomen is brown above and yellow at the sides.

The genus Clisiocampa is familiar to English entomologists on account of the pretty and variable little Ground Lackey Moth (*Clisiocampa castrensis*).

The present species is spread over a considerable portion of Europe. Like our own insect, it is so variable that to describe it is not an easy task, the description which would apply to one specimen being quite unsuitable when applied to another. The male is smaller than the female, and of rather brighter colours, the upper surface of the first pair of wings having a beautifully

gilded appearance, which extends even to the long silken hairs which clothe the thorax and abdomen. This lovely golden hair also runs along the edge of the lower wings, but it cannot be seen without a favourable light, which brings it out in all its radiance



Fig. 413.—Clisiocampa sylvatica and Larva.
(Brown and dun.)

The general colour of the larva is dark black-grey with light grey and yellowish streaks. In the background is seen the web constructed by this larva, which much resembles that which is spun by the larvæ of the common English Lackey Moth.

Owing to the size of the insect, which measures six inches across the wings, the figure of *Ceratocampa regalis* is much reduced in dimensions. It is a native of North America, and is more common than welcome.

The colour of the upper wings is olive, streaked with light red, and the lower wings are rust-red, paling into yellow towards the upper edge. The thorax is rust-red, edged and streaked with yellow, and the abdomen is coloured in the same manner, the edges of the segments being marked with yellow.

As may be seen by the illustration on page 682, the larva is a formidable looking creature, with its panoply of horrent spines. In most places where it lives it is dreaded almost as much as if it were a rattlesnake, and very few can be found who are

bold enough to put a hand upon it. The popular name for it is the "Hickory Horned Devil." It feeds upon the walnut and allied trees.

Its colour is greenish yellow, and upon it are patches of black, blue, and orange. The spikes are black and orange. The



Fig. 414.—Ceratocampa regalis.
(Olive, red, and yellow.)

length of the full-grown larva is almost five inches, and its formidable aspect is increased by an odd habit of wriggling its body sharply from side to side, as if to use the spikes as offensive weapons.

The simply-coloured but beautiful Moth which is figured on page 683 is an Australian insect, and is not very easy of description, in consequence of its strong tendency to variation, both in colour, markings, and dimensions.

Brown is the prevailing character. Upon the upper wings the brown is dark, and near the base are some silvery markings, thrown up by a nearly black irregular streak just above them. A row of similar silvery spots runs from the tip parallel to the

outer edge of the wing. The insect derives its specific name from a most intricate and labyrinthine pattern of different browns, which covers the wing, but in so subdued a way that some trouble is needed in order to trace it fully. As this can

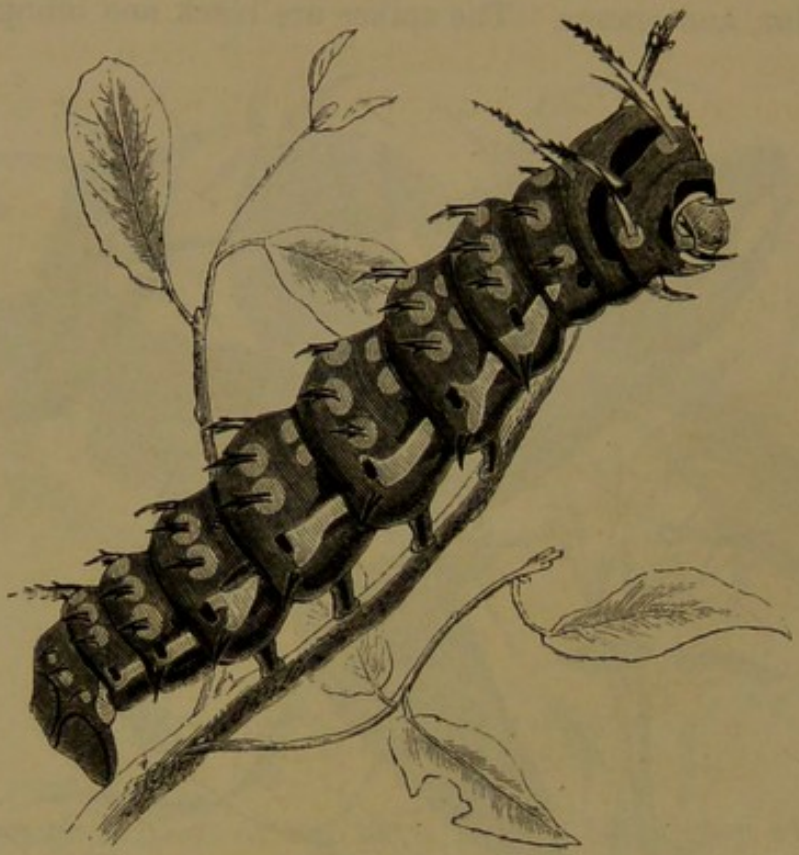


Fig. 415.—Larva of Ceratocampa regalis.

only be done by shifting the insect about so as to change the direction of the light, the artist has indicated rather than copied the marks as they appear in one particular light.

The lower wings are pale brown without any markings, and the sides of the body are fringed with very long brown hairs.

The genus Xyleutes is closely allied to our Cossus, or Goat Moth, and both insects appear to have somewhat similar habits.

The present species is a native of North America, and as the caterpillar chiefly attacks the black locust tree, it is popularly known as the "Locust Carpenter." In some parts of the country it is so numerous that it has killed whole groves of the trees on which it feeds. It has been found that a tree may be tolerably protected against the insect by smearing the trunk well with soft soap, as high as the brush can reach. This application

prevents the female from gaining a foothold, and so debars her from depositing her eggs. The oak, as well as the locust, needs this protection.

The colour of this insect depends much upon the sex. The female, which is larger than the male, is entirely grey, white, black, and brown, while the male is generally darker than the female, and has the hind wings of an ochreous yellow, of which

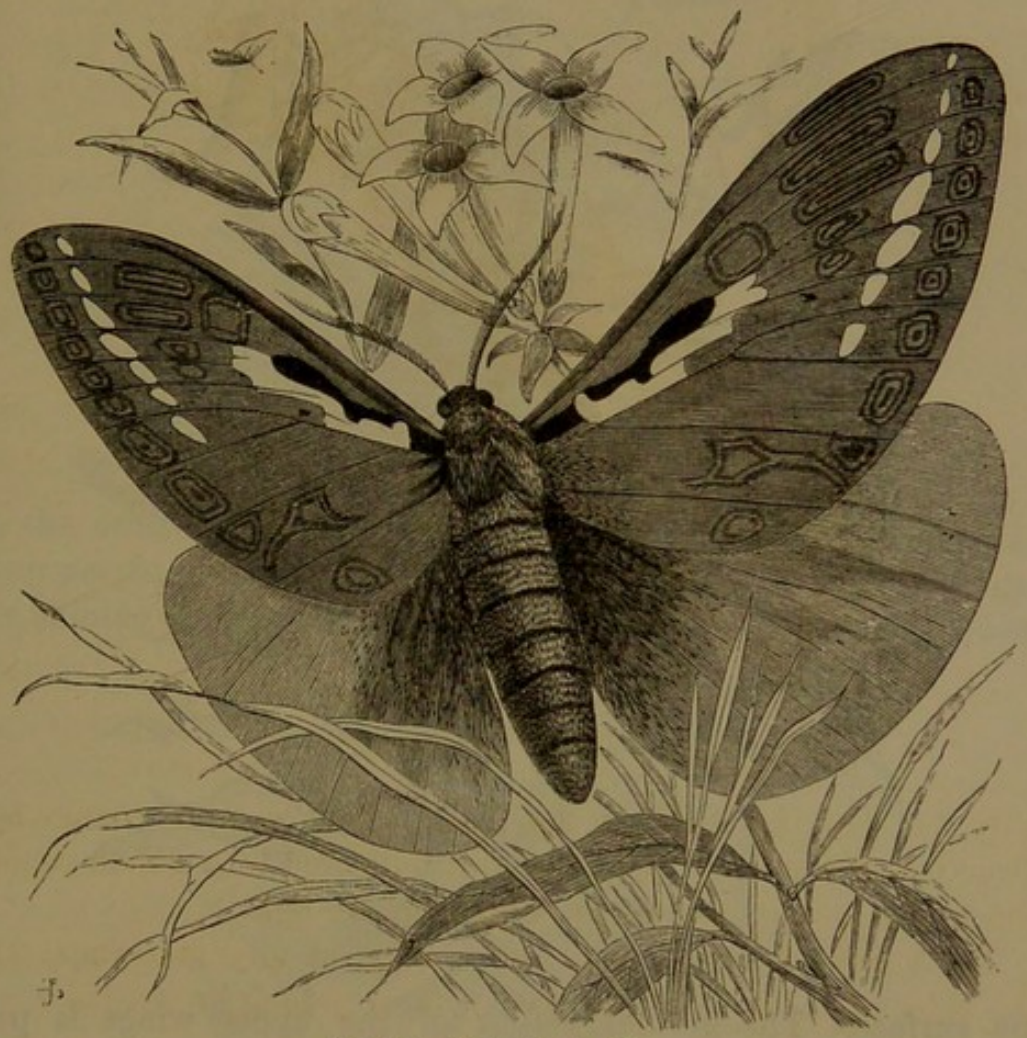


Fig. 416.—Pielus labyrinthicus.
(Brown and silver.)

colour the female has none. When the caterpillar is full-fed, it spins a cocoon within the body of the tree, and changes to its perfect state about June or July. As soon as it has issued from the tree, its first care is to find a mate, and its second to deposit its eggs. If, therefore, by the application of soft soap or any such substance, the Moths can be prevented from settling on the trunks during June and July, they may be considered as tolerably safe.

I HAVE already mentioned that, owing to the impending changes among the arrangements of the Lepidoptera, the smaller divisions of these insects will not be noticed, and only the larger groups be mentioned. One of these is the Noctuites, of which we shall have several examples.

The first is the beautiful insect called *Euglyphia hieroglyphica*, both names being derived from the pattern which is traced on



FIG. 417.—Xyleutes Robinea. Female.
(Brown, grey, and yellow.)

its surface. The ground colour of the upper wings is pale golden brown, and upon it are bold lines and a dull row of spots. The colour of the lines is shining metallic green, shifting to blue in certain lights, and the spots are dark brown with a gloss of copper. The lower wings are simply pale brown.

The generic name is formed from two Greek words signifying "beautifully written," and the meaning of the word *hieroglyphica* is self-evident. Mr. A. H. Butler tells me that one specimen has been taken in England, but that as this is a West Indian insect, it has probably been brought from Jamaica in the pupal state and developed after its voyage.

ANOTHER beautiful insect is called *Eudryas grata.*

The colouring of this Moth is rather complicated. The ground colour of the upper wings is yellow, changing to creamy white



FIG. 418.—Xyleutes Robinea. Male.
(Brown, grey, and yellow.)

in the centre. The dark border which surrounds the wings is deep purple-brown with a very glossy surface. The lower wings are shining yellow, with a stripe of purple-brown near the lower



FIG. 419.—Euglyphia hieroglyphica.
(Golden brown and green.)

edge; and the body and thorax are also glossy yellow, with purple marks along the centre.

One of the most remarkable points in this insect is the structure of the fore-legs, which are so thickly covered in front with long white down, that they look as if the insect had put its feet into a couple of white muffs, and as it has a way of holding them side by side in front of the head, the effect is very remarkable. The insect is a native of North America, and the larva feeds upon the grape-vine. The generic name is formed from two Greek words, one signifying "beautiful," and the other "a wood-nymph."



FIG. 420.—Eudryas grata.
(Cream-white, yellow, and purple.)



FIG. 421.—Nyctalea superciliosa.
(Brown.)

THE reader would scarcely think, on looking at the illustration

of *Nyctalea superciliosa*, and seeing the simple word "brown" given as applicable to its colouring, that it could possess any beauty. Its specific name expresses the same idea, inasmuch as it is a word which is sometimes used to signify anything that is sad or dull. The generic name, *Nyctalea*, which signifies "nocturnal," also refers to the dull, dark colouring. Yet, that it does possess beauty we shall presently see.

The surface of the upper wings is rather warm brown, covered with a profusion of marks of different qualities of brown. These run transversely across the wing, and look as if incursive waves of colour had washed over the wing and left their marks, just as do the sea-waves upon a sandy shore. The only way to see these marks properly is to hold the insect so as to look along the wing from base to tip. The artist has therefore represented the creature as it appears to an ordinary glance, and indicated a few of the marks only. The insect is a native of San Domingo. The under surface is shining grey.

THE name of the next insect, which literally signifies "sun-fringed," refers to the colouring of its wings, though in this case the word signifies beauty, and not dulness. The genus is a large and very pretty one, shining pink, white, and gold being the leading hues of the wings. None of the species are large, and some are much smaller than the present one.



FIG. 422.—Heliothys armigera. (Pink-brown and gold.)

The ground colour of the upper wings is pink-brown with dark markings, and the light-coloured specks that run parallel to the outer edge are dun. The lower wings are grey-brown, broadly edged with dark brown on the lower and outer edges; while along the upper edge runs a streak of brilliant shining gold. This gold streak exists more or less throughout the genus, and has gained for it the name

of "Sun-fringe." The thorax is boldly mottled with brown and white.

There are very few insects which have so large a range of locality as this. There are many specimens in the British Museum, and they were taken in the following localities, which I give in the same order as they occur in the Museum, without any attempt at grouping them :—Europe, Gibraltar, Navigator's Island, Rio de Janeiro, Natal, Congo, Venezuela, Georgia, Australia, Jamaica, Mexico, Northern India, Ceylon.

THE insect called *Praxis corvus* is a native of Tasmania. Its general colour is black, but with a side-light there is a gloss of



FIG. 423.—Praxis corvus.
(Sooty black.)

blue, like that of iron. The specific name *corvus* signifies "a crow," and is given to the insect on account of this blue-black colour, which is just that of the crow's plumage.

The upper wings are boldly scolloped at the edges, and are crossed by three irregular bands of jet black. The lower wings are similarly coloured, but have only two black bands, and

along their inner edges is a greyish down. As the nervures are somewhat thick, they become shining in an old and worn specimen, and consequently make it look very different from a young and fresh one. The abdomen is sooty black, with the edges of the segments grey, and the sides rather greyish.

THERE is a group of large Moths called from their sombre colours, Erebidæ. The reader will remember that Erebus was the name given by the ancient Greeks to the lower regions,



FIG. 424.—Thysanira Agrippina.
(Grey, brown, and black.)

which were represented by them to be dark, dull, and sombre. In consequence of the exigencies of space, the insect is drawn of barely half its proper size, the extended wings of the Moth itself measuring about seven inches across. The Erebidæ are South American insects, and the present species is a native of Brazil.

The colour is pale grey mottled and banded with brown and black, and the wings have a curious aspect which cannot be better expressed than by the word "peppered."

The habits of these Moths are very much like those of our large Underwings (*Catacola*). They will sit motionless on the trunk of a tree or any similar surface, the mottled grey, the brown and black of their wings so exactly coinciding with the object on which they rest, that they can scarcely be detected even by a practised eye. Sometimes, when disturbed, it will fly deliberately to some trees, suddenly whirl, and settle so quickly that it is practically undiscoverable. Mr. Gosse mentions that the under side of felled trees is a favourite resting-place for the Erebidæ. Sometimes one specimen takes a fancy to a particular spot, "to which it resorts with such uniformity during its hours of repose, that it may almost with certainty be dislodged on any afternoon by giving a smart rap on the outside of its shelter. Out it rushes with such a startling suddenness, and with so irregular and zigzag a motion, as often to defy capture, even though we are all on the watch for it."

THE handsome and variable Moth called *Brana calopasa* is a native of Ceylon. There is but one species of the genus at present known to entomologists.

Although there is some variety both in the colour and the markings, the insect may be briefly described as follows. The ground colour of the upper wings is pale brown glossed with gold, and the marks which stud its surface are black, edged with white. At the tips of the wings there is a large patch of dark blackish brown, traversed by a narrow white bar. The lower wings are sooty brown edged with white.



FIG. 425.—Brana calopasa.
(Pale gold, brown, and black.)

The thorax is grey with a brown tuft, and the abdomen is black, with a patch of bright grey at its base, and the last few segments are of the

same colour. The name *calopasa* is formed from two Greek words signifying "entirely beautiful."

THERE is a small group of Noctuites called Ophiderides, or Snake-backed Moths, of which we shall take two examples. The first is *Ophideres apta*, a native of Santarem. The ground colour of the upper wings is light brown with a pinky gloss, and upon it are multitudinous markings, dispersed as seen in

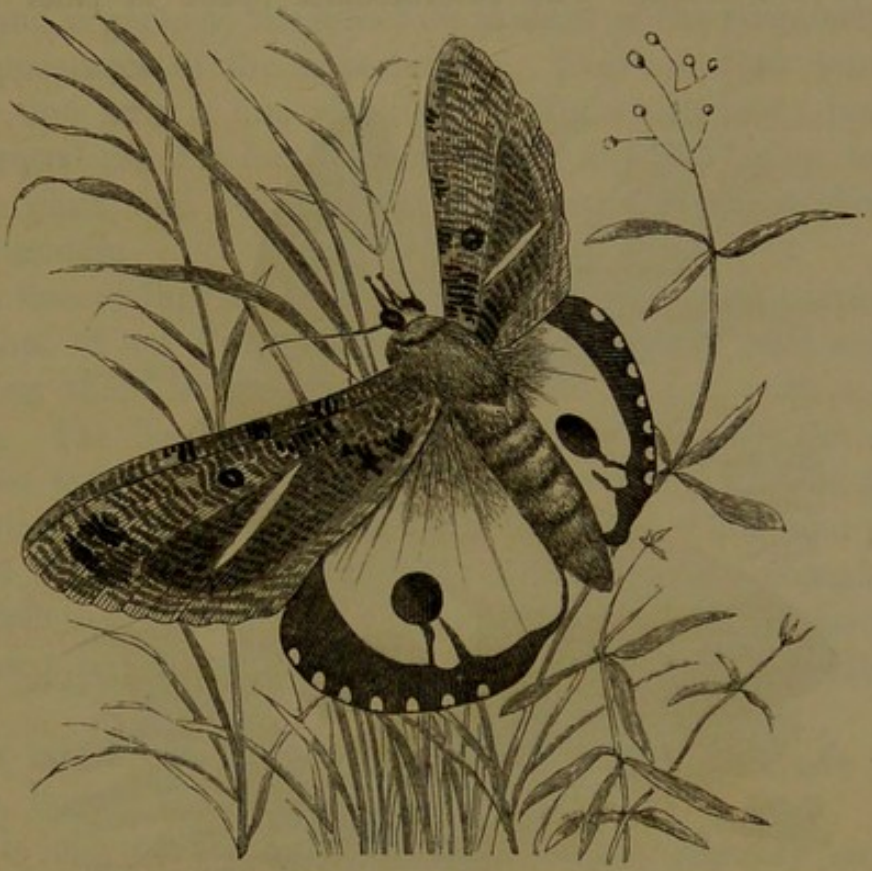


FIG. 426.—Ophideres apta.
(Pinky brown, orange, and black.)

the illustration. There are also some dark brown spots and mottlings. One of the most conspicuous points in the upper surface is the bold streak of pure white that is drawn across the centre of the wings. The lower wings are more handsome than the upper, their ground colour being orange, with a broad edge and large spot of black washed with purple. A number of white spots run round the outer edge of the wing.

In the Museum is a cocoon of this Moth. It is so wrapped in leaves that it is not easily seen, but in forcing its way out, the insect has brought with it a piece of the cocoon, so that its

texture is visible. It is very slight in texture, like the finest muslin, and when examined with the aid of a magnifier, is seen to be a delicate lace-like structure, with a sort of indefinite pattern about it.

THE second species, *Ophideres dividens*, is a native of Java.

At the base the upper wings are brown, with a wash of olive-green, and a broad band of the same colour occupies the outer edge of the wing. The intermediate space is paler brown,

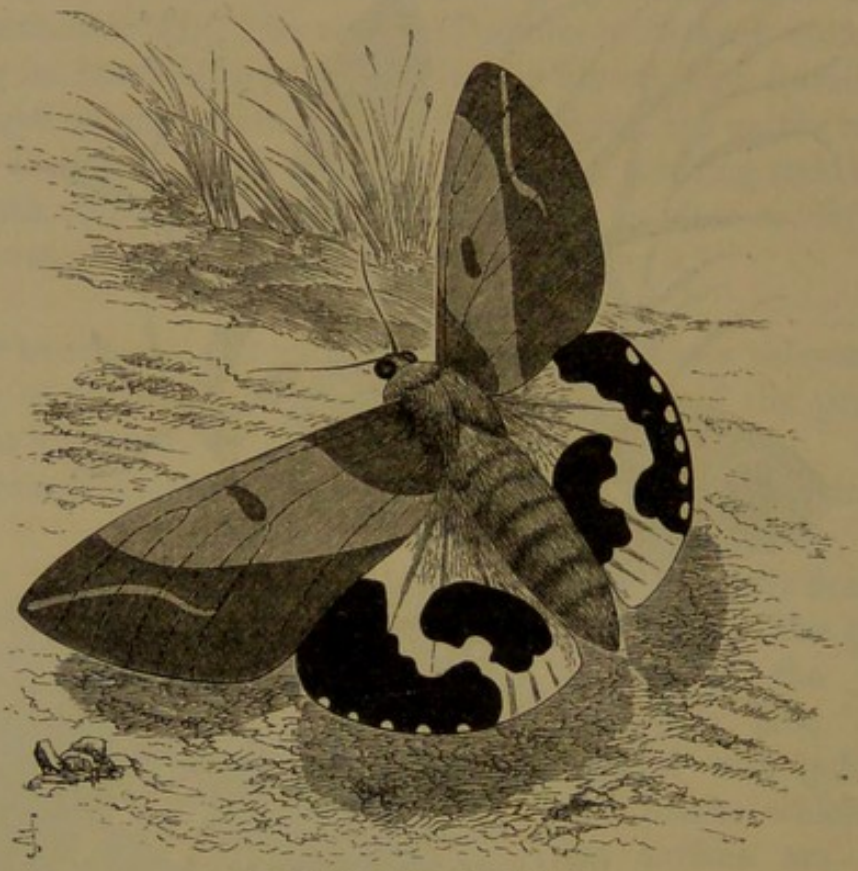


FIG. 427.—Ophideres dividens.
(Brown, yellow, and black.)

washed with pink. The lower wings are coloured much like those of the last-mentioned insect, except that there is not so much red about it, the ground colour being yellow instead of orange, darkening towards the base. The thorax is soft brown, and the abdomen yellow.

There are many species of Ophideres, and the similarity of colour is so close that it is not easy to distinguish between several of them. There are two, however, which stand out rather conspicuously from the rest. One is *Ophideres Salminia*, a native

of India and Java, in which the upper wings are beautifully glossed with shining green. The other is *Ophideres smaragdipicta*, in which the wings are purple-brown, on which is laid a pattern defined as sharply as if painted with emerald-green. The specific name is Greek, and signifies "emerald painted."

On Plate XVI. Fig. 2 is seen a Moth called *Phyllodes consobrina*, a native of Silhet.

The generic name is formed from a Greek word signifying "a leaf," and is given to the insect on account of the singularly leaf-life appearance of the upper wings. They are dark brown in colour, and have a line along the centre which looks just like the central rib of a leaf. Towards the tip the brown takes a purple gloss, and there is a doubly curved mark of chocolate in the middle.

The lower wings are dark brown, changing to rich purple, just like that of our Purple Emperor. Towards the anal angle of the wing there is a large spot of bright scarlet, with a white centre. The body is brown, glossed with purple. The reader will see that the distribution of the colours is intended for the protection of the insect. The brilliant scarlet, white, and purple of the lower wings would make it exceedingly conspicuous, but when their glories are veiled under the leaf-like upper wings, the insect becomes scarcely distinguishable from dead foliage.

The insect which is shown on page 694 is found in India, China, Borneo, the Philippines, and Java.

It is one of the most variable insects, scarcely any two specimens being alike. That which is the subject of the illustration is coloured as follows. The upper wings are dun brown from the base to half their length, and then change to yellowish brown speckled with black. The spots are black, edged with white. A similar division of colour occurs in the lower wings, except that the basal portion is chocolate. In the middle there is a large oval mark of pale blue. The specimen which has been described was taken in Silhet.

Another inhabitant of Silhet now comes before us called *Nyctipao albicincta*, both names being very appropriate.

The ground colour of both pairs of wings is dark brown,

taking a chocolate hue towards the edges. A bold white belt runs nearly parallel to the outer edge of the wing, and from it diverge a number of streaks of the same colour. The specific name *albicincta*, "or white-girdled," refers to this belt. In the centre of the upper wings there is a large eye-like spot, almost too complicated for description. It looks like a combination of



Fig. 428.—Potamophora manlia.
(Brown, black, and blue.)

the eye-spots on our well-known Peacock Butterfly, some streaks of bright blue occupying the centre, and surrounded with black, chocolate, olive, and dun, all blending together in the most exquisite manner.

There are many species of Nyctipao, but none in which the eye-spot so much resembles that of the Peacock Butterfly. The generic name signifies "Night Peacock," and is given to the insect on account of this peculiarity.

The insect which next comes before us is Australian.

It is a very beautiful species, and curiously variable. The ground colour of the upper wings is a light chocolate, taking a

pinkish hue towards the tips, and being covered with a multi-

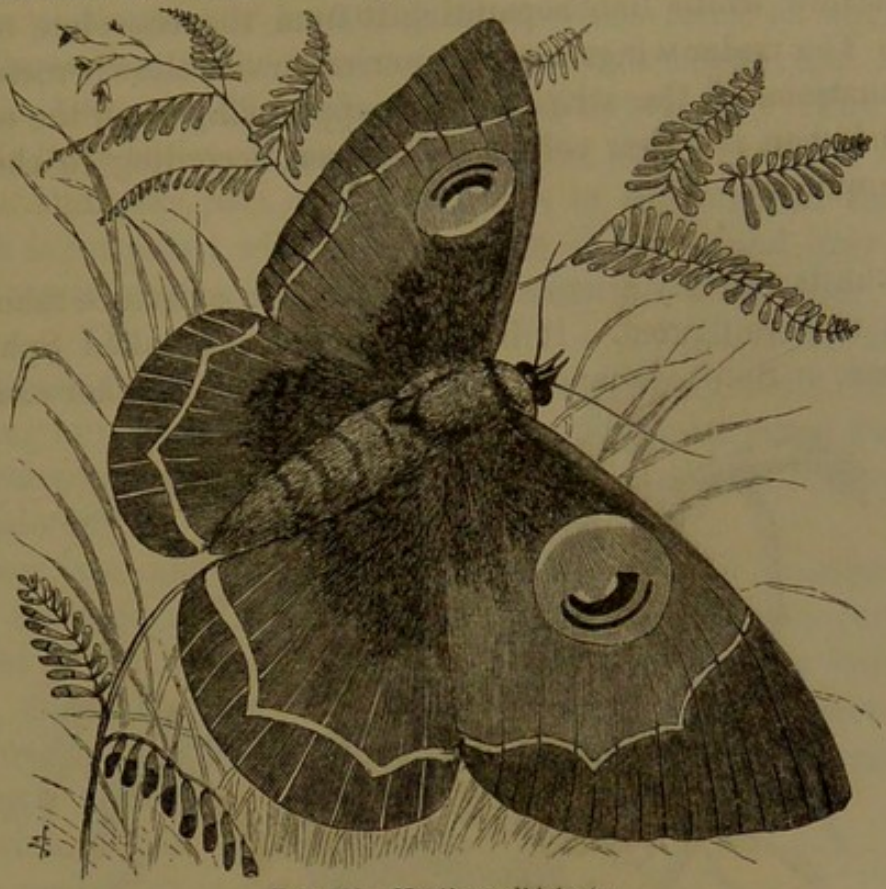


Fig. 429.—Nyctipao albicincta.
(Dark brown, white, and olive.)

tude of little brown marks. From the base of each wing a bold streak of white runs towards the tip, and is edged on either side with black. Five stripes run from the tip of the wings to the inner edge, one being straight and the others wavy. The colour of these stripes is very variable, ranging from white to yellow.



Fig. 430.—Calliodes orbigera.
(Chocolate and crimson, or yellow.)

On the middle of the wing is an eye-like mark, coloured as follows. In the centre is a crescent-shaped spot of dark brown, edged with black, and being surrounded with a circle of choco-

late. Then comes a black circle, then a white one, and lastly a very narrow white line separating it from the chocolate of the wing. The under wings are either crimson or yellow, crossed by continuations of the stripes of the upper wings, and the end of the abdomen is either yellow or crimson, according to the hue of the wings.

THERE is scarcely a more curious Moth in existence than that which is here figured. It belongs to a group called Sphingomorphas, or Sphinx-shaped Moths, and affords another example



FIG. 431.—Sphingomorpha fulgurifera.
(Reddish brown and grey.)

of the imitative forms so often seen among insects. The resemblance which is borne by these insects to the Hawk Moths is so remarkably close that anyone who saw a Sphingomorpha for the first time would be nearly certain to rank it among the Hawk Moths rather than to place it in its proper position.

The upper wings of the insect are divided into two totally distinct portions by two shades of brown. The upper half of the wing is light chestnut, and the lower dark brown, the line

of demarcation running from tip to base. Upon the wing are drawn a number of beautiful silver-white lines, as shown in the illustration. The lower wings are dark brown, and in the middle there is a triangular patch of a lighter hue. The abdomen is light brown, barred with a darker hue.

The strangest part of the insect is to be found in the tail, which is furnished with a large brush of brown and grey hairs, the former occupying the upper and the latter the lower portion. The appearance of the tuft is curiously like that of the Brush-tailed Porcupine. The hairs, which are, in fact, nothing but developed scales, are exceedingly long and flat, and are widened at the ends so as to resemble very much elongated battledores.

There are many species of this group, mostly Brazilian, but none so large as this. Mr. A. H. Butler describes a very fine species which he has named *Tarsolepis remicauda*, a native of Java, and has given an admirable figure of the insect as it appears in life, clinging to a twig, so that the double tail-tuft displays its peculiar construction. The specific name *remicauda* is Latin, signifying "oar-tail," and is given to the insect because the long tail-hairs with their widened and flattened ends look very much like oars.



FIG. 432.—Achæa Chameleon.
(Brown, olive-grey, and white.)

THE CHAMELEON MOTH well deserves its name, for it is so exceedingly variable in colour that two specimens can scarcely be found which are exactly alike. It has a tolerably wide range of country, the specimens in the British Museum having been brought from almost all parts of Southern and Western Africa.

The specimen which is here figured has the upper wings chocolate brown from the base to nearly half their length, the

remainder being browns of various shades. The lower wings are brown, with a spot of grey in the middle, and some white marks on the outer edge. This, however, is only one out of the twenty-five specimens in the British Museum, in which the colours of brown, grey, olive-green, chocolate, and white are so indifferently spread over the surface that it is hardly possible to decide upon any particular specimen as the type of colouring.

THE Moth which is here figured inhabits India, Ceylon, Sumatra, and Java, and is a pretty though not conspicuous insect.

The upper wings are olive-brown and pink, arranged as follows. First comes olive-brown, extending from the base to nearly the middle of the wing. Then comes a pink bar, extending completely across the wing; and the rest is olive-brown, with the exception of a curved pink stripe stretching from the lower edge nearly, but not quite, to the tip. The lower wings are brown, edged with a paler hue, and having a yellow patch in the middle.



FIG. 433.—Ophiusa fulvotænia. (Brown, pink, and yellow.)

There are many species of this genus, one of which—perhaps the most remarkable in colour—has not yet been described. The upper wings are rich deep brown, with a slight blue gloss. Across the middle of each wing is drawn a broad diagonal bar of chalky white, so arranged that when the wings are closed the bars unite and form a saddle-shaped mark over the back. The wings are edged with a row of little chalk-white marks like the cogs of a wheel. As the thorax is red, the appearance of the insect when at rest is sufficiently remarkable.

The specific name *fulvotænia*, or "tawny-band," refers to the reddish bar across the upper wings.

THE generic name of *Trigonodes* is Greek, signifying a triangle, and is well applied to all the members of the genus. The triangle is the chief character of the insects, no matter where they may live. They are found in India, China, Africa, Australia, and Jamaica. None of them reach any great size, the present species being, as may be inferred from its name, the largest of the genus. There is but little diversity in colour among them, brown, chocolate, yellow, and grey being the prevailing hues.

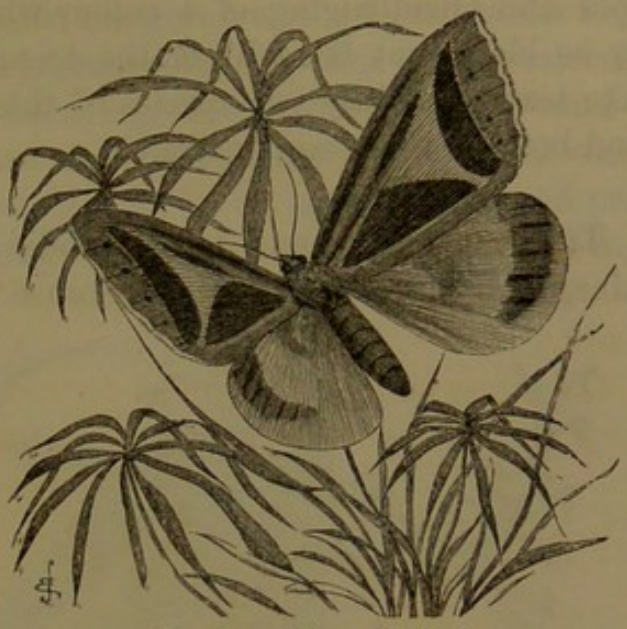


FIG. 434.—Trigonodes maxima.
(Brown and yellow.)

In the present species the ground colour of the upper wing is pale yellowish brown, on which are placed three bold marks of dark chocolate-brown. The lower wings are yellow-grey, and the two pointed stripes upon them are rather dark brown. This species comes from Hindostan.

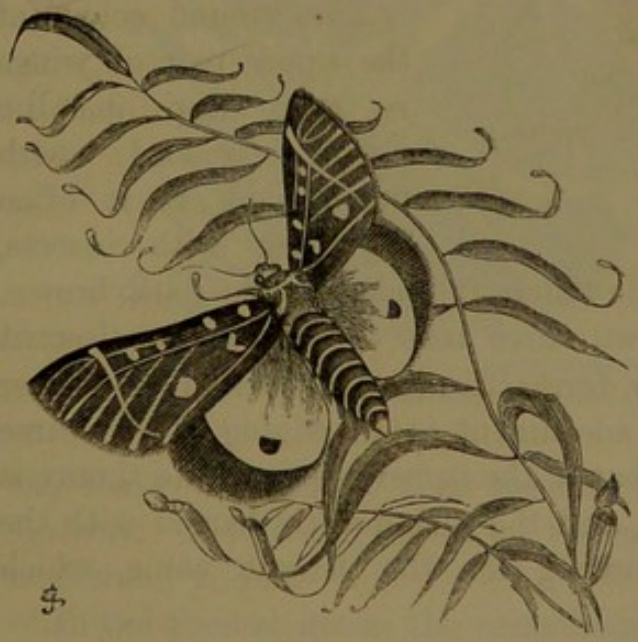


FIG. 435.—Cardamyla carinentalis.
(Orange, grey, and purple.)

OF the great and important group of the Pyralidæ we can take but two examples, the first of which is called *Cardamyla carinentalis*, and is a native of Australia.

It is one of the many insects which require a favourable light before their beauties are appreciated. At first it looks as if it were simply coloured with black and orange, but with a good light it is seen to be really a splendid example of colouring.

The ground colour of the upper wings is sooty brown, with a glossy silky surface, and upon it are a number of lines of shining grey glossed with gold. The lower wings are orange, with a spot and broad edging of a colour which at first sight appears to be black, but is really of the deepest purple, with a velvet-like texture. Only two species of this genus are as yet known, and both of them are Australian.

THERE is a small and most splendid group of Pyralidæ called Margarodidæ, or Pearl Moths, because the ground colour of their wings is exactly like mother-of-pearl both in colour and in iridescence. It is scarcely possible to imagine anything more magnificently dazzling than a collection of these Moths, one of the largest of which is the present species, a native of Domingo.



FIG. 436.—Lypotigris reginalis. (Pearl and purple.)

The ground colour of the upper pair of wings is rich deep metallic purple, washed with green, and, as is often the case with insects, there are some lights in which it looks simple dark brown. Upon this wing are drawn three bars of lustrous, opalescent pearl. This latter colour forms the ground hue of the lower wings, whose only other adornment is an edging of the same deep metallic purple as that of the upper wings. The thorax is mottled black and white, and the abdomen is barred with the same colour, thus accounting for the generic name, which signifies "Wolf-Tiger."

One of the most curious of the group is *Phakellura hyalinotatis*, of South America. With outspread wings it is very triangular in shape, and the wings are glossy in the middle, with an edging of gold-brown. The tail is ornamented with a tuft of diverging oar-shaped hairs, almost exactly resembling

those of the Sphingomorpha. The generic name, which literally signifies "bundle-tail," refers to this peculiarity.

As all entomologists know, the group of the Geometridæ is so enormous that only a few characteristic species can be selected as representatives. The name signifies "land-measurer," and is given to the insects because the caterpillars do not crawl when walking, but double themselves up in an arched form, and proceed as if they were engaged in measuring the ground. From



Fig. 437.—Erebomorpha fulguraria
(Brown, yellow, and grey.)

the shape which they then assume they are popularly called Loopers. A full description of them will be found in "Insects at Home," p. 446.

In the present genus the resemblance to the Erebus Moths is so close as to earn for the insect the name of *Erebomorpha*. The ground colour of the wings is brown, covered with minute pencillings of paler brown, grey, and yellow. Over both wings is a curious, irregular jagged pattern of greyish white lines, which has given to the insect the name of *fulguraria*, or Light-

ning Moth. There is a tuft of yellow at the base of the thorax, which, with the abdomen, is brown.

This is really a difficult insect to describe. As long as there is any definite pattern, that pattern can be traced. As long as there is any definite colour, that colour can be indicated. But there are cases, as with the present insect, where exists neither definite pattern nor colour, and where the powers of description are utterly baffled. Without a figure no description could be of the least service, and, even with it, I can only offer the following approximation to a description.



Fig. 438.—Elphos hymenaria.
(Yellow, brown, grey, and black.)

Take your Moth and wet it. Take some pepper-boxes, and fill them respectively with raw and burnt umber, gamboge, Indian ink, Chinese white, and sepia. Shake them indiscriminately over the Moth, let the colours all run together on the wet surface, and these will be a good representation of the ordinary colouring of this insect. Perhaps the yellow may be the predominant colour, or perhaps the white, or the black. It does

not in the least matter, for the actual insects exhibit just such eccentricity of colouring, and it is absolutely impossible to say definitely what the ground colour really is. Some specimens are almost entirely sooty brown, others are mostly grey, like lichens; in others the yellow predominates, while in some the prevailing characteristic is a series of black blotches and spots.

It is equally variable in size, and in this insect sex has nothing to do with the variation, some of the smallest specimens in the British Museum being females. This specimen is a native of Northern India.

THE delicate-looking insect which is here represented is a native of Sarawak, and belongs to the small family called Micronidæ.

The colour is a peculiarly soft, creamy white, with a kind of sparkle upon it here and there as if powdered glass had been thinly sprinkled over the wings. On the upper wings are six transverse stripes of the palest brown, four being long stripes and the other two short. On the lower wings are two stripes and a few pencillings of the same hue. The only positive colouring in the insect is found in the little black spots along the edge of the upper wings, and the short streaks on the edge of the lower wings.

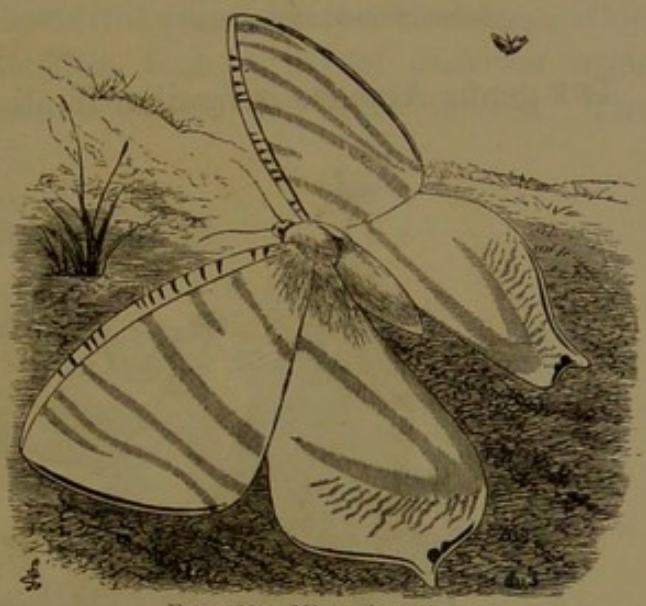


FIG. 439.—Micronia astheniata. (White and pale brown.)

The specific name *astheniata* signifies "enfeebled," and refers to the paleness of the colours. Another species, *Micronia justasia*, of New Guinea, is almost exactly like this insect, except that it has three brown bands on each wing. There are twenty-nine species in the British Museum.

THE genus Panagra is a very large one, and is mostly African or Australian, from which latter country the present species

was brought. Generally they are dull coloured and small, and this is the only one which takes the eye at a first glance.



Fig. 440. Panagra tricolor. (Brown, yellow, and orange.).

From the base to the centre the colour of the upper wings is dark brown. Then comes a stripe of greenish yellow, and the rest of the wing is chocolate-brown. The lower wings are dark brown, and in the centre there is a large patch of warm orange.

The genus Abraxas is familiar to all English entomologists on



Fig. 441.—Abraxas tigrata. (Orange and black.)

account of the Magpie Moths. On taking out the drawer con-

taining this genus, it is rather startling to come upon our Currant Magpie and Clouded Magpie, looking like old friends in a strange land.

The present species is a native of Northern China. In common with most insects of this genus, it is much liable to variation, as may be seen by inspecting the four specimens in the British Museum. In one of them the ground colour is entirely orange. In another, both pairs of wings are edged with orange, the centre fading into greyish white ; and in the two others the upper wings are entirely orange and the lower are grey, edged with orange. In all the spots are black.

The body is orange banded with black. The insect is called *tigrata* because it bears some resemblance to the Tiger Moths.

We now come to the beautiful group of the Erateinas, which look so much like butterflies that a casual observer would be nearly certain to mistake them for those insects. They are mostly Brazilian, and in some respects remind the observer of the Catagramma butterflies, some of which have already been described. Some species are tailed, while others have the hind wings simply rounded.



Fig. 442.—Erateina leptocircata. (Brown, green, and orange.)

The present is an example of the tailed Erateinas. The upper wings are olive green at the base, changing gradually to dark brown at the tips. Across the centre runs a band of pale, shining yellow-green. The greater part of the lower wings is orange, paling to yellow at the end of the tails, and having a dark brown stripe on the outer edge.

This species inhabits New Granada. Another species, *Erateina Julia*, somewhat resembles it, except that each of the lower

wings is traversed throughout its whole length by a bold, wavy, black stripe.

As several of the Erateinas are remarkable for the beauty of the under surface, two species will be given, so as to show both surfaces of each.



Fig. 443.—Erateina lineata. Upper surface. (Dark brown, green, red, and yellow.)

The first is *Erateina lineata*, a native of Bogotá. The upper surface of the upper wings is dark brown with a peculiarly glossy surface, and across the middle is drawn a streak of pale green, very much like that of the preceding species, but a trifle brighter and with more green in it. From the base of the lower wings to the centre or beyond it, the colour is dark brown, traversed by a number of yellow lines, which have earned for the insect the specific name of *lineata*. The remainder of the wing is red, but the width of the red edging is exceedingly variable.



Fig. 444.—Erateina lineata. Under surface.

The under surface of the upper wings is rich warm chestnut, with a narrow gold-brown streak running parallel with the outer edge. A bar of pale green coincides with the mark on the upper wing. The lower wings are chestnut, warming into bright red near the tips, and upon them are drawn a number of golden lines disposed as shown in

the illustration. Round the edge of the wing are alternate spots of very dark brown and bright yellow, so that the under surface of the insect is very much handsomer than the upper.



Fig. 445.—Erateina regina. Upper surface. (Copper-red, silver and gold, and white.)

The last of these beautiful insects is *Erateina regina*, one of the rarest and, as far as is at present known, the handsomest of the group. There is only a single specimen in the British Museum. It is a native of Bogotá.

Although the upper surface of this insect is handsome, it has not much to distinguish it from the other species of the same genus. The upper wings are rich copper red, becoming darker towards the edge, and there is no green mark across them as is usually the case with the Erateinas. The lower wings are olive brown for half their length, when they are crossed by a narrow wavy line of bluish white, followed by a very wide bar of black-brown, edged with snowy white.



Fig. 446.—Erateina regina. Under surface.

On the under surface the upper wings are silvery grey at the base, followed by chocolate. Near the outer edge of the wing is an indistinct bar as of powdered silver, and across the middle stretches a bold and well-defined bar of burnished silver. The lower wings

are olive-brown at the base, traversed by gold lines. Through the middle runs a broad silver bar edged on either side by a line of ruddy chestnut. The next portion of the wing is powdered with gold, and the rest is rich chocolate brown, edged with snowy white.

THE last of the Moths which can be described in this work is *Nelcynda rectificata*, a native of Darjeeling, in Hindostan. This is the only species at present known.

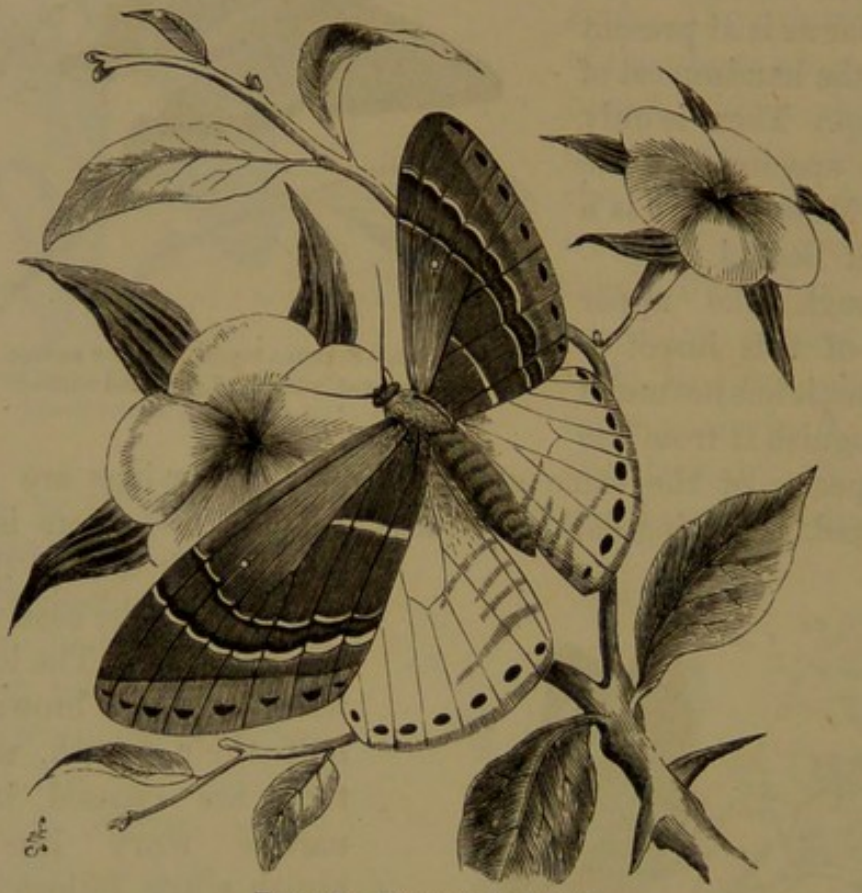


FIG. 447.—Nelcynda rectificata.
(Brown, white, and grey.)

The ground colour of the upper wings is soft grey-brown towards the base, becoming darker near the tip. A little roundish spot of white is near the middle of the wing, which is crossed by several narrow bands of the same hue. A row of small dark chocolate-brown spots runs parallel with the outer edge of both pairs of wings.

The lower wings are very pale grey-brown, nearly translucent towards the base, and they are transversely pencilled with a brown very slightly darker than the hue of the wings.

HEMIPTERA;

OR,

HETEROPTERA.

HEMIPTERA;

OR,

HETEROPTERA.

BOTH these titles are used as names of the next order of insects, and both are appropriate. The former word signifies "half-wings," because the upper pair, which are analogous to the elytra of the Beetles, are partly hard and opaque, and partly membranous and diaphonous. The word Heteroptera signifies "different wing," and is given to the insects because the upper wings are partly opaque and partly transparent.

The mouth of these insects is modified into a piercing and sucking apparatus which may be called its beak; and there are some species in which the beak is so sharp and strong that it can inflict a wound on the human skin which, for a time, is nearly as painful as the sting of a wasp. Details of this organ may be found in "Insects at Home."

We will now pass to the foreign species of Hemiptera, taken in the order which they occupy in the British Museum, which arrangement can but be considered as a provisional one.

OF all the variable creatures in the world, commend me to the insect called *Cimex* (or *Tectocorix*) *Banksii*. It has a very wide range of locality, having been taken in Java, New Caledonia, Australia, Timor, the Celebes, and Tonga.

The specimen which is here figured is coloured as follows. The ground colour of the insect is yellowish brown, and the marks upon the elytra are either blue or green, according to the light, and are glossed with gold. The marks on the thorax are

purple. As for the other specimens, here are a few examples of variation: scarlet, barred with black; blue, edged with green; orange, with a few brown pencillings; yellow, spotted and edged with green; all scarlet; all brown. And, as if to carry variation to its furthest extent, some specimens are not half as large as others.



Fig. 448.—Cimex [or Tectocorix] Banksii. (Almost any colour except black or white.)

Here is another insect called *Scutellaria nobilis*, a native of India and Siam.

Above, the insect exhibits every imaginable shade of blue and green, varying from deep violet to emerald. In many cases the colour, whether it be blue or green, is so deep that no spots are visible upon it. When, however, the spots are visible, they are always black.

No matter what may be the colour of the upper part of the body, the under surface is invariably scarlet barred with black, and the legs are scarlet as far as the tibia, which, with the tarsus, is black.



Fig. 449.—Scutellaria nobilis. (Violet, green, and black.)

In the insect called *Phlœa corticata*, there is little room for variation, the colour being pale brown.

It is an odd-looking being—the sides of the head, thorax, and

abdomen being flattened until they are thinner than the paper on which this book is printed. Each segment of the abdomen is cut into a toothed form at the tip, and the combined outlines are exceedingly graceful. They are so thin as to be partly translucent, and the only opaque portions of the insect are those which are occupied by the vital organs and covered by the wings.



Fig. 450.—Phlœa corticata. (Pale brown.)

The general appearance of the insect so closely resembles that of a piece of dead bark or withered leaf, that it really seems wonderful how such an insect could have been detected at all. Only a few species of this genus are known, and they are all Brazilian.



Fig. 451.—Catacanthus incarnatus. (Brown, black, and scarlet.)

The insect which now comes before us is rather widely spread, the specimens in the British Museum having been taken in India, Ceylon, Malacca, the Celebes, Java, Siam, and Borneo.

Like many of its kin it is exceedingly variable, not only in the colour, but in the number and shape of its markings. The specimen which is figured is red, with a kidney-shaped black mark in the middle of each elytron. The ends of the wings are dark blue-brown.

Some specimens have a large black oval spot on the two upper angles of the scutellum, while others have the ground colour brown or dun. But, no matter what may be the colour of the upper surface of the elytra, the under surface is always red.



Fig. 452.—Edessa cornuta.
(Grey, brown, and yellow.)

The insect which is here given is a native of Pará, and the specimen from which the figure was drawn was brought to England by Mr. Bates.

It derives its specific name *cornuta*, or "horned," from the shape of the thorax, which is prolonged on either side so as to look like a pair of horns. The colour of the thorax is rather variable, being in some specimens pale brown and in others greyish olive. The scutellum is yellow, and the upper part of the body azure. The upper wings are brown with a purple gloss, edged with golden yellow on the upper margin. Below it is yellow pencilled with black.

The genus is West Indian, and is a very large one, more than one hundred and thirty species being known.

Both names of the accompanying insect are descriptive, one of its form and the other of its colour. The name *Brachystethus* is Greek, signifying "short-breasted," and is given to the insect on account of the shortness of the thorax. The Latin name *rubromaculatus* signifies "red-spotted," and refers to the large red spots upon the black surface.

These indeed are the only colours. The ground hue is shining black with a green gloss, and the other portions are bright scarlet. The scutellum is very deeply punctured, and the rest of the surface slightly so. The colour below is exactly the same as it is above. The insect is a native of Brazil.

On Plate XIX. Fig. 3 is seen an insect with some external resemblance to *Edessa cornuta*. It is a native of Sarawak, and its name is *Pygoplatys lancifer*.

The oddly-shaped thorax is blackish brown, changing to yellow in front. The scutellum is also brown, and is lengthened behind into a curious double spike like two fingers laid side by side. The ends of the wings are very dark brown, and the flattened abdomen, which projects on either side of the wings, is barred black and brown.



Fig. 453.—Brachystethus rubromaculatus. (Black and red.)

The peculiar beauty of the accompanying insect cannot be seen until the wings are spread. Above, its colour is soft brown tending to chestnut, and very finely punctured. When the wings are spread, the upper surface of the abdomen is seen to be deep velvet-black, on which is a tesselated pattern of rich panelled brown, the two colours looking much like those on the sides of our common cockchafer.

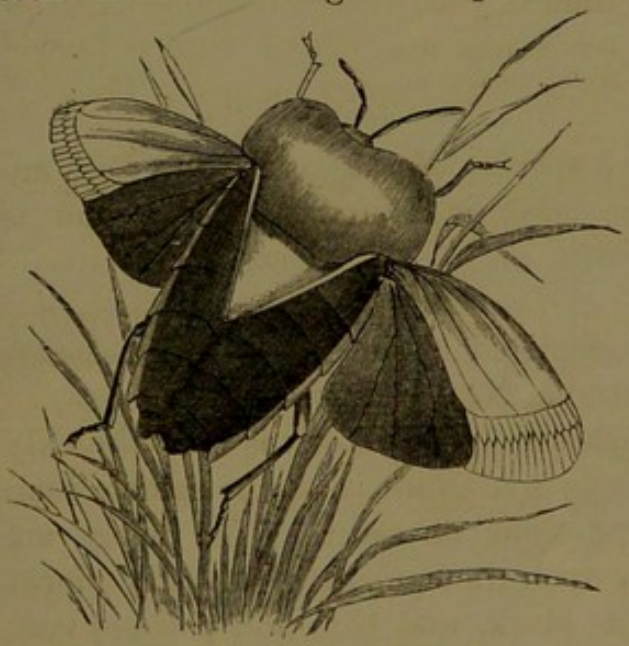


Fig. 454.—Tesseratoma Javanica. (Pale brown and velvet-black.)

As its name implies, it is a native of Java, but is also found in India. The genus is also spread through the Philippines, Celebes, Timor, Malacca, and Burmah. There are between twenty and thirty species.

The name of Atlas is given to the next insect because its enormous thorax bears some resemblance to that of the Atlas Beetle.

It is a curious looking creature, being very much flattened, and the thorax developed into the singular form which is here given. This part of the insect is very shining, and has a few punctures sparingly scattered over it. The scutellum is brown, and so is the end of the wings, while the body of the wings is



Fig. 455.—Amissus Atlas.
(Yellow-brown.)

yellow. There are only two species of the genus, and both are natives of Singapore. The other is *Amissus nitidus*, and is entirely shining yellow-brown.

On Plate XIX. Fig. 4 is depicted an insect called *Oncomeris flavicornis*, a native of Australia, New Guinea, and Ava.

It is a very handsome creature. The thorax is black, thickly punctured, and the very long scutellum is of the same colour, with a yellow mark running along its centre. The wings are blue, with a yellow pattern upon them, changing to fiery copper at their tips. The legs are black, and the hind pair are very widened—a peculiarity which is denoted in the generic name, which signifies "swollen legs," while the specific name signifies "yellow-horned," and is given to the insect because the antennæ are bright yellow

PLATE XIX.



THE pretty insect called *Sephina formosa* is a native of Venezuela.

The general colour is black with a violet gloss, and upon it are sundry markings of red disposed as seen in the figure. The thorax is fringed with black hair. Below, it is mottled with black and scarlet, and along the sides run a row of scarlet wedge-like spots, with a black spot in the middle of each.

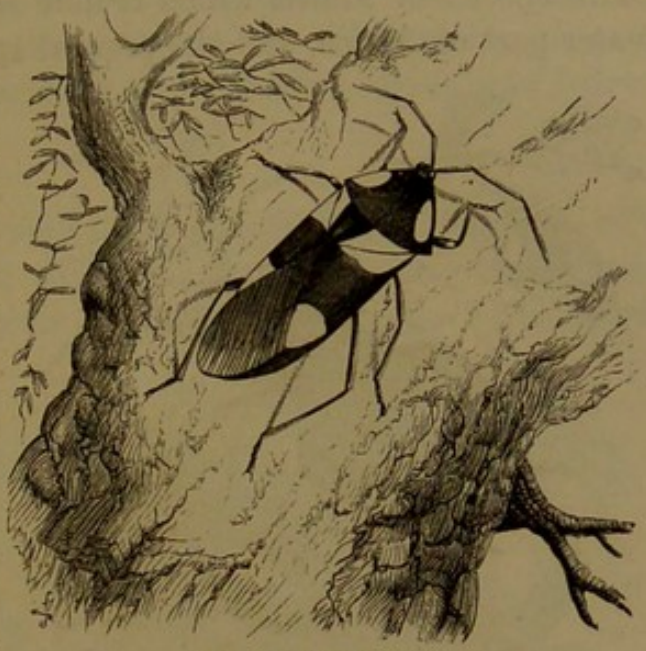


FIG. 456.—Sephina formosa. (Black and scarlet.)

TWO figures are given of *Dalader acuticosta*. One is seen on Plate XIX. Fig. 2, in order to show its appearance with closed wings; while in the accompanying illustration a figure is given with the wings spread as if in flight.



FIG. 457.—Dalader acuticosta. (Brown and yellow.)

Although its colours are simple, being only various shades of brown and yellow, it is a really pretty insect. It is flat, with the abdomen very much dished, and the whole of the surface is marked with the two colours already mentioned. The thorax is covered with tiny spikes, just like that of a very small spider-crab, and these spines make the sharp ends of the thorax rather formidable. The specific name *acuticosta*, or "sharp-ribbed," refers to this structure. Towards the end of

the antennæ is a round flattened plate. The insect inhabits India, Burmah, Borneo, and Siam.

THE species of Mictis which is here shown is spread over the greater part of Africa, and the present species has been selected on account of the singular shape of the hind legs, which has earned for the insect the specific name of *curvipes*, or "curve-footed."



FIG. 458.—Mictis curvipes.
(Grey-brown above, red-spotted below.)

The general colour of the upper surface is dark grey-brown, profusely punctured. The thorax comes into a spike at each angle, and the antennæ are black, changing to red at the tips. When the wings are spread, two spots of yellow are seen on the upper part of the abdomen. Below, it is spotted with red, especially on the sides of the thorax. The thigh of the hind legs is thick, massive, boldly curved, and furnished with several sharp spikes.

ANOTHER and rather striking example of the same genus is here given. It has a very wide range of country, specimens in the British Museum having been taken in Australia, New Caledonia, New Hebrides, Celebes, and Ceram.

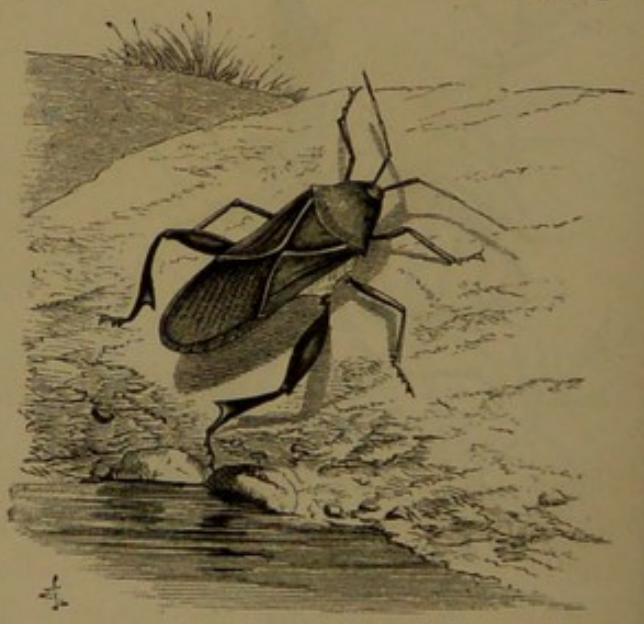


FIG. 459.—Mictis symbolica.
(Brown, with yellow cross on back.)

Above, its colour is brown, dark towards the head, and light towards the extremity of the body. Bold yellow lines are distributed in such a way on the back, that when the wings are closed they assume the form of St. Andrew's cross, and thus give rise to the specific name *symbolica*. When the wings are opened, the abdomen is seen to be reddish above, and below it is pale brown.

Both names of the following insect refer to the shape of its hind legs. The generic name is formed from two Greek words, one signifying "a flat plate" and the other "a leg." The specific



Fig. 460.—Petascelis remipes.
(Brown, yellow, and chocolate.)

name is Latin, and signifies "oar-footed." It is a native of Southern Africa.

The thorax is brown edged with yellow, and having a stripe of the same colour down the centre. The wings are chocolate-brown, deepening at the tips. Below, it is brown slightly mottled with yellow. The most conspicuous point in the insect is the structure of the hind legs, which are very large, flattened

like an oar-blade, and are edged on the inside with a coating of thick red down.

In many of the Hemiptera the two sexes can easily be distinguished by the hind legs, the thighs of which are large in the male and small in the female. This is the case with *Molchina compressicornis*, which is a native of Pará.

The general colour of this insect is velvet-black, with a number of metallic emerald-green scales. If examined by the



FIG. 461.—Molchina compressicornis.
(Black, with emerald spots.)

aid of a magnifying glass, these scales are seen to be gathered thickly round certain centres. This is most conspicuous on the wings. Their ground colour is brown, powdered with golden scales, and upon each is a velvet-black spot surrounded with several rows of the most brilliant emerald scales.

The ends of the wings are bronze, and below it is purple-brown, changing to pinkish on the sides. The antennæ are black, except the first half of the flattened portion, which is yellow.

Flattening in unexpected places is one of the principal characteristics of the Hemiptera, in which the legs, the antennæ.

the thorax, the abdomen, and sometimes the whole body, are as flat as if they had passed between rollers.

In the genus Metapodius, of which the present insect—a native of Brazil—is a good example, the hind legs are the portions affected. The colour of the insect is a dull red-brown, much like that of a cockroach, the former hue predominating in a line along the middle of the hind legs. In those limbs the thigh is round, while the tibia is quite flat, except a narrow red ridge which traverses the centre. All the legs are armed with

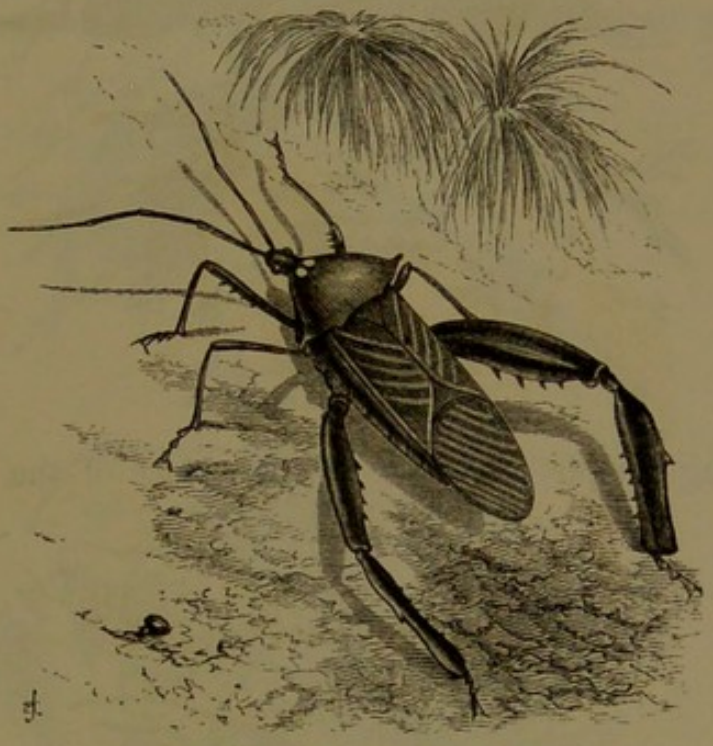


Fig. 462.—Metapodius latipes.
(Reddish brown.)

many spikes on the inner edge. It is a very odd-looking insect, and when the large hind legs are stretched at right angles with the body, its aspect is absolutely ludicrous. Below, it is brown flecked with white.

In the two following illustrations the same insect is represented in the perfect and larval stages. This is a Mexican insect, and in either stage of existence is very handsome. The principal colours are scarlet and black. This bold contrast of colours is well shown on the flattened portions of the antennæ, one half of which is scarlet and the other half black. The wings are velvet-green, traversed with shining yellow stripes,

and at the tips they change to copper-green. The lower wings



Fig. 463.—Pachylis gigas.
(Green, scarlet, and black.)

are shining purple, and the upper surface of the abdomen is

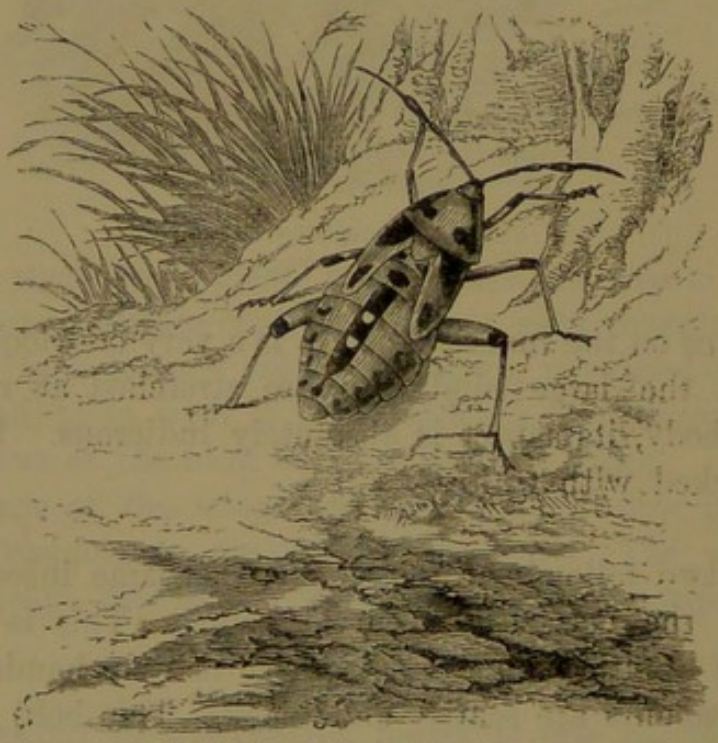


Fig. 464.—Larva of Pachylis gigas.
(Black and scarlet.)

scarlet. Beneath, it is dull white. These colours are exceed-

ingly brilliant even in the dried specimen, but in the living insect must even be more vivid.

The larva is coloured very much like a harlequin, the whole of the creature being alternately red and scarlet, with the exception of the undeveloped elytra and the spots along the back, which are bright yellow.

ANOTHER species of the same genus is here given. This is a native of Orizaba.

Without being so gorgeously coloured as its relative, it is a very handsome insect, and is remarkable for some peculiarity

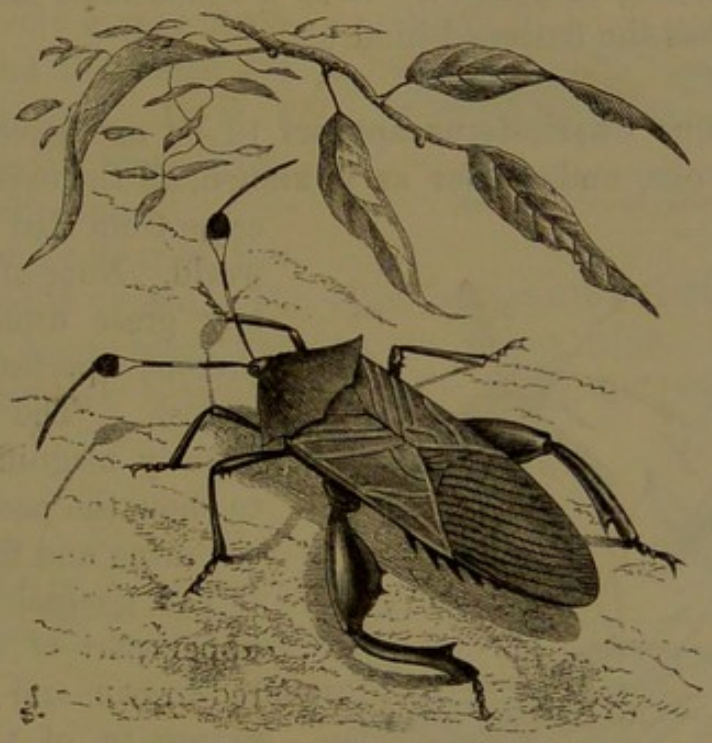


FIG. 465.—Pachylis acutangulus.
(Black, orange, and purple.)

of form. The flat plate on the antennæ is half yellow and half black. The thorax is dark brown, and the wings are black, traversed with orange lines. Towards the tips they become olive green with lines of metallic coppery red. The males have the thighs of the hind legs very much thickened and armed with sharp spikes. The most characteristic point in this insect is, however, the structure of the abdomen, which is much flattened, and has each segment developed into a sharp point, as is indicated by the specific name, which signifies something which has sharp angles.

On Plate XIX. Fig. 1 may be seen a representation of *Diactor bilineatus*. The former of these words signifies a conductor, or steersman, and is given to the genus because the hind legs are flattened so as to resemble the peculiar oar or paddle with which the ancients, who had no real rudders, were accustomed to steer their vessels.

It is very variable in size and colour, but as a rule it is dark red-brown, with two yellow stripes on the thorax and passing over the head. The upper surface of the abdomen is green. The flattened blades of the hind legs are reddish, tipped with yellow, and having several yellow spots upon them, mostly, but not always, four in number. It is a remarkable fact that even the larva has the flattened hind legs.

The genus Chariesterus appears to be exclusively a South American one, and, as far as is known, all the existing species came from that part of the world. None of them attain any great dimensions, the present species being the largest. The figure is slightly magnified in order to show the peculiarities of colouring and form.



Fig. 466.—Chariesterus mœstus. (Reddish brown.)

The general hue of the upper part of the body is red-brown, and that of the extremity of the wings is dark brown; the antennæ, with their flattened joints, being of the same hue. The lower wings are translucent. The upper surface of the abdomen is velvet-black, and its edges are white.

When its wings are closed, the accompanying insect bears a singular resemblance to our common Wasp Beetle (*Clytus arietis*).

The colour of the upper wings is brown, with two yellow patches, and crossed with a bar of translucent material. The body is dark brown, barred with yellow, and so shaped that

when the insect is seen in profile with spread wings, it looks almost exactly like one of our common sand wasps. It is a native of New Guinea, and one of the many insects that were captured there by Mr. Wallace. The figure is slightly enlarged.

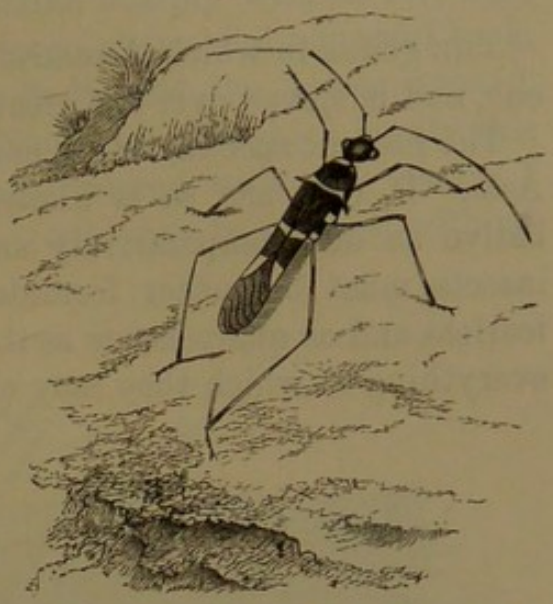


Fig. 467.—Marcius generosus.
(Dark brown and yellow.)

It has been already mentioned that many of the Hemiptera are flattened in various places. In the next insect, the body is very much flattened, and the limbs are greatly elongated. It is a native of India, Siam, Java, and the Philippines.

The general colour of this insect is reddish brown. The upper wings are red at their base, and have a large black spot on the upper edge. At the tip they become dark brown with a blue gloss, and, when crossed

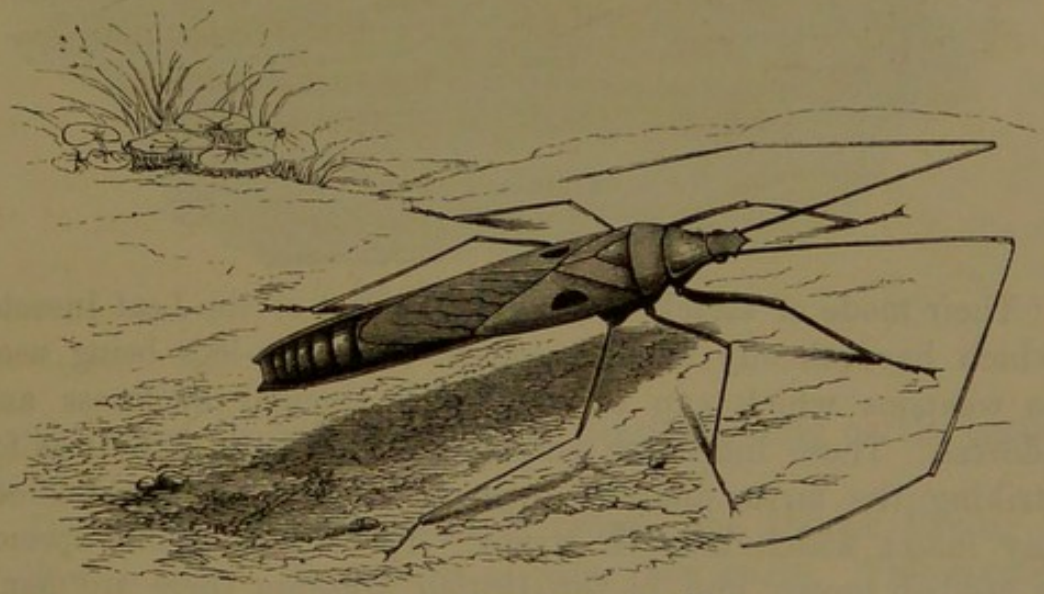


Fig. 468.—Macrocheraia grandis.
(Brown and red.)

upon each other when the creature is at rest, are so dark as to look quite black. The long antennæ are black, and so are the legs except the thighs, which are red. The abdomen is very

flat and scooped, and is red above. Below, the insect is red spotted with black.

THE genus to which *Ranatra Asiatica* belongs is a very large one, and is spread over the greater part of the world.

The present species, as its name imports, is an inhabitant of Asia. If they are, as is likely, as fierce, voracious, and combative as our comparatively small species, some of the exotic insects must be rather formidable. Our own species are as fearless and as quarrelsome as the great Rove Beetles, and attack everything to which they may choose to take an objection.



FIG. 469.—Ranatra Asiatica.
(Red-brown.)

Their mode of attack is exactly like that of the Leaf Insects, which have already been described, their fore-legs being used as weapons which can be used with singular swiftness and address. These limbs are employed for capture as well as for striking, the tarsus doubling over on the tibia so as to enclose any insect which may be struck. The colour of this species is reddish brown, and in the British Museum there are many specimens not yet named.

THE insect which is represented in the accompanying illustration is the largest of the Hemiptera, and is really a formidable creature. It is here only represented about half its real dimen-

sions, the length of a full-grown specimen being little short of five inches, and the spread wings measuring more than seven inches from tip to tip. It can strike sharply with its fore-legs, capture prey, and draw it to its large, sharp, and powerful beak, which is then driven into the body and the juices sucked. Seeing that several of our little Naucoridæ, to which family this insect belongs, can inflict a painful wound with their beaks, I should think that the Belostoma could not be handled without



Fig. 470.—Belostoma grandis.
(Brown.

extreme care, its beak alone being nearly as long as the entire Naucoris.

The colour of this insect is brown, the thorax having a yellowish edge. Beneath, it is paler than above. This species is a native of Pará.

The last of the Hemiptera which can be mentioned in this work is the little insect which is popularly known as the Chinch-bug (*Micropus leucopterus.*)

It is a North American insect, and is one of the pests of the country, feeding in its larval state upon the roots of wheat, and sometimes destroying half the crops of a district. On pulling up a wheat-plant, hundreds of the minute eggs may sometimes be seen adhering to the roots, where the mother insect has placed them, having made her way underground for that pur-



Fig. 471.—Micropus leucopterus.
(Blackish; white wings.)

pose. Fortunately the larva is killed by wet, so that a rainy season will be of the greatest service by destroying the young larva before they are able to produce young in their turn. In droughts, however, the Chinch-bug increases with fearful rapidity, and though the insect feeds chiefly on wheat, it does not disdain other vegetables. In fact, as an aggrieved farmer said of the insect, "nothing comes amiss to it."

The figure is necessarily magnified.

HOMOPTERA.

HOMOPTERA.

THE HOMOPTERA, or Equal-winged Insects, are so called because both pairs of wings are of the same character. The mouth is modified into a proboscis, and the feet never have more than three joints. In our own country the species are but small, and not at all conspicuous, but in other countries they often attain



FIG. 472.—Cicada septemdecem.
(Green; wings edged with brown.)

a great size, and play a conspicuous part in the economy of Nature, mostly as destructive agents.

One of the most celebrated examples of the kind is the insect so familiar in North America under the name of Seventeen-

years Locust. It has gained this name from its almost regular recurrence in the same spot once in every seventeen years. It does not appear and disappear simultaneously over the whole country, but takes one district at a time, appearing in vast swarms, doing great damage for a season, and then vanishing until the time for its next periodical visit. In some places its term of re-appearance is thirteen years.

Its colour is green, and the wings are edged with brown.

ANOTHER example of the Cicadas is given on Plate XVIII. Fig. 1, where *Cicada adusta* is mentioned. I very much regret that want of space debars me from inserting a long and very interesting account of the habits of certain species of Cicada, which I had preserved for this work. Suffice it to say that they are tree-feeders, and that the males are remarkable for the loud shrilling noise which they produce by means of an apparatus called the "drum," which is placed in the under side of the thorax, and is covered with a horny plate that can mostly be seen from the upper surface of the insect.

The present species is a native of Siam and Java, and is rather variable. Being a very large insect, the figure is necessarily reduced one-half. In some specimens the wings are wholly translucent, as shown in the illustration, and in others they are spotted with brown at the intersections of the nervures. Their whole surface is extremely iridescent.

THE remarkable insect called *Cystosoma Saundersii* is a native of Australia, and is a singular example of imitation, being almost exactly like the Cystocœlia which has been described on page 342.

In this insect the abdomen of the male is extremely large, and quite hollow, the vital portions only occupying a slight streak of thicker substance on the lower surface of the abdomen. The horny cover of the "drum," to which reference has been made, is seen just at the base of the lower wings. The object of this singular structure is uncertain, but some entomologists think that the hollow abdomen may increase the resonance of the sound produced by the drums.

The female has a much smaller abdomen, but it is solid and opaque, whereas that of the male is quite translucent. The

PLATE XVIII.



general colour is green. The upper wings are pale green, with he nervures of the lower surface traced in a brighter green, and



Fig. 473.—Cystosoma Saundersii.
(Pale green.)

the lower wings are translucent and iridescent. Three species of this genus are known, all Australian.

The accompanying illustration represents one of the most extraordinary of the insect race, the celebrated Lantern Fly, respecting whose luminosity a fierce controversy has long raged. When Madame Merian first described this insect, she mentioned very graphically its wonderfully luminous properties. Succeeding observers, however, flatly denied the luminosity, and attributed it to mere invention on the part of Madame Merian.

The conflicting accounts, however, can be easily reconciled. In all luminous insects the luminosity is capricious, and only endures for a certain time, so that many persons might observe the Lantern Fly carefully and never see its luminosity. There is, however, no doubt that the creature is luminous, as is shown by the fact that a description of the insect has been written by its

own light. There are four luminous spots, two on the upper surface of the abdomen, just below the thorax, and two on the under surface. The former give a purple and the latter a green light. Mr. F. Smith has pointed out that the body of the insect is covered in parts with a white efflorescence, like that of our glowworm.

The wings are brown, with a large eye-like spot on each of the lower pair, and the enormous head is as hollow as the



Fig. 474.—Fulgora laternaria.
(Wings brown and chestnut; head crimson, yellow, and blue.)

abdomen of the Cystosoma, and coloured with the most brilliant crimson, yellow, and blue. In Honduras, this insect is popularly called "La Belle."

We now come to some of those odd-looking insects which are popularly called Chinese Lantern Flies, and are found in every collection of insects brought from China. It is very difficult to judge of the real colours of these insects, as the hues fade almost immediately after death. The form, however, is of more im-

portance than the colour. Like the Lantern Fly, the head of the accompanying insect, which is a native of Java, is largely developed and hollow. Its chief peculiarity is the manner in which it is covered with multitudinous spikes, short, sharp, and sturdy, the use of which it is difficult even to conjecture. The colour of the wings is brownish green, spotted with black.

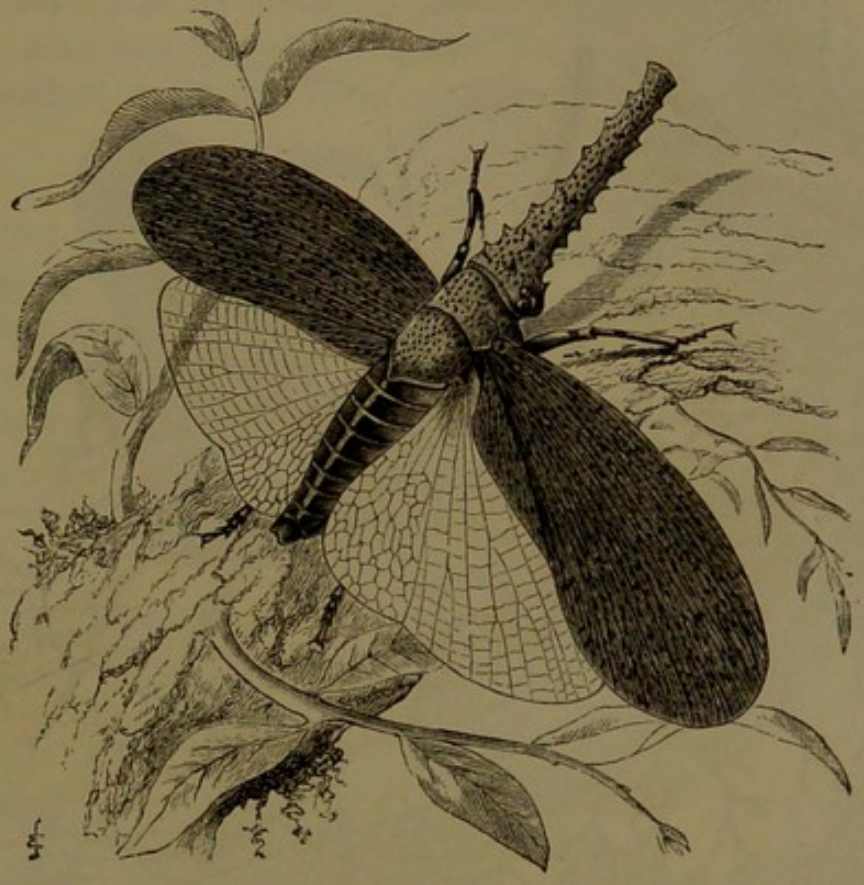


FIG. 475.—Pyrops nobilis.
(Brown, green, and black.)

There are many species of this genus found in Africa, India, and Ceylon, and they vary much in dimensions, some being no larger than the common house-fly.

ANOTHER of these creatures is *Hotinus subocellatus*, a native of various parts of China.

The general colour of the upper wings is pale ruddy brown, with a number of indistinct dark red spots, surrounded with yellow, upon them. Towards the tips they become greenish. There is a reddish patch upon the lower wings, and a somewhat vague pattern in brown.

It is one of the luminous insects. A general officer who was in Hong Kong saw a number of boys throwing stones at an object on the wall, which, according to his account, shone like a star. He hooked the object down with his cane, brought it into the house, and found that it was the species which has been figured.



Fig. 476.—Hotinus subocellatus.
(Brown-green, indistinctly spotted.)

On Plate XVIII. Fig. 2 is shown another species of this remarkable genus. It is a native of Ceylon.

The upper wings are blackish grey, profusely spotted and mottled with white. The lower wings are grey, changing to black towards the lower edges.

The pretty insect which is next shown is a native of Venezuela, and is coloured in rather a complicated fashion.

The thorax is green, with a yellow collar. The upper wings are greenish, spotted with white towards the base. Then comes a broad, waving band of cream-white, and the two patches at the tip of the wing are green. The lower wings are orange at the base, and tend to a pale yellow towards the tips.



Fig. 477.—Poicocera combusta.
(Golden, white, and orange.)

Among the Homoptera, variety of form seems to run riot, and we have in the present instance one of the most singular forms that could be imagined. Anyone

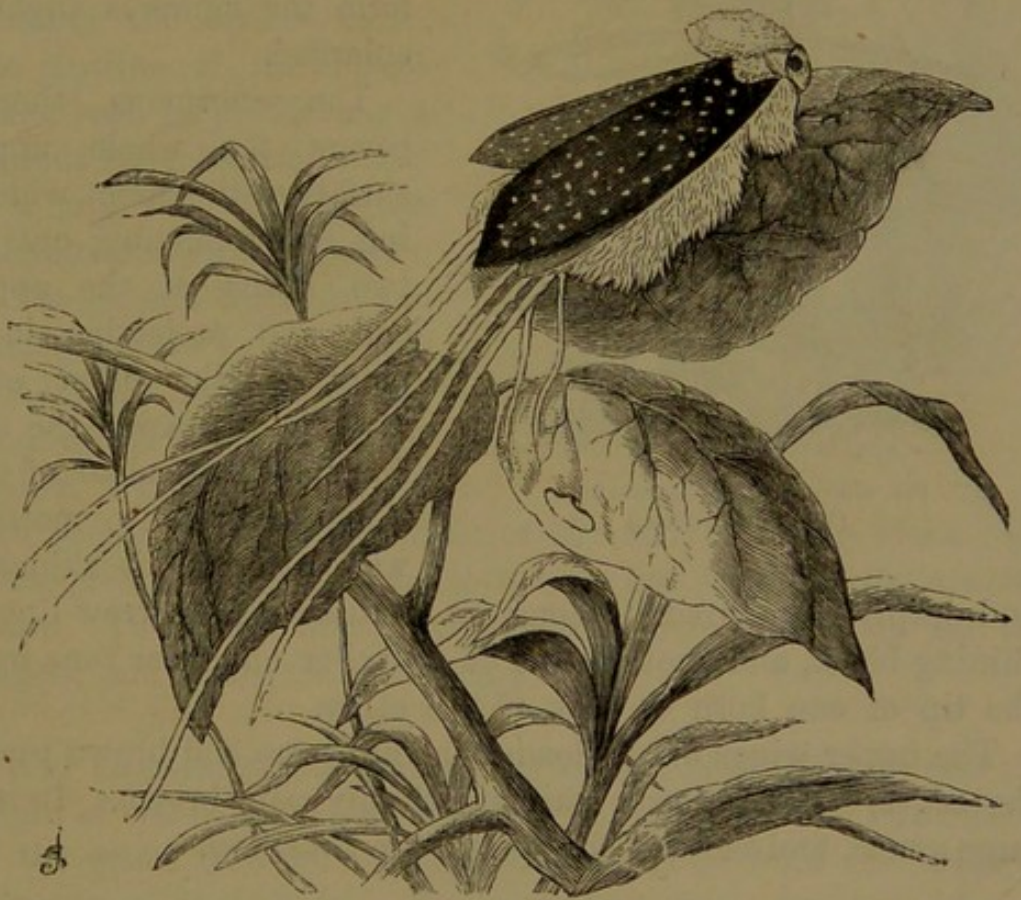


Fig. 478.—Phenax auricoma.
(Green, with yellow head-tuft and white processes.)

unacquainted with entomology could hardly believe that it really

was an insect and not the creation of some fantastic manufacturer of sham insects. It is a native of Mexico.

The general colour of the insect is pale green, but it has upon its head a crest of long soft, silken, gold-coloured hair. The whole under surface of its body is covered with a white downy secretion, which looks as if the insect had been hastily made from cotton-wool. The long fibres that trail behind the insect are of similar material, and look very much as if they had been made of cotton-wool loosely twisted between the hands. There are many other insects which secrete a similar substance, but we have not sufficient space even to mention them.

We shall now come to several insects of most extraordinary, not to say grotesque, forms, the first of which is called *Hemiptycha punctata*. It is a native of Brazil, and in order to show its peculiar form the figure is slightly enlarged.



Fig. 479.—Hemiptycha punctata. (Black and yellow.)

The enormous thorax covers the whole upper surface of the insect, widening and stretching out its two horns at the upper end, and projecting in a point at the other end, until it overpasses the abdomen. The colour of the thorax is yellow, mottled with black, and it is thickly and deeply punctured. Along its centre runs a narrow line of shining black, and another line of a similar character runs from the tip of one horn to that of the other.

The upper wings are yellowish in the centre and brown round the edges, and the lower pair are simply pale brown. It is a large genus, and most of the species are Brazilian.

On Plate XVIII. Fig. 3 is shown an insect called *Flata* [or *Pœciloptera*] *circulata*.

It is a native of Java, and is a very pretty insect, the colours

of the upper wings being brown and white, and those of the lower pair pure white. Some species of this genus, as, for example, *Flata marginella* of Northern India, have the females flocculent like those of the Phenax, while the males have broad expansive wings, and no flocculence. There are many species of Flata, spread over the warmest parts of Asia, New Guinea, South Africa, and other countries.

HERE is another of the eccentric formations so often seen in the Homoptera. The figure is enlarged to rather more than twice the size of the real insect, so as to show the singular structure. Its body is studded with long and curved spikes, and in this respect it very much resembles the strange little beetle (*Amphisternus Satanas*) which has been described on page 273. Putting the spikes aside, the outline of the insect when seen in profile has a curious resemblance to that of a large ant. This species inhabits the lower Amazons.



FIG. 480.—Heteronotus aronatus. (Pale red.)

The general colour of the insect is pale yellow, with some black streaks on the front of the thorax; and the spikes, together with the two projections in the middle of the body, shining black. In consequence of these long spikes, it has received its specific name. There are many species, of which this is by far the largest, and some are quite tiny.

ANY classical reader will remember the hero Œdipus, and the origin of his name, which signifies "swollen foot." The insects of the genus Œda have received their name from the singular structure of their body. We have seen one or two examples of insects in which the abdomen is swollen and empty, but in these the whole body is little but a skin as empty as a blown bladder the vital and muscular parts being scarcely perceptible.

In these insects the whole body is composed of a material very much resembling the wing of a dragon fly, except that the nervures form two kinds of meshes, the one large and square, and the others small and hexagonal, which fill up the space between the large meshes. In this species the colour is reddish yellow, but in another, *Œda informis*, the creature looks exactly as if it were nothing but the cast skin of some insect, so colourless and translucent is the whole of its structure. Both species are Brazilian. The figure is about twice the size of the real insect.



FIG. 481.—Œda inermis.
(Reddish and transculent.)

As will be seen in the two following insects, the thorax is the



FIG. 482.—Bocydium tintinnabulariferum.
(Brown, black thorax.)

part in which eccentricity of form seems to have reached its utmost limits.

The first of them is *Bocydium tintinnabulariferum*, a native of Brazil. Although the largest of the extensive group to which it belongs, it is but a little creature, being about as long as a common house-fly, but not so stoutly made. The colour of the body is pale brown, while that of the thorax, with its extending appendages, is black. The form of these appendages can be better seen by reference to the illustration than by description. The four round knobs look very much like hawk-bells, and have given rise to the long specific name, which signifies "bell-bearer." They are covered with long black hairs.

THE generic name *Hypsauchenia* signifies "high-necked," and, as may be seen by reference to the illustration, is very appropriate. The figure is much enlarged, the insect being about as



FIG. 483.—Hypsauchenia Westwoodii.
(Brown; black thorax.)

large as the preceding species. It is one of an extensive group all of which are remarkable for the singular development of the thorax, and its division into a fork-like extremity. It is rather variable in point of hue, but the average colour of the body is pale brown, and that of the thorax blackish brown. It is a native of the Philippines. One species, *Hypsauchenia Hardwickii*, has the extremity of the thorax just like a pair of sugar-tongs, the ends of the fork being flattened into a spoon-like shape.

THE genus Cercopis is familiar to English entomologists by means of the pretty Scarlet Hopper (*Cercopis sanguinolenta*), whose scarlet and black wings look so beautiful upon the fern-leaves on which the creature loves to rest.

The present species, which inhabits the Philippines, is a very large and fine one, though it does not possess the brilliant hues of its English relative. The thorax is yellowish brown, thickly and finely punctated and wrinkled. The scutellum is black,



FIG. 484.—Cercopis Theora.
(Blue, black, and yellow.)

and the abdomen yellow. The upper wings are blue-black, with deep yellow marks, and the lower wings are brown, changing to yellow on the upper edge.

CLOSELY allied to the preceding insect is the handsome species which is shown in the illustration. Not long ago it was considered as belonging to the genus Cercopis, but has lately been removed to its present position. It inhabits Brazil, and is one of many species, most of which are natives of the same country.

It is really a beautiful insect. The ground colour of the upper wings is warm chestnut at the base, changing gradually to red at the tip. The bold markings are black, glossed with blue, and

the shape of the mark at the base has gained for the insect its specific name, which signifies "forked." The lower wings are

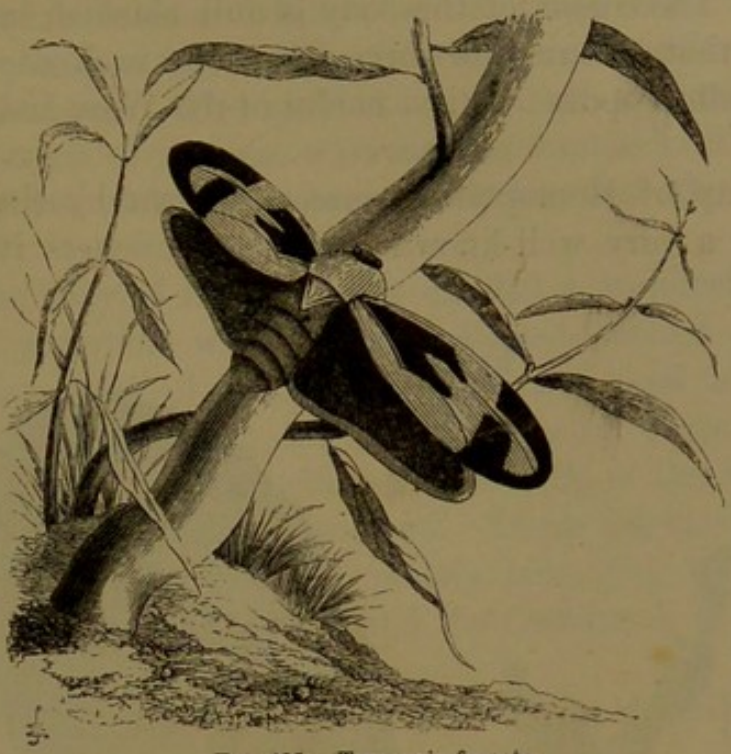


Fig. 485.—Tomaspis furcata.
(Black, scarlet, and violet.)

dark brown, edged with very pale brown, and the abdomen is shining metallic violet.

Perhaps many of my readers may remember the pretty little Tettigonias, that look so much like beetles, and whose brilliant colours are so lovely as the insects march about the white flowers which they love. The insect which now comes before us belongs to this group, and, although not possessing the vivid colouring of its lesser British relatives, is yet a pretty creature, its markings being bold in form and rich in colour.



Fig. 486.—Proconia atra.
(Brown and yellow.)

The ground hue of the upper wings is yellow, and upon it are

sundry streaks of dark brown, arranged as seen in the illustration. The lower wings are pale brown, without any distinctive markings. The colour of the body is dull blackish brown, very much like that of our glowworm, and along each edge is a row of bright yellow spots. It is a native of the West Indies.

THE group of Homopterous insects known by the name of Coccidæ is a very well-known one. To gardeners it is better

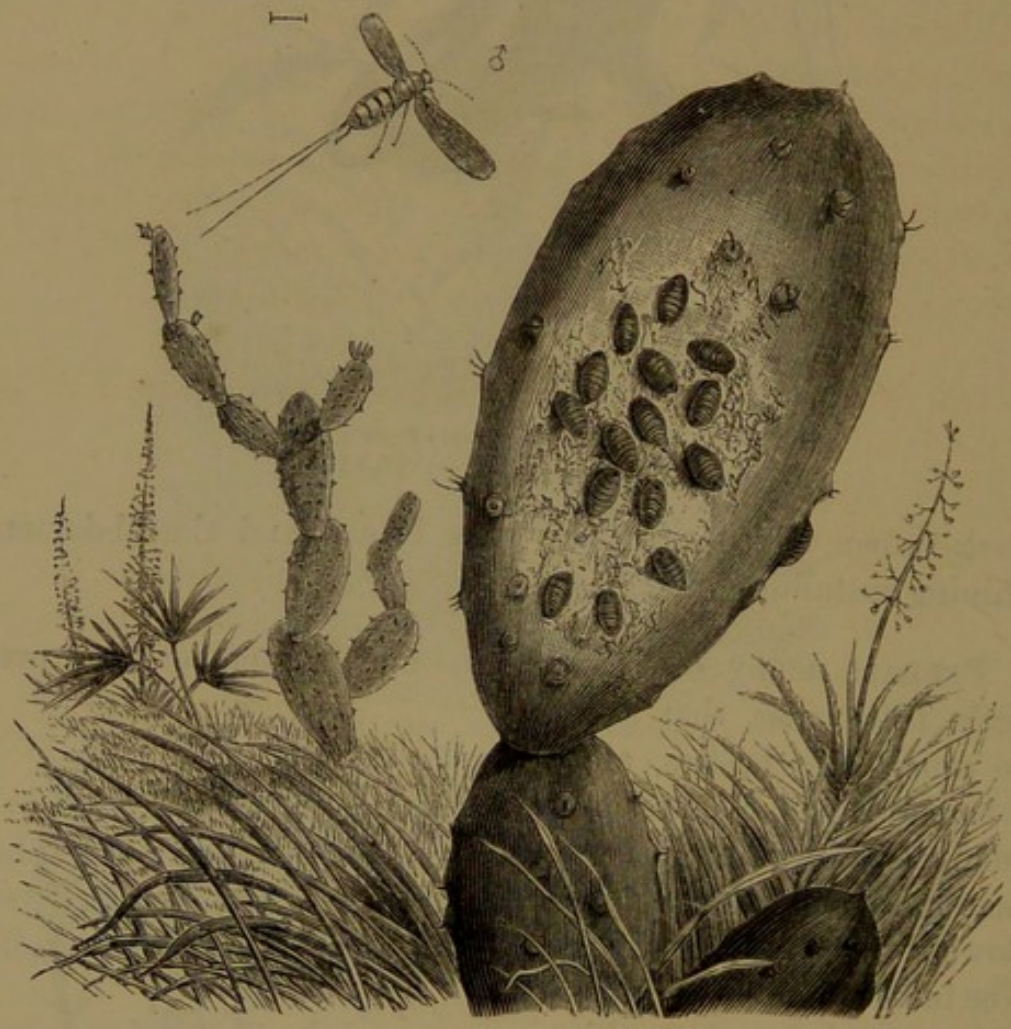


FIG. 487.—Coccus Sinensis.
(Brown.)

known than loved, as they are terrible enemies in the orchard and greenhouse under the popular names of Scale Insects and Mealy-bugs. The former are so called on account of the shape of the female, who looks like a convex scale stuck to the leaf; and the latter derive their name from the flour-like secretion which is copiously emitted from the body.

In trade, the Coccidæ are familiar as being the producers of a sort of wax (which is more used in China than in England), of the useful substance called "lac," and, above all, of the invaluable "cochineal" dye. The first of these species is shown in the illustration. The male is very small, winged, and flies freely in search of a mate, whereas the female is fixed to one spot, dies there, and her withered body becomes the shelter of her young.

From the body of the female is exuded a wonderful amount of a white secretion, which, when collected, melted down, and strained, has many of the properties of wax, and is generally called by that name. In the British Museum there are many specimens of the insect, together with a lump of the wax, which looks almost exactly like spermaceti. There are also specimens of other wax-making Coccidæ, mostly belonging to the genus Ceroplastes, of the Lac Insects, and the Cochineal.

THE last of the Homoptera which can be described in this

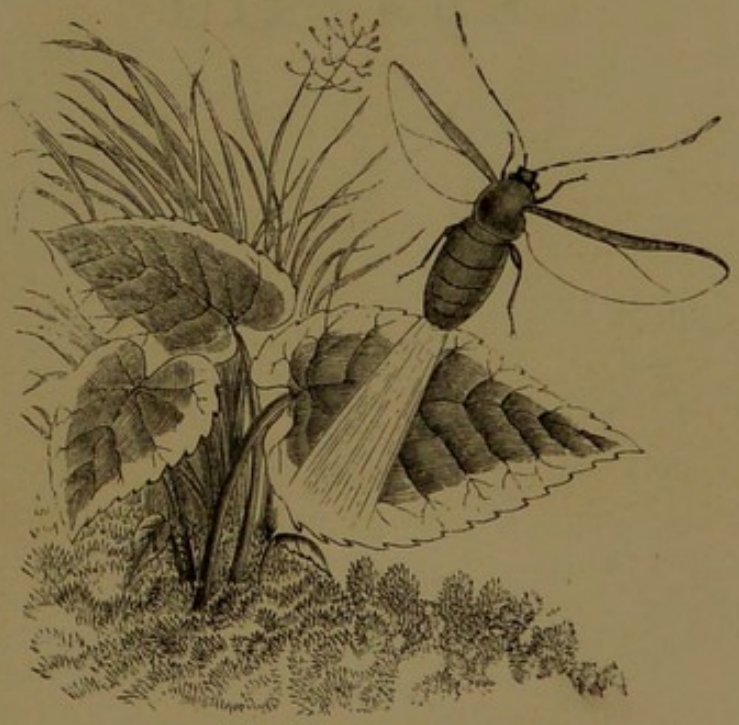


FIG. 488.—Callipappus Westwoodii.
(Pale brown; white train.)

work is an example of the singular genus Callipappus, a male of which is here shown.

As to the female, she is simply hideous. She is a big, black,

plump, flat, grub-like creature almost an inch and a half in length, and looking as if she would burst if touched.

The male, on the contrary, is a beautiful, though not brightly coloured insect. The body and wings are pale brown, but from the tail proceeds a train of soft glistening white threads, looking exactly like the tails of the spun-glass birds which are so popular at bazaars. This species is a native of Australia.

DIPTERA.

DIPTERA.

As their name implies, the DIPTERA possess only two wings. These, again, cannot be folded, and the place of the lower pair is taken by two little winglets or balancers. The mouth is formed for suction. Without going further into technical detail, we will proceed to a short description of the insects which have been selected as examples.

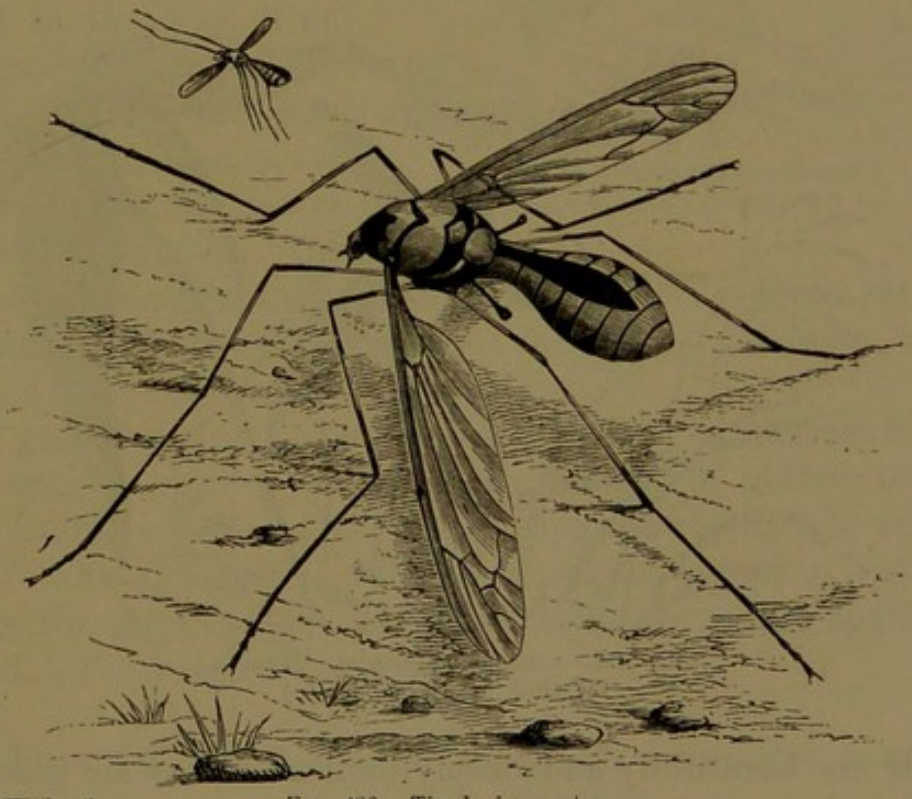


FIG. 489.—Tipula imperator.
(Yellow and black.)

EVERYONE is familiar with the group of flies called Tipulidæ, the various insects known by the popular title of "Daddy Long-

legs." These creatures strike unutterable terror into many minds, the generality of people thinking that they possess venomous stings, while others are almost equally terrified by the legs, which to them are inexpressibly revolting. Why anyone should object to an insect's legs is rather unaccountable. That they should fear the sting or the jaws is intelligible enough, but that they should fear the legs more than the wings is not so easily understood.

The present species may perhaps lay claim to being the largest and the handsomest of them all. Its colours are black and yellow, which even extend to the enormously long legs. The mode of flight employed by the insect is very remarkable. Instead of allowing all its legs to dangle beneath it, the creature stretches its two fore-legs in front of it, on the same principle employed by the heron when it stretches out its long neck in flight. This species inhabits Australia.

THE Greek word *Ctenophora* signifies "comb-bearer," and is given to the insects of this genus because the antennæ of the



FIG. 490.—Ctenophora gaudens. [Female.]
(Yellow, brown, and black.)

males are beautifully and deeply toothed. They are gracefully curved, the teeth being inside the curve, so that they look like two delicate plumes. Several species of this genus inhabit England, such, for example, as *Ctenophora pectinicornis* and *Ctenophora bimaculata*.

The figure which is here given represents a female, the male being much smaller. The whole of the thorax and body is yellow, except the end of the abdomen, which is black. The wings are brown, with the exception of a patch of yellow towards the tip. The insect inhabits the Celebes.

THERE is a large group of Diptera, scientifically termed Tabanidæ, and popularly known as Breeze Flies, Gad Flies, or Clegs. Their mouths are developed into a piercing apparatus, which is so powerful that it can be driven through the tough skin of cattle. These insects attack man as well as beast. They made my life a burden to me in the New Forest, until I repelled them with paraffin, even driving their beaks through thick woollen clothing.

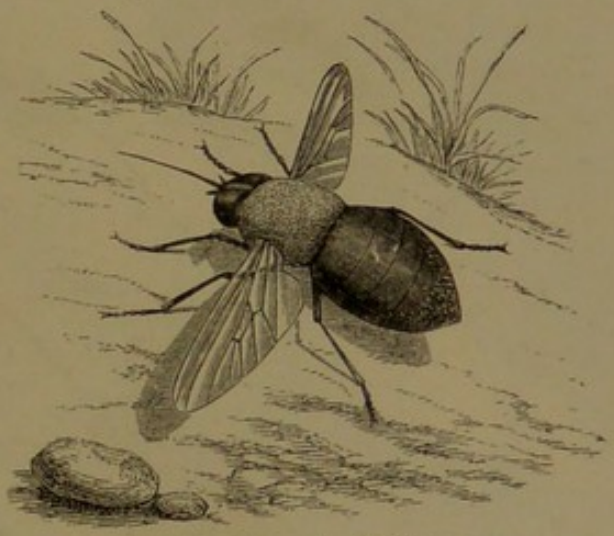


FIG. 491.—Pangonia fulvithorax. (Black, with yellow down.)

Our species are bad enough in the way of annoyance, but some of the foreign species are very much larger than ours, and have proportionately powerful means of offence. One of the most important genera of these flies is Pangonia, several examples of which will be given. The first is *Pangonia fulvithorax*, a native of Brazil.

The ground colour of this insect is shining black-brown, but the thorax is covered with a dense coating of golden yellow down, having a silken gloss, and looking something like yellow velvet. The abdomen is without the down except at the end and on the sides, where the yellow hairs are rather sparingly planted. The wings are shining brown.

ON Plate XX. Fig. 1 is shown *Pangonia longirostris*, a native of India.

Its colour is brown, like that of our common Drone Fly, barred with yellow. Its specific name signifies "long-beaked," and, indeed, the proboscis is so long in proportion to the body, that

the insect is said to be incapable of attacking cattle except on the wing. In common, however, with many of the Tabanidæ, it draws much of its nutriment from flowers. The proportionate dimensions of the proboscis may be gathered from the fact that whereas an ordinary specimen measures ten-twelfths of an inch in length, the proboscis is two inches and a half long.

ANOTHER of these long-beaked insects is here given, which, as its name implies, is a native of Amboyna. It is a pretty insect,



FIG. 492.—Pangonia Amboinensis.
(Brown, black, and yellow.)

with a bee-like aspect about it. The colour is very dark brown, with a coating of yellow down on the thorax, and a black band across the base of the abdomen.

WE now take an example of the typical genus, *Tabanus hilaris,* an East Indian insect.

The general colour is reddish brown. The head is white, the thorax is traversed by two grey streaks, and the abdomen by three similar stripes. The large compound eyes are divided into

PLATE XX.



two distinct regions. The upper region is composed of very large facets, while the remainder is composed of very small facets. This remarkable arrangement of the facets is found in several other insects.



FIG. 493.—Tabanus hilaris.
(Reddish brown.)

THERE is a genus of Tabanidæ called *Acanthomera*, or "thorn-legged," because a sharp spike projects from the end of the thigh. They are very large insects, and much resemble the grey flies popularly known as Millers, except that they are much larger.

The species which is here given is Brazilian. The abdomen is dark brown, and so is the thorax. The latter, however, is



FIG. 494.—Acanthomera Heydenii.
(Brown and silver-grey.)

covered with a coating of silken down, arranged in stripes of silver-grey, black, brown, and white. The eyes are so large that the multitudinous facets of which they are composed are

visible even without the aid of a lens, and even in death they retain something of the sheen which makes them so beautiful in life. The pattern on the centre of the wing is yellow and brown.

ANOTHER species of this genus, *Acanthomera magnifica*, is shown on Plate XX. Fig. 2. It inhabits South America. The abdomen is rich ruddy chestnut, and the thorax is silver-grey, striped with dark brown. The thighs are yellow, and the rest of the leg brown. The wings are very pale yellow, with a slight pattern of brown on them.

WITH the genus Mydas we close our account of the Tabanidæ. Our first example, *Mydas filatus*, is a native of North America, and is rather a handsome insect. Its general colour is dark



FIG. 495.—Mydas filatus.
(Brown and yellow.)

brown, relieved by a broad yellow band at the base of the abdomen. The wings are brown and iridescent. One of the most beautiful of the genus is *Mydas dives* of Brazil, in which the body is shining metallic blue.

The largest of these insects is *Mydas giganteus*, also a native of Brazil, which is shown on Plate XX. Fig. 3. It appears at first sight to be black, but in a good light is seen to be of a very

deep blue, this colour being imperceptible except with a strong light directed upon the insect from the side. The wings are rather dark brown at the base, and become lighter towards the tips.

Of the family Acroceridæ we shall take two examples, the first of which is *Tricopthalma vetelinea*, a native of Australia.

This pretty insect is covered with a thick dark brown down, which has a velvety look about it. On the sides of the thorax is long grey down, and the longitudinal stripes upon it are white. The abdomen is also brown, but the edge of each segment is marked out with a narrow ring of short bright golden hairs. There are many species of this genus, most of which are Australasian, though some are found in Southern Africa, and others in Europe.



Fig. 496.—Tricopthalma vetelinea. (Brown, white, and yellow.

The rather odd-looking insect which goes by the name of *Exetasis tumens* is a native of Brazil. In order to show its structure the better, the figure has been enlarged about one-third.

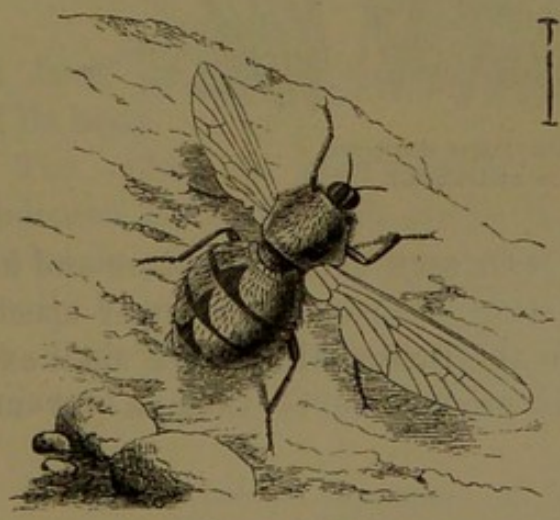


Fig. 497.—Exetasis tumens. (Brown and black.)

The ground colour of the insect is shining black, but the whole of the thorax and a great part of the abdomen are covered with thick tawny down, looking very much like the fur of a mole. The edges of the segments of the abdomen, however, are without the downy coating, so

that they are shining jetty black, and the same colour extends upwards in a triangular form, as seen in the illustration. The wings are ashen grey. The specific name, *tumens*, signifies "swollen," and is one of the characteristics of the family, which are sometimes called Vesiculosæ, *i.e.* Bladder Flies.

We now come to the Asilidæ, some of the finest of the insect tribes. They prey upon other insects, as can be seen by watching the proceedings of our English species. A Continental



Fig. 498.—Dasypogon spectrum.
(Yellow and black.)

species, *Asilus diadema*, has been seen even to capture and kill the hive bee, in spite of its sting. Some of the larger species are said to attack cattle, like the Breeze Flies. We shall examine several species of this group, one of them a yet undescribed insect.

The first species is a native of China, and is a formidable looking insect. It is entirely yellow and black, the latter being

yellow down distributed in bands across the body. The wings are pale yellow.

There are many species of this genus, some of them exceedingly large insects. One of the prettiest is *Dasypogon Vica* of Northern India, in which the abdomen is shining black, and the wings are beautifully iridescent, with shifting tints of blue, purple, and green.

THE genus Laphria being a very large and important one, we shall take several species, the first of which is *Laphria alternans*



FIG. 499.—Laphria alternans.
(Brown barred with gold.)

of Java, its specific name being due to the alternating hues of its body.

The colour is brown-black, mottled with black, and the abdomen is barred with golden yellow. The wings are rather curiously coloured, being white at the base and changing gradually to pale yellow. The dark marks upon them are brown. In order to show the markings better, the figure has been enlarged to twice the size of the insect.

SEVERAL curious examples of imitation occur in this genus, one of which is called *Laphria xylocopiformis*, from the extra-

Figures of some of these bees may be seen on page 520 and on Plate X.



Fig. 500.—Laphria xylocopiformis.
(Blue-black.)

The specimen from which the figure was drawn was taken at Madras. Its colour is wholly blue-black, just like the female of the species described on page 520, or *Xyclopa morio*, which is given on Plate X. The resemblance in form will be seen at a glance by comparing the two figures.



Fig. 501.—Laphria consimilis. New Species.
(Black and grey.)

The insect which now comes before us is an undescribed species, which I call *Laphria consimilis*, on account of its remarkable resemblance to one of the wood-cutter bees of Southern Africa. Indeed, so close is the resemblance, that if a specimen of these flies were placed

among a number of the bees, it would probably pass muster except to a very practised eye. It is a native of Natal.

The colour of the thorax is black, and so is that of the abdomen. The latter, however, has a fringe of long grey down. There is a tuft of yellow down on the top of the head, and a patch of the same colour on the tibia of the fore-legs. Those of the hind legs have a fringe of long grey hair running along the inner edge. The rest of the limb is black. The wings are deep blackish brown, and with a strong side light a deep gloss of blue is seen upon them.

Our last example of this genus is *Laphria horrida* of Sumatra. It is represented in the act of pouncing on a luckless insect, which it will speedily drain of its juices. In these insects the grasping power of the fore-legs is wonderful, and the tenacity with which they stick to their prey scarcely less so. On a windy day, our English hornet-flies may be seen drifting along in the breeze as if without any purpose. No sooner, however, do they come near another insect than they pounce on it, clasp it tightly with their fore-legs, and drive the beak into its body. It often happens that the remaining legs are not sufficiently strong to enable the insect to hold its own against the wind, and so it may be seen rolling over and over, clutching at the grass with the second and third pairs of legs, but never for a moment relaxing its hold of its prey.



Fig. 502.—Laphria horrida. (Black, with yellow wings.)

The present species is almost entirely black. There is a tuft of yellow hairs on its head, and its legs are yellow, but these latter are nearly concealed by the long black hairs with which they are covered. A ridge of yellow hair runs along both edges of the thorax. The wings are shining yellow.

On Plate XX. Fig 4 is seen an insect called *Phellus glaucus*, an inhabitant of Western Australia. The specimen from which the figure was drawn is in Mr. Saunders' collection.

The colour of the thorax is black, fringed with pale yellow hairs. The ground colour of the abdomen is bright deep blue, clothed with short black hairs. The first two segments are also covered with long, thick, yellow down. The legs are black and covered with short black hairs, changing to tawny at the ends of the tarsi. The wings are blackish brown at the base, and the rest is grey, traversed with black veins.

I presume that the accompanying insect derives its specific name from the colours which it wears, which are those of the traditional stage demons. It is a native of Brazil.



Fig. 503.—Asilus infernalis. (Black and yellow.)

Nearly the whole of the insect is black, and it is entirely covered with thick down. At the junction of the abdomen with the thorax there is a semicircular patch of long orange hairs, an there is a broad band of the same hue across the middle of the abdomen. The thighs of the hind legs are fringed with very long black hairs above, and covered with white down below. The wings are smooth, shining brown in colour, and iridescent with various tints of blue and purple.

Our last example of the family is *Asilus coriarius*, a native of New Holland, which is represented as in the act of chasing prey. The specific name *coriarius* is formed from a Latin word signifying "the bark of a tree," and is given to the insect on account of its resemblance in colour to the rough brown bark of the oak or similar tree.

The colour of the abdomen is warm brown, with a black bar at its base, and a series of tufts of jet black hair along the sides.

The thorax is brown, edged with white down, and a large quantity of similar down grows on its under surface. A patch of



Fig. 504.—Asilus coriarius.
(Brown, black, and white.)

grey-white hair occupies the front of the head. The wings are pale brown.

Of the family Leptidæ two examples will suffice. These are also predacious insects, and in one species, *Leptis vermileo*, the larva behaves very much like that of the Ant Lion, digging conical holes in the loose sand, remaining at the bottom of them, and then pouncing on the insects that fall into them. Yet, voracious as the creature is, it has been known to survive a total fast of six months.



Fig. 505.—Anthrax seniculus.
(Chocolate and yellow.)

The species which is given in the illustration is chocolate-brown on the thorax, and blackish brown on the abdomen. There is a very narrow collar of yellow between the head and the thorax. The wings are singularly handsome, being the richest brown by way of ground colour, and having several large translucent spots of yellow. It is a native of Southern Africa.

This is a very large genus, spread about over the whole world, and extending even to England, where we have several species.

THE form of *Bombylius analis* must be familiar to every English entomologist, on account of the Humble-bee Flies, as they are popularly called, which are so well known in this country. These insects are spread all over the world, wherever flowers can grow, and they feed, like many of the Hawk Moths, by poising themselves on the wing before a flower, and extracting its juices with the long and straight proboscis.



FIG. 506.—Bombylius analis. (Black and yellow or white.)

The present species is a native of Southern Africa. The thorax and abdomen are covered with long black hair, with the exception of a large patch at the end of the abdomen, which is white in some specimens and golden yellow in others. The wings are nearly translucent, but they are dark brown at the base, and a wavy patch of very pale brown runs parallel with the upper edge.

IN the family of the Conopsidæ, the larvæ are parasitic upon other insects, mostly belonging to the bee tribe. One species, *Conops russipes*, was found by Latreille to undergo its transformations within the abdomen of the living humble-bee, and the insect has been seen patiently flying in chase of the bee. The word *Conops* is Greek, and was used to signify a large kind

of gnat. The proboscis is incapable of being withdrawn, is powerful, and bent under the head in a sort of elbow-shape.

The insects are nearly all prettily coloured, and the present species, which is a native of Brazil, forms no exception to the rule. At a first glance it appears to be only blackish brown, but a closer inspection shows that the abdomen is clothed with silvery down, while there are gleams as of patches of burnished gold on the legs and forehead. From this latter mark the species receives the name of *aurifrons*, or "golden fronted." The wings are glossy green, with a gold gloss, and darker towards the upper edge.



FIG. 507.—Conops aurifrons.
(Brown, silver-white, and gold.)

THE fine insect which is given in the accompanying illustra-



FIG. 508.– Bacuntius vespoides.
(Black and yellow.)

tion belongs to the same family as the preceding insect. It is a native of Singapore.

From the black and yellow which form its chief tints, and which give it no small resemblance to a wasp, it has received the specific name of *vespoides*, or "wasp-like." The thorax is quite black, and the abdomen is nearly so. Across the middle of the abdomen runs a very broad band of deep yellow, just like the colour of the common wasp. The wings are dark brown, with a shining surface. When the insect is alive, the eyes must present a very beautiful appearance, for even when the creature has been dead and dry for years, these organs shine with a coppery lustre that tells of long-vanished beauties.

We now come to the enormous family of the Muscidæ, in which is included such vast masses of interesting insects, that it is no easy task to make a selection from them. In fact, the whole work might be devoted to this one family alone, and then not nearly exhaust it.



Fig. 509.—Glossina morsitans. (Brown.)

Our first example is the terrible Tsetse Fly (*Glossina morsitans*). No one on looking at this insect could form the least idea of the terrors which its presence inspires. Like many other insects, it attacks man and beast; but it has this peculiarity, that while man is only affected by the slight and brief pain caused by the puncture of the proboscis, horses and cattle almost invariably die. The effect of the Tsetse poison on them is most remarkable, the blood being blackened and thickened, and the whole frame rendered one mass of disease, the strongest muscles becoming so disintegrated that they can be broken to pieces by the thumb and finger.

The Tsetse lives on the banks of rivers, and it is a curiously local insect, one bank of a river being free from it, while the opposite bank will swarm with the flies. There is a long and interesting account of the insect in Livingstone's travels. The colour of the Tsetse is pale brown. It is about the size of the

common house-fly, the figure having been enlarged in order to show its structure the better.

THE generic term *Tachina* is formed from a Greek word signifying "rapidity," and is given to the insects in consequence of their swiftness. There are very great numbers of species belonging to this genus, and there is scarcely a part of the world in which they are not represented. None of them are brilliant in point of colour, brown, black, grey, and yellow being the invariable hues.



FIG. 510.—Tachina grandis.
(Brown and yellow, variable.)

The present species is a native of Mexico. Its general colour is black, and even the long hairs which thickly clothe the body are of the same colour. The thorax is black, but is relieved by some lines of silver-grey, with a very slight tinge of blue in them. This is the usual colouring, but the insect is exceedingly variable, both in size and colouring. Some specimens are barely half as large as others, while in some the colour is entirely yellow, in others half yellow and half black, and in others again the colour is entirely black, with the exception of a yellow tip to the tail.

THE genus to which belong the next two insects is rather a large one, and contains some of the most splendidly coloured of the Diptera. The first species, *Dexia effulgens*, is a native of New Guinea. The ground colour of the insect is soft velvety black. Upon the abdomen the black is relieved by a number of interrupted bands, which glow with tints so varying that it is almost impossible to decide which is the real colour. One bar, for example, will seem to be glittering emerald-green, another gold, and another azure; but on shifting the position of the insect it will be found that the same colours pass in turn over each bar, the hue depending wholly on the direction of the

light. The wings are dark brown at the base, and the remainder is pale yellowish brown.

The second species is a native of New Holland.

The colour of this insect is wholly green, glossed with gold, very much the hue of our common Rose Beetle, but with much more gold about it. There is a tuft of long black hair at the end of the abdomen. The wings are translucent, with a round patch of dark brown at the base.

Among the notable examples of this genus may be mentioned *Dexia regalis*, also a native of New Holland. This is a much



FIG 511.—Dexia effulgens.
(Black, barred with blue, green, and gold.)

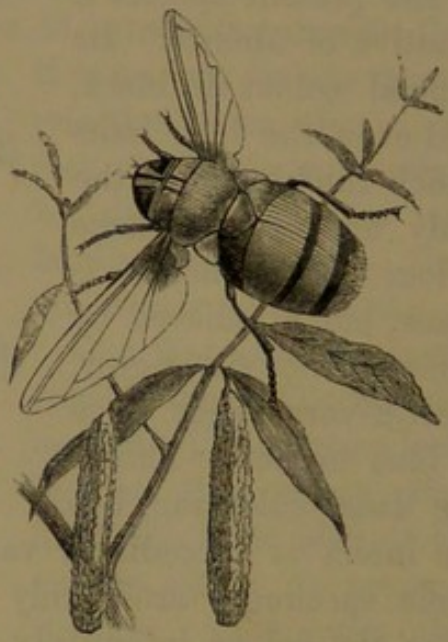


FIG. 512.—Dexia formosa.
(Green, glossed with gold.)

smaller insect than the last species, but is strikingly beautiful, its rich and delicate colouring causing it to stand out boldly from among its brilliant kinsfolk. The gold and the blue are as vivid as in *Dexia effulgens*, but instead of the green, pink is substituted, and, indeed, may be considered as the ground colour.

ANOTHER of the rare insects in Mr. Saunders' collection is here given.

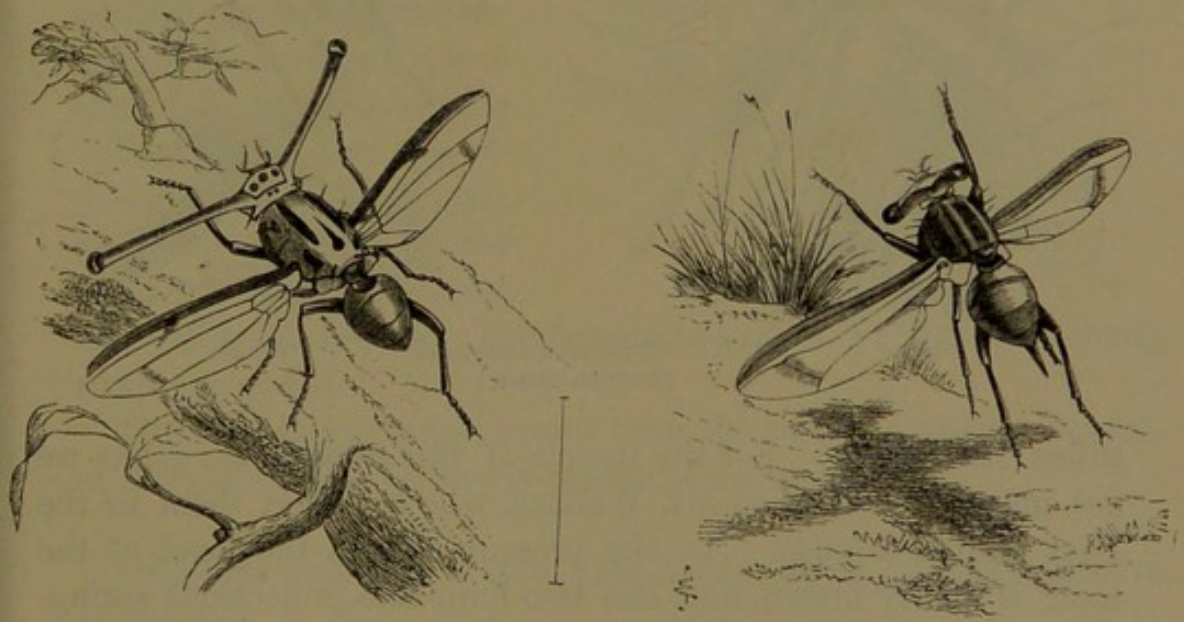
The colour of the thorax is chestnut-brown, relieved by four white stripes. The head is darker, and has a coating of grey down in front. The base of the abdomen is reddish brown, and

the rest black. In the legs, the thighs are very strong and thick, thus giving rise to the generic name *Rhopalomera*, or "club-thighed." They are covered with hair, and are black, except the knees, which are yellow. The wings are grey clouded with brown. The insect is a native of Brazil.



Fig 513.—Rhopalomera tibialis.
(Chestnut and black.)

No one who was unacquainted with the subject would think that the two insects which are next represented are but the male and female of the same species. Yet this is the case, the insect being one of a small group in which the males are distinguished by some extraordinary appendages to the head, while the females have nothing remarkable about them.



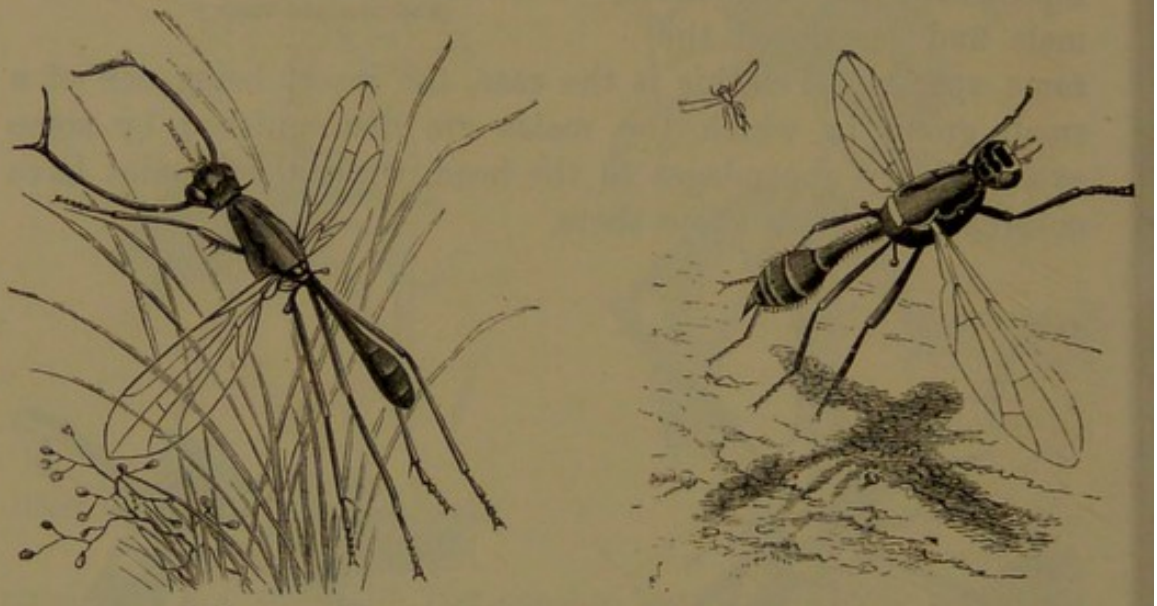
Male. Fig. 514.—Achias longividens. Female.
(Purple, blue, and grey.)

In the first of these insects, the head of the male is developed sideways into two long and nearly straight projections, at the end of which are placed the eyes. The whole shape of the head

is almost exactly that of the Sentinel Crab (*Podopthalmus vigil*), in which the footstalks of the eyes are enormously lengthened. This species is a native of Ava. The figure is slightly enlarged.

The head, with its projections, is dark brown; the thorax is very dark purple, variegated with streaks of silver-grey. The ground colour of the abdomen is shining blue, changing to purple in certain lights, and covered sparingly with soft brown hair, so that it is handsome in colour as well as remarkable in form. The wings are translucent, with a slight brown pattern on them. There are several species of this genus, but this is the largest and most conspicuous.

Both names of the following species refer to the singular conformation of the head of the male. The Greek word *Elaphomyia* literally signifies "Stag Fly," and the Latin word *alcicornis* signifies "Elk-horn." For the insects of this remarkable genus we are mostly indebted to Mr. Wallace, who collected them in the East Indian islands. In the present species the head of the male is ruddy brown, and has two horn-like projections springing from beneath the eyes. These horns are curiously like those of the deer tribe, and have one long projecting tooth towards the tip, and six smaller teeth on the rounded portion of the stalk. A few yellowish lines run down the broad front of the horn towards the teeth.



Male. Fig. 515.—Elaphomyia alcicornis. (Reddish brown.) Female.

The thorax is rusty brown, with four long black lines, two parallel with the vertical line of the insect, and two slanting diagonally towards the abdomen. The long legs are reddish brown, and in the middle of the thighs of the fore-legs is a patch of black bristles pointing forwards. The female is coloured much like the male, except that the head and thorax are yellowish brown, and that she wants the patch of bristles on the fore-legs. The illustration is magnified in order to show the shape of the insect, the length of which is about half an inch.

ANOTHER of the insects captured by Mr. Wallace is *Elaphomyia cervicornis*, which inhabits the island of Dorey.

The head is blackish brown above and ruddy brown below. The oddly-shaped horns take their origin just below the eyes, and are black tipped with white. The thorax is yellowish olive above and whitish beneath. The abdomen is modified into a sort of footstalk, which is yellow brown, and the remainder is dusky brown, becoming darker at the tip. The legs are long, and yellowish brown. The female has no horns, her head being simply rounded.



FIG. 516.—Elaphomyia cervicornis. (Yellowish brown.)

This is rather a larger insect than the last, the average length of the male being about six-tenths of an inch.

OUR last example of the Stag-horned Flies is also a native of Dorey.

The head of the male is blackish brown, streaked with yellow in front. The eyes are very protruding, and just below them is a short, rounded, and rather flattened projection which takes the place of the horn. The colour is brownish black, but across the footstalk of the abdomen passes a bar of yellow. The reader

will doubtless observe the remarkable shape of the wings. Instead of having the upper edge nearly straight, as is the usual custom with insects, it is much thickened in the middle, and formed into an angular projection. The length of the insect is rather less than half an inch.



Fig. 517.—Elaphomyia brevicornis. (Brown.)

The remarkable fly which is given in the accompanying illustration inhabits the United States.

It is called *Militaris*, because in its larval state it is parasitic on the "Army Worm," *i.e.* the caterpillar of *Leucaria unipunctata*, which traverses the country in vast hosts, completely devastating whole fields of the grain and grass crops. Nothing stops them but a deep ditch with perpendicular sides, and when such a ditch is cut across their line of progress, it is often found filled to a considerable depth with a seething, moving mass of larvæ.

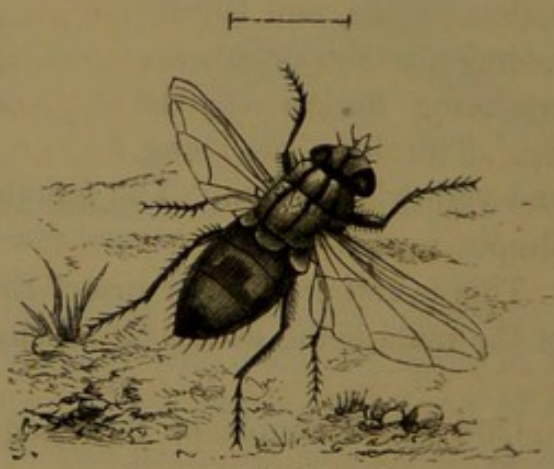


Fig. 518.—Exorista militaris. (Dark silver-grey)

Many stupid people, on seeing the Exorista emerge from the Army Worm, took it into their heads that it was the parent of the caterpillar, and so destroyed every fly they could catch, instead of protecting the insect as their best friend.

It is also parasitic on the larva of *Attacus Cecropia*, which feeds on the apple, cherry, plum, and other fruit trees. A peculiarity of this insect is, that instead of causing the larva which it infests to decrease in size, it has just the opposite effect.

For example, a larva of Attacus which was attacked by the Exorista, measured more than four inches in length, was a full inch in diameter, and weighed two ounces. Its body was entirely covered with the empty egg-shells of the fly, the larvæ having burrowed into its body. It died, rotted, and in about twelve days there appeared a vast number of maggots very much like those of the blue-fly. They went into the earth at once, and remained in the larval state all the winter. At the beginning of April they changed to pupæ, and at the end of May emerged in the perfect state. For the Cecropia Moth see p. 670.

THE curious family of the Hippoboscidæ, or Horse Flies, is here represented by an African species which infests the camel. We are all familiar with the English Horse Flies, which cling so tightly to the animal with their powerful legs, and run so actively in any direction if disturbed. These insects are remarkable for their manner of reproduction. They do not lay eggs after the fashion of most insects, nor deposit living larvæ as do several flies. But the female deposits the pupa ready formed, and enclosed within a soft, white, oval case. Exposure to the air soon hardens this case and turns it brown, and the fly, when developed, makes its escape by pushing off one end of the case.



FIG. 519.—Hippobosca camelina. (Brown.)

THE true position of the APHANIPTERA, or Fleas, is still a problem. Systematic entomologists of the present day seem to think that they are least out of place at the end of the Diptera.

From these I have selected the best-known foreign Flea, the Chigoe (*Pulex penetrans*). This insect burrows into the feet of human beings, and, if left undisturbed, forms a globular hollow in which the young are reproduced. Many accounts of this insect have been published, but I give a short and graphic description by one of my brothers.

"You ask me whether I am practically acquainted with the Chigoe. Rather so; just a little; in fact, I may say that we have been on terms of most intimate acquaintance for some years.

"As far as I have read upon the subject, a great deal of rubbish has been written about the Chigoe. It is true that our friend is a great nuisance in his way, but in six years I have never known, or ever heard, of anyone being much the worse for the Chigoe, though I have seen some people too lazy to extract them until their feet were full of their nests. As far as my experience goes, I can only state that for six or eight days after they have made their entrance, there is no trouble beyond a slight itching, and then, if they are extracted with any reasonable amount of care, the nest of eggs comes away all correct. If it should be broken, which will happen sometimes, a pinch of snuff is put into the hole, and there is an end of the matter.

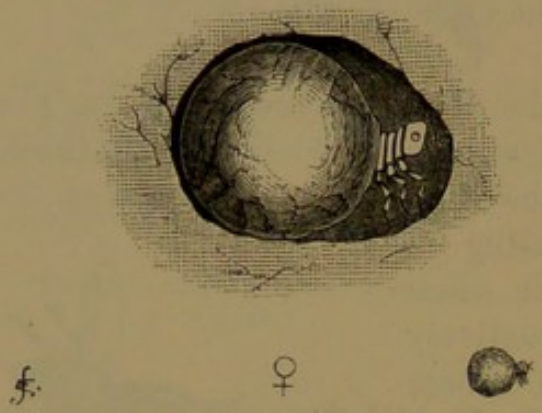


FIG. 520.—Pulex penetrans. (Red-brown.)

"I may be more thick-skinned than other people, and not suffer the same amount of inconvenience, but such is my experience. Since February last, when I came to this house, which is an old Brazilian Fazenda, I have had literally hundreds taken out of my toes. During the past month there would be half a dozen at a time boring away and removed two or three times a day. Some would escape observation for a few days; then out they come on the point of a pin, are put in the candle, and go 'Pop.' Now, after four months' continual washing and scraping of floors, they are so much diminished that I sometimes pass a couple of days without one. Mr. B. has just sent me a fine one for you. I don't know whether it will be of any use to you, but I enclose it. If you want any more, only say so."

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