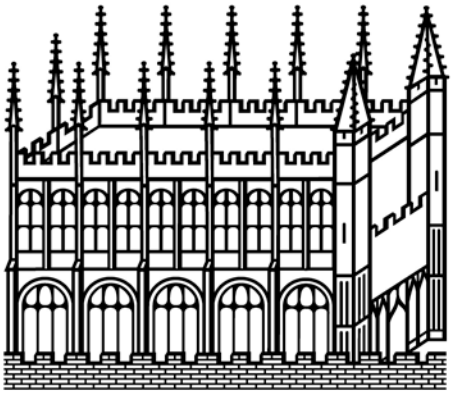

BUTTERFLIES & MOTHS
OF THE
COUNTRY-SIDE

THE DEATH'S HEAD HAWK MOTH.

CATERPILLAR AND PUPA.

BUTTERFLIES AND MOTHS OF THE COUNTRY SIDE

FIGURED AND DESCRIBED

BY

F. EDWARD HULME, F.L.S., F.S.A.

AUTHOR OF
"WILD FRUITS OF THE COUNTRY SIDE"
"FAMILIAR WILD FLOWERS," "WAYSIDE SKETCHES,"
"NATURAL HISTORY LORE AND LEGEND," ETC., ETC.

WITH THIRTY-FIVE COLOURED
PLATES BY THE AUTHOR

London: HUTCHINSON & CO
Paternoster Row

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IN NUMERICAL SEQUENCE

THE names in ordinary type are the popular names in more or less common use. Those in *italics* are the scientific names; these are ordinarily employed by entomologists in referring to a species. The numbers from 1 to 72 inclusive appertain to butterflies; thence to the end of the series to moths. When a plant is introduced, it is a food-plant of the caterpillar associated with it; but in most cases it is only one of several that are acceptable. When considerable difference of size, form, colouring, or marking is found in the two sexes, the letters *m.* or *f.* are added to the name to indicate whether the insect figured is the male or the female.

The Frontispiece gives the larva, pupa, and imago of the Death's Head Hawk Moth (*Acherontia atropos*), together with the potato, the favourite food-plant of the larva.

1. Swallowtail. *Papilio machaon.*
2. Brimstone. *f. Gonepteryx rhamni.*
3. Brimstone. *m. Gonepteryx rhamni.*
4. Pale Clouded Yellow. *Colias hyale.*
5. Clouded Yellow. *m. Colias edusa.*
6. Clouded Yellow. *f. Colias edusa.*
7. Orange Tip. *f. Euchloe cardamines.*
8. Orange Tip. *m. Euchloe cardamines.* Upper side.
9. Orange Tip. *m. Euchloe cardamines.* Under side.
10. Green Veined White. *Pieris napi.* Under side.
11. Orange Tip. *f. Euch'oe cardamines.* Under side.
12. Large White. *f. Pieris brassicæ.*
13. Large White. *m. Pieris brassicæ.*
14. Bath White. *Pieris daplidice.*
15. Green Veined White. *f. Pieris napi.*
16. Wood White. *Leucophasia sinapis.*
17. Larva of Small White. *Pieris rapæ.* Dorsal view.
18. Pupa of Small White. *Pieris rapæ.* Front view.
19. Pupa of Small White. *Pieris rapæ.* Side view.
20. Small White. *m. Pieris rapæ.*
21. Small White. *f. Pieris rapæ.*
22. Small White. *f. Pieris rapæ.* Wings closed.
23. Indian Cress. *Tropæolum majus.*
24. Larva of Small White. *Pieris rapæ.* Side view.
25. Marbled White. *Melanargia galathea.*
26. Speckled Wood. *Pararge egeria.*
27. Grayling. *m. Satyrus semele.*
28. Meadow Brown. *Epinephele janira.*
29. Grayling. *f. Satyrus semele.*
30. Small Heath. *Cœnonympha pamphilus*
31. Wall Butterfly. *Pararge megæra.*
32. Ringlet. *Epinephele hyperanthus.*
33. Ringlet. *Epinephele hyperanthus.* Under side.
34. Large Heath. *f. Epinephele tithonus.*
35. Large Heath. *m. Epinephele tithonus.*
36. White Admiral. *Limenitis sibylla.*
37. Purple Emperor. *m. Apatura iris.*
38. Purple Emperor. *f. Apatura iris.*
39. Painted Lady. *Vanessa cardui.*
40. Comma. *Vanessa C. album.*
41. Small Tortoiseshell. *Vanessa urticæ.*
42. Peacock. *Vanessa io.*
43. Red Admiral. *Vanessa atalanta.*
44. Large Tortoiseshell. *Vanessa polychloros.*
45. Camberwell Beauty. *Vanessa antiopa.*

46. High Brown Fritillary. *Argynnis adippe.*
47. Silver-washed Fritillary. *m. Argynnis paphia.*
48. Silver-washed Fritillary. *f. Argynnis paphia.*
49. Brown Hair Streak. *m. Thecla betulæ.*
50. Brown Hair Streak. *f. Thecla betulæ.*
51. Brown Hair Streak. *Thecla betulæ.* Under side.
52. Purple Hair Streak. *f. Thecla quercus.*
53. Green Hair Streak. *Thecla rubi.*
54. Green Hair Streak. *Thecla rubi.* Under side.
55. Purple Hair Streak. *m. Thecla quercus.*
56. Large Copper. *f. Chrysophanus dispar.*
57. Large Copper. *m. Chrysophanus dispar.*
58. Small Copper. *Chrysophanus phlæas.* Under side.
59. Small Copper. *Chrysophanus phlæas.*
60. Common Blue. *m. Lycæna icarus.*
61. Common Blue. *f. Lycæna icarus.*
62. Brown Argus. *Lycæna agestis.*
63. Bedford Blue. *f. Lycæna alsus.*
64. Bedford Blue. *m. Lycæna alsus.*
65. Holly Blue. *f. Lycæna argiolus.*
66. Holly Blue. *m. Lycæna argiolus.*
67. Chalk Hill Blue. *m. Lycæna corydon.*
68. Chalk Hill Blue. *f. Lycæna corydon.*
69. Large Blue. *Lycæna arion.*
70. Large Blue. *Lycæna arion.*
71. Small Skipper. *m. Pamphila linea.*
72. Small Skipper. *f. Pamphila linea.*
73. Small Elephant. *Chærocampa porcellus.*
74. Six-spot Burnet. Var., *Anthrocera filipendulæ.*
75. Six-spot Burnet. Type, *Anthrocera filipendulæ.*
76. Convolvulus Hawk. *Sphinx convolvuli.*
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78. Green Forester. *Procris statices.*
79. Lime Hawk (small specimen). *Smerinthus tiliæ.*
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83. Larva of Privet Hawk. *Sphinx ligustri.*
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85. Privet. *Ligustrum vulgare.*
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87. Striped Hawk. *Deilephila livornica.*
88. Poplar Hawk. *Smerinthus populi.*
89. Elephant Hawk. *Chærocampa elpenor.*
90. Silver-striped Hawk. *Chærocampa celerio.*
91. Broad-bordered Bee Hawk. *Macroglossa fuciformis.*
92. Humming-Bird Hawk. *Macroglossa stellatarum.*
93. Oleander Hawk. *Chærocampa nerii.*
94. Bedstraw Hawk. *Deilephila galii.*
95. Wood Leopard. *Zeuzera æsculi.*
96. Reed Moth. *Macrogaster arundinis.*
97. Goat Moth. *Cossus ligniperda.*
98. Ghost Swift. *Hepialus humuli.*
99. Festoon. *m. Limacodes testudo.*
100. Festoon. *f. Limacodes testudo.*
101. Rosy Footman. *Calligenia miniata.*
102. Dew Moth. *Setina irrorella.*
103. Orange Footman. *Lithosia aureola.*
104. Feathered Footman. *m. Euchelia grammica.*
105. Feathered Footman. *f. Euchelia grammica.*
106. Four-spotted Footman. *m. Lithosia quadra.*
107. Four-spotted Footman. *f. Lithosia quadra.*
108. Clouded Buff. *f. Euthemonia russula.*
109. Clouded Buff. *m. Euthemonia russula.*
110. Crimson Speckled. *Deiopeia pulchella.*
111. Larva of Cinnabar Moth. *Euchelia jacobææ.*
112. Larva of Cinnabar Moth. *Euchelia jacobææ.*
113. Larva of Cinnabar Moth. *Euchelia jacobææ.*
114. Larva of Cinnabar Moth. *Euchelia jacobææ.*
115. Ragwort. *Senecio jacobææ.*
116. Cinnabar. *Euchelia jacobææ.*
117. Pupa of Cinnabar. *Euchelia jacobææ.*
118. Cinnabar. Variation from type. *Euchelia jacobææ.*
119. Wood Tiger. *m. Chelonia plantaginis.*

192. Great Oak Beauty. ***Boarmia roboraria.***
193. Small Emerald. *Iodis vernaria.*
194. Large Emerald. *Geometra papilionaria.*
195. Essex Emerald. *Geometra smaragdaria.*
196. Common Emerald. *Hemithea thymiaria.*
197. V-Moth. *Halia vauaria.*
198 Common Heath. *Fidonia atomaria.*
199. Frosted Yellow. *Fidonia conspicuata.*
200. Bordered White. *m. Fidonia piniaria.*
201. Bordered White. *f. Fidonia piniaria.*
202. Blood Vein. *Timandra amataria.*
203. Clay Triple-lines. *Ephyra trilinearia.*
203A. Maiden's Blush. *Ephyra punctaria.*
204. Yellow Belle. *Aspilates citraria.*
205. Currant. *Abraxas grossulariata.* Variation.
206. Currant. *Abraxas grossulariata.* Variation.
207. Gooseberry. Food-plant.
208. Currant Moth. Abnormal size. *Abraxas grossulariata.*
209. Currant. Type, *Abraxas grossulariata.*
210. Currant. *Abraxas grossulariata.* Variation.
211. Larva of Currant Moth. *Abraxas grossulariata.*
212. Larva of Currant Moth. *Abraxas grossulariata.*
213. Larva of Currant Moth. *Abraxas grossulariata.*
214. Larva of Currant Moth. *Abraxas grossulariata.*
215. Pupa of Currant Moth. *Abraxas grossulariata.*
216. Currant. Variation. *Abraxas grossulariata.*
217. Clouded Magpie. *Abraxas ulmata.*
218. Mottled Umber. *m. Hybernia defoliaria.*
219. Mottled Umber. *f. Hybernia defoliaria.*
220. Clouded Border. *Lomaspilis marginata.*
221. Clouded Border. *Lomaspilis marginata.*
222. Dotted Border. *f. Hybernia progemmaria.*
223. Dotted Border. *m. Hybernia progemmaria.*
224. Grass Wave. *Aspilates strigillaria.*
225. Beautiful Carpet. *Melanthia albicillata.*
226. Argent and Sable. *Melanippe hastata.*
227. Purple Bar. *Melanthia ocellata.*
228. Purple Bar. *Melanthia ocellata.*
229. Yellow Shell. *Camptogramma bilineata.*
230. Barred Yellow. *Cidaria fulvata.*
231. Barred Straw. *Cidaria pyraliata.*
232. Treble Bar. *Anaitis plagiata.*
233. Scarce Tissue. *Scotosia certata.*
234. Barred Hook-Tip. *Deprana unguicula.*
235. Pebble Hook-Tip. *Deprana falcataria.*
236. Oak Hook-Tip. *Deprana binaria.*
237. Buff Tip. *Pygæra bucephala.*
238. Poplar Kitten. *Dicranura bifida.*
239. Lobster. *Stauropus fagi.*
240. Alder Kitten. *Dicranura bicuspis.*
241. Chimney-Sweeper. *Tanagra atrata.*
242. Chimney-Sweeper's Boy. *Fumea radiella.*
243. Puss Moth. *Dicranura vinula.*
244. Egg of Puss Moth. *Dicranura vinula.*
245. Larva of Puss Moth. *Dicranura vinula.*
246. Larva of Puss Moth. *Dicranura vinula.*
247. Larva of Puss Moth. *Dicranura vinula.*
248. Larva of Puss Moth. *Dicranura vinula.*
249. Larva of Puss Moth. *Dicranura vinula.*
250. Pupa of Puss Moth. *Dicranura vinula.*
251. Black Poplar. Food-plant.
252. Chocolate Tip. *Clostera curtula.*
253. Cockscomb Prominent. *Notodonta camelina.*
254. Swallow Prominent. *Notodonta dictæa.*

ILLUSTRATIONS

IN ALPHABETICAL SEQUENCE

THE names in ordinary type, as in the Numerical List preceding this, are the popular names; those in *italics* are the specific names as ordinarily in use by entomologists; those in small capitals are generic names.

Butterflies and Moths of the Country Side

CHAPTER I

What Entomology is—The Field we cover—Necessity of Specialisation—Classification—Lepidoptera—The Glossata of Fabricius—The Genera of Linnæus—Arrangement of Latreille—Difference between Butterfly and Moth—Popular Ideas thereon—The Gay Trifler Idea—The malignant Wardrobe Destructor—Rhopalocera and Heterocera—Butterflies at rest—Newman on Butterflies—The Antennæ—Attempted Classification by Caterpillar—and by Egg

IN a previous volume of the present series it was our pleasant duty to deal with the wild fruits of the country side—the scarlet hips, the crimson haws, the purple sloes, so attractive to the eye, so disappointing to the taste, the clustering hops and long festoons of bryony, the luscious blackberries, the nuts so dear to the squirrel and the village urchin, and many another form of interest to be found in the hedgerow, the forest glade, the wild expanse of wind-swept moorland. It becomes now our duty, and one no less pleasant, to deal with the butterflies and moths that throughout the year are represented by the various species that cross our path in our country rambles, or visit us in our flowery gardens. We have, advisedly, written "throughout the year," for though the glorious days of summer reveal these insects to us with an insistence that will not be denied, and that he must be blind indeed to country delights who does not recognise, yet many species are in evidence

until late in the autumn, some few even in chill December; while one of the cheeriest sights of returning spring is to see, while the hedgerows are yet but budding, the butterflies that have ventured from their winter shelter, and are fluttering abroad in the increasing warmth and sunshine.

We can well imagine that some may exclaim that any new book on our butterflies and moths can be but a work of supererogation; that all which can really be said has been said well-nigh *ad nauseam* before; that the standard works of Messrs. A, B and C, the noble volumes of the great authorities D, E and F, to say nothing of the manuals of Messrs. G and H, amply cover the whole ground. Even yet, however, here and now, we would beg to differ, and strive to justify our existence. It appears to us, from some considerable knowledge of the works of the eight authors we have alluded to, and from acquaintanceship with many others, that there is yet room for one more—that one, we need scarcely say, being the present volume.

One patent fact in so many of the treatises written is that they are obviously far too technical—dare we venture to say dry?—for the ordinary reader, since they presuppose an amount of knowledge on his part that is by no means an assured quantity, and clothe it in a language with which he is entirely unfamiliar. In an excellent book before us as we write—a standard work on the subject—we find introduced such terms as the following:—apodal, fovea, hyaline, lamellate, polyphagous, presubterminal, prensor, retinaculum, tornal—all thoroughly descriptive and valuable, but perhaps somewhat wanting in charm to the ordinary reader.

To deal really adequately with even every British species of butterfly and moth, by description and by figure, means not one volume alone, and implies great costliness; while too many who deal with the subject, in the desire to attract by cheapness, give illustrations that so far miss their mark as to fail to elucidate, being almost unrecognisable in their

crude colouring as the presentments of the insects they profess to portray, one common red, or blue, or yellow, or brown, doing duty all round.

The mission we take on ourselves is to endeavour to so write that all can see at a glance our meaning, and therefore to avoid as far as may be all technicalities ; to seek, if possible, to place ourselves in full sympathy with all nature lovers ; and, as a concluding ideal, to endeavour to have the good fortune to make some few recruits in a study and field so enjoyable as this proves to be to all who come under its spell. The illustrations will, we trust, be found to be reproduced in the best style : we have certainly ourselves spared no pains to make them adequate, and we may, in justice to ourselves and our figures, declare that no butterfly or moth appears in our plates that has not been drawn by us there and then for the purpose of this book with the actual insect before us. Some of these examples come from our own collection ; many by kindly loans from brother enthusiasts. Others came from the stores of the well-known naturalists, Messrs. Watkins and Doncaster, who most unreservedly placed their fine collection without fee or reward at our service ; while the magnificent collection in the Natural History section of the British Museum at South Kensington has also been laid by us under contribution. In our illustrations we deal with some insects that, meeting us almost everywhere, our readers must necessarily desire to know something about, while others in our pages claim a place from their rarity. These latter are species that, from their extremely local character, their very irregular appearance, or, in some cases, we fear, their approaching extinction, few will ever see, and many therefore be glad to here make their acquaintance.

Entomology,[1] the study of insects, covers an enormous

[1] The word entomology, like so many other scientific terms, is Greek in its derivation, being built up from *entoma*, insects, and *logos*, a discourse. This *entoma* is itself derived from *temno*, to cut ; while the word insect is Latin in its base, being derived from *in*, into, and *seco*, to cut. We thus

field, and remains yet a vast area of research when we so greatly circumscribe it as to deal with the insect-life of our own country alone. Stag-beetles, cockchafers, nut-weevils, lady-birds, earwigs, grasshoppers, crickets, ants, dragon-flies, May-flies, wasps, gnats, are all familiar enough, if not at times a little too familiar, to dwellers in the country, and all are insects, and, therefore, in their thousands of species, within the ken of the entomologist. In the present pages we deal not with entomology as a whole, nor even with British entomology, but narrow yet further our field by dealing with but one portion of this great area of study, our butterflies and moths. Our position is analogous to that of a numismatist who, feeling the study of the coinage of the whole world a task far too all-embracing, therefore deliberately confines himself to the coins of one country, and who presently, finding even this too large a field for his energies, his opportunities, or, perchance, his pocket, limits himself to the collection of the moneys of a single reign. If we imagine that even under this limitation the thing was yet too comprehensive, and that he confined himself severely to only the silver money of that period, we have the numismatic equivalent of an entomological acquaintance of ours, who finds even the collection of British butterflies and moths too great an undertaking, and limits himself in all singleness of heart and aim to the former alone, securing every possible variation from type, working out their life

find both in the Greek and Latin a suggestion that an insect is something that is cut into, and the most cursory observation will reveal the reason for this suggestion, since the body of an insect is ordinarily very sharply narrowed at one point. We may see this quite clearly in such very marked examples as the ant or the wasp, in which the body is at this point attenuated almost to a thread. Bonnet, writing some hundred and fifty years ago, affirms, "I have given the name insectology to that part of natural history which has insects for its object; that of entomology would undoubtedly have been more suitable, but its barbarous sound terrify'd me." It does not seem to have occurred to him that the mixture of Latin and Greek in his word produced a result yet more barbarous.

histories, and so forth, and never straying over the narrow border-line that shuts him off from the closely allied moth forms.

Amidst the ever-increasing store of material, the ever-lengthening vistas of knowledge, specialisation becomes a necessity. There was a time when a studious man might reasonably expect to feel that he had fairly grasped the multitudinous details of some great province of human thought or experience, but those days have passed for ever. Lord Bacon, in all sincerity of heart, wrote in the year 1590 to Lord Burleigh: "I confess that I have as vast contemplative ends as I have moderate civil ends; for I have taken all knowledge to be my province, and I would purge it of two sets of rovers, whereof the one, with frivolous disputations, confutations, and verbosities; the other, with blind experiments, auricular traditions and impostures, hath committed so many spoils." Buckle, another eminent Englishman, centuries later, realises that this ambition can be but a dream. "Once," he declares, "when I first caught sight of the whole field of knowledge, and seemed, however dimly, to discern its various parts, and the relation they bore to each other, I was so entranced with its surpassing beauty, that the judgment was beguiled, and I deemed myself able, not only to cover the surface, but also to master the details. Little did I know how the horizon enlarges as well as recedes, and how vainly we grasp at the fleeting forms, which melt away and elude us in the distance." In entomology then, as in all else, as soon as one gets beyond the first smattering,[1] one realises the absolute necessity of staking out a little plot to work in, while sympathising to the full with the workers in the other fields around us.

The question of Classification, then, is an important one, that thereby we may see what we are really undertaking, and

[1] Knowledge is proud that he has learned so much;
Wisdom is humble that he knows no more.—COWPER.

what relation our special section has with the other insects around us: why, for instance a hornet is not a butterfly, while a "Small Copper" is.

All created forms are included in one of the three great comprehensive kingdoms—the animal, the vegetable, and the mineral; and in one of the sub-kingdoms of the first of these, the insects form one out of several classes. This particular sub-kingdom—the Articulata—comprehends all those forms that are without a vertebral column or other internal skeleton, but which have a more or less solid external framework to which the various organs essential to the creature's existence are more or less attached. Other classes in this sub-kingdom are the domains of the Crustaceans, such as crabs, lobsters, and shrimps; of the Myriapods, such as the centipedes; or of the Arachnida, spiders and the like. Leaving these other classes henceforth alone, we turn to the class of Insects. A class is in itself much too large and unmanageable to be dealt with as a whole, and it must therefore be split up into orders, these again into sub-orders, these in turn into families, and possibly sub-families, these again into genera, and these yet again into species; and so we finally locate, beyond possibility of misapprehension, the exact position occupied by our "Small Copper" in the great scheme of creation.

We have not, however, yet cleared up the question of why the hornet is not a butterfly, while the "Small Copper" is. Both alike are insects; both denizens in this one great class, and having equal rights there. On splitting up this class into orders, in other words grouping all together that agree in some conspicuous way, and shutting them off from those in which that feature is wanting, we find that butterflies and moths are differentiated from all other insects—hornets, dragonflies, and so forth—by the fact that these alone have their wings covered with scales, scales so minute that it needs the microscope to see them adequately, but which in the aggregate are visible enough. In a few species, as in the

Broad-bordered Bee Hawk, Fig. 91, only a portion of the wings is thus covered. In some, as in the Transparent Burnet, Fig. 77, the covering of scales is so thin that the wings are semi-transparent; while in others, as the Oak Eggar, Fig. 163, the surface appears thickly felted from their abundance, but, whatever of more or less we may encounter in different species, the broad fact that the wings bear scales remains. Hence this order is known scientifically as the Lepidoptera, a word derived from the Greek words *lepis*, a scale, and *pteron*, a wing.

Aldrovandus, an Italian writer on natural history, who was contemporary with Shakespeare, classed butterflies and moths together as having *alæ farinosæ*, wings that were covered with a farinaceous or floury material; but it must be remembered that he wrote in the days before the aid of the microscope could be invoked.[1] Randle Holmes again, another early writer, declares these scale-bearers to be "such as have farinaceous wings covered with a mealy substance,[2] being many varieties of them for colours and magnitude, under these kinds of butterfly, moth, and hawk-butterfly."

The classification of insects into orders is mainly based upon their wing structure. Thus all the beetles are placed together and called Coleoptera, because in these insects the fore wings are modified into stout horny cases beneath which, when not in use,

[1] Spenser sees with poetic vision in this rich covering of the butterfly the beauty of some choice fabric—

> The velvet nap which on his wings doth lie,
> The silken down, with which his back is dight.

[2] Keats writes of his golden butterfly as

> High it soar'd,
> And downward suddenly began to dip,
> As if, athirst with so much toil, 'twould sip
> The crystal spout-head; so it did, with touch
> Most delicate, as though afraid to smutch,
> Even with mealy gold, the waters clear.

the second pair of wings is folded away: hence they are the sheath-winged. Other insects are in like manner grouped together from wing peculiarities and individualities as Hymenoptera, Neuroptera, Diptera, and so forth.[1]

Fabricius, a Dane, a pupil of the great Linnæus, and himself a distinguished naturalist, ventured to dissent from this view of classification by wing structure, esteeming other features as being of at least equal importance, and, especially, the organs of the mouth. Instead, therefore, of adopting the Linnæan term Lepidoptera, the scale-winged, he elected to call butterflies and moths Glossata, in allusion to the long spiral tongue that is so conspicuous in these insects, the term being derived from *glossa*, the Greek word for tongue. The Fabrician term is no better and no worse than the Linnæan.

That we should group butterflies and moths together implies that there is much similarity between them; that we should use the two names implies that there must be distinct points of difference. Let us endeavour, then, to define what the features are that differentiate these each from the other, and makes these two sub-orders necessary in our classification.

Linnæus in the earlier edition of his *Systema Naturæ*,[2]

[1] "At the base of all truly scientific knowledge lies the principle of order. There have been some who have gone so far as to say that science is merely 'the orderly arrangement of facts.' While such a definition is defective, it is nevertheless true that no real knowledge of any branch of science is attained until its relationship to other branches of human knowledge is learned, and until a classification of the facts of which it treats has been made. When a science treats of things, it is necessary that those things should become the subject of investigation, until at last their relation to one another, and the whole class of things to which they belong, has been discovered."—HOLLAND.

[2] First published in Leyden in 1735. During the lifetime of Linnæus twelve editions were issued, all but the first being published at Stockholm. The first edition was a pamphlet of twelve pages, but the book ultimately grew into as many volumes.

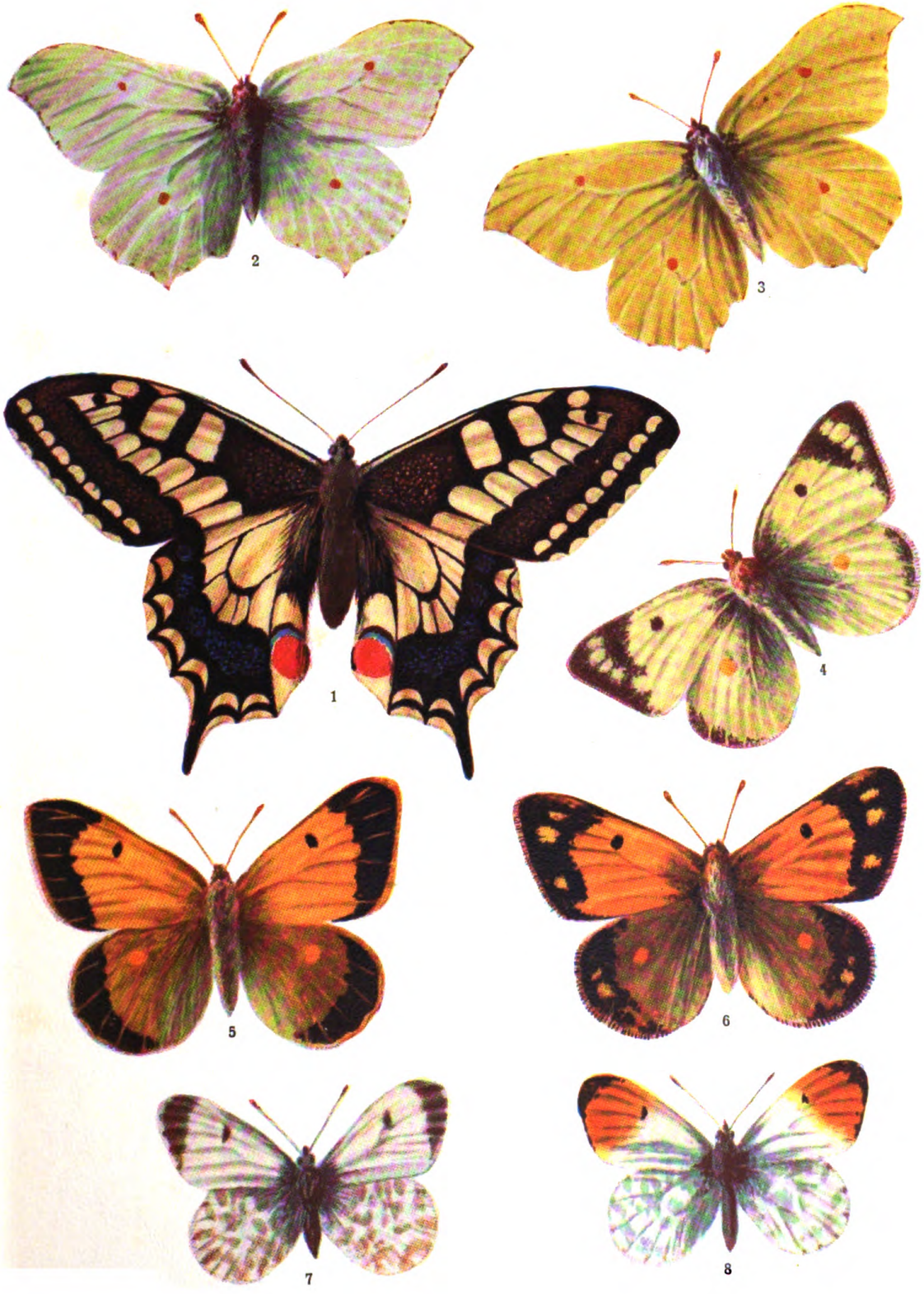
adopted only two genera, Papilio and Phalæna, which we may take at once to agree with the popular terms butterfly and moth; but he presently realised that the hawk-moths were so distinctive in character that in later editions he added a third genus, Sphinx. This arrangement was soon found to be much too circumscribed, and we have to deal nowadays, not with three genera, but with hundreds. Still the simple Papilio and Phalæna classification may yet stand as representative of sub-orders, to be afterwards again split up into numerous genera.

Latreille, born in 1762, and one of the most distinguished of French naturalists, adopted in the main the classification of Linnæus, but called his divisions Diurna, Nocturna, and Crepuscularia, or, in other words, those lepidoptera flying by daytime, those only to be found at night, and those abroad in the twilight. This classification, however, will not stand the test of experience, for though no butterfly flies at night, and all these may therefore be classed as diurnal, it is quite impossible in practice to draw a sharp dividing line between twilight-flying and night-flying moths; while, to complicate matters yet further, not a few of our moths decline to limit their activity either to the dusk of the evening or the darkness of the night, but may be found also very much in evidence at midday. The "man in the street," who is so often quoted as a fair exponent of public opinion, will be found, not ordinarily being a specialist in matters entomological, to hold entirely the idea that butterflies fly by day, and moths, of course, by night. *Voilà tout!* The facts, however, are against him.

Some people will tell us that the real difference between butterflies and moths is sufficiently obvious, seeing that the bright, attractive ones are the butterflies, while the dull, dingy ones are the moths. This is a very broad, clear, and simple classification, and only needs just the element of truth to make it a very useful and workable definition. Even here

PLATE I

1. Swallow Tail. *Papilio machaon.*
2. Brimstone. Female. *Gonepteryx rhamni.*
3. Brimstone. Male. *Gonepteryx rhamni.*
4. Pale Clouded Yellow. *Colias hyale.*
5. Clouded Yellow. Male. *Colias edusa.*
6. Clouded Yellow. Female. *Colias edusa.*
7. Orange Tip. Female. *Euchlœ cardamines.*
8. Orange Tip. Male. *Euchlœ cardamines.*



Tafel I.

we should perhaps get into difficulties presently, and should need, like Linnæus, a third and intermediate term, finishing off at last with the pretty, the ugly, and the so-so, but of course clothing these terms in Greek, to give them the proper scientific weight and flavour.

When, however, we look at our illustrations and find that the Small Heath depicted in Fig. 30, or the Ringlet shown in Fig. 32, are declared by entomological authorities to be undoubtedly butterflies, while the brilliant Cinnabar illustrated in Fig. 116, and the Scarlet Tiger of our 124th figure, to say nothing of the Red Underwing, depicted in Fig. 293, are pronounced to be moths, we realise that the more or less of attractive appearance seems to become a characteristic of no value. Some would even appear to think that a process of development is going on, and that steps of promotion are possible; at least a friend of ours once said to us in our garden: "That is a rather pretty moth; will it presently turn into a butterfly?" When we assured her that it really would not, she was sorry and disappointed, saying: "No? I thought it would turn into a yellow butterfly like that one." As "that one," the yellow butterfly in question, was indicated by pointing to a Yellow Underwing moth, the species we have shown in Fig. 266, the matter became hopelessly involved. The choice "butterfly" that one's non-entomological friends advise one of the dispatch of is generally on arrival found to be a Tiger moth, such as we have depicted in Fig. 127, its bright colouring attracting attention, while its sluggish habit renders its transfer to the matchbox easy. The descriptions given by amateurs are often extremely unreliable. A lady told us, for example, of a moth that her son had caught: "It was brown, but its underwings were red and white." As we could not think what it could be, it was duly forwarded to us, and turned out to be the Red Underwing (Fig. 293). How far this conforms to the description a reference to our illustration will suffice to show. People tell

us that they saw such a very pretty plant, something between a poppy and a thistle, only it had leaves like grass, and its flowers were pale yellow. On being sent it turns out to be a water lily. We do not indeed remember this particular case, but we have had many not far short of it in lack of accurate observation.

Some people, prosaic souls, hailing from Philistia ordinarily, divide our butterflies and moths into two great classes, based on their supposed moral dispositions: first, the gay triflers that flutter in the sunlight, toiling not, spinning not, serving as ever-ready texts against idleness and frivolity, in sharp contrast to the busy bee, the industrious ant; and, secondly, those blacker characters whose one preoccupation, the thrifty housewife thinks, is to ravage her wardrobe and generally destroy her property, and whose sole thought when she hears the word "moth" uttered is to exclaim in strident tones: "Where? where? Kill it!"

That some such proportion as ninety-nine one-hundredths of the moths she collectively dreads feed in their larval state on quite other pabulum than blankets does not come within her experience. Dr. Johnson, we see, too, defines moths in the earlier editions of the great dictionary with which his name is always associated, as "a small insect or worm, which eats clothes or hangings, and afterwards becomes winged"; while Shakespeare, in *Coriolanus*, declares that "all the yarn Penelope spun in Ulysses' absence did but fill Ithaca full of moths." The word moth is in its origin Anglo-Saxon, being derived from *motha*, the creature we now call a maggot.[1] Fulke in 1580 writes: "We rake not up olde mouldie and

[1] "The moth shall eat them up like a garment, and the worm shall eat them like wool," wrote Isaiah over two thousand six hundred years ago; while Job, more than three thousand years ago, wrote of a thing consumed "as a garment that is moth-eaten," and elsewhere in Holy Writ we are warned against laying up treasure where moth and rust doth corrupt.

mothen parchments to seeke our progenitors' names"; while Dryden, in his translation of Juvenal, declares—

> Let moths through pages eat their way,
> Your wars, your loves, your praises be forgot,
> And make of all an universal blot.

In all these illustrations we see that the thrifty housewife, the great dictionary-maker, the yet greater poet, are at one in this belief, that the moth is a hopelessly bad character, a malignant creature to be flattened out at sight, as being beyond extenuation, alibi, or appeal.

The distinguishing mark that is accepted as enabling us to decide whether an insect before us is a butterfly or a moth is the form assumed by the antennæ. Should these bear at their termination a more or less rounded knob, then the specimen before us is a butterfly. Like most broad, sweeping statements, this must be accepted with a little reservation, but in nearly one hundred cases per cent. it holds good. This distinction is so far valid that on it are based the names of the two sub-orders, the butterflies being called Rhopalocera and the moths Heterocera. *Rhopalon* is the Greek word for a club, as *keras* is for a horn, while *heteron* signifies different, dissimilar. In the one large class, therefore, all the constituents are club-horned, and in the other they are anything varying from this, the horns being sometimes thread-like, sometimes more or less elaborately toothed, sometimes thickened in the centre, and in other ways differing from the simple terminal ball or club-like form. We have said that this broad and simple distinction must be received with a slight reservation, for we find in the tropics a few rare genera of moths that have this club-like termination to their antennæ, and we find, no less, certain genera or butterflies without it. Even in our own country the butterflies known as the Skippers have the knob curving like a hook and ending in a point, this terminal hooked point being also very characteristic of the antennæ of the Sphinx moths.

Many minor differences between butterflies and moths may be noted, though none of them may be pushed too far. Thus we may point out that the wings of butterflies are often brightly coloured on both their upper and under surfaces; while in moths, whatever the upper may be, the under sides are ordinarily very quiet in tint. Butterflies ordinarily, too, on alighting throw their wings up, as shown in Fig. 22, until their surfaces are almost in contact, while in moths this erection of the wings is not seen. There is, however, considerable diversity of practice, for the Peacock butterfly on the instant of alighting almost invariably throws its wings together, exhibiting, therefore, only their under sides, while the Red Admiral, a very closely allied species, more generally suns itself with fully expanded wings. Many moths when at rest drop the upper wings over the lower, and especially do we find this the case where the lower wings alone are gaily coloured. This may be very well seen in Fig. 269, where we have the common Yellow Underwing depicted at rest, and in Fig. 300, where we find the Red Underwing under similar conditions. The Buff Tip, Fig. 237, when quiescent wraps its wings round its body, so that the result is more suggestive of a piece of dead twig than of any living creature. The chrysalis of the butterfly is often gaily coloured, frequently being angular in form, is seldom found enwrapped in a cocoon, but is more ordinarily suspended from a leaf, and bound by a silken cincture to a stem, as we may see in Figs. 18, 19. The moth chrysalis differs in all these points, being commonly more or less cylindrical or spindle-shaped, brown or black in colour, enwrapped in a cocoon, or buried beneath the earth. Representatives of moth chrysalids will be found in Figs. 117, 123, 250. The bodies of butterflies are ordinarily much more slender than those of the moths, terminate in a more distinct point, and are considerably more pinched in at what in colloquial term we may call their waists. This is a point that reference to our illustrations will readily confirm, though, like

most other matters, it is not safe to dogmatise, since for acute termination of the body nothing can compete with the Elephant Hawk, of which Fig. 89 is a representation.

Newman, a well-known insect collector, wrote an entomology in verse for the edification of the children of his friend and fellow entomologist, Douglas. In dealing with the diurnal Lepidoptera, he writes :—

> Butterflies we always call them,
> And it is not hard to know them:
> First, they always fly in sunshine;
> Then they have these knobbed antennæ
> Coming forward from the forehead:
> These are sometimes called the feelers,
> And some think them ears for hearing;
> But we know they are antennæ,
> And were made for some wise purpose.
> What that purpose is we know not.
> All their wings are very ample,
> All the hind wings gaily coloured,
> Gaily coloured like the fore wings,
> Never hidden by the fore wings,
> Never folded up beneath them.
> When these insects rest at night-time,
> Or would hide from passing showers,
> Then their wings are all erected,
> Meeting up above their bodies.

The book, a mere brochure, to which the writer thereof would attach little importance from the literary or scientific point of view, was entitled the "Insect Hunters."

> And if further you would wish me,
> Saying: "Who then is the Douglas?
> Who this great and learned Douglas?
> Tell us all about this Douglas."
> I should answer your enquiries
> Straightway in the words which follow:
> "Very near the Blackheath Station,
> Station of the North Kent Railway,
> In a lonely place called Kingsland,
> Dwells the wise and learned Douglas."

Descending from these Olympian heights to plain prose, John William Douglas was the secretary during Newman's time of the Entomological Society of London, the author of the "World of Insects" and several valuable monographs published in the Transactions of that Society and elsewhere.

While there is no absolute line of demarcation between butterflies and moths, it is practically convenient to accept the structure of the antennæ as supplying us with a good working system—though other tests have been used to aid the classification of the Lepidoptera as a whole, and ignoring the distinction between butterflies and moths as a purely arbitrary one.

We need scarcely remind our readers that the moth and butterfly condition is but the last of a series of phases, commencing with the egg stage, passing thence to the caterpillar, thence onward again through the chrysalis state, before final emergence into the imago or perfect insect; and it has been asserted with much show of reason that "an animal cannot find a natural and definitive place amongst its relatives, until not only its own entire adult organisation is fully investigated, but also all the peculiarities which it exhibits in its progress towards maturity."

Attempts have been made to found a system of classification based on the caterpillar stage only, but this is clearly as much a limitation of the field of investigation as to base one's requirements, Fabricius-like, on the form of the organs of nutrition or the shape of the antennæ. Messrs. Denis and Schiffermüller, for example, published in the year 1776 a systematic catalogue of Lepidoptera, employing the caterpillar forms exclusively to characterise the divisions; but such a system can only be of the most artificial nature, ending in the grouping together of insects of the most dissimilar type. With few exceptions there seems to be nothing tangible in the relationship between caterpillars and the resulting winged insects. We cannot, as a matter of course, get hold of a caterpillar hitherto unknown

to us, and say that from our knowledge of other caterpillars much resembling it the result on the final emergence will be a foregone conclusion, though in some cases we can more or less do so. If the caterpillar be very short and broad it is probably going to result in one of the "Blues"; if furnished with a recurved horn on its last segment, as in Fig. 83, we may anticipate that some species of Hawk-moth will be the final outcome; and what we know as looping caterpillars, such as we see in Fig. 211, 212, are also ordinarily, but not inevitably, the indication of a certain kind of moths, those known, as we shall see later on, as Geometers. Nevertheless the data are far too scanty to place exclusive trust in; some caterpillars, for instance, are densely covered with hair and others nearly or quite smooth, though the resulting insects may be of near relationship, while colour is of absolutely no value as a clue to the final stage.

The advocates of this system forced together certain groups of caterpillars, such as those they called the *Mediostriatæ*, those with lateral colour markings, though such marking is extremely common throughout the whole range of caterpillar coloration; the *Ursinæ*, so called from their shaggy, bear-like appearance; the *Acutospinosæ*, so termed from their prickly hairiness; the *Larvicidæ*, those of cannibal propensities. The system is practically analogous to the procedure of an ornithologist who should classify his birds according to the colour of their eggs —grouping together the stock-dove, barn-owl, and gannet, since their eggs are white; making one family of the thrush, the jackdaw, and the guillemot, because they all laid eggs of a blue colour more or less mottled with black or brown.

An Englishman named Withers also advocated this caterpillar idea. His system was a purely artificial one, and might possibly be of some little mechanical aid in identification. He first divided his caterpillars into two great sections, the butterfly-producing and the moth-producing, though how a novice was thus to apportion any particular find does not appear.

These again were subdivided into those having circular colour markings, those having spines, those that were smooth, somewhat hairy, and those decidedly hirsute, with or without protuberance, etc., until at length, with the caterpillar, or the analysis of it, before one, we might venture to decide that the final result would be an Emperor butterfly or, perchance, a Goat moth, unless possibly it might be one of half a dozen others that seemed to about equally fulfil the conditions.

A Mr. Doherty endeavoured to formulate a series of rules by which our butterflies and moths could be grouped according to the forms of their eggs; and while we find a certain unity—as, for instance, the Sphinx moths laying eggs of flattened character, while Tiger moths, the Goat moth and its allies, and many others, lay what may be termed upright eggs, their vertical axis being considerably larger than their horizontal—yet these and many other observations on form, sculpture, etc., are so girt round with exceptions that no practical basis is really obtainable, while any attempt to make the chrysalis form of any real identificatory value is equally hopeless. The final outcome, therefore, is that butterflies are distinguished from moths, butterflies grouped off from other butterflies, moths from other moths, by characteritics almost wholly appertaining to them in the final stage of their being, though at the same time no recognition of the various butterflies or moths that we meet with in our rambles on the country side would be entirely adequate, or of any real value or full interest to us, if unaccompanied by some knowledge of, and regard for, their previous life-history.

CHAPTER II

External Structure of a Butterfly or Moth—Winged or Wingless Moths—The Scale Covering—The Wing Nervures—The Wing Margins—Scales as viewed by the Aid of Microscope—Scale Forms—Coloration—Curious Absence of Green—Protective Colour—Upper and Under Surfaces—Recurring Patterns—Difference in Sex Coloration—The Sex Symbols—Albinism—Melanism—Natural Selection—The Head and Eyes—The Proboscis or Sucker—Haustellata—The Antennæ again—The Thorax—Abdomen—Legs—Complete and Incomplete Metamorphosis

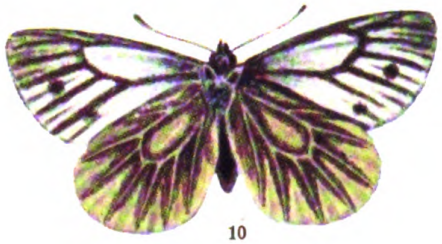
IN the present chapter we desire to enter upon some little consideration of the external structure of the butterfly or moth. In a book intended for popular acceptance any elaborate physiological investigation would be beside the mark ; at the same time we would impress upon our readers that the more one knows, in this as in every department of nature study, the more one appreciates the beauty of contrivance, the wonderful adaptation of means to ends, of even the lowliest forms. To most persons who have not thought much about it a caterpillar, for instance, may be taken broadly as representing so much more or less pulpy matter, a tempting morsel enough for some hungry bird ; but that is really about all. Nevertheless, so elaborately provided for are the means whereby a Goat-moth larva, or other well-developed species, performs the necessary movements essential to locomotion, nutrition, and other functions, that the comparative anatomist defines and names on its dissection a considerably greater number of muscles than suffice for the requirements of a man.

In the butterfly or moth the wings—the means of flight—are four in number, when possessed at all, since we find some

PLATE II

9. Orange Tip. Male. Under side. *Euchloe cardamines.*
10. Green Veined White. Under side. *Pieris napi.*
11. Orange Tip. Female. Under side. *Euchloe cardamines.*
12. Large White. Female. *Pieris brassicæ.*
13. Large White. Male. *Pieris brassicæ.*
14. Bath White. *Pieris daplidice.*
15. Green Veined White. Female. *Pieris napi.*
16. Wood White. *Leucophasia sinapis.*

9



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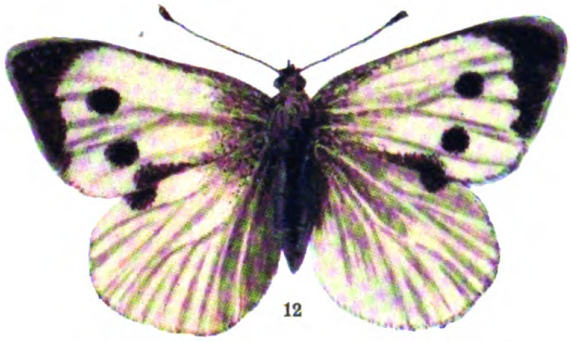

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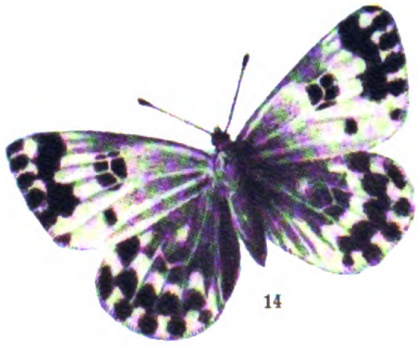

14

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Plate II.

few specimens entirely wingless. Amongst the lepidopterous insects this wingless condition is confined to the females : such instances are found occurring amongst some few moths, but no British butterfly, whatever its sex, is denuded of its full complement of wings.

Though, as we have seen, all butterflies and moths have their wings more or less thickly covered with scales, or they would not be Lepidoptera at all, these scales with due care can be completely removed from the wings. They are found clothing both the upper and under surfaces. If the insect we propose to strip of its scales be a common species—one that we can readily replace—we shall have no compunction in denuding it ; for, our object being to get a general knowledge of the nerve arrangement, a common Large White will serve our turn as efficiently as any other and rarer species. A very good and simple way of removing the scales is to place the wing we propose to operate upon between two pieces of thin and fairly smooth paper, and then proceed to very carefully rub finger-nail, paper-knife, or some such object on the upper face of the paper, looking from time to time to see what progress is being made in the loosening and removal of these minute bodies ; a small paint-brush, such as one would use for water-colour work, is also very useful. The operation is necessarily a delicate one, and a few failures, most likely from over-pressure, must be anticipated ; practice makes perfect, however, in this as in most other things. Some species naturally yield more readily to treatment than others. Should our specimen be a choice one, not readily replaced, our investigation may take a more temporary form ; for we shall find that if we damp the wings with benzine, it renders them for a short time sufficiently transparent to allow the arrangement of the nerves to be clearly visible, and then presently the benzine entirely evaporates, leaving absolutely no ill effects to our specimen behind it.

On the removal of the outer covering, the wings are found

to be of a membranous nature, and the nerves, nervures, nervules or veins (all these names being applied to them) are conspicuous upon them. On examination these nerves are found to be tubular, and, if we investigate yet more closely, we shall note that even within this minute tube runs yet another, the outer one being for the circulation of the blood, while the inner one is filled with air. The passage of the blood into these tubes is more especially when, after the emergence from the chrysalis, the insect is gaining its full development. After this important period this flow of the blood becomes of little moment, and is often entirely suspended.

The arrangement of the nervures varies considerably ; but though the details are modified, one general principle runs through all. This arrangement, whatever it may be, is called technically the neuration, and is so far constant in all insects of one group that it affords a very valuable means of identification and classification. These nervures spring from the bases of the wings, and run outwards to the margins, sometimes directly and sometimes more or less branching. The spaces between these numerous lines are known as cells.

For convenience of description, the fore and hind wings of a butterfly or a moth are divided into the costal margin, the outer and the inner margins. If we turn to one of our illustrations (say, for example, the Camberwell Beauty, depicted in Fig. 45), we may very readily identify these parts : taking the fore wing first, the costal margin is that edge of the wing where we find the two isolated cream-coloured spots ; the outer margin is that which is parallel to the line of blue spots, while the inner is that portion of the upper wing which is in contact with the hind wings. The front wings of butterflies and moths may be described broadly as approaching the triangular in outline, some species, in the wonderful variety of form we find in nature, naturally having this feature more marked than others. A reference to our illustrations will supply numerous examples of this more or

less typical triangular form, together with others that depart considerably from it, any very definite suggestion of an angle being lost in the rounded character of the wing-form. The meeting-point of the costal and outer margins is called the apex ; this is sometimes very sharply accentuated, as in the Elephant Hawk Moth, Fig. 89. The junction of outer and inner margins is called the outer angle. It may be seen very sharply defined in the Oleander Hawk Moth, Fig. 93, for instance, but is ordinarily so rounded off that any idea of an angle that is based on geometrical definitions and pre-conceptions seems rather far-fetched. In the Wood Leopard, for instance, Fig. 95, and the Ghost Swift, Fig. 98, it is, as Italy was long defined to be, a geographical expression rather than a definite entity. The portion of the wing springing from the body of the insect is called the base. In the hind wing the costa is ordinarily out of sight, being beneath the inner margin of the upper wing. It would have required our Camberwell Beauty to have been set up in an entirely unnatural position to enable us to have seen this costal edge of the lower wing. The outer margin is the position which in Fig. 45 runs parallel to the hind-wing series of blue spots, the remaining margin being necessarily the inner.

A strong nervure is always found running close to the costa, and is hence called the costal ; while two other very conspicuous ones, the subcostal and the median, arise from the middle portion of the base of the wings. These are partly united by other branches, and enclose a large space called the discoidal cell. This cell is often marked on its outer margin by what is called the discoidal spot. We may see this spot very clearly in the Brimstone butterfly, where it is clear orange in the midst of the field of yellow, or in the Pale Clouded Yellow, where it is on the front wings black, and on the hind wings orange, on the delicate sulphur yellow ground.

Any one seeking to work out the ramifications of the nervures can ordinarily do it much more readily by examining

the under sides of the wings. The upper surfaces are in most cases much more thickly covered with scales, though in some species the wings, being semi-transparent from the thinness of this covering, show the nervures equally well on either side. The Black-veined White butterfly and the Transparent Burnet moth are very notable examples of this great paucity of scale-covering. On the upper faces not only the thickness of the scaling, but a certain crinkling of the surface, often greatly obliterates the nervure lines, rendering them sometimes almost entirely invisible.

The artist is satisfied to give us the sweet attractions of some fair young face, without insisting that beneath this comeliness is a wonderful machinery of muscular mechanism based on the osseous framework. We are well content to believe that, if he chose to do so, his knowledge of structure would enable him unerringly to indicate on his work the origin and insertion of the buccinator, the trend of the ligaments that bind in its position the lower maxillary; but we have certainly no desire, as we stand before his vision of youthful charm and grace, to put him to the proof.

One of the faults that one occasionally sees in butterfly and moth illustrations is that the draughtsman, knowing that the nervures are really there and of great importance, will insist on showing them, rendering the work excellent as a diagram, but contradicting the appearance as brought before the eye. In the various kinds of Fritillary, as in Figs. 46, 47, 48, the nervures are generally much in evidence, and their positions very obviously affect the placing of the veins, blotches, and markings; they must therefore not fail to be in evidence in any representations of these insects; but in many other species they are by no means insistent.

The costal margin of the wing varies from being nearly straight to a very considerable curvature; reference to our illustrations will readily show the marked variations of form in this respect. The outer margin is still more varied in

form. In many species, as in the Swallowtail, Fig. 1, it is almost a straight line. In some insects, as in the Brimstone butterfly, Fig. 2, the Speckled Yellow moth, Fig. 176, or the Burnished Brass, Fig. 292, we get a double curve. In others, as in the Comma, Fig. 40, the Lime Hawk, Fig. 81, or the Early Thorn, Fig. 181, it is very irregularly notched; while in Fig. 180, where the Lilac Beauty is depicted, we see it undulating. In the Poplar Hawk, Fig. 88, and in the Large Emerald, Fig. 194, this margin is scalloped; while in the Puss Moth, Fig. 243, it is rounded.

The scales or plumules—little feathers, as they are sometimes called—are physiologically only modified forms of hairs. Microscopical examination of a wing will show us that often intermingled with the scales are typical hairs and bristles, and together with these two extremes may be seen a series of forms in various stages of transition between them. From the simplest form of hair we pass, first, to one split at its free extremity into two or three divisions. We then find the interspaces gradually filling in more and more with material until we presently arrive at the typical broadly flattened-out scale form. These scales are inserted into the wing membrane by means of a little foot-stalk and a terminal bulb, and overlap each other on the whole surface of the wing like the tiles upon a roof.

A naturalist, somewhat over a century ago, in referring to the pinions of a butterfly, wrote: "The beautiful dust with which they are covered has been likened by some to the feathers of birds; by others to the scales of fishes, as their imaginations were disposed to catch the resemblance." We have seen, too, it likened to actual dust, to flour, to rich dress fabric, to the pollen of blossoms.[1] A microscope of

[1] Shortly before writing these lines we saw two boys in hot pursuit of a butterfly. One cried out to know if the other had knocked it down, an enquiry to which he was obliged to respond in the negative, but declared with much satisfaction, as showing what a near thing it had been, "I've knocked a good deal of its pollen off it." That its beauty had probably been thereby a good deal spoiled seemed a quite secondary matter.

even moderate power of course indicates its true nature, and separates its component parts. Dust is under microscopic scrutiny found to be a wide term indeed, yet scarcely wide enough to include these scales; while there is, one readily sees, nothing farinaceous or otherwise botanical in their structure. The comparison that we have seen Spenser making to the richest fabric of the loom falls short indeed of the perfection of the Divine handiwork.

To any one who has seen these scales beneath a good microscope, any attempt at a description is felt to be hopelessly inadequate; while those who have not would think even the most restrained and sober attempt to picture them mere rhapsody, would-be fine writing, fantastic exaggeration. There is really therefore nothing to be done but for each for himself, herself, to bring the matter to the test of experience, and then, like her Majesty of Sheba, exclaim, "I believed not the words until I came, and mine eyes had seen it; and, behold, the half was not told me."

A modern writer, Coleman, endeavours to tell us what he saw on bringing a portion of the wing of the Peacock butterfly, the insect we have depicted in Fig. 42, under microscopic observation. "Beginning," he tells us, "our observations at the outer edge of the wing, we notice a delicate fringe of scales or plumes of a quiet brown colour. This tint is continued inwards for a short space, gradually brightening, when, as we shift the field of view towards the centre of the wing, the colour of the scales suddenly changes to an intense black; then a little further, and the black ground is all spangled with glittering sapphires; then strewed deep with amethyst round a heap of whitest pearls. Golden topaz (jewels only will furnish apt terms of comparison for these insect gems)—golden topaz ends the bright, many-coloured crescent, and in the centre is enclosed a spot of profoundest black, gradating into a rich unnameable red, whose velvet depth and softness contrast deliciously with the

adjacent flashing lustre; then comes another field of velvet black, then more gold, and so on until the gorgeous picture is complete." This is descriptive of but one square quarter-inch.

The scales often vary greatly in form, and on different portions of the wings of even the same butterfly or moth. Some are fan-like, having their outer margin serrated; some like hands with widely extended fingers—fingers, too, sometimes considerably in excess of those on the human hand; some resemble boat-paddles, while others suggest battledores; but all with a delicate beauty of outline that no comparison with such prosaic objects as fans or paddles can at all suffice to express. The commonest species—the large Garden White, the Brimstone, the Small Tortoiseshell—yield us charming examples as readily as the choicest insects of our cabinet, and even a moderately strong pocket lens will reveal much of interest; but, naturally, the work being Divine, not human, each increase of power impresses us more and more with the grace of outline, the rich sculpturing of the surface, the splendour of the colouring.

Before leaving this general consideration of the wings of our butterflies and moths, we must not, we think, omit to point out the wonderful variety of their outlines and proportions. Some of these insects, we see at once, are provided with the power of rapid and sustained flight, while others, no less obviously, we are sure must be home-keepers, incapable of straying far beyond somewhat circumscribed and local limits. The lines of the wings, for example, of the Oleander Hawk, Fig. 93, we note at a glance, are as finely cut as those of a racing yacht, and it excites in us little surprise that this beautiful moth, an insect really of Southern Europe, does from time to time wing its flight to these northern islands across the hundreds of miles that separate us from its home on the sunny shores of the Mediterranean. What a contrast of build between such an ocean-liner as the Convolvulus Hawk, Fig. 76, found sometimes a hundred miles out of sight of

land, and the Currant Moth, Fig. 209, that weakly flutters about our gardens!

The proverbial dictum that tastes differ is so generally accepted that we can scarcely expect the judgment of our readers to coincide with our own; but, having the courage of our opinions, we will affirm that the forms of the Brimstone, Figs. 2, 3, the Purple Emperor, Fig. 37, the Striped Hawk, Fig. 87, the Oleander Hawk, Fig. 93, the Kentish Glory, Fig. 167, the Oak Hook-tip, Fig. 236, the Gold Spangle, Fig. 282, and the Silver Y, Fig. 291, appear to us especially attractive in beauty of outline and general proportion.

The coloration of our butterflies and moths, though not so gorgeous as that of their tropical relatives, is full of interest, many points arising on the contemplation. The first thing that strikes one is the curious absence of green. One hears so much of the protection afforded by colour, as shown by the green snakes of arboreal habit, the mottled-brown reptiles of the desert sand, the protective colouring of the Polar bear, and the fifty other examples that are so readily forthcoming, that one would be fully prepared to anticipate a goodly number of butterflies and day-flying moths of varying shades of green; and after all we search in vain, though brown, another strongly protective colour, is much in evidence. We shall, however, we presume, be reminded that butterflies are less denizens of the forest glades than of the open country, that it is to the flowers, so gaily and so variously coloured, their attention is devoted, and that, therefore, green would be a less protective colour than the white, yellow, blue, and other tints we really find. The under surfaces are ordinarily much less brilliant in colour than the upper, and the pattern they bear is generally of a quite different design to that on the other face; or it sometimes in part resembles it, but with curious omissions of spots or bands with no apparent reason, two being replicas possibly, while a third is entirely missing; or possibly, again, with equally

curious redundancies. In such repeating patterns the one on the under surface is ordinarily in a lower key, the black of the upper being gray in the lower, the scarlet of a brickier tone, the strong clear yellow a faded straw colour, the pronounced white somewhat sullied from its purity. As one example out of the many that could be brought forward of paled colour, we may take the under surface, Fig. 58, of the Small Copper as contrasted with the rich metallic gloss of the upper, Fig. 59. As typical instances of a quite different design on back and front, we may contrast the two surfaces in the Ringlet, Figs. 32, 33, the under surface, while sombre enough in colour, being considerably the more enriched in markings; while in the Brown Hair-streak the upper surface, Fig. 49, gives us no hint as to the meaning of the popular name of the butterfly, though we obtain this clue readily enough when, on reversing the insect, as in Fig. 51, we find the under surface of a rich, strong brown colour crossed with streaks of white—streaks hairlike in their proportion and thickness. The Green Hair-streak, a closely allied species to the last, is yet more notably diverse, being an entirely brown butterfly if we see its upper surface, an entirely green one if we reverse it. These two Hair-streak under surfaces, the only visible ones when the respective insects at rest throw up their wings, are clearly of considerable protective value. In such a case as the Red Underwing Moth, Figs. 293, 296, protection is afforded by the dull upper wings dropping on and concealing, as in Fig. 300, the brilliant lower ones, the under surfaces not entering into the matter at all. The broad bands of strong alternate brown and white of the under face, Fig. 296, are in themselves very striking and harmonious and in very marked contrast in design with the dull mottling of the upper surface of the wing. In some instances, as in the Orange Tip, Fig. 9, the Green-veined White, Fig. 10, the Small White, Fig. 22, the lower face is the stronger in colour; but here again we readily see that this deepened colour is a protection, the insect

being, when at rest on leaf or flower, less conspicuous than if the then visible surfaces were as sharply white as the upper faces.

It is very curious to note how certain broadly similar ideas run through the domain of Nature. Thus in the floral world we have not only our little daisy, the wee, modest, crimson-tipped flower, the bairnwort so endeared by early associations, but wherever we travel the wide world over are daisies, not identical with those that bestar our lawns and pastures, but strongly reminiscent of them. Composite flowers, umbel-bearers, the graceful fern fronds, are but a few of these type-forms. In like manner the entomologist finds a constant recurrence of certain broadly similar patterns. All round the globe may be found what we may term the "Fritillary" design—the rich golden-brown ground spotted and streaked with black. We have in England several of these, and two of them we illustrate—the High Brown Fritillary, Fig. 46, and the Silver-washed Fritillary, Figs. 47 and 48, the male and female. The Large and Small Tortoise-shells, Figs. 41, 44, may be, again, called variants of one theme, while our blue butterflies form a very notable group, all agreeing in a general way in their comparatively small size and the more or less distinct blue of their wings—some silvery, some intensely azure of perfect brilliancy and purity, some with a delicate suggestion of lilac. We might in the same way refer to that large group of brown butterflies, more or less mottled with yellow, varying from a pale straw to a deep tawny or almost orange colour; but we have, we think, sufficiently illustrated that unity in variety that is so charming in Nature. A closer examination of any of these groups shows that variety in unity, self-contradictory as the idea may be, and a phrase to the brain-bound pedant absurd, is no less a principle and a potent charm.

The little Purple Hair-Streak, Fig. 52, repeats at a respectful distance the purple sheen of the splendid Purple Emperor, depicted in Fig. 37, as the Small Elephant, Fig. 73,

repeats to a considerable degree the form and beautiful colouring of the Elephant, Fig. 89, though it will be noted how quaintly the variation steps in, in the stripes on the body running in the one insect across the abdomen and in the other in the direction of its length. We could imagine any one whose experience had not yet run in an entomological direction pointing to the drawing of the Death's Head Hawk (our frontispiece) and saying: "There, at least, is something strikingly individual. In magnificent size, in brilliant colouring, in curious marking, it stands alone,"—and if we confine ourselves to the insects of our own country the comment is absolutely just; but we shall see later on, when the insect comes more individually under notice, that here again we are dealing with a form that stands by no means in such isolation, that so far away as Japan and throughout the East forms almost identical with this may be found, and that we are here but dealing with one unit in a strongly resemblant group.

In some butterflies and moths it will be readily observed that the same design runs over all the wings, while in others a very strong contrast between the upper and lower wings is seen. As an instance of the first of these conditions nothing can exceed the beautiful simplicity of the Brimstone butterfly, Figs. 2, 3, with its field of one colour throughout, varied by recurrent contrasting spots; while amongst the moths the Lappet, Fig. 162, the Oak Eggar, Figs. 163, 164, the Swallowtail, Fig. 171, may be taken as representative of the numerous examples open to us. As illustrations of insects having an entirely different scheme of colouring and marking in the two pairs of wings we may instance the Six-spot Burnet, Fig. 75, the Scarlet Tiger, Fig. 124, and the Jersey Tiger, Fig. 145. While any broad generalisation is generally unsafe, since ordinarily so many exceptions can be brought forward to weaken or vitiate it, we would point out a curious peculiarity that has only now been borne in upon us, in looking

PLATE III

17. Small White. Larva. *Pieris rapæ.*
18. Small White. Pupa. *Pieris rapæ.*
19. Small White. Pupa. *Pieris rapæ.*
20. Small White. Male. *Pieris rapæ.*
21. Small White. Female. *Pieris rapæ.*
22. Small White. At rest. *Pieris rapæ.*
23. Indian Cress. *Tropæolum majus.*
24. Small White. Larva. *Pieris rapæ.*

Plate III.

over our figures for illustrations of hind wings markedly different in colour and marking from the front ones. It is this—that while moths afford any number of examples of this, the butterflies do not. If the White Admiral, for instance, Fig. 36, has dark brown fore wings spotted with white, so, too, are its hind wings. If a Peacock, Fig. 42, bears a bold eye-like spot on one wing, so, no less, does it on the remaining three.

It may be suggested as a simple explanation of this, by those who have a bad habit of jumping at conclusions (it occurred at least to ourselves), that butterflies, if they display their wings at all, display them all equally, and they may therefore as well be all one scheme in colour as not, since no protection is gained by change of coloration, as we find it gained in the case of the moths by their instinct of veiling the brightness of the lower wings by covering them by the upper less gaily coloured ones. The protection of all four wings is secured by the butterflies by throwing their bright sides inwards over their heads, as in Fig. 22. This explanation of the concoloration and general similarity of marking may, we think, stand for the butterflies. That many moths can afford to indulge in the luxury of brilliant under wings is very true, since they have the power of, nevertheless, protecting themselves from observation ; and, if the matter ended there, there would be no more to be said. But what shall we say, then, as to that great army of moths that have their under wings markedly different in the other direction, being much quieter in colour, less pronounced in marking than the upper? The illustrations of this state of things are so numerous in our plates that it is scarcely worth while to particularise. The problem is this—to give a concrete example—if the Buff Tip depicted in Fig. 237 had been a butterfly instead of a moth its hind wings would have been of equal colour-strength and richness of marking with the upper. Why are they not so now ?

One reply might be, that in a collection of butterflies and moths, or in illustrations of them, we display all alike with wings

widely outspread, that we may see the surfaces of all the wings equally; that this treatment does very well for the butterflies, but that with a great majority of the moths this position is arbitrary, non-natural. We thus drag to the light of day and subject to our criticism what is ordinarily veiled, and therefore of less beauty, Nature not needing or caring to bestow on those wings that are mostly hidden and strictly utilitarian a charm that is needless, reserving this for the front wings, since they alone are always in evidence.

This, very possibly, is the best answer forthcoming; but it is not quite satisfactory, because, while it is true that the great creative and overruling Power often appears to work with what we may, without irreverence, call a thought to economy, yet more often a wealth of beauty, far outstripping all limit of utilitarianism, is lavished in rich profusion on the minutest shell, the smallest organism, the lowliest wayside flower.[1] Moreover, it proves too much; for if quaker-grey and quiet brown be good enough, why then the brilliant scarlet under wing of the Scarlet Tiger, the orange-yellow of the common Yellow Underwing, the delicate violet of the Clifden Nonpareil?

Many butterflies and moths show no manifest difference in the general appearance of the sexes. Where any sexual difference in the insects asserts itself, it is ordinarily a question of relative size or of colour, or maybe, not unfrequently, of both. The female butterfly or moth is generally the larger of the two in spread of wing, and has a more robust body. When a difference of colour is visible this variation is

[1] "As the powers and goodness of Heaven are infinite in their extent and infinite in their minuteness, to the mind cultivated as Nature meant it to be, there is not only delight in contemplating the sublimity of the endless sea and everlasting mountains, or the beauty of wide-extended landscapes, but there is a pleasure in looking at every little flower and every little shell that God has made. Nature has scattered round us on every side an inexhaustible profusion of beauty."—BASIL HALL.

"Finis Creationis telluris est gloria Dei ex opera Naturæ, per hominem solum."—LINNÆUS.

in the direction of a duller or greyer tint than in the male, and, if our insect be a moth, instead of the pectination, or fringing, more or less elaborate, that is often a characteristic of the antennæ of the male, the antennæ of the female are simple and thread-like in character. There are, however, many exceptions, some species showing all these divergencies, others some of them, others none at all; so one can only generalise in a very broad way. Sometimes we may have in both sexes similarity of colouring but difference in the markings.

If we turn to our illustrations we at once encounter on Plate I. an example of sexual difference of colour, the male, Fig. 3, of the Brimstone butterfly, an insect charming alike in colouring and in form, being much the brighter in tint. In the Orange-tip, Figs. 8, 9, the male again is much the gayer, being really orange-tipped, while the female is wanting in this rich patch of colour. In the Clouded Yellow butterfly, depicted in Figs. 5 and 6, the sexual difference is one, not of colour, but of marking. Each has the rich yellow field of the wing, each the brilliantly effective black border; but in the male, Fig. 5, we find this bordering crossed by yellow lines, while in the female, Fig. 6, it bears spots instead. In the Large White the female, Fig. 12, has, as a sexual distinction, the conspicuous black spots we see on the upper wings, while the male, wanting these, is less decoratively attired, unless, indeed, we are prepared to quote on his behalf the well-known assertion of the poet Thomson that—

> Loveliness
> Needs not the foreign aid of ornament,
> But is, when unadorned, adorned the most.

The Large White however, we fear, is far too common, and in its caterpillar state far too destructive, to have much sentiment lavished on it, much poetic feeling outpoured on its behalf. Reverting to plain prose, it is at all events an interesting insect in this question of markings, as being an

exception to the general principle that, in the distribution of less or more of adornment, it is the female that ordinarily gets the less.

The characteristic difference of colouring as a sex distinction is excellently shown in our Figs. 37 and 38, the male and female Purple Emperor, if indeed we should not depart from accepted entomological custom and dub them respectively Emperor and Empress. Here we find the male glitteringly attired, with a purple sheen that even the splendid butterflies of the tropics can scarcely surpass, while the female dons but a sombre brown.[1] However, we see very well in her case another of our general rules exemplified, as she is considerably larger in spread of wings than her Imperial consort.

Many of the "Blues," as in Figs. 67 and 68, the beautiful Chalk Hill Blue, are only on the female side Blues by courtesy, the one sex being blue, and the other either purely brown, or brown with a slight sheen of blue upon it. In the case of the Four-spotted Footman, represented in Figs. 106, 107, the difference in colour is very marked, and the difference in size still more so. In the male and female respectively of the Gipsy Moth depicted in Figs. 146, 149, we get all the three points referred to as sex indications, the difference of antenna

[1] We, naturally, if we bring the whole world under review instead of confining ourselves to these British Islands, find many very striking examples of sex coloration. In the *Ornithoptera paradisaica*, for instance, a butterfly of New Guinea, the male is attired in shining green and lustrous orange on a ground of deep velvety black, while the female is black with white spots. The *Argynnis diana*, the Diana butterfly of the southern portions of the United States of America, is in the male of a deep warm brown, with a very broad margin of orange to all the wings, while the female is of a more purplish brown, with a bordering of lavender-coloured spots. These are but two examples, and not specially picked ones for their striking character, out of the many illustrations that might be brought forward. In the earlier days of entomological investigation it was often not realised that these very different-looking insects were really one and the same species, so that they received different names and were counted as two entirely independent insects.

form, difference of size, and difference of colouring—features again that we see excellently displayed in the case of the Oak Eggar, Figs. 163, 164. The Kentish Glory male insect, Fig. 167, and that of the Emperor, Fig. 169, are other admirable examples of the sexual difference of size and of the more pronounced colouring, as we see readily enough when we compare them with their respective mates, Figs. 168 and 170. In Figs. 200 and 201, representations of the male and female forms of the Bordered White, we find a great dissimilarity of colouring in the two sexes, and other examples will readily be found on reference to our illustrations.

In all technical works on natural history the male sex is indicated by the use of this sign, ♂, the astronomical sign of the planet Mars; and the female by similarly employing as a symbol the astronomical sign, ♀, for Venus. This applies all through zoological work: whether we visit the lion house at the Zoological Gardens and, studying the labels, find that the creature popularly called a lioness is there "lion ♀," or read a treatise on cockroaches, these useful little signs will be found to the fore, a sort of shorthand that is at once distinctive and labour-saving.

One would naturally have supposed that the butterflies that are classed together in the same genera or families would show a general likeness to each other in colouring, and to some extent this is the case; but if we take such closely allied insects as the Peacock, the Red Admiral, the Large Tortoise-shell, and the Camberwell Beauty, Figs. 42, 43, 44, 45, we cannot but be struck with how little they agree, either in colour or in the disposition and nature of their markings. One alone has conspicuous eye-like spots; one alone has a sharply defined band of brilliant colour obliquely across the fore wings; one alone has a continuous band of self-colour margining all the wings, and within it those studs of azure that come so beautifully on their sable ground; one alone has a general effect of rusty brown and black. Still we are able

to indulge in a few generalities. Thus the genus to which our Whites belong is one in which the species are almost exclusively white, while the genus in which the Clouded Yellow is placed is noteworthy from the general yellow tint of so many of its members.[1] The Fritillaries everywhere are conspicuous from their rich brown colour and their black spots. It is needless to give more examples of this colour relationship; any one visiting a good museum will readily discover that certain drawers in the insect collection at once strike the eye from the general blue effect of the specimens they contain, even though there are examples of many different species in the genus or family there set forth, while another drawer has its numerous occupants largely running towards yellow, brown, or some other colour. It is a matter for consideration that will not bear pushing too far, however, as, like the round world itself, there is a great deal to be said on both sides, and whichever side we take up, the wonderful variety of coloration or the remarkable similarity, has much to be said for it.

We may occasionally come across butterflies and moths in which the one side is purely male in coloration and markings and the other side female. Where the difference is pronounced, as, for instance, the two left wings blue, the two right wings brown, the effect is very curious. If it be a moth

[1] The species found in Britain are the *Colias hyale* (Fig. 4), and the *C. edusa* (Figs. 5, 6). If amongst the mountains of Colorado we capture the *C. meadi*; in the Corderillas the *C. elis*; in California the *C. chrysomatus*; in chilly Labrador the *C. pelidne*; in Central Asia the *C. erate*; in Lapland, the *C. hecla*, we find amongst them all a strong family likeness: varying shades of yellow and a more or less deep bordering of black. This little list is only representative; many more examples in illustration of this common colour-scheme could be brought forward. The moral of course is that, in catching some such insect in any part of the world and desiring to classify it, we should at least assume the possibility that it may be one of this genus. It will by no means necessarily be so, but let the first search be through Colias.

this peculiarity may extend even to the antennæ, the one on the male side being pectinated, that on the female side thread-like. Such forms are sometimes called hermaphrodite. The word is based on the old Greek myth that tells us how Hermaphroditus, the son of Hermes and Aphrodite, was so united in affection with the nymph Salmacis that not in heart alone but altogether they became one.

Butterflies and moths sometimes vary from their normal coloration in two very dissimilar ways. Occasionally, by a more or less complete absence of colour pigment, the insect assumes, wholly or in part, a very much lighter tint, being sometimes almost or quite white. Such an insect as the common Yellow Underwing, for example, the species depicted in Fig. 266, may be found with all the golden yellow of the lower wings eliminated, and one can realise at once on looking at the illustration how great must be the difference in appearance. When this state of things is produced by physiological causes the result is termed albinism. One is familiar with these albino forms amongst mankind, rabbits, and other creatures. The influence at work is the same all through, but albinism amongst butterflies is of rare occurrence. We must not confuse with this true albinic form the very considerable lightening of colour from the typical coloration that we much more frequently encounter, which arises from the process of natural selection. The Annulet moth, for instance, the *Gnophos obscurata* of science, varies greatly in colour, being anything from a pale pearly grey to a very dark brown.[1] Any one seeing a series of these in any really good entomological collection could not fail to be greatly struck by the very marked diversity of tint amongst them. Many species that rest on the ground

[1] It is in many places abundant, and may be recognised amongst all its mutations of colour from having invariably two darker zigzag lines running across the fore wings and one across the hind wings. On each wing, in close proximity to those lines, is seen a black ring or annulet: hence the popular name of the insect.

PLATE IV

25. Marbled White. *Melanargia galathea.*
26. Speckled Wood. *Pararge egeria.*
27. Grayling. Male. *Satyrus semele.*
28. Meadow Brown. *Epinephele janira.*
29. Grayling. Female. *Satyrus semele.*
30. Small Heath. *Cœnonympha pamphilus.*
31. Wall Butterfly. *Pararge megæra.*
32. Ringlet. *Epinephele hyperanthus.*
33. Ringlet. *Epinephele hyperanthus.* Under side.

Plate IV.

approximate in likeness to the colour of the soil on which they are accustomed to alight. The Annulet is one of the insects in which this habit is pronounced, and in chalk districts, for instance, is found to be almost white in colour, natural selection having gradually weeded out the darker and therefore more conspicuous specimens. The greater or lesser strength of the grey arises from the proportion of black scales to white ones on the wing, the colour we here call grey being but an effect on the eye produced by the juxtaposition of minute black and white scales. If we, for instance, get a pint of flour and a pint of soot, and then mix them in varying proportions, the result will be a grey effect of greater or less depth.

When an insect develops a tendency towards a degree of blackness that is in marked excess of the typical coloration, the aberration is termed melanism; but where the ground colour becomes deepened without becoming more pronouncedly black, the result is called melanochroism. In some cases this melanism has a physiological basis, but in others it is but another illustration of the survival of the fittest. It is a quite definite fact that many insects when found in London and its suburbs, or the vicinity of any other great soot-stained town, are much darker in colour than those same specimens are when found amidst rural surroundings, since the lighter specimens are too conspicuous for their well-being when at rest on begrimed tree trunks, palings, etc. This principle of natural selection has been increasingly at work in this direction of protective melanism; in some localities a quite definite and permanent darkening of the race has resulted, so that there are to-day many established variations from type that were quite unknown less than a century ago. The Waved Umber, Fig. 190, for example, is one of those insects that have an urban darker type; and the Peppered moth, Fig. 189, is a still more marked instance, as we shall presently see when discussing it individually. The Annulet moth that we may find almost white on the Sussex chalk downs is on the peat bogs

nearly black, while the Marbled Coronet, Fig. 278, is another insect that is found varying in a very marked degree. The Marbled Minor, Fig. 303, is another moth greatly influenced by its surroundings: the black form of it, that was once rare and quite an exceptional find, is now locally quite common. It was at one time given specific rank, but now, with three or four other named varieties, is recognised to be but a divergence from the type. So dark is it that its popular name is Blackamoor; its specific name while it was yet separated from the type form was Æthiops, another testimony to its negro blackness. Any one looking at our illustrations of the various insects we have named as readily varying in depth of colour, will at once see from their mottled appearance how easily this might be. The White Ermine, represented in Fig. 142, is a good example of melanochroism, as this insect, normally white, may vary from pale cream-colour to a strong ochreous buff. A rather common type of variation is where various darker markings on the wings that are ordinarily sharply defined as bands, or lines, or blotches, become blurred and suffused.

Having given consideration to the wings of our butterfly or moth, what remains to us is broadly divisible into three distinct portions—the head, the thorax, and the abdomen. The head is the seat of the organs of sense; the thorax is conspicuous as bearing all the organs of locomotion, the four wings and the legs, these latter being typically six in number; while the abdomen deals more especially with the reproduction of the species.

The head is, roughly speaking, spherical in form, and the eyes are very large in proportion to the size of the head, as contrasted, say, with those parts in man or mouse. On the capture of any of the larger moths this great size and conspicuousness of the eyes is a very notable feature. They are compound in structure, built up of very numerous facets, each of which may be considered a single eye. The facets are hexagonal, and therefore fit together like the cells in honeycomb.

At the angles of junction of these facets is often found planted a minute hair. The facets vary considerably in number, but run into thousands in many cases.[1] It is, therefore, not to be wondered at that a butterfly takes sudden alarm when it sees what looks like an army of twenty thousand entomologists all thirsting for its life. These facets form collectively the great hemisphere of the compound eye, so that the total power of vision covers a very wide field. If we, for instance, were thus provided for, we should, in crossing a busy thoroughfare, have some few score eyes looking right in front of us, while the outer facets, situated about where our ears are now placed, would have an uninterrupted view at the same time of the traffic bearing down upon us from either direction. In addition to these great compound eyes, many species possess a pair of simple eyes, though these are usually lost to sight beneath the thick mass of soft hairs that cover the head.

The parts forming the mouth of a butterfly or moth are so far modified from one's idea of a normal mouth that they are adapted for suction only. Though we may find mandibles and lips, they are in the most rudimentary condition, much as we may see in the skeleton of a whale a small group of bones representing the hind legs of this noble mammal, though in life they are deeply hidden beneath the flesh. That the butterflies or moths derive what nourishment they take purely by suction is happily expressed by Hood, when he terms them—

> The pretty genii of the flowers
> Daintily fed with honey and pure dew.

But this elementary fact in the lepidopterous economy is by no means generally realised. We may fairly hope that the increased interest in nature study and its inclusion as a school subject will bear fruit in the dissemination of such knowledge. One of our servants, while we were known to be making

[1] The Goat moth, for instance, has over eleven thousand in each of these great compound eyes.

drawings of such things, caught a big moth for "master," and most kindly brought it to us on a plate, covered over with a tumbler, and with some cubes of lump sugar for its refreshment. A piece of quartz or a bootlace would have served the purpose equally well. Still, there was here at least a recognition of a saccharine diet being acceptable; all that was really wanting being a set of good teeth on the part of the moth to enable it to enjoy the delicacy provided. We remember receiving a tiger moth by post from a well-educated lady, who enclosed with it a sycamore leaf for its refreshment on the journey!

The organ called the proboscis, or sucker, the means by which any nourishment is imbibed, is composed of two very delicate tubes, laid parallel to each other and practically welded into one. It is exceedingly flexible, and often, as in the case of the Hawk moths, of great length. In some species it is but rudimentary, and these insects, though some of them are very active on the wing and of robust build, take no food whatever from their emergence from the chrysalis to their death. When not in use it is curled up like a watch spring, between two organs called the palpi. As this sucker, scientifically called the haustellum, is so characteristic a feature in butterfly and moth economy, these insects have sometimes been called Haustellata instead of Lepidoptera, the tube-bearing instead of the scale-clothed.

This necessity of taking all refreshment by suction naturally confines these haustellates in their choice of food within somewhat narrow limits, so that certain plants have much greater attractiveness than others, and these we shall find are those bearing tubular blossoms, such as honeysuckle, teasel, thistle, marjoram, valerian, hemp-agrimony, jessamine, pentstemon, petunia, and the like. The hemp-agrimony is a very special favourite; it grows commonly enough in many places, and its flower-heads may sometimes be seen bearing the Painted Lady, Fig. 39, in profusion. This butterfly is also very partial to the thistle and teasel. We may sometimes come

across a large patch of spear-plume thistle by the roadside, or in an open clearing in the wood, and here we shall probably find in plenty the Red Admiral, the Peacock, and the Large Tortoiseshell; while a field of clover is a particularly happy hunting ground for the Clouded Yellows. The blossoms of the blackberry, though not of this tubular character, are also very attractive. We shall find flitting around them, and sipping at them from time to time, the White Admiral, Fig. 36, the Fritillaries we depict in Figs. 46, 47, 48, the Meadow Brown, Fig. 28, the Ringlet, Fig. 32, the Large Heath, Fig. 34, the Small Heath, Fig. 30, and others.

The function performed by the antennæ, or horns as they are popularly termed, is not at all satisfactorily ascertained. Some comparative anatomists declare that they are organs of feeling (they are sometimes called feelers colloquially, but this is clearly begging the question), others of hearing, others of smelling, while yet others suggest that they may possibly be the organs of some sense of which we know nothing and cannot therefore form any definite idea. By various tests, such as shortening or removing one or both of these antennæ, it has seemed clear that they in some way influence the power of flight, but what this influence may be is not known, and as, moreover, many insects that are without wings have fully developed antennæ, it is evident that they perform other functions than the regulation of flight. They vary very greatly in length. In the Ghost Swift moth, Fig. 98, we find them particularly short, while in the Longhorn, the *Adela De Geerella* of science, they are about five times the length of the body, or about twice the length of the total span of its extended wings from tip to tip.

Antennæ, though they often look to the naked eye as of unvarying character throughout, like a piece of fine thread, are, under the microscope, found to be built up of a series of joints, varying in number from seventeen to one hundred

and twenty; few, however, have less than twenty-five, and we find them to be clothed with scales. The first of this series of joints is usually both stouter and longer than any of the others, and from its character is sometimes of value in distinction of sex. We have already seen that what is termed pectination, the fringing of the antennæ with small lateral set-offs like the teeth of a comb, is in some species a sexual distinction, as contrasted with the plain thread-like form. We see this for instance in Figs. 151 and 152, the male and female of the Black Arches moth, but in many cases, as in Figs. 99 and 100, the male and female of the Festoon, we find the antennæ similar in both sexes. When pectinated, this fringing ordinarily extends throughout the whole length, but in some cases, as in the Lobster moth, for example, Fig. 239, it is only partial. The pectinations may be either small and very numerous, or thick and few in number.

In the case of butterflies the antennæ are ordinarily thread-like, and more or less pronouncedly thickened at their extremity. In some few cases the thickening is slight and gradual; in one family the thickening commences from near the centre and then the terminal joints again slightly diminish, but it is ordinarily well-nigh as abrupt as the ball on the head of a drumstick. In some moths the antennæ are long and slender, tapering to a point, or we may find them thickest in the centre, tapering in either direction. This latter is known as a fusiform or spindle-shaped antenna; it is very characteristic of the Hawk moths. If gradually thickening to the extremity they are termed claviform or club-shaped. There are some other slight modifications of form that we need not particularise.

The thorax is in butterflies, ordinarily, somewhat sharply cut off from the head, and still more deeply from the abdomen, while in the moths it more generally merges into these, making a more continuous form. It is of rounded

or ovate character, and ordinarily liberally furnished with long silky hairs that sometimes form a crest along the centre. On close examination, on removal of this hairy covering, the thorax is found to be really composed of three segments. The first of these is small, and to it are attached the first pair of legs; the second is very much larger, and carries the second pair of legs and the fore wings; while the third, intermediate in size, has as its share the third pair of legs and the hind wings. These sections are so far blended together that they can only be discriminated by careful dissection.

The abdomen is usually built up of nine segments. In many moths it extends considerably below the hind wings, as in Fig. 76, the Convolvulus Hawk; very notably in Fig. 90, the Silver-striped Hawk; Fig. 161, the Fox; Fig. 162, the Lappet; very conspicuously again in Fig. 263, the Bulrush; while in the butterflies it is shorter, as reference to any of our butterfly figures will show. The nearest approach to an exception to this rule is in the butterflies known collectively as the Skippers—butterflies that in several ways, their thick bodies, the form of their antennæ, and so forth, approximate much more nearly to moth character than any other of our butterflies. In Figs. 71, 72, the male and female of the Small Skipper, we have a representative of this family.

Butterflies and moths rarely use their legs for locomotion; they are content to employ them as supports, steadying them when they are at rest, and giving them grip. A butterfly going a walk, with all sails set, is a very unusual spectacle, since it can on its great pinions so readily transport itself from place to place whither it would.

All true insects, beetles, dragon-flies, crickets, ants, cock-roaches, grasshoppers, earwigs, bees, etc., have six legs: it is their birthright; but in some cases the lepidopterous members of the family have in certian butterflies the front pair, or sometimes in moths the hind pair, rudimentary and so short as

PLATE V

34. Large Heath. Female. *Epinephele tithonus.*
35. Large Heath. Male. *Epinephele tithonus.*
36. White Admiral. *Limenitis sibylla.*
37. Purple Emperor. Male. *Apatura iris.*
38. Purple Emperor. Female. *Apatura iris.*
39. Painted Lady. *Vanessa cardui.*
40. Comma. *Vanessa C. album.*

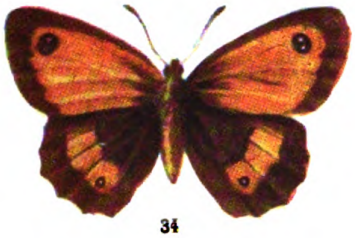

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Plate V.

to be of no use for walking; so elementary, in fact, that at a casual glance one would be tempted to say, birthright or not, here is a four-legged insect at last. Amongst our British butterflies the greater number are in possession of three pairs of fully developed legs, but others have the front legs in the females somewhat short and entirely rudimentary in the males, while yet others have these anterior legs rudimentary in both sexes. As this possession of six fully developed legs, or of four fully formed and two abortive, is a constant feature in the various groups in which the one or the other state of things occurs, it is a valuable feature in classification. Thus the big family technically called the Papilionidæ, have always three complete pairs of legs. This includes the Swallowtail, Brimstone, Clouded Yellow, the Large and Small Whites, the Orange-Tip, etc. The butterflies technically known as the Nymphalidæ, that are apparently four-legged, irrespective of sex, include such insects as the Marbled White, Ringlet, Wall butterfly, White and Red Admirals, Purple Emperor, Peacock, the Tortoiseshells, and Fritillaries; while the Hair-streaks, the Coppers and the numerous Blues all have the females with six practical legs, and the males with the front pair abortive. In the language of science these are the Lycænidæ. In the human subject we have in the leg one very strong, stout bone, the femur, extending from the hip to the knee; from knee to ankle we have two bones, the tibia, and a little bone, the fibula, and then we arrive at the tarsal region, the numerous bones forming the ankle. The leg of the butterfly has as obviously its femur and tibia and then the five small joints of the tarsus, the fibula being absent. The last tarsal segment carries the bifid claws. These in the butterflies are of no great strength, but in some of the moths we find them to have a great gripping power, as we fully realise when we wish to dislodge one of these big moths from its standpoint in space.

Insects we need scarcely say do not in their final stage grow

at all. Some specimens are larger in size than others, because the circumstances of their past in some way favoured them, but an insect that makes its final appearance stunted will stunted remain to the end of its days. As men on maturity vary in stature, so do insects vary on either side of a normal bulk. There was possibly in the days of larvahood a check in the growth through malign climatic influence or a temporary deficiency of food ; or in the interval of pupadom there may have been the adverse operation of over-much or over-little moisture to hinder full development.

Sometimes this dwarfing may be attended with malformation, but this is by no means of necessity the case. An entomological friend of ours takes as a special hobby the collection of these small specimens ; what one may term pocket editions, Peacock butterflies and the like, beautifully perfect in form and colour, that a half-crown piece could easily cover. There are many of these also in the magnificent national collection at South Kensington. The diminutive Magpie moth, Fig. 208, is from this source ; except as regards size it will be seen to be as typical a Magpie as Fig. 209, a specimen of the normal size.

The metamorphosis of insects is divided into two very definite and diverse sections, the complete and the incomplete. All members of the lepidopterous order are examples of the former, passing through four stages—the egg, the larva, the pupa, and the imago—and each of these is cut off from the others by its entirely different form, nature, and all else that makes for individuality. In the same way a blue-bottle fly lays its eggs in a piece of meat, whether in larder, shop, or in the body of some dead animal by the roadside, and from these eggs issue, not flies at all, but something essentially different. If a robin lay an egg, from that egg proceeds a robin, but if a blue-bottle lay an egg, the creature issuing from it is a footless wormlike thing, a maggot. This maggot is presently full grown, and then changes again into another entirely new form,

equivalent to the pupa of the butterfly, and from this quiescent form presently breaks forth the winged fly, and the cycle of life is thus complete. In the grub state the creature was provided with jaws for cutting up the tainted flesh on which it battened, but when it becomes a fly it lives solely upon what it can gather up with its tongue—a change as great as that from the ravening caterpillar to the nectar-sipping butterfly. Ants, wasps, bees, horse flies, house flies, saw flies, ichneumon flies, in like manner pass through these entirely distinct changes. When the metamorphosis is thus complete it is technically called metabolic. When a colony of ants is disturbed the white forms that almost every one calls eggs are really the pupæ.

Those insects that only pass through a partial change have applied to them the yet more formidable term, heterometabolic. A young grasshopper, for instance, on its emergence from the egg is small, and has no wings, but in general form it is easily recognisable as a grasshopper on its way to full development. Presently rudimentary wings make their appearance, and in due course the adult condition is reached, without any retirement into a state of pupadom.

Amongst the heterometabola we may include crickets, earwigs, dragon-flies, May-flies, beetles, and cockroaches. House holders plagued with these latter will possibly have noticed that they are not all alike, and may even have got so far in their study as to cry out: "What a funny black beetle!" We have heard such a remark, and the testimony is very valuable, as it indicates the recognition that the larval and fully developed cockroach are different in form, and therefore under the domain of metamorphosis, while this change of appearance does not prevent the equal recognition that, funny or not, it is clearly a cockroach all the same ; that we are, in fact, in the presence of a typical example of heterometabola. The householder too, on the war path against nocturnal disturbers of the peace, may be interested to know that while the lively flea

is metabolic in its arrangements, undergoing a complete change of appearance in its various stages towards its final aggressiveness, and therefore more difficult of recognition by the non-entomological housewife, the more saturnine and obnoxious bug undergoes changes that are more partial, and should therefore the more readily fall a victim to its pursuers.

CHAPTER III

The Number of our British Butterflies—Immigrants—Our Lists not Final—The Butterflies of the Continent—And of the World—The Families in which our Butterflies are placed—Papilionidæ—Nymphalidæ—Erycinidæ—Lycænidæ—Hesperidæ—The Equites, Heliconii, Danaii, etc., of Linnæus—What the Knowledge of the Life-History of any Species implies—The Question of Acclimatisation—Agency of Nature and of Man—Our British Butterflies dealt with Individually

PROCEEDING now to a consideration of our butterflies, we find that, compared with many other countries, the number of species to be found in the British Isles is but small. Many of these are very common denizens of the country side, familiar to all who have the taste and opportunity for rural life. Others are more or less local and circumscribed in their habitat, and one may spend many a long year without coming across them, though a visit to one of their chosen localities may reveal them at last to us in profusion. Yet others, few in number, are distinctly rare, here, there, and everywhere, so long, at least, as we limit these vague localities to points within the margin of our own shores, for some of our insects that are of rare occurrence in these islands are common enough when we have once crossed the Channel. We have occasionally yet others that are, literally, windfalls to the collector, blown across, as they from time to time are, by favouring gales from our Continental neighbours. Others again vary so much in different localities that what one entomologist will hail as a species another will declare to be but a strongly marked and constant local variation,

not worthy of specific rank. Naturalists, like their spoils, are open to classification, and they have been irreverently subdivided into "splitters" and "lumpers." The latter are those who would gather together into one unit divers forms in themselves somewhat varying, regarding them as, after all, only reasonable modifications that may be expected under differing circumstances in the life-history of a species; while the others, the former, are ever on the watch for these aberrant forms and prepared to recognise in them solid ground for the formation of a distinct entity. There was a time, for instance, when an entirely scientific botanical work assigned five as the number of species of British brambles, while ten times that number scarcely now suffices to satisfy some specialists.

When, however, reverting to our butterflies, we have taken due count of the abundant, the fairly common, the distinctly local, the very occasional, the specially rare, we may total them all up to about sixty-six, leaving a slight margin on one side or the other for the doubtful. If to these sixty-six butterflies we add moths we arrive at a total figure slightly beyond two thousand. It must, however, be borne in mind that, as the remoter districts are more thoroughly worked by entomologists, yet other species, at present unknown to our list, may be added, hence the somewhat vague character of our arithmetic. Finality, we may assume, judging by even the quite recent past, has not been reached. It is, then, at least possible for any of our readers to reap abiding glory by finding in some remote glen, or amid the boulders of some wild mountain side, a moth, possibly very insignificant in size, more than possibly very dingy in hue, but conspicuous in this—its prominent position as the latest enrolled on our ever-lengthening list of British species. Should these readers declare that for them, at least, this renown is not possible, seeing that they lay no claim to entomological knowledge, we would tell them that this need be absolutely no hindrance, since it is a well-known fact that many captures of the rarest insects have been made entirely unknowingly, the captor

having no notion of the value of his find until some expert saw it in his collection of indiscriminate odds and ends, good, bad and indifferent. The schoolboy, for instance, who, once seized with the desire of being a collector, slashes round at all comers, may thus land a Bath White or a Speckled Footman, while the more self-contained entomologist does not at a little distance detect their special nature, and sees no special need to rush off in pursuit of what is apparently a common White, or something else of equally everyday possibility.

We need scarcely point out that when we claim an insect as British we by no means lay an exclusive claim to it. Such a term, after all, only implies that it is found within the boundaries of these islands of ours, as probably it is found no less in Sweden, or in Spain, and divers other places on the continent of Europe or far outside it.[1] Unless we bear this modest reservation in mind, it becomes somewhat comic to label as British an insect that is at least as common by the roadsides in Maryland, or the object of eager chase by the youngsters in Japan.

We may say parenthetically that while such an insect as the Camberwell Beauty, if captured in Britain, is a choice rarity and one to much pride oneself on, it is in many cases elsewhere a very common species. If we insist on all our specimens being British born, we must be content to wait long years maybe for some of them, while a trip across the Channel will probably lead to our capture of them at an early date. If we could imagine any one caring to purchase such things, we would define the pecuniary difference in value between the true native and the foreign as so many shillings against a very few pence.

[1] Thus we have seen the Swallowtail, the first insect we figure, in a collection made in the far north of Sweden and Lapland; and in a letter we saw that had been written from Jerusalem, not only was this species referred to, but mention was also made of the finding in the vicinity of that city of such familiar insects as the Large, Small, and Green-veined Whites, the Bath White, the Clouded Yellow and the Painted Lady.

PLATE VI

41. Small Tortoiseshell. *Vanessa urticæ.*
42. Peacock. *Vanessa io.*
43. Red Admiral. *Vanessa atalanta.*
44. Large Tortoiseshell. *Vanessa polychloros.*
45. Camberwell Beauty. *Vanessa antiopa.*

Plate VI.

Any one placing amongst his specimens those caught abroad should be careful to indicate this on the affixed labels, while choice rarities, netted in some English shire or highland glen, should have the place of capture at least as carefully recorded.

As we travel southward towards more congenial climes we find that the number of butterflies considerably increases. Thus the British total of sixty-six looks small indeed beside the two hundred and forty of France. Switzerland, a much smaller country in area than England or France, has yet some seventy butterflies; while Germany, Spain, Italy, far surpass our modest total. Switzerland owes its comparatively large number of species to its very varied geological conditions. We have in our own country some few butterflies that are especially associated with mountain habitats, and these, and such as these, find in Switzerland in abundance the altitudes they need, while elsewhere, even in Switzerland, there is abundance of pastoral land, marsh, and other varieties of condition. In Great Britain our Ringlet butterflies, for instance, few in number, include but one specimen that truly belongs to the mountain altitudes, being unknown south of the Cumberland and Westmorland mountains, while this genus, *Erebia*, is represented in the Alpine districts of Switzerland by no less than twenty-six distinct species. The *Erebia glacialis*, one of the most characteristic of Swiss butterflies, may, with its companion Ringlets, be found ranging over the snow-fields, and has been captured at eleven thousand feet above sea level. As an example of the richness of Switzerland entomologically, we may mention that Mr. Rowland Brown, an English enthusiast and collector, tells us that on one day in July, on a mountain overlooking the Brenner Pass he counted sixty-eight different kinds of butterflies on the wing, a greater number than the whole English list. Species that with us are exceedingly rare may be seen fluttering, sometimes in abundance, over the flower-strewn mountain slopes or sunning themselves on the rocks, while even

the forms that with us are common are there yet more abundant. The very differing geological formations produce, as one result, a very varied Flora, and we must not forget in our sentiment for the butterfly that it is after all the final product of a vegetarian caterpillar, and one often of somewhat limited tastes. The greater variety of vegetation means the greater choice offered to those caterpillars; they in such a district are numerous and of many kinds.[1]

As caterpillars are favoured or otherwise by their surroundings in any country, so the list of its Lepidoptera is extensive or meagre. This seems a truism when stated, but nevertheless it needs stating, as it is a truism that might yet be overlooked. The operations of the farmer and landowner are therefore important factors in the nature of the fauna of a country. When land, long a waste, is ploughed up, certain creatures that found sustenance in the old state of things suffer. If boggy land be reclaimed, the Bittern, the Large Copper butterfly, the Swallow-tail, are at once at a disadvantage. If woods are cut down, the creatures that found in them welcome sanctuary are thrown upon a world they find desolate and unsympathetic; while, on the other hand, the ploughed land, the drained marsh, produce an entirely different crop of plants, and all creatures that feed on the products of cultivation increase and multiply. To pass from the general to the particular, if we could imagine the British market-gardener and cottager ceasing to grow cabbages, the Large White butterfly would become a rare insect; while, if all Britain were seized with a sudden enthusiasm to grow scarcely anything else, this particular butterfly would soon be in our midst in startling profusion.

The butterflies of the whole world have been estimated at over twelve thousand in number; but here, still more than in a well-trodden and minute fraction of it like England, it

[1] Should the reader feel thus far interested he may refer to Professor Frey's book, *Die Lepidopteren der Schweiz*, where over two thousand species are enumerated.

is evident that such an estimate may be far short indeed of the truth.

It is sufficiently evident that, whatever our number of home-grown butterflies—be they many or few—we must, if we are to learn much about them, do some little sorting out; or, to be more technical, must adopt some system of classification.

What we may term the standard arrangement is to place the five great families into which butterflies are divided in the following order :—Papilionidæ, Nymphalidæ, Erycinidæ, Lycænidæ, and Hesperidæ. Sometimes the third and fourth of these change places with one another; while Bates, a great authority amongst the systematists, takes the first family from the pride of place and puts it fourth.

These names do not, when analysed, help us very much. The first family derives its name from the Latin word *papilio*, a butterfly; but as the members of all the other families are no less butterflies than the Papilionidæ, the special significance of the title when thus restricted is not patent. The Nymphalidæ derive their name from *Nymphalis*, a genus of exotic butterflies that supplies the type form; while the Erycinidæ are in like manner so called from their type, the *Erycina* genus, also composed of typical species. The Lycænidæ are so named from the genus *Lycæna*, the typical form. Of these genera we have several English representatives, our Blues. Lycæna is derived either from the Greek word for a she-wolf or from Lycia, one of the alternative names of Diana, Fig. 67, for example, the beautiful Chalk Hill Blue, being as suggestive of a she-wolf as of a pair of boots, a volcano, or many other things that might have been selected; while to call Fig. 69, the eagerly hunted, rare Large Blue, after the huntress goddess, is so entirely inconsequent that one recognises in it a triumph of topsy-turvy nomenclature. The Hesperidæ are so called from the type-genus *Hesperia*, Hesperia being an ancient name for Italy, used by Virgil and other writers.

These great families are presently broken up into sub-families, and these into genera, and these latter into the individual species.

The first family, the Papilionidæ, has eleven representatives in Great Britain. Their caterpillars are cylindrical, and either smooth or very slightly hirsute. The chrysalis is fastened by its tail to stem, paling, or other supporting body, and it is kept in position, head upwards, by a silken girdle thrown around it, as we may see in Figs. 18, 19. The butterflies of this family have six perfect legs. In Britain white or a yellow of varying intensity, with more or less of black, are, except in the Brimstone, which is purely yellow, the ruling colours. A reference to our illustrations (the Swallowtail, Fig. 1 ; the three common Whites, Figs. 12, 13, 15, 20, 21 ; the Bath White, Fig. 14 ; the Wood White, Fig. 16 ; the Orange Tip, Figs. 7, 8 ; and the two Clouded Yellows, Figs. 4, 5, 6) will show this very clearly ; but this must not be crystallised into a world-wide formula, many of the exotic Swallowtails, for example,[1] travelling in their colouring far beyond this narrow limit.

The second family, the Nymphalidæ, includes what we may term the Browns, such as the Speckled Wood, Fig. 26, the Meadow Brown, Fig. 28, the Grayling, Fig. 29, the Wall Butterfly, Fig. 31, the Ringlet, Fig. 32, the Large and Small Heaths, Figs. 34, 30. Also the splendid Purple Emperor, Figs. 37, 38, and those beautiful specimens, the White and Red Admirals, Figs. 36, 43, the Painted Lady, Fig. 39, the Peacock, Fig. 42, the two Tortoiseshells, Figs. 41, 44, the Camberwell Beauty, Fig. 45, and the

[1] A Brazilian butterfly, before us as we write, the *Papilio dardanus*, is mainly of a rich black, shot with violet, while in the fore wings we have a large yellow spot, and on the hindwings a large scarlet one. *P. protesilaus*, a South American Swallowtail, is white, marked with red ; while *P. paris*, an Indian butterfly, is of a deep bronze green, spotted with lighter green of rich metallic sheen.

numerous Fritillaries, of which Figs. 46, 47 may be accepted as a type. The caterpillars are spiny, or with horned or possibly bifid tails, and the chrysalis, instead of the double attachment, and the erect head, of the previous family, now hangs freely, head downwards, having but a single attachment by means of the tail. All these butterflies have their front legs so atrophied that the remaining four only are available for walking.

The Erycinidæ, though a large family, have in England but a single representative, the Duke of Burgundy Fritillary, an insect so called, as regards the last half of its name, from its strong resemblance in general appearance to the true Fritillaries. Why the first portion of its popular name should be of so high-sounding a character we cannot say. The larvæ of this family are much shorter and stouter in proportion to their length than one ordinarily finds in such things. The chrysalides are girdled as in the first family. The male insects have only four practical legs, while the females have six.

The Lycænidæ have as their English representatives the Hair Streaks, the Coppers, and the goodly little group of Blues. From Figs. 49 to 70, inclusive, our illustrations deal with these. The caterpillar in this family is of erycinid type; it is often compared in form to a wood-louse, and the resemblance is pronounced. The pupa is suspended Papilio-fashion.

The members of the last family, the Hesperidæ, have a very distinctive appearance, being much more moth-like in general build than one ordinarily expects to find a butterfly. Their bodies are stout, their heads broad, and their wings of a certain exceptional sturdiness of aspect. There are some seven or eight British representatives of this family, and from their short jerky flight they are popularly known as Skippers. We have, in Figs. 71, 72, a typical illustration. The chrysalis is spun up into a slight cocoon, another feature more moth-like than butterfly-wise. Both sexes have six perfect legs.

It is curious to compare with this modern classification,

based throughout on differences of structure, that of Linnæus, a quite arbitrary arrangement founded on dots and spots, and resulting in dwellers in paradise, in nobility, and in quite plain country folk. He, too, divided the butterflies into five principal groups. The first of these were the Equites, or Knights, divided into Greeks and Trojans, from their differing markings. The second were the Heliconii. These were characterised by specially slender wings that are often almost wholly transparent, the opaque and coloured portions being the margins, with occasional streaks or spots on the wing surfaces. From their graceful forms and beautiful colouring these butterflies were held fit associates with Apollo and the Muses on Mount Helicon, and the shades around Parnassus. The third were the Danaii, subdivided into the Candidi, the white-winged, and the Festivi, those with variegated wings. Then we arrive at the Nymphales; the previous group had wings of simple outline, but these are dentated, toothed, and jagged. Of these there were also two subdivisions—the *ocellati*, those with eye-like spots, and the *phalerati*, those with simple spots. Finally we got to the *plebeii*, the insignificants, split up into the *rurales*, that have dark spots; and the *urbicolæ*, those with other spots. It will be seen at once how artificial such a grouping is, and how it combines or separates the various species in the most arbitrary way.

The Papilionidæ are divided into sub-families, but in this matter there is some difference of opinion, some writers classing the Swallowtail as our one English example of the sub-family Papilionidi and all the other members as belonging to the sub-family Pieridi, while others boldly cut up the old family into three new ones: the Papilionidæ; the Pieridæ, this taking all the whites—Wood White, Common White, Bath White, and Orange-tip; and the Rhodoceridæ, of which the Brimstone and the two species of Clouded Yellow are the British representatives. In like manner the second great family, the Nymphalidæ, containing, according to some authorities, its

four sub-families of Satyridi, Nymphalidi, Vanessidi, and Argynidi, is by others broken up into distinct families—Vanessidæ, Apaturidæ, and Satyridæ. It will be noted that family names terminate in "dæ" and sub-family names in "di." It will be seen, therefore, that while some authorities are content with five great divisions, others ask for almost as many again.

While in the midst of all these changes the leading influences have been the various modifications of structure affecting the perfect stage, another authority declares that all this is dealing with but a small portion of the facts open to our service in classifying, affirming that "no scheme based on a single set of characters belonging to only one stage of an insect's existence could possibly be even approximately perfect. No scheme of classification that is not founded upon a consideration of the structural details and peculiarities of the insects in all their stages can be considered as really sound, or as founded upon a natural basis. It is also evident that the results of the various systems, whether based on oval, larval, pupal, or imaginal [1] characters, must be compared and the sum-total of evidence brought together, if a satisfactory result is to be obtained." [2] This, it must be confessed, sounds most reasonable, but one result of its adoption must be that everything goes *de novo* into the melting-pot, and what will ultimately flow out of it, who can say? As in endeavouring to re-sort our ideas of our distinguished men and to assign them their place in the Temple of Fame by commencing their biographies with a consideration of the influence the various brands of infants' food had in forming their characters, and thence following them step by step to the imaginal condition of Lord Chancellor or Archbishop, so in this entomological rearrangement, we shall feel the pressing need of a vast body of new facts ere we dare

[1] The final stage in the life of the insect is known as the imago: imaginal is the resulting adjective.

[2] Tutt, *British Lepidoptera.*

PLATE VII

46. High Brown Fritillary. *Argynnis adippe.*
47. Silver-washed Fritillary. Male. *Argynnis paphia.*
48. Silver-washed Fritillary. Female. *Argynnis paphia.*
49. Brown Hair Streak. Male. *Thecla betulæ.*
50. Brown Hair Streak. Female. *Thecla betulæ.*
51. Brown Hair Streak. *Thecla betulæ.* Under side.
52. Purple Hair Streak. Female. *Thecla quercus.*
53. Green Hair Streak. *Thecla rubi.*
54. Green Hair Streak. *Thecla rubi.* Under side.
55. Purple Hair Streak. Male. *Thecla quercus.*
56. Large Copper. Female. *Chrysophanus dispar.*


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venture to say that any two butterflies that certainly look very similar may really claim any relationship with each other.

An adequate knowledge of the life-history of any butterfly or moth implies, at least, the following points :—the size, form, and coloration of the egg ; on what food-plants deposited ; in what number and arrangement ; dates of deposit and of hatching forth : a full description of the caterpillar, detailing any change of appearance at the various moults ; whether smooth, hirsute, spiny ; the arrangement of the hairs or spines ; whether solitary in habit or gregarious ; whether day- or night-feeder ; what range of food-plants ; what parasites attack it : the date of pupation ; description of the form and colouring of the pupa ; position of pupa, subterranean or otherwise ; formation of cocoon ; duration of pupa state : date of emergence of imago ; duration of its life ; hybernation or otherwise ; the number of broods in a season ; difference of sexes in size and colouring ; wing-power ; favourite plants ; number of legs ; neuration of wings ; area of distribution. These are all important points in the structure and habits of the insect as Nature has created it.[1] To these may be added what man has made of it in the endeavours of men of science to assign it its proper place in the insect world, what of its life-history has already been recorded, and what names have been bestowed on it, by which reference to it can be facilitated in searching the works of the older writers or studying the conclusions of the latest authorities.

The area of distribution suggests to us the interesting question of acclimatisation—to some men an ideal to be striven after, to others a suggestion that rouses them to indignant

[1] Ascription to Nature arises from two very diverse causes : a disbelief in a Higher Power, and therefore a taking refuge in some vague *causa causans* in an attempt to explain the inexplicable ; or a recognition that Nature is the handmaid of God, the visible evidence of Omnipotence, accepting to the full the words of Cowper :—

"Nature is but a name for an effect,
Whose cause is God."

protest. One man travelling abroad sees no reason why the beautiful forms around him should not be transported to his native land to give pleasure to multitudes who may otherwise never see them, and points out that nothing would be easier than to transfer them to our shores while they are in the pupal state, while another sees in such a proposition an atrocious attempt to upset by such alien arrivals the British fauna. If this acclimatisation takes place through the operations of nature these latter are willing to admit that there is no more to be said; but they insist that definite human agency must take no share in the work. To ourselves it appears no more depraved to introduce into England some butterfly from the United States than to introduce salmon into New Zealand.

It is clearly no use to attempt to naturalise any foreign species here unless the climatic conditions be in its favour, and its food-plant be available, or some substitute that it may be persuaded into accepting. Some insects might be introduced into the palm-houses of such gardens as Kew, but probably any authority of the botanical frame of mind that befits the guardianship of such conservatories would not take quite happily to seeing his plants riddled by caterpillars. If it be objected that a butterfly from Assam cannot fairly be considered a botanical specimen, we would reply that it is at all events as much so as the penguins, pelicans, peacocks, that the botanists of Kew admit within their domain, and which give much pleasure to their visitors.

The Monarch butterfly, or the Milkweed as it is sometimes called, the *Anosia plexippus* of science, we can scarcely doubt will presently take its place in our lists. One book on English butterflies has gone so far, we see, as to admit it already, since several specimens have been captured here. It is a North American species, fully as large as our Swallowtail, of a rusty brown colour, having the margins of the wings black and freely decked with white spots. With characteristic American enterprise, it has taken passage across the Pacific, probably

travelling as a chrysalis in bales of hay, and is now thoroughly at home in Australia. It has also found its way to the Philippines, and is equally well known nowadays in the Cape Verde Islands, and bids fair shortly to be cosmopolitan. In like manner our Small White has crossed the Atlantic, and is now as thoroughly American as British. A friend of ours who is great at the cultivation of tropical orchids tells us that they not unfrequently inadvertently find themselves the possessors of tropical butterflies emerging from the parcels of plants they have imported, while it is common knowledge that in the neighbourhood of the London docks all sorts of more or less unwelcome strangers—snakes, mosquitoes, scorpions, and the like—seek, on transfer from the ships that brought them, to find a home amongst us.[1] We find recorded in an entomological periodical that the larva of one of the commonest Canadian insects, the *Pyrrharctia isabella*, has been found in boxes of Canadian apples in British provision shops ; it will feed on various low plants, such as dandelions, grass, plantains, and the like. And we have heard, too, of larvæ of the *Heliothis armigera* being taken out of boxes of tomatoes from Spain; these duly pupated, and presently appeared as perfect insects. It is evident, therefore, in view of the great commercial intercourse between the various nations, that we are always open to the immigration either of such objectionable aliens as the Colorado beetle or of others we could more heartily welcome in our midst. Even in our own country this involuntary distribution is going on, moths characteristic of the south of England

[1] A man told us that he had seen one of the most poisonous Australian snakes in the principal street of Melbourne. It had been concealed amongst some bundles of faggots that had been brought in from the country, and presently shook itself loose from the cart and fell into the roadway. We can, perhaps, better bring this home to ourselves if we imagine a rattle snake, fully aware of its death-dealing power, fully alert, a swaying mass of rage and fury, prepared to do battle with all comers, in the centre of Cheapside. The warmest advocate of acclimatisation would in such a case admit that the thing could be overdone.

being frequently found in the north, having travelled by train, creeping under a tarpaulin in some little Surrey station and dozing off comfortably until arriving at Sheffield or Glasgow, there to find themselves entomological treasures in imminent peril of the jubilant collector's setting-board. Nature employs many agents to do her work of dispersion : geological changes whereby whole continents are joined or severed, the transport of seeds and eggs in the fur of animals, and even, as we see, goods trains, wherein man is an unconscious helper.

Doubleday, a well-known entomologist and writer, a man, therefore, who was acting with full knowledge of what his proceedings involved, reared a brood of eggs of the *Saturnia pavonia major* that had been sent to him from the United States of America, and turned them loose in the depths of Epping Forest, hoping to naturalise them. His intention, however, was frustrated ; several of the perfect insects were brought to him to name or to purchase, by persons who were quite unaware of how their captures became possible to them, but no specimen was ever seen after that one season. In the *Zoologist* we find recorded that a well-known entomologist turned out from the chrysalides some hundreds of the Swallowtail butterfly in the neighbourhood of Matlock, but here again no abiding result followed. The following passage from the *Introduction to Zoology*, by Gosse, represents one point of view, that in favour of acclimatisation ; and we follow this by a passage from another writer, dealing with the question from the other side. The affirmative view runs as follows :—

" We wonder that no one has tried to naturalise some of those splendid foreign butterflies which inhabit climates similar to our own, and whose caterpillars feed on plants which grow naturally in both localities ; and there are many such, especially in North America—such as the beautiful *Papilio turnus*[1] and

[1] This is one of the most beautiful of the Swallowtails. It is somewhat larger than our British species, and from its deeper yellow ground-colour striped with black, is sometimes called in America the Tiger.

asterias,[1] the former of which feeds in the larval state on the willow and ash, and the latter on the parsnip and other umbelliferæ. Both of these are common, even so far north as Newfoundland. It might, doubtless, be easily effected by collecting the caterpillars in their own country, and allowing them to go into chrysalis, in which state they might be transported during the winter, and be evolved here in spring. We have had a specimen of *P. asterias* produced here from a chrysalis which we had brought from North America."

The negative view is in our next extract very strongly expressed, and one can really only feel that there is a great deal to be said on both sides of the question :—

"The proposed reintroduction of extinct and resuscitation of waning species of native Lepidoptera will not, I trust, be carried out. It appears to me that it would be both an unsatisfactory and also foolish proceeding. Unsatisfactory, because the capture of a rare insect (say *V. antiopa*) would be robbed of half its charm and delight were we once doubtful whence the specimen came. If we knew that Mr. Brown, of London, had been 'turning out' *antiopa* from imported pupæ, or that Mr. Jones, of the New Forest, or Mr. Robinson, of Brighton, had been doing the same, we should, on capture, never pin one of those insects into our cabinets with any real satisfaction, or be able to point to it as a British-caught specimen with any show of honesty. Foolish, because the disappearance or increasing rarity of certain species indicates a change in, or withdrawal of, those circumstances or conditions essential for their prolonged existence amongst our fields and woods ; and, unless we can restore those conditions, to attempt to revive the species is simply to fight against nature. Let us keep our

[1] *Asterias* is rather smaller than our English Swallowtail. In colouring it is very similar to it, but there is much more black in proportion to the yellow. It is a very striking insect. The larva is often found in gardens in the United States, feeding on fennel and parsley.

island soil safe against the intrusion of foreign 'lepidops,' as we would against foreign bayonets."

The SWALLOWTAIL, Fig. 1, is our largest British butterfly, though it will be seen from our illustration that the Purple Emperor, Figs. 37, 38, or the Camberwell Beauty, Fig. 45, are very slightly inferior in size. It is entirely unlike any other British butterfly, though it has numerous relations much resembling it scattered over the world. It is the *Papilio machaon* of science. The generic name is the Latin word for a butterfly, the noble species that form the Papilionidæ being of special beauty, and, therefore, one's ideal of what a butterfly should be. The specific name, *machaon*, is an illustration, of which we may find many, of the arbitary bestowal of names. It was given to this insect by Linnæus. This Machaon is mentioned in the *Iliad* as on the medical staff of the Greek army in the Trojan war, a skilled physician, and one of the sons of Æsculapius.

The larva is, when full grown, some two and a half inches long. It feeds in full sunshine, and is to be sought for on various plants of umbelliferous type, such as the wild carrot, cow parsnip, and the like, from June to the beginning of September. In captivity it will feed freely on the leaves of the garden carrot, and it has been found occasionally on plants of other orders, such as the pimpernel and rue. It is somewhat sluggish in disposition, spinning a few threads, and so attaching itself to the leaf on which it is feeding, thus securing a firm position. When full grown it is of a dark green colour, each segment of the body having on its verdant ground a cross band of velvety black, and on these bands a series of orange dots, the result being decidedly brilliant and attractive. In the earlier stages of its existence the larva is very different in appearance, being black with whitish markings, the general effect being highly suggestive of bird-droppings. Many larvæ are thus protected, and it is curious that several of these are the larvæ of other species of Swallowtails. At each moult it

greatly increases in size and voracity, but it is not until the third change of skin that the tentacles appear. These tentacles rise from the back of the head. The Swallowtail is the only British larva thus provided, and the provision appears to be of no special value. At each moult the caterpillar's first business is to devour its old coat, a habit, however, by no means confined to this species. There are two broods in the year, the first in May, the second in July.

The pupa is of pronouncedly bulky proportions. It should be searched for during autumn, winter, and spring, and will be found attached to the stems of reeds and other water plants. It is rather brilliant in colour, being a brightish yellow on what we must call its back, while the abdomen and wing cases are of a strong green. It must be remembered, however, that while these colours strike us as being rather conspicuous as the pupa rests in our hand, they are really the colours of all others that, in a state of nature, tend to its concealment. It is attached by its tail, head upwards, its hold to the stem being strengthened by a girdle of silk cast round it.

In the perfect insect the sexes are similar in marking, but the female is the larger. The scheme of colour, straw-colour and deep black, is very effective. The upper and under surfaces are much alike, but there is on the latter less of the black, and instead of the one red spot seen on the upper surface we find three or four. Though the typical colouring of much of the wing surfaces of *machaon* is of a pale straw tint, we may occasionally come across a form of variation where these portions are, in lieu of this, of a dark tawny brown. The effect is sombre and by no means so attractive as the type coloration ; in these variants, too, the black portions are sometimes more or less clouded, wanting in sharpness of definition.

The Swallowtail is essentially a butterfly, at least in England, of the fen districts, and need scarcely be sought for except in such localities in Cambridgeshire, Huntingdonshire, and Norfolk, though it may at times appear in places

PLATE VIII

57. Large Copper. Male. *Chrysophanus dispar.*
58. Small Copper. *Chrysophanus phlæas.* Under side.
59. Small Copper. *Chrysophanus phlæas.*
60. Common Blue. Male. *Lycæna icarus.*
61. Common Blue. Female. *Lycæna icarus.*
62. Brown Argus. *Lycæna agestis.*
63. Bedford Blue. Female. *Lycæna alsus.*
64. Bedford Blue. Male. *Lycæna alsus.*
65. Holly Blue. Female. *Lycæna argiolus.*
66. Holly Blue. Male. *Lycæna argiolus.*
67. Chalk-hill Blue. Male. *Lycæna corydon.*
68. Chalk-hill Blue. Female. *Lycæna corydon.*
69. Large Blue. *Lycæna arion.*
70. Large Blue. *Lycæna arion.*
71. Small Skipper. Male. *Pamphila linea.*
72. Small Skipper. Female. *Pamphila linea.*


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far remote from these; probably in most of these latter cases as an escape from captivity. The chrysalides are largely sought for sale, and sent broadcast over the country to dealers in things entomological, and it may well happen that some of the chrysalides may have matured in the absence of their purchasers, the insect sailing forth into at least temporary liberty a hundred miles or more from the spot where pupation took place. There was a time when this grand butterfly was to be freely found in the marshy ground by the banks of Father Thames at Battersea; ground which is now drained and made into a public park, duly equipped with bandstand and multitudinous warning notices to keep off the grass, but which we remember as a glorious no-man's-land, a most happy hunting ground for any lover of natural history. *Machaon* has also, in the past, occurred fairly frequently in the New Forest, and was formerly abundant at Westerham, in Kent.

While on economic grounds it may be a good thing that the fen-lands should be drained and brought under cultivation, producing wheat instead of ague, one important result will be that such operations ever more and more narrow the localities specially favoured by this noble insect, and we can only fear that it will presently, as other fen creatures have already done, become extinct in England. It is very strong and swift on the wing, and soars to a considerable height, so that its capture is not altogether easy; the entomologist realising painfully enough that plunging through plashy marsh, and the rank vegetation that this swampy ground yields so abundantly, places him at a considerable disadvantage, when the butterfly interested in the chase can sail on wide-spreading pinions high in air, above the vicissitudes that beset the hunter, on what it would be the grossest flattery to call *terra firma*. It is curious that on the Continent the Swallowtail shows no special partiality for fen-land, but is commonly met with in meadows and gardens. Though the caterpillar is specially fond of various umbelliferous plants, it will, as we have seen, take

kindly to others, and when we find it occurring in spots so remote from ourselves and from each other as Alaska and Assam, it must clearly find welcome provender in plants unknown to Britain or even Europe.

One of the many pleasant indications of returning spring, and, in the open country, well nigh as characteristic as the opening buds themselves, is the ever-welcome appearance of the gay BRIMSTONE BUTTERFLY fluttering in the strengthening sunshine. One may find it sometimes even in January, if the weather be so exceptionally mild as to tempt it forth from its winter quarters; but it is more ordinarily seen somewhat later, when the sandy banks are bright with the golden stars of the coltsfoot, the woods decked with daffodils, and the cuckoo with persistent egotism is announcing his arrival. We have known of one appearance of the butterfly on December 21st, the shortest day, but this was, of course, exceptional. The insect soon tired of a world so cheerless, a day so short, and retired anew until a more propitious season should dawn.

The Brimstone, Figs. 2 and 3, is of robust build, and in its appearance in the woodland glades in springtime has ordinarily as bright a colouring, as perfect a form, as if it had only just emerged from the chrysalis, instead of having been stowed away for months in some dark shelter out of the way, secluded safely from the death-dealing frosts and biting winds of winter.

The responsibilities of parentage, unknown in the autumn, are presently undertaken, and the female lays her eggs, and generally singly, on the twigs or under surfaces of the young leaves of the buckthorn. These eggs are of tapering sugar-loaf form; yellowish in colour; very delicately ribbed and reticulated. The caterpillars should hatch out somewhere about the end of May. They then proceed with the main business of their life, the absorption of buckthorn leaves, feeding morning, noon, and night, until, by the end of June, or thereabouts, they are ready to enter on the next stage of their

existence. Any dates we give are necessarily very open ones, depending largely upon locality, season, and other controlling influences.

The pupa, as in *machaon*, is attached by silken cords by the tail, while a slender cincture is thrown round its centre. This pupa, the general tint being bluish-green, and the wing cases a more grass-like green, in due time begins to change into varying shades of yellow, that grow ever more pronounced in colour till presently, in July or August, the perfect insect emerges, and after the necessary interval of time, some two hours or so, for the full development of its wings, soars away to enter upon its new life ; presently, with the shortening days, finding, like the warriors of the olden days, refuge in winter quarters.

The Brimstone is, amongst British butterflies, unique in its special colouring of rich canary yellow, and in its quaint beauty of form. Its English name is very fairly descriptive of its colour, while the French name for it, Citron, is at least as happy. To have called it amongst ourselves the Daffodil, from its spring contemporary, one would have thought as obvious, and distinctly more pleasing. While referring to its colour we must not omit, however, to notice that while the male, Fig. 3, is of this glowing yellow tint, the female, Fig. 2, is of much paler hue, and more decidedly greenish in general effect. Each sex bears in the centre of each wing a rich orange spot. When the insect is at rest we notice that the under surfaces of the wings are considerably paler than the upper, while the brilliant orange spots are now but reddish-brown. The body is thickly clothed with soft silky grey hairs, that meet on the thorax in a central ridge or crest.

The perfect insect is found from August to October, and then again, after hybernation, from February to May. It is very generally distributed through the south of England, but grows scarcer as we approach the Midlands. It occurs fairly commonly in the south and west of Ireland, but in Scotland is

unknown. The Brimstone is also generally distributed over Europe, Western Asia, and North Africa.

The food plants of the caterpillar are the two buckthorns; the plants known to botanists as the *Rhamnus catharticus* and the *R. frangula*. The prevalence, or otherwise, of these plants in any locality naturally influences the more or less abundance of the butterfly.

In many species of butterflies and moths we find considerable difference of colour between the sexes, while in others they are identical. Where they are dissimilar the male is much more ordinarily the more brilliantly attired, though in some few cases the reverse is seen. This, however, it will be clearly recognised, is a general principle that applies not to insects alone.

The name bestowed by science on the Brimstone butterfly is *Gonepteryx rhamni*. It is admirably descriptive, referring as it does to the angular wings, and to the fact that the food plant of the larva is the buckthorn. Duponchel, a distinguished French entomologist—the author of *Hist. Nat. des Lepidoptères de France*, a *Catalogue Méthodique des Lepidoptères d'Europe*, and other valuable works—severed the Brimstone and the two Clouded Yellows, with others of which we have no British representatives, from their old moorings, and devised for them a new family (the *Rhodoceridæ*), making the British butterfly the type, and changing its name from *Gonepteryx* to *Rhodera*. The name means the rose-horned, in allusion to the red colour of the antennæ. The title has not met with general acceptance.

The Pale Clouded Yellow, *Colias hyale*, Fig. 4, is very variable in its appearances, since it may sometimes be found in abundance and then for years be a great rarity. This peculiarity it shares with its near relative, the Clouded Yellow, *Colias edusa*, depicted in Figs. 5, 6, and there seems absolutely no explanation forthcoming for this great fluctuation. Sometimes we have what entomologists call a "*hyale* year,"

when the butterfly is in such abundance that one scarcely realises that there could ever have been a time when it was a great rarity, or that this rich abundance will probably be followed by long years of dearth. The Pale Clouded Yellow appears to be gradually growing more common and extending its range more widely over the country, but it shows a special partiality for the neighbourhood of the sea and the great chalk downs. The particular specimen we figure was captured on the South Downs, near Alfreston, a very typical locality for it.

The Pale Clouded Yellow specially delights in clover and lucerne fields, and it is in these that the largest numbers are captured. Many other insects show a great partiality for these crops. The butterfly is with us an autumn species, but abroad it is often double-brooded, the perfect insect appearing first in May and then again in August.

The larva is of a deep green colour, dotted with black. Two yellow stripes run along the back, and on each side is a somewhat paler one. It should be sought for in June and July on the various leguminous herbs it favours. Though the larvæ may be satisfactorily hatched and fed up thrivingly on lucerne or clover, they nevertheless largely die off in winter, and it does not seem that the species can quite stand what cheery optimists about Christmas time call "seasonable weather." Hence it would appear that we are largely kept supplied by immigration across the English Channel, and that these visitors, despite their efforts to naturalise themselves, find in due time the climatic conditions here too stern for them. It is abundant throughout France, Holland, and Belgium; we are, therefore, very nearly within its normal northern range of well-being. It is found frequently in Switzerland, and at great altitudes; in Germany, too; in the countries, European, African, and Asiatic, that border the Mediterranean; and stretching right across central Asia to far Japan.

The Pale Clouded Yellow has, in the male, wings of a delicate sulphur yellow, while in the female they are of a

greenish white. The wings are bordered with brownish black, this bordering being much broader on the upper wings than the under, but dying away at the lower angle of the wing. On the upper wing this border encloses a series of spots of the general wing tint. Each wing has also a central spot on it—black on the upper wing and orange on the lower.

The generic name Colias is one of the names of the goddess Venus, bestowed on her from a locality in Attica where a special cult in her honour drew many worshippers ; while Hyale was an attendant nymph on Diana, the huntress deity.

The CLOUDED YELLOW, *Colias edusa*, depicted in Figs. 5, 6, is a magnificent insect in its intense brilliancy of colour and the striking contrast of the orange and the black that form its simple but effective coloration. Like the preceding specimens, it is very capricious in its appearances, there being "*edusa* years" when it is in abundance, and intervals of varying duration between these when it is a scarce insect. The year 1877 was a very notable one for the profusion in which the Clouded Yellow was almost everywhere encountered, and it was not till 1892, fifteen years afterwards, that there was anything like such a recurrence. While it is specially common in the south, its northern range is much greater than that of *hyale*, being reported from as far north as Arran, and it has occurred in many districts in Ireland. It is also rather partial to the Metropolis : we have known of its capture on Wandsworth Common, in Regent's Park, and on the ground, then meadow-land, at South Kensington, where thousands of its fellow Lepidoptera in stately array are now impaled.

The Clouded Yellow is very strong on the wing, settles but seldom, and flies very swiftly, so that if one misses one's first stroke there is little likelihood of another opportunity. Like *hyale*, it has a special partiality for clover fields ; and these, when the crop is fairly luxuriant, do not yield much opportunity for the display of one's running powers. We recall now, with something approaching remorse, the devastation

we must have committed in our younger days amongst the growing crops, when the chase of *edusa* was all-absorbing and the farmer's interest in the clover entirely forgotten.

The larva is of a bright green colour, with a yellowish lateral line. The chrysalis stage is reached about the end of July, and soon afterwards the perfect insect emerges. A stray *edusa* may at times be seen even as late as the end of October. It will be noted that the black bordering of the Clouded Yellow is much broader than in the preceding species. In Fig. 5 it is seen to be crossed by yellow lines, while in Fig. 6 there are yellow spots instead. This is a sexual distinction, the former being the male. There is a curious constant colour modification in the female that is known as the *helice* variety; in this the normal orange of the wings is replaced by whitish yellow. This variety is not uncommonly met with in Britain; it is very common in France and Germany, and generally abundant in South Europe. It is very suggestive of *hyale*, and may be mistaken for it by a novice; but the difference is at once apparent if we remember that in *helice* the black margin, as in the normal *edusa*, Fig. 6, extends the whole distance, while in *hyale* we have seen that it fades away. There is also much more black bordering on the hind wings of *helice*. Transitional forms between the type and *helice* may be met with occasionally; and we have seen a specimen in which the orange spots on the hind wings, instead of being merely defined by this darker background, were actually surrounded by a black ring; while in another the black central spots on the forewings were absent. Such forms are merely aberrant, and of rare occurrence; but are, when encountered, of interest. Edusa, we may mention, in taking leave of her lepidopterous namesake, was a minor Roman deity, whose special function—and a somewhat responsible and exacting one—was the protection of children.

The ORANGE-TIP BUTTERFLY—Fig. 7 being the upper, and Fig. 11 the lower, side of the female; Fig. 9 the lower,

PLATE IX

73. Small Elephant. *Chærocampa porcellus.*
74. Six-spot Burnet. *Anthrocera filipendulæ.* Variation from type.
75. Six-spot Burnet. Type, *Anthrocera filipendulæ.*
76. Convolvulus Hawk. *Sphinx convolvuli.*
77. Transparent Burnet. *Anthrocera minos.*
78. Forester. *Procris statices.*
79. Lime Hawk (small specimen). *Smerinthus tiliæ.*
80. Lime Hawk. *Smerinthus tiliæ.* Variation from type.
81. Lime Hawk. *Smerinthus tiliæ.* Typical specimen.

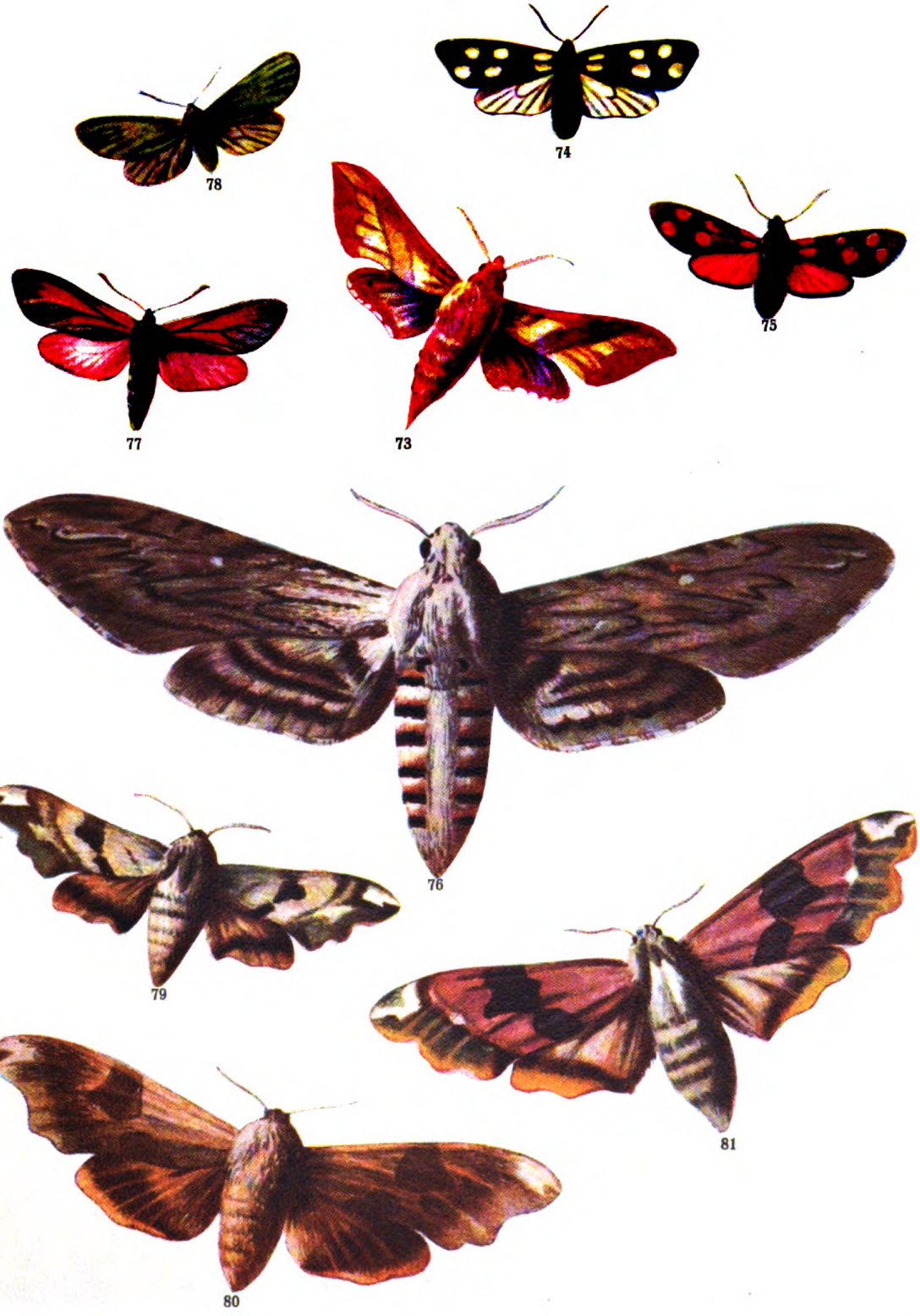

Plate IX.

and Fig. 8 the upper, side of the male. It will be observed that the brilliant patch of colour that gives the butterfly its popular name is the exclusive property of the male. This beautiful little butterfly must be familiar to all Nature-lovers, since it is found in abundance almost everywhere, and is, after the Brimstone, one of the most characteristic insects of the spring, as it flutters along the hedgerows during the month of May, a few days' margin of April and June being perhaps added on. From the weakness of its flight it falls an easy prey to the collector. The under surfaces of the wings in both sexes are beautifully mottled in what we should at first glance call green, but under more careful scrutiny, and especially if aided by a powerful glass, we find that this colour-effect is really produced by multitudinous minute scales, that are either dense black or pure bright yellow. When the insect is at rest with closed wings, this coloration has great protective value. It is an insect that varies considerably in size, and especially on the female side. The females, too, would appear to be ordinarily much less common than the males. The male, from the rich colouring of its wings, is much more conspicuous than the female, and no doubt the latter when seen is often thought to be one of the other common Whites. Still, all allowance being made for this, the real reason why we see so many more males than females is because there are actually so many more of them to see.

The Orange-tip is by some systematists called the *Euchloe cardamines*, by others the *Anthocharis cardamines*, the former being the name the more commonly found. The egg is of a bright yellow when laid, but changes in a few hours to a deep orange, and from this presently hatches out a dull green, black-dotted larva, having a lateral white line. This feeds on many common plants, one of these being the lady's smock or bitter cress, the *Cardamine pratensis* of the botanist: hence the specific name of the butterfly. It is also found on the garlic-mustard, charlock, hedge-mustard, penny-cress, and other

plants—not, however, eating their leaves, but concentrating attention on the pods and seeds. The pupa is of very peculiar shape, being what is called fusiform, or spindle-like, tapering at either extremity to an acute point. The pupal condition is assumed in July, and it is in this stage that, girdled securely to the food-stem, the winter is passed.

The Orange-tip is not subject to much variation, but we have seen a female in which there was a slight suffusion of yellow on the outer halves of the upper wings, and we have also come across a case where a male had black spots as pronounced on the hind wings as those on the fore. In the South of Europe one finds a variety, *turritis*, in which the black discoidal spot has a white eye.

The Bath White, Fig. 14, *Pieris daplidice*, is one of our rarest butterflies, and proud indeed is he who becomes its possessor—not, indeed, by ignoble purchase, for it is a very common butterfly abroad, and a few pence will make it ours if we so will, but by its capture on British soil. It so far resembles in general appearance our common Whites that no doubt it from time to time escapes pursuit, being regarded as much too ordinary a thing to take any trouble about. The example we figure is the female. In the male the isolated spot near the lower angle of the fore wing is absent, and almost the whole of the black markings on the hind wing are also missing. The differences between the sexes are therefore very marked. The insect is sometimes found with the parts that are ordinarily a greyish black a strong rusty brown colour. The under surface is beautifully mottled in soft yellowish green and white, emphasised here and there with black, the markings on the upper surface being thus reproduced on the under. From this elaborate marking it has been called by the alternative name of the Chequered White. This green, as in the last species, is really an optical effect resulting from the aggregation of minute black and yellow scales.

While the name Bath White would seem to indicate that

its British home should be sought in the west, the insect is, as a matter of fact, almost confined to the south-east. It can only really be considered as an occasional immigrant: hence it has occurred, and not unfrequently, at such places as Deal, Dover, and Folkestone. It has been found as far inland as Cambridge, Newmarket, Colchester, and Worcester; but it is an insect better known even in Tangier or Yokohama than in Kent. It is very slow on the wing, and the flight is heavy. The butterfly keeps near the ground, and settles very frequently, and may therefore be very easily captured when seen, the seeing it being the only real difficulty. It should be watched for in August.

The records of the capture of the Bath White, as set forth in the entomological papers, indicate clearly how great a rarity it is, being ordinarily notified as occurring singly, or in twos and threes, in any one year, while often these so far favoured years are at a considerable interval from each other.[1] On August 9th, 1901, one specimen was taken at Eastbourne, and two days later three were captured at Dover. In the year 1872 twenty-nine were netted! This was indeed a "*daplidice* year": there has been nothing ever like it before or since. The larva is of a pale bluish-grey tint, plus four longitudinal stripes and a sprinkling of divers black dots of varying sizes. It is especially partial to wild mignonette. Should our readers ever encounter any of these and successfully rear them, they will be indeed fortunate.

The generic name Pieris is derived from the Muses. They were sometimes called the Pierides from a mountain, their abode;[2] while the Daplidice, who lends her name in the cause of science, was one of the fifty daughters of Danaus, King of Argos.

[1] Curtis records "a faded specimen in June 1802, in White Wood, near Gamlingay, Cambridgeshire, and another upon the heights near Dover Castle in August 1818"—an interval of sixteen years!

[2] From whence flows that Pierian Spring that Pope warns us to drink deeply from, or taste not.

In Figs. 12 and 13 we have depicted that very well known butterfly, the LARGE WHITE, or, alternatively, the Cabbage White, *Pieris brassicæ*, the female form being readily distinguished, by the two large black spots on the upper wing, from the male. Both in butterflies and in most other creatures we find the male the more decorated, but in the present species the female has the extra adornment. It is very commonly found throughout Great Britain and Ireland from April to August, and is no less abundant throughout Europe, the north of Africa, and much of Asia. Though we grow our own specimens to an extent that agriculturists fail to sympathise with, our copious home supply[1] is sometimes considerably reinforced by vast flights of immigrants that waft their way across from France to our shores—those shores that have ever been the resting-place of the undesirables of other nationalities.

The larva of the Large White is of bluish green colour, dotted with black, and having longitudinal stripes along it. This and the larva of the allied species, the Small White, with the exception of some little assistance from the wood-boring larvæ of some of the moths, are the only caterpillars that do an appreciable amount of damage in England to human surroundings, and we may indeed congratulate ourselves that it is so when we see what those few are able to effect. We have a May or June brood, and then in August or September a second. The specific name is derived from *Brassica oleracea*, the botanical name of the cabbage, one of the favourite food-plants of the Large White in its larval condition. The caterpillars that become chrysalides in September remain in that condition throughout the winter, yielding in May the first crop of butterflies, those of May and June, and these in turn become the progenitors of the later swarm.

[1] A correspondent in the country told us that he had counted eighty-nine of these Large Whites in a drive of a quarter of a mile, and it would appear that in these swarms the females, the great mischief-makers, are in immense preponderance.

The caterpillars are gregarious, feeding quite openly on all cultivated kinds of cabbage, turnips, rape, and mustard, radish, and other allied plants. They and those of the Small White not unfrequently get boiled and served up at table, hence we have heard a Londoner specialise them as restaurant caterpillars. They have a very unpleasant odour when plucked off the plants and stamped upon, but this is not by any means the first time they have been in bad odour. We know of a market gardener who entirely lost seven thousand promising plants of broccoli through their assault. We remember, too, seeing an old cottager neighbour of ours spending much of her time sallying forth into her garden, and attempting with waving cloth and rustling apron to drive off the big white butterflies from her cabbage plot; but the contest was too unequal, and before long her plants were riddled through and through.

The pupa of the Large White may be found under the eaves of outbuildings or the copings of walls, attached to palings or the trunks of trees all through the winter. It varies a good deal in colour, being sometimes greenish white, peppered over with minute black dots, at others a darker and bluer green. To collect these chrysalides in the spring and destroy them[1] is of infinitely more utility than to wage war on the caterpillars or butterflies. The eggs, too, should be sought for. They may be found in great numbers, sometimes fifty or more together, on the undersides of the food-plants. They are dull yellow in colour, curiously furrowed and reticulated, and standing on end like little flasks.

These voracious caterpillars of the Large White would soon increase to an enormous extent, were it not for the check afforded by the operation of a parasite, the *Apanteles glomeratus*,

[1] "To prevent their numerous increase, gather them off in the winter, taking away their puckets and burning them."—*Systema Agriculturæ*, 1675. Puckets we may take to be equivalent to pockets, and descriptive of the pupa that contains as in a pocket the future marauders.

a fly which also attacks the larva of the Small White, an equally destructive enemy to our fields and gardens. This parasite was known to Linnæus. The caterpillar is its unconscious host; while it in turn is a prey to two other parasites, the *Hemiteles fulvipes* and the *Mesochorus aciculatus*. The female of this ichneumon fly deposits her eggs within the body of the caterpillar, and these on hatching become grubs feeding on the interior of the caterpillar, by a wonderful instinct avoiding vital parts. They presently eat their way through its skin and pupate on its surface, over sixty sometimes issuing from one caterpillar. One may see in the autumn large clusters of these little ovoid cocoons, of a fine silken texture and bright yellow colour, adhering to the shrivelled skin of the defunct larva, and presently maturing into flies that issue forth prepared to commence the same round of operations on other cabbage caterpillars.

The GREEN-VEINED WHITE is another very abundant species, Fig. 10 depicting its under surface, and showing the conspicuous markings that give the butterfly its popular name. It is the *Pieris napi* of science. In Fig. 15 we have the female insect represented: the male having only one round spot, instead of two, on the fore wings. The nervures on the upper wings are darker ordinarily, and the tip a stronger black in the female than in the male, but the strength of colouring varies very much in different individuals. It is an insect, too, that fluctuates a good deal in size; but, as a general rule, we find that the female is somewhat larger than the male.

The eggs are laid on cabbage, turnip, horse-radish, watercress, and other cruciferous plants, and the resulting caterpillars are of a delicate green colour. Like those of the Large White, they are vigorously attacked by a special parasite, the *Hemiteles melanarius*.[1] This butterfly is double-brooded, one

[1] This and all its fellows are duly set forth for those who care to pursue this very curious study, in a book of special interest and research, the *Ichneumonologia Europæa*.

generation appearing in April or May, and another in July or August. They remain in the pupal state about three weeks before emergence. The specific name *napi* is bestowed on the species from the botanical name for the turnip, *Brassica napus*, one of the food-plants of the larvæ.

A variety of the Green-veined White is sometimes found in which the colour of the wings, instead of being white at all, is of a beautiful canary colour, the veining, soft shading, and definite spots and tips of the wings being, as normally, black. It is a very striking and beautiful form, and, entomologically, is the variety known as *flava*. We sometimes also get very dark forms and other modifications from type, such as the *bryoniæ*, *sabellicæ*, and *napææ* varieties: these were formerly given full specific rank, but are now accepted as being merely variants. Though called the Green-veined White, the veining is often really grey. When the ground-colour of the wings is white the grey asserts itself; but this ground-colour varies a good deal, and when decidedly yellow the minute black scales that form the fringing of the nervures, blending with this yellow, appeal to the eye as green.

Our third abundant white butterfly is the *Pieris rapæ*, the SMALL WHITE. The specific name is derived from the rape, *Brassica rapæ*, one of the food-plants of the larva. The insect is represented in various stages of its life-history on Plate III. Not only is the Small White one of the commonest butterflies of the country side, but even in the streets of our towns it may frequently be seen, a sight that at once sets off all the small urchins in eager chase. The eggs are generally laid singly, and are of a pale greenish tint. The larva, it will be seen, is green, having a yellow line running along the back, as we see in Fig. 17, and a series of yellow spots along each side, Fig. 24. The larva of the Green-veined White is very similar to this, but it has not got the yellow dorsal line that we see in the present species.

The caterpillar of the Small White feeds on cabbage, rape,

PLATE X

82. Privet Hawk. *Sphinx ligustri.*
83. Privet Hawk. Larva. *Sphinx ligustri.*
84. Privet Hawk. Pupa. *Sphinx ligustri.*
85. The Privet. Food plant. *Ligustrum vulgare.*


85
82
83
84

charlock, hedge-mustard, and other plants. In our flower gardens it is partial also to the mignonette, the Indian cress, Fig. 23, and the canary-creeper, and will be found, the insect being double-brooded, in June, and again in September. It is a troublesome pest to the market gardener, and, having an uncomfortable way of eating into the centre of the cabbages and cauliflowers, may very possibly become an adjunct to the family dinner.

The chrysalis, Figs. 18, 19, is ordinarily of a brownish-yellow, but varies greatly, being sometimes of a dingy grey or of divers shades of green. It is, as we see in our illustration, affixed by the tail, and bound by its silken girdle, as in all the other members of this family. The summer brood of butterflies passes but a fortnight in pupahood, while the spring flight spends about eight months, from September to May, in this preliminary state.

The male butterfly, Fig. 23, has only one spot, and occasionally none at all, on the upper wing; while the female, Fig. 21, it will be observed, has two. The lower wings have in each sex one black spot. The under side of the upper wings is white, and of the lower dull yellow-green; this is seen clearly in Fig. 22, where we have the insect at rest. The butterfly appears from April to June, and again from July to the beginning of September.

It is a very variable insect in colour and strength of marking. It is occasionally of a strong buff or cream colour, and more rarely of a clear yellow. The butterflies of the early brood are often smaller and much less sharply marked than those of the second flight, and we may sometimes find them entirely spotless. This variation was at one time accounted a distinct species. As the butterfly is almost everywhere so abundant, it is evident that the chances of occasional variations are greater than in a less common insect.

For some occult reason the insect at times multiplies abnormally, and then migrates in great flights from one

district, or even one country, to another. It has on several occasions been known to come over in countless thousands from France to England, the more energetic flying the whole way, the others availing themselves of the resources of civilisation and coming across by boat. Vessels arriving at these times at Dover have thousands of these butterflies settled in their rigging, and so taking possession of the deck that it is impossible for the other passengers to move about without crushing them.

It is a butterfly of very wide distribution, being not only abundant throughout the British Isles, but equally at home throughout Europe, the north of Africa, and the more temperate parts of Asia, fluttering in a Japanese tea-garden with the same happy consciousness of being at home that it displays in Richmond Park. It has quite recently appeared in North America, having been unknown on that continent until 1860, when it appeared in the neighbourhood of Quebec. How it crossed the Atlantic no one can say. It has been the cause of immense loss, and steps have been taken to land in the New World the *Apanteles glomeratus* to aid in its destruction. Six different species of ichneumon fly are told off by Nature in Europe to keep a special eye on the Small White, and by crossing to America it escapes all these. If unchecked, a single fertile female might be the progenitor in a few generations of millions. We learn from Dr. Holland's excellent book on the butterflies of North America that "in 1863 the butterfly was already common about Quebec and was spreading rapidly. By the year 1881 it had spread over the eastern half of the continent, the advancing line of colonisation reaching from Hudson's Bay to Southern Texas. In 1886 it reached Denver, and it now possesses the cabbage fields from the Atlantic to the Pacific. The injury annually done by the caterpillar is estimated to amount to hundreds of thousands of dollars." It has now taken possession of Mexico, and, like the rabbit in Australia, is master of the situation, at all events until *glomeratus* is safely landed and sets to work.

The BLACK-VEINED WHITE, or Hawthorn butterfly, *Aporia crataegi*, is now so very rare that there seems little doubt but that it will presently have to be eliminated from our British list. It appears to have been always of uncertain appearance, though often reported as abundant, and why it should now have practically disappeared no one can surmise. The larva feeds on hawthorn, sloe, cherry, pear, apple, plum, and gooseberry, and these are as much to the fore as ever. What has been, may be, and we may even yet find that a great "*crataegi* year" has burst upon us. The insect is found all over Europe.

The caterpillars live together in a large society under a great silken tent which they jointly weave, quitting it in the daytime and coming back at night. They pass the winter huddled together in a dormant state beneath this shelter, after they have strengthened it to withstand the shock of wind and snow and aught else of storm and stress. On the third moult the colony breaks up, each larva wandering off by itself. Abroad the larvæ are often very destructive to the orchards.

The butterfly appears in June. The wings are very thinly clothed with scales, those of the female being semi-transparent. The nervures are very sharply defined, and instead of the fringing that we ordinarily find on the outer margins of the wings, in this species there is a bordering nervure that gives a quaint and pleasing sharpness of outline sufficient in itself to identify the butterfly.

Fig. 16 is the WOOD WHITE, a delicate-looking little butterfly that, though common or even abundant in some districts, is very local. One may collect for years without seeing it. It should be sought for in woodland glades in May, and again in August. Its flight is weak and fluttering, but it is very rarely seen to settle. The curious squareness of the spot will be noticed in our illustration. This spot is a sexual distinction : in the female it is much less marked, or may be entirely absent. It is a common insect throughout Europe in open woods ; rarely seen in the hot sunshine,

but preferring the cooler hours of the early morning. The underside of the hind wing is normally irregularly mottled with grey, but this is sometimes absent. The long, slender body projecting beyond the hind wings is a marked characteristic; we see at once how distinctive it is by comparing it with those of the other butterflies on our plate. The Wood White is the *Leucophasia sinapis* of the man of science. The generic name is derived from two Greek words signifying light appearance. The specific name is from the botanical name, *Sinapis nigra*, of the mustard; but the name is not a happy one, as the larva preferably feeds on various wild pea-bearing plants.

Yet another so-called white butterfly, though this time the white is certainly not very white, but distinctly creamy, while the black and the cream-colour are so equal in amount that one can hardly venture to say which is the ground colour. It is the MARBLED WHITE, Fig. 25, the *Melanargia galathea*. It is, however, no relation to our previous Whites, as we have now entered on another great family, the Nymphalidæ. From the eye-like spots that are seen on the under surface, and especially under the hind wings, an old name of the insect is the Marbled Argus, while yet another old English name for it, from its marbled markings, was the Marmoress. In France it is popularly called, and very happily, the Semi-deuil, the half-mourning. *Melanargia* signifies black and white, and is therefore a distinctly descriptive title.

Though found all over England, the Marbled White is an exceedingly local insect. It prefers rough meadows and the margins of woods, and is so markedly attached to the spot where it was bred, that one may see a hundred in one meadow, and in those around scarcely a single specimen. The colony is not always, however, in the same place. In one, for instance, that we know of on the South Downs, and which supplied the subject for our illustration, it was this year about a mile distant from last season's locality. The Marbled White is on the wing

during July and August, and, when found, is in profusion Like our last species, the Wood White, it is unknown in. Scotland. The female lays her eggs in July ; they are perfectly round and quite smooth, so that they roll down to the roots of the grass. They hatch out in about a fortnight, and the caterpillars lie concealed and abstaining from food all through the winter. In spring they wake up and feed on the tender young blades, being fully matured about the beginning of June. They then change on the surface of the ground to the pupal stage, emerging in about three weeks.

The Marbled White is rather variable in size and markings. Sometimes the dark colour is of a dense black, at others a purplish brown. The under surface has evidently more of yellow than of black in its design.

Every one who has had any acquaintance with country life must have noticed that several brown butterflies have crossed his path in his rambles. The family, Satyridæ, to which they belong has very numerous representatives, nearly one-third of the European butterflies belonging to it, and being mostly brown insects having their wings variously ringed and spotted. The nervures are often considerably swollen at the base of the fore wing. These butterflies, not so immediately conspicuous as the Whites, nor so daintly attractive as the Blues, have yet a quiet richness that has its charm. The first of these that we would consider is that known as the SPECKLED WOOD, Fig. 26, or alternatively, the Wood Argus, either name being very happily descriptive. It is to the scientific the *Pararge egeria*, though by some systematists the generic name is given as *Satyrus*, *Lasiommata*, or *Pyrarga*.

The Speckled Wood is to be found almost everywhere throughout the country, delighting in the woodland clearings, gaily fluttering before us in our country lanes, not flying with any swiftness, and frequently settling. The caterpillar is rather a sombre green in colour, striped dorsally with a darker green and laterally with paler yellowish lines. These colours are

very protective, as it feeds on various grasses. *Egeria* is double or treble brooded, so the larva may be looked for in April, June, and August. These latter hybernate, changing to the pupa state in spring, the emergence forming the April flight of the butterfly. The pupa is short and bulky-looking, brown or yellowish green, and may be found suspended by the tail from the grass leaves. The perfect insect may be looked for between April and October.

The sister *Pararge*, the *P. megæra*, we represent in Fig. 31. It is probably called the WALL BUTTERFLY from its habit of resting, wings fully displayed, in the bright sunshine on any rough wall or fencing. Some old writers call it the Great Argus, but the name is not a particularly happy one; the Grayling, for instance, Figs. 27 and 29, an allied species, is also Argus-eyed, and is considerably larger. The Wall Butterfly is double brooded, and may therefore be found both in May and June and again in August and September. It is very commonly distributed over England, fluttering just in front of us along the country lanes, frequently resting momentarily, and then off again. Its rich orange-brown colour and deeper markings make it a very attractive insect; to call it Megæra, the name of one of the Furies, seems an atrocity. The male, the sex we depict, is somewhat smaller than the female, and the markings on the wings in the two sexes are slightly different. The broad band of brown that we see in our figure running right across the fore wing and fairly parallel to its edge is characteristic of the male.

The larva is of an apple-green colour with darker stripes, and is a grass-feeder. One of the broods hybernates, changing into pupæ in April, and developing in May into the early butterfly-flight. This flight lays eggs that hatch about the beginning of June, and from these we have the autumn flight. The pupa is suspended by the tail as in *egeria*, and considerably resembles it in form, size, and colour.

The MEADOW BROWN is one of the larger butterflies of

this section. It is the *Epinephele janira* of science. It is perhaps the most abundant of all our British butterflies, being found very commonly almost everywhere throughout Great Britain, and equally abundantly throughout Europe, Western Asia, and Northern Africa. In these islands it should be looked for in June, July, and August. The sexes so far differ in appearance that Linnæus thought they were two quite different species, so that while he called the male *janira*, the female became *iustina*. The sex we represent is the female; the black spot has sometimes two white eyes in it instead of one. The male is very much darker in colour, and almost all over alike, the conspicuous blotch in the female being replaced in the male by a much smaller and less brilliant ring-like spot. It is an insect that in both sexes is subject to considerable variation. We may occasionally find it with the rusty red portion bleached almost white. The underside is of a much paler brown colour, but the white-centred black spot is quite as deep in strength as above, and therefore very conspicuous.

The Meadow Brown deposits her eggs at random as she flutters in July on the grass. The caterpillar is of a somewhat dull green, lined above with darker green, and laterally with a light line. It will be found on various grasses between August and May. The pupa is of a pale green colour, streaked and spotted with brown. It remains in the pupa state only a very brief time. One we dated became a pupa on May 22nd, and the butterfly emerged on June 9th. Lewin, an old writer, states, we see, that "it makes its appearance in all its splendour." This is certainly making the best of it, its apparel being by no means so gorgeous as those who have seen the quotation but not the butterfly would anticipate. The caterpillars hybernate amongst the grass roots and general tangle of the hedge until the spring brings them to light again.

The GRAYLING, Figs. 27, 29, though we have caught it in the old days where the South Kensington Museum now

PLATE XI

86. Eyed Hawk. *Smerinthus ocellatus.*
87. Striped Hawk. *Deilephila livornica.*
88. Poplar Hawk. *Smerinthus populi.*
89. Elephant Hawk. *Chærocampa elpenor.*
90. Silver-striped Hawk. *Chærocampa celerio.*
91. Broad-bordered Bee Hawk. *Macroglossa fuciformis.*
92. Humming Bird Hawk. *Macroglossa stellatarum.*

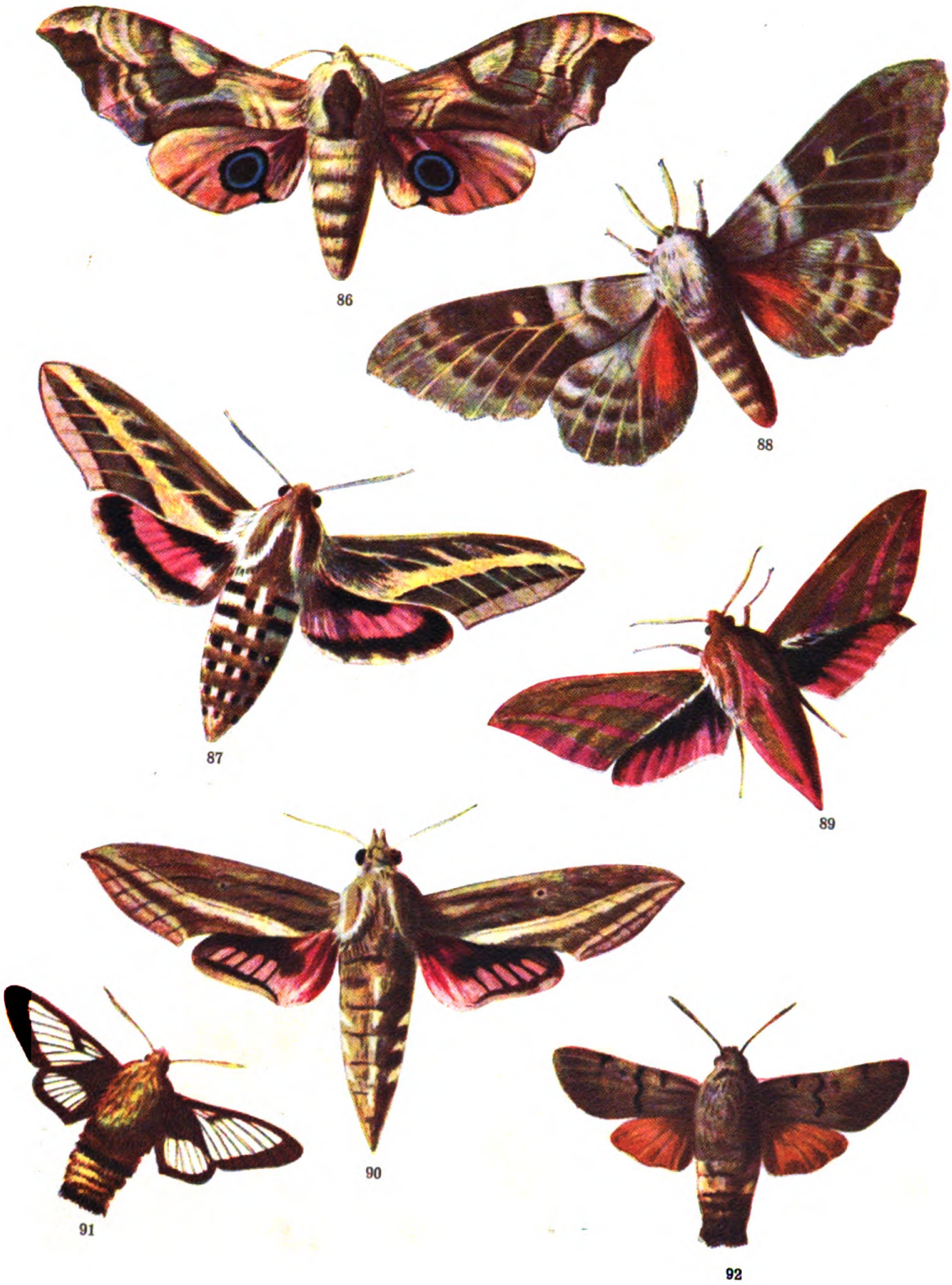

Plate XI.

stand, is not everywhere to be found. It seems to have a preference for limestone and chalk districts, downs, heathy ground, and the margins of woods. It is the largest British butterfly amongst the Browns, and it is also somewhat more elaborately marked than many of them. The female is considerably larger than the male, being nearly three inches sometimes from tip to tip, is richer in her colouring, and has the markings more distinct. It is a less powerful flier than its clean-cut appearance would suggest, and it readily falls a victim to the wiles of the collector, unless it can momentarily drop out of sight. It is then, with closed wings, so similar to its surroundings that it is hard indeed to detect it. By one old writer it is called the Rock Underwing, since the under surface is beautifully marked with streaks, reminding one of rock surfaces. It seems to have been first taken at Tunbridge, and so another old name for it is the Tunbridge Grayling. In some specimens the markings on the upper surface are very suffused, but the effect is not nearly so charming as in the more definite marking of Fig. 29, the normal patterning. It varies too in intensity of colour. The Grayling should be looked for in July, August, and September. It is the *Satyrus semele* of science. The larva is found on various grasses. At first it feeds either by day or night, but later on is entirely a night-feeder, remaining concealed at the roots of the grass during the day. It is found in autumn, goes into winter quarters, and then reappears in the spring, forming its chrysalis in June just below the surface of the ground, combining silk and particles of earth together in the formation of a little chamber.

Our next illustration, Fig. 30, is that of the SMALL HEATH BUTTERFLY, an abundant species on dry common land, rising up before us in abundance as we tramp across the broken ground. Its coloration and markings, as our figure shows, are of the simplest. It is in profusion everywhere from June till well into the autumn. The larva is bright green

with darker stripes, and may be found on grasses from July to April. Scientifically the Small Heath is the *Cœnonympha pamphilus*.

That there should be a Small Heath naturally suggests the idea that there must be also a LARGE HEATH. It is by no means so abundant a species as *pamphilus*, but still in most parts of England it is common enough. We have represented it in Figs. 34, 35. The sexes are much alike, but the male is the smaller, and has a broad dash of brown across the tawny orange of the upper wing. It will be observed that the black spot on the upper wing has two white spots within it, and that on the lower has one. The butterfly should be looked for, as its name suggests, on heathy commons, July and August being its time of appearance. An old name for it was Gate-keeper—why, one can hardly see; entomologically it is the *Epinephele tithonus*.

The larva of the Large Heath feeds on grasses, changing to the pupa state in June, and developing into butterflyhood about a month later. We sometimes find specimens of this butterfly in which the rusty red is replaced by a pale whitish yellow, while the deep brown and the black eyes remain in their full strength; in others, otherwise normal, the black spots are without the white dots.

The WOOD RINGLET, *Epinephele hyperanthus*, is our most sombre-looking butterfly, and such adornment as it possesses is almost entirely confined to the under surface of the wings. Our illustration, Fig. 32, represents the male. Both sexes have their wings almost entirely of one uniform deep warm brown. Several black spots may be seen; in the female they are somewhat more conspicuous, and are placed within a ring of lighter colour. In the male they are sometimes entirely wanting; or very slightly ringed; or present, but not ringed. When we examine the under side, Fig. 33, we find the general ground somewhat lighter in colour, and marked with numerous black spots, white centred, and placed

within rings—hence the popular name—of pale yellow. It is an insect subject to considerable variation of marking.

The Wood Ringlet may be freely found in June, July and August, in most woodland districts. Hyperanthes was a son of Darius, and fell in the great struggle at Thermopylæ; how he ultimately became transformed into the Wood Ringlet history does not relate.

The Mountain Ringlet, *Erebia epiphron*, is a species only to be found in "Caledonia, stern and wild," and the mountain region of northern England. In Switzerland the genus is a large one, and has its headquarters on the great Alpine slopes, but in Britain it has but two representatives, this and the *E. æthiops*. Both species have very dark brown wings having an orange-reddish band running across each of them. This band is crossed by the nervures, and more or less broken up by them into spots, and these spots, normally, are centred with a small black dot; even this may at times have a minute white dot within it. The insect is in evidence at anything between one thousand and three thousand feet from the end of June to about the middle of August, and, though very local, is, when found, usually in abundance.

Erebia æthiops, the Scotch Argus, is very similar in colour and general appearance to the Mountain Ringlet, but is somewhat larger. It is, when found at all, often abundant in Scotland or the north of England,[1] but it is a very local species. It should be sought for in July and August, in broken marshy ground on the mountain sides. It is contented with a lower altitude than appeals to *epiphron*, about eight hundred to a thousand feet being about its limit skywards. The male is smaller than the female, and the coppery band across the wings is less rich in colour. All the *Erebias*, British and Continental, are rather

[1] We remember seeing a report of the Yorkshire Naturalists' Union giving details of an excursion to Grassington, in upper Wharfedale. *Erebia æthiops* was in great abundance; hundreds were secured by the members, and hundreds more, it was stated, might easily have been taken.

small dark-brown butterflies, more or less spotted or eyed, their caterpillars being all grass-eating. There are many species, and their distinctive markings are so variable that their identification is often difficult. The *Cœnonympha tiphon*, or MARSH RINGLET, is another of these northern species, being found from Lincolnshire or Cheshire to the Shetlands. It is another of those sober-hued, eye-spotted butterflies, and one so variable that half a dozen different varieties of it have at one time or another been thought to be distinct species. It should be searched for in June and July on the marshy patches of the great moorlands or in swampy ground. It varies from strong brown to pale tawny, having normally one large black spot near the tip of the upper wing and some three or four smaller ones below it, while the hind has three or four of these black spots near its margin. All these spots are within light rings. It is sometimes called *C. davus*. This name was given in 1777, but recent researches have brought to light the fact that two years before this it had been termed *tiphon*, and therefore the earlier name takes precedence.

A very distinctive-looking insect that we may naturally hope to have the good fortune to encounter is the WHITE ADMIRAL, *Limenitis sibylla* ; we have it depicted in Fig. 36. The sexes are alike in marking and coloration. The deep brown-black and the band of white make a very rich and effective contrast. Occasionally a variety is met with in which the white is partially or completely absent ; this is much more curious than beautiful. Instead of this deep sombre black we have on the lower surface the white markings on a groundwork of rich burnt-sienna brown, spotted with black, the inner portion of the hind wings being a pale greenish blue. The contrast in effect between the upper and under surfaces is very great, as we realise when the insect, resting awhile, throws up its wings, and we see the quick transition from one surface to the other. *Sibylla* must be sought in the woods of southern England during June and July. It is very local, but when met with is

in fair abundance. It will sometimes alight before us on the forest path, but it quickly takes alarm, and when pursued flies with great swiftness. When not alarmed its flight is particularly graceful. It was at one time very common around London, in woods near Finchley and elsewhere, but we may take it that those good times are over. The egg is laid in July, so during the winter the green spiny larva is at rest in its silken hammock affixed to the stem of the honeysuckle, its food plant. By the end of May it is transformed into a curiously angular chrysalis. This hangs head downwards, and is of various shades of green varied by spots of silvery sheen and whiteness.

The PURPLE EMPEROR and his consort are amongst the grandest of our butterflies, for though to the male alone is given the refulgent purple, the female is a very fine insect from its size and bold markings. Entomologically the species is the *Apatura iris*; we have the male represented in Fig. 37, the female in Fig. 38. By the collectors of former days it was sometimes called the Purple-shades. Almost the whole surface of the wings of the male has on the upper face this rich sheen that is revealed as it is caught by the light, and though our drawing only shows it on the one side, if the left-hand wing had been turned as much to the light as the other it would have shone with equal brilliancy. On the under surface the white markings are much as we see them above. The black and orange spot we see in Figs. 37, 38, is below replaced by one of a delicate lilac blue, while on the front wing we find a sable black spot having a rich lilac centre, a feature that the upper surface gives no inkling of. The wings are beautifully mottled and varied with tints of brown and lilac, with black, and considerable spaces of deep Indian red; altogether a very striking combination of strong yet harmonious colours. These underside markings are similar in each sex.

The Emperor establishes himself on the higher boughs of some noble oak, from whence he soars aloft in the sunshine until lost to sight, while the female is rarely seen on the wing.

It might appear entirely hopeless to acquire for one's collection an insect with ideas so aspiring, except indeed by rearing it from the larva, were it not that it possesses a strange hankering after objects far too offensive, one would have thought, for so noble-looking an insect, for it will descend from its lofty eminence to feast on matters excremental or putrid. A well-decomposed stoat has a charm for it that the most fragrant honied blossom cannot compete with. We have known eighteen Emperors captured in one day, and nineteen the next, by the judicious placing of this unsavoury bait on a woodland path. It is of so fearless a nature that when within reach it is very easily taken.

The larva, brown when hatched, is finally green, dotted over with yellow and having oblique slashings of a pale yellow, bordered with red. It is decidedly handsome. It feeds on the sallow, the eggs being laid in July. It has two curious tapering horns that, when the larva is alert, are erect or thrown back, but when at rest are thrown forward horizontally. Secured by a silken tie, it hybernates on its food plant in a fork of the boughs, and turns to a chrysalis in June. The perfect insect should be sought for in July, but it is only to be found in oak woods, and those only in the southern half of England. An excellent old name for it was the Purple Highflier.

The PAINTED LADY, *Vanessa cardui*, is curiously uncertain in its appearance, being in some years scarcely to be seen, while in others it is one of the commonest of butterflies. The year 1879 was notable for the abundance everywhere of this species, and 1884 was another exceptional year. It sometimes migrates in immense swarms, so that observers endeavouring to record the phenomenon take refuge in such figures as hundreds of thousands. This 1879 was a good "*cardui* year" all over Europe. In one locality the butterflies were counted as passing by at a hundred a minute. France and Italy gave much the same testimony, while in India a swarm, countless beyond all computation, took half a day to pass a given point. It should be the best known butterfly in the world, for it appears

to be absolutely cosmopolitan—Europe, Asia, Africa, America, Australia, New Zealand, and the countless islands of the sea all find it a resting-place. It is found with us on waste broken ground, sunning itself on thistle and teasel, from about the end of July to the end of September, or even later. When the cold weather comes it hybernates, ordinarily making a long sleep of it and scarcely reappearing till June, though we have had one specimen reported to us on January 8th. The female, the sex we figure, is a little larger than the male, but is nearly identical in marking.

The eggs are laid singly on thistles, or occasionally nettles, in mid-June. The black and yellow spiny larva spins a slight webbing fastening one or two leaves together as a protection against bad weather and other casualties, and in mid-July turns to a variously marked brown and grey chrysalis with metallic sheen, and after a very short duration of chrysalis probation, some fourteen days, develops into the perfect insect.

The name Painted Lady is not particularly charming, but it has been so long in use that it appears hopeless to think of its being changed. A more pleasing name is that of the French—la Belle Dame. An appropriate name for it would be the Thistle butterfly, since it is the only species that has its caterpillars thistle-feeders. Our illustration (Fig. 39) gives us the colouring and markings of the upper surfaces. The under surfaces are particularly beautiful in their marking, and blending of pink, cream-colour, yellow, black, and white. No verbal description can do them justice : they must be seen.

The COMMA BUTTERFLY, *Vanessa C. album*, Fig. 40, has the outline of its wings so quaintly irregular that the novice may well conclude when he first sees this insect that the species before him has been battered and tattered in a too eager chase for its acquisition. The colouring of the upper surface is very rich in its harmony of orange-red, brown, and black, as our illustration, we trust, suggests. The under surfaces are beautifully mottled, streaked, and spotted in various

PLATE XII

93. Oleander Hawk. *Chærocampa nerii.*
94. Bedstraw Hawk. *Deilephila galii.*
95. Wood Leopard. *Zeuzera æsculi.*
96. Reed Moth. *Macrogaster arundinis.*
97. Goat Moth. *Cossus ligniperda.*
98. Ghost Swift. *Hepialus humuli.*
99. Festoon. Male. *Limacodes testudo.*
100. Festoon. Female. *Limacodes testudo.*

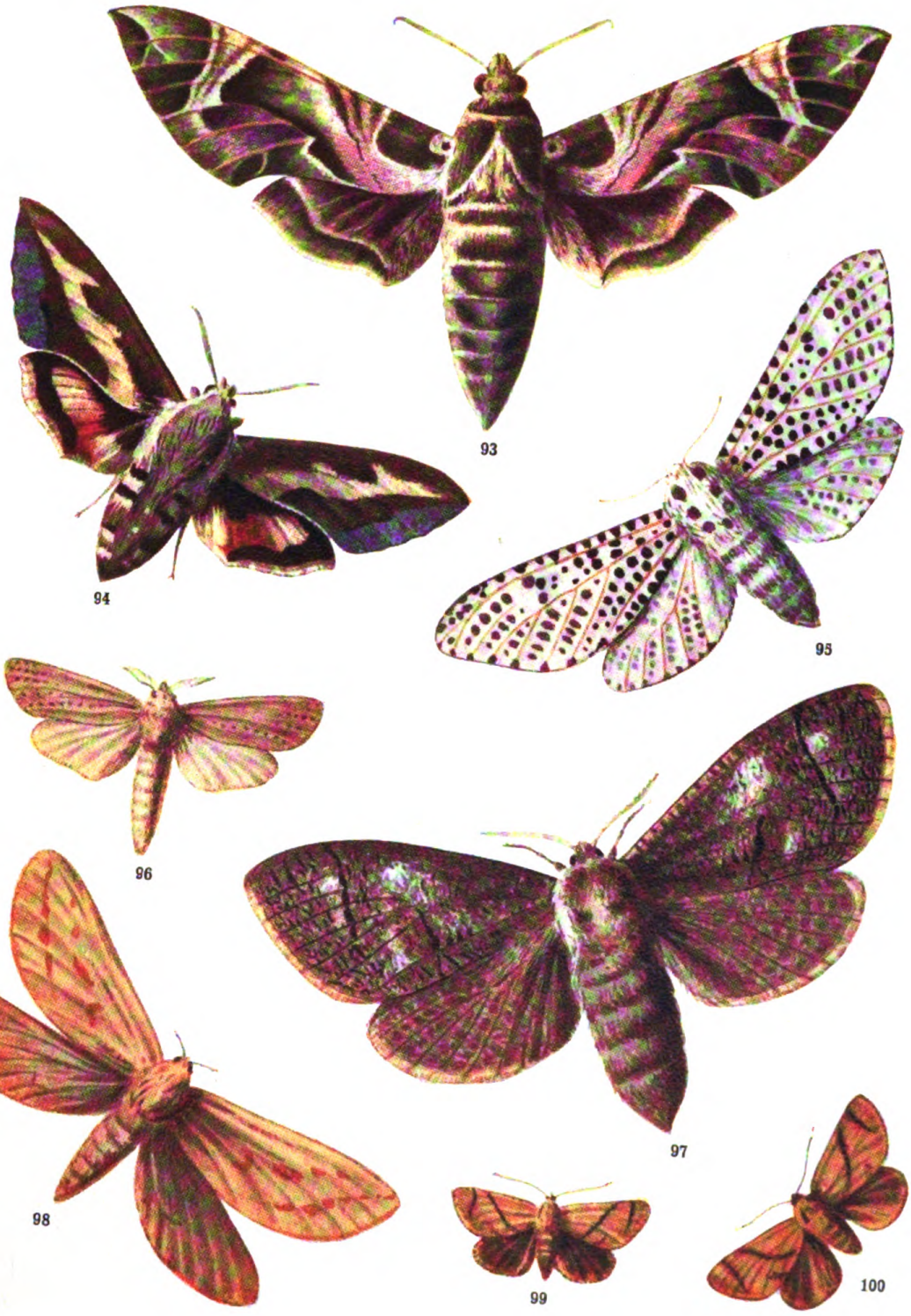

Plate XII.

shades of brown, with a delicate suggestion of a rich sage-green, except that in the centre of the two lower wings with sharp distinctness is seen a G-like form. As we have a moth known as the Silver Y, so with equal appropriateness might this beautiful butterfly be called the Silver G. The specific name *C. album*, signifying the white C, and its popular name Comma, each take their origin from this marking, as also does its French name, la Virgule.

The Comma is very graceful in its flight, though when alarmed it flies with considerable swiftness and directness of purpose, and is by no means easy to capture. In the female the ground-colour of the wings is somewhat paler, and the insect larger, than the male ; the outlines, too, of the wings are less jagged. The specimen figured is the male. The Comma has a partiality for sunning itself, with extended wings, on walls, or flowers, or the trunks of trees, and it has a curious habit of continuously frequenting the same spot, alighting time after time on the same plant, the same spur of projecting rock. Though once a very common species, it seems of late years to have been growing decidedly scarcer : why, it is impossible to say. It is a very local species, too, occurring most commonly in Wales and in the western counties of England. It should be sought for in clearings of woods, or flitting along the hedgerows in the bright sunshine, and especially if they include a goodly quantity of blackberry, as this insect is rather partial to this fruit and to plums, imbibing the juice from those that are over-ripe.

The eggs are laid, one or two at most in one place, on the hop or stinging-nettle, and sometimes, less commonly, on hazel, willow, sloe, currant, and elm. After the larvæ are hatched they secrete themselves on the under surfaces of the leaves. The chrysalis is brown, decorated with golden spots, and the butterfly makes its appearance in July, being in evidence until the increasing cold drives it to hybernate. It is to the fore again about April, and then proceeds to the duties of parenthood.

The SMALL TORTOISESHELL, *Vanessa urticæ*, Fig. 41, is one of the commonest and gayest of our butterflies, and no one who has a garden, even in Suburbia, but must have welcomed its visits to their flower-beds. To liken it to tortoiseshell is scarcely to do it justice. Albin, an old entomologist, calls it, we see, the *Papilio testudinarius minor*. Some of the older names run to very considerable length. Thus another venerable author calls our butterfly *Papilio urticaria vulgatissima*, which is at least a testimony to its abundance. Yet another old writer calls it "a very beautiful species," and says of it, truly enough, "were it less frequent it would be infinitely esteemed for the elegant combination of its colours." While it varies considerably in size, more than most butterflies do, it is in England very little subject to variation in its markings. The female is larger than the male, and somewhat paler in colouring. It is curious that in the Isle of Man a very small form is to be found, and appears to be quite constant.

The larva of this butterfly feeds gregariously upon nettles, hence some entomologists have called this species the Nettle Tortoiseshell to distinguish it from one closely allied to it. The eggs are laid many together, and the young caterpillars proceed to form a web for the collective habitation. At each moult they build a new and enlarged tent, until they presently grow too large for such close fellowship and scatter independently. At first of a pale yellow, they are ultimately black, studded and striped with stronger yellow, and along their backs are tufts of short branching spines. The pupa is at first of a pale green colour, but soon it changes to a dull brown or rich metallic gold, and then in about three weeks the butterfly appears. It may be found from July until the colder weather suggests the desirability of winter quarters, and then it reappears with the lengthening days.

While few of our butterflies appear to be getting more common, several are growing scarcer, and awhile ago there appeared to be a general impression that the PEACOCK,

Vanessa io, Fig. 42, was to be, unfortunately, one of these. It is a beautiful insect, and one that we could ill spare. It is one, moreover, that finds its way freely into our gardens, and is therefore better known than many others. It is an insect that is in some seasons much more abundant than others, and there is, we trust, no real need to hold any pessimistic views concerning it.

The conspicuous eyes that adorn each wing are a sufficient explanation of its popular name, but in some parts of the West Country it is called the Prince George—why or wherefore no man apparently knoweth. The Peacock is found generally throughout England and Ireland and the south of Scotland from August until May, the winter months being spent in hybernation in some sheltered spot, whence in March or April it is wooed forth by the strengthening sunshine. Its flight, as it wafts on its gaily decorated pinions from flower to flower, is very graceful, and it has little fear ; but, if alarmed, its powers of flight are considerable. Like other butterflies that visit our flower-beds, it seldom strays far from them, and even if we, with some regret, see it departing over the hedge, our regret is but short-lived, for it will probably soon return, and day after day its visits will recur. When it is at rest, we see the whole under surface of its wings to be of a very elaborate patterning of brown and purple and black. As the Peacock has a habit when resting of gently fanning its wings to and fro, the great contrast in brilliancy between the upper and under surfaces becomes under these circumstances very evident.

Peacock caterpillars, like those of the Small Tortoiseshell, but unlike those of most other butterflies, are gregarious, living socially in large clusters amid the heads of the nettles, their special provender. When young, they draw together the leaves into a shelter with fine silk, and at each moult find it necessary to enlarge this. This mass of webbing is very conspicuous, and guides the entomologist to the colony. When young, the

larvæ are of a greenish white ; they then change into a brown suit, and at their fourth moult are of a deep black, peppered over with minute white dots. They are very spiny, the hairs being rigid, black, and branching, and a quarter of an inch long. At this stage the caterpillar is some two inches long, so there is a general dissolving of partnership, and each fends for itself. They arrive at maturity about the middle of July, and then, after about eighteen or twenty days of pupahood, the butterfly appears.

Tastes proverbially differ, but to our mind our British butterflies can reveal nothing more perfect than the RED ADMIRAL, the *Vanessa atalanta* of science, the forty-third of our illustrations. Like the Small Tortoiseshell and the Peacock, it is very partial to gardens, and nothing much more beautiful can be seen in Nature than one of these glorious butterflies at rest sipping nectar from some blossom in the bright sunshine. Our appreciation is not singular, since by the older writers it is often called the Admirable.[1] It has also, with less of poetry, been vernacularly called the Alderman, since its brilliant scarlet and black suggests the garb of those dignitaries on high occasions. It is an insect that is very markedly free from variation ; one may rear or capture thousands, and find them all conforming to type. We have known of one example where the black spots on the scarlet bordering of the hind wing were absent, and another where they were beyond normal size and centred with blue. The female is the larger insect. The Red Admiral is very fearless. Like the Peacock, it has a habit of sunning itself and gently swaying its wings to and fro, while in its flight it is fully as graceful as that species. The under surface of the wings defies description in the intricacy of its markings, the richness and variety of its colour, all being blended in perfect harmony.

[1] Thus Albin in 1720, Wilkes in 1773, Harrison in 1775. It is only fair to say that even before these dates we find Ray in 1710 and Petiver in 1717 calling it Admiral.

Like the Peacock, again, the Red Admiral larva is a nettle-feeder. The eggs are laid singly in June, and the larva on emergence draws the leaves together, as a shelter and passive defence against all comers. It is spiny, and in colour of a greyish green and yellow. The pupa is of a pearly grey, spotted with gold, and with a fine bloom upon it. The pupal stage is entered upon about the beginning of August, and then some three weeks hence the perfect insect appears. It is to be seen on the wing later than any of our other butterflies before seeking its winter domicile. We see from our note-book that we have had a visit from one as late as November 8th. It is also the last to reappear, being rarely out after hybernation before June. It has a great partiality for the sap that we sometimes find exuding from old trees. We have seen these butterflies week after week assembling in large numbers under such circumstances, and so absorbed in their banquet that one could pick them off by hand.

As *Vanessa urticæ* is, we have seen, sometimes called the Nettle Tortoiseshell, so the *Vanessa polychloros*, Fig. 44, is sometimes known as the Elm butterfly, but they are best known as the SMALL and the LARGE TORTOISESHELL. While there is considerable resemblance between the two species, it will be noted that they are entirely different in general colour. In *urticæ*, again, the outside spot of the three along the costal edge of the front wing is always white, and in *polychloros* it is always yellow. Size in butterflies is never a very good distinction to found a name upon; we have seen Small Tortoiseshells actually larger than some Large Tortoise-shells, though, of course, as a general rule, the adjectives have their value.

The Large Tortoiseshell is very partial to sunning itself on the trunks of trees or on the woodland path, though one reason sometimes for its choice of the tree-trunk is that, like the Red Admiral, it enjoys feasting on the sap. It has a strong and sustained flight, and, as an old writer observes,

" requires nimbleness to take it." It is found fairly frequently in the southern half of England, though it is uncertain in its appearances. It is local, but widely distributed, and, though ordinarily partial to the neighbourhood of woods, has been frequently taken immediately round London. The first we ever captured, we well remember, was in the Old Brompton lanes, long since built over and dignified with the name of South Kensington. The only sex distinction is that of size, the female, as usual, being the larger. The Large Tortoiseshell is very constant to type, but one may sometimes find specimens where the little crescents in the bordering of the hind wing reappear in like position on the fore wing.

The eggs are laid, three hundred or more together, in a mass around the stem of the food plant in May, and hatch out in about a fortnight. The larva is, when full-fed, nearly two inches long, with numerous branching spines, and handsomely decked in lilac-grey, black, and rich warm brown. It is gregarious, and though found chiefly on the elm, may be met with too on the nettle, poplar, willow, birch, cherry, etc. It arrives at maturity about the middle of June, and then the pupal condition lasts about another month. Like the rest of the Vanessas, the Large Tortoiseshell hybernates, taking shelter at the first hint of cold weather, and only reappearing about the middle of April, when the responsibilities of parentage are undertaken.

The splendid butterfly we picture in Fig. 45 is the CAMBERWELL BEAUTY, *Vanessa antiopa*, one of the rarest of our British insects. We have only once had the pleasure of seeing it alive, at Ripley in Surrey, but our excitement outstripped our judgment, and we failed to capture it for our collection. It appears in August, then presently hybernates, and reappears in the spring. While it is so scarce in Britain it is in Europe and some other parts of the world a very common species. In Switzerland, for instance, it is as often seen as a Red Admiral is with us. It is reported from Lapland,

Siberia, and North America. It is abundant throughout the United States,[1] and is there called the Mourning Cloak, and it is found freely in North Africa. The British specimens have ordinarily a whiter margin than the foreigners.

The popular American name refers to the deep colouring of the insect, but the Camberwell Beauty when seen basking in the sunlight is by no means a sombre-looking insect, so that the somewhat funereal name ascribed to it really does it less than justice.

In England the Camberwell Beauty was in unusual abundance in 1793, and other great *antiopa* years were 1846 and 1872. In this latter year over three hundred were caught, and mostly in the eastern counties. It is a very common insect in Norway, so that some would have us conclude that these were immigrants from thence; but, on the other hand, as its food plant is the willow, it seems not unreasonable that these English counties, with their great stretches of willowy fen-land, should, in a favourable year for the insect, yield it freely. Taking a dozen recent consecutive years at random, we find from the records the captures to have been five, none, none, three, three, one, three, eleven, seven, none, one, one. This may possibly not be an absolutely correct statement; entomologists, knowing the value of their find would report it in the scientific papers, but some few specimens might fall into hands ignorant of their value and thus fail to get reckoned in. There seems to be absolutely no rule as to locality, single specimens having appeared at Birmingham, Virginia Water, Box Hill, Herne Bay, Tunbridge, Holgate, Wimbledon, Guildford, Durham, Edinburgh, Peterborough, Bristol, Ely, Epping, Worthing, Manchester, Appleby, and many other places. The insect is sometimes called the Willow Butterfly, the White

[1] The go-aheadism of the Americans would appear to extend even to their Lepidoptera. Packard, an American entomologist of repute, affirms that *antiopa*, though it hybernates, appears in the spring before the snow is off the ground.

PLATE XIII

101. Rosy Footman. *Calligenia miniata.*
102. Dew Moth. *Setina irrorella.*
103. Orange Footman. *Lithosia aureola.*
104. Feathered Footman. Male. *Euchelia grammica.*
105. Feathered Footman. Female. *Euchelia grammica.*
106. Four-spotted Footman. Male. *Lithosia quadra.*
107. Four-spotted Footman. Female. *Lithosia quadra.*
108. Clouded Buff. Female. *Euthemonia russula.*
109. Clouded Buff. Male. *Euthemonia russula.*
110. Crimson Speckled. *Deiopeia pulchella.*

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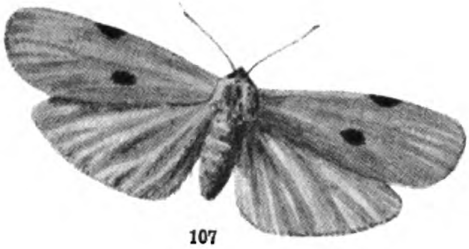

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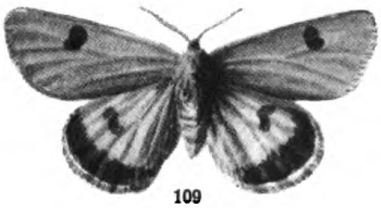

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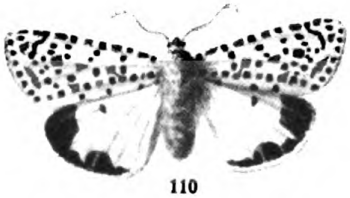

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Plate XIII.

Border, and the Grand Surprise. Its more familiar name, Camberwell Beauty, arose from the accident that in that locality three were caught in the year 1748; it was not reported again till 1789, a period of over forty years. Entomologists in those days were few and far between, and had little means of intercommunication.

The Camberwell Beauty shares with the other members of its genus the love of sweet things, so that we read of one that was attracted by a mixture that had been set to trap wasps, of others caught while feasting on fallen and decaying fruit, or while visiting trees that had been sugared to attract moths. It has also been lured to its fate by the charm of an empty yet fragrant spirit cask, or a sugar tub. The caterpillar is gregarious, spinning a collective web, spiny, feeding chiefly on willow, though occasionally found on poplar or birch. It grows to considerable size and is black in colour, but has a line of dark red dorsal spots and a general covering of soft grey hairs. It should be looked for in June or July. The pupa, suspended head downwards, as in all the Vanessas, is fully one inch in length and stout in proportion, its general colour being brown, with various dottings of black.

The Fritillaries form a very distinct class by themselves, all being butterflies of rich orange-brown colour with black markings, and with a very strong family likeness between them. As typical of these we have in Fig. 46 the HIGH BROWN FRITILLARY, and in Figs. 47 and 48 the SILVER-WASHED. In America they give these butterflies the expressive name of Checkuer Spots.

The HIGH BROWN, or *Argynnis adippe*, will be found in open woods and wild heathy wastes in July and August. It is generally distributed, though not so common as the next we figure. It is very partial to sunning itself on a thistle-head, and, like all the Fritillaries, seems to have a special attachment to blackberry blossom. It is very strong on the wing. The lower surfaces of the hind wings are beautifully marked with

numerous silvery spots, and within those of the border we find a series of rusty-red spots with silvery pupils. We occasionally meet with a variety, *cleodoxa*, where the metallic markings are either very ill defined or altogether absent. The female is the larger insect ; somewhat paler in colour, but having the silver flakes more brilliant than we find in the male.

The spiny caterpillar is found on the dog violet, sweet violet, and wild pansy ; the eggs being laid in August and hatched out in about fourteen days. On the approach of winter the larvæ shelter in a dormant state beneath dead leaves or around the roots, waking up in the spring, and resuming the business of their lives, the prompt demolition of violet leaves, and then turning into chysalides in June.

The SILVER-WASHED FRITILLARY, the *Argynnis paphia*, it will be seen greatly resembles the preceding species, but on turning it over we find that the hind wings are in part beautifully green, in part delicate lilac, with three irregular silvery streaks, and a similar metallic colouring on the hind margin. The male, Fig. 47, it will be observed has four of the nervures on the front wings marked with broad bands of black, and it is, too, of a rather stronger orange-red in colour than the female. There is a curious variety of the female in which the colouring is of an olive brown, a lurid bronzy tint gradating off to a dull straw-colour on the outer half of the fore wings. This variety, *valesina*, is abundant in Southern Europe, and is not uncommon in the New Forest. We heard of a case in which an entomologist reared from the eggs eleven specimens of *paphia*, and as the eggs were all from the same laying, one would naturally have anticipated identity of result. Three were males, and therefore outside our reckoning, as the variation is confined to the other sex ; but out of the remaining eight no less than five were *valesina* forms. Our illustration, Fig. 48, was reared from a New Forest larva, but in our case the after result was normal.

The Silver-washed Fritillary is fairly abundant in the

open clearings of woods during July and August. The larva is a dull brownish black, with two dorsal lines of a sulphur yellow. When full grown it is two inches in length. The larvæ of all the Fritillaries have bristly branching hairs, or spines, and feed on violet, the present species adding wild raspberry to its bill of fare. The pupa is stout and very angular in form. They hang suspended head downwards. We have found them on blackthorn twigs, the under side of leaf of honeysuckle, on elm trunks, etc., from three to six feet above the ground.

Though we may see that the names bestowed on our butterflies and moths are often singularly inappropriate and meaningless, we may at least point out that both the generic and specific names of the present beautiful insect are happily chosen, being associated with the goddess Venus, whose charms, if the judgment of Paris was not somewhat warped by bribery, were held pre-eminent. The popular name is suggested from the more or less resemblance to the chequered markings of the fritillary, one of our wild flowers.

In addition to the two Fritillaries we figure, we have the *Argynnis aglaia*, the *A. lathonia*, *A. selene*, and the *A. euphrosyne*, the first of these being of about the same size as those we have illustrated, and the other two considerably smaller. All are to be found flying at the same time, and all are woodland insects; all are similar in colouring. It becomes, therefore, very necessary to find some means of distinguishing one from another. *Aglaia*, the DARK GREEN FRITILLARY, may be identified from having on the under surface the fore wing with silvery marginal spots near its tip, and the hind wing greenish, with very numerous, twenty or more, silver spots; while *lathonia*, the QUEEN OF SPAIN, has its hind wings on the under side yellowish, and its distinctive spots in sevens—seven silvery spots along the margin, then a series of seven dark brown, silver-centred spots, and then on the inner half of the wing a group of seven large spots of silvery sheen.

The two last will be identified one from the other from the fact that on the straw-coloured under surfaces of their respective hind wings *selene*, the SMALL PEARL-BORDERED bears more than one large central spot of silver, while *euphrosyne*, the PEARL-BORDERED, has but one.

The colouring of the under surfaces of the DARK GREEN FRITILLARY is very harmonious and beautiful. The upper wings have a bordering of warm yellow, much the colour of oatmeal, the bulk of the wing being pale fawn brown. The spots are as on the upper surface, but much less black, and at the outer angle are four small silvery spots. The lower wings are of deep oatmeal, the seven lunules on the outer edge being in silver. The main body of the wing is of this oatmeal tint, mottled with a rich sage green and large silver spots : a delightful harmony of quiet colour.

The QUEEN OF SPAIN FRITILLARY is one of our decidedly rare butterflies, and it is impossible to give any clue to aid in its discovery, except that it appears to have a liking for clover fields, and has been found more frequently in the South of England, and near the coast, than elsewhere—Dover, Brighton, Eastbourne, Margate, Ramsgate, Ventnor, Sandown, Folkestone, Swanage, having all furnished specimens. On the other hand, it is recorded from places so far north and inland as Peterborough and York. It is common across the English Channel, and the truth probably is that many of the specimens seen and captured are immigrants, and that some that escape capture settle down and breed here, but find our climatic conditions too trying for more than a precarious foothold. Dover, the nearest point to France, yields also the greatest number of captures, one year twenty-five being caught, and another giving a total of sixteen ; while most localities, even when the insect is found, have to be content with a record of one or two, and those by no means forming an annual institution.

The PEARL-BORDERED FRITILLARY, *A. euphrosyne*

derives its popular name from the row of seven silvery spots on the margin of the lower surface of the hind wing. These sufficiently suggest a string of pearls to justify the name.

Even yet we have not exhausted our list of British Fritillaries. While all members of the *Argynnis* genus have metallic-looking spots or streaks, those of the genus *Melitea* have no such markings. The *Meliteas* are three in number, all marked on the upper surfaces with the characteristic patterning of black on orange-red, and therefore, as before, best distinguished by an inspection of their lower surfaces. *Melitea cinxia*, the GLANVILLE FRITILLARY, has several rows of black spots. *M. artemis*, the GREASY FRITILLARY, has only one row of these, while *M. athalia*, the PEARL-BORDERED LIKENESS, has no black spot at all.

The GLANVILLE, abundant on the Continent, is in England exceedingly local. It seems to have been at one time considerably more abundant, since the older writers mention several localities where it is at the present time entirely unknown. The only really reliable habitat now is on the broken ground fringing the coast that is to be found in several parts of the Isle of Wight. The food of the larva is the narrow-leaved plantain. It is gregarious, and hybernates under a compact webbing of silk woven amongst the stems of various low-growing plants.

M. artemis has in its popular name, GREASY FRITILLARY, a somewhat unfortunate title. We need scarcely say that this is a name of ill omen to the entomologist, as grease entirely spoils the beauty of his specimens, some of the larger moths sometimes exuding unctuously and staining his cabinet. In the present case the name at most stands for no more than apparently greasy, the wings having a shiny appearance that suggested the name. Its alternative name, the Marsh Fritillary, is much happier, as it really refers to the partiality of the insect for damp meadow land and marshy ground. The larva feeds on the two species of scabious and one or two other

species of plants. The insect is local, but fairly common, and should be looked out for in June.

M. athalia is also another very local insect, though widely distributed. To call it the PEARL-BORDERED LIKENESS is unfortunate, as being too similar in sound and appearance to the Pearl-Bordered. It has, however, a very good alternative name, the Heath Fritillary, since it is a species that we ordinarily find on wild heathy wastes and clearances in the woods. Down south it is often abundant within a circumscribed area, though we find it no longer in many localities where once it was a common insect.

A small butterfly, not a Fritillary at all, but much resembling one in its coloration and marking, is popularly called the DUKE OF BURGUNDY FRITILLARY. It is the *Nemeobius lucina* of science, and in the caterpillar and chrysalis state is entirely unlike a Fritillary. It is of interest because it is not only the only British, but also the only European representative of a family of small but brightly coloured butterflies, chiefly tropical, the *Erycinidæ*, in which, amongst other peculiarities, the males have only four practicable legs, the other two being atrophied and useless, while the females have the normal allowance of six. It is to be searched for in woods during May and June, but while found in numerous localities, it is by no means of general distribution.

The eggs are laid in June on the primrose and cowslip, the food-plants of the larva, and a very quaint-looking larva it is. In colour it is of a deep warm brown, covered all over with short hairs that spring in little bundles from a series of wart-like protuberances : not much more than twice as long as it is wide, of the form that is called onisciform, or wood-louse-like, and having its legs lost to sight beneath its corpulent sides. In September the pupal stage is reached. The pupa is of a light brown colour, stout in its proportions, girt about with a silken girdle and covered with brown hair. It is unfortunate that the butterfly should be popularly classed as a Fritillary,

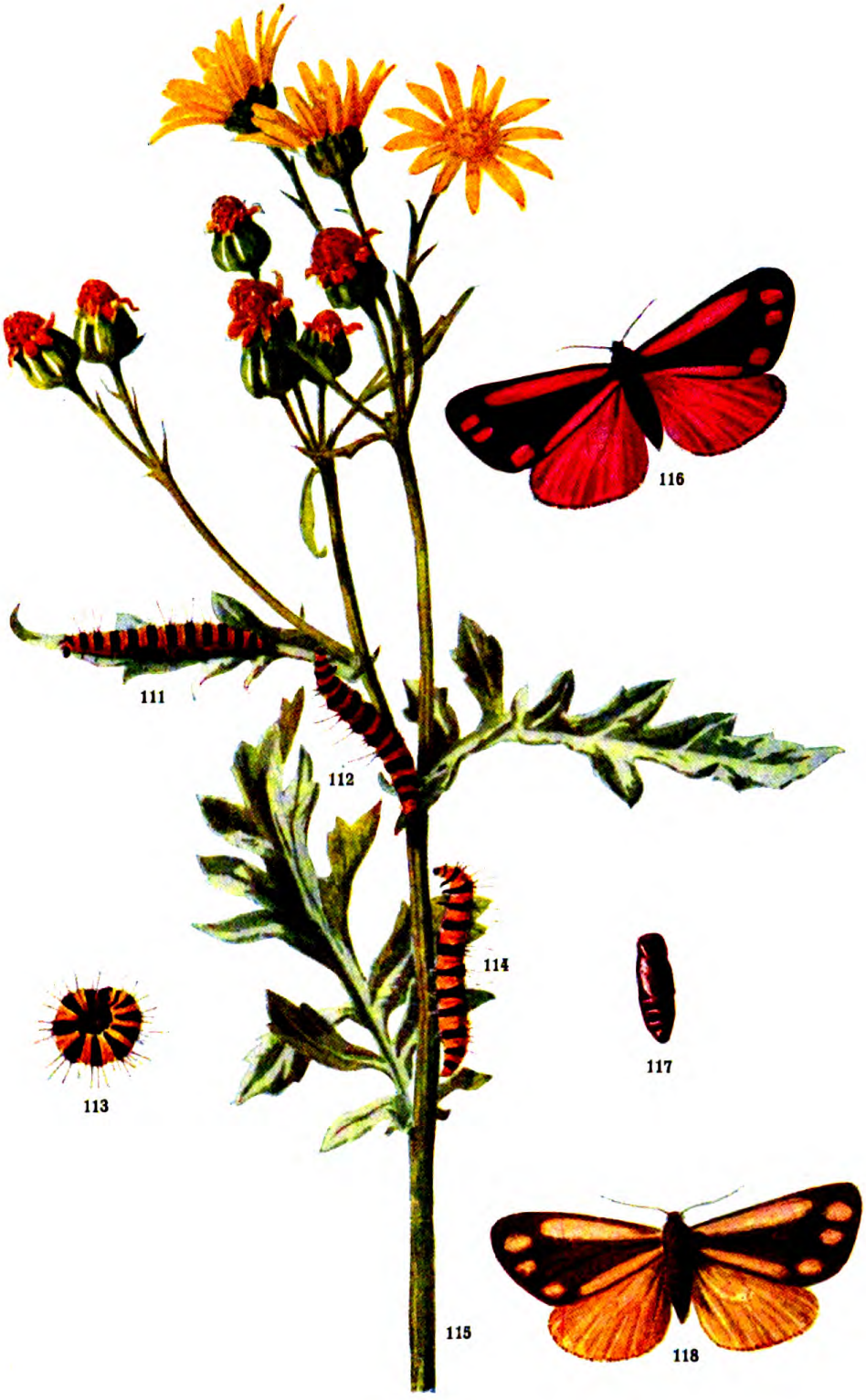
and somewhat absurd that it should bear so sonorous and aristocratic an appellation. A happier name for it would be the cowslip butterfly.

We arrive now at a little group of butterflies, five in number, known as the Hair Streaks. The popular name is derived from the more or less conspicuous white lines that are seen on the under surfaces of the wings of four out of the five British representatives of the group. They may be known too, again in four cases out of the five, by being tailed, and our native species will be the more easily remembered, perhaps, if we associate with them the adjectives brown, purple, green, black, and white.

The BROWN HAIR STREAK, or *Thecla betulæ*, is shown in Figs. 49, 50, and 51, the first being the male, the second the female, the third the under side. In this last figure the white lines may be very clearly seen ; it will be noted that each white line has on one side alone a black edging. While the female is always larger than the male, we may say that our illustration gives one of rather more than normal size. The wings of the male are all brown except for the orange spots on the hind wing, and a black discal spot on the fore wing, the brown colour beyond this spot being for a short distance much lighter. The female has the orange spots on the hind wing, plus a broad dash of orange athwart the upper wing. When male butterflies differ in colour from their mates it is ordinarily the former that are the more brightly apparelled, but here matters are reversed. The Brown Hair Streak is on the wing during August and September, but it is a very local insect. It must be sought for in the open glades and clearings of woods, and especially of oak woods. The eggs are attached in September to the food plant, and in this stage pass the winter. The larva is green, striped with whitish yellow. It is onisciform or wood-louse shape. In walking its legs are not visible, its mode of progression suggesting that of a slug rather than of a caterpillar. It feeds upon birch and blackthorn, and is

PLATE XIV

111. Cinnabar Moth. Larva. *Euchelia jacobææ.*
112. Cinnabar Moth. Larva. *Euchelia jacobææ.*
113. Cinnabar Moth. Larva. *Euchelia jacobææ.*
114. Cinnabar Moth. Larva. *Euchelia jacobææ.*
115. Ragwort. Food plant. *Senecio jacobæa.*
116. Cinnabar Moth. Type. *Euchelia jacobææ.*
117. Pupa of Cinnabar Moth. *Euchelia jacobææ.*
118. Cinnabar Moth. *Euchelia jacobææ.* Variation from type.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full fed by June. The specific name, *betulæ*, meaning of the birch, would suggest the idea that this tree was the favourite food of the larvæ, but it stands really only second in its esteem, blackthorn being the favourite. The chrysalis is very stout and rounded in form, and attached by its tail and by a silken girdle to the food plant. The males emerge from the chrysalis some little while before the females.

The PURPLE HAIR STREAK is a very attractive and charming insect. The beautiful purple sheen is a sexual distinction, for while the male is of a deep brown colour with just a suggestion of it, the female, also brown, has the wings, and especially the upper ones, suffused with a rich mass of glowing purple, an effect that, like the colour of shot silk, is more visible at some angles than others. The under side is of a pearly or quaker grey tint. Each wing is crowned by white hairs, and on the hind wing the line, near the anal angle, doubles back into a very rounded W. These lines have a dark edging on their inner side, as in *betulæ*. Some orange spots will also be seen on the hind wing.

The Purple Hair Streak flies high, and is of a very lively and pugnacious disposition, resting on the topmost boughs of the oak tree it especially favours and sallying forth at a moment's notice to frolic or to battle with all comers, whether of its own species or any other butterfly that comes within challenging distance. It is the *Thecla quercus* ; we represent the female at Fig. 52 and the male in Fig. 55. It is fairly abundant and widely distributed, becoming rarer in the north. Even in its own localities it is not always equally to the fore. In one year we know it was in the New Forest abundant, and in the next year scarcely a specimen to be seen. The insect, when it descends from its lofty perch, is very partial to blackberry blossom, and is then most easily secured.

The eggs are laid in July in the oak, and it is not till the following spring that they are hatched. The caterpillar is full

fed by the end of May or a little later,[1] but even then is only about the size and shape of a wood-louse, so it is by no means easily observed. The pupa state lasts three weeks. The pupa is sometimes attached to the oak in the open air, and at other times is found to be buried in the ground.

It seems curious that, while we have insects that are grey like lichen, or brown like the trunk of a tree, both admirably protective colours, we have so few that, like leaves, are green. Figs. 177, 193, 194, 195, 196, are amongst the few that can be instanced, and to these we have no difficulty in adding Fig. 54, representing the under surface of the GREEN HAIR STREAK. The upper surface is shown in Fig. 53. The Green Hair Streak is on its upper surface an almost uniform warm brown, with a certain metallic sheen visible in strong light, but unmarked by any stripe or spot, while the lower surfaces of the wings are of a rich full green, a few white dots, often very indistinct, or possibly altogether wanting, and a little brown on the inner margin of the upper wing, alone breaking the mass of colour. The spots, if present, may be anything from one to half-a-dozen in number, and if numerous enough form a line across the hind wing; occasionally one or more may be found on the front wing also. It will be remembered that in describing the Hair Streaks we pointed out that four out of the five were distinctly tailed and had white streaks on their lower surfaces. This, the *Thecla rubi*, is the exceptional fifth. If we try very hard to see a tail we may perhaps just manage to do so, but the white lines are absent and only suggested by the very inadequate substitute of a possible row of white dots. Though ordinarily ranked as a *Thecla*, our insect is sometimes placed in another genus and becomes *Callophrys rubi*. The male and female are alike in general appearance, but the female is decidedly the larger. The male flies alertly in the sunshine, but the female is more rarely

[1] One we observed went into the pupa stage on June 17th, emerging on July 14th, but we have known others reach the imago stage by June 20th.

seen on the wing. It is generally distributed, and must be searched for in heathy wastes and open woodland spaces. An old writer tells us that "it delights to settle on Boughs four or five feet from the Ground, by moving which the Fly will rise, and if not much frightened will settle on the same Place again, by which Means you may take it." All our readers therefore have to do is to go and find "the same Place," May and June being the appropriate months for their quest.

The larva is of the characteristic *Thecla* wood-louse type, green in colour, with yellowish longitudinal lines, softly hairy. It is to be found in July in the buds and blossoms of the blackberry, the *Rubus fruticosus* of the botanist; whence its name *rubi*. An old name for the insect is the Bramble Green Fly. The caterpillar is sometimes found on broom, furze, whortleberry, and dyer's-greenwood. The pupa is small and decidedly obese in figure, of a dull purplish-brown, and covered with short hairs. It is fastened by tail and cincture to the food plant, passing the winter in this condition and emerging in the following May. In lieu of aërial suspension it occasionally goes in for inhumation.

The BLACK HAIR-STREAK, *Thecla pruni*, the *Thecla* of which the caterpillar feeds on the *Prunus spinosa*, or black-thorn, is ordinarily in fair quantity where it occurs, the main trouble being that these favoured spots are by no means numerous, and only occur in five of our forty English counties. The expanse of the wings is not much over an inch, and these wings are of a very dark brown, with three or four crescent-like orange spots on the border of the hind wing, so that both in size and colouring it is inconspicuous. These orange spots are somewhat more brilliant in the female; at the anal angle of the wing may be found a minute blue spot. The insect much resembles the White-letter Hair Streak, but these orange spots at once distinguish it. The under surface of the wings is of a little brighter and warmer brown tint, the white streak passing across each wing nearly at its centre,

running fairly parallel to its outer margin, but not quite continuous. On the hind wing we have a broad marginal orange band, and within this a series of black spots.

The eggs are deposited on the blackthorn in the autumn, and do not hatch until the following spring. The caterpillar is yellow-headed and green-bodied, longitudinally and obliquely striped with whitish lines. It may be found not only on the blackthorn but also on the oak, May being the month to seek it. The pupa is attached by tail and silken belt to the food plant, and should be sought in June.

The WHITE-LETTER HAIR STREAK, *Thecla W album*, derives its specific name from the white line on the under surface of the wings. The streak extends, as in the last species, across both wings in a series of scallopings, and on the lower wing terminates in a very definite W-like marking. The orange bordering on the under surface of the lower wing makes a series of arch-like forms, bounded by a fine black line, and has on its outer edge three or four black spots. The upper surfaces are of a very dark brown, but near the centre of the upper wings may be seen a spot of paler brown. Besides the one conspicuously long black tail there is a second but much shorter one. The caterpillar feeds on the elm during May, the eggs having been laid in the autumn and hatched in the spring. The perfect insect appears in July and August. It is a lively, energetic little insect; very local, unfortunately; but, where found, fairly abundant.

The LARGE COPPER BUTTERFLY, *Chrysophanus dispar*, is an insect that occurred only in Great Britain, and is now presumably extinct even there—as lost, maybe, to the world as the great auk or the dodo. To say that it will never reappear is to venture too far, but the chances are woefully against it. There was a time within the memory of man when it was in great abundance. Haworth, for instance, tells us that in 1827 he took fifty in one day, but no specimen

has now been seen for over fifty years. Various causes have been assigned for this extinction. The Large Copper was exclusively a fen insect, and therefore of restricted range; and it is believed that a series of heavy floods, the burning of the surface-growths where land was to be reclaimed, and more especially the drainage operations necessary for this reclamation, have combined to effect its destruction; and to these causes we may perhaps add the greed of collectors. One man tells us complacently that he captured them at the rate of sixteen to the half-hour; and the local price, another informant tells us, used to be two shillings a dozen if one took them as they came, or half a crown if selected. They are now worth considerably more than their weight in gold. Nine specimens of this splendid insect came to the auction-room in 1902, and realised £44 6*s*. In the British Museum may be seen a series of over twenty fine specimens—roughly a hundred pounds' worth—and there is a magnificent set in the Museum at Cambridge.

The fiery glow and luminous splendour of the colour it is impossible to even adequately suggest, or the rich contrast of this coppery sheen with the bordering black. In our illustrations, Fig. 56 is the female, Fig. 57 the male. On the under side the upper wing is fairly strong orange, its outer edge being pale ashy grey, the dark spots of the upper side all reappearing, but all in their ring of this grey. In the lower wings the main body of the wing is of this ashy grey, in some cases almost silvery blue, while the outer edge is orange; so that the two wings on their under sides are curiously reversed in colour. The specific term *dispar* is from the Latin and signifies unlike, and refers to the difference of appearance in the two sexes.

The larva was green and fed on the foliage of the great water-dock. There is a very similar insect that is common on the Continent, the *C. hippothoe*, and it is suggested by some writers that *C. dispar* was a large local variety of this,

and not a distinct species. Doubleday, an authority in his day, held this view, and in his collection of British butterflies, now in the Bethnal Green Museum, may be seen thirty magnificent specimens, but all named as *hippothoe*. Newman also describes the insect under this name.

Whatever may be in store for the entomologists a century hence, the SMALL COPPER, *Chrysophanus phlæas*, is an abundant species nowadays everywhere, and a very bright, attractive little thing it is as it flits about in its rich metallic ustre in the bright sunshine. Figs. 58 and 59 are the under and the upper sides. It may be seen right away from April to September or even later, and must be entirely familiar to any one at all at home in country life. It is triple brooded in the year. While the greater number by far of those caught are normal, it is more subject to variation than some others of our butterflies in size, patterning, and even in colour. The number of spots and their bulk are by no means fixed quantities, while the bright orange field is sometimes much suffused with black, or, more rarely, is almost white. We have seen specimens, too, in which the hind wings were without the brilliant bordering, and others where the copper colour of the wing was of full intensity, while the normal brown was replaced on each wing with a pale yellowish tint.

The caterpillar, stout in proportion to its length, and of the wood-louse pattern, must be looked for on the sorrel or dock. It is green with dull red dorsal line. The generic name of this and of the preceding species is sometimes given as *Polyommatus*.

The British Museum entomological specialists recognise *Chrysophanus chryseis*, the PURPLE-EDGED COPPER, as a British insect and have specimens of it in the cabinet of British butterflies, but its claim to admission would appear to be of the slightest. It is found in marshy places abroad, but is a very local insect. In this species in the male the wings are of a deep ruddy copper, considerably darker than in *phlæas*,

their margins having a rich violet tinge. In the female the wings are of a duller copper red and the purple bordering is absent.

The authorities of the British Museum also admit to the British cabinet the *Chrysophanus virgaureæ*, or SCARCE COPPER, having eight specimens of it. In this species the male is of a brilliant metallic copper colour without any black spot, but with a narrow black margin to the wings ; the female being of somewhat duller hue, and with numerous black spots. The caterpillar feeds on the golden rod. The insect is abundant in France, Switzerland, and elsewhere, but if it ever got any real hold on British soil it has long since lost it. It was by the older writers mentioned as a fen insect here. Lewin, writing in 1795, says : "I have been informed that a collector of insects used to take this fly and supply the different collections in London with it, but would not give the least account of its manners or of the place where he found it. In the month of August I once met with two of these butterflies settled on a bank in the marshes, the sun at that time shining very hot upon them ; they were exceedingly shy and would not suffer me to approach them." He nevertheless figures them ; of course from Continental specimens. We are here introduced to a dealer, who may have been reticent either because he did not wish any one to share with him this choice English locality, or because there was no such locality at all, and he was therefore palming off Continental specimens. We are also introduced to a genuine naturalist, who entirely believed that he saw the insect, but failed to capture it, and who, being naturally very anxious to make his book complete, and especially to include anything choice in it, would be predisposed in all good faith to its admission.

We pass now to a consideration of the little butterflies known collectively as the Blues, though they do not all quite conform to that colour definition, since the Brown Argus is absolutely without any tinge of blue, while in some of the

PLATE XV

119. Wood Tiger. Male. *Chelonia plantaginis.*
120. Wood Tiger. Female. *Chelonia plantaginis.*
121. Scarlet Tiger. Larva. *Callimorpha dominula.*
122. Scarlet Tiger. Larva. *Callimorpha dominula.*
123. Scarlet Tiger. Pupa. *Callimorpha dominula.*
124. Scarlet Tiger. *Callimorpha dominula.*
125. Scarlet Tiger. At rest. *Callimorpha dominula.*
126. White Dead Nettle. Food plant. *Lamium album.*

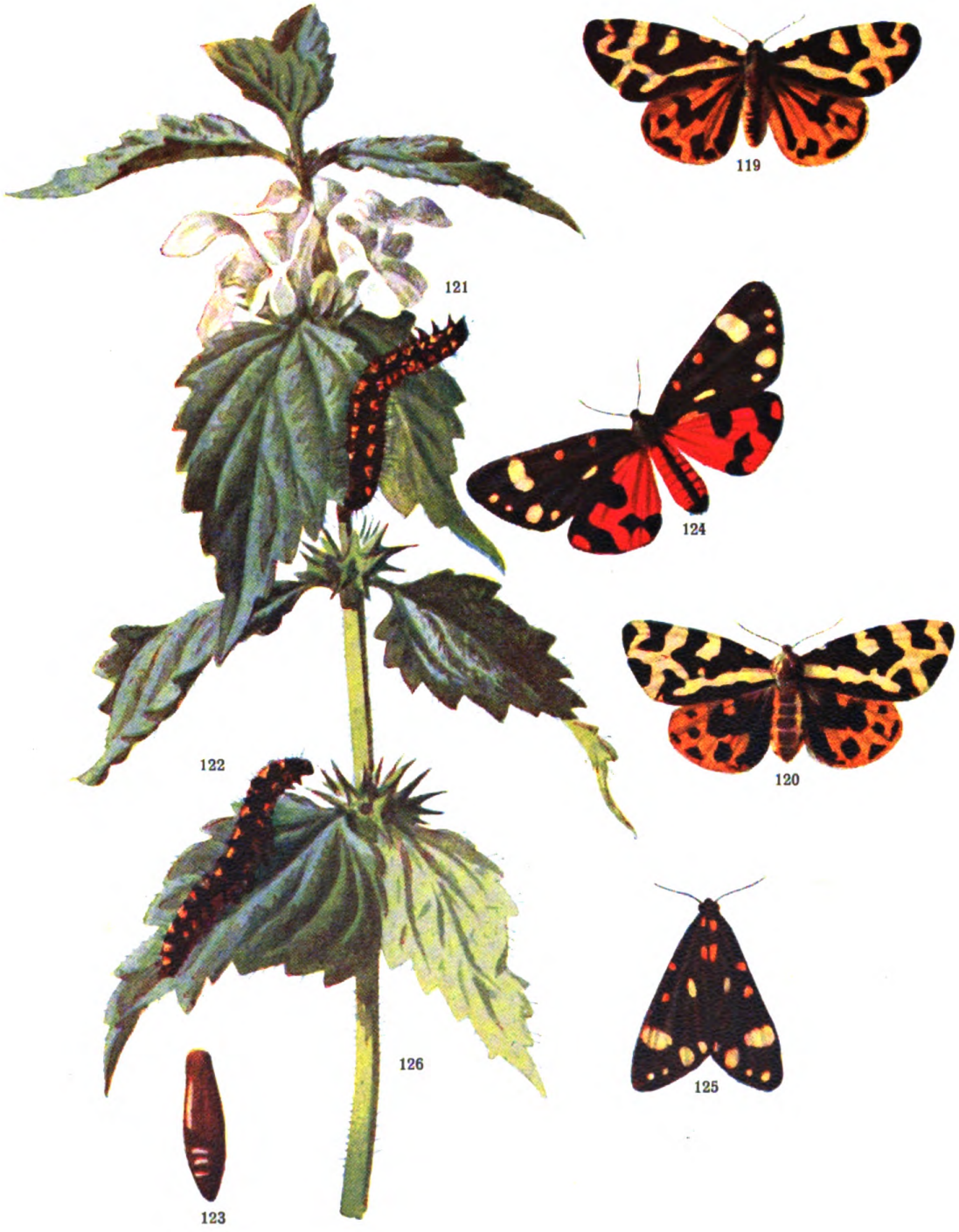

Plate XV.

other members of the group it is the male alone that has the blue attire. The best known of all these butterflies is the one we have represented in Figs. 60 and 61, the COMMON BLUE. The male, Fig. 60, is of a delicate lilac-blue tint, with a thin black edging line, and then a pure white fringing. The female, Fig. 61, is more variable, the general dark brown of her wings being more or less suffused with violet, and the marginal spots of orange more or less in evidence, or, at times, entirely missing. The under surface of the wings is grey, but of a warmer tint in the female. We see a row of red spots near the margin and numerous black spots with a white ring around them scattered over the wings. Normally there should be nine of these on the fore wing and thirteen on the hind, but these sometimes combine. Occasionally a specimen may be seen in which the two wings on the one side may be of male type and the two on the other of female. The colour contrast is in such abnormal case very curious and striking.

The Common Blue is abundant everywhere on heaths and open land, and often visits one's garden. It may be found, being double-brooded, almost continuously from May to October. The dark green larva feeds on grass, clover, bird's-foot trefoil, rest-harrow and other low-growing plants. The scientific names of the Common Blue have undergone a good deal of change. In our younger days, when we were reared on Stainton's Manual, they were *Polyommatus alexis*. To-day one authority favours *Polyommatus icarus*, another says *Lycæna icarus*, while yet a fourth declares for *Lycæna alexis*. *Alexis* was long the favourite and dates from the year 1776, but some one has found out that in 1774 it was called *icarus*, and priority carries the day in these matters.

In Fig. 62, a representation of the BROWN ARGUS, we see a graceful little butterfly, entirely brown save for the effective bordering of orange spots at the margins of the wings, a black discoidal spot on the fore wings, and the pure white fringing outside all. In this species neither sex has a trace of

blue about it, though in other points it so far conforms to the Blues as to claim a place amongst them. The only sexual distinction is that in the female, the sex we figure, the orange spots are more distinct than in the male. A marked and constant variety, that has sometimes been given specific rank under the name of Scotch Argus or *artaxerxes*, has the discoidal spot white instead of black, and the bordering of orange spots almost or quite wanting on the fore wings and but ill-defined on the hind ones. The difference between a black discoid spot and a white one sounds as extreme as it is possible to imagine, but it is curiously bridged over by varieties, as we travel north, in which the black spot becomes surrounded by a white line, and this gradually widens until the black is entirely absorbed. The fully modified form is only to be found in Scotland. The under side of the typical Brown Argus much resembles, with its red spots and black-centred white ones, that of *icarus*. In *artaxerxes* the white spots are without the black centres. This may not in verbal definition sound a very great difference, but in really looking at the two insects, the type and the variety, the appearance is very diverse. The Brown Argus may be found from May to June and then again in August possibly. This, however, is a question of locality, the insect being double-brooded in the south, single-brooded in the north. It is somewhat local. The pale green caterpillar, with its pinkish lateral lines and black head, and its characteristic wood-louse form, feeds on the rock rose, the stork's-bill, and divers crane's-bills.

Like its fellows of the genus, the scientific nomenclature sadly needs precision, as we may look it up in divers authorities as *Chrysophanus astrarche*, or *Polyommatus astrarche*, or *Polyommatus agestis*, *Lycæna medon*, *Lycæna astrarche*, *Lycæna agestis*.

In Figs. 63, 64, we have representations of our smallest British butterfly. This is the LITTLE BLUE or Bedford Blue; the first name being happily descriptive, the second absurd.

It is generally found in chalk and limestone districts all over the country, though from its small size and rather sharp flight it either goes entirely unheeded, or, if observed, soon gets lost to the eye. The Little Blue delights in warm and sheltered spots. The breeze that an elephant or a field-mouse would be entirely unconscious of blows this little butterfly altogether out of its course, depriving it of all volition and self-esteem: hence an old sheltered chalk-pit that the sunshine streams into is an ideal position. The Little Blue is somewhat variable in size, but is always very small. The difference of size in our two illustrations is not a sexual difference; the species we selected are of somewhat differing span of wing, because we desired to indicate this disparity.

The Little Blue is of a rather dark and dingy brown; in the female entirely so, and in the male with a powdering of blue at the bases of the wings, so that Fig. 63 represents the female and Fig. 64 the male. On the pale grey under surface of the wings, too, we have the characteristic black spots of most of the Blues, but the red ones are in this species wanting. The eggs are deposited on the downy calyx of the kidney-vetch, and are so minute that they necessarily escape anything but the most searching scrutiny. The caterpillars emerge from these eggs about the end of June; after feeding on the flower heads for about four weeks they rest dormant for many months, not turning to the pupa state till about the end of May. As three full-fed larvæ placed end to end, or four chrysalises, would measure about an inch they are not features that force themselves on the attention of the casual stroller. Still, small as the larva is, it is a creature of some little distinction, as we should all agree if it were only three yards longer, since it is green with orange stripings. The Small Blue is the *Lycæna minima* of science, or, perchance, the *Polyommatus alsus*, the *Chrysophanus minimus*, or *Lycæna alsus*.

The HOLLY BLUE, Figs. 65, 66, derives its name from

the food plant of the larva, though it is also found feeding on the ivy and buckthorn. The butterfly is sometimes called the Azure Blue, but, as it is absolutely less azure than some of the other species, this name is not a very happy one. It appears to be one of the insects that are growing common throughout the country. We have it fluttering in abundance around our suburban ivy-clad walls, at a distance from the heart of London that we may perhaps define as "eightpence return," and we have had the pleasure, too, of greeting it amongst the traffic in the Strand, its place of origin being probably the Embankment Gardens, or those of the Temple. There would appear to have been a series of seasons that have proved favourable to its well-being in some special way that we cannot understand.

The Holly Blue has much the same lilac-blue tint that we find in the Common Blue. In the male, Fig. 66, there is a narrow edging of black, but in the female, Fig. 65, this grows into a more or less broad band. The under sides of the wings are of a very delicate, almost silvery, blue, marked over with numerous but small black dots, the red spotting, as in the last species, being absent. The Holly Blue may be found from about the middle of April, and a second brood appears in July and August. The life-history of these two broods is very dissimilar. The eggs of the first result in full-grown caterpillars by about the third week of June, and these remain in the pupa state only about three weeks before emergence. The eggs of the second brood result in matured caterpillars that pupate about the middle of September, while the perfect insects emerge about the middle of the following April or a little later, the pupal state therefore being about seven months. The Holly Blue is the *Lycæna argiolus* of most writers, though to others it is the *Polyommatus argiolus*.

One of our most beautiful Blues, beyond cavil, is the CHALK HILL, *Lycæna corydon*. Like some of our other species it markedly attaches itself to chalk or limestone

districts, though it is not by any means exclusively associated with these. Amongst the delights of the pursuit of natural history are the possibilities always hanging over one's path. We are not thinking now so much of actions for trespass as of the unexpected appearance of something choice, or at least new to ourselves; and we can well recall to our mind to-day our first sight in our boyhood of *corydon*, a vision of delight that we had not until then even heard of. Its large size and the delicate silvery blue of its colouring render it specially noticeable. This lustrous tint is, however, the possession of the male exclusively, Fig. 67. This pale blue darkens on the outer margins of the wings into strong brown, and a row of spots that are more especially defined on the hind wings. The female, Fig. 68, has the wings of a dark dull brown, with a marginal row of orange spots. Those on the front wings may be indistinct or wanting, while on the lower wing they are emphatic and black-centred. We may see, too, at the base of her wings a slight suggestion of blue, a few sprinkled scales of silvery azure. It will be noted that the fringing of the wings has some black in it at the extremities of the nervures.

The eggs may be discovered on clover, kidney vetch, bird's-foot trefoil, and others of the leguminous plants. The larva will be found till about the beginning of June, when it pupates. After a short period of pupahood, the perfect insect arrives to view, and may be met with on the wing from June to the beginning of September. The pupa does not attach itself to the food plant, and at times buries itself in the earth.

The insect we represent in Figs. 69 and 70 is called, reasonably enough, the LARGE BLUE, as it is pre-eminent amongst its fellows from its size. For many years it has been persistently growing scarcer, and it seems too probable that it may presently become extinct. On the other hand, we cannot in most cases trace the causes at work: the unexpected is always happening, and we may yet see the Large Blue take a

new lease of life. Lewin, we note, writing in 1795, says, "This species is but rarely met with in England"; yet, in 1871, a writer says of a visit to the Cotswold Hills: "It would, I am sure, have been possible for an active collector of the greedy school to have caught over one thousand Large Blues during the season, for in a few visits I secured about one hundred and fifty"; and elsewhere he describes how, at sunset, he found seven at rest within a space that a man's hat would cover. 1876 and 1877 were also good "*arion* years."

The Large Blue has had in the past a wide distribution, but has always been a rather local insect. It should be searched for in June and July on high chalk or limestone plateaux, on broken ground like old quarries, and flowery wastes. The sexes have no colour-difference, but it is an insect that varies a good deal in size and markings, what one may venture to call the normal number of spots being considerably modified by obliteration and coalescence. This seems to be specially the case in the hind wings. A variety, *obscura*, is so deepened by suffusion, and the confluence of the black spots, that it is only by courtesy a Blue at all, that colour being confined to a small portion at the bases of the wings: this, however, is more especially a South European modification. As no other British Blue has the upper surfaces of its wings spotted with black, we have another guide, beyond its size and steel-blue colour, to its identification. The eggs are a pale greenish blue, and are laid on the wild thyme—a plant so characteristic of the great breezy uplands and the natural flower gardens that clothe with beauty the rocky wastes. Entomologically the Large Blue is the *Lycæna arion*, or, peradventure, in the next book we turn to, the *Polyommatus arion*.

The MAZARINE BLUE is now one of our very rare, and possibly extinct, species. The male has its wings of deep purple-blue with a black edging, while the female has wings of a dark brown, often somewhat iridescent, and with a few purplish scales. It is an insect nearly as large as *corydon*. It

should be searched for in June and July. Fifty years ago it was fairly common. It was last heard of in South Wales, but no locality can now anywhere be given for it. It is the *Lycæna semiargus*, or the *Chrysophanus semiargus*, or, maybe, the *Polyommatus acis*, as the authority we consult elects.

The SILVER-STUDDED is one of our smallest British Blues, and on open, sandy, heathery wastes and chalk downs seems to be fairly generally found. The male is of a deep purplish-blue, with a black marginal band, while the female is an equally strong brown, margined all round the wings with orange-red spots. On examining the under side—greyish in male, brownish in female—we find bordering rows of red spots and black, and others of the latter in the body of the wings. Some of these are centred with a bright metallic spot—the silver stud that gives the popular name. This charming little Blue is on the wing in July and August. It is the *Lycæna ægon.*

The most splendid in colouring of all our Blues is undoubtedly the ADONIS or CLIFDEN BLUE, the *Lycæna bellargus*. The male has its wings of a brilliant sky-blue colour pure and simple, no suggestion in it of the *alexis* lilac, the *ægon* purple, the silvery green of *corydon*, the grey steeliness of *arion*; while in the female this intense azure gives place to dark, dull brown, though the bases of the wings bear scales as purely cerulean as those of her consort, and she has, in addition, a bordering of more or less pronounced spots of orange. As the *Adonis* is double-brooded, we find it first in May and then again in August. It delights in the breezy expanses of our great chalk downs, and more especially those of our southern counties. It does not wander far from where it was bred, and very frequently settles, and therefore readily falls a prey to the wiles of the collector.

One would gladly, if possible, add to our list of home-grown Blues the LONG-TAILED BLUE, *Lycæna bætica*, an insect common over much of the Continent, and which has

PLATE XVI

127. Common Tiger. *Arctia caja.* Type.
128. Common Tiger. *Arctia caja.* Variation.
129. Common Tiger. *Arctia caja.* Variation.
130. Common Tiger. *Arctia caja.* Variation.
131. Common Tiger. *Arctia caja.* Variation.
132. Common Tiger. *Arctia caja.* Variation.
133. Common Tiger. *Arctia caja.* At rest.

Plate XVI.

actually been captured some few times in England, but we can at most only regard it as a very occasional migrant. It differs from our native Blues in the possession of a very decided tail-like appendage to the lower wings, while the under surface of the wings, instead of having that spotting and ringing that is so characteristic a feature in our Blues, has markings of pale warm brown and white that form into bands more or less parallel with the outer margins of the wings. At the anal angle we find two black spots, edged with pale metallic green-blue. The Long-tailed Blue should be looked out for along the Southern Coast during August and September. The wings in each sex are of a greyish brown, sparingly suffused over almost the whole of the wings of the male with purple-blue, and in the female concentrated on the inner half of the wings alone. There is also a marginal row of pale spots on the hind wing. These spots are much more obvious in the female than in the male. The anal spot is clearly defined, the second yet more so, while the others of the series gradually and progressively become less and less pronounced.

Our British Skippers—there are seven of them—are our representatives of the great family known as the *Hesperidæ*, a family met with almost all over the world, and in great force in the tropical regions. Some two thousand species of Hesperids have been named and described, and there are no doubt others yet awaiting enrolment. They have a much robuster frame, head, thorax, and abdomen, than we ordinarily associate with the idea of a butterfly. They are generally quite small and of quiet coloration. Their antennæ are set at a considerable distance apart on their broad heads, and have a stout and elongated club, often terminating in a small hook—a feature we find in no other kind of butterfly. In the larva state they live in a tent, made by rolling the leaves of their food plant together. The caterpillars are smooth, and taper backwards and forwards in bulk from the middle. When they assume the pupal state, some are attached by their tails, but the more typical arrange-

ment is the weaving of a slight silken cocoon. Both sexes have six fully developed legs. The wings are small, stout, and with thick nervures. When the butterfly is at rest, the hind wings are ordinarily horizontal, while the fore wings are at an angle. The eyes are large and prominent. In structure and general habit the Skippers are very moth-like.

In Figs. 71 and 72 we have represented the male and female forms of the SMALL SKIPPER, a very common and generally distributed little species, the sexual distinction in the colouring of the male being the oblique dash of darker hue that we see on the fore wings. It may be found in July and August. In Switzerland it occurs in abundance up to an altitude of five thousand feet. The larva is one of the numerous green ones that one finds on various grasses. This particular one may be identified from the slender white lines, dorsal and lateral, upon it. It may be found from August until June, passing the winter in a dormant state, and eventually turning into a green chrysalis.

The Small Skipper is a striking example of the difficulties of entomological nomenclature. We may find it recorded as the *Pamphila linea*, the *Hesperia thaumas*, the *Pamphila thaumas*, and the *Hesperia linea*. These butterflies obtain the popular name of Skippers from their jerky intermittent flight as they skip or flit from one blossom to another in a restless eager way. They delight in hot sunshine. In 1888 the *H. lineola* was recognised as a new member of our very limited list of British butterflies, as till then it had been considered to be but a Small Skipper. It certainly very much resembles it, and is found at the same time, though the list of localities is much more limited. It differs in the following respects from *thaumas*: the antennæ are on their under surface black tipped instead of buff, the streak on the fore wings of the male is shorter, more oblique, less distinct, and the hind wings are without the orange anal blotch.

The GRIZZLED SKIPPER is fairly common where in an

open clearing in the wood we come across a rather moist patch of ground. It is an attractive-looking insect, its colouring being black with a greenish tinge chequered over with creamy white square spots. These spots are much more numerous on the front wings. The fringes of the wings are also very prettily chequered alternately black and white. The sexes are alike in their wing markings. The Grizzled Skipper should be looked for in May and again in August. It is the *Syrichthus malvæ*, or the *Thymale alveolus*, or the *Hesperia malvæ* according to the authority on whom we pin our faith. The eggs are deposited in June on the blackberry, raspberry, strawberry, and other plants, and the pupa is enclosed in a slight cocoon in a further shelter made by drawing one or two leaves together. The antennæ do not possess the hook termination.

The DINGY SKIPPER is also a May butterfly that is distributed throughout the country, and especially in the south, though somewhat less freely than the preceding species. It has a preference for sandy and chalky banks and open hillsides. The food plant is the bird's-foot trefoil. The Dingy Skipper is a little larger than *malvæ*, but there is no great difference in size in any of the three, as the largest has not a span of an inch and a half. The wings are of a dingy greyish-brown variously mottled with suffused bands of darker and lighter brown, while, near the borders, we find some white dots. The marking and coloration are alike in both sexes. It is the *Nisoniades tages* or *Hesperia tages*. It must be looked out for in May and June, or, on the appearance of the second brood, in August. When at rest its wings are all spread out horizontally.

The LULWORTH SKIPPER, *Hesperia actæon*, is another of these little brown butterflies. It is very similar in colouring to the Small Skipper, Fig. 72, a little darker perhaps at the margins of the wings, and having a few brighter and much yellower brown spots on the upper wings. While it is of slight attractiveness as an insect, it is valued for its rarity, since only

at Lulworth and one or two other localities in that vicinity is it to be found. The male is differentiated from the female in its markings by an oblique dash of darker colour, as in Fig. 72. When in repose the fore wings are raised while the back ones remain horizontal.

Though our next species is called the LARGE SKIPPER the adjective is a very relative one, as the insect is about an inch and a quarter in span of wing. It is freely distributed throughout the country. It is the *Hesperia sylvanus*, or according to some authorities the *Pamphila sylvanus*, the specific name in either alternative indicating the sylvan spots it favours, though by no means exclusively. The ground colour of the wings is of a rich warm brown that is almost orange, more or less mottled in other browns and black. It is on the wing in May and in August. At rest it throws up the fore wings and has the back wings horizontal.

The SILVER-SPOTTED SKIPPER is one of our rarer members of the family. In general colouring it is very similar to *sylvanus*, but the markings are more distinct, and on the under side the greyish ground colour of the wings bears several sharply defined somewhat square white markings. This is the silver spotting that gives the butterfly its popular name. Scientifically it is the *Hesperia comma*, or, alternatively, the *Pamphila comma*. It is on the wing in August.

The CHEQUERED SKIPPER is another of our less common butterflies, being a distinctly local species. It is the *Steropes paniscus* of some authorities, the *Carterocephalus palæmon* of others. It should be sought for in May. It is nearly black in the general ground colouring of the wings, but there are numerous orange-tawny chequerings spread over the wings, and a less distinct row of spots near their outer margins. When in repose the wings are all four held erect. The Chequered Skipper must be looked for in June.

CHAPTER IV

Our Native Moths—How Classified—The Zygænidæ—Burnets, etc.—The Hawk Moths: Death's Head, the Privet Hawk, Poplar Hawk, Oleander Hawk, and others—Increasing Commonness of the Convolvulus Hawk—Cats as Entomologists—The Humming Bird of the Newspaper Correspondent—Bee- and Hornet-like Moths—Clearwings

IN entering on the consideration of our native Moths, it would be well to point out what has been accepted by many authorities as a good practical system of classification. It is obvious that any reference to these insects would be greatly facilitated by the recognition of some generally received order and sequence. The one we proceed to give is not the only one, since nomenclature and classification have not yet reached a point that all are willing to accept; but it is one that gives us a good working basis. The following chart illustrates readily enough at a glance the main divisions. Of the nine groups into which the moths are divided the first four are, for the sake of convenience, called macro-lepidoptera; while the remaining five are known as micro-lepidoptera, though this division by size is rather a rule-of-thumb procedure, and is not always borne out.

LEPIDOPTERA (scale-winged Insects).
- Rhopalocera (Butterflies).
- Heterocera (Moths).
  - Sphinxes.
  - Bombyces.
  - Noctuæ.
  - Geometræ.
  - Pyralides.
  - Pterophori.
  - Crambi.
  - Tortrices.
  - Tineæ.

Commencing then with the Sphinxes,[1] we find this group subdivided into families, the first of these being the Zygænidæ. The insects in this family are small in size but brilliant in colour. The Six-spot Burnet, *Anthrocera filipendulæ*, or *Zygæna filipendulæ* of some writers, is a sluggish insect common enough in many parts of the country, though its apathetic views of life tend to make it a rather local insect. Hence it may be abundant in one district or even on one hillside, and a short distance away entirely absent. In rural districts, where men are away at plough by six in the morning, this very restful disposition has gained for it the somewhat sarcastic name of "the ten o'clock sleeper," but it is fairly active in the bright sunshine. It is partial to the chalk or sandy districts, and on some rugged cliffs may be found in hundreds. It may also be very commonly met with in meadows and amidst the grass fringing the country path. It is particularly easy to capture, all that is ordinarily necessary being to stoop down and pick it off the stem on which it is at rest.

The caterpillar of the Six-spot Burnet may be found during May and June feeding on various wild members of the pea family, but its life is at the mercy of fifteen different species of parasites, told off by Nature to keep a check on over-increase. The pupa is enclosed within a tough and paper-like semi-transparent cocoon fastened on a grass stem, and tapering from the centre of the cocoon to a somewhat attenuated point at either extremity.

The moth should, normally, have six deep crimson spots on the rich metallic greenish-blue field of the upper wing (the hind wing being purely crimson throughout, except its bordering of darker colour), but these spots have a way, not uncommonly, of becoming confluent, the two at the base of the wing especially. The two centrals often coalesce, and the two outer also, so that we may get three spots instead of six,

[1] The word is frequently, and as correctly, given as Sphinges. The singular, in either alternative, is Sphinx.

or they may run together in quite an arbitrary manner, until at length we arrive at a mere blotch across the wing. We may from time to time find examples in which the crimson is replaced by yellow, as in Fig. 74. The Six-spot Burnet will be found in June and July, the female being ordinarily considerably the larger. The great thickening of the antennæ is a point that will not be overlooked.

The BROAD-BORDERED FIVE-SPOT BURNET, *A. trifolii*, and the NARROW-BORDERED, *A. loniceræ*, are less common. In these species, too, there is abundant modification of markings through confluescence. The genus also has a great tendency to develop local races, so that even to an expert the correct apportionment of a captive to its proper place in the ranks of the Burnets is not always an easy task.

The TRANSPARENT BURNET, the *Anthrocera minos*, Fig. 77, is readily recognisable from its semi-transparent wings, giving a novice the idea that he must have come across a sadly rubbed specimen. The red is not so rich in tint as the other Burnets, while the strong metallic green gives place here to a dull smoky grey. It was first recorded as a British species in the year 1854. The Transparent Burnet flies vigorously in the morning sunshine, but retires to rest early. When found it is often abundant, but though at home in parts of Ireland and Scotland, seems as yet chary of visiting England. The larva feeds on bird's-foot trefoil and other equally common plants in English hedgerows, so the food problem is no difficulty, and it can scarcely be a question of politics, or a disinclination to associate with our Anglo-Saxon Burnets. The caterpillar is about in May, and then after a brief interval the perfect insect appears.

Our next illustration, Fig. 78, is a representation of the little GREEN FORESTER, *Procris statices*, a rather sluggish species, and especially on the female side, though it may sometimes be found on the wing in the sunshine, June being the month for it. Like *minor* the wings are semi-transparent,

PLATE XVII

134. Common Tiger. *Arctia caja.* Variation.
135 Cream-spotted Tiger. *Arctia villica.*
136. Common Tiger. *Arctia villica.* Variation.
137. Cream-spotted Tiger. *Arctia villica.* Variation.
138. Cream-spotted Tiger. *Arctia villica.* Variation.
139. Cream-spotted Tiger. *Arctia villica.* Variation.
140. Cream-spotted Tiger. *Arctia villica.* Variation.

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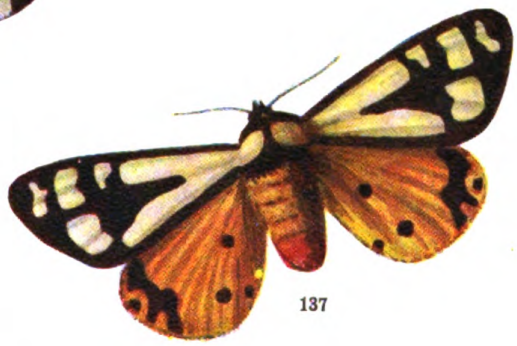
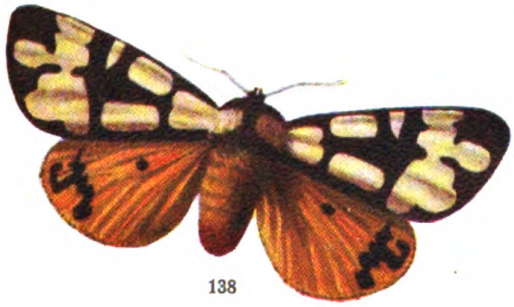
136



137



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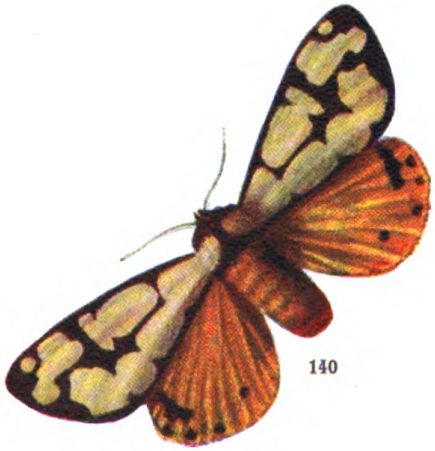

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but have a lustrous sheen on them, the green varying from a brassy green to peacock blue-green. The Forester will be found in meadows, and especially on the outskirts of woods. It is a very local insect, hundreds being found in one small area of pasture land, and absolutely no more in the whole district around. It is very curious how old associations stand by one : the first Forester we ever saw was a Harrovian, over forty years ago, and to this day we find its memory reminiscent of the little meadow patch beneath the church-crowned hill. The larva is full fed by the end of April, having been hatched in the previous July, and passing a long period of hybernation. Its food plant is the sorrel. The pupa rests in a strong grey cocoon attached to the sorrel stem.

There is a *Procris geryon* and also a *P. globulariæ*, but these species are by no means so common. They are very similar in size and colouring to *statices*, the differences being of a very technical character, the tip of the antennæ, for instance, in *statices* being blunt, while in *globulariæ* it is pointed. There is naturally some considerable difficulty in satisfactorily identifying closely allied species where the colouring is so similar, and where no pattern of any kind is found on the wings to differentiate them. One authority takes what to another appears a mere variation from type, and gives it full specific value ; six distinct and fully recognised or named varieties of *statices* alone being, we see, recorded in the pages of a specialist on this subject.

The next family to engage our attention is that of the Hawk Moths, or *Sphingidæ*. These insects are of noble size, as a reference to our Frontispiece and to Figs. 76, 81, 82, 87, 90, 93, 94, will abundantly demonstrate. Their bodies are large and robust ; the tails somewhat acutely pointed. The wings of these Hawk Moths are much narrower in proportion to their length than is the case with our other moths or butterflies, but they are very stout in structure, so that these insects are exceptionally strong in flight, covering great distances, and

with great speed. Hence their popular name of Hawk Moths. They are, with one or two exceptions, furnished with a very long proboscis, which they uncoil and thrust into the tubes of nectar-bearing flowers while poised in the air. The vibration of their wings when thus employed is far too rapid for the eye to follow, but to the ear it is very evident. The antennæ are thickest in the centre and taper off gradually in either direction, a form that we find in no other lepidopterous insects. The larvæ are of goodly size, often very brightly coloured, and, except in one instance, furnished, as in Fig. 83, with a hard and curving horn-like member at the tail, for which no very evident or satisfactory function can be assigned. These caterpillars have a way sometimes of throwing back their heads that is supposed to suggest something of the form of the couchant Sphinx; hence *Sphingidæ*. The larvæ in nearly all cases pass into the ground to assume the pupal state, the only exception that occurs to us being the genus to which the Small Elephant belongs, the pupæ of which may sometimes be found in a very loosely spun cocoon on the surface of the ground.

To those who up till then had thought always of moths as being dull, dingy things, the first sight of the Elephant Hawk, Fig. 89, or its relative, the Small Elephant, Fig. 73, must be rather of the nature of a revelation, while their beauty of form is no less marked than their coloration. There is nothing in Nature much more charming either in colour or outline than either of these insects. The SMALL ELEPHANT HAWK, Fig. 73, is widely distributed, and may be seen from the end of May to nearly the end of July in our gardens, hovering in the gloaming over the pinks and other flowers attractive to it. The particular specimen we figure was captured at rest at Tunbridge Wells. The caterpillar has merely a small tubercle to indicate where in most other Sphinx larvæ the tail-like horn is found. It may be encountered from July to September by duly searching for it, but it hides itself during the daytime from observation. Its principal food is the

bedstraw, but it is also fond of the various willow-herbs and one or two other plants. The pupa state fills in the interval between the September of one year and the May or June of the next.

Like many other insects the Small Elephant Hawk has been the victim of much scientific naming and re-naming. *Chærocampa porcellus* is the usually accepted term, but while its specific name appears the same in all cases we may find as generic titles *Metopsilus*, *Theretia*, and *Deilephila*. The generic name *Chærocampa* is Greek in its origin, and signifies hog-caterpillar, while the specific title *porcellus*, Latin in its inception, is equivalent to little pig. Why so charming a moth should thus be doubly branded by appellations so porcine may not at first sight be evident, but they arise from the rather forced resemblance the fore part of the body in the caterpillar bears to a hog's snout, the first two segments of the body being small and rectractile. This power of flexible and ready motion suggested to other folk the idea of an elephant's trunk; hence the popular name bestowed on the moth. In France these caterpillars are called chenilles cochonnes.

That there should be a Small Elephant naturally suggests the idea that there is probably another and larger one, and this we find represented in Fig. 89. The ELEPHANT HAWK, *Chærocampa elpenor*, is very commonly met with in gardens towards the end of May and in June throughout England and Wales. In Ireland it is particularly abundant, while in Scotland it is by no means common. The eggs are ordinarily found in June, the larvæ in July and August. The various species of willow-herb and bedstraw should be examined, and the larva may also at times be found on the enchanter's nightshade, or in gardens, on fuchsia, vine, and apple.

The caterpillar of the Elephant Hawk has a small anal horn, and has the same curious power as *porcellus* of contracting and elongating the first three segments. On the fourth and fifth segments are large eyelike marks. On retracting the anterior

segments within those next to them the eyed segments, looking then like the head of the creature, suddenly come into prominence, with an effect that is somewhat weird and uncanny, and of defensive value against some at least of its enemies. The specific name is as suggestive as that of Small Elephant, Elpenor being one of the companions of Ulysses who were changed by Circe into hogs. The pupa is enclosed in a cocoon, built up by blending together with silk divers odds and ends lying about on the ground. Old authors sometimes call this moth the Bedstraw Hawk, from one of its favourite food plants.

The CONVOLVULUS HAWK, *Sphinx convolvuli*, Fig. 76, one of our largest British insects, is very uncertain in its appearance, being in some seasons entirely absent, and in others in abundance. The year 1846 was a very notable Convolvulus Hawk year, and so, too, were 1856, 1859, 1875, 1887; and there have been several others since, when the pages of the entomological periodicals teemed with records of its capture. The caterpillars and chrysalises are both found here occasionally, but we may fairly assume that the unusual numbers of perfect insects that from time to time are so striking, must be due rather to immigration than to home growth, and this seems the more likely when we find the south-eastern counties of England supplying the greater number of records. It has, nevertheless, been captured at points so remote from the French coast as the Isle of Man and the Shetland Islands, and it has been reported from every county in Ireland. It is cosmopolitan, being found alike in Europe, Asia,[1] and Africa, in America, and in Australia; while, to come nearer home, one was caught awhile back in Mark Lane Railway Station, in the City of London.

[1] An officer in the Royal Navy, of entomological tastes, writes to us that the Convolvulus Hawk was found by him to be abundant at Yokohama and Wei-hai-wei; scarcely an evening passed but that specimens of it were brought to him.

The specimen we figure was captured in a garden near Seaford while hovering over the sweet-scented white tobacco, a plant for which it has a very special regard. In 1898 a correspondent told us that in their garden at Ryde they had during the last ten days of September caught twenty of these noble moths while visiting a bed of tobacco; and in the same year another tells us that at Morthoe they sometimes had five or six at once over the same plant. We know of many such experiences, but where this plant is not forthcoming petunias are a good second. In one case that came to our knowledge a man had a bed of petunias twenty yards long and one yard wide, and off this strip he captured between August 6th and October 4th forty-one Convolvulus Hawks. They are most fearless insects, and if they escape the first stroke of the net do not hesitate to return. They are also attracted by gladiolus, pelargoniums, honeysuckle, and divers other flowers. When they find a bed of gladioli they invariably begin at the lowest flower of the spike, going up flower after flower till they have tried each blossom, making a loud deep humming noise with their rapidly vibrating wings as they sip the nectar from the bottom of each blossom by means of their proboscis. This proboscis is of great length, nearly three inches, and is so conspicuous when unrolled that an alternative name for the moth is the Unicorn Hawk. The rustic mind is prone to the sensational, declaring that newts spit fire, that if a hairy caterpillar once gets round your finger it can never be got off again, and, amongst many other absurdities of like calibre, that the proboscis of a butterfly or moth has deadly stinging powers. We know of a case where some men brought, at the peril of their lives they fully believed, a Convolvulus Hawk to an entomologist, having somehow beguiled it into a large paper bag, in which it was dashing about furiously and thus fully confirming them in their belief in its ferocity. It is very curious to watch these moths at work: one can approach quite closely to them, so closely that the body, with its bands of black and red

and white, is quite distinct, while the wings from their rapid vibration are undefined, a sort of haze. The effect of a body suspended in mid-air without any definite support is very peculiar.

While wanting in the brilliancy of colour of many of its fellows there is a quiet charm in the delicate shades and markings of black and varying depths of brown, and in any case its noble size would attract our attention. It is curious that amongst the keenest of its captors is the cat, who hearing the rustle and whirring of the wings presumably takes it for some outlandish pattern of mouse, and springs upon it with a certainty that the entomologist may well envy. The following experience, from a correspondent to *Science Gossip*, is so graphic that we give it in full as it stands : "A neighbour's cat was crouching under a bush close by, following the moth with her eyes as eagerly as I. Puss was stealthily creeping, *ventre à terre*, closer and closer to the unsuspecting prey, and though by voice and gesture I sought to frighten her off, she pertinaciously returned. At last I ceased, wishing to see the result ; and puss made her spring, striking down the moth at my very feet, with the utmost ease, closing upon it at the same instant, and carrying it off in her mouth behind the shrubs. I presently pursued ; but in the deepening dusk I could find no trace of the moth, while pussy began to purr and to invite caresses, as cats often do when they have caught a mouse, evidently thinking that she had performed a praiseworthy feat. It was a rather ignoble fate for my noble insect visitor." The Convolvulus Hawk is readily attracted by light, coming boldly in at the open window on a summer's night, or hovering round the street lamps.

The eggs, small, very numerous, and bright green in colour, are laid about the middle of July, and are hatched in about eight days. The larva, which ultimately becomes some four inches long, must be searched for on the field convolvulus, or on the allied hedge bindweed. One or two other plants occasionally prove attractive, but in England the first we

mention is by far the most likely to yield it. The larvæ should be looked for during July and August, but it must not be forgotten that while the looking for them is comparatively easy the finding them is quite another matter, as they are very rarely met with on this side of the English Channel. Barrett, a great authority, says that it is doubtful whether there are records of the finding of twenty larvæ, in all, in these islands, while Newman, another reliable writer, states that he never saw one.

The insect, would appear, however, to be getting less rare in England, and we have heard of an entomologist finding at Dovercourt fourteen in eleven days, while two other brothers of the craft report the discovery of twenty-six, in 1901, on sandhills on the Lancashire coast. The caterpillar is curiously varied in colour; in some the ground tint being very pale green, bright apple-green, or a darker and more sombre green, and in others again of equally varying shades of brown, the oblique slashing on its coat similarly ranging from bright yellowish green to purplish black.

The pupa, nearly two and a half inches long, is of a rich mahogany colour and very glossy. The proboscis of the coming moth is much in evidence, being enclosed in a case that, starting from the head and presently doubling back to it, stands freely out in the greater part of its length from the main body of the pupa. The pupa is in habit subterranean, and most of the examples found in England have been unexpectedly brought to the surface during potato-digging, the potato plots giving exceptional facilities for the free and undisturbed growth of the trailing pink-flowered convolvulus, the food plant.

The LIME HAWK, Figs. 79, 80, 81, is very curiously varied in its colouring, as we readily realise when a considerable series of the moth is brought before us. Fig. 81, with its blending of dull pink, olive green, brown, and yellow, may be accepted as a typical specimen, but in many the pink is less to the fore, and then we realise the appropriateness of an old name for the insect, the Olive Shades. Fig. 80 is entirely abnormal

PLATE XVIII

141. Ruby Tiger. *Spilosoma fuliginosa.*
142. White Ermine. *Spilosoma menthastri.*
143. Buff Ermine. *Spilosoma lubricepeda.*
144. Jersey Tiger. *Callimorpha hera.* Variation.
145. Jersey Tiger. *Callimorpha hera.* Type.
146. Gipsy. Female. *Liparis dispar.*
147. Yellow Tail. *Porthesia auriflua.*
148. Muslin. *Spilosoma mendica.*
149. Gipsy. Male. *Liparis dispar.*

Plate XVIII.

in its colouring, a variation so curious that we gave ourselves the pleasure of presenting it to the magnificent National Collection at South Kensington. We captured it in Kew in a state so perfect that it must have been within a very short time of its emergence. The Lime Hawk is a species that varies a good deal, not only in colouring but in size, so we include Fig. 79 in our illustrations. What untoward circumstance led to it being thus dwarfed it is impossible to say. It may sometimes happen that when we rear insects, these or others, from the caterpillar, we may do, or fail to do, something in the way of insufficient provision of food or an improper dietary, lack, or excess, of light or moisture, incautious handling, or what not, that affects the well-being of the future insect; but in this case the larva was found on October 1st and turned to pupa on the following day, and therefore passed through its larval stage without human help or hindrance, the perfect insect emerging on June 1st of the following year. It may at first glance appear a needless precision to declare that its emergence took place the following year, since the June of any year precedes its October, but it is a curious fact that in the case of the Hawk Moths and some other species emergence is sometimes delayed. We have had a brood of these caterpillars all pupating together in July and the great majority of them emerging in the following April or May, while one or two will sleep on for another twelve months. The particular larva that developed into Fig. 79 was considerably behind time in its arrangements, August and September being the ordinary months for pupation, while we have known the moths to appear as early as April 8th.

The body of the Lime Hawk is somewhat stout, and the curiously irregular notching of the posterior margins of the fore wings will be noted. It is a fairly common insect, and more especially in the south. If we, about the normal period for its appearance, examine the trunks of elm or lime, we may very possibly find it, as it does not fly till night. It is a somewhat sluggish insect, and is seldom taken on the wing. It is

attracted by light. It is the *Smerinthus tiliæ.* The eggs are laid in June on lime or elm, or less commonly on birch, alder, hazel, ash, and oak, the caterpillar being full fed in about six weeks. It is stout-bodied, clear bright green in colour, dotted over with yellow, covered with little protuberances that give it a roughened look, and bearing a series of seven yellow oblique lateral stripes, sometimes edged with red. This oblique striping is rather a characteristic larva adornment amongst the Hawk Moths. We see it in Fig. 89, for instance, and in the larvæ of the Death's Head, the Lime Hawk, and the Poplar Hawk. When ready for its change to pupahood the larva descends the tree and buries itself in the earth at its foot, remaining, however, some days in the larva state in its subterranean domicile before pupating. One may occasionally find, where the ground —owing to drought, the stamping down of horses or cattle, or other causes—has offered difficulties to burrowing, the larva finds a resting-place instead beneath loose bark or in a crevice for its great change. The pupa is dull red in colour and rough in surface.

The Poplar Hawk, *Smerinthus populi*, is a closely related specimen to the last. It is represented in Fig. 88. It is an insect that varies very much in colour and in strength of tint. In some specimens there is a good deal of pale lilac grey, in others a large proportion of deep purplish brown. It varies also considerably in size; we have seen specimens barely two and a half inches in span, others three and three-quarter inches. These dimensions, however, hardly give an adequate notion of the great difference in size, as one wants really to see the great difference in bulk that is involved in these linear measurements. The female is the larger insect. The scalloping of the margins of the wings will be noted. We have seen one curious variation where the characteristic brick-red spot on the lower wings was absent, and one may not unfrequently find hybrids between this and the Eyed Hawk, the species we next consider. These are intermediate in appearance

between the two parents, but are wanting in the attractiveness of either.

The Poplar Hawk is double-brooded, so that we may find specimens in May and June, and again in July, August, and September, so that some of them are produced from the larvæ of the preceding years, and others, the later ones, from those of the same year. It flies at night, and somewhat weakly. Ordinarily it is most easily secured for the cabinet by examining during the day the trunks of trees or palings where it is at rest. It will also come to a light, and therefore is found around street lamps. It appears to be fairly common all over the country, and especially in the south. It is the commonest ordinarily of all the Hawk Moths. It might almost be called a metropolitan insect, as it is found from time to time in the London squares and open spaces, though less frequently now than formerly. The address of the particular specimen we figure was, at the time of its capture, the Stock Exchange, London, E.C.; and we recall that in our younger days, when we lived in Kensington, we used to find specimens every year in our garden, said garden possessing the special attraction for them of a fine black poplar.

The eggs, though more especially laid on the twigs or leaves of the poplar, are occasionally found on the different kinds of willow, or on birch or laurustinus, only one or two being laid on each leaf. As the female moth is prepared to lay between two and three hundred eggs, the task of setting them out in the world is a long and heavy one. The caterpillar is of a yellowish green, spotted with dull purple, having several diagonal slashings of yellow, and of roughened texture like shagreen. It appears to be rather subject to the attacks of parasites, three different species devoting themselves to its destruction. Between fifty and sixty parasitic larvæ will sometimes emerge from one caterpillar. The pupa is subterranean, but often so slightly buried that it is barely covered.

The Eyed Hawk, Fig. 86, is the *Smerinthus ocellatus* of

science, and a very beautiful insect it is in its delicate blending of varied colours. Though somewhat local, it is very generally distributed, at least in England, and more especially in the south. A night-flier, like its relatives, it may sometimes be found slumbering soundly on tree trunks and fencing during the daytime. It should be sought for in May, June, and July, though occasionally, as we may see in other Hawk Moths, a precocious specimen is unwilling to wait the normal time, and puts in an appearance in August or September. Like many other insects, the Eyed Hawk succumbs to the fatal fascination of light. The female is the larger insect, but in pattern and coloration it is very similar to the male. The fore wings are variegated very delicately in grey and brown, and over all is a beautiful purplish bloom, while the hind wings have a good deal of rose red in them, plus the large blue and black spot. The popular name, Eyed, and the specific name, *ocellatus*, both clearly refer to this conspicuous eyelike marking.

The caterpillar is hatched about the middle of June. It is nearly four inches long, stout and stiff, of a bright green colour, powdered over with minute white spots, and showing, in addition, seven oblique white stripes edged with purple on its sides. The horn is blue. These caterpillars are found on the poplar, different species of willow, pear, apple, and sloe, and more rarely on the peach and almond. When fully grown they bury themselves in the earth, though it is some days thereafter before the pupal stage is reached. A little chamber is hollowed out some two or three inches below the surface, little or no silk being used in its formation ; but its walls are prepared with a glutinous secretion, and here throughout autumn, winter, and spring the reddish-brown glossy chrysalis awaits the day of its awakening. The moth was by some of the old writers called the Willow Hawk.

The STRIPED HAWK, sometimes called the *Deilephila livornica*, sometimes the *D. lineata*, and represented in Fig. 87, is a species that is very rarely seen in this country. It is very

charming alike in colour and in form. The popular name and the *lineata* refer obviously enough to the very strongly marked light-coloured nervures running across the fore wings. While most of the specimens seen are Continental in their origin, there are undoubted records of British-born examples of the moth, the larvæ having being found at divers times and places in England and successfully reared. The year 1868 was a very notable *livornica* year, four-and-twenty captures being recorded in the entomological papers ; but ordinarily two, three, or four notices of its occurrence, or, more ordinarily yet, none at all, are about what we may anticipate or look back upon. Though we may conclude that most of those that have been seen in England were immigrants, they were widely distributed throughout our land, Durham, Glamorgan, Carlisle, and other places far remote from the Continent reporting it, while others have been notified from Ireland. It is an insect really of Southern Europe, of Africa and Southern Asia, and even in France is accounted a rarity.

The caterpillar of the Striped Hawk feeds on bedstraw, vine, fuchsia, sow-thistle, toad flax, sorrel, and other plants during June and July, the perfect insect being produced in August and September. The pupa stage is passed upon the surface of the ground, within a shelter found by drawing together, with silken cords, dead leaves, pieces of stick, and other suitable odds and ends.

The beautiful insect depicted in our Frontispiece is the largest of our British moths, and alike from its noble size, from the beauty of its form, and the brilliancy of its colouring, compels our attention ; while the curious skull-like mark on the thorax gives it just that little touch of the weird which seems to have for so many people an irresistible attraction, and has always rendered the insect an object of terror to the ignorant and superstitious. The Death's Head Hawk Moth varies in abundance, but is seldom common. As with other insects, it appears in certain years (or rather should we not

say in uncertain years ?) with perplexing profusion ; 1846, 1865, 1869, 1877 were of this description. September and October are the months when it appears most commonly, though we have known it to emerge from the chrysalis as tardily as November 14th.

In the Death's Head the two sexes are similar in their markings, but the male is the smaller. These markings on the fore wings are very variable, the lighter brown bands differing much in width. We have seven examples before us as we write, and no two quite resemble each other. The very prominent eyes, the dark but white-tipped antennæ, and the very broad abdomen will be noted. The bold black and yellow striping of the body gives the insect one of its old names, the Tiger Hawk. We have seen a variety in which the hind wings had but one black band. The insect comes to light, and, attracted by this, is sometimes captured far out at sea.

The caterpillar should be sought for in August[1] or possibly the beginning of September, in the neighbourhood of dwale, thorn-apple, woody nightshade, jasmine, elder, tomato, damson, hemp, spindle-tree, or potato, the latter plant being the prime favourite, though it is evident that, as a comparatively recently introduced plant, it must have supplanted something else in the dietary. Hence amongst other old names the insect is called the Potato Hawk. The larva feeds by night, concealing itself by day ; moonlight or lantern-light are therefore great helps to its discovery. The lateness of its dinner-hour does not, however, secure it against the untiring diligence of an ichneumon fly, that lays its eggs within it and destroys it, one special parasite being told off in the wonderful economy of Nature to bring about this end in the case of the larvæ of the Death's Head. When full fed it is nearly six inches long.

[1] A correspondent tells us that on August 14th he found seven of these caterpillars in a potato-field ; on the 16th, six ; on the 17th, five ; and before the end of the month, twenty more.

The rustics in some parts of the country call these larvæ "tatur-dorgs." They vary greatly in colour, from almost pure lemon yellow to a soft clear green, or even a strong brown or purplish hue. Seven oblique lateral slashings of dull violet give an additional colour-note, and these meet, V-like, on the back; but in the brown varieties these are indistinct or wanting. The tail-like appendage has a double curve, an S-like shape, instead of the simpler form we see in Fig. 83. The farm labourers in some places know them as locusts, which seems to show that, though they have got a vote, they have still something to learn.

When the larvæ are fully developed they bury themselves in the earth and then pass into the pupal stage, this pupa being, as we see in our Frontispiece, of very considerable size. A large chamber in the soil, some eight or nine inches from the surface, is formed by means of a gummy secretion. In this stage the creature is very readily injured, and after disturbance does not generally survive; this probably being, apart from direct harm, because it is so difficult to provide the proper amount of moisture. If kept too dry emergence is impossible, while over-damping leads promptly to mildew and decay. They are often, of course, dug up casually by the farm hand or cottager when potato-digging. An entomologist told us that he had thirty brought to him from one field[1]; while Stephens tells us that "in the potato-fields near Ham in Essex nearly a bushel of pupæ were obtained in the course of a few weeks by a gentleman from the labourers."

This creature, in all stages of its existence after the egg-period, has the curious power of emitting sounds, though it is equally curious that some specimens possess this power much more than others, or are at least much more willing to exert it. The larva, on being interfered with, draws back its head angrily, and makes a sharp, snapping noise—a sound generally

[1] Curtis tells us in his *Farm Insects* that he has known the caterpillars so abundant in Kent that the peasants collected them to feed their poultry.

PLATE XIX

150. Vapourer. *Orgyia antiqua.*
151. Black Arches. Male. *Liparis monacha.*
152. Black Arches. Female. *Liparis monacha.*
153. Pale Tussock. Female. *Dasychira pudibunda.*
154. Pale Tussock. Male. *Dasychira pudibunda.*
155. December. *Pœcilocampa populi.*
156. Lackey. *Clisiocampa neustria.*
157. Lackey. Var., *bilineata.*
158. Ground Lackey. Male. *Clisiocampa castrensis.*
159. Small Eggar. *Eriogaster lanestris.*
160. Ground Lackey. Female. *Clisiocampa castrensis.*

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short and abrupt, like the tick of a watch, but sometimes more prolonged. This, no doubt, is a means of defence, as we can imagine a curious investigator, already half-scared by its size, incontinently dropping it when it gives an uncanny tick, suggesting a warning note of something much more serious to follow. The chrysalis, when about to pass to the moth-stage, squeaks very audibly, while the moth itself gives a sharp, mouselike cry when handled,[1] peculiarities that render it yet more an object of terror to the superstitious. It is curious that, while the matter has received much attention from scientific men, no adequate explanation of the sounds is yet forthcoming.

Another curious habit that the creature has in its final stage is that it is so particularly fond of honey that it creeps into the beehives in search of it, abstracting by means of its stout proboscis the honey from its rightful owners, who are quite unable to eject the marauder. From this peculiarity yet another old name for the insect is the Bee Tiger.

The scientific appellation of the Death's Head is *Acherontia atropos*, names recalling, in classic mythology, the gloomy river bordering the shades of death, and the relentless Fate who severed at her will the thread of human life. It is curious that, while we have in Britain no other insect at all like it, it is not by any means a unique design in Nature, the *A. medusa* and the *A. morta*, for instance, of Japan, Java, and the far East generally being almost identical in size, colour, and markings with the *A. atropos* of Europe, and bearing, as their names clearly suggest, the same strange, skull-like form on the thorax. Harris, an old author, calls it the *Caput mortuum*, "from the mark on the back, which much resembles a dead

[1] This gift was to our knowledge in one case at least a drawback, for a collector found a beautiful specimen that had recently emerged and was in magnificent condition, attention being drawn to it while some feet away by the squeaks it was indulging in. Had it not possessed and used this gift, it would probably have been passed unnoticed.

Scul." This mark varies in colour from pale to deep brown, and is in some specimens much more clearly defined than in others, though it is always sufficiently skull-like to fully justify the application of the somewhat gruesome name of Death's Head to this noble insect. It is in France the Tête de Mort, in Germany the Todtenkopf.

Plate X. is devoted entirely to the PRIVET HAWK, *Sphinx ligustri*, and its food plant. Though the two sexes are much alike, the male, the one we figure, is the smaller, and the more deeply coloured. It is also less stout in build and in size of abdomen. It is an insect that is very common in the South of England, but becomes much rarer as we travel northward. Like other Hawk Moths, it may be found in the dusk of the evening hovering in our gardens over tubular flowers, as the honeysuckle or jasmine, or over pinks and rhododendron clumps, and should be watched for in May or June. Though less showy than some others, it has a quiet attractiveness in the delicate blendings of browns of varying strengths, fortified by black streaks, and brightened by the rosy-red of the hind wings and abdomen. In the Reading Museum may be seen two specimens in which this rose-colour is replaced by yellowish-white. These were bred specimens, and it will be within the knowledge of every entomologist that variation from type is much more common in specimens that have been reared in captivity from the larva than in those that have had no help or hindrance from human agency. When the insect is at rest with closed wings, the quiet mottling of neutral colours on the fore wings is of great protective value. It is allured to its fate by light, coming very readily within the danger-zone under its fascination.

The eggs when first laid are of a bright green colour, but prior to hatching out turn white. The larva, as we see in Fig. 83, is of considerable bulk, a bright green in colouring, its sides being adorned by seven oblique slashings of purple and white. While privet, Fig. 85, is far and away its favourite

food, it will eat lilac, ash, and the prickliest, toughest holly, and may also be tempted to eat dogwood, syringa, elder, laurustinus, strawberry, guelder-rose, teasel, and some few other things; and from the large size of the larva and its commonness, would make an excellent beginning for any of our readers who would like to do a little bit of most interesting and instructive rearing.[1] Occasionally one comes across a purple Privet Hawk larva. By August ordinarily, though sometimes not till considerably later—we have even known it to be October—the larva is full fed, and buries itself some four or five inches in the ground to enter on the pupa-stage, Fig. 84. This is at first bright green, but very soon assumes a deep reddish-brown colour. A by no means inconsiderable number of the pupæ, instead of changing into the perfect insect the following summer, delay this for another season, putting in no appearance till May or June twelvemonth, a space of some twenty-two months in the pupal stage.

The SILVER-STRIPED HAWK MOTH, the subject of Fig. 90, is so called from the silvery bands that run across the upper wings. The abdomen also has these metallic lustrous marks on most of its segments. This has a shot effect, the sheen being only seen to advantage when viewed from one side. Scientifically the insect is the *Chærocampa celerio*, the specific name being from the Latin *celer*, swift, in allusion to the magnificent powers of flight of the insect. We see at once that such an insect, with its strong, far-spreading, finely cut pinions and acutely pointed body, is built for speed: it is no mere hedgerow flutterer. This strength and swiftness of flight occasionally brings this beautiful moth to our shores. It should be looked for—which, we fear, in this case is by no

[1] We heard a story of an old rustic, who could not at all understand how a caterpillar could become a moth; but when he was told, he was so interested that he declared he would henceforth feed and watch all "bots" that he met with to see what kind of "buzzard" they would produce. The larger night-flying moths are often in country districts called "owlets."

means the same thing as being seen—in September and October.

While the larva has been found in England, it would appear that our winters are too severe for the insect, and that our supply of it is almost dependent on immigration. Light has rather a special attraction for it, so that a perceptible number of its recorded captures hail from lighthouses and chemists' shops. The Silver-striped Hawk moth travels far, for though the south-eastern counties yield by far the greater number of records of its capture, yet we hear of its being seen and caught at places so remote from the English Channel as Southpool, Lytham, Oldham, Manchester, Retford, Carnforth, Hartlepool, Lancaster, Carlisle, Doncaster, Preston, Aberdeen, Dingwall, Cheltenham, and Taunton. Four, we know, were taken in one year in one garden near Brighton, the attraction being a noble bed of verbenas. The year 1885 was a very special "*celerio* year."

The caterpillar feeds from July to October on the vine—a common enough plant in the Sunny South that is the insect's true home. It will be found, however, on fuchsia, bedstraw, carrot, and some few other plants. The Silver-striped Hawk Moth is found not only in Europe, but in Asia, Africa, and Australia.

The next illustration, Fig. 93, deals with a moth as rare as the preceding, a claim as precarious; but from its striking character, its beauty of form and chasing, we very gladly include it. It is the OLEANDER HAWK, the *Chærocampa nerii*. It is an insect by no means uncommon in France, though even there it has its mysterious periods of scarcity and abundance, and it occasionally wings its way on its powerful pinions across to England. As the caterpillar feeds on the oleander, an introduced plant here much too scarce to provide it with its food, it would appear that it could never really be acclimatised; it will, however, as an alternative, eat the foliage of the lesser periwinkle, and this is an English wild plant.

An entomological friend was so fortunate as to capture two specimens at Dover, and was good enough to allow us the loan of one for the purpose of making a drawing of it.

The Oleander Hawk is a grand insect, and so individual in its markings that it is impossible to mistake it; the variegation of deep green, lilac, and delicate rose-colour is very charming. A correspondent writes from Weymouth: "A specimen was brought to me in a cardboard box." There is more in this than meets the eye at first glance, since it implies that the moth was truly caught in England—was not a dead one foisted on one from abroad. We have also heard of its being captured as far north as Perth, Manchester, Birmingham, Sheffield, Hartlepool; but naturally the southern counties have the advantage, so that we more freely find records of captures in such localities as Brighton, Eastbourne, Hastings, Lewes. The larva is out from July to September, the perfect insect appearing about the following September.

The HUMMING-BIRD HAWK, Fig. 92, is in most seasons very abundant in Britain. From its small size and habit of hovering over flowers it is the cause of a perennial flow of letters to newspapers from non-entomological folk, who declare that they have seen in their gardens a humming bird. It vibrates its wings with such rapidity that one is only conscious of a hazy something, and on approaching it it instantly disappears, only, however, ordinarily, to promptly return. Ray, an early writer, calls it the *papilio velocissima*; while Lister, another of the ancients, says of it: "It is an exceedingly swift flyer. He is very frequent in July in Gardens amongst Gilly-flowers and Pinks. I did once take a small Species of them exceeding beautifull, in Morgan's Garden in London. I us't to call them the Hawk-Flye, for their exceeding Swiftnesse." One that was carefully watched and timed was found to visit one hundred and ninety-four flowers in seven minutes. It has great powers of sustained flight, and has been known to come on board a vessel thirty miles from land. The Humming-Bird

Hawk may be seen almost the whole year round, except during flowerless, cheerless winter. Unlike many moths, it is a lover of the sunshine, and may be seen on the hottest days imbibing nectar from the open flowers. In our own garden, though it finds much that is attractive, its special spot is where the big clumps of red valerian grow. It is in the larva state during July, August, and possibly the beginning of September. The pupal condition, some two or three weeks long, succeeds, and then we arrive at the imaginal stage. We have seen the moth still flying briskly during the third week in November, but it presently hybernates, reappearing with the lengthening days. The caterpillar feeds on stellate plants, such as the madder and the bedstraws, hence the specific title *stellatarum*, while the generic name *Macroglossa*, Greek in its origin, signifies long-tongued.

The genus to which the Humming-Bird Hawk belongs includes two other species, the *M. fuciformis* and the *M. bombyliformis*. The first of these, popularly known as the BROAD-BORDERED BEE HAWK, we have represented in Fig. 91. All three agree in their delight in the sunshine, in their large antennæ, in the broadly tufted termination of the abdomen. In the latter two the wings are transparent in their centre, but it is a very curious fact that on emergence from the pupa the wings are entirely covered with scales, and that it is only on flight that most of these are shed. Though fairly common in some districts, and especially in the south, it is local, and should be sought for in open clearings near woods during May and June. Like the Humming Bird Hawk, it sips sweet nectar from the blossoms by aid of its long tongue while suspended in air above them, its wings well-nigh invisible from the rapidity of their motion. The caterpillar is found from June to August feeding on the honeysuckle, but also taking bedstraw, scabious, campion, and other plants. The pupal stage lasts from August till May, a loose cocoon being woven on the surface of the ground.

The NARROW-BORDERED BEE HAWK is readily distinguished from the preceding species by the yet more attenuated strip of brown scales fringing the wings; though there was a time here, too, the day of emergence from the pupa, when these wings were fully clothed. It is not so common as the Broad-bordered, and while that, we saw, favoured the south of Britain more than the north, matters are here reversed. It is very swift and strong on the wing. It should be searched for in May. The larva feeds on the field scabious during July and August.

The BEDSTRAW HAWK, alternatively known, though not so happily or so commonly, as the Madder Hawk, is depicted in Fig. 94. It is one of the less common Hawk Moths, being somewhat irregular and erratic in its appearance; but it is a true Briton, not an immigrant. It is to be watched for during June, July, and August: it has a distinct preference for the coast, though flying far inland on its sturdy pinions. Like the other Hawk Moths, it will be found hovering over our garden flowers, honeysuckle, jasmine, sweet-williams, pelargoniums, verbenas, gladioli, and the like. While many other insects scarcely appear before nine or ten o'clock, when the sun has gained power, the Bedstraw Hawk may be found busily breakfasting at early dawn, while the dew is yet on the flowers, not being so much in evidence during the noontide heat, but appearing again in the pleasant twilight at the close of the long summer day. Any bright light has a special attraction for this moth and lures it to its capture.

The caterpillar is out during August and September, busily feeding on the lady's bedstraw found on the sandhills fringing the sea; hence it should be looked for in such localities as Lytham or Cromer, and, of course, many other such spots that will readily occur to the reader. It is a striking-looking creature when fully grown, being of no inconsiderable size, and its deep green coat brightened by a row of yellow circular spots on either side. The pupa is lightly

PLATE XX

161. Fox. *Lasiocampa rubi.*
162. Lappet. *Gastropacha quercifolia.*
163. Oak Eggar. Female. *Lasiocampa quercus.*
164. Oak Eggar. Male. *Lasiocampa quercus.*
165. Drinker. Female. *Odonestis potatoria.*
166. Drinker. Male. *Odonestis potatoria.*

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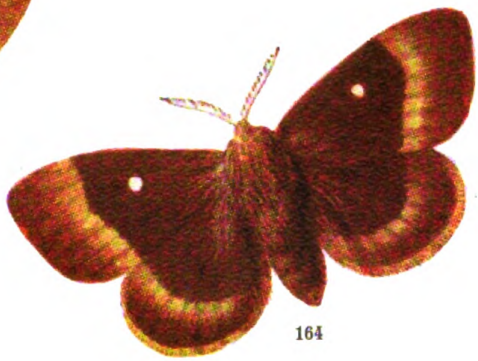

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Plate XX.

buried in the sand or on its surface. The insect is the *Deilephila galii*.

Another *Deilephila*, a closely allied species, very similar in size and general appearance to the Madder Hawk, is the *D. euphorbiæ* or SPURGE HAWK. This has been found with extreme rarity in June in widely scattered localities over England as a wanderer, but more especially near the coast. The caterpillars feed on the sea-spurge during August and September and have been found at divers places around the coast, but it seems to be a species that has great difficulty in getting or retaining a foothold on these northern shores. It is perforce little more than an occasional resident amongst us, though some of the specimens that have been recorded have been bred from eggs laid here, and have therefore full claim to recognition as British.

The PINE HAWK, *Sphinx pinastri*, is another rare species in England ; a fact much to be regretted, since it is a perfect triumph of delicate subdued colouring. The general tone of the upper wings is lavender grey, with stripes and mottling of brown, the fringe being chequered dark brown and white. The lower wings are a warmer brown, fringed as before. The body is grey, banded with black. It is ordinarily in England but a casual visitant, and a rare one even on that footing, so rare that it has been excluded from some British lists ; but it appears to have become naturalised in Suffolk, and may gradually spread over the country. As the larva feeds on different kinds of pine, and does a great deal of damage on the Continent in the woods, its naturalisation here might be received with mixed feelings ; entomologists, who probably are not ordinarily large landed proprietors, taking one view, while very possibly large landed proprietors, who are not entomologists, might take another.

The accompanying table of the genera and species of our British Hawk Moths shows the ground that we have covered, and systematises matters somewhat.

ACHERONTIA . *atropos*

SPHINX . . { *ligustri.* *convolvuli.* *pinastri.*

CHÆROCAMPA { *porcellus.* *elpenor.* *nerii.* *celerio.*

SMERINTHUS . { *populi.* *ocellatus.* *tiliæ.*

DEILEPHILA . { *livornica.* *galii.* *euphorbiæ.*

MACROGLOSSUM { *stellatarum.* *fuciformis.* *bombyliformis.*

We may occasionally come across a small moth that, like the Broad- and Narrow-bordered Bee Hawks, has the greater part of each wing transparent. This will be one of the Clear Wings, or *Sesidæ*. We have in England thirteen of these, but some of them are very rarely seen. They fly in the hot sunshine, and rather resemble wasps, gnats, and other insects, than conform to one's idea of what a moth should look like. Hence all their specific names end in *formis*, meaning in the likeness of. Thus *cynipiformis*, resembling a gall-fly; *tipuliformis*, resembling a midge; *culiciformis*, in the likeness of a gnat; *apiformis*, resembling a bee. The two Hornet Clear Wings are each about an inch and a half in span, the eleven others being but an inch or less.

The caterpillars are smooth, and feed within the stems of various plants, and here, too, the change to the chrysalis state takes place, so in these preliminary stages little or nothing is actually seen of them, though the effect of their work is apparent in the destruction they cause.

If we presently find in our country rambles an insect at rest on a post and bearing a strong likeness to a hornet, it will, if not a hornet after all, be one of the two Hornet Clear Wings, *Sesia bembiciformis* or *S. apiformis*. The former, the OSIER HORNET CLEAR WING, has a very sluggish habit and will be seen more often at rest than on the wing, and when it does fly travels slowly and heavily. It should be looked

for in June. Its larva feeds on the osier and does much damage.

The POPLAR HORNET should also be found in June, and its larva, as the name suggests, lives in the stem of the poplar. *Apiformis* has a yellow head and blackish thorax, with a yellow spot on each side, while *bembiciformis* has the head black, and a yellow collar to the thorax. Their larvæ are over an inch long, and very maggot-like in their soft white bodies.

The larva of the CURRANT CLEAR WING, *S. tipuliformis*, is very destructive to our currant trees, devouring the pith of the more tender branches and is more or less energetically at work from July to May. It has somehow lately got introduced into the United States, and is, wherever it is found, a great pest. The moth is about in June and July. It may be recognised from the abdomen being black and crossed by three yellow belts, the fringed tail being also black. The YELLOW-LEGGED CLEAR WING, *S. cynipiformis*, has four of these yellow belts, while the SIX-BELTED, the *S. ichneumoniformis*, has six narrow bands across the abdomen. The RED-TIPPED CLEAR WING, *S. formicæformis*, found in June and July, is at once recognisable from the patch of strong Indian red on the upper wing, and from the one broad red band that circles the black abdomen, while the COPPER CLEAR WING, *S. chrysidiformis*, a rather local species, has a rich orange colour on the upper wings and base of body. It should be looked out for in June and July in the South of England. It can at once be recognised from this strong copper colour.

CHAPTER V

The Bombycina Group, the Wood Leopard, and Goat Moths—The Cosmopolitan Crimson Speckled—The Various Tiger Moths—Variation in Tiger Coloration—Woolly Bears—The Jersey Tiger settling down in England—The Ermines—Wingless Females—The Gipsy, Fox, Lappet, Oak Eggar, Drinker, Kentish Glory, Emperor, and other Notable Moths—Capture by Assembling—Retardation of Emergence

THE next large group to attract our attention is the Bombycina, a division containing many large and gaily coloured insects. Insects therefore conspicuous, and, moreover, many of them so commonly distributed that even those who pay little regard to these matters can scarcely fail to have seen such insects as the Buff Tip, the White Ermine and the Tiger moths. We must of course remember that our British insects are but a very minute portion of the whole insect life of the world, while they yet form a portion of that whole, and cannot, therefore, be treated as though they stood alone in the world. We have the character as a people of being "insular," but we must not at all events be so insular as that. We therefore find in our classification families in juxtaposition that seem to have but little in common, and this is the time when we must not fail to remember that the intermediate families, which would bridge over the interval, have no British representatives and are therefore missing. Hence, too, while some genera are wanting in our lists altogether others are represented by but one or two species.

The REED MOTH, Fig. 96, of which we represent the male, is less interesting from its beauty than its rarity. The

female has a broader span of wing than the male, while its abdomen is greatly elongated. The larva is found within the stems of the common reed during April, and the moth is due in June and remains till September. The colouring of both sexes is similar. It is during the day a very sluggish insect, and from its colour and habit of clinging to the reed-stems is difficult to detect. At night it flies freely. It is a fen insect exclusively, and was once abundant, but the extensive draining of the marsh lands has made it in these later days much rarer. It is the *Macrogaster arundinis*. The generic name refers to the length of the abdomen in the female, while the specific title indicates that the larva feeds on the *Arundo phragmitis*. Hence it is sometimes known as the *Phragmatœcia arundinis*.

The moth we have represented in Fig. 95 is very aptly styled in popular parlance the WOOD LEOPARD. The sex we figure is the female. The male is considerably smaller, and the antennæ, instead of being simple, as in Fig. 95, are thickly pectinated, or comblike, in the lower half of their length. The wings have a semi-transparent appearance and a lustrous sheen on them, the nervures being very conspicuous. The spots, it will be noted, are deeper in colour on the fore wings than the hind, and the under surfaces repeat the marking of the upper: a somewhat unusual circumstance in moth patterning. The Wood Leopard is very apathetic and sleepy by day, and will allow us to pick it off the palings or trunks of trees on which it is resting, but at night it is alert and flies swiftly. It is a local insect and intermittent in its appearances, but has a special partiality for the outskirts of the Metropolis: we have captured it in the London parks. It must be searched for in July.

The larva of the Wood Leopard is of a yellowish white, much spotted over with raised black dots. It feeds in the burrows that it cuts in the stems of various trees: the elm, poplar, apple, pear, plum, quince, horse-chestnut, ash, sycamore, willow, birch, lilac, holly, walnut, beech, hazel, and oak. It passes into the pupa state in May, within a cavity under the

bark, in a cocoon built up of atoms of wood glued together. The Wood Leopard is the *Zeuzera æsculi* of science. The specific name implies a special association with the horse-chestnut, but this is one of the trees that it seldom visits.

We may sometimes find crossing our path a caterpillar that is noticeable from its size and strong colour, being as stout and as long as one's fore finger ; of a deep yellow beneath, and having a series of large mahogany-red spots forming an almost continuous band along the back. Added to this it is distinctly, peculiarly and penetratingly malodorous, with a rankness that betrays its presence, and enables us to detect it even when it is not visible. This is the larva of the GOAT MOTH, the insect shown in Fig. 97 ; an insect that, large as it is, one rarely sees, as it is only on the wing after dark. The larva, when disturbed, has an aggressive way of lying with the head raised in a very threatening attitude. It lives and burrows in the heart of trees, and is very destructive to timber, since, unlike other caterpillars that are deprived of their food supply in winter, it is at all times in the midst of plenty. Some old writers call it the Auger Worm, as the holes it makes look as though bored by an auger. It remains in this destructive larva state for three years, and, when full fed, gnaws a large cavity, lining it with a beautifully smooth coating of web and sawdust-like wood powder as a home during its two months of pupahood.

When the change to the moth state is imminent the pupa wriggles itself to the outer end of its burrow. We may see, after emergence has taken place, the empty shell half protruding. The larva sometimes passes the winter in the ground, and presently enters upon the pupa stage in a subterranean chamber, lined with silk and macerated earth. It is while searching for a convenient spot for this that we occasionally come across the larva on its travels. The change to pupa takes place ordinarily in April, our experience giving such dates as April 3rd, 6th, and 10th, though another we see did not change till May 3rd. They are very troublesome to rear, as one's patience is tried at having

them in charge for so long a time ; it is useless, too, to attempt to confine them in a wooden box, as they eat their way through in a very short time, while the fœtid odour they give off does not tend to make them more attractive members of the household. The scientific name of the moth is the *Cossus ligniperda*. The ancient Romans found some stout kind of caterpillar, which they called *Cossus*, a toothsome delicacy, and we are asked to surmise that it was probably the larva of the Goat Moth, though it seems difficult to believe that this could be so. The specific name signifies wood-destroying, and is most expressive.

The Goat Moth is really rather common in June and July. One may find it at rest with wings closed over it in roof-like fashion during the day-time on tree trunks, though its quiet colouring aids it to escape detection. The body is very stout, the wings strongly built and far spreading. The eggs are laid under the bark of some tree, and for some time the young caterpillars are content with this, but ultimately penetrate to the very heart of the tree, cutting long galleries in every direction.

The FESTOON MOTH, Fig. 99 being the male and Fig. 100 the female, is so called from the festoon-like lines crossing the upper wings, a marking that will at once identify it. It will be noted that, as is so often the case, the female is the larger insect. The male flies freely, and by day, but the female takes things much more quietly. The dull green caterpillar is to be found on oak and beech, preferably on the under sides of the leaves. It has a curious way of drawing in its feet, so that it appears to be footless, and in its locomotion suggests a diminutive slug. Towards the end of September it spins itself a strong silken shelter amongst the leaves, retiring to it for the winter, not entering the pupal state until the spring. The perfect insect may be found in the oak woods during June and July, but is local, and nowhere very common. The particular specimens we figure are from Abbot's Wood, in Sussex. The

PLATE XXI

167. Kentish Glory. Male. *Endromis versicolor.*
168. Kentish Glory. Female. *Endromis versicolor.*
169. Emperor. Male. *Saturnia carpini.*
170. Emperor. Female. *Saturnia carpini.*
171. Swallowtail. *Ourapteryx sambucaria.*
172. Bordered Beauty. *Epione apiciaria.*
173. Brimstone. *Rumia cratægata.*

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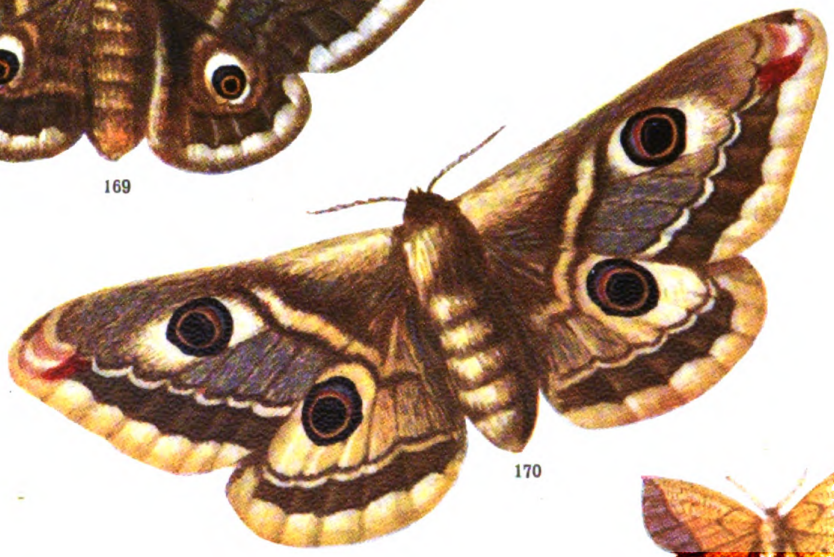

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peculiar structure of the larvæ places them in a special family, the *Cochliopodidæ*, meaning the snail-footed; this family being represented in Europe by only two species. In scientific nomenclature the Festoon moth is the *Limacodes testudo*, the generic name referring again to the snail-like form of the larva, while the specific term *testudo* signifies a tortoise, and yet again refers to its not having visible legs. Alternatively the insect is the *Apoda limacodes*, but here again we cannot get away from the legless larva, the generic name still carrying on the reference to this peculiarity.

The GHOST SWIFT is one of our decidedly common insects, being abundant almost everywhere in the country, and even visiting our suburban gardens. The male, considerably less in expanse than his spouse, is of a silvery whiteness, and flits along the hedgerows in ghostly fashion in the dusk. It hovers apparently aimlessly in one spot, and from time to time suddenly disappears, reappearing as mysteriously. Uncanny as this performance may appear to superstitious rustics, it is capable of easy explanation. When in flight the white upper surfaces of the wings are the visible part, but when alarmed or resting it suddenly drops to the ground, and is lost to sight in the vegetation. Our illustration, Fig. 98, portrays the female, and it is her presence, invisible to us in the dusk amidst the sheltering grass, that explains the attraction her partner finds in one particular spot. The orange markings on the tawny wings differ considerably in different specimens in their strength and clearness of definition. The very small antennæ will be observed.

The caterpillars of the Ghost Swift feed throughout the winter on the roots of various common plants, such as the burdock, dandelion, and stinging nettle. It has also a taste for the hop, a penchant which the hop-grower rather resents. The scientific name of this species is the *Hepialus humuli*. The generic name, Greek in its origin, signifies a fever, and refers to the fitful, restless habit of the moth; while the specific

title refers to the *humulus*, the hop. We have in England four other species of Swift; but our space entirely forbids detailed mention of each of the two thousand species or so of moths within our borders, and some must perforce go unwept, unpictured, and unsung.

The pretty little moth we represent in Fig. 101 is doubly named, being either the Rosy Footman or the Red Arches. Why rosy seems fairly evident; why footman not evident at all. The second name, Red Arches, is distinctly unfortunate, since the moth is red all over, saving the arches, and these are black. It will be found in June or July. The dull brown hairy little caterpillar is a lichen-feeder on the oak, beech, and birch; hatched out about the end of June, and then feeding pretty steadily on until the end of the following May, a period of eleven months. The pupa will then be found enveloped in a loosely woven cocoon. The insect is of a rather sedentary disposition all day, but wakes up at night. It is widely distributed in woods and high-hedged lanes; it is very abundant, we know, in the New Forest. Our little Red Arches is in scientific lists the *Calligenia miniata*. The generic title is meaningless entomologically, being a classic epithet applied to Demeter; while *miniata* signifies red lead. The delicate rosy-red of this pretty little moth is scarcely done justice to by such a comparison. Its older name of *rosea* was on this ground much to be preferred.

The Dew Moth, *Setina irrorella*, Fig. 102, is another attractive little species that, if we only go to the right place for it, is by no means uncommon. Its wings are of delicate texture, and but lightly clothed with scales. The Dew Moth is found in open woods during July and August, but generally near the coast. The female is considerably smaller than the male, but is in colour and markings similar to it. The insect is of sluggish temperament, and it is suggested that when at rest suspended from a blade of grass or the stem of some plant, its semi-transparent wings give the idea of a dew-

drop, though others tell us that it derives its popular name from its early flight in the dew-laden morning. Dewdrops, in the country, at least, are not of a dull orange colour, and it would perhaps be simpler to say that we cannot now tell what induced people a hundred years ago to give it its popular name. The larva is a lichen-feeder, and is full fed in May.

The ORANGE FOOTMAN, *Lithosia aureola*, Fig. 103, is not a very common species, but it is widely distrbuted, and should be searched for in fir plantations and beech woods, and especially in the south. During the day-time it dozes, but if we shake the branches vigorously we can dislodge it, when it falls, and then, like the last species, shams death; but at dusk it becomes quite lively. The caterpillar feeds on the brightly coloured lichens that we see clothing the fir trees and beech trunks.

The FEATHERED FOOTMAN, Figs. 104, 105, though fairly common abroad, is exceedingly rare in this country, so if any of our readers come across it they may indulge in much self-gratulation. Though probably only a very occasional migrant, it has been found as far north as Anglesey. The sexes are very different in appearance, the male being deeper in the ground colour of both the upper and under wings; while the female has but a few small black dots on the fore wings as a set-off to the elaborate stripings of the male. Scientifically it is the *Eulepia grammica*, or, alternatively, the *E. striata*, both specific titles referring to the lining or striation of the wings in the male insect.

The two insects we have represented in Figs. 106, 107, though so different in appearance, are the same species, being the male and female forms of the FOUR-SPOTTED FOOTMAN. It is the *Lithosia quadra*, or, according to other classificators, the *Gnophria quadra*, or *Œnistis quadra*. The specific name, it will be seen, remains the same all through, and it is rather curious that this should be so, since it was bestowed by Linnæus under a misapprehension. The word refers to the four spots seen on the wings of the female, Fig. 107. The

male, it will be observed, has no such spots, and it is obviously a weak definition that in half its applications fails to define. Linnæus, in fact, not aware of the relationship, thought the male to be a distinct species, and bestowed an entirely different title on it. From its comparatively large size amongst the *Lithosia* genus it is also often called the Large Footman. It occurs in July and August in the woods, and, though widely distributed and often abundant, is somewhat local. It is in size a rather variable insect. It is very sedentary in day-time, and, from its habit of enfolding its wings around its body, might easily be passed as a curled-up and withered leaf. The particular specimens we figure were reared from New Forest larvæ. The upper wing of the male is dull in colour, but a thin strip along the outer edge is shining. It is difficult to express this in colour on this small scale, but it is very evident when the insect is in one's hand. It is the dark part in the drawing, but in some lights it looks lighter than the rest, and we then see that it has a metallic lustre. The very dark streaks at the base of the upper wings look nearly black, but this, too, at certain angles is seen to be a very deep metallic blue-green. The way some of the grey of the upper wing has its counterpart in the lower is very curious. The apparently black spots on the wings of the female are seen to have the same rich metallic gloss in some lights.

The larva feeds on lichen on the beech, oak, and apple, from August to July. Its quiet grey and black colouring with a few points of brighter colour harmonise admirably with its surroundings, and is of great protective value. The hairs of the larva we find on handling it have an urticating quality causing a very painful and stinging sensation, to which some people, the thin-skinned, are much more exposed than others. When we rear the caterpillar in captivity it develops a cannibalistic desire to devour its companions. The shining black pupa rests within a loosely woven cocoon, spun beneath some sheltering moss or lichen.

In Figs. 108, 109, we find another instance of the great diversity of appearance sometimes seen in the sexes of one and the same species, Fig. 108 being the female, and Fig. 109 the male of the CLOUDED BUFF. This, like the preceding, was one of the occasions when the great Linnæus, from imperfect knowledge, thought that he was dealing with two entirely different species, and therefore gave the two sexes distinctive names. The female, contrary to general rule, is smaller than the male, the disparity, in many cases, being greater than our drawings indicate. It will be noticed that the male has the antennæ fringed. It is much more frequently seen than the female. Our examples came from Broadwater Forest, near Tunbridge Wells, but it is a species that may be found pretty freely amidst the heather and fern on rough common land in various parts of the country. It is the *Euthemonia russula.*

The curious moth shown in Fig. 110, the CRIMSON SPECKLED, though rare in Britain, is almost a cosmopolitan, being equally at home in Europe, Asia, Africa, Australia, New Zealand, the Philippines, and New Guinea. We can, in these northern islands of ours, regard it as but a migrant that fails to really establish itself, though almost every year we have records of its appearance. In one year recently thirty were recorded, and we may take it that a good many more escaped recognition, as to gain this recognition it is necessary not only to have the insect to hand to catch, but also some one who can identify the moth, and who will know the value of the capture and duly report it. It is naturally more to the fore in the southern counties and in localities near the sea[1] than in more northerly districts. Still, it has made its appearance in Yorkshire and Lancashire, and has even once or twice been notified from Scotland and Ireland. Like many other folk it has found its way to London, and has been reported from Wandsworth and

[1] To give but a dozen localities where it has been more or less freely found: Lulworth, Ventnor, Brighton, Hastings, Worthing, Folkestone, Eastbourne, Dover, Deal, Swanage, Felixstowe, Bournemouth.

other metropolitan districts. It seems to have a special partiality for flitting along stubble fields, and should be carefully watched for during June and again in September. The two sexes are similar in their marking, but the males are the smaller. When an insect has many markings there is naturally some variety in their size and distribution, and the Crimson Speckled is no exception to this. The spots are many of them of a curiously square form, arranged irregularly, but in recognisable rows alternately red and black in colour; five of the former, six of the latter.

The caterpillar, greyish in form, an inch or so in length, and scantily covered with hair, is marked with red and black streaks and spots, in curious general agreement in colour with the moth. It feeds in Europe on plantain, bugloss, field forget-me-not, and grasses, but being world-wide in its occurrence must needs have a very extended dietary. It is found in June and July, and again from October to May. The pupa is enclosed in a cocoon. The insect is the *Deiopeia pulchella*, Deiopeia being one of the handmaidens of Juno, while the specific name *pulchella* signifies beautiful.

Plate XIV. is devoted wholly to the CINNABAR MOTH in its larval, pupal, and imaginal conditions, together with its food plant, the ragwort. It is the *Euchelia jacobææ*. The generic name, Greek in its derivation, signifies well and a claw; wherefore, the writer knows not. The specific name testifies to the association of the caterpillar with the ragwort. One sometimes finds *Callimorpha* or *Tyria* as alternative generic titles. It is an insect that varies singularly little, though the two tints are sometimes each paler than we figure, being then of a pale pink and a nearly lavender-grey. We sometimes, however, as in Fig. 118, have the crimson eliminated, replaced by light yellow. The two sexes are similar in colouring, and, curiously enough, for it is a very exceptional circumstance amongst butterflies and moths, the under side in this species agrees with the upper in tint. It is a night-flying moth, passing its days in

lethargy, and when disturbed flutters away a few feet and drops again amidst the low-lying plants of the hedgerow. This beautiful moth is very generally distributed in England, though in Scotland it is a pearl of price. It settles on the herbage by the roadsides and lanes, and visits our gardens, and is sometimes in such profusion that hundreds might be collected in a half-hour stroll.

The caterpillar, Figs. 111, 112, 113, 114, is brilliant in yellow and black, and will be found in July and August. It is gregarious, and may be seen sometimes in the greatest profusion, stripping plant after plant, though Nature has assigned to it five distinct species of ichneumon fly, having as their function the keeping of this larva within reasonable bounds. Those utilised by ourselves for the due setting forth of the life-history of the moth, in Plate XIV., we obtained on the banks of the Thames at Mortlake, where they could be procured by the hundred. It may occasionally be found feeding on coltsfoot or groundsel. The pupa, Fig. 117, which is sometimes subterranean, sometimes concealed under dead leaves, is noticeable for its very small size.

We have, in Fig. 124, a representation of one of our most beautiful moths, the SCARLET TIGER, and, associated with it, its larval and pupal forms. Fig. 125 is its appearance when at rest, the brilliant under wing being then concealed. The deep rich green of the under wing has, when seen at varying angles, a beautiful metallic sheen. When examining in any collection a series of these charming insects, we notice that while there is a strong general similarity there is also a considerable variation in the size and shape of the markings, the spots on the fore wings being sometimes so coalescent as to give a much lighter general effect than we see in Fig. 124. A very distinct variety, known as *rossica*, is sometimes seen, in which the rich red of the abdomen and lower wings is replaced by an equally rich yellow; a feature which we see again in the Common Tiger and the Jersey Tiger, allied specimens which we figure a little later on.

PLATE XXII

174. Orange. Male. *Angerona prunaria.*
175. Orange. Female. *Angerona prunaria.*
176. Speckled Yellow. *Venilia maculata.*
177. Light Emerald. *Metrocampa margaritaria.*
178. Scalloped Hazel. *Odontopera bidentata.*
179. Scalloped Oak. *Crocallis elinguaria.*
180. Lilac Beauty. *Pericallia syringaria.*
181. Early Thorn. *Selenia illunaria.*
182. Lunar Thorn. *Selenia lunaria.*
183. Large Thorn. *Ennomos alniaria.*

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One may, but much less commonly, encounter the variety *persona* in which the black spots of the lower wing nearly or absolutely join, and almost or entirely blot out the red. It is an insect, too, that is somewhat variable in span of wing, some we have measured being less than an inch and a half, others well over two inches. Our figure, No. 124, may be taken as typical, the happy medium both in size and marking. The Scarlet Tiger will be found, though it is somewhat a local species, in damp woods during June, and flying freely in the day-time.

The larva, Figs. 121, 122, is a handsome looking creature, and may be found from August to the following May. It feeds on the hound's tongue, thistle, nettle, and other low plants. Ours we have generally nourished on the white dead nettle, the plant we here figure. The pupa, Fig. 123, is spun up in a thin-textured, light-coloured cocoon amongst the hedge-row dead leaves and odds and ends, and in a little over three weeks we are rewarded by seeing, in all its bravery and beauty, a Scarlet Tiger. It is the *Callimorpha dominula*, the first title referring to its beauty of form, the second to its queenly splendour of colouring.

The Wood Tiger, Figs. 119, 120, is a very handsome and widely distributed moth that we may find flying freely and rapidly in the sunshine in open woods and over heath land during May and June, but having a partiality for limestone and chalk districts. While it is perhaps especially common in the south, we have had it reported from the Shetlands. The specimens we illustrate came from a midway point, the golf ground at Llandudno. It will be noticed that in Fig. 119 there is much less of black at the base of the lower wings than in Fig. 120; this is a sexual distinction, Fig. 119 being the male coloration. It will be noted, too, that the antennæ are pectinated in the male. The Wood Tiger is a rather variable insect, the pale colour on the upper wings being sometimes almost or quite white, and sometimes of a deep cream colour,

and varying much in amount, some specimens having the black and others the yellow greatly preponderating. We may sometimes, though rarely, find a variation in which the hind wings lose their deep yellow, and are of the same strength, or want of strength, as the cream-coloured fore wings.

Though the coloration, as we see it in our figures on white paper, appears very strong, it is in the normal conditions of the moth's life really protective. When one finds the Wood Tiger at rest, the pale yellow markings are very suggestive of a piece of withered fern, while the black seem so like the dark background between the leaves that one might readily overlook the insect entirely. The dull brown caterpillars are hatched at the end of August, and presently hibernate, reappearing and resuming feeding about March. The food plants are numerous; the specific name, *plantaginis*, suggests that the plantain is the favourite, but the larvæ are equally willing to take chickweed, nettle, etc. By about the third week of April the caterpillars are full fed and ready for the next stage of their history, spinning a thin grey cocoon amongst the leaves, through which we presently clearly see the pupa. Scientifically the insect is the *Chelonia plantaginis*, though some authorities invite us to consider it as *Nemophila plantaginis* instead.

One of the commonest, and at the same time gayest in colouring, of our moths is the COMMON TIGER, of which we give in Fig. 127 the typical colouring. This brilliant insect must be familiar to every one, and has probably in not a few cases been the starting point of an interest in things entomological. When at rest the fore wings, as we see in Fig. 133, drop over the yet more brilliant hind wings, and it is under these conditions that we more ordinarily make acquaintance with it.

The Tiger Moth is an insect that, at least when reared in captivity, is peculiarly subject to variation, Figs. 128, 129, 130, 131, 132, 134, 136 being all interesting modifications from type. The cause of these variations it is impossible to say; the larva, for instance, from which the widest departure of any

of our illustrations from type was developed, was treated by us in exactly the same way as many others that produced entirely normal forms, and yet how strikingly different the coloration! It would naturally suggest itself that a difference in the food plant would be of influence, but we know of a case where an enthusiast gathered round him a family of over two thousand of these Tiger Moth caterpillars, and divided them into six lots, feeding one set exclusively on butter-bur, another on willow, another on plum, another on dock, and yet another on hawthorn, while the remaining lot he supplied with a varied diet of bramble, nettle, lettuce, chickweed, and other things, the final result being that no connection whatever between the variations and the dietary could be detected.[1]

The great hairy caterpillar of the Tiger Moth is popularly known as the Woolly Bear. When disturbed it promptly rolls itself up hedge-hog fashion. We have been warned by rustic observers of our proceedings that these caterpillars are diabolically poisonous, and that, if we once allowed one to coil itself round our finger we should never get it off again, the creature, with malignant satisfaction, ever tightening its grip as we wasted away. As we have handled hundreds, and live to tell the tale, we imagine a mistake has crept in somewhere. We may warn any readers who propose to set up a colony of these larvæ that their appetites are phenomenal, and that if they be not well supplied with food they may develop cannibalism, not, indeed, devouring each other as fellow caterpillars, but attacking those that have reached the pupal state. As seven different species of ichneumon flies devote themselves to their destruction, one must be prepared for disappointments now and then, a host of little parasites being possibly the final outcome of all our care. The pupa is enclosed in a dull yellowish cocoon spun up with silk and hair. If we examine the hairs of most of these hirsute

[1] The collection of a Mr. Harper was sold by auction in 1884. It was a wonderful exhibition, variation being the collector's hobby. His Tiger Moth examples alone realised nearly £90.

caterpillars with a microscope, we find—and the present is no exception—that they are fringed with small spines, so that they mat together very readily and form a felting of much strength. Old writers call this species the Great Tyger. One authority suggests that the moth is called a tiger because it is spotted, but as tigers are not spotted the derivation seems lacking. The Common Tiger Moth appears to be common almost everywhere—as well known in Japan as in England. It is a very sluggish moth by day, but wakes up into activity at night. It is the *Arctia caja*, or, as some would have it, the *Chelonia caja*.

Like the preceding species, the CREAM-SPOTTED TIGER is subject to considerable variation in the disposition, size, and number of its markings ; but, unlike that, does not much vary in its colouring, though we have seen a specimen in which the hind wings were the same pale cream tint as the fore, and another on which the spots on the fore wings were pure white. These, however, were very exceptional cases, while most singular of all was one that had no markings on it at all, but was all over of a warm dark brown colour, so that only from its having been reared amongst a brood of normal larvæ, from which it was in that stage no way differentiated, could it have been known as a Cream Spot at all. Fig. 135 may be taken as a typical example, while Figs. 137, 138, 139, 140, are variants that we have come across. It is a brilliant-looking insect ; not at all the dingy combination of greys and browns that some non-entomological folk assume that a moth must necessarily be. It may be found during May and June sedent on hedge-banks, starting off readily if disturbed, raising no difficulties as to hot sunshine, in fact, rather basking in it, but developing its true energy at night-time. It is often captured after dark by the attractive force of a strong light. It is fairly generally distributed in the south, but is somewhat local.

The caterpillar of the Cream-spotted Tiger is velvety black, red-headed, thickly clothed with long reddish hair, and, when

full fed, two inches long. At the close of summer it seeks a hole in the bank, and lies dormant till March. Its favourite food is chickweed, but it will take dandelion, dock, plaintain, groundsel, milfoil, and several other common plants. Like its brother, *caja*, it prefers cannibalism to starvation. The change to pupa takes place in the beginning of May within a greyish white loosely woven cocoon, and the perfect insect emerges about three weeks thence. The Cream-spotted Tiger is the *Arctia villica*, or, as others would tell us, the *Chelonia villica*.

The little insect, Fig. 141, bears a name that, in its jewelled significance, may give rise to some little disappointment when one sees the moth for the first time ; for if merely Common Tigers are so splendid in their colouring, Cream-spotted Tigers so richly apparelled, what may we not expect when a RUBY TIGER shall at last burst on our expectant gaze ? Its specific name, too, *fuliginosa*, has a suggestion of refulgence about it, and it is somewhat of a shock when we presently remember that *fuligo* is, after all, but Latin for soot, and that the name is bestowed as indicating the suffusion of black on the lower wings. This black sometimes, instead of being a bordering, spreads over the whole wing, or at other times breaks up into a row of detached spots. One may sometimes see a variety where the general reddish tinge is replaced by yellow.

The Ruby Tiger must be sought for in June, July, and August in the open spaces in woods, on the hill sides, and open commons ; it may not uncommonly be met with, and it is fairly generally distributed over the country. It does not seem to fly much by daylight, but is active on the wing at night, and comes very readily to light. The wings, especially the upper ones, are very thinly clothed with scales, giving it a semi-transparent look that leads the novice to think that he has captured a much rubbed specimen.

The larva of the Ruby Tiger feeds on hound's tongue, ragwort, and various other low plants, lying dormant during the

winter, and possibly spinning a slight cocoon in some cranny of the old wall, some crevice in the fencing. While all agree as to the specific name, its generic name is *Phragmatobia*, or, maybe, *Arctia*, or, perchance, *Spilosoma*, according to the authority on whom we pin our faith.

In Figs. 144, 145, we have yet another Tiger, and a very interesting and beautiful one. We have had to lament over and over again how certain species, such as *machaon*, are growing ever scarcer ; how others, as *dispar*, appear to be absolutely lost to us ; but here we have something distinctly to the good, an item on the credit side. While this beautiful moth was at one time only British politically, coming no nearer to us than the Channel Islands from the Continent, it is now, how we cannot say, firmly established in Devonshire, and we may trust that it will ultimately, if not too extravagantly assailed, find its way over the length and breadth of the land. The first welcome stranger landed at Newhaven in the year 1855, and it would be interesting to know that he returned home and gave a good report of the new land ; but truth compels us to state that, having a pin stuck through his thorax, he remained in the land of his adoption. In 1859, 1871, 1877, 1881 others found their way to our shores, and since 1882 they have been yearly visitants, and more specially abundant in 1901, until at last it is no exaggeration to say that, during the last dozen years or so, thousands have been taken or bred from the district around Starcross and Dawlish, one entomologist we know of having himself captured or reared over two hundred. Fig. 145 is the typical JERSEY TIGER, *Callimorpha hera*, while Fig. 144 is a very common variety, *lutescens*, in which the red of the lower wing gives place to yellow. A regular and complete gradation of colour between these two extremes may be met with. It is very curious that, whereas on the Continent and in Jersey the *lutescens* variety is distinctly rare, about thirty per cent. in England are of this type. The Jersey Tiger is somewhat lethargic, and is generally captured by beating the hedges, and

so driving it into the open; still, it sometimes flies freely in the sunshine.

The larva of the Jersey Tiger, to be searched for from September to May, keeps out of sight all day, being a night-feeder. Like its fellow Tigers, it develops cannibal tastes under pressure, but its natural food includes such a varied *menu* as dandelion, borage, lettuce, scorpion grass, ground ivy, groundsel, honeysuckle, dock, comfrey, celandine, plantain, white and red dead nettles, raspberry, dog rose, and coltsfoot. The pupa may be found enveloped in a very slight cocoon on the ground under dead leaves, moss, or general hedge-happenings.

One of the commonest of moths on the country side is the subject of Fig. 142, the WHITE ERMINE. We find it at rest during the day in a very lethargic condition on palings, walls, tree-trunks, and so forth, and it is often a visitor to our gardens. If we touch it, it remains motionless, pretending to be dead. After darkness sets in it develops considerable energy, and it is very susceptible to the alluring power of light. It varies considerably in appearance, some specimens having an almost total absence of black dotting, while in others these dots are very numerous, and sometimes even become elongated dashes or streaks. This extreme form is the variety known as *walkeri*. Fig. 142 may be taken as the happy medium and type-form.

The small, globular, pale green eggs of the White Ermine may be seen in May in compact clusters on the elder. The resulting larva is hairy, of a general dark brown, with black spots, and having an orange stripe on its back. It is out during July and August, and is practically omnivorous, though elder would appear to be the prime favourite. The specific name nevertheless implies that wild mint occupies this favoured position. We see in our notes records of the pupal state being reached on July 27th and on September 2nd—a considerable margin of time; and a corresponding difference in dates of emergence—March 14th and May 26th. The

PLATE XXIII

184. Canary-shouldered Thorn. *Ennomos tiliaria.*
185. Dusky Thorn. *Ennomos fuscantaria.*
186. Purple Thorn. *Selenia illustraria.*
187. Brindled Beauty. *Biston hirtaria.*
188. Oak Beauty. *Amphydasis prodromaria.*
189. Peppered. *Amphydasis betularia.*
190. Waved Umber. *Hemerophila abruptaria.*
191. Pale Oak Beauty. *Boarmia consortaria.*
192. Great Oak Beauty. *Boarmia roboraria.*
193. Small Emerald. *Iodis vernaria.*

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Plate XXIII.

White Ermine of popular parlance is scientifically the *Spilosoma* (or alternatively, the *Arctia*) *menthastri*.

The White Ermine varies in strength of ground colour from almost pure white to a strong cream—this latter a tint which we find yet more emphasised in the equally abundant BUFF ERMINE, Fig. 143, sometimes called the Spotted Buff. The male in this species has the antennæ toothed, and is stronger in tint than the female. Our figure is of the former sex. The patterning in this species is much more definite than in the last, since we find on the costal edges two dots, while others form a definite chain across the fore wings. These sometimes blend together into one continuous waved band. It will be noted that in both the Ermines the markings on the hind wings are few in number.

The Buff Ermine is an insect that varies somewhat freely from what we may accept as a type-form, both in more or less strength of colour and fewer or greater number of spots. One example before us as we write has, we see, only four small spots at the outer end of what would ordinarily be the freely furnished line across the wings, and only the first two at the inner end. The markings on the upper and under surfaces of the wings in the Buff Ermine ordinarily repeat each other, and it is curious that in the particular specimen we are referring to the spots that should normally be present, and are not, on the upper surface yet appear in their proper places below. We occasionally get the spots on both wings so developed and confluent that the black is greatly in excess of the cream-colour, the result being an entirely different-looking insect.

At the beginning of July we find the compact group of little green eggs beneath various leaves, and these hatch about the middle of the month, when the caterpillars may be found on plantain, dock, rose, nettle, willow-herb, dandelion, chick-weed, cabbage, and many other things. Though ordinarily on low-lying things, we have known of their being found on Virginian creeper some twenty feet from the ground. In

September the caterpillar weaves for itself a pupal home, and presently, in May or June, the moth emerges, and the cycle of life is complete. Like the Woolly Bear and other caterpillars of this family, the *Chelonidæ*, it is an active, restless creature in the larval state, and the specific name of the Buff Ermine, meaning swift-footed, testifies to this. The moth is the *Spilosoma* (*Arctia*) *lubricepeda*.

In the MUSLIN MOTH, Fig. 148, the wings are diaphanous, the fore wings being specially thinly clothed with scales. In the insect before us as we write we can see, through its wings, the label below it indicating its place of capture, Tal-y-Cafn—a detail we have forborne to reproduce in our illustration, lest haply some one, ignoring our text, might be under the impression that all Muslin moths bore this as a distinctive marking. The male is of a smoky black, the female, the sex we figure, of a smoky white, the difference—shall we say?—between muslin curtains urban and suburban. The body and wings are of like colour. The moth may be seen during May and June, and is in most places one of our common species. Like all these spotted moths, it varies somewhat in the more or less of number and of size of these markings. The larva, as in the case of most of its fellows in this group, is practically omnivorous, so long as the dietary is vegetable in its origin. The Muslin Moth is in the entomological lists the *Spilosoma* (or perhaps *Diaphora*) *mendica*. Why it should be thus labelled as a mendicant, who shall say?

For perfect charm and brilliancy of tint nothing can surpass the WHITE SATIN MOTH. Here at all events there is no talk of smoky black or smoky white—nothing but a superlative seems sufficient to indicate its most delectable purity of coloration. The wings have a lustrous, satin-like sheen upon them, and are absolutely and entirely without spot of any other colour upon them. The moth is ordinarily in great abundance in July and August. The eggs are deposited in mid-July on the bark of various trees, and a white silky

network covered over them. On emergence, some three weeks later, the duty of their lives begins—to demolish as much foliage as possible—and this they perform very effectually, concealing themselves in the winter, but coming forth again in the spring, and not being full fed till the beginning of July, the result being that they are regarded as amongst our noxious insect-plagues. These caterpillars seem to have a preference for various kinds of poplar and willow. One can take them in hundreds from the willows, for instance, on the towing-path at Hammersmith. A web is presently spun for the change to the pupal condition, either in the crannies of the tree-trunks or binding the foliage together. In stripping the foliage from the trees, they not only render them very unsightly, but do them absolute harm, so that when for several years in succession the caterpillars resume their devastation, the younger and weaker trees perish. Several birds—the tomtit, flycatcher, and others —zealously search in the crevices of the bark for these larvæ. It is stated that this caterpillar is less exposed to the attacks of ichneumon flies than many others, but as far as our own experience goes in rearing up the Satin Moth, we have been rewarded with a considerably larger percentage of active young emergent parasites than we at all appreciated. In the family to which the Satin Moth belongs, and which includes the Yellow Tail, Vapourer, Black Arches, and some few other species, not only are the larvæ clothed with hair, but the pupæ are no less hirsute—a very exceptional state of things.

The YELLOW TAIL MOTH, Fig. 147, pretty little thing as it is, is another of the insects that are destructive in their larval state, often doing much damage in our orchards, though fortunately it is some years much less abundant than in others. The moth puts in an appearance about the end of June, and is in the day-time so torpid that it can easily be handled. The eggs, gold in colour, and very numerous, are laid in a compact mass and then shielded with yellow hair gathered from the abdomen, and from thence emerge by the end of July the larvæ.

They commence life a dull yellow, with rows of blackish dots, but at the end of their career are black, with dorsal scarlet lines and white spots. They are at first gregarious in habit and spin for the colony a noble joint web, drawing the leaves together and forming a domicile, in which they are sheltered from bad weather and other foes to their well-being. From this nest they sally forth for food, and to it they return when in need of a refuge, and in this habitation the winter is passed. On the bursting of the buds in spring the community is broken up, and the larvæ disperse over the orchard or hedgerow; but in June, on entering the pupal state, from three to a dozen join in weaving a common cocoon for their shelter. The food of the larva is very varied and includes the foliage of the plum, pear, apple, blackthorn, hawthorn, beech, elder, oak. Grub-eating birds will have nothing to do with them. Any one touching these larva with the naked hand will find that their hairs have an irritating property that no doubt explains the aversion shown by the birds. The Yellow Tail is as well known in India, Java, and Japan, as in Sussex; it is the *Porthesia* (or according to some authorities the *Liparis*) *auriflua*.

An allied species, the BROWN TAIL, the *Porthesia* (or *Liparis*) *chrysorrhœa*, though not so common as the preceding insect, is sometimes too much in evidence for the comfort of the fruit grower. Like the Gold Tail Moth, its visits are somewhat intermittent, some years producing it in great abundance. Curtis tells us that in 1782 people were employed to gather in the webs and their contents at a shilling a bushel, eighty bushels being gathered in one day in Clapham, while prayers were offered up in the churches for the removal of so great a plague and to avert the famine that was anticipated. The Brown Tail Moth is spotlessly white, lustrous like satin, and with an anal tuft of golden brown. It is similar in size to the preceding species.

One of the commonest of all our moths is the VAPOURER, Fig. 150. This may be found from June to October in the

hedgerows, and no less plentifully in our gardens, and even in the London parks and squares may be freely encountered. It is rather small certainly, so that some of our readers may have disregarded it, but the spot of clear white on the rich brown wings will in future suffice for them to identify it. The male, the sex we figure, is most energetic, flying freely all day in the sunshine, but when at rest it is scarcely visible owing to its close resemblance to a dead leaf. The female is practically wingless, and not like a moth at all. On closer inspection very rudimentary wings, mere flaps of an eighth of an inch long, may be noticed. She is entirely quiescent, not to say downright torpid, never leaving the place of her emergence; dilated with a great number of eggs that are laid and hatched at intervals, so that one may find all through the summer the insect in all its stages. Other examples of these apterous females may be seen in the pale Brindled Beauty, the Belted Beauty, the Mottled Umber, the Scarce Umber, the Spring Usher, the Winter Moth, and the Brown Muslin, and this by no means exhausts the list.

The larva of the Vapourer may be found on almost everything from May to September; we have known it on sallow, hornbeam, poplar, hazel, oak, elm, alder, bramble, blackthorn, apple, plum, rose, sunflower, marigold, strawberry, and lime, the latter appearing especially popular. It is of a delicate lavender grey, with a good deal of lateral crimson spotting, with four very conspicuous upright tufts of hair, like brushes, on the back, and other more slender and longer tufts fore and aft, each of these hairs being thickened and tassel-like. The pupa, enclosed within a silken cocoon with hair interwoven, is of a glossy brown, and bearing numerous tufts of short, whitish hair. It may be found adherent to old walls, tree trunks, and the like. The moth is the *Orgyia antiqua*, but why it should be held to be more antique than other moths, it is hard to say.

If we find an insect very Vapourer-like in appearance, but with the fore wings having a yet richer and more varied

mottling of yellow and brown, if the hind wing be considerably deeper in colour, if the white spot be somewhat less conspicuous and accompanied by some few smaller white spots near the tip of the fore wing, we have chanced on the SCARCE VAPOURER, *Orgyia gonostigma*. Here, too, the female is wingless, being scarcely more than an egg-holder. The male is on the wing during June and July, but the species is, as its popular name implies, not ordinarily to be found. The specific name means angle spot, in reference to the white mark near the lower angle of the fore wing, but this name might much more happily have been bestowed on the common Vapourer, since there this spot is a most prominent and distinctive feature, while in the allied species it is but one spot out of several.

THE GIPSY MOTH has for some time been growing less and less common, and must now be counted amongst our rarer insects. We have in Fig. 146 the female, and in Fig. 149 the male form. The difference in size, coloration, and stoutness of abdomen is very marked. Hence the moth is specifically called *dispar*, a Latin word from which we get our English word disparity. It is unfortunate that the Great Copper Butterfly is, as we have seen, also called *dispar*. The male insect flies by day while the female is quiescent on tree trunks or amidst the foliage. They should be searched for in July or August. The eggs are laid in August and September, some three or four hundred together, and are covered with fine down from the maternal body and thus preserved from the rigour of winter, and in the spring the caterpillars are hatched. They feed on oak, willow, elm, lime, hawthorn, and various fruit trees, and on the Continent are found to be very destructive. By the end of June they are fully grown, and have a way of lying extended on the tree trunks that rather facilitates their detection. They presently spin a large loose cocoon.

For purposes of experiment some of the Gipsy Moth eggs were imported into the United States, as it was thought that

the moth might be of value as a silk producer, but the result was disastrous. Holland, an American entomologist, tells us that the legislature of Massachusetts has in recent years been spending hundreds of thousands of dollars in the attempt to exterminate this moth. The matter is, however, quite hopeless, and it will no doubt spread all over the States, so that we may be well content to know that in England the moth seems scarcely able to hold its ground.

The BLACK ARCHES MOTH, like the Gipsy, is on the Continent very abundant and very destructive. In England, while it is widely distributed, it is local, and is not in such profusion as to be regarded as a noxious insect. It comes very freely to sugar, and finds strong light quite irresistible.[1] The male is represented in Fig. 151, while Fig. 152 depicts the female. It will be observed how strongly pectinated the antennæ of the male are as compared with those of the female ; on closer examination it will be seen that the antennæ of the male are really bi-pectinated, each of the lateral rays having itself a fringing. The female is a considerably larger insect than the male, and the difference in form of the abdomen is very marked. The black arch-like markings that give the moth its popular name are very obvious in our illustrations, but one sometimes finds several of them suppressed, or in other cases so large and so suffused that the whole wing is of a deep smoky grey, plus yet deeper markings on this ground work. It is an insect of the woods, and quiescent by daylight. It is on the wing in August. While some would give it the generic name of *Psilura*, others would have it *Liparis* or *Ochneria*, but all agree in adopting the specific name *monacha*. This word, signifying a nun, refers to its garb of black and white. When at rest its

[1] An observer in Germany, by aid of the electric light, captured 16,484 moths in two nights, these being of forty-one different species. Of these 8,591, or speaking roughly half, were Black Arches, the other half being divided amongst the other forty species. The proportion of males to females was nearly thirteen to one : 7,985 males, 606 females.

PLATE XXIV

194. Large Emerald. *Geometra papilionaria.*
195. Essex Emerald. *Geometra smaragdaria.*
196. Common Emerald. *Hemethia thymiaria.*
197. V-Moth. *Halia vauaria.*
198. Common Heath. *Fidonia atomaria.*
199. Frosted Yellow. *Fidonia conspicuata.*
200. Bordered White. Male. *Fidonia piniaria.*
201. Bordered White. Female. *Fidonia piniaria.*
202. Blood Vein. *Timandra amataria.*
203. Clay Triple-lines. *Ephyra trilinearia.*
203A. Maiden's Blush. *Ephyra punctaria.*
204. Yellow Belle. *Aspilates citraria.*
205. Currant. *Abraxas grossulariata.* Variation.
206. Currant. *Abraxas grossulariata.* Variation.

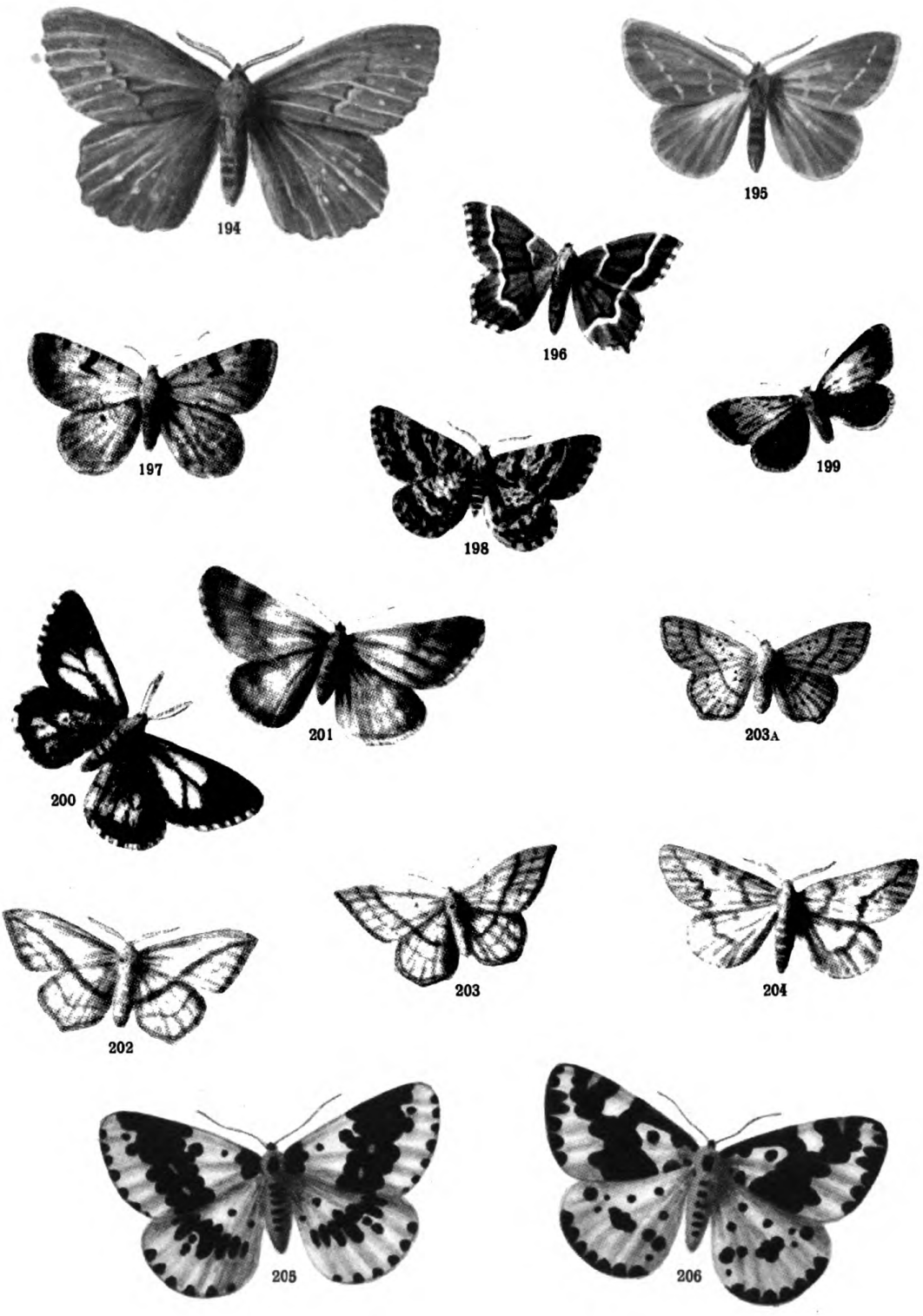


Plate XXIV.

quiet colouring is very suggestive of a patch of lichen on the tree trunk, and is admirably protective.

The eggs of the Black Arches Moth are laid by means of the ovipositor in cracks of the bark and covered over with fine hair, a hundred eggs or more being laid. The egg state lasts from September until March. The caterpillar feeds on many trees, pines and firs by choice, but on oak, aspen, lime, birch, and various fruit trees, and is full grown about the end of June. It then spins a slight and semi-transparent silken web amongst the foliage or over hollows in the bark, the pupa being a deep brownish red with a glossy metallic sheen.

The PALE TUSSOCK shows the same disparity in the size of the sexes as we have just seen in the Gipsy and the Black Arches Moths, Fig. 154 being the male, and Fig. 153 the female. Here again we notice the deeply fringed antennæ of the male, the bulky body of the female. It is an insect that in both sexes is densely clothed, the legs, thorax, abdomen, and bases of the wings, with soft furry hairs that give it a very fluffy look. The Pale Tussock may be expected in May and June, and is very generally distributed.

The caterpillar is very handsome, being pale green and deep velvet black. It has several groups of yellow hairs that stand up from the back like paint brushes, and a terminal and longer tuft of red. These dorsal tufts are supposed to somewhat resemble the tussocks of grass that spring up by the roadside, and so the popular name of Tussock was bestowed on the moth. The caterpillar feeds freely on the hop, and is known amongst country folk as the Hop-dog. It may also be found on the oak, lime, and other trees. The pupa is sheltered beneath a silken web spun among the leaves of its food-plant. These Hop-dogs may be seen from the beginning of August to about the end of September.

That there should be a Pale Tussock suggests, at least, the possibility of a DARK TUSSOCK, and the fact supports the surmise. While there is a strong family likeness between the two

species, the latter, as the name implies, is deeper in colour. It should be looked up about the end of June, but is not a very common species; dry heathy ground seems to offer the best chance of finding it. The Light and Dark Tussocks are the *Dasychira* (or some would say *Orgyia*) *pudibunda*, and the *D.* (or *O.*) *fascelina* respectively.

There is also a Reed Tussock, *Lælia cænosa*, but this has always been a particularly local insect, almost confined to the fen districts, and is now, so far as Britain is concerned, apparently on the verge (or perhaps beyond it) of extinction. On the Continent it is equally local, confining itself to low marshy land, but is widely distributed. It is on the wing during June, July, and August, while the larva, feeding on reeds, may be found during July, August, and September. It is of a smoky white, the male having its fore wing a little tinged with yellowish-brown and a row of small and inconspicuous spots on the hind margin. The female has wings that are entirely without markings of any kind.

The December Moth, Fig. 155, is so called from the lateness of its appearance, November or December. Its colouring, though quiet and subdued, is rich and very effective in the waving creamy yellow bands crossing the brownish purple. The chequered margins to all the wings are also an added charm. The male flies freely at night, and is one of the many species lured by light. The female is much more lethargic. In the male, the sex we figure, the antennæ are pectinated, while in the female they are filiform. The wings it will be noted are rather sparsely clothed with scales. The December Moth is widely distributed and fairly common, though, as people are not often out in the woods at midnight in the depth of winter, it is not much in evidence. Any one, however, of entomological tastes who was prepared to give them play under these somewhat severe conditions, might very possibly find also on the wing a stray Feathered Thorn, *Himera pennaria*; or Mottled Umber, *Hybernaria defoliaria*; or

possibly a Sprawler, *Petasia cassinea*, and some few other belated species.

The caterpillar of the December Moth feeds on hawthorn, poplar, oak, birch, and other trees, its grey colour, mottled with yellow and red, harmonising so well with the lichens that its detection is difficult. It is out in May and June and presently pupates enveloped in a firm egg-shaped cocoon ; ordinarily the emergence of the moth takes place in November or December, but sometimes this is retarded for two or three years.

The LACKEY MOTH, Figs. 156, 157, is particularly variable in its markings, even when we rear a family from one brood of eggs. In a series of nine before us this variation is very apparent, some being of a pale sandy brown, others of rather dark chocolate colour. In one example the band across the fore wing is very perceptible, while in another the whole wing is so even in tone that the band is only felt by its light outline, while in yet another no band is visible at all, and is only suggested by its bordering lines being darker than the rest of the wing. This latter form is the variety known as *bilineata*. The band across the lower wings is in some cases conspicuous, and in others invisible. The Lackey is on the wing during July and August, but is irregular in its appearance, some years being in much more abundance than in others. Though the caterpillars are often too visible, as they make the trees look very unsightly, the moth is seldom seen, as it only flies by night, and is in concealment during the day-time.

The eggs are ordinarily laid with great regularity around a stem, though sometimes we may find them merely in a patch on the trunk. The ring form is the more common arrangement. This ring is composed of some two or three hundred eggs, and as each is broader at the top than below they fit accurately together like the masonry of an arch. A glutinous covering is secreted by the moth ; this binds the eggs together and forms a varnish that preserves them from exposure to the storms of winter. These annular egg clusters are by the country children

called fairy rings. The young caterpillars are gregarious until their third moult, spinning a general web for shelter, and sallying forth thence to feed. By June the handsome caterpillar is fully grown; and is gaily striped with lateral bands of white deep red, black, orange, and blue. This bravery of attire was supposed by our ancestors to be so sufficiently suggestive of livery, lace, and embroidery as to justify the name of Lackey. The caterpillar feeds on oak, sycamore, elm, beech, poplar, hawthorn, blackthorn, and most fruit trees, and on the Continent is one of the most deadly foes of the woodman and farmer. The pupa is snugly tucked aside in a double cocoon; a loose outer wrapping and a substantially woven inner one. The Lackey Moth is the *Clisiocampa neustria* of science.

The GROUND LACKEY, a closely allied species to the preceding, is a particularly local insect, being chiefly found in the salt marshes bordering the Thames and Medway, and by the estuaries of some of the Suffolk streams, yet abroad it is a very common insect, found in the woods and on waste grounds, and in no way confined to maritime districts. It must be looked for in July and August. Within its limited British area it is found in abundance.[1] It is very variable in appearance. Figs. 158 and 160 are the male and female respectively. The eggs are laid on the stems of the sea wormwood and other salt-marsh plants. The caterpillars, gregarious when young, develop into very handsome creatures adorned with longitudinal stripes, dorsally black, then deep-yellow, then blue, the hairs being a rich warm brown. The scientific name of the Ground Lackey is *Clisiocampa castrensis*, the specific name meaning living in a camp, the caterpillars when young all living in one community.

[1] A correspondent in one of the technical papers writes: "Went again to Queenboro' and found the larva of *castrensis* in immense abundance. Brought away several hundreds. They seem to revel in the moist places overgrown with grass, statice, artemisia, and other salt-marsh plants. They were crawling about in such profusion that one could scarcely walk without treading upon them."

Our next illustration, Fig. 161, deals with the Fox Moth. The male Fox is of a strong reddish-brown, in fact fox-colour; while the female, the sex we figure, is of a greyer or more purplish brown, each sex having across the fore wings the conspicuous band of paler colour that we see in our drawing. The antennæ of the male are strongly pectinated, while the abdomen is considerably more slender than that of the female. The male may be seen sometimes flying in the hot sunshine.[1] The moth is about in June; it is commonly found, and though local is very generally distributed throughout the country. The wings are semi-transparent. We can, it will be noted in our illustration, see the under wing showing through the upper one. This is so distinct a feature as to be at once noticeable, if we compare it, for instance, with the Oak Eggar, a closely allied species, Figs. 163 and 164. This latter is so thickly clothed with hair, that it must be like being always in one's great coat, and must make a great difference in the weight to be carried.

The eggs are deposited by "the hen" in May and June. The young caterpillars are hatched in July, and are then velvety black, with a yellow ring around each segment. At each moult they assume a different appearance, but finally they are reddish-brown, with yellow and black bands across their bodies. They are then some three inches in length. When young they appear to be ready to dine at any hour of the twenty-four, but when nearing maturity grow nervous of ichneumon flies and other perils, hiding themselves during the day and only appearing at dusk. On the approach of cold weather they retire into winter quarters, reappearing for only a short period in the spring, and then changing, apparently without taking

[1] Wilkes, an old writer, says that "the cock flies swiftly in an afternoon." Many of the old writers differentiate the sexes by these farmyard terms, the effect being often somewhat absurd, a cock Fox and a hen Emperor being cases in point. Any even nominal alliance between the fox and the poultry-yard appears altogether too good to hope for.

any more food, into the chrysalis stage, spinning a large, loose, black-looking cocoon at the end of April. The food-plants are heath, bramble, sea buckthorn, and many others. It is a difficult caterpillar to carry safely through the winter. One can only even attempt it by half filling a box with soil, and on this ground-work placing moss, dead leaves, and general hedgerow débris for their shelter and concealment, placing it out of doors all winter and taking good care that any moisture may drain away. The placing of a fine wire meshing across will naturally occur to the experimenter from its double value of keeping in and keeping out. Though the caterpillars are able to stand unscathed an intense cold, they are liable to be attacked by a fungoid growth that kills them off rapidly, and if one rears but a quarter of one's store there is full cause for gratulation. The Fox Moth is the *Lasiocampa rubi.*

The SMALL EGGAR is a local insect and somewhat uncertain in its occurrence, being at times abundant, at other seasons scarcely to be found. It is an insect that would rarely be seen, as it is only flying at night-time and is not one of those to which light has an attractive power. The male, the sex we represent in Fig. 159, has the antennæ pectinated, a sex distinction, and is decidedly smaller than the female, a male averaging about one and a half inch span, while the female is two inches. It is not an insect subject to much variation of colour or marking. The abdomen of the female is thickly covered with soft down, and when the eggs are laid in a ring round a stem at the latter end of March they are carefully covered over with this silky hair. The young caterpillars, hatched in April, proceed by their united exertions and zeal for the common good to build a noble tent for their joint occupancy, the boughs of hawthorn or blackthorn being the favourite location. On this tabernacle one may see the larvæ sunning themselves and taking the air, while in stormy weather they disappear beneath it. They are, for some reason, very difficult to rear in captivity; possibly

the author and his readers would be so too. The mortality that seems inevitable is scarcely wholly the result of imprisonment; there is probably some other cause that renders the larva a delicate one, or else, in view of the great number of eggs that are laid and hatched the species should be much more in evidence than it is. A correspondent, experienced and ordinarily successful, tells us that, in one year, out of fifty Small Eggar caterpillars he was only able to reach the moth stage with three, while the following season from forty larvæ he procured but two. The caterpillar when fully grown spins a small compact cocoon, and in this the pupa hibernates. This moth and the Oak Eggar, Figs. 163, 164, derive their popular name from this egg-like cocoon. A second, and even a third, winter is sometimes passed in the pupal condition. As the caterpillars are produced early in the spring, when sharp frost might destroy their food-plant and consequently themselves, this arrangement would appear to be designed to prevent the destruction of the species by dividing the risk run. All who have reared this species will have noticed this curious retardation. Most of the chrysalids mature in the first season, a fair number remain to the second, while a few even run on to the third. The Small Eggar is, entomologically, the *Eriogaster lanestris* ; both names, the one Greek in its origin the other Latin, having reference to the downy wool of the female.

The fine moth represented in Fig. 162 is the LAPPET, the *Gastropacha quercifolia.* The male, the sex we figure, is of a rich reddish chocolate colour suffused with a beautiful purple bloom. This rich purple sheen, however, is not very lasting. To see this to perfection one must breed the moth from the chrysalis, as a very short period of flight suffices to fade and dissipate it. The female is somewhat larger than even the noble insect we figure. While the fore wings are broad and ample the hind ones are, in proportion, notably small; the bold scalloping of the margins will not escape notice. It is an insect that is widely distributed and not uncommon, but it only flies by night.

PLATE XXV

207. Gooseberry. Food-plant.
208. Currant. Abnormal size. *Abraxas grossulariata.*
209. Currant. *Abraxas grossulariata.* Type.
210. Currant. *Abraxas grossulariata.* Variation.
211. Currant. Larva. *Abraxas grossulariata.*
212. Currant. Larva. *Abraxas grossulariata.*
213. Currant. Larva. *Abraxas grossulariata.*
214. Currant. Larva. *Abraxas grossulariata.*
215. Currant. Pupa. *Abraxas grossulariata.*

Plate XXV.

The moth is called the Lappet, because when at rest the fore wings are elevated like a roof, while the lower ones are extended, a portion of them lapping over the first, the result being a strong protective resemblance to a bunch of dead oak leaves. The specific name refers to this resemblance, while the generic is from the Greek words for stout and body. A glance at our illustration will suffice to show the special appropriateness of this generic term.

The eggs of the Lappet Moth are laid in July, and hatch in about fourteen days. The caterpillar is specially partial to hawthorn and sloe, though found on some few other plants. It remains in the larval condition all winter, and is full fed by about May. It is quiescent all day on the twigs and bark, though from its neutral colour it is difficult to detect. The pupa is black, but dusted over with a whitish powder. It is stowed away in a big cocoon of loose construction, whence in about four weeks the moth emerges.

Different in appearance as Figs. 163 and 164 are, they are but two states of the same moth, the Oak Eggar, *Lisiocampa quercus*, the first being the female, the second the male. The female it will be seen is much larger than the male and of paler coloration. Each has the body and bases of the wings thickly clothed with soft woolly hairs. The male is a particularly rich brown and deep yellow, and if we turn the insect over the reverse side is almost as strong a mahogany colour and deep fulvous as the upper surface, but the white discal spot that is so effective on the upper side of the fore wings is wanting. If we visit the borders of woods in July and August we may possibly see the Oak Eggar as it is generally distributed, and in some districts abundant. The male flies with great activity and at high speed in the hot sunshine, while the female moves but little and never before dusk. If we have bred a female Oak Eggar we can on taking her in a cardboard box into the fields capture the males freely by her attractive power. Many species may be thus "assembled," as it is termed, but with no

moth is it more successful than with this. We have known in a district where no male was visible at all, twenty captured in an hour, settling fearlessly in their quest after their mate on the collector's coat and hands.

The larva of the Oak Eggar feeds on hawthorn, blackthorn, heather, and other plants, and later on, when these are not available, on laurel and holly. It may be found from September to the following May, and when full fed is nearly four inches long. We see in an old note book that the dates in five consecutive years of finding this larva in its mature condition prior to pupation are April 24th, May 15th, April 21st, April 23rd, and May 16th. We would, parenthetically, strongly advise all Nature-lovers to keep notes of the comings and goings of the creatures and plants around them. The Oak Eggar larva spins a solid oval cocoon about an inch in length, attaches it to a twig, and in this the pupa sleeps for about a month, though sometimes emergence is retarded for a whole twelvemonth.

The DRINKER MOTH, Figs. 165, 166, is a very common species, to be sought for in the green lanes of the country side and on the margins of woods during July and August. The male, Fig. 166, is beautifully variegated with purplish-brown and deep yellow: it varies a good deal in strength of colour, and sometimes has the darker markings considerably suffused. The female, Fig. 165, is considerably larger and of a lighter colour. It will be observed that in both sexes the antennæ are pectinated, but in a differing degree, the male showing this feature much more markedly. The male flies with abundant vigour after dusk, and is more amenable than most moths to the allurement of light, while the female is much less energetic, and much less too under the fascination of light, and is therefore more seldom captured. These fine moths may be found at rest during the day on the hedges, but in this quiescent state so resemble a dead leaf that it takes a somewhat practical eye to detect them. The straight line athwart the lower wings

is an unusual arrangement; it is almost mathematically direct. Lines of markings on the wings ordinarily curve with the general outline of the wing, or are else at right angles to its curve, as a general reference to our illustrations will clearly show.

The eggs of the Drinker are laid on coarse grass and adhere by a gummy secretion, hatching in July about fourteen days after they are deposited. The larva, a dark bluish-grey one with a lateral line of orange spots and dense tufts of white hair, feeds on grasses, hibernating and feeding up in the spring. At the end of May it forms a rather elongated cocoon, thin but very tough. This is attached to the grass stem, and in about thirty days the enclosed brown pupa emerges. The larva is curiously fond of water, and will eagerly quaff a drop of dew in its food. It is a very easy caterpillar to rear, and if we sprinkle its grass with a little water the attention will be appreciated. Hence the moth gets its name of Drinker. Its scientific name is *Odonestis potatoria*, the specific name referring as we see to the potations of the caterpillar, and not, as we once heard suggested, because it feeds on potato.

The KENTISH GLORY, Figs. 167, 168, is very rightly named, for it is but rarely found except in the county of Kent, while its delicate beauty of form and colouring may well unite those two great bodies, the "Kentish Men" and the "Men of Kent," in mutual pride in the glory of its possession. It must be sought in birch woods during April and May. It is curious that, while it is rarely found but in the south of England, it has been met with in profusion in the Rannoch Woods in Perthshire. The male, Fig. 167, flies very swiftly in the sunshine, and is very difficult of capture, being soon lost to sight amongst the trees, while the female, Fig. 168, is much more inclined to take life quietly. This is one of the specimens in which "sembling" is very successful, over one hundred males having by its means become the prey of the collector in a few days. The wings, stout as they are in build, are but thinly clothed

with scales; they are what is technically called sub-diaphanous. The scientific name of the Kentish Glory is *Endromis versicolor*. The generic name, Greek in its origin, refers to the very hairy abdomen that our illustrations show to be so marked a feature, while the specific name, Latin in inception, means of varied colours, and is at least of equal appositeness, as one speedily finds on attempting to picture the delicate variations and gradations of tint in either the male or female.

The caterpillar of the Kentish Glory, in its green coat slashed obliquely with darker green and yellow and its anal hump, is very suggestive of a sphinx larva. When first hatched, in May, these caterpillars are gregarious, forming little family parties of a dozen or so, and sheltering under a jointly produced web. The main food-plant is the birch, though they have been fed on alder, hazel, and other trees. When, about the middle of July, they are fully grown they descend the trees, and in the sheltering moss on the ground weave of coarse brown silk a stout cocoon, its surface having worked into it moss and birch leaves for its more effectual concealment. From this snug shelter the moth emerges in the following spring in the ordinary course of things, but it may possibly be that this liberation does not take place till twelve months later.

The EMPEROR MOTH is conspicuous not only from its noble size, but from bearing on each wing a large eye-like spot, a feature that in itself gives it an individuality, differentiating it from any other British species. The male, Fig. 169, as in the preceding species, is much smaller than the female, Fig. 170, and of a richer brown. The markings at the back are very slightly paler in colour, and identical in design with those in front. In each sex the wings are beautifully variegated in quiet neutral tints of grey colour: it is an insect of much distinction of appearance. It is very common almost everywhere, and must be looked for in April and May[1] on heather

[1] We see in our notes the emergence of one of these moths is recorded as early as March 18th.

land and in the neighbourhood of woods. The male is very active on the wing, flitting very swiftly over the heather in the spring sunshine, while the female is rarely seen in flight, but contents herself with remaining quiescent. It is another of those species where "sembling" can be practised very successfully; we know of a case where fifty males were thus attracted in two days.

The eggs are deposited around the stem of the food-plant and hatched out in about a month. The larvæ are sociably inclined until their third month, when they start an independent career. The caterpillar is a handsome one; green, having each segment bearing a pink tubercle within a ring of black, from whence springs a star-like cluster of short hairs. It must be sought in June, July, August, and September, and when full grown is over three inches long. Heath, blackthorn, and willow are its favourite foods. On pupation it spins a pear-shaped or flask-like brown silk cocoon with open ends, so constructed that the moth on emergence can easily crawl out, while entrance to a foe is not possible. At the open end several short bristly hairs project and converge: through these a passage is easily forced from within. Emergence is in some cases retarded till the second year. One man we know of had sixty of these cocoons, of which forty produced moths the first year, the remaining twenty not putting in an appearance until the following year; while in another case thirty cocoons were developed, all from caterpillars bred from the eggs of one female, and the first year the owner had twenty-one moths, and in the second year nine. It will be noted that the proportions are in the two cases practically identical, the retardation of one-third. The moth was long known as the *Saturnia pavonia*, but appears to be now accepted as the *S. carpini*. This *carpini* signifies "of the hornbeam," not at all a happy title; *pavonia* refers to the peacock-like eyes; while *Saturnia*—one of the names of Juno—was, we presume, bestowed because the peacock was especially associated with that goddess.

CHAPTER VI

The Geometrina Group—Geometer Larva—The Swallowtail, Brimstone, Oak Beauty, Peppered Moth, and other Typical Species—The Thorns —The Emeralds—The Currant Moth, Variation of its Coloration

WE now enter on another great division of moths, the Geometrina. The name arises from a larval peculiarity. If we examine most caterpillars we shall find that, as a rule, they have six legs well formed, and, in addition to these, and in rear of them, what are called pro-legs—cushion-like forms with minute hooks at their bases—by which they gain additional hold; and these pro-legs, except under abnormal circumstances, are ten in number—five pairs. If, however, we examine a Geometrical larva, we shall readily see that only two of these pairs are present, all the central ones being missing. The ordinary larva, therefore, walks with a steady, continuous motion, each pair of legs and pro-legs in succession taking up its share of work; but the Geometrician larva, having no intermediate organs of locomotion, first of all takes firm hold with its fore legs, and then, by great muscular effort, draws up the whole body in one great loop until the hind or pro-legs are brought up to the others. The fore legs then let go their hold and the body is thrown forward, while held only by the pro-legs, as far as it will reach; the fore legs then renew their grip, and so on—the motion being not continuous, but broken by a series of pauses during the readjustment of the machinery. Fig. 214 shows us this looping process in action, and the whole of our moths from Figs. 173 to 237 have their larvæ

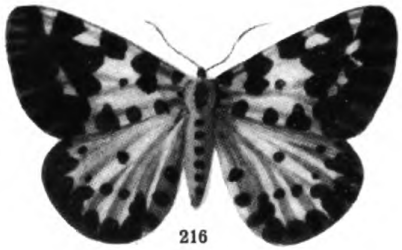
of this type. Span-worms is an old name for these caterpillars; and this measuring out of the leaf or ground before them has led to their being termed Geometricians. It would at first appear that Surveyor would be a happier name than Geometrician; but if we recall the actual meaning of the latter word—one who measures the earth—we see that the term, as applied to these caterpillars, is wholly appropriate.

The first of these moths to invite our attention is the SWALLOWTAIL—a very abundant species, and one that, from its large size and pale colour, is particularly conspicuous in the gloaming. It will be observed fluttering somewhat feebly, and quickly settling again if disturbed, in the hedgerows, and in our gardens during May, June, and July. The female, the sex we represent, Fig. 171, is larger than the male, but the colouring and markings are identical in the two sexes. While in the preceding families the fore wings and hind wings have ordinarily been of different patterns, as in the Tiger, Fig. 127, or the Black Arches, Fig. 151, amongst the Geometricals we very frequently find that what one may call the same idea, both in colour and patterning, is found in all the wings. The moths, too, of this great division ordinarily have their wings of ample size, held horizontally in repose; all equally displayed, and not having the lower wings lost to sight, as in Figs. 125, 300, by the dropping of the fore wings over the others. In all these points the Swallowtail is a very characteristic Geometer. The moth is very delicate in its colouring and graceful in form. It is the *Ourapteryx sambucaria*—the generic name meaning tail-winged, and the specific title referring to the elder, one of the favourite food-plants of the larva. It is also found on lime, sloe, hawthorn, willow, bramble, and other plants; hibernating in cracks of the bark or other shelter during the winter, and entering on the pupal stage in March.

The caterpillar of the Swallowtail is, when full fed, nearly three inches long, of a rusty brown colour, and variously

PLATE XXVI

216. Currant. *Abraxas grossulariata.* Variation.
217. Clouded Magpie. *Abraxas ulmata.*
218. Mottled Umber. Male. *Hybernia defoliaria.*
219. Mottled Umber. Female. *Hybernia defoliaria.*
220. Clouded Border. *Lomaspilis marginata.*
221. Clouded Border. *Lomaspilis marginata.*
222. Dotted Border. Female. *Hybernia progemmaria.*
223. Dotted Border. Male. *Hybernia progemmaria.*
224. Grass Wave. *Aspilates strigillaria.*
225. Beautiful Carpet. *Melanthia albicillata.*
226. Argent and Sable. *Melanippe hastata.*
227. Purple Bar. *Melanthia ocellata.*
228. Purple Bar. *Melanthia ocellata.*
229. Yellow Shell. *Camptogramma bilineata.*
230. Barred Yellow. *Cidaria fulvata.*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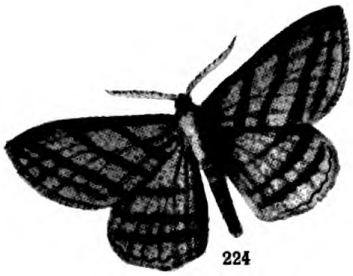
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mottled and warted, so that it is the very image of a piece of dead stick. These Geometrical caterpillars have a way of extending themselves straight out and remaining for a long time absolutely motionless. The head is supported sometimes by an almost invisible line of silk, attached to a point above; but this is by no means always the case. The muscular strength must be immense. If our readers will stand on their staircase with their feet gripping the edge of one of the stairs, and then, entirely ignoring the handrail, extend their bodies rigidly at any angle they feel most agreeable for three hours, they will perhaps the better realise the task performed by the larva. This resemblance to a dead stick is of great protective value; but when danger is imminent, and their nerve gives way under the strain, the caterpillars drop themselves suddenly, only hanging suspended by a fine thread, until they judge the peril to be past. The pupa of the Swallowtail, brown, spotted with black, rests in a silken cradle, suspended by a few cords from a leaf or stem; and upon the surface of this cradle are worked in some bits of withered leaf, to aid in its concealment.

The BORDERED BEAUTY, Fig. 172, with its sharply contrasting colours and wings of graceful curve, may not uncommonly be found in July and August, at all events in the south. As we go northward it grows scarcer. It is the *Epione* (or, as some would have it, the *Euchlæna*) *apiciaria*, and it much resembles in form, size, and colouring its close relative, the Dark-bordered Beauty, *E. parallelaria* (or, according to some writers, *E. vespertaria*). This latter is less frequently met with, but a ready means of distinguishing the two is that in the one we figure the broad bordering on the upper wing runs to a point at the apex of the wing, hence *apiciaria*; while in the other species this broad bordering does not thus die away, but remains parallel to the outer margin of the wings, hence *parallelaria*.

A very abundant, and surely well-known, species is the

BRIMSTONE, the moth we depict in Fig. 173. As soon as the warm evenings come round we find this lively little insect with us all through the summer. It flies rather weakly, and falls an easy prey to the collector. It is a rather variable insect in colour and in its markings, the ground tint of the wings, normally a clear canary yellow, being sometimes considerably deeper in tone, while the rusty brown spots along the edge of the fore wing vary considerably in size in different specimens. The other spots on the wings vary much in strength of definition, being sometimes almost invisible, in other examples very conspicuous. The under surface is practically identical in tint and patterning with the upper. The caterpillar feeds on hawthorn by choice, but will take one or two other things. It has four pairs of pro-legs, instead of two, but the extra pairs are abortive, and therefore the larva remains a true looper. There are two broods in the year. The moth is the *Rumia cratægata* of some authorities, the *R. luteolata* of others.

The ORANGE MOTH, Fig. 174, in all its richness of colouring, is rightly named. It is the male alone, however, that is thus bedecked. The female, Fig. 175, is much less brilliantly attired, though we would venture to say that in its quiet harmony of rich buff and brown it is at least as attractive. The male varies somewhat in the more or less amount of orange on the wings, but Fig. 174 may be taken as a typical example. It is the *Angerona prunaria*, the blackthorn, *Prunus spinosa*, being a favourite food-plant with the larva. What the Goddess of Silence, who appears in the generic title, has to do with the Orange Moth is quite another matter. The larva is of the typical Geometer type, grey colour, blotched, and spotted, and withal humped and protuberated into the perfect similitude of a piece of stem. The moth is very fairly common in June and July.

The LIGHT EMERALD, Fig. 177, is of a very delicate tint of green, the wings being crossed by white bands. It

is a moth that varies a good deal in colour. The one we represent, captured on the common at Tunbridge Wells, is fairly typical, a pale bluish-green. Another before us is of a yellow green inclining to brown, and yet a third is so far a pale golden brown that there is scarcely a tinge of green in it—light topaz would be almost as descriptive a name for it as light emerald. This latter tint is, however, very exceptional. The moth is on the wing in April and May, and again, being double-brooded, in July. It is widely distributed, and in many districts very fairly common. The angulated character of the wings will not escape notice. The antennæ in the male, Fig. 177, are pectinated. It is the *Metrocampa margaritaria*. The generic name signifies to measure and a caterpillar, and is not very happily chosen, for while it is absolutely true that this larva is of Geometer type, it is only one of many that are equally measuring caterpillars, and therefore the name lacks distinctiveness. Why the specific name should refer to a pearl is equally inconsequent.

That the moth we have represented in Fig. 176 should be popularly called the SPECKLED YELLOW seems quite in accord with the fitness of things, for it is abundantly dotted over, and is gloriously yellow. All insects that are freely maculated show some variation in the arrangement and number of the spots, but this moth seems to vary as little as any. We have a series of twenty-five before us as we write, and practically they all look exceedingly alike. In the Doubleday Collection we remember to have seen a specimen where all the wings were of pure golden yellow, and absolutely immaculate save for a row of four small spots on the costal edge of the fore wing. This collection is a very good one, and open to all comers on request; it is to be found in the Bethnal Green Museum. The Speckled Yellow, *Venilia maculata*, flies freely in the woods in May and June, often settling on the furze flowers in the clearings, and rivalling them in its brilliant colouring. The larva, green striped with white,

may be found on various low plants during August and September.

The Scalloped Hazel, Fig. 178, *Odontopera bidentata*, has a very distinctive and individual look, with its widely extended pinions and rich outline of form. In colour it is inconspicuous, but by no means wanting in quiet harmony of tint. It must be sought for in May, and is generally in abundance. The caterpillar is on oak, beech, fir, and other trees. It has four pairs of fore legs instead of the normal two pairs, but it makes little or no use of these additional members. The pupa is particularly slender, and will be found between leaves spun together, or under moss at the foot of a tree. Both generic and specific names refer to what they are pleased to consider the toothed margins of the wings, but one's idea of toothing is something somewhat more angular than those rounded forms : the popular name is truer.

The Scalloped Oak, Fig. 179, or *Crocallis elinguaria*, exhibits the rounded outline of the wings to a much less degree than we see it in the previous species. It is widely distributed and in most places common, and may be looked out for in July and August. It is a night flier, and will be found on the wing from dusk. The broad band of dark brown across the upper wings, and the discal spots, will suffice to identify it. In the male the antennæ are twice pectinated. The thorax is densely clothed with soft hair. The caterpillar is of a brownish-yellow colour, and marked with brown spots. It will be found in May and June, frequently on the honeysuckle, but on hawthorn also, whitethorn, apple, pear, beech, willow, oak, and other trees. It presently goes into winter quarters, and then in the early summer spins a slight cocoon for the pupa amongst leaves or moss on the ground or near it. One finds on attempting to rear the caterpillar that it is only too prone to develop into a sanguinary cannibal. The specific term, *elinguaria*, means tongueless, the spiral proboscis being in this species obsolete.

The LILAC BEAUTY, Fig. 180, is marked in various delicate shades of brown, yellow, indian red, white, and a pale lilac. To see it in its full beauty one ought to rear it, or come across it promptly after its emergence from the chrysalis, before the wear and tear of life has marred it. Its generic name is *Pericallia*, signifying exceedingly beautiful, a not too strong testimony; while its specific name, *syringaria*, indicates that its larva feeds on the lilac, though it is found too on privet, elder, and other plants. It is a rather common moth, and will be found in woods and pasture land during July. The double curve in the costal edge of the fore wing, and the acuteness of its tip are points to be noted. The larva is about from September to the following June, but spends the winter in a dormant condition in concealment.

The EARLY THORN, Fig. 181, like its brother Thorns, as Figs. 182, 183, 184, 185, 186, is quaintly beautiful in form, and, like them too, a study in delicate harmonious colouring. There are two broods in the year, and the spring brood may be distinguished from the summer one in that the moths are larger in size and deeper in colour. These broods are, in fact, in appearance so diverse that they were long considered to belong to two entirely different species. It will be noted that, while in Figs. 184 and 186 there is a moon-like mark on the wings, the Early Thorn has no such marking; therefore it is specifically *illunaria*, the moon-less. Its generic name is *Selenia*, in allusion to the moon-like forms that most of the other members of the genus bear. The Early Thorn is, therefore, in science the moon-marked moon-less one, which seems a little confusing. The caterpillar is of a rusty brown and yellow, or sometimes dull purplish and yellow, and may be found in June and September on hawthorn and several other trees.

The LUNAR THORN, *Selenia lunaria*, we depict in Fig. 182. The outlines of the wings, it will be noted, are much waved as compared with most other moths or butterflies. It may be

paralleled amongst butterflies by the Comma, Fig. 40. The crescent spots are much in evidence in our present species. A fair inquirer once asked us, "Why lunar thorn? does it sit on a thorn in the moonlight?" A truthful answer lacks the sentiment that the questioner would no doubt have desired to have found in it. The minute spots all over the surface of the wings give an added richness of effect. The Lunar Thorn is a rather common insect, and may be expected in June.

The insect we depict in Fig. 183 is one of our rarest species, and when it does occur, though it has been found as far north as York, is held to be more likely an immigrant than a native, so that any captures of it become a noteworthy event. It appears in August and September. Though called, and justly, the LARGE THORN, it is after all, as we see by our illustration, not really of much greater expanse and bulk of wing than our commoner Thorns. The scalloping round the wings is more regular than in its fellows. It is the *Ennomos alniaria*. The caterpillar feeds in July and August on sycamore, birch, beech, alder, elder, and other trees common enough in Britain.

The PURPLE THORN, Fig. 186, might really have been appropriately specialised as, before all, the Lunar, since in its wing markings the four white spots, one on each wing, are of a distinctly crescentic form. We heard it once rather happily described as a sort of eighteenth-century insect, like our grandmothers would have worked in solemn purples and greys in their needlework, and just the bizarre shape that they would have delighted in. It is really, in its soft shades of grey and brown and dull purple, a beautiful insect. Scientifically it is the *Selenia illustraria*, the specific name being from the same root as our word illustrious, a testimonial to its worth. It has also been called the *S. tetralunaria*, in allusion to the four moons it bears. The Purple Thorn should be looked out for in May and again in August, being double-brooded, but, though found over most of England, it is not a common

insect. The caterpillar feeds on birch, beech, oak, sloe, wild roses, and ash during June and September.

The CANARY-SHOULDERED THORN, *Ennomos tiliaria*, Fig. 184, is a very pretty little insect that is very fairly common, and which is at once recognisable from the bright canary-coloured thorax. It is on the wing in July and August. The specific name suggests special association with the lime, but the birch and oak appear to be more especially the pabulum of the caterpillar.

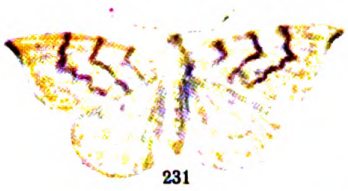
The DUSKY THORN, Fig. 185, is but dull in contrast with its more brilliant relatives: on its own merits it scarcely deserves a name that seems to imply disparagement. It is the *Ennomos fuscantaria*, the specific name reasserting its dulness of colouring. It may be found in August and September. We have known it attracted by light in the heart of town. The caterpillar is green, feeding in June on ash by preference, but quite content to take privet. The chrysalis, too, is green, a somewhat unusual colour; almost all moth chrysalides being of various shades of brown or black.

The BRINDLED BEAUTY, the moth depicted in Fig. 187, is on the wing early in April, and occurs very freely, sometimes abundantly, on the lime trees even in our large towns. It is so notably a metropolitan insect that an alternative popular name for it is Cockney. The male, the sex we depict, has the antennæ feathered; in the female these organs are simple,[1] while her wings are less densely clothed with scales than those of her mate. The moth is at rest during the daytime on the trunks of the trees, and while thus torpid on the brown bark is by no means easy of detection. The caterpillar feeds at night on the lime, and on elm and other trees, and is often in such numbers that its ravages are very conspicuous. All the day it is dormant, stretched out at its full length, in

[1] "The Hen may be known from the Cock by her Horns, which appear like fine Threads, while those of the Cock are comb-like."—Harris, *Aurelian.*

PLATE XXVII

231. Barred Straw. *Cidaria pyraliata.*
232. Treble Bar. *Anaitis plagiata.*
233. Scarce Tissue. *Scotosia certata.*
234. Barred Hook-Tip. *Deprana unguicula.*
235. Pebble Hook-Tip. *Deprana falcataria.*
236. Oak Hook-Tip. *Deprana binaria.*
237. Buff Tip. *Pygæra bucephala.*
238. Poplar Kitten. *Dicranura bifida.*
239. Lobster. *Stauropus fagi.*
240. Alder Kitten. *Dicranura bicuspis.*
241. Chimney-Sweeper. *Tanagra atrata.*
242. Chimney-Sweeper's Boy. *Fumea radiella.*



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colour and form strongly resembling a ridge of bark. It is feeding in June and July, and then passes into pupahood in the ground at the foot of the tree. The moth is the *Biston hirtaria*. Biston, a classical name, is entomologically meaningless; the specific name signifies hairy, and refers to the densely clothed thorax.

The PALE BRINDLED BEAUTY, *Phigalia pilosaria*, an insect about as large as the preceding, has the female wingless, while the wings of the male are sub-diaphanous, and mottled over in varying tints from white to black through greys and browns. The wings are crossed, as in Fig. 187, by bars, but these are of a very indefinite character. The moth is notable from its early appearance, February and March. It would seem to be more common in the north and west of England than down south. The brown caterpillar, warted on several of its segments, feeds on oak foliage, and is particularly twig-like in appearance.

The OAK BEAUTY, Fig. 188, is a local insect to be met with fairly commonly in its special localities in March and April. The male, the sex delineated, is somewhat smaller than the female, and has its antennæ pectinated. The broad transverse bands of colour athwart the ample fore wings are very decided in tint, giving a very definite character that makes the insect easily recognisable. It may often be taken drowsily at rest on oak trunks. The larva is feeding on oak, elm, and birch in June and July, and the pupa is subterranean. The insect appears to present some little difficulty to the nomenclators, being the *Biston stratarius*, the *Amphydasys strataria*, or the *Amphydasis*[1] *prodromaria*, according to the authority one is willing to accept.

The insect we have represented in Fig. 189 is, appropriately enough, called the PEPPERED MOTH, or, in the words of some old entomologists, the Pepper and Salt. The ground-work of

[1] *Amphidasys*, *Amphydasis*, *Amphidasis* are all forms of spelling that we encounter.

the wings being at best but a dingy white does not happily suggest the pure whiteness of salt, but at all events the peppering is evident enough. The great elongation of the fore wings in proportion to their breadth is very noticeable and alone suffices to identify the insect. It is a common species, and will be found in May quiescent during the day-time on tree trunks and palings. It is a particularly variable insect in its markings, the pepperings being sometimes so coalescent as to be practically blotches. In some cases this is carried so far that there is no peppering at all, or rather, perhaps one should say that it is done so liberally that it is all pepper—one even surface of dark brown. It is even then still recognisable from its characteristic form. This almost black variety, specialised as *doubledayaria*, was some forty years ago an exclusively British product, but is now becoming common on the Continent. From the same brood of eggs one may get a progeny varying from one lighter than Fig. 189, which may be accepted as typical, to the full *doubledayaria* density, together with all intermediate grades. The moth is the *Amphydasis betularia*. The caterpillar, very variable in colour, feeds during August and September on elm, lime, walnut, oak, plum, and other trees. The black shining pupa is at the foot of the tree, and may be dug up any time between September and May.

The WAVED UMBER or, alternatively, Waved Ochre, Fig. 190, is one of our common moths, flying chiefly by night, and resting during the day with outstretched wings, on fences and the trunks of trees, its rich mottling of brown assimilating admirably with the colour of the object it settles on. It is double-brooded: we have one flight in May and June, followed by another in August. It may often be found in our gardens, since the caterpillar feeds on rose, privet, lilac, broom, jasmine, and other plants of cultivation. It is very dark brown in colour, and feeds quite openly in June and July. The pupa is enveloped in a stout silken wrapping at a forking in the stems of the food plant. The moth is the *Hemerophila*

abruptaria. The wings of the male, the sex we figure, is of a richer and deeper ochreous brown than we find in the female. The specific name refers, and perhaps not over-happily, to the abrupt transition in colour-strength in the markings.

The quietly attired moth we have brought before us in Fig. 191 is the PALE OAK BEAUTY, a decidedly local insect and only to be found in the south. It is on the wing in June and July in the neighbourhood of woods, the caterpillar being by choice an oak-feeder, though it may be met with sometimes on poplar, willow, birch, and other trees. This caterpillar varies from green to brown, is warted all over, and when full-fed is nearly two inches long. The pupa is subterranean. The moth is the *Boarmia consortaria.* There are six species in this genus, and they all have a very strong family likeness. We have another of them in Fig. 192, the GREAT OAK BEAUTY, *B. roboraria.* In this the ground-work of the wings is of a somewhat lighter grey, and the moth is larger than the Pale Oak Beauty. The caterpillar feeds on the oak, hence the name *roboraria.* The *consortaria* of the preceding species means allied, all of this genus being so similar in appearance. The Great Oak Beauty should be watched for in June and July, but, though found throughout the land, is not a common insect. The larvæ are hatched in July, and in the autumn bind themselves by silken cords to the stems, and thus in a dormant state pass unscathed through the winter.

The LARGE EMERALD, Fig. 194, is a very beautiful insect. Its wings, as our illustration shows, are of a full rich green, crossed by a very delicate scalloped band of slightly darker colour and a series of white dots, the only other bit of varied colour being the pale brown abdomen. The white crescents and dots vary somewhat in arrangement in different specimens, in some being continuous, in others isolated, while in some examples what are quite definite forms are in others merely round spots. It is a common insect in most parts of the country, though local, and should be looked for in birch woods

in June and July. The larva also is green, and found from September to May on birch, alder, beech, hazel, and other trees. It hibernates while still young, and feeds up in the spring, not being full grown till the end of May. The pupa, too, is green, varied with yellow, and is enclosed in a slight semi-transparent white cocoon between the cones. The Large Emerald is the *Geometra papilionaria*; it has certainly a very papilionaceous, or butterfly-like, look about it.

The SMALL EMERALD, Fig. 193, is a very pretty little insect, the contrast between the rich verdant ground-work of the wing, and the sharp white lines that cross it, being very effective. It is called the *Iodis vernaria*, a name which implies an insect of the spring-time, but the Small Emerald must really be expected in June and July. The larva is green with white lines, feeding on the Traveller's Joy, and being findable from September to the following June. The food plant thrives specially on the chalk, and in the chalk districts the moth is commonly to be found.

The ESSEX EMERALD, Fig. 195, though found throughout Western and Southern Europe and much of Asia, is in Britain confined to the coast of Essex, and a small portion of that of Kent. It is, nevertheless, entirely at home with us, and not a mere immigrant blown across from the Continent, or taking passage on a cargo boat. The moth is flying in July. The caterpillar feeds on the yarrow and sea wormwood. The eggs are laid on these plants in July, and the caterpillars may be found from August to June, when they spin a little almost transparent cocoon. The larva is of a greyish hue, but its colour is a matter of very little importance, as it has a way of dressing itself in fragments of its food plant, and so forming a protective covering. It does this at once on emergence. When the necessary moulting is over, these fragments are of necessity shed with the old skin, when it will be seen that on the back are a number of tubercles secreting a glutinous matter. On the change of skin being

complete, it at once proceeds to re-clothe itself with particles of foliage. The moth is the *Geometra smaragdaria*, though we sometimes find the generic title given as *Euchloris*. The specific name signifies an emerald.

A much more abundant, and much less verdant species, is the COMMON EMERALD, Fig. 196. It is what our forefathers would have called a "sad-coloured" green. The crossing lines, half white, half dark green, and the chequered fringes of the wings will be noted. It is very generally distributed, and will be seen on the wing during June and July. It is the *Hemithea thymiaria*. The specific name implies that the caterpillar feeds on the thyme, but it is really to be found on oak, blackthorn, and other trees. The generic name signifies half divine, which is really going quite as far as circumstances will justify. It may sometimes be found indexed with the specific affixes of *strigata* or *æstivaria*.

The BLOTCHED EMERALD has its wings mainly of a yellowish-green, but irregularly spotted or blotched with dull white or rusty brown. It is to be found, though not very commonly, in the woods in June and July. The caterpillar, like that of the Essex Emerald, enwraps itself in a covering of leaves, the foliage of the oak, its food plant. This curious instinct at once asserts itself, the caterpillar immediately after its birth proceeding to gnaw off small pieces of leaf, and to fasten them on its back. One that was put into a white paper box at once covered itself with fragments of the loosened paper; while another, placed amongst rose petals, in a few moments was attired in rosy pink, concealment by resemblance to surroundings being in each case the dominant idea. The caterpillar may be found from August to the following May, but when the cold weather comes it doubles up into a ball and fixes itself to an oak stem by a silken holdfast, and then closely resembles a little tuft of withered material, a bit of dead leaf or lichen; on its change to pupahood this idea of self-protection is as prominent as ever, as the open network

hammock in which it reposes still bears on its surface odds and ends of vegetable débris. The moth is the *Phorodesma bajularia*, its specific name, from the Latin word for a porter or carrier, bearing witness to its habit in the larva state of carrying with it everywhere its burden.

The insect represented in Fig. 197 is called the V-Moth, evidently from the very conspicuous V-like mark on the fore wings. This moth will be recognised readily from its somewhat unusual colour—a dull purplish-grey, resembling, if we may be allowed such a comparison, the tint we get when, starting with a cup of cocoa, we add milk freely to it. It is a very common species about everywhere in July, and its pale greyish-green caterpillar may be found in May and June, sometimes too plentifully on the gooseberry and currant bushes. The moth is therefore often found in our gardens. It is the *Halia vauaria*, the vau or V in its markings being suggested by its specific name. One authority called it *H. circumflexaria*, the marking on the wings much resembling the circumflex accent used in so many French words.

The Common Heath, the subject of our next illustration, Fig. 198, may be commonly found on open heathy ground and on great stretches of chalk down from May to August, and sometimes in such profusion that we disturb examples of it at almost each step as we tramp across the waste. The sexes vary somewhat in colour, the male, the sex we figure, having the ground-work of the wings a rich brownish-yellow, while in the female they are whitish. The female is generally a rather smaller insect. It is the *Fidonia atomaria*.

The moth represented in Fig. 199, the Frosted Yellow, is a member of the same genus as the last. In the language of science it is the *Fidonia conspicuata*, though to label this unpretentious little moth as being something specially conspicuous or remarkable is rather like making fun of it. It is on the wing in June or July, but is a very local insect.

Figs. 200 and 201, though so different in character, deal

with the same insect, the BORDERED WHITE, *Fidonia piniaria*, the first of these being the presentment of the male, the second of the female. The male flies freely in the firwoods in the twilight, and occasionally in the day-time, during May and June, but the female is much less energetic. An old writer describes the wings of the male as being of brimstone yellow begrimed with soot, and it is a rather happy simile. The antennæ are in the female filiform, and in the male strongly plumose. The caterpillar, pale green with lighter stripes, feeds on the Scotch fir during August and September, and on the Continent does sufficient damage to get itself included amongst the noxious pests that the landowner vilifies.

Fig. 202 depicts an insect that is not by any means uncommon. It will be found in June and July fluttering along the hedgerows, and by the sides of the watercourses that are the home of the larval food plants, the various kinds of dock and persicaria. It owes its not altogether poetic popular name of BLOOD VEIN to the broad band of ruddy colour that, in graceful undulating line, crosses the centres of all the wings. It is the *Timandra amataria*; why it should be thus specifically specialised as being beloved it is hard to see or say.

The CLAY TRIPLE-LINES, Fig. 203, is not a very common insect, but it may be looked up in beech woods during the summer, especially in the south and west. The ochreous-yellow of the wings and body is very clay-like in colour, though with the fear of the critic and the geologist before us and our remembrance of the formation known as London Clay, we had perhaps better qualify a bit and modify clay-like into like some kinds of clay. The triple lines are somewhat varying, the middle one being always in evidence, while those on either side of it are often more or less broken up. The moth is the *Ephyra trilinearia.*

The MAIDEN'S BLUSH, Fig. 203A, is perhaps not quite happily named, its dull brown wings, covered by a line of

PLATE XXVIII

243. Puss Moth. *Dicranura vinula.*
244. Egg of Puss. *Dicranura vinula.*
245. Puss. Larva. *Dicranura vinula.*
246. Puss. Larva. *Dicranura vinula.*
247. Puss. Larva. *Dicranura vinula.*
248. Puss. Larva. *Dicranura vinula.*
249. Puss. Larva. *Dicranura vinula.*
250. Puss. Pupa. *Dicranura vinula.*
251. Black Poplar. Food plant.

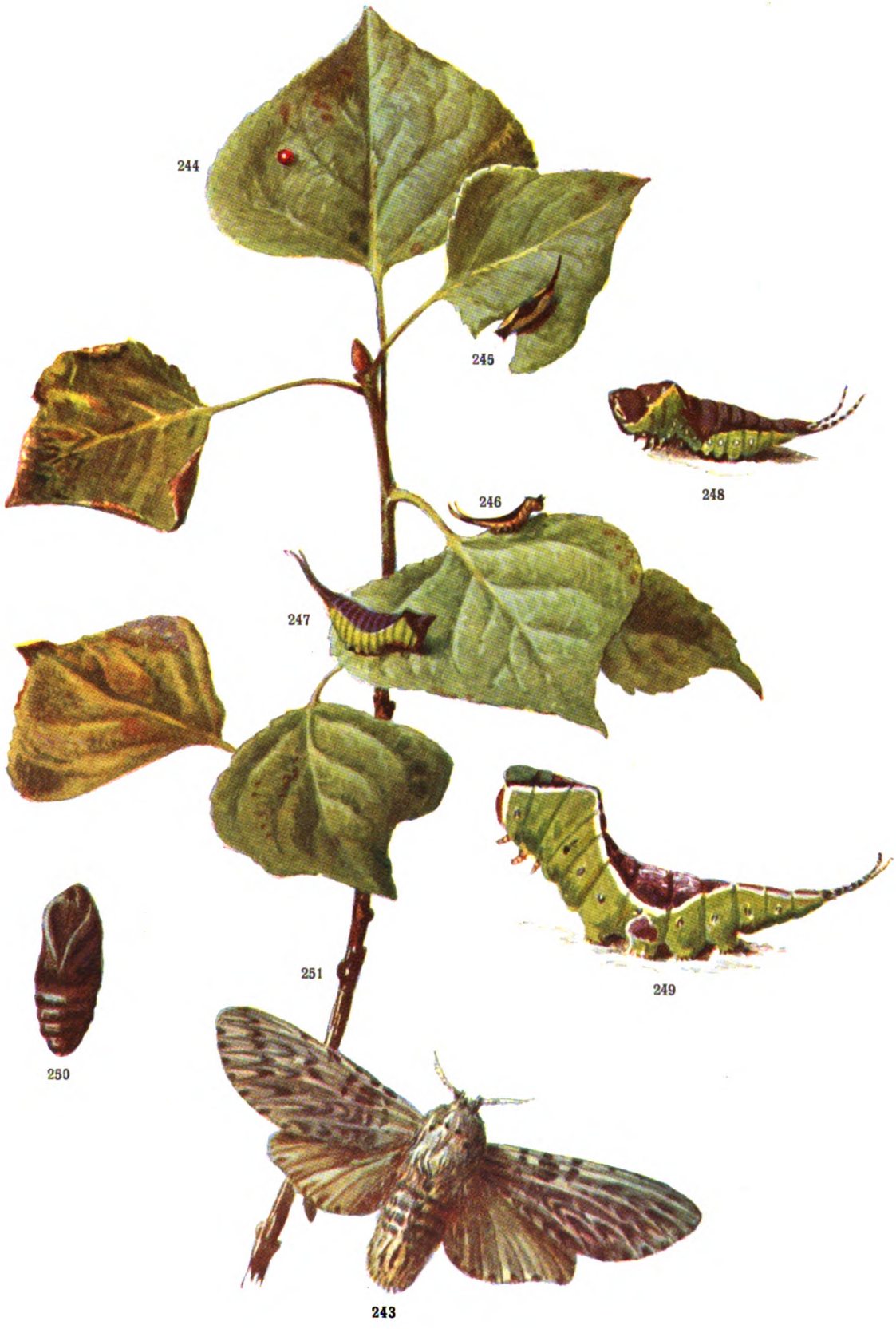

Plate XXVIII.

dark red and a series of black spots, scarcely suggesting the complexion of some ingenuous fair damsel. Still, as we have to deal with an accepted name, a protest is useless. The angle in the centre of the outer margin of the hind wing will be noted; as in Figs. 202, 203, it adds much to the beauty of the form. The moth appears to be very fairly common in most parts of England, and, being double-brooded, appears both in May and in August, though we have known as late an emergence as November 1st. The larva, an inch long when fully grown, is found on oak and sometimes birch in June and September. It is very variable in tint, being sometimes brown, sometimes green, sometimes a dull flesh colour. In this and the preceding species the pupa is attached both by its tail by a silken thread and by another cast around its body; an arrangement we have found freely amongst butterflies, but one that is very rare with the moths. The Maiden's Blush is the *Ephyra punctaria*. When we recall that *punctum* is the Latin word for a spot we recognise the appropriateness of the specific title.

The YELLOW BELLE, Fig. 204, is another species that has earned its reputation somewhat cheaply, for, pretty as it is in its delicate yellows and browns, its name overweights it. It is double-brooded, appearing in May and in August, but is particularly local. It was long the *Aspilates citraria*, the specific name being from the Latin *citrus*, a citron, and referring to the delicate yellow colour of the moth; but the now accepted title is *A. ochrearia*, a name that is really more descriptive, as the pale yellow of the wings is warmer, more ochreous in tint, than the word citron suggests.

A really beautiful little moth is the GOLDEN-BORDERED PURPLE, *Hyria auroraria*, or sometimes *H. variegata*. It is not much more than half an inch in span, and will be found, locally, in July. In the fore wing the ground-work is of a rich yellow, much marked with dulled crimson, while the hind wing is altogether of this crimson but for a central yellow

spot and bordering. Another, no larger and equally charming, is the SMALL YELLOW WAVE, *Asthena luteata*, a midsummer species, having its wings of a rich warm yellow, lined and striped with zigzag marks in warm brown.

There is, perhaps, no moth that is better known than the species we depict in Fig. 209, and which is popularly known alternatively as the CURRANT MOTH, from one of the favourite food plants of its larva, or the MAGPIE, from its strong black and white colouring. It is abundant almost everywhere, and from the food plants being species in cultivation it is very frequently to be found in our gardens. It is about from June to August, and is somewhat lethargic, fluttering around in an intermittent and heavy way. It is greatly attracted by a bright light. We heard of a man in the suburbs of London who, surrounded by market gardens, used to find a great number of these moths fascinated during the summer by the charm of his brilliant hall lamp. Thirty a night was a fair average, his maximum being forty-four. The small yellow eggs are laid in mid-July on gooseberry and currants, and occasionally on blackthorn and hawthorn. Since the introduction of the Japanese Euonymus that plant too has proved very attractive, caterpillars in captivity actually preferring it to any other food. The caterpillars are gregarious, and often from their abundance do a good deal of damage. Some gardeners use black hellebore in powder, sprinkling it over the plants when wet with dew or rain, and mustard has been commended as being equally efficacious, less expensive, and much less dangerous. While ordinarily there is no affinity between the colours of the caterpillar and those of the insect it produces,[1] in the Currant Moth they are identical. These caterpillars, pronounced

[1] Thus the brilliant Tiger moths result from black and brown caterpillars, while the dull-coloured Sword-grass Moth, *Calocampa exoleta*, has a larva gorgeous in green, intense scarlet, brilliant yellow, pure white, and dense black.

loopers, may be seen in Figs. 211, 212, 213, 214. They hibernate, fixed, and motionless, on the twigs, wakening to renewed zeal and vigour on the return of the leaves in spring. The chrysalis, Fig. 215, fusiform in type, hangs suspended by a few threads or rests horizontally in a hammock. Its coloration, yellow and black, will be noted; it is at first entirely yellow, then banded with black. Fig. 209 may be accepted as a typical Currant Moth. It is an insect that is specially prone to variation: Figs. 205, 206, 210, 216 are interesting illustrations of this,[1] while Fig. 208, typical in colouring, is abnormally small. This was reared, the rest of the brood from whence it came producing moths of normal size.

An allied species is the CLOUDED MAGPIE, Fig. 217. It has also been called the Yorkshire or Scarce Magpie, but it is very common in many parts of England, while it exhibits nothing of the strong contrast of colour of the magpie, either entomological or ornithological. It may be found in June and July. It makes a somewhat helpless flutter, and readily falls a prey to the collector. As the Currant Moth is *Abraxas grossulariata*, because its larva feeds on gooseberry, so this is *A. ulmata* because its larva feeds on the elm. It is the *A. sylvata* of some authorities, that name appearing to have a slight precedence in date over the other. The Clouded Magpie enters the pupal state about the beginning of September, attaching itself by silken cords to leaves or rough walls, and thus passing the winter.

The MOTTLED UMBER belongs to what are known as the winter moths. It is really generally distributed in woods; but as it is only to be found in October and November, when

[1] Some collectors devote themselves specially to the acquisition of variations from type. On the dispersal of the collection of Mr. Harper, there was great competition to acquire the extraordinary varieties that he had accumulated. The series of specimens of the Currant Moth was bought for £105.

scarcely any one is thinking about butterflies or moths, it goes unsought and unregarded. Fig. 218 represents the male, an amply winged insect, while Fig. 219 is its absolutely wingless mate. This last presents a very spider-like appearance, as one sees it at rest on the tree trunks. The deep yellow fore wings of the male are crossed by two broad bands of warm brown, and are freely peppered over with small dots; but both the ground-work and the bandings are very variable in their strength of colour in different specimens. The male comes very freely to light. The larva is about during May and June, on sloe, hawthorn, oak, lime, and many other trees, and may occasionally be found sufficiently freely on trees to be voted a nuisance. It presently changes into a pupa of subterranean habit. The moth is the *Hybernia defoliaria*—name very happily descriptive of the appearance of the insect, at a time when winter has stripped the trees of their foliage.

Other moths of this genus are the *H. rupicapraria*, or EARLY MOTH (this is to be looked up in January and February); the *H. leucophearia*, or SPRING USHER, a moth to the fore in February and March; and the *H. progemmaria*, or DOTTED BORDER. This last we represent in Figs. 222, 223, the first of these being the female, a creature not absolutely wingless, yet having those organs in a condition so rudimentary as to be entirely incapable of use in flight. Fig. 223 is the male: this is on the wing normally in February and March, though we have known of the capture of precocious specimens in the opening days of the new year. The caterpillar feeds freely on birch, oak, hazel, willow, and hornbeam, in May and June, and may be found abundantly on the latter in Epping Forest. Our female was captured on the trunk of a tree within that forest; the male on palings at Wembley. On such typical resting-places as these, the insects, owing to their sombre and quiet colouring, are very difficult to find. While we give the localities from whence

our two specimens were derived, the moth is really a common one in most districts: there is no special virtue in Loughton or Wembley. The specific name signifies springing forth, the appearance of the moth coinciding with the period of bud-development. Its popular name, Dotted Border, is happily descriptive: it will be noted that, whilst the general colouring is in various shades of brown, there is on each wing a marginal series of much darker spots.

The CLOUDED BORDER is a decidedly variable insect in its markings, so we give, in Figs. 220, 221, two representations of it, both of which may be taken as fairly typical. It would have been easy, from the series before us, to have found others much more pronounced at either extreme—of abundant dark marking, or conspicuous absence of it. It is a very common insect in woods throughout the land from May to August, being double-brooded. The scientific name of the Clouded Border is *Lomaspilis marginata*—the generic name, Greek in inception, meaning spot-bordered, while the specific, Latin in derivation, signifies margined or bordered, the patterning of the wings being the point in reference all through. The caterpillar feeds on various kinds of willows, in June August, and September.

Another common insect, and more especially in the south, is the GRASS WAVE, the subject of Fig. 224. It should be looked for on open commons, in June and July, since the caterpillar feeds on heather, though it may be found on plantain, broom, and other things. The purplish-grey ground colour of the wings is minutely spotted over with a profusion of dark dots, while each wing is crossed by broad purplish-brown bands that vary from three to four in number and in strength of colouring. It is the *Aspilates strigillaria*. Aspilates is a precious stone mentioned by Pliny; and we may, perhaps, if we try hard, fancy we see a justification for the name in the marbled markings, agate-like in their suggestiveness. The specific name signifies streaked, a reference again to these markings.

Fig. 225 depicts the BEAUTIFUL CARPET, an insect by no means showy or assertive in colouring, but in the blending of creamy white, lilac grey, and browns, quietly attractive. The moth is found in June and July, while the caterpillar feeds on bramble, raspberry, strawberry, etc., in August and September. It is the *Melanthia albicillata.*

The ARGENT AND SABLE, Fig. 226, is a very effective-looking moth, in its strong contrast of colour and the sharp definition of its pattern. It is curious, too, that it has the same markings on both surfaces of the wings, the under side being almost imperceptibly less strong in its black, so that the upper and under faces are practically alike. This striking-looking moth is ordinarily found in the woods in June and July, and especially if the birch be in abundance, as this is the food plant of the larva. The deep brown gregarious caterpillars are not uncommon in August, but in captivity seem difficult to rear; and even if the pupa stage be reached, emergence is by no means a certainty. The insect is the *Melanippe hastata.* The generic title is, entomologically, meaningless, Melanippe being one of the daughters of Æolus; while the specific name is from *hasta*, a spear, the white markings near the margins of the wings being somewhat spear-headed in form.

The PURPLE BAR MOTH, *Melanthia ocellata*, varies somewhat in coloration and markings, so we give, in Figs. 227 and 228, a couple of illustrations of it. In one the central band across the upper wing is of a warm brown, in the other of a cool grey; while in one of our figures the wings, upper and lower, are considerably covered over with scalloped lines, and in the other these are entirely wanting. It is a common species, and on the wing in June. The caterpillar feeds on the bedstraw in July and August, and then spins itself a slight cocoon as the winter home of the pupa.

Our next illustration, Fig. 229, gives us the YELLOW SHELL, or *Camptogramma bilineata*, an abundant species almost

everywhere in June and July. It is noticeable from the rich orange yellow ground-work of the wings, crossed by deeper bands of purplish-brown, and from the profusion of wavy lines with which all is covered. These markings are sufficiently similar to those one may often see on shells to make the popular name a good one. It will be noted, too, that the margins of the wings are scalloped—another shell-like feature. The wings are rather delicate in texture, and liable to injury in capturing the insect. The generic title means a bent mark, in obvious reference to the numerous wavy lines that traverse the wings. The specific name, twice-lined, refers to the two bands on the upper wings.

Our last illustration on Plate XXVI. is the BARRED YELLOW, Fig. 230, the *Cidaria fulvata*. The fore wings, of a rich yellow, are crossed by a broad band or bar of strong rusty brown. On the emergence of the moth this bar has a purple bloom on it, but this is evanescent. The hind wings are of a much paler yellow, and entirely plain. It is one of our common moths of the late summer, being found almost everywhere in July and August. The caterpillar feeds in May on the dog-rose.

There are fifteen members of the *Cidaria* genus, and in Fig. 231 we have another of these, the *C. pyraliata*, or, in popular parlance, the BARRED STRAW. As it is most obviously barred, and of a clear straw colour, its colloquial name may be fully accepted as a good descriptive title. The ancients believed that strange creatures were generated from fire, and this inoffensive little insect was supposed to be so far flame-like in form and colour as to at least suggest the old belief to one's mind, hence the *pyraliata*. It is a generally distributed and common insect, and will be found freely enough during July and August. The caterpillar is a feeder on hawthorn, bedstraw, goosegrass, and some few other things.

Yet another of these barred moths: this time the TREBLE BAR, Fig. 232. This, too, is a common species, and may be

PLATE XXIX

252. Chocolate Tip. *Clostera curtula.*
253. Cockscomb Prominent. *Notodonta camelina.*
254. Swallow Prominent. *Notodonta dictæa.*
255. Iron Prominent. *Notodonta dromedarius.*
256. Pebble Prominent. *Notodonta ziczac.*
257. Figure of Eight. *Diloba cæruleocephala.*
258. Smoky Wainscot. *Leucania impura.*
259. Peach Blossom. *Thyatira batis.*
260. Treble-lines. *Grammesia trigrammica.*
261. Rosy Rustic. *Hydræcia micacea.*
262. Straw Underwing. *Cerigo matura.*
263. Bulrush. *Nonagria typhæ.*

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looked for in May and June, and again, being double-brooded, in August and September, the larva feeding during July on St. John's wort, and again onwards from October, and then hibernating; finally changing to the pupa state in April.

We depict, in Fig. 233, the SCARCE TISSUE, the *Scotosia certata*. It is of right goodly size for a Geometer, and handsomely marked on the dull chocolate ground with lighter and darker bands. It is on the wing in May and June, but is somewhat local. The caterpillar may be sought in June on barberry, and it is full-fed in July.

The particularly dark moth we find reprinted in Fig. 241 is very appropriately called the CHIMNEY-SWEEPER. While the fringe at the tip of the fore wing is pure white, everything else, wings, head, thorax, abdomen, is dead black. It is, locally, a very common species, and has a wide distribution. It must be looked for in June and July. Entomologically it is the *Tanagra atrata*. The little moth alongside, Fig. 242, is the CHIMNEY-SWEEPER'S BOY, *Fumea radiella*. It is not quite true to nature, however, that he should be less densely black than his master, since the latter would ordinarily see to it that his fag did an abundant share of the work, and the boy-nature of the latter would consider even a modified cleanliness as somewhat of a weakness.

CHAPTER VII

Cuspidate Moths—The Familiar Buff Tip—Lobster, and Puss Moths, the various Prominents, and other Typical Species—The Noctuina Group—The Orbicular and Reniform Stigmata—General Sameness of Colouring and Appearance—The Cabbage Moth, Antler, and other Destructive Species—The Various Yellow Underwings, Silver Y, and other Typical Members of the Group—The Red Underwings—Protective Mimicry—The Sallows, etc.

WE enter now on the consideration of the cuspidate moths and those of the division of the NOCTUAS. The first to engage our attention are the Hook Tips: a reference to our Figs. 234, 235, 236 will indicate the meaning of the popular name, since in each case we find the apex of the fore wings of a very pronouncedly hooked form, what would be described entomologically as acutely falcate.

The BARRED HOOK-TIP, Fig. 234, is in many districts abundant, and especially in localities where the beech flourishes. The rich fulvous of the ground colour of the wings, and the darker bands across them, make a very effective combination. The antennæ of the male, the sex we figure, are strongly pectinated; in the female thread-like. There is often a dark discal spot on the fore wing, but this is sometimes very indistinct or may be wanting. The Barred Hook-Tip, being double-brooded, makes two appearances, in May and in August, the ochreous brown caterpillar being found on the beech in June and July, and again in September. The pupa is enclosed in a slight webbing spun amongst the leaves. The Barred Hook-Tip has given the systematists some little

trouble. It is the *Deprana unguicula*, the *Platypteryx unguicula*, the *Deprana cultraria* of various writers, the first title having the best claim, we think, to recognition.

In Fig. 235 we have the presentment of the PEBBLE HOOK-TIP, the prenomen suggesting that the various markings on the wings are suggestive of those we sometimes find on pebbles. It is the *Deprana falcataria*, both names bearing reference to the sickle-like form of the apex of the fore wing. It is a common moth in May, and again in August.

In Fig. 236 we have the OAK HOOK-TIP, an insect very rich in its colouring. This, though not so common as the preceding, we may find in the oak woods in May and June, and, later on, in August. We may recognise it by the two central dark spots on the fore wing. The caterpillar, though found on one or two other trees, prefers the oak, and may be found thereon in June and July, and, as a second brood, in September. It is the *Deprana binaria*, though we may also find it listed as *Deprana hamula* and *Platypteryx hamula*. Should we in May or June, or possibly in August or September, come across a moth that has the falcate wings we see in Figs. 234, 235, 236, but the outer line of the fore wings much waved, we have found the SCALLOPED HOOK-TIP, a not uncommon species. The caterpillar feeds in June and July, and again in September, on the birches.

The subject of our 237th illustration, the BUFF TIP, *Pygæra bucephala*, will probably be familiar to all our readers, since few moths are more abundant from May to July, while even to the non-entomologist it is sufficiently striking in size and patterning to provoke attention. When at rest it has a curious habit of wrapping its wings around it, so that the general cylindrical form that results gives it the appearance of a piece of dry stick, the buff tip at the end of the fore wing looking like the cut end of the twig. The purplish-grey, with more or less of silvery sheen intermingled, and the rich cream and chocolate, combine to make the Buff Tip a very handsome

insect. The hairy larva is of a strong mustard yellow, with numerous black bars across and along it, giving it rather a plaid or chequered appearance. When full grown it is nearly three inches long. These caterpillars are gregarious and congregate in great clusters, and are capable of doing a good deal of damage by the wholesale stripping of the foliage from the trees. They may be found on lime, elm, hazel, oak, beech, birch, alder, and other trees. When full grown they descend from the trees to enter on the pupa state, and at this period of migration may often be seen travelling in large numbers along the ground in search of a suitable resting-place for the next stage of their life-history.

The Lobster Moth, *Stauropus fagi*, varies considerably in size, the female being ordinarily much the larger. The sex we illustrate in Fig. 239 is the male; the female would have a span of wing nearly equal to that of the Buff Tip, Fig. 237. In the male Lobster the antennæ are thickly fringed for some distance and then terminate in a thread-like form; in the female they are filiform throughout. The moth may be searched for in May, June, and July, and especially in beech woods. It is widely distributed, but chiefly in the south, but anywhere must be considered a distinct "find." We have known forty specimens to be captured in three weeks in the New Forest, but another correspondent, in a locality that we had better perhaps not too closely indicate, tells us of one hundred and four being taken between May 14th and June 24th. It is an insect that is subject to a considerable amount of variation in colour, some being lighter in tint than the one we figure, and others very much darker. When at rest with closed wings on the tree trunks it is very difficult, without close scrutiny, to detect it. It is attracted by light.

The larva is found on the oak, beech, hazel, sallow, sloe, birch, lime, and other trees during August and September. It is of very peculiar shape, the second and third pairs of pectoral legs being greatly elongated—a feature we see in no other

caterpillar. The frontal and anal segments are held erect, and the creature is furnished with two little protruding tails. The caterpillar is of a deep brown red in colour and of shining surface, hence, plus the large claw-like legs, the popular name Lobster. In confinement these larvæ fight furiously, relentlessly, murderously, so that they must be kept apart, or our store will be not merely decimated or even halved, but brought within measurable distance of the proportion between victors and victims that is said to obtain when the cats of Kilkenny engage in combat.

The two very similar-looking grey moths seen in Figs. 238, 240 are popularly called Kittens, a much larger species, Fig. 243, being the Puss Moth, these feline titles being applied to them from their very considerable fluffiness. Fig. 238 is the POPLAR KITTEN, *Dicranura bifida*. This is on the wing during June and July, flying in the dusk of the evening and during the hours of darkness, and is to be fairly commonly found during the day-time asleep on the tree trunks. It will be met with chiefly on or about poplars, this being the food plant of the larvæ. The sex we figure is the male; the female is considerably larger. The caterpillar is a night-feeder to be come across in August and September, and is in general form and colour a reduced copy of Fig. 249. The larvæ of these Kittens and of the Puss Moth have the usual anal pro-legs absent, and have instead two projecting tails on the last segment of the body, a point that has greatly impressed those responsible for their name. The generic name *Dicranura*, Greek in its building up, signifies forked tail, while *bifida*, Latin in its origin, signifies twice-cleft.

Fig. 240, the ALDER KITTEN, is the *D. bicuspis*, *bis* signifying twice and *cuspis* a spear-point, so that here again we have reference to this abnormal forked tail-like development, while the SALLOW KITTEN is *D. furcula*, from *furca*, the Latin word for a fork. The Alder Kitten is a somewhat rare species, and, like the preceding, flying by night and resting by day. Alder

and birch trunks should be searched for it during May and June, and it may be attracted by light. The cocoons of all these Kittens and the Puss are exceedingly strongly built from fragments of bark macerated and agglutinated together.

The Puss Moth in various stages of its life-history forms the subject of our next plate, the perfect insect being pictured in Fig. 243. The specimen we figure is a male. The female is similar in colour and markings, but is larger in span of wing and bulk of abdomen. The Puss Moth is very fairly common all over the country during May and June. It is a night flier. It may very readily be attracted by light, or may be found at rest during the day on bank or palings, when it is most sluggish and will suffer itself to be picked off at our pleasure. The eggs, we have one depicted in Fig. 244, are deep red in colour, and are generally laid singly on poplar or, occasionally, sallow. This particular egg hatched out on June 24th.

The larva of the Puss Moth is at first very small, and entirely black. At the first moult we arrive at the form, size, and colour of the creature depicted in Figs. 245, 246, when it is absurdly and grotesquely like a minute tortoiseshell kitten. By July 10th our larva had arrived at its third moult, and was, as we see in Fig. 247, much larger, and at the next moult, on July 17th, it had grown tremendously, the head much larger, the projecting ear-like forms gone, the spiracles conspicuous, the tentacles striped in alternate black and white. On July 24th it had assumed the appearance we see in Fig. 249, and on July 28th it entered on the pupal stage.[1] It will be seen that the body fines off almost to a point, and the anal claspers are converted into a pair of tube-like appendages,

[1] These dates are perhaps a little later than the normal happenings. We see in another record which we kept that we had an egg hatched on June 2nd, the moults following each other on June 7th, 18th, 26th, and July 4th, the cocoon being built and occupied on July 12th, emergence taking place on May 27th of the following year. This makes the caterpillar's duration of life about forty days, and the pupal condition over three hundred.

each of which contains a thin thread-like organ which is thrust out at will and moves freely. If we touch the creature these are at once protruded, and though they cannot inflict the slightest injury we may conclude that, as they are thrown forward by the curving of the body, they look sufficiently formidable to serve as some little means of defence, and thus deter its enemies from touching it. In captivity the larvæ have a strange habit of nibbling at their neighbour's tentacles and often devour them, while the victim is unconscious of the outrage. The larva feeds vigorously during the day and requires a continuous succession of fresh food. Though the caterpillars will eat willow, we have always found that they are at any time prepared to leave it in favour of poplar. The dorsal shawl-like mark varies in depth of colour, but always pales as the creature matures. It is ordinarily a brown more or less purpled, or a paler lilac, in either case freckled and lined with long streaks of greyish-white. It is occasionally green, but its position is even then still sharply defined by the white bordering line.

When full fed the brilliant green of the larval colouring turns to a dull and lurid brown, and the creature must then at once be supplied with material for the manufacture of its cocoon. In one case we overlooked this, and the larva, confined in a cardboard box, made its pupa case of this paper. It will use rag, sand, sawdust, anything that is available. We have known one to settle on an old red sandstone wall and disintegrate the stone, agglutinating it, and modelling it into a cocoon. Whatever the case be made of it is exceedingly dense, one can scarcely break it up, even with a knife. As the material is always that on which the cocoon is built, it merely appears as a portion of the tree, or wall, or box, or whatever it may be, and is thus greatly protected from discovery and molestation. Though the moth ordinarily appears in the following May, it may at times not emerge till a twelvemonth after this. The *Dicranura* genus to which the Kittens and

PLATE XXX

264. Dot. *Mamestra persicariæ.*
265. Broad-bordered Yellow Underwing. *Triphæna fimbria.*
266. Common Yellow Underwing. *Triphæna pronuba.*
267. Orange Upperwing. *Hoporina croceago.*
268. Lesser Broad Border. *Triphæna ianthina.*
269. Yellow Underwing. At rest. *Triphæna pronuba.*
270. Satellite. *Scopelosoma satellitia.*
271. Orange Sallow. *Xanthia citrago.*
272. Great Brocade. *Aplecta occulta.*
273. Black Rustic. *Epunda nigra.*
274. Lesser Spotted Pinion. *Cosmia affinis.*
275. Small Yellow Underwing. *Heliodes arbuti.*

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Puss belong received its name from Latreille in the year 1829, but Schrank many years before this had designated it *Cerura*, meaning horntail, and the name is still in alternative use.

In Fig. 252 we have depicted the CHOCOLATE TIP, *Clostera curtula*. It is not a common insect, but is more or less met with all over the country. It should be sought for in May and, being double-brooded, in July. The caterpillar may be found in May and June, and again in August and September. When young these caterpillars are gregarious, and live in a home of sallow and poplar leaves drawn together, but later on they separate, each going its own way ; the food around the old house that sufficed for twenty little caterpillars not being sufficient to maintain the twenty when their requirements grew with their size : hence emigration in this and all such cases. The generic name, Greek in its birth, signifies a spindle, and is supposed to refer to the slender fusiform abdomen, but one scarcely sees that this feature differs so much from that of others, as for instance those on the same plate with it, as to call for special note. The specific name signifies short or broken. It is from the same Latin root as our English word *curt*, but in the case of the insect refers not to shortness of manner, but to the conspicuous way in which the chocolate tip is cut off from the rest of the wing.

The SCARCE CHOCOLATE TIP, *C. anachoreta*, is, as its popular name indicates, a considerably rarer insect. It may be sought for, which is not altogether the same thing as may be found, in April and May and in August and September. It is a very similar insect in size and colouring to the preceding species, but the chocolate tipping is less striking in colour, and there are two conspicuous dark spots on the fore wing beneath this ruddy patch. The tip too in the common species is, as we see in Fig. 252, continuously one colour, while in *anachoreta* it has a whitish zigzag line running across it, and dividing it into two unequal parts.

The SMALL CHOCOLATE TIP, though local, is fairly common. It may be readily distinguished from the other two by its decidedly smaller size, and from the brown-red spot not extending to the apex of the wing. The popular name is thus a misnomer, since the spot fails to tip. It is the *C. reclusa*, and is on the wing in May and August. Why name fabricators should consider the insect as appropriately labelled a recluse we cannot see. All these Chocolate Tips are by some authorities placed in *Pygæra*, the genus in which the Buff Tip, Fig. 237, finds a resting-place, that name having a seniority of nearly twenty years over *Clostera*.

Several of our moths are popularly known as Prominents, a name that has been bestowed upon them from a tuft of scales that may be seen, as in Figs. 253, 254, 255, 256, projecting beyond the general outline of the lower edge of the fore wing, and which, when the wings are drawn together at rest, makes a little prominence on the back. In Fig. 253 we have the COCKSCOMB PROMINENT, *Notodonta camelina*. It is a species that is very generally found throughout the country from June to August: the rich brown colour plus the curious feature of the large tuft on the wing margin will readily serve for its identification. The generic title means tooth on back, and refers to the dorsal projection, while the specific name compares this prominence to the hump of a camel.

Fig. 254 is the SWALLOW PROMINENT, *N. dictæa*, a very fairly common insect in most places. It is on the wing in May and June, and again in July and August. It is a night flier, but is readily attracted by the fascination of a strong light. In the day-time it is exceedingly lethargic. There is a LESSER SWALLOW PROMINENT that greatly resembles *dictæa*: this is the *N. dictæoides*. It is smaller and has at the anal angle of the fore wing a conspicuous wedge-shaped white spot that is absent in the other species. It may be sought for in May, June, and August. The prominence in these two species has so grown on the imagination of the nomenclator

that tooth or hump fail to describe it, and nothing but Dicte, a mountain in Crete, suffices.

Should we find an insect of this Prominent type, with a stretch of wing approaching two inches, having its upper wings a pale oatmeal yellow, banded and spotted with deeper colour, and the lower wing a smoky brown with a lighter band chevroned across them, we have made acquaintance with the PALE PROMINENT. Another feature to recognise it by is the very conspicuous pair of palpi that project in front of its head and justify its specific name. It is a common insect, quietly effective in colour, and at our service in May, June, and July. Entomologically it is the *Pterostoma palpina*. The antennæ are pectinated in both sexes, though less pronouncedly so in the females.

The IRON PROMINENT, *N. dromedarius*, is depicted in Fig. 255. It is an insect commonly to be met with, and may be looked out for in June. The caterpillar is a birch feeder, though at times found on the alder, and when full grown fabricates a slight cocoon on the surface of the ground at the foot of the tree. We have seen that the hump of the camel has supplied one simile; the dromedary is now called upon for another. The male Iron Prominent has its antennæ pectinated, while those of his mate are filiform.

The PEBBLE PROMINENT, Fig. 256, no doubt owes the first half of its popular name to its pebble-like shadings and mottlings. The male, the specimen we depict, has antennæ of pectinate type, while the female has them simple. She is the larger insect of the two. It is a common and widely distributed species where sallow, birch, and poplar are in fair abundance, and may be watched for in May and June, and then again in August. The Pebble Prominent is only on the wing during the hours of darkness, but comes readily to light; during the day-time it is quiescent amongst the leafy branches and escapes notice. The larvæ are on the food plants we have mentioned during June, or form a second brood

succeeding them in August and September. The scientific name is *N. ziczac*, the specific name being bestowed from the quaintly angular form assumed by the caterpillar. It looked as though it had been crumpled up, and folded on itself, being when at rest something like an open W.

If we find an insect of this Prominent type, but much larger than any of those we have figured, having its fore wings a greyish-brown marked over with many fine markings in deeper brown, and its semi-transparent hind wings of pale greyish-yellow, we have come across a specimen of the GREAT PROMINENT, the *N. trepida*, and may be duly congratulated, since it is a somewhat rare insect. It may be watched for in May.

The moth represented in Fig. 257 bears the appropriate name of the FIGURE OF EIGHT, this eight mark being very visible as a device in the centre of the fore wings. It is common everywhere, but is not on the wing until September, or even October. Its generic name, *Diloba*, signifies twice-lobed, and refers to the two lobe-like spots that between them form the figure eight. The eggs are deposited on the food plants in clusters of six and eight together, and the resulting larvæ are full-grown in May or June, and are then nearly two inches long. They may be found on hawthorn and fruit trees. Linnæus calls the moth the Pest of Pomona, and in some parts of the Continent it has proved itself capable, while in the larval stage, of inflicting great damage, but the British Isles are specially favoured in all these matters, even those insects we possess, that elsewhere are noxious, inflicting upon us comparatively but little loss, while others that are a terror in other countries, such as the Colorado Beetle, seem, even if they gain a footing in Britain, to be unable to retain it. The caterpillar of the Figure of Eight Moth is ordinarily of a pale yellowish or greenish hue, striped down the back with deeper yellow. It has also a blue head, a point to be noted, as the specific name of the moth is *cæruleocephala*, a word signifying

blue-headed. On pupation the caterpillar makes to itself on tree trunk or wall a case of moss, or lime, or chips of wood cemented together. As these materials are furnished from the spot where the pupa is to rest an unpractised eye finds it difficult to see the cocoon at all.

When we pass to the NOCTUAS we are at once confronted by difficulties, since they are not only very numerous, some four hundred or so being found in Great Britain alone, but also, with some few brilliant exceptions, are greatly alike in their general size and colour.[1] This fact is not so patent in our drawings as in looking over any good private or public collection of lepidoptera, since we have naturally selected those that so far differ as to render it possible for our readers to identify them from our drawings, and for the colour-printer to have fair chance of a satisfactory reproduction. This sombreness of colour is in harmony with their nocturnal habits. Still, though the more typical groups are made up of night fliers some few are abroad by day, and these are ordinarily somewhat brighter in colour, and especially in the coloration of the hind wings.

In most of the Noctuas we find certain markings frequently recurrent on the fore wings. Thus near the centre of the wing are two spots. One of these, rounded in character, is called the orbicular stigma, while the other is the reniform, or kidney-shaped, this latter being the further of the two from the base of the wing. Sometimes beneath these there is a third, should this occur it is more or less of a wedge shape. There are also four lines crossing the fore wing, and these, from their frequent occurrence, have also conveniently received distinctive names. Continuing from the base of the wing

[1] Thus the obscure wainscot, shore wainscot, smoky wainscot, reed wainscot, clouded brindle, light arches, dusky brocade, cabbage moth, crescent, garden dart, square spot clay, barred chestnut, quaker, mountain drab, and many more that we might have set down are all much alike in size, all slight variants on one general mottling of dull brown colouring.

outwards the first we arrive at is known as the half-line, since it rarely extends more than midway athwart the wing; the second is the inner line; the next the elbowed line, from its generally more angular character, while the last is the sub-terminal. It must be borne in mind that while some insects exhibit these stigmata and lines clearly, others have them more or less suppressed or indistinct, or some of them are present and others entirely wanting, while in yet others they are not in evidence at all. While in other butterflies and moths the fore and hind wings often bear much the same colouring and design they are in most of the Noctuas ordinarily strikingly different, the under wings being generally patternless, as in Figs. 271, 272, 298, 310, or crossed by broad simple bands of contrasting colour, as in Figs. 265, 281, 287.

The caterpillars of the greater number of the Noctuina hide during the day, and come forth at night to feed. The perfect insects are very susceptible to sweets, though not, of course, in such crude forms as toffee and bull's eyes; entomologists, besides visiting at night the honey-yielding flowers, take advantage of this taste by painting the tree trunks and palings with a fascinating mixture in which sugar largely enters, and by this means catch specimens freely.

The SMOKY WAINSCOT, Fig. 258, may be recognised from the three black dots that are arranged triangle-wise on the fore wing. The rather specially rounded character of the wing will also be noted. The moth is generally very plentiful over the whole country, and will be found during June and July. The caterpillar feeds on sedges and grasses from September to May. The insect is the *Leucania impura*, the specific name being in somewhat reproachful allusion to the quaker habiliments of this moth.

The PEACH BLOSSOM, Fig. 259, is not an uncommon insect if we only seek it in the right places, the outskirts and open glades of woods, and at the right times, the months of June and July. The particular specimen we figure was

captured at Brockenhurst, in the New Forest. When in good condition it is a very beautiful insect, the delicate flushing of pink on the white spots being very attractive. On the reverse side we have a metallic shimmer, in colour like a blending of gold and silver. In some lights the upper surface spots are seen reproduced beneath, but the only conspicuous marking is the dark patch that comes between the tip spot and the next to it on the costal line of the wing. The effect is decidedly rich—the golden shimmer, and the one strong marking on each upper wing.

The larva feeds on the bramble, and the moth when at rest on that plant can scarcely be distinguished, from its resemblance in colour to the delicate pink petals. The pupa rests amidst a spinning together of leaves. The Peach Blossom is the *Thyatira batis.*

Amongst the noticeable early arrivals in the opening year, and a rather common one, is the YELLOW-HORNED MOTH, or *Cymatophora flavicornis.* The specific title indicates that the antennæ are yellow in colour, a fact also emphasised in the popular name. It is on the wing in March. The wings are of considerable span, the fore wings grey, with a decidedly greenish-yellow tinge, and crossed by seven darker lines. The orbicular spot is pale and large, and therefore conspicuous. The hind wings and body are of a rather warmer grey. The caterpillar feeds on the birch, and is of a pale greenish-yellow, spotted liberally with dots, black and white. It is about from May to July, but it is difficult to find, as it takes refuge in a rolled up leaf, and is very shy of showing itself. The moth comes freely to sugar, if we bait for it on birch trunks.

Fig. 260 shows us the TREBLE-LINES, a very inconspicuous moth, but common withal. The wings are of an ochreous brown, the fore wing showing no trace of the stigmata, but having a very conspicuous crossing of lines. It is curious that as these lines are ordinarily four in number, the popular name of the moth should make a point of there

PLATE XXXI

276. Merveil du Jour. *Agriopis aprilina.*
277. Small Dark Yellow Underwing. *Anarta cordigera.*
278. Marbled Coronet. *Dianthœcia nana.*
279. Angle Shades. *Phlogophora meticulosa.*
280. Red Sword-grass. *Calocampa vetusta.*
281. Clifden Nonpareil. *Catocala fraxini.*
282. Gold Spangle. *Plusia bractea.*
283. Herald. *Gonoptera libatrix.*

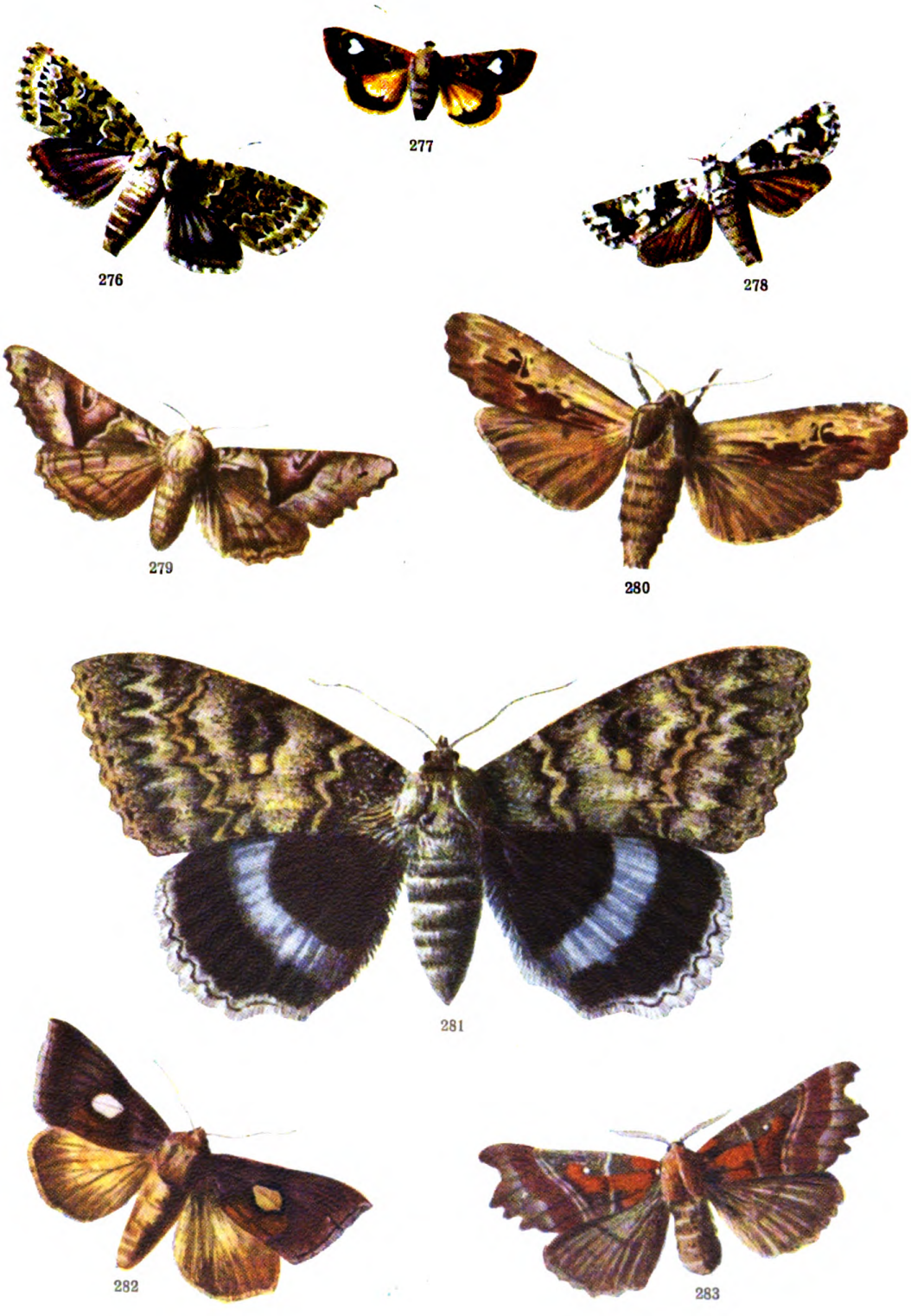

Plate XXXI.

being but three. They vary, however, in different specimens in strength of definition, and the median line is sometimes very slightly in evidence, or may be entirely suppressed. The Treble-lines is the *Grammesia trigrammica*, though we sometimes find the specific name given as *trilinea*. It is to be found in June.

Amongst the prevailing quietness of colour of the Noctuina, the Rosy Rustic, Fig. 261, appears almost brilliant, the fore wings brown with a more or less rosy tinge, crossed by a broad median band of deeper brown, its outer margin being specially emphasised. The orbicular and reniform spots are not brought out by any difference of colouring, but are merely outlined. The hind wing is crossed also by a darker band that is practically parallel with the outer margin of the wing, but is central instead of being in the more ordinary form of a bordering. It is a very fairly common moth, and will be found flying at dusk throughout the later months of summer and autumn. Entomologically the Rosy Rustic is the *Hydræcia micacea*. We occasionally find the fore wings so deep in colour as to be almost black.

The Frosted Orange, *Gortyna flavago*, is a rather brilliantly coloured insect, the fore wing being of about equal parts of strong ochreous yellow and rich ferruginous brown, two sharply defined bands of this latter crossing the wing. There is, however, considerable interchange of colour, the yellow portion being flecked with brown, the brown broken up by the intrusion of the yellow. The hind wing is of a dull yellowish-brown, with a darker bordering. It is, though widely distributed, a somewhat local insect: it is to be watched for during July and August. The specific name is sometimes given as *ochracea*, either this or the alternative term *flavago* equally referring to its yellow colour. The caterpillar feeds within the stems of the various thistles, burdock, foxglove, mullein, and other plants. The Frosted Yellow comes very freely to light.

The Straw Underwing, Fig. 262, may at first sight be taken for a somewhat faded specimen of the common Yellow Underwing, Fig. 266, that is so abundant everywhere, but it has a distinct individuality of its own. It is fairly common, and must be looked for in July and August. It is the *Cerigo matura*, though we often find it listed as the *C. cytherea*. As the first of these names dates from 1767, while the second can claim no greater antiquity than 1794, the more venerable, by accepted usage, claims priority and the right to acceptance. The larva of the Straw Underwing feeds on various grasses from September round to March, but from its dull greyish-yellow colour escapes observation.

The Antler Moth is easily recognised from the characteristic markings that give it its popular name. The ground colour of the fore wings is a deep reddish-brown, the leading nervures being of a much lighter brown, and greatly resembling the ramification of a tree or the branching antlers of a stag, though one old author, less poetic in his ideas, compares them, we see, to a three-pronged fork. The under wings are of a pale brown, and the general monochrome effect is very pleasing. The expanse of wing is about one and a half inches. It may be found all over Britain during July, August, and September on dry, grassy wastes. The Antler Moth is in scientific nomenclature the *Charæas graminis*. The caterpillar, about an inch long when full-fed, a state of things due about midsummer, is almost entirely subterranean in habit, eating the roots and tender shoots of the grasses, and doing sometimes much damage. The grass goes yellow, and presently perishes. Rooks destroy many, but in Britain these caterpillars rarely become really noxious, as Continental folk would regard the word. Abroad they devastate whole districts. We read of two hundred men in Germany collecting in four days three-and-twenty bushels of Antler larvæ, a bulk calculated to represent over four million caterpillars. As these all had to be dug up, the creature, as we have seen, being subterranean,

it represents an enormous amount of labour. When the time of pupation arrives the caterpillar comes to the surface and spins a slight web under moss or stones.

In Fig. 263 we have depicted the BULRUSH MOTH, *Nonagria typhæ* or *N. arundinis*. Each of these terms we find in use, and as one dates from 1787, the other from 1789, their claims are very nearly equal; *arundinis* is, however, the earlier. This moth is common in all parts of the country where the food plant of its caterpillar, the bulrush, is to be found. Hence, marshy districts, fenland, meadows watered by placid winding streams, are the happiest hunting-grounds. The moth is out in September. It varies somewhat in its markings, some specimens being much more liberally dotted and dashed than others, and in some examples we find no marking at all, the whole wing being of a dark brown. This extreme case is known as the *fraterna* variety. The caterpillar, a dull flesh colour, feeds within the stem of the bulrush, and there, too, changes to the pupal state, having first cut an opening in its gallery to ensure escape, since it is not only necessary to secure emergence from the chrysalis, but also emergence from the stem into light and liberty.

The moth we figure in No. 264 is the DOT, the *Mamestra persicariæ*. The fore wings are of a rich brown that almost approaches to black, and having in some lights a purplish gloss. On this deep background we see but slight indication of the orbicular stigma—a few white scales at most—but the reniform spot is large and very much to the fore, and this, of course, is the "dot" that has attracted notice, and suggested the popular name. This dot is white, with a pale brown centring, and supplies a feature that at once serves for identification. The moth is widely distributed and common, June and July being its time of appearance. Though the specific name suggests that the persicaria is the food plant, it is but one out of several that appear equally attractive.

The CABBAGE MOTH is another *Mamestra*, the *M. brassicæ*,

one of the most abundant of species, and to the collector an absolute nuisance. Should he lay his tempting sugar bait, should he sally forth at night with his beguiling lantern, whatever else he may obtain or fail to obtain, cabbage moths will reward his toil with exasperating profusion. The moth has its fore wings richly mottled and obscurely patterned in shades of grey and brown, the hind wings patternless and also brown. It appears in May and June, and rests during the day-time on tree trunks and palings, reserving its activity for the night season. To the gardener it is in its larval state an unmitigated pest, for while in its dietary it will accommodate itself very readily to almost everything, it has a special predilection for cauliflowers, cabbages, and lettuces, burrowing deeply into their hearts, devouring and defiling, and thus causing enormous damage, a task that it lays itself out for with steady zeal during July, August, and September.

The Broad-bordered Yellow Underwing, *Triphæna fimbria*, is a really beautiful insect, for though when at rest we see nought but the usual Noctua type of upper wing, when these are extended we find the lower wings brilliant in deep orange and dense black—a very effective contrast. The upper wings are sometimes of the deep brown of our figure, and sometimes very much paler, a brown that only just misses being a creamy yellow, the latter being much the more commonly seen. We have a series of thirty-one of these beautiful moths before us as we write, and we notice that whatever the tint of the other wings, the abdomen and lower wings are always intensely orange. Those in our Fig. 265 are able in their strength of colour to hold their own, and each pair of wings sets off the other; but where the fore wings are of the very light sandy brown tint, they look weak in colour as compared with the brilliancy of the under wing. The thorax and head go in colour with that of the upper wings, whether these be strong or pale. The moth is on the wing from June to September, and is not uncommon. It was

formerly a great rarity, but has now from some occult cause become very fairly abundant.

The larva of the Broad-bordered Yellow Underwing is found on hound's tongue, potato, primrose, violet, birch, sallow, and divers other things; but it must be remembered that in this, as in most other noctuæ, the caterpillar is revealed to us not by daylight but by lamplight. The generic name is that of a lady mentioned as one of the members of the early Christian Church in Rome, while the specific signifies a border, a feature which this insect most obviously exhibits, if, indeed, that noble band of black occupying half the hind wing may not claim to be something more than a mere bordering.

One of the most abundant of all our moths is the COMMON YELLOW UNDERWING, as it flutters and flusters itself into the attention of even the most unentomological. Like the preceding species, it is a very variable insect in the coloration of the fore wings. Some are a very pale fawn colour, with orbicular and reniform stigmata fairly distinct and the lines very pale; some are deep brown, richly mottled, and elaborated, and with all the typical markings well to the fore. Fig. 266 may be taken as an example of this latter class. All hind wings are similar in colour and marking to those we depict, and do not vary in strength with the fore wings. When the Yellow Underwing is at rest, as shown in Fig. 269, it not only entirely conceals all the gaily coloured back wings, but much also of the lower fore wing: there is nothing of the triangular look that so many moths assume under such circumstances.

The caterpillar of the Common Yellow Underwing feeds on almost anything; presently hibernates, then reappears, and is fully-fed up in May. It is a night feeder, and thus largely escapes many perils, ichneumon flies and birds being out of the way, and even larva collectors at some little disadvantage. The moth is the *Triphæna pronuba*. The specific term signifies a bridesmaid. To those superior persons who

affirm that the popular names are ridiculous and meaningless, unworthy of the recognition of science, the fact that the Yellow Underwing is scientifically a bridesmaid must be somewhat of a shock, provoking the unlearned, when they make the discovery, to carry the war into the opposite camp.

The ORANGE UPPERWING, Fig. 267, will be found, but chiefly in the south, in the woods in September and October, and even November, and then it hibernates in some sheltered spot, and reappears with the spring days. This is a very attractive-looking insect, and a very pleasant "find" when one encounters it. The hind wing is just tinged with yellow, the combination of very pale yellow and strong orange being an unusual one. The larva is one of the enormous number of insects that find sustenance on the oak. It will be found from May to July, when it descends the trees and fabricates a tenement for its pupal days of agglutinated earth and binding silk. This moth is the *Hoporina croceago*, the generic name dwelling on its autumnal appearance, the specific on its saffron-coloured wings.

The insect figured in Fig. 268 is known as the LESSER BROAD-BORDERED UNDERWING. It is a very common species, especially in the south and west, and may be looked for in July and August. The upper wings are richly patterned with a strong brown colour and with a certain metallic violet tinge. Entomologically the insect is the *Triphæna ianthina*, the specific name having reference to the violet gloss on the wings. The fore wings do not vary in strength of tint, as we have seen is so markedly the case with *fimbria* and *pronuba*. The hind wings, rich in their colour effect, have, besides the broad bordering, their bases clouded, a feature in which they vary, it will be observed, from Figs. 265, 266. The larva, a dingy yellow one with black spots, feeds on dead nettle, primrose, and other low plants, and hibernates. It is full-fed in April, and then descends into the earth to enter on the pupal condition.

The SATELLITE, *Scopelosoma satellitia*, Fig. 270, is very happily named; very readily recognised. It will be seen from our illustration that the fore wings are throughout of a rich ferruginous brown. The orbicular spot is entirely absent, while the place of the reniform stigma is taken by a conspicuously white spot, having above and below it two minute white dots, the satellites. The hind wings are of a duller, smokier brown with pale fringing. The moth is not uncommon in the autumn, occurring in September and October, then hibernating, and reappearing in the spring. It is curious that in France, which is really not very far away, it makes its appearance in July and August.

The caterpillar feeds at night on oak, beech, and other trees in May and June. In captivity it is a ferocious and cold-blooded cannibal, devouring not only its own species but any others that may have the misfortune to find themselves in its company; and even in a state of nature it is known to leave its vegetable dietary to gratify its carnivorous tastes at the expense of its milder-mannered neighbours in the leafy shades. The white spots on the wings occasionally vary to bright orange, or may even be entirely wanting.

The ORANGE SALLOW, Fig. 271, is a very similar-looking insect to the Orange Upperwing, but a comparison of the two, side by side, soon enables us to recognise not only points of similarity, but to detect those of difference. The fore wing of *croceago* is, for instance, of a deeper orange and bearing stronger markings, while the hind wing is much paler in tint. Our present insect is the *Xanthia citrago*, both generic and specific names referring to the colour of the moth, though not very happily, one term signifying yellow, and the other citron-like. The caterpillar feeds on the lime, and at its last moult retires to a chamber made by drawing the leaves together. In this it remains quiescent for some three weeks or so before its transformation to the chrysalid state. The caterpillar reaches maturity in June, and the moth appears in August.

PLATE XXXII

284. Broad-bordered White Underwing. *Anarta melanopa.*
285. Shark. *Cucullia umbratica.*
286. Old Lady. *Mania maura.*
287. Alchymist. *Catephia alchymista.*
288. Copper Underwing. *Amphipyra pyramidea.*
289. Marbled Clover. *Heliothis dipsaceus.*
290. Crimson Underwing. *Catocala sponsa.*
291. Silver Y. *Plusia gamma.*
292. Burnished Brass. *Plusia chrysitis.*

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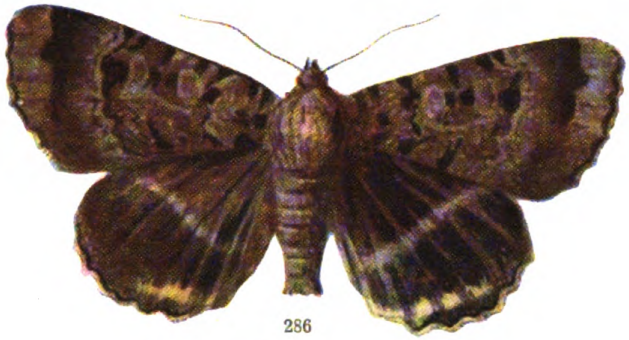

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Plate XXXII.

The GREAT BROCADE, Fig. 272, one of our larger Noctuas, is not so common as many other species, though it is reported from various localities in England and Scotland, and more commonly in the north. It must be watched for in July and August. The general character of its colouring and markings will be gathered from our illustration. It is in scientific parlance the *Aplecta occulta*, though what there is specially occult in it we cannot divine. It is a species that varies somewhat in strength of colour, for, while our drawing may be taken as representing the typical state of things, it is sometimes very much darker than there shown. The white margins of the wing are a pleasant brightening of the general sombre effect of its neutral tinted pinions.

The BLACK RUSTIC, Fig. 273, is a homely enough name for a very unassuming-looking moth. The fore wings are so deep in colour as to be almost black, though on their surfaces in yet darker tint may be seen the characteristic Noctua lines. In the male the hind wings are a clear white, a strong colour-contrast with the upper ones; while in the female, the sex we figure, they are a good deal clouded, and especially at their outer margins, with a smoky brown. It is a rather local insect, that may be looked for, though probably not found, in September and October. The moth is the *Epunda nigra*. The caterpillar is exceedingly variable in colour, being sometimes of a yellowish-green, or may be an olive green, at other times a yellowish-brown or a rich cinnamon tint, or, mayhap, a dull crimson, and, in any event, with divers subordinate variations of colour in its stripings and dottings. It is to be found from October to May.

The little moth we represent in Fig. 274 is the LESSER SPOTTED PINION, the *Cosmia affinis*. The orbicular spot has a central darker dot, while it will be noted that the reniform has two, the form of the stigma being less kidney-shaped than resembling a figure eight. The under wings, save for a yellow margin, are dense black. The moth is on the wing in July

and appears to be somewhat local, occurring in some places freely and elsewhere unknown. The particular specimen we figure was at the time of its capture, July 19th, strolling along the pavement in the village of Hadley, near New Barnet. The caterpillar feeds on elm, and ultimately spins a loose cocoon under fallen leaves or moss.

An allied species, the *Cosmia diffinis*, or WHITE SPOTTED PINION, is a striking-looking insect, the fore wings being of a rich purplish or Indian red, with four very conspicuous white spots along the costal edge. The hind wings are greyish-brown. The specific names of this and the preceding species are somewhat quaint in their relation to each other, one being *affinis*, implying an insect having affinity, alliance, with *diffinis*, while the other, *diffinis*, implies distinction, difference from, *affinis*, Pompey and Cæsar being very much alike, and especially Pompey.

The minute little moth in the corner of our plate, Fig. 275, is the SMALL YELLOW UNDERWING, the *Heliodes arbuti*, an insect widely distributed, and flying by day in May and June. It has been asserted that its generic name refers to its golden brilliancy of colour shining in sun-like strength, *helios* being the Greek word for the sun; but the name would be at least as properly bestowed from the habit of the moth of flying freely in the sunshine. The specific name suggests that the caterpillar feeds on the arbutus, whereas it finds its provender really on the much more abundant and lowlier chickweed.

Yet another Yellow Underwing, and a very striking and easily recognisable one, is depicted in Fig. 277. It is the SMALL DARK YELLOW UNDERWING—a name that, set up in almost any kind of type, would considerably exceed in length the span of its bearer. Scientifically, it is the *Anarta cordigera*—the first name being practically meaningless, at least, in any entomological sense, while the second, happily enough, signifies heart-bearing. The heart-shape on the upper wing is curiously symmetrical, as precise in form as the ace of

spades: it is the reniform stigma really, though so far modified from kidney-shape as to be cordate. Curiously, on the reverse side of the wings this white heart form becomes a straw-coloured circle. It is a common insect in May and June on the great moorland wastes in North Europe, the larva, in July and August, feeding on the bilberry and other wild growths; but with us it is only found in Scotland. Where found it is by no means uncommon.

The MERVEIL DU JOUR, the moth we represent in Fig. 276, has a strong individuality, being one of the few green-winged moths. It is the *Agriopis aprilina*. The caterpillar feeds on the oak in the spring and summer months, and in September and October the moth may commonly be found, and especially in the neighbourhood of woods. The fore wings are very attractively spotted and striped in green and black and white; while the hind wings, in their neutral grey, make an excellent foil to them. The pupa is buried at a very considerable distance from the surface of the ground.

A very similar insect is the SCARCE MERVEIL DU JOUR, *Diphthera orion*. This moth may be found at times at rest on the trunks of trees in the woods; but it is local, and one of our less common insects. It varies slightly in different specimens in the character of the green, some being of a more bluish tint than others. We have a series of twenty-two before us as we write, and we note that, except for this, they are very constant in appearance.

The MARBLED CORONET, the subject of Fig. 278, is a somewhat local and scarce insect that may be searched for in May and June. The orbicular spot is white and wide-spreading, the reniform also white, but with a central darker mark. The whole wing shows sharp interchanges of dark grey and white, as does the thorax; and when the insect is at rest, it has much the appearance of a patch of grey lichen. The caterpillar feeds in July within the capsules of the ragged

Robin and the campions. The moth is the *Dianthœcia nana*; or, with some authors, the *D. conspersa.*

An old author, Donovan, says of the ANGLE SHADES, Fig. 279: "This certainly exceeds many other insects for elegance and simplicity: the variety of teints so delicately, indeed, almost insensibly, extend into one another, and neatness of the waves and lines interspersed over the whole, amply compensate for the defection of more gaudy colours." This testimony to the attractions of the insect is a very just one. Different specimens vary somewhat in the strength and rosy colour of the markings on the fore wings. In one example before us we see that the patterning is much fainter than in the more typical specimen that we figure, and is wholly worked out in various shades of fawn and brown, with no hint of pink. The Angle Shades is a very common insect, and widely distributed, the particular specimen we figure having been caught in the Metropolis itself, at rest in Finsbury Square. It is double-brooded; so that, besides the May and June output, we get a second in September and October. We see a record in our notes of its being noticed at ivy on several nights in November, each evening from two to seven specimens being observed; while two correspondents report capturing it on December 26th and December 31st respectively. It is the *Phlogophora meticulosa.* When at rest, the wings have a curiously crumpled look, arising from the way that they are folded up.

The RED SWORD-GRASS, Fig. 280, is very curiously marked, the effect being singularly like the graining of wood—an appearance that is helped by the colouring. It is a common insect, but not appearing until September or October. The fore wing is noticeably narrow in proportion to its length, and when at rest the moth folds its wings longitudinally around it, so that, from its stick-like appearance, it must often escape detection. The caterpillar feeds on dock, sedge, and other plants from May to July, and presently fabricates a cocoon on the ground as its pupal home. The moth is the *Calocampa vetusta.*

The moth we represent in Fig. 282 is popularly known as the GOLD SPANGLE, and no name could more exactly describe it, the large spots on the centre of each rich purple brown fore wing shining with a rich metallic lustre. One must note, too, the curious mass of plumage on the thorax. We were about to describe its form as apron-like, and thought the term a happy one, until we unfortunately remembered that this article of clothing is never worn on the back. When we view the insect from the side, this stands boldly up from the body; and below it, on the abdomen, are two large tufts of hair that are equally prominent. The strong brown of the fore wings, the metallic gold of the spangles, the plainer brown of the lower wings, combine very harmoniously. The moth appears in July, but is local, and not common: it is a northern species. It is the *Plusia bractea*—names each expressive of its golden splendour.

The GOLD SPOT, *Plusia festucæ*, is very similar to the preceding, but it has not one but three of these glistening golden spots on each fore wing. It is of very common occurrence throughout the country, and will be found in early autumn. The metallic spots in this species are not of the deep ruddy gold of the preceding species, but paler in colour. It is a very beautiful insect.

The HERALD, Fig. 283, has a marked individuality of appearance, the orange scarlet on the fore wings being an unusual colour in moth circles, while the great irregularity of form caused by the deeply notched outlines of its fore wings is another very distinctive feature. In the language of science it is the *Gonoptera libatrix*. The generic name signifies angle-winged, but why the moth should specifically be a maiden offering a libation we fail to detect. The Herald is common everywhere in the autumn, then presently hibernates, and reappears in March. The blossom of the sallow in the spring has a great attractiveness to many moths, and the Herald is one of its most constant visitors. The velvety green caterpillar

feeds chiefly on willow, and is full-grown by July, when it spins a rather conspicuous cocoon amongst the leaves and awaits developments.

The magnificent insect depicted in Fig. 281, the *Catocala fraxini*, or CLIFDEN NONPAREIL, is, unfortunately, one of our very rare insects, though on the Continent it is generally distributed. If, then, we would purchase an undoubted British specimen we must first proceed to line our purse with gold, but if we are content to forego this British nationality a much less expenditure will make it ours.[1] Incidentally we may say that mere purchase is a very low element in making a collection; the captures should be our own to make them of much interest or value to us. The Clifden Nonpareil is specially attracted by sugar. We have heard of one specimen captured at Hammersmith on an apple-tree in a back garden, the suburban entomologist never supposing, we may be sure, that amongst the ordinary things he hoped to beguile by his saccharine temptation could be so great a prize. Specimens have been recorded from Folkestone, Lewes, Brighton, Worthing, Canterbury, Burton-on-Trent, Manchester, and many other places, but its appearance is always an event. It has several times been seen in the metropolitan parks. Its first notified appearance was at Clifden, in Buckinghamshire, hence its popular name. During the day it is at rest on the tree trunks, and should be watched for in August and September, but when thus quiescent the fore wings entirely conceal the lower pair and make the insect exceedingly difficult to detect, the neutral grey of the surfaces harmonising with the bark. The generic title, *Catocala*, signifying beautiful beneath, refers to the contrast between the overshadowing grey of the upper wings and the brilliancy of colour that is revealed when the

[1] In the interests of our book an insect so distinguished could not go unrepresented. It was not in our own collection or in that of any of our friends, but it became our property by purchase for the modest sum of ninepence.

under wings are displayed. The under side is very effective; the lilac band on the under wing is entirely missing, its place being taken by a pure white, and on either side of this occurs a broad black one. The upper wing also is white, with three strong broad bands of black crossing it, everything being either black or white. The moth is *fraxini* because its caterpillar is specially partial to the ash, though it may be found on poplar and elm, June and July being the months of its appearance. The pupa is of a purplish tint covered with a grey powdering, and is wrapped up in a loose cocoon spun amongst the leaves.

The genus *Catocala* comprises many very beautiful species, and in Figs. 290, 293 we depict two other British members of it.

The CRIMSON UNDERWING, *Catocala sponsa*, Fig. 290, may commonly be found in our southern oak woods in July and August; the larva, itself strongly resembling a twig, being found in May and June feeding on the oak. The fore wings of this beautiful moth are richly mottled in various tints of brown, while the hind wings are of a deep crimson and black. It may be distinguished from the third *Catocala* we figure, the *C. nupta*, Fig. 293, from the greater variegation of colour in its fore wings, and from the more multi-angled character of the black band crossing the hind wing. In this species it may, speaking broadly, be called a W, while in the other it is a V: this band is, moreover, more slender in bulk, as a comparison of Figs. 290, 293, will readily show. The Crimson Underwing is a somewhat local species. Why it should be called *sponsa*, or spouse, we cannot say or see. A closely allied species is the Pale Crimson Underwing, *C. promissa*, or, as the specific title implies, one promised in marriage, while the Common Red Underwing is the *C. nupta*, the bride, all terms, it will be seen, strongly matrimonial in their bearing and equally incomprehensible in their entomological application.

In Figs. 293, 296, 300, we have three illustrations of the COMMON RED UNDERWING, a species that during August,

PLATE XXXIII

293. Red Underwing. *Catocala nupta.*
294. Spotted Sulphur. *Agrophila trabealis.*
295. Silver Barred. *Bankia argentula.*
296. Red Underwing. *Catocala nupta.* Under surface.
297. Light Orange Underwing. *Brephos notha.*
298. Brown-line Bright-eye. *Leucania conigera.*
299. Silver Hook. *Hydrelia uncula.*
300. Red Underwing. At rest. *Catocala nupta.*
301. Four-spot. *Acontia luctuosa.*

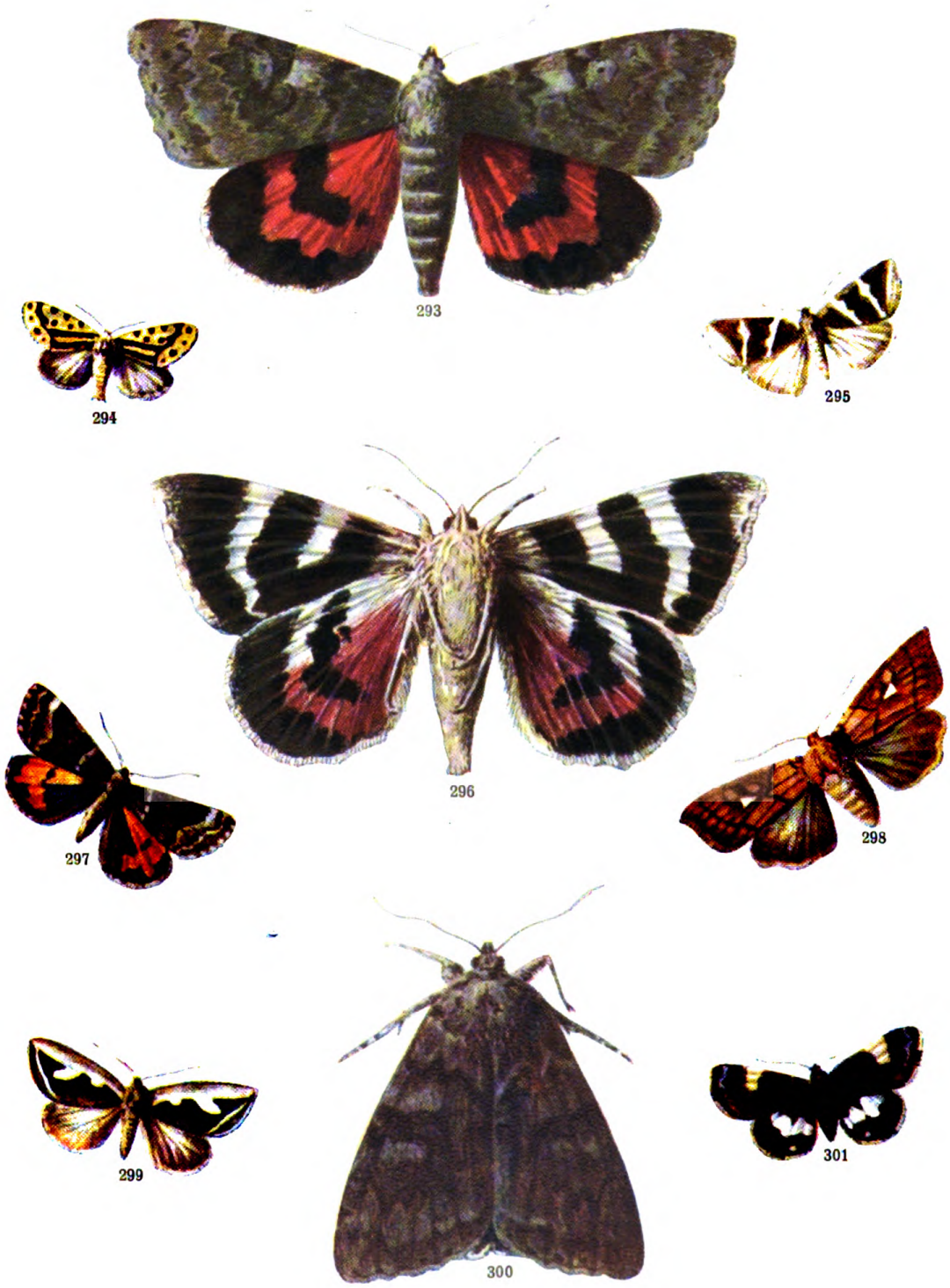

Plate XXXIII.

September, and October may commonly be found throughout the south of England and more rarely in the midlands. As the golden stars of the coltsfoot in earliest spring remind us, keen though the air may be, that the reign of winter is passing away, so the appearance of the Red Underwing, no matter how bright its surroundings, is an indication that the shortening days are drawing on apace. Like its fellow *Catocalæ*, the insect is when at rest difficult to detect, since, as we see in Fig. 300, it is but a patch of neutral colour, then strongly resembling in hue the tree trunks on which it settles. Well do we remember—can it be really half a century ago?—our first introduction; the scene a fir wood in Surrey, the sudden appearance of a rich crimson something or other, awakening ardent desire for its inclusion in our store, and the no less sudden disappearance and dashing of our hopes. This tantalising experience was repeated more than once, but at length while peering cautiously about we were conscious of the presence of the insect high up on one of the tree trunks, and even then only by the slight shadow that it cast, when a clod of earth judiciously dropped in its vicinity led to its renewed flight in all its bright attractiveness. The under surface is decidedly effective in its strong banding of black. We depict it in Fig. 296. The caterpillar feeds in June and July on the willow: hence an old name for the species is the Willow Underwing. It changes to pupa either beneath the bark or amongst the leaves about the end of June.

An Underwing of quite different bulk and scale of magnificence is presented to us in Fig. 284, the unassuming little BROAD-BORDERED WHITE UNDERWING, the *Anarta melanopa* of scientific nomenclature. It is to be found in June, but only by those willing to go in search of it to the north of Scotland. It flies briskly by day and revels in the sunshine. The central isolated spot on the hind wings is rather an exceptional feature in moth patterning. Our insect is a very near relative to the Small Yellow Underwing we have depicted in Fig. 277. Though with us an insect so local it is found

throughout the northern parts of both Europe and America. The purplish-grey larva feeds in July on the bilberry.

The SHARK, Fig. 285, is very commonly to be found almost anywhere from May to July, though, from its habit of settling on fencing and such like things as neutral in colour as it is itself it may often be passed unnoticed. It is the *Cucullia umbratica*. The caterpillars are dark grey or ochreous yellow, with a dorsal row of orange spots. They will be found on the sowthistle from the end of July to September. They appear, even more than most other Noctua larvæ, to have a strong aversion to light, a feature that is brought out in the specific *umbratica*, shade-loving. In the day-time they are closely concealed beneath the lower leaves of the sowthistle, but at night they are active enough, and may be seen, when the lantern is flashed upon them, busily engaged amongst the upper foliage and flower-heads.

The moth we have depicted in Fig. 286 is one of the largest of the Noctuas, and of wide distribution. From its dull and dingy appearance it is called the OLD LADY, which seems rude to old ladies. One old author, we see, refers to it as "this grave insect." Nevertheless, despite its sombre appearance, it has a purplish glow on the wings, and in places a coppery sheen scarcely translatable into colour, but which may be seen in different lights as we move the insect to and fro. The upper surface, as seen in our drawing, is mottled in neutral brown; the lower surface has the same metallic sheen, but is much simpler in patterning; a broad border to each wing of lighter brown, and then across the centre of each wing a broad continuous light band, an arrangement that is very effective. The Old Lady is out in August, and may often be disturbed in the day-time sheltering in various dark recesses. The specimen we figure we captured in a London suburb within a shilling return fare of the heart of London City, and it was not by any means the only one that has crossed our path in that locality. The caterpillar hides by day, but feeds during

the night on dandelion, dock, chickweed, primrose, willow, poplar, and various fruit-trees, hybernating during the winter months, and then in May assuming the pupal condition. It is called *maura* from its black-a-moor (black as a Moor) complexion.

Though so unpretending in appearance, the moth we figure at 287 is of interest from its rarity. It is called the ALCHYMIST, why or wherefore we know not; it seems passing strange that a moth so scarce should have a "vulgar" name at all. It should be expected in May and June, oak woods being its preference. Scientifically it is the *Catephia alchymista*. The reddish-brown caterpillar is one of the well-nigh innumerable creatures that find their sustenance in the monarch oak.

The COPPER UNDERWING, Fig. 288, is very common in southern and central England, but beyond this becomes much scarcer. It is out in July and August, and appears to have a rather special predilection for sugar. The curious way in which the portion of the lower wings nearest the upper loses its coppery tint and shares the brown of the upper wings will be noted. It is an Underwing, too, that, unlike so many of the others, has no banding or bordering of darker colour on its lower wing. The Copper Underwing is in technical parlance the *Amphipyra pyramidea*. While the thorax in many insects is of the rounded type we see in Figs. 285, 286, and so many other of our examples, we often see it adorned with lappets and epaulettes, the present insect being a case in point. We may see this feature again in the Black Rustic, the Red Sword-grass, the Clifden Nonpareil, the Jersey Tiger, and many others.

The MARBLED CLOVER, or *Heliothis dipsacea*, Fig. 289, is a pretty little species to be looked for in June and July, but rather local in its distribution. The generic name signifies burnt by the sun, a name that appears somewhat meaningless when we regard this cool-looking, dapper little moth in its neat garb of greenish-grey. The second name implies that in the larval condition the teazel is the food plant, but the caterpillar is found feeding no less willingly on knapweed, heath, rest-harrow,

and several other plants. It is equivalent to calling a youngster Apple, because he is prepared to eat that, or sweets, or most other things that come his way. *Puer pomi* would be a very inadequate description of such a person.

One of the most abundant, surely, of all our moths is the SILVER Y, the *Plusia gamma*, the subject of Fig. 291. Though the insect is at first glance of quaker-like sobriety of hue, a closer examination reveals a great variety of tint. Here a purplish bloom, there a rich metallic golden sheen, then a beautiful mottling and variegation of shades of chestnut and sepia-brown, while superimposed, and bringing all to a focus, is the Greek Gamma, the Y, more accurately to be described as of pale gold than of silver. The hind wings are of a rich umber-brown, with a broad bordering of darker brown, and the fringing of the wing chequered alternately light and dark. While the Silver Y is in such profusion that no one, scarcely, heeds it, it is, and especially on its emergence, a very beautiful insect, the upper wings having a brilliant metallic gloss as we turn them about at various angles with the light. It flies in the brightest sunshine from May onwards, and we see it on bright sunny days right into autumn, fluttering busily over our flowers like a small version of the Humming Bird Hawk. It seems equally busy in the dusk of the evening, and long after most people, except entomologists, poachers, and the like, have retired to rest. It is at night very susceptible to bright light and easily tempted by sugar; not, indeed, that collectors need inveigle by such arts an insect so abundant, but coming of its own motion, unbidden, to the temptations prepared for other game. The caterpillars appear to feed on almost everything, presently spinning up a very silvery looking silken web as their home and defence during the period of pupation.

There is also a SCARCE SILVER Y, the *P. interrogationis*, and two or three other members of the genus, and all distinguished by bearing on the fore wings a conspicuous Y-like or interrogation mark.

Another beautiful *Plusia* is the *P. chrysitis*, or BURNISHED BRASS, the subject of Fig. 292 ; an insect that is commonly to be met with almost everywhere throughout the country ; it is frequently to be found in our gardens, and must be looked for in June, and, being double-brooded, again in August. Its specific name implies that it is golden, but it is really of a brassy green, with a rich metallic sheen, the burnished effect that is the full justification of the popular name. The fore wing bears two broad bands of this metallic lustre, having between them a central band of brown, this brown colour occurring again outside the spaces occupied by the metallic portions. The caterpillar, light green, finely lined with white, feeds in July on white dead nettle and the low plants of way-side and meadow, and there spins a slight cocoon of coarse silk. The second brood appears in September, and then hybernates, its members not being fully-fed up till April.

An equally charming insect is the SCARCE BURNISHED BRASS, the *Plusia orichalcia*. In this we have one large squarish blotch of greenish-yellow glister near the outer edge of the fore wings, and showing splendidly on the general mass of rich purplish-brown. It appears in August, but unfortunately is a decidedly rare species. It occurs freely, but locally, in Central and Southern Europe. The caterpillar feeds during June and July on the hemp-agrimony. The specific name signifies shining with the lustre of copper ore. It is with some writers the *P. chryson*, this latter name appearing to have the precedence by one year, the respective dates of bestowal being 1789 and 1790.

The SPOTTED SULPHUR, Fig. 294, is a handsome little moth, which has, like the preceding species, the misfortune of being one of our great rarities. The generic name implies a lover of the country, but one could wish it would love this particular country a little more, and take up its abode with us somewhat more freely. It is met with more commonly on the continent of Europe and in Western Asia, Persia

being considerably more favoured than Norfolk. The popular name is not quite a happy one. It is certainly spotted enough to warrant the first half of its title, but then it is not sulphured enough, the ground colour of the wings being not at all the beautiful colour that we see in the Brimstone Butterfly, for instance, but a strong straw-colour. Still, as it stands, it is abundantly attractive, and a more pleasing harmony of colour, really, than sulphur-yellow and black would make; it is not by any means the insect itself that we fall foul of, but only its name. Almost all the captures in England seem to have taken place in the Eastern Counties, and to have arisen rather from the accidental attraction of light than from any other cause. At all events, any of our readers finding themselves in Essex, Suffolk, or Norfolk during June, July, and August, may, sitting in their room by lamplight, the window being open to admit the welcome cool of the evening after the heat of the day, have the supreme felicity of welcoming the Spotted Sulphur, and even if this does not happen (and it probably won't!) many other things of entomological interest will. The caterpillar feeds on the little field convolvulus. Entomologically, the moth is the *Agrophila trabealis*, a name given by Scopoli, an Italian scientist, in 1763, though the name given by the yet greater Linnæus, *Agrophila sulphuralis*, three years later, is still met with.

The SILVER BARRED, the subject of Fig. 295, is, like *trabealis*, curiously unlike a Noctua, in the absence of the usual stigmata and lines. It is an active little moth that is commonly found on the Continent, but in Britain it is a very local fen-land species, a species therefore that, like *machaon* and *dispar*, has suffered from the extensive drainage and reclamation of these marsh-lands. It has been taken in considerable numbers around Ely and Killarney, districts far remote from each other. Elsewhere it has but appeared spasmodically. This, from the entomologist's point of view, at least, seeing that he has ordinarily no special landed interest

in turning bog into cornfields, is to be regretted, as it is a very delicate looking little insect, with a strong individuality of appearance, and—may we venture to add?—refinement. The Silver Barred should be watched for in June. The little green, white-striped, caterpillar feeds on different grasses in July, turning in August to a pupa that finds its resting-place till the following June in a cocoon spun amongst the grass shoots, and close to the ground. The moth is the *Bankia argentula*, the specific name referring to the silvery stripings on the fore wings. It may occasionally be found described under the name of *B. bankiana*. Some little error would appear to have crept in, as it is sometimes called *Banksia*. As the generic name was bestowed in honour of Sir Joseph Banks, a great traveller and naturalist, *Banksia* would appear to be the preferable form of the word.

In Fig. 297 we have the presentment of the LIGHT ORANGE UNDERWING, the *Brephos notha* of the systematist. In Fig. 305 we find another insect closely resembling this, the Orange Underwing, and the orange in this Light Orange Underwing seems fully as deep and rich in colour as in that. The present species, *notha*, is a little the smaller; so possibly the lightness that the popular title insists on may be in avoir-dupois! The masculine antennæ are distinctly bi-pectinated, not at all a usual state of things amongst the Noctuina. It is a local and not common insect, on the wing in March and April.

The caterpillar of the Light Orange Underwing, though endowed with the regulation Noctua number of legs, curiously enough never uses four of them, but is content to mimic the looping mode of progression that we have seen is so characteristic of the Geometer larvæ. It feeds on sallow and aspen during June, spinning the leaves together as a defence and shelter, and presently drills out a chamber beneath the bark, or in the solid wood itself, in which its pupal days are passed.

The ORANGE UNDERWING, Fig. 305, the *Brephos parthenias*, is, as we see in our illustration, a very similar looking

PLATE XXXIV

302. Flame Brocade. *Trigonophra flammea.*
303. Marbled Minor. *Miana strigilis.*
304. Mother Shipton. *Euclidia mi.*
305. Orange Underwing. *Brephos parthenias.*
306. Hebrew Character. *Tæniocampa gothica.*
307. Burnet Noctua. *Euclidia glyphica.*
308. Small Angle Shades. *Euplexia lucipara.*
309. Centre-barred Sallow. *Cirrhœdia xerampelina.*
310. Pink-barred Sallow. *Xanthia flavago.*
311. Bordered Sallow. *Heliothis marginatus.*

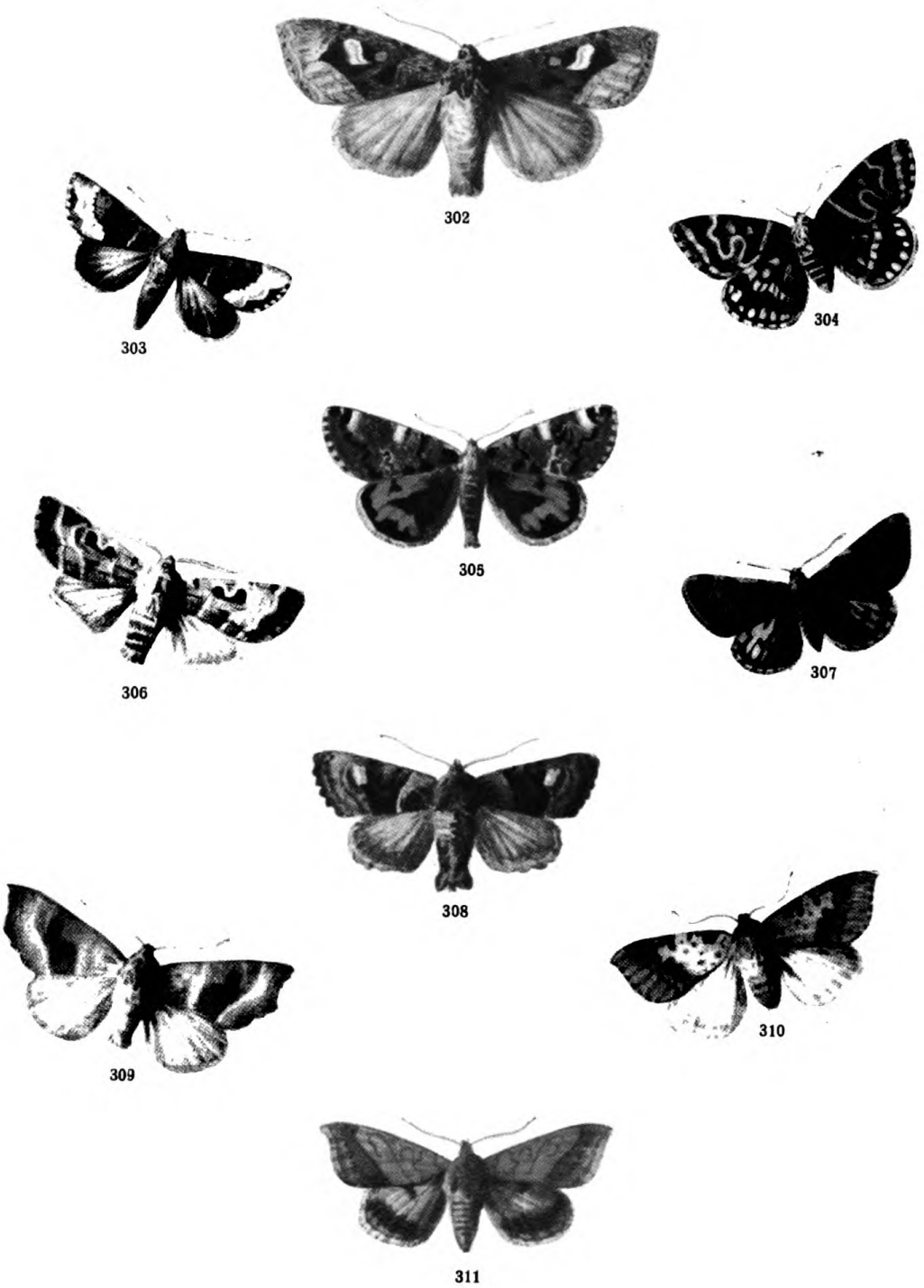

Plate XXXIV.

insect to its close ally, *notha*, but it will be noted that *parthenias* has a yellowish blotch about the centre of the costal edge of the upper wing, and that *notha* is without this. The Orange Underwing should be sought in birch woods during March and April. It flies vigorously in the sunshine, and is generally common, if we follow the altogether reasonable course of searching for it in the right places. The caterpillar is found on the birch trees during May and June, spinning itself a home amongst the leaves, and, like the *notha*, affects the Geometer style of locomotion.

The moth we depict in Fig. 298, the *Leucania conigera* of science, bears as its popular name the unwieldy title of the BROWN-LINE BRIGHT-EYE, a title that is admirably descriptive, but about twice too long for comfortable use. It is a very common species during July. The specific name, meaning cone bearing, is in apt allusion to the conspicuous triangular spot forming the lower portion of the reniform stigma.

In Fig. 299 we have another little moth, the SILVER HOOK, that, like Figs. 294 and 295, departs widely from the generally accepted type of Noctua colouring and pattern, and goes in for a strong and attractive individuality of its own. The colouring is in varying shades of cool sepia-brown, the silver hook having, as befits its name, its termination pure white, though we cannot quite avoid the criticism that this hook is a terribly blunt-pointed one. It is a rather local insect, on the wing in June and July, fluttering in broad daylight in damp, low-lying meadows, the caterpillar being a grass-feeder, and to the fore during July and August. The Silver Hook is the *Hydrelia uncula*; the generic name, Greek in its inception, meaning watery, in apt allusion to the localities favoured by the insect, while *uncus* is the Latin word for a hook, the specific title being a diminutive from this.

The last illustration on Plate XXXIII., Fig. 301, gives us the FOUR-SPOT, the *Acontia luctuosa*. It is a somewhat

variously marked insect in the size of these four spots. In our figure they are all of goodly size, but in some specimens they are scarcely more than half the area of those we depict. The spots on the lowest wing are always white, while on the upper wings they may be either white or of a reddish tinge. It is, perhaps, as well to point out that the four spots of the popular name are one on each wing, the large or small white patch on the lower wing, no matter how irregular its outline, how obviously cut into by the nervures, but counting as one spot. The curious dark patch of fringing in the midst of the light-coloured bordering to each wing will be noted. The Four-spot is a local insect, coming out in May and June, and then again in August and September. The caterpillar, a nocturnal feeder, like most of the Noctua larvæ, will be found on the leaves and flowers of the small field convolvulus in June and July, and in September.

The FLAME BROCADE, Fig. 302, *Trigonophra flammea.* The fore wings of this fine Noctua are of a very purplish brown, while the hind wings are of a much paler and yellow tint. The orbicular stigma is fairly conspicuous, but by no means so much in evidence as the reniform. This, nearly white in colour, is a very prominent feature in the pattern of the wing ; it has, it will be noted, a slightly darker colour. It is a very local moth, and appears to be confined to certain limited districts on the south coast. It must be looked for during September and October. Lewes appears to be at present the most northerly point of its occurrence, which certainly leaves a good deal of Great Britain and Ireland outside its bounds. The greenish-brown caterpillar feeds on the leaves of the ash and privet and other plants, its preference appearing to be for the lesser celandine. The Flame Brocade is sometimes given in the text books as *T. empyrea* ; but this is a later name, dating from 1799, while *flammea* goes back to 1785, and has, therefore, abundant margin of time to establish its right to precedence.

The MARBLED MINOR, the *Miana strigilis*, is the subject brought before us in Fig. 303. It is an insect that varies very greatly in its coloration and markings, it being difficult to find two specimens that are precisely alike. One result of this has been that several variations have been in the past raised to the rank of independent species. Thus one particularly dark one, in which no trace of grey is visible, has been called *M. æthiops*, or the Blackamoor; but these variations, whether abnormally light or exceptionally dark, are but the extreme links of a long chain and can be joined into one by a steady succession of intermediate forms. Fig. 303 we would venture to call the central link, or that most useful institution in all sorts of matters, the happy medium. The antennæ of the male are finely serrated, and in side view the abdomen will be seen to be very conspicuously humped with a series of tufts of black hair.

It is a curious fact that there was a time when the black form of the Marbled Minor was a rarity, though it may now be found in plenty; one illustration the more of the increase of melanism. We may see this tendency to the production of dark forms very plainly in *betularia*, Fig. 189, and other insects, and amongst these illustrations of it may be included *strigilis*. The Marbled Minor is abundant almost everywhere during June and July. The caterpillar feeds from September to May on various grasses, and then dives into the ground to fabricate an earthen chamber in which to pass its period of pupahood.

The pretty little moth we find depicted in Fig. 304 is the *Euclidia mi*, or, popularly, the MOTHER SHIPTON, a very common species in most places, and flying in June over the meadows. The caterpillar goes a little short in the matter of legs, so that when it has to walk it adopts the Geometer method of advancing by a series of large loops. It feeds on grasses, clover, lucern, medick, arriving at maturity about the end of August. Curtis includes it in his book on *Farm Insects* amongst the noxious species, from its ravages in the clover

fields. The curious markings on the wings suggested to Ochsenheimer, a distinguished German entomologist, the generic name *Euclidia*, a title in which we have no difficulty in recognising a reference to Euclid, the arch fabricator and abettor of geometrical problems, and who might be supposed to regard with interest and sympathy the convolutions of line on the wings of this little moth. The specific name *mi* is from the M-like form of the contorted line that fills so much of the fore wings.

Immediately below the Mother Shipton on our plate is, in Fig. 307, another of the genus, the *Euclidia glyphica*. Glyphic work we know to signify carved work, but any suggestion of carved surface in the marking of this species, the BUR ET NOCTUA of common parlance, does not seem to be borne out. The brown of the fore wings has a purplish tinge, while the bright yellow of the lower wings suggests at first the idea to us that we have found some species of Yellow Underwing. The Burnet Noctua is a common species, but with a special partiality for chalk districts, fluttering in the meadows and along the edges of the copses in May and again in July. The caterpillar must be looked for in June and in September. Like the larva of *mi* it arches itself like a Geometer larva when travelling. In the day-time it stretches itself along the stalk of the food plant, remaining motionless; not feeding until night-time. It luxuriates on various kinds of clover, and has earned for itself in consequence a place in the lists of our insects inimical to the farmer. The chrysalis is of a deep purple brown, dusted over with a delicate plum-like bloom.

The HEBREW CHARACTER is of a delicate purplish-brown ground colour, variously mottled and striped in brighter and darker brown. We represent it in Fig. 306. Entomologically it is the *Tæniocampa gothica*. It is common almost everywhere in the spring, and takes full part in the goodly company of different kinds of moths that are then attracted by the sweetness of the blossoming sallows. The antennæ in the male,

the sex we figure, are pectinated. The caterpillar feeds on oak, sallow, hawthorn, broom, lilac, clover, and many other things, reaching maturity about the middle of June.

In Fig. 279 we dealt with the Angle Shades, and we have now in Fig. 308 the SMALL ANGLE SHADES. We find in this little moth a charming blending of rich warm colour, culminated in focus by the yellow spot. The outer half of the fore wing shows a rich copper colour in some lights, and the hind wings under like conditions have a brassy sheen on them. The rich purplish band across the centre of the fore wing is very telling in effect. The under surface of all the wings is of a metallic pale gold, the light spot of the upper surface making itself slightly felt. At first sight, maybe, the insect may not seem worthy of much regard, but it is well deserving of it, we soon find, on full and careful appreciation of its quaint beauty. On obtaining a side view of the insect it will be seen that the abdomen is crested, two of the segments near the thorax being very distinctly humped. The Small Angle Shades may be met with commonly almost everywhere, being on the wing in June and July. The caterpillar, sometimes green, sometimes reddish brown, may be found on various species of fern plants that most insects do not seem to much appreciate, and on birch, foxglove, plantain, and other things from July to September. The moth is the *Euplexia lucipara*. The generic name signifies prettily folded, and refers to the gathering in of the wings of this species when at rest. The specific name means light-bearing, but what light the moth carries we fail to detect, unless by something of poetic imagery we are invited to see in the bright spots on the deep purple brown wings the suggestion of lamps shining in the darkness.

In Fig. 309 we have the CENTRE-BARRED SALLOW, or *Cirrhædia xerampelina*, a brilliant-looking insect in its grand colouring of strong orange-yellow and ruddy brown band and bordering on the fore wings; the hind wings being considerably paler and more subdued in colour, but with, in

some lights, a touch of iridescence. The centre bar on the fore wings extends across from the inner line to the elbow-line, scarcely reaching to the costal edge, but emphasising the renal spot.

The caterpillar is found on the ash from October to June. It is very lichen-like in colour, being of a greyish brown, mottled with a blackish brown, and having some whitish lines and blotches. In the day-time it creeps into a chink in the trunk, and there lies concealed, as its colouring is in well-nigh perfect assimilation with its surroundings. When June, the time for the pupal change, has arrived, the caterpillar descends the tree, and at its foot forms a rather small cocoon of mingled silk, moss, and earth. This it enters, but it does not actually turn into a chrysalis for some considerable time.

The perfect insect is to be found in September, but it is rather a local species. The generic name, Greek in its birth, signifies of a tawny yellow colour, while the specific name, also Greek, is made of two words, dry and vine, the colour of the wings of the insects resembling that of the foliage of the vine when autumn has laid its fiery fingers upon it, a comparison which in these northern latitudes would not have occurred to an English scientist, but which, when made, we feel to be a very happy one. The popular name is satisfactory, so far as the centre bar is concerned, but one fails to see why there should be any reference to the sallow.

We have already, in Fig. 271, made acquaintance with the Orange Sallow. There is also a Barred Sallow, *Xanthia aurago* ; a Dusky Lemon Sallow, *X. gilvago* ; and the Centre-barred Sallow that we have just had under consideration : now in Fig. 310 we have yet another of these, the PINK-BARRED SALLOW, or *Xanthia flavago.* In this latter the ground colouring is very similar to that of its near relative the Centre-barred. The deeper colour on the wings is perhaps a little redder : there is a touch of purple in the brown of *xerampelina* that is missing here, but we could scarcely, by the

most vigorous imagination, feel inclined to accept it in *flavago* as pink. Nothing but a pronounced case of colour-blindness could be of much service to us here. Whatever measure, however, of adverse criticism we may apply to its popular name, the insect itself, beyond doubt, is a bright-looking and attractive one. It will be noted that in the Centre-barred the outer margin of the fore wing is considerably notched, while in the Pink-barred it is of one continuous line of double flexure. In the former species, too, the patterning is scarcely more than one broad band, while in the latter the dark colour is distributed amidst the light by a considerable sprinkling of blotches and dots, large and small. This moth we have no difficulty in accepting as a Sallow, as the plant in question is really the food plant of its caterpillar. The moth is about in September and October, the caterpillar in April, May, and June.

In Fig. 311 we have yet another of these Sallows, the *Heliothis marginata*, or BORDERED SALLOW. In this species we have on the fore wings a ground colour of dull orange bordered with purple brown, the stigmata being emphasised by dark boundary lines. The hind wings, too, having a yellow ground tint, are strongly margined by a border that is so dark as to be almost black, and beyond this, ere we reach the fringing of the wings, a fimbriation of orange. This handsome little moth is with us in May and June, and is of fairly general distribution, flying actively by day as well as in the dusk of the evening. The caterpillar of the Bordered Sallow may be found on the rest-harrow, and at times on the knot-grass during July and August. *Heliothis* is in significance burnt by the sun, and we may take the title to refer to the general warmth of colour of the insects of this genus; while *marginata*, the margined, calls for no explanation, as a glance at the moth shows its appropriateness beyond dispute.

Lepidoptera, as we have seen, have been sorted out into certain large divisions, some being butterflies, some sphinxes, others

geometers, and so forth ; and all these, no matter what their differences amongst themselves may be, are placed together as dealing with what are termed the macro-lepidoptera. Beyond this great division we get quite other groupings, and these deal with the minuter forms, the micro-lepidoptera. With these we cannot deal. Their minute size, and at the same time, in so many cases, their exquisite richness of marking, render any attempt to do justice to them, by any method of colour printing as yet known to us, impossible. A visit to any fine collection of them is a revelation, and it is really by such collections alone that one gains any adequate idea and knowledge of these minuter forms. Illustrations which fail to illustrate are, it is evident, of absolutely no value. If one cannot by their means identify a species that we may have found, they are mere surplusage ; blind leaders of the blind, while it is practically impossible to deal with the micro-lepidoptera by description alone. Such text would necessarily have to be exceedingly technical, and would therefore fail to conform to our present ideal—a book that all nature-lovers may take up, and, we trust, feel in sympathy with, even though they be not equipped with all the paraphernalia of the specialist.

It now but rests with us, in drawing our book to its conclusion, to express the hope that some at least of the pleasure it has given to us in its preparation may be shared by those into whose hands it may fall. The study of Nature is an ever-present delight. To all in sympathy with such pursuit we dedicate our book.

QUIA DELECTASTI ME, DOMINE, IN FACTURA TUA ; ET IN OPERIBUS MANUUM TUARUM EXULTABO.

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PRINTED BY A. C. FOWLER, MOORFIELDS, E.C., AND SHOREDITCH, E.