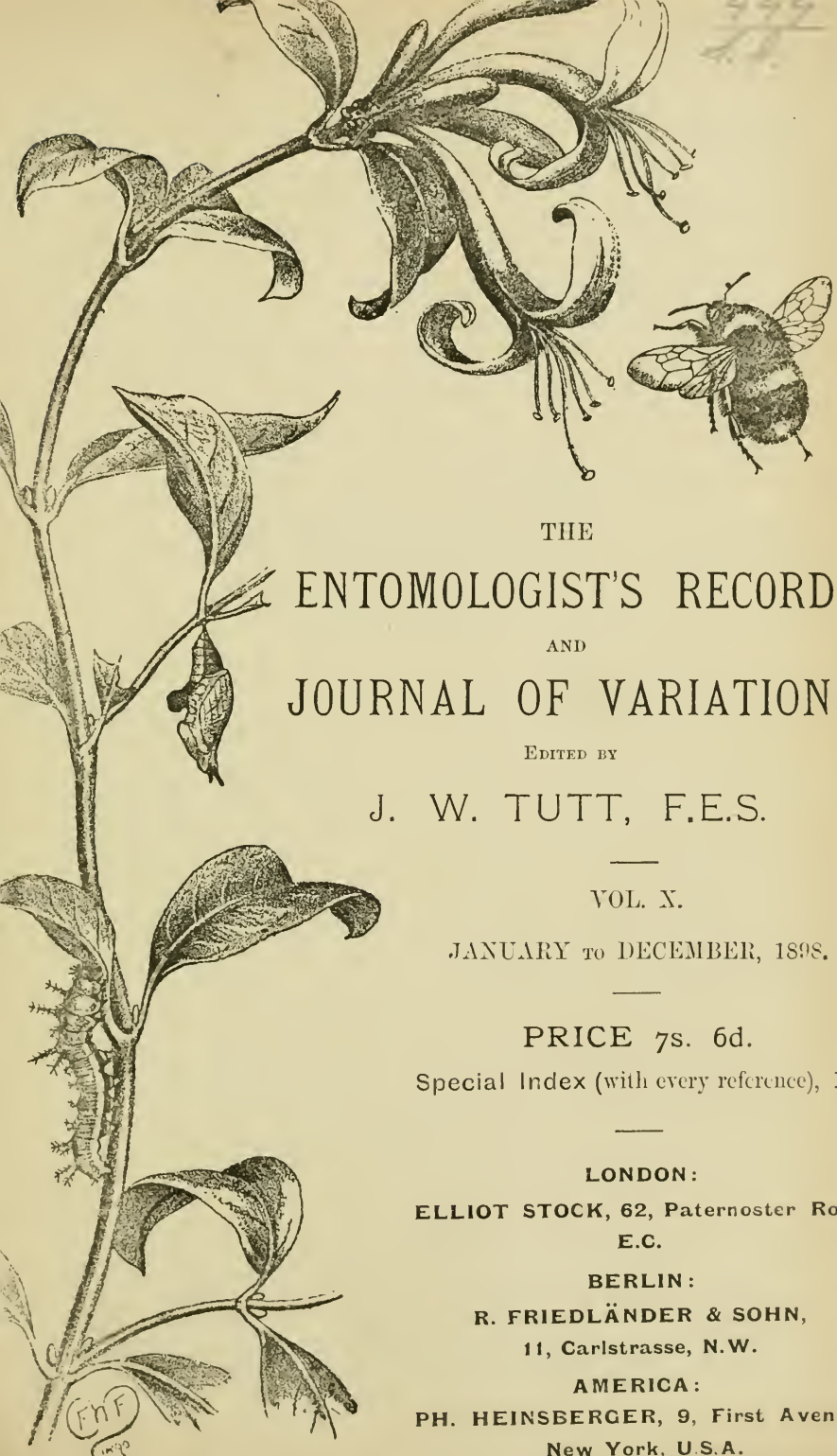

LIBRARY OF CONGRESS
1800



THE

ENTOMOLOGIST'S RECORD

AND

JOURNAL OF VARIATION.

EDITED BY

J. W. TUTT, F.E.S.

VOL. X.

JANUARY TO DECEMBER, 1898.

PRICE 7s. 6d.

Special Index (with every reference), 1s.

LONDON:

ELLIOT STOCK, 62, Paternoster Row, E.C.

BERLIN:

R. FRIEDLÄNDER & SOHN, 11, Carlstrasse, N.W.

AMERICA:

PH. HEINSBERGER, 9, First Avenue, New York, U.S.A.

PREFACE TO VOL. X.

On the completion of our tenth volume we again tender our heartiest thanks to our subscribers and contributors.

To the latter we are exceedingly obliged for the great number of communications sent, and if we have sometimes been obliged to delay articles, it is simply because we have had so much material on hand that space has been lacking for their immediate publication. Our own papers, on the "Migration and Dispersal of Insects," have on this account been delayed, and we have other interesting articles now standing over from some of our best entomologists Mrs. M. de B. Nicholl, Mr. J. J. Walker, F.L.S., F.E.S., Dr. T. A. Chapman, F.Z.S., F.E.S., Professor Enzio Reuter, Ph.D., F.E.S., and others. These articles we hope to publish early in the New Year.

During the past year we have preferred to occupy the space previously taken up by the reports of societies (which are sometimes found in at least half-a-dozen magazines) with original articles. Considering that all the best Societies print their reports in their *Proceedings*, and we add as a "Current Note" any point of more than usual interest that occurs at the meetings, this practice will be continued. It gives us a page or two each month for "Practical Hints" and other details that seem to be appreciated.

Twelve months ago we had the pleasure of announcing that Mr. Horace St. John K. Donisthorpe, F.Z.S., F.E.S., would undertake the editing of all notes on Coleoptera submitted to us. For the vast improvement in this section of the magazine our thanks to Mr. Donisthorpe are entirely due. We have now to chronicle another addition to the editorial staff, Mr. M. Burr, F.Z.S., F.E.S., having kindly undertaken to edit any notes on the "Orthoptera" that may be submitted for publication. The maintenance of a permanent section of the magazine for this order, under so capable and energetic a specialist, is a matter of great gratification to us, and will, I doubt not, be fully appreciated by our readers.

We have already on hand a large number of "Practical Hints" for publication in the next volume. This feature of the magazine will, therefore, be maintained. It is one, however, in which the Editor would be glad of outside help. We should also be pleased to receive "Current Notes," especially important items of entomological news gleaned from foreign sources, or relating to British work.

Our thanks are again due to Mr. G. B. Routledge, F.E.S., who has undertaken, for the fifth time, the preparation of the *Special Index*. To those who, like ourselves, sometimes have to search laboriously page by page the old magazines for almost every reference required, owing to the uselessness of the Indexes that then had to suffice, an Index of this kind is invaluable.

Evidently the time is arriving when each of our entomological magazines will have its Special Index fairly complete, and even at the expense of reducing the General Index to vanishing point and occupying a large part of the last number of each volume, the change will be welcomed. We shall, however, continue to publish the General Index as hitherto with the last number of the volume, and, separately, a Special Index that contains every reference to species, etc., in the volume.

The Entomologist's Record AND JOURNAL OF VARIATION.

VOL. X. No. 1. JANUARY 15TH, 1898.

Aberration of Arctia caia (with figure).

By J. A. CLARK, F.E.S.

Fig. 1.—ABERRATION OF ARCTIA CAIA.

The figure of this aberration will give the readers of *The Entomologist's Record* a better idea of its peculiarities than any extensive description. From this it will be seen that the forewings show considerable malformation, the costa being hollowed and the outer margin somewhat bulged beyond the normal condition in this species.

This modification in shape is accompanied by a weak coloration, the brown areas of the fore-wings, although much extended, being badly pigmented, and this has evidently resulted from a failure to reach the normal state of pigmentation. The spread of the brown markings beyond their normal limits has resulted in a corresponding contraction of the creamy areas. The latter are remarkable for the fact that they are almost symmetrical on the two wings, a slight difference in the size of the central arch of the creamy mark being the main point of distinction. The hind-wings and abdomen are orange in colour, the former with a dark fringe; the black spots on the hind-wings are strong and well-developed, and a fine black longitudinal line joins the black marks that reach the costa.

The specimen was bred in July, 1897, from a larva found at Walthamstow, by Mr. Coleman, of Ada Street, London Fields.

Retrospect of a Lepidopterist for 1897.

By J. W. TUTT, F.E.S.

Another year has passed, and I am again about to offer a short critical review of the Lepidoptera of, and the doings of Lepidopterists in, the year 1897.

The season, this year, seems to have been, on the whole, below the average from the collector's point of view, although such species as

have occurred have been moderately normal in their time of appearance. Some counties—*e.g.*, the south-eastern—have been particularly disappointing; on the other hand, in the south-western counties, some species, usually rare, have appeared in unusual profusion. From various reports, the Scotch collectors have been very unfortunate.

Among the butterflies there has been no special abundance of any species. As in 1895, there have been records of a few autumnal specimens of *Colias edusa*, but none of *C. hyale*—Dorset, Cornwall, Suffolk, Norfolk, Essex, Hants, Kent, Somerset, and the Isle of Man being among the favoured spots. A few autumnal *Pyrameis cardui* also appeared—usually single individuals. *Pieris daplidice* has been recorded as captured at Dover, and as seen in the neighbourhood of Herne Bay. *Thymelicus actaeon* appears to have abounded at Swanage; and Mr. Stockwell records *Aporia crataegi* from Kent, "much scarcer, but more widely distributed, and not so extremely local as last year." *Lycaena arion* occurred sparingly in the Cotswolds, more abundantly in Cornwall, and Mr. Sheldon discovered a new locality for the species in Devonshire. Many lepidopterists took an early summer holiday in Cornwall, in order to obtain the insect, this year. I hear also of *Melitaea cinxia* having been captured in the Isle of Wight, and I am informed by Mr. Goss that the dark aberrations (*staenotenia* and *nigrata*) of *Limenitis sibylla* were again taken in considerable numbers in the New Forest. In Ireland, Mr. Kane found a new locality for *Melampias epiphron*.

Among the moths, fair work has been done. The discovery of *Platyptilia tesseradactyla*, taken at Clonbrock the previous summer, stands first. Its larva feeds on *Gnaphalium dioicum*. Mr. Meyrick records *Crambus rostellus* from Ross-shire. He treats his capture as a variety of *Crambus perlellus*, which, from the description given, it may well be, as the latter applies exactly to a form of the latter species brought from Lewis (Hebrides) a few years ago; but the application of the name of what is generally assumed to be a distinct Alpine species, to this variety, is quite another matter. A fair number of Sphingids have been captured, among others, *Deilephila galii*, which appeared almost a month later than is usual when there is an immigration, and these imagines were followed by very few larvæ. *Sphinx pinastri* has not been recorded from Suffolk, but an odd one appeared in the Rev. J. Tarbat's breeding-cage, much to that gentleman's surprise, last June, the pupa of which, he thinks, must have come from the Weybridge district. *Choerocampa celerio* (a few solitary specimens), *Sphinx convolvuli* and *Acherontia atropos* (both comparatively rare) have also occurred. Dr. Chapman was fortunate in obtaining pupæ of *Cerura bicuspis*, and, after many years' absence, and apparent extinction, *Porthesia chrysorrhoea* occurred again in moderate abundance at Sheerness. In the early spring, the kindness of Mr. Bankes in distributing eggs of *Dasycampa rubiginea* resulted in the appearance of a fair number of imagines this autumn; whilst at Penmaenmawr, Mr. Porritt obtained, in early spring, larvæ of *Agrotis* var. *ashworthii*, and, later, turned up *Acidalia contiguaria*. In Wicken Fen, *Hydrilla palustris* occurred on June 5th and 7th. The Devon coast, though, was the most prolific area this year. There, we understand, three or four collectors made a great haul of *Leucania putrescens*, *L. albipuncta*, *Caradrina ambigua*, *Laphygma exigua* and *Lithosia*

caniola, amounting, in some cases, to many dozens. Mr. Prout was also fortunate in obtaining *L. albipuncta*, *C. ambigua* and *L. exigua*. The capture of *Nonagria neurica* and *Leucania obsoleta* at Benfleet is interesting; whilst a specimen of *Leucania unipuncta* (*extranea*) is recorded from Carnarvonshire. *Plusia moneta* may now be taken, at least in our southern counties, wherever its food-plants grow, and is scarcely worthy of mention. In Cornwall, Mr. Ficklin has recorded a new form of *Luperina lutea*go, for which we would suggest the name *ficklini*, n.ab. Mr. Woodforde is also reported to have taken yet another form of the species in Wales. Mr. Barrett refers an aberration of the almost polymorphic *Crymodes exulis*, from the Shetlands, to *maillardi*, an Alpine insect, that Staudinger long ago considered as probably not specifically distinct from *C. exulis*. *Catocala nupta* ab. *caerulescens* has again been bred, this time from a larva taken at Brondesbury. *Epione parallelaria* (*respertaria*), restricted in England to Yorks and Hants (and with a single record from Waltham Cross), was obtained (several specimens) by Salvage, in 1892, in Sutherlandshire. This year it has been recorded from Hawick. My observations on this local insect, which is widely distributed in the Alps of Central Europe, lead me to suppose that it has a much wider range in this country than has hitherto been suspected. The interesting melanic specimens of *Phigalia pedaria*, bred by Mr. Butterfield, the capture of *Amphidasys betularia* ab. *doubledayaria*, in London, by Mr. A. Mera, and the extensive take of aberrations of *Abraxas ulmata*, in Yorkshire, are also noteworthy. Mr. Christy, I may mention, has taken, in Scotland, an interesting lot of Oporabias that may prove to be *O. addendaria*. Among the smaller fry, Dr. Chapman records *Nephopteryx hostilis* and *Lithocolletis distentella* from Wyre Forest; Mr. Bower, *Lithocolletis cerasicolella* and *Coleophora potentillae*, from Kent, and Mr. Richard, *Ochsenheimeria vaculella* from Brockley.

Our Micro-Lepidopterists do so much, that it is well not to overlook what they do. Mr. Bankes telescopes the unique *T. cochylidella* into *T. ruricolella*: the same gentleman has also worked out the distribution of *Gelechia suppeliella*, has described the larva and pupa of *Depressaria pulcherrimella*, and published the life-history of *Anetoleidia tetragonella*. Lord Walsingham shows that *Plutella cruciferarum* ought to be called *Cerostoma maculipennis*; he also thinks that Mr. Hamm, at Reading, and Mr. Evans, in the Pentland Hills, have obtained cases of a new *Solenobia*. Mr. Durrant has re-christened *anthyllidella—Aproaerma*; he also thinks that the *Solenobiae*, in the Doubleday collection, are *S. wockii*, or a new species; he further finds the unique specimen of *Chalybe* (*Ethomia*) *pyrausta* to be correctly named. This, I think is all.

Considerable interest has been aroused in the matter of *Tephrosia bistortata* and *T. crepuscularia* by the experimental work of Dr. Riding and Mr. Bacot, who have obtained hybrids from reciprocal cross pairings of these species. A summary of the results exhibited by the various broods will, I believe, appear in due course in the *Trans. Ent. Soc. London*. Mr. Merrifield has completed some temperature experiments, and Mr. W. H. B. Fletcher is still continuing his enquiries into the hybridisation of the Zygaenids. I cannot help asking Mr. Fletcher to publish, preferably, of course, in the *Entom. Record*, his conclusions, so far as they have reached, both with regard to the Zygaenids, and

also with regard to the enquiries he made into the effect of selection with other species.

The societies are still doing excellent work, and I am pleased to state that the readers of the *Entom. Record* responded very satisfactorily to the appeal, made last January, to become Fellows of the Entom. Soc. of London. I like to feel that this magazine is responsible for about half the entries each year, and we have again almost reached this point. The excuses offered by entomologists, who ought to join, are practically:—(1). Inability to attend the meetings. (2). Too expensive. I will not discuss either of these points. I shall be very pleased to hear from any of our subscribers who would like to join this (or other) society. The South London Entomological Society has, during the past year, taken an important step forward. This is no less than the publication of its *Proceedings* half-yearly, so that the part for the first half year is already to hand. The City of London Society will now have to look to its laurels, and when it comes to the consideration of the publication of its *Transactions*, it is hoped that the members will treat the matter in such a manner as will show entomologists that they can be as generous as they are known to be scientific. The Leicester is the only other society, I believe, that publishes its papers and proceedings, and, although the entomological branch of the Yorkshire Nat. Union has the *Naturalist* at its back, the entomological work systematically published is *nil*. Such space as can be ill-spared in the magazines suffices for a brief notice of what the Birmingham, Cambridge, Carlisle, Lancashire, Nonpareil, and North London Societies do. One cannot help feeling that some permanent record of the work done by these societies should be on the specialist's bookshelves.

Growing out of our consideration of the Societies, we may consider some of the principal papers of the year. These papers are such that it is hoped that all entomologists will make it a point to see them: "The utility of specific characters and physiological correlation" (Meldola, *Trans. Ent. Soc. Lond.*). "Mimetic attraction" (Dixey, *Tr. Ent. Soc. Lond.*). "On the prothoracic gland of *Dicranura vinula*, &c." (Latter, *Tr. Ent. Soc. Lond.*). "The philosophical aspect of entomology" (*Trans. City of Lond. Ent. Soc.*). "Development of the wing, wing-scales and their pigments in butterflies and moths:" a critical summary and review of Mayer's paper of the same title (*Ent. Record*). "Some observations on the moulting and pupation of *Charaxes jasius*" (Chapman, *Ent. Record*). These important observations are likely to be overlooked, attached as they are to a life-history of *Charaxes jasius*. "The genus *Oporabia*" (Prout, *Entom. Record*). "Representative species" (Grote, *Proc. Sth. London Ent. Soc.*). "Some considerations of natural genera and incidental references to the nature of species" (Tutt, *Proc. Sth. Lond. Ent. Soc.*). "British day butterflies and the changes in the wings of butterflies" (Grote, *Proc. Sth. Lond. Ent. Soc.*). "Hybrid *Smerinthus ocellatus-populi*" (Bacot, *Ent. Record*). "Mimicry and Homœochromatism in Butterflies" (Blandford, *Proc. Ent. Soc. Lond.*). "Classification of the Pyralidæ" (Hampson, *Trans. Ent. Soc. Lond.*). "On the Classification of the Thyrididæ" (Hampson, *Proc. Zool. Soc. Lond.*), and the large paper of the year, "Revision of the Oriental Hesperiidæ" (Elwes and Edwards, *Trans. Zool. Soc. Lond.*).

Of the separate works published, there are Mayer's two brochures:— "The wing, wing-scales, and their pigments in butterflies and moths," and "The colour and colour-patterns of moths and butterflies." "Die Palaearktischen Gross-schmetterlinge," an excellent book (Standfuss). "Die Schmetterlings-fauna von Hildesheim. Erster Theil: Tagfalter" (Grote). "Economic Entomology" (J. B. Smith). To British lepidopterists, the publication of another volume of "Larvæ of British Butterflies and Moths," excellently edited, and in part written, by Mr. G. T. Porritt, is the most important (perhaps, the only important) addition to the library for this year. Mr. N. M. Richardson's "List of Portland Lepidoptera" we have already favourably noticed. We can call nothing else to mind worthy of special mention.

We have, as usual, a few adverse criticisms to offer. Mr. Rickard continues to find "Fungi parasitic on the wings of butterflies" (*Entom*). Such papers as this bring upon us the contempt of foreign lepidopterists. Then Mr. G. W. Smith, in "Melanism and climatal conditions" (*Entom.*), thinks that "moisture cannot increase the melanic tendencies in insects" *because* "light-coloured species such as *Macrogaster arundinis*, etc., are present in especially marshy districts." I can hardly hope that Mr. Smith will so far honour me as to read *Melanism and Melanochroism in British Lepidoptera*, pp. 21-22. Mr. Barrett, describing (*Ent. Mo. Mag.*) some specimens of *Luperina* (*Dianthoecia*) *luteago*, captured by Mr. Ficklin, in Cornwall, says: "They represent a local race, different from those hitherto known," and calls them, "to be strictly accurate, *D. luteago* var. *barrettii*." How they can be this variety if "they represent a local race different from" it, "I do not quite understand." Mr. Harding (*Ent. Mo. Mag.*) lumps together "*Setina irrorella*, *aurita* and *ramosa* as climatic varieties of the same species," because, so far as I understand his note, his Cotswold captures of *S. irrorella* are in better condition than those in his collection from other British localities. Mr. Shepheard Walwyn (*Entom.*) is surprised that *Apatela* (*Acronycta*) *aceris* should occur in Kensington. Even Newman would have dissipated this surprise. Dr. Knaggs (*Entom.*) says that "A liassic soil, such as occurs at Charmouth, seems to "him" to be a very unlikely one for *bondii* to inhabit." This opinion is unfortunate, for Mr. Farn, thirteen years ago (*Entom.*, xvii., p. 211), states that he took it there, and reiterates the statement (*Entom. Rec.*, ix., p. 335). Mr. South, *re* the capture of *Lampides boetica*, made by the late Mr. Neil McArthur, falls (*Entom.*) into an oft-repeated error, corrected both in the *Entom. Record*, viii., p. 87, and also in *British Butterflies*, pp. 193-94. Mr. Imms (*Entom.*) found *Z. filipendulae* larvæ swarming on almost every flower of ragwort at Barmouth. We should like to know what they were doing there!! The present writer has also made a stupid of himself in his paper on *Zygaena medicaginis* (*Entom. Record*), and it will require a sheet or two of foolscap (well earned) to put the matter straight. This finishes the humours of the year.

There are one or two personal items that should not be overlooked. Mr. Elwes has been elected a Fellow of the Royal Society, an honour now rarely bestowed on entomologists. Professor Poulton has offered a statue of Charles Darwin to the University of Oxford, and the University has accepted the offer. The Rev. Canon Fowler and Mr.

Herbert Goss have retired from the position of Secretaries to the Ent. Soc. of London, after many years of able and onerous service. Mr. Verrall's annual dinner brought together a large concourse of our most eminent entomologists, and this, as well as the gathering at Mr. Adkin's, proved abundantly that entomological studies promoted, rather than checked, a love of social intercourse. The presence of Lord Walsingham at the conversazione, held by the City of London Society at the London Institution, wss an act of courtesy and kindness, keenly appreciated by the members. The thanks of all entomologists, too, are due to Dr. Standfuss and Mr. Merrifield, to the former for sending, and to the latter for obtaining the loan of, the valuable aberrations and hybrids, which were the result of several years' experimental work in rearing lepidoptera at different temperatures, and in crossing allied species with each other and with their most permanent varieties, and which, after being exhibited at the conversazione of the Royal Society, were on view for a time at the Natural History Museum, South Kensington.

Space forbids the extension of this brief summary beyond its present limits. I will only, in conclusion, reiterate the wish that 1898 may prove, in every way, a more successful year, entomologically, than its predecessor.

The food habits of the Tettigidæ.

By Dr. JOSEPH L. HANCOCK.

The deficiency of published knowledge relative to the food habits of Tettigians is justification for the appearance of this brief contribution. Many of the North American species eat the decomposing mud immediately bordering streams, which, under the mid-day summer sun, generally teems with low vegetable life. Algæ form a large part of the residuum left by the receding water, while lichens find a favoured foothold. On these substances, mixed with clay, Tettigians feed freely. They digest it with rapidity, deriving nourishment therefrom, and excrete the same in little oval masses, which are expelled with considerable force. This mud-eating propensity, which is most eagerly enjoyed by *Paratettix*, is in keeping with the slight development of the salivary gland, which, in this genus, is in the simplest form. The peculiar selection of this diet, to the exclusion of higher forms of vegetation, shows somewhat of a departure from the recognised food habits of other *Acrididae*. Some species that live away from the water (not being sub-aquatic), in open woods, on light sandy soil, feed both on the superficial deposit of vegetable mould, and the lichens growing on it. Certain forms of *Tettix* and *Nomotettix* are fond of *Cladonia*. One, out of many experiments which were tried with members of this group, will prove instructive in this connection. In the early part of August, 1897, nine living specimens gathered from the edge of the Des Plaines river at Riverside, Ill., including representatives of *Paratettix* and *Tettix*, were put in a glass jar. At the bottom had been provided, first a layer of sand, then black earth, and on the surface a piece of lichen-covered soil, transplanted for their food. On freeing them from a tin box, in which I carried them from the river, it was an interesting sight to see them feast. They walked from the barren earth to the miniature pasture in

the centre of the jar, and, like a herd of sheep, commenced browsing on the lichens. During this period the head is frequently lowered, outstretched, or easily moved from one side to the other, in reaching for food. In the course of twenty-four hours the spot of two square inches would be laid bare, leaving nothing but the black earth. Each day I replenished the pasturage by substituting a fresh piece. When I placed wet clayey mud, having a marshy odour, coming fresh from the river border, in the jar, it was always devoured with avidity; the feeding sometimes lasting hours at a time. Meantime, the excrement accumulations became troublesome, covering the limited area. At the expiration of a week the individuals died, as the result of the cramped quarters. Tettigians are not unlike the earth-worm in the nature of their food. In the matter of fertilisation of the soil, they, too, contribute to this end, but within narrow limitations. I have seen specimens of *Tridactylus*, a little member of the *Gryllotalpidae*, living as close neighbours of, and often feeding with, the *Tettigidae*. None of the species could be induced to eat the parts of higher vegetation, such as the leaves of plants. *Tettigidea* feeds upon the same kind of food as the other genera.

Notes on hybrid Smerinthus populi=ocellatus.

By A. BACOT.

(*Continued from* Vol. ix., p. 302).

Pupæ.—Just a dozen larvæ went down, and up to the present I have examined two of my pots in which seven of the larvæ had buried.

The result of this examination was so disappointing that I decided not to pursue my researches any further, but to await the spring, and not risk disturbing the remaining five before the winter.

Only six pupæ had resulted, and of these one had already emerged, two were mildewy, in one the moth had developed and then died, one had failed to complete its pupation, and the remaining one appeared alive and healthy, but appearances are apt to be deceptive, and I am by no means inclined to feel even moderately certain that it will produce a moth.

Variation of Pupa.—The pupæ varied to a slight extent, both in colour and shape; they are, as a rule, nearer in shape to the pupa of *S. ocellatus*, being longer and not so dumpy as that of *S. populi*, with a tendency to narrow towards the head. On the ventral area, the scars of the prolegs and anal claspers do not show up so plainly as is usually the case with *S. populi*; the final segments are, however, not nearly so rounded off as they are in *S. ocellatus*; the dorsal aspect of the anal segments and cremaster are much more distinctly like those of *S. populi*. The surface is much smoother than that of *S. populi*, but without the polished finish of *S. ocellatus*. As regards colour, four were dead black, two of these having a slightly greyish tinge on the wing-cases; the remaining two being of a deep reddish-brown with a slightly smoother surface. The sexual organs are quite as plainly marked in pupæ of the hybrid as in those of the parent species; the reddish pupæ were female, and the four black ones male.

Cocoon.—Two of the larvæ formed rather large and firm oval cells

in which to pupate, but no silk appeared to have been used in their construction, they were from two-and-a-half to three-and-a-half inches below the surface. Of the remainder, I cannot speak with certainty, their cells, if any, must have been extremely fragile.

Imagines.—On September 2nd, a ♂ specimen emerged from a pupa that had been out of doors for several weeks. I found it in the cage at about 8 p.m.; its wings were then fully expanded, and it had probably been out for several hours. It looked so exactly like *S. populi* that, at the first glance, I thought it must be a belated specimen of this species from an 1894 pupa. At rest, its position was similar to that usually adopted by *S. populi*, with the fore-wings hanging back, and the hind-wings protruding far beyond the costa of the anterior pair. The only other emergence was a crippled ♀, on the 15th; but Mr. J. A. Clark tells me that he has bred a specimen from a larva which I passed on to him. My male specimen is superficially more like the ♀ than ♂ parent, though a close examination reveals the fact that in many faint, but important markings, it follows *S. ocellatus*. The wings are narrower than those of *S. populi*, especially the secondaries, the notch at the anal angle being very distinct. There are three dark patches on the fore-wings, to which I desire to call attention; two are situated near each other towards the angle of the outer and hind margin, whilst the third is placed at about the middle of the outer transverse band. These patches are of very general occurrence throughout the genus (using this term in its widest sense), being especially distinct, and evidently forming protective markings, in *S. quercûs*, and some of the American and exotic species. They are present in both *S. ocellatus* and *S. populi*, strong and dark in the former, faint only in the latter, but in both I fancy they have lost their (?) original significance, and in *S. populi* are probably disappearing. In the hybrid, though they are scarcely so strong as in *S. ocellatus*, they appear to me to partake more of the (?) ancestral character. The hind tibiæ of the hybrid moths possess two spines only, as in the parent species. No trace of the frenulum can be observed with a hand lens, and I did not consider it worth sacrificing my specimens in order to determine the presence or absence of this character, which exists only in the male parent in a rudimentary state. While examining the ocellated spot on the hind-wing of the hybrid (this spot, by-the-bye, is rather lunular than ocellated), it occurred to me that *Triptogon modestus*, a large North American species, had rudimentary ocellated spots of somewhat similar shape and appearance on the secondaries; but a visit to our national collection showed that this character in *T. modestus* had no close resemblance to the ocellated spot of the hybrid. What it did very clearly show, however, was *how* similar stripes to those on the secondaries of *Acherontia atropos*, *Sphinx convolvuli*, etc., may become modified into the rudiments of an ocellated spot, thus giving us a hint as to the way in which the perfected eye spots of *S. ocellatus* have been evolved.

(To be continued.)

Notes on the Distribution, Habits, Egg & Larva of Acidalia immorata.

By J. W. TUTT, F.E.S.

In 1868, Mr. S. Stevens exhibited "a moth from the collection of the late Mr. Desvignes, labelled *immoraria*, Hub., which it was sug-

gested was an extraordinary variety of *Strenia clathrata*" (*Proc. Ent Soc. London*, 1868, p. xxxviii). In the *Ent. Mo. Mag.*, xxiv., p. 133, Mr. J. H. A. Jenner announced the capture of two specimens of the same species, on June 27th, 1887, by Mr. C. A. Morris, on some heathy ground, near Lewes. A month later (Nov., 1887) this same note was duplicated in the *Entomologist*, and a figure of the species given. On Nov. 2nd, 1887, Mr. S. Stevens again exhibited, at a meeting of the Ent. Soc. of London, the "Desvignes" specimen, when Mr. J. Jenner Weir stated that Desvignes was a friend and correspondent of Mr. Hopley, who formerly lived at Lewes, and that probably Mr. Stevens' specimen came from that district. In 1888, the species was again recorded by Mr. Jenner, from Lewes, and during this, and following years, the species has been taken in more or less abundance in the neighbourhood of that town.

In his original note on the species, Mr. Jenner mentioned that the species somewhat resembled the female of *Fidonia atomaria*; Guenée and Berce places it in *Strenia*, and to this genus, until this year, I have been inclined to refer it. Staudinger places it in *Acidalia*.

Guenée (vol. x., p. 11) says that it inhabits "Près bas, champs de prairies artificièlles de l'Allemagne, de la Suisse, des Basses Alpes, etc., en mais, puis en août. Ne se trouve pas ordinairement aux environs de Paris. Cependant elle a été prise, autour de Compiègne." In England, I believe, it has only been taken in June and July, and Jenner says that its food-plant is *Calluna vulgaris*, and it has been among this plant that the Lewes specimens have been captured. He further says that it is readily disturbed from the herbage by day, and apparently does not fly at dusk. Jordan pointed out (*Ent. Mo. Mag.*, xxv., p. 75) that the habits of the imago were much like those of *Strenia clathrata*, that, in the beginning of July, 1888, he saw dozens flitting over a large patch of lucerne, between S. Nicholas and Zermatt. He further remarks that the larva cannot be very particular about its food-plant, for Frey gives "*Erica*, and other low plants," and adds that he has frequently taken the moth where there was no *Erica* to be found within many miles. I saw it in great abundance near Aix-les-Bains, last July (second brood, I should say), not flying among, but easily disturbed from, the herbage in the daytime. Its habits somewhat resemble *Strenia*, but are much more like those of *Acidalia ornata*.

As to its distribution, I have already quoted Guenée. Berce (*Faune Ent. Française*) gives, "Basses-Alpes, Auvergne, Alsace, and Burgoyne." It occurs in Holland (Snellen); Staudinger gives: "Central and north Europe (except polar region and England); central and north Italy, Bulgaria, south-east Russia, Bithynia, north-east Siberia." I have taken it at 7,000 feet elevation in the Dauphiné Alps (Le Lautaret), August, 1896. I found it in great abundance near Aix-les-Bains, July 24th-27th, 1897, and the following week, more sparingly, at St. Michel de Maurienne.

Two years ago, I happened to mention to Mr. W. E. Nicholson that I thought the insect really was a *Strenia*, but he sent me larvæ, and told me he thought Staudinger had correctly placed it—in *Acidalia*. Last summer I obtained eggs, and expected to find the insect a Fidoniid. I examined these eggs side by side with those of *S. clathrata*, and found that, whilst the latter had a distinct Fidoniid egg, the former was an Acidaliid, belonging to that section of the latter group, with longi-

tudinally ribbed eggs, a form which, I believe, Dr. Chapman has associated with *A. imitaria*, and that I have associated (*Ent. Rec.*, viii., p. 188) with *A. marginepunctata*.

Egg.—My description of the eggs, made under a two-thirds lens used as a hand-glass, laid by a female taken near Aix-les-Bains, on July 26th, is as follows:—Variable in shape. Some cylindrical, others wider at the micropylar end than at its nadir. Length : breadth : : 5 : 3. The newly-laid egg is pale green in colour; the shell shiny and glassy-looking, very distinctly ribbed longitudinally with about 16 ribs, and with about 20 fine transverse ribs crossing the longitudinal ones. The micropylar area is very strongly marked, most of the longitudinal ribs uniting on the edge of the minute central depression, at the base of which the micropyle is placed. (Described July 27th, 1897.) After two days the eggs become pale reddish to the naked eye, but are pale straw colour, blotched with crimson, under the microscope. The ribs are now very distinct, eight being the usual number on the upper half, whilst a rather deep and oval depression is noticeable on the upper surface. The eggs are usually laid singly, and on the long side, but some few are laid quite on end. (Further note, July 29th, 1897.)

General description and resting habit of larva.—Having sent on some of the eggs to friends, Mr. H. J. Turner handed me over a few larvæ, about the middle of September. One was then about three-quarters of an inch long, and I felt certain would feed up this autumn. It lived until well into October, and then died, whilst the smaller ones, about half an inch long, were laid up for hybernation. A description of the larva, made on Sept. 17th, 1897, is as follows:—The larva is long and slender, scarcely any thicker posteriorly than anteriorly, and yet a suspicion of gradual increase from the meso-thorax to the 8th abdominal segment. The smaller individuals rested with the dorsum forming a curve or bow (not rolled up), but the larger individual stood out rigidly, its body making an angle of about 60°, with the stem on which it rested. The larva does not drop when disturbed, but quickly throws its head and body to one side, and then stands immovable as before. In colour, the larva is greyish-brown to the naked eye, and has a longitudinal series of small black dorsal markings placed in the incisions between the abdominal segments. There is a fine longitudinal medio-dorsal line, on either side of which is a dark grey line, then a brownish line followed by a black supra-spiracular line. Below the spiracles, a tumid white sub-spiracular line is conspicuous. The ventral area is very pale (whitish), without markings. The true legs are placed very close together, white, with pale brown hooks, and scattered tuberculate hairs. The prolegs are also whitish, shaded outside with brown, also with a few tuberculate hairs, the marginal, at the base of each proleg, being conspicuous; the hooks are crimson in colour. The marginal series of tubercles are to be found as a longitudinal series on all the segments; those that have no prolegs also carry these tubercles. Under the microscope the grey-brown ground colour becomes clear white on the thoracic segments, and creamy on the abdominal, the skin being minutely pitted, and the dark (blackish) supra-spiracular line has the appearance of dried black ink. The tumid sub-spiracular line is snowy white, much broken up by the segmental incisions, and thrown into striking convolutions on the thoracic segments.

DETAILED LARVAL DESCRIPTION.—HEAD.—White and shiny (like china), with a fine black central line extending from the dorsum of the head, and bifurcating along the edges of the clypeus; sparingly sprinkled with pale hairs, arising from black tuberculate bases; antennæ white, tipped with black; ocelli six—five of which are placed in curved series on lower part of cheek; of these, the three lower are black, the two upper and outlying one, white. The two dark sub-dorsal lines, and the two greyer dorsal ones are continued as brown patches on the head. THORAX.—The pro-thorax is tumid, the head being partly retractile, a ring of four dorsal and two lateral (on each side) tubercles, pale, each bearing a single, pale, black-tipped hair, passes round the front edge of the pro-thorax, whilst a similar ring runs round the hinder edge. The pro-thorax is divided into four sub-segments, the first being much larger than the others; the pro-thoracic spiracle is placed well back, almost in the inter-segmental incision. The meso- and meta-thorax are not so swollen as the pro-thorax. Each of these segments is divided into five sub-segments, the first of which bears a ring of four dorsal and two (on each side) lateral, single-haired tubercular warts. These are arranged as two anterior and two posterior trapezoidals, the two former being placed near together on the front of the sub-segment, and the two latter farther apart, and farther back on the same sub-segment. The two lateral tubercles on each side agree exactly with the two pre-spiracular tubercles of the abdominal segments, and here they are respectively placed above and below what looks something like an aborted spiracle. ABDOMEN.—The first abdominal segment is divived into 15 sub-segments. On this segment, the third sub-segment is the largest, and bears only two dorsal tubercles, the anterior trapezoidals. The spiracle is black, and has a shiny black rim, and is situated on a raised portion of the skin on the fourth sub-segment; there are two pre-spiracular simple-haired tuberles, one situated at a higher, and one at a lower level than the spiracle itself; there is also a post-spiracular tubercle in the same line as the spiracle. The posterior trapezoidals are placed on the 13th sub-segment. A lateral tubercle (in the spiracular line) is also present on the last sub-segment. The 3rd–5th abdominal segments are each divided into 20 sub-segments, the anterior trapezoidals being on the 5th, the posterior on the 17th, and the spiracle on the 7th sub-segment; otherwise these segments resemble the 1st abdominal. The 6th abdominal segment is reduced to five sub-segments, the anterior trapezoidals being on the 1st, the posterior trapezoidals on the 4th, and the spiracle on the 3rd, sub-segment. The 7th abdominal is further reduced to three sub-segments, the anterior trapezoidals and the spiracle being placed on the 1st, and the posterior trapezoidals on the 2nd, sub-segment. The 8th abdominal is composed of only two sub-segments, the anterior trapezoidals on the 1st, and the posterior on the 2nd, sub-segment; the spiracle is also on the 1st sub-segment, but placed high up (quite out of the line of the other spiracles). The 9th abdominal consists of only one sub-segment, swollen dorsally, the posterior trapezoidals being actually placed farther forward than the anteriors, the two lateral tubercles also very distinct. The 10th abdominal forms a long anal flap, bearing the tubercles on its posterior edge. The anal prolegs stand out well behind. The ventral prolegs also point backwards.

The Butterflies of Carinthia.

By FREDERICK C. LEMANN, F.E.S.

There is no doubt about it, the pursuit of European butterflies engenders in one a restless roving spirit, which leads on from modest trips to well-known Swiss and French centres, to more outlandish regions, where rare and local insects find their home. There is a weird fascination in all this, akin, I suppose, to the force which drove Nansen to the North Pole, and Stanley to Darkest Africa, but once this power gets you in its grasp, resistance is useless, and follow you must.

I really believe that Mr. W. F. de Vismes Kane, in his excellent *Handbook to the European Butterflies*, is mainly responsible for that rapidly growing tendency of British entomologists to "take their walks abroad," and I, for one, owe him a deep debt of gratitude for having inspired me with the desire to make the acquaintance of the Continental insects.

In discussing Carinthia as a hunting ground in the present year, I was mainly influenced by an account given to me by Mrs. Nicholl, of her captures in that district in 1895, and it was finally arranged with my travelling companions, Dr. T. A. Chapman, Messrs. W. E. Nicholson and R. Wylie Lloyd, that we should start from London on July 3rd.

Our route lay through Calais and Basle, to Innsbruck, where we spent a night, then on to Villach, where we had a day's collecting, but without great results, the surrounding country being too highly cultivated for entomological purposes. From Villach we took train to Mösel, and walked thence to Lölling, a village at an elevation of 2,982 ft. Here we rested for a couple of nights, and did a little collecting; the weather, however, was not very favourable, and we took nothing more noticeable than *Brenthis* (*Argynnis*) *thore* and *B. ino*. From Lölling we walked up to Stelzing, which lies at the foot of the Grosse Sau Alpe, a mountain reaching 6,828 ft. Stelzing itself, or rather the small Alpine inn which represents the village, stands 4,626 ft., consequently we could reach our collecting ground on the upper slopes of the mountain in less than a couple of hours. A steep rough path led up through pine forests to the foot of a peak called the Geierkogl, and it was there, on a grassy slope above the forest, that we first found a genuine Carinthian butterfly, in *Erebia* (*Melampias*) *arete*. This insect, together with a very fine and distinct form of *Erebia criphyle*, was fairly plentiful whenever the sun was shining, but unfortunately the weather was for the most part dull and cold, and our bag was correspondingly diminished. In addition to the above-named species, we took interesting forms of *Erebia medusa*, including the var. *hippomedusa*.

On July 14th we left Stelzing, and walked over the mountains to Wolfsberg, the capital of the Lavant Thal, a sunny, fertile valley, known as the Eden of Carinthia. Here we had the pleasure of meeting Herr Gabriel Höfner, the well-known Carinthian entomologist, who was particularly kind in putting us up to localities and other entomological wrinkles.

At Wolfsberg we fell in with many interesting forms, such as *Erebia* (*Melampias*) *pharte*, which flies in profusion on the Kor Alpe, 7,024 ft. It was interesting to note that *E. pharte* was common over the whole

upper region of the Kor Alpe, and in places in great profusion; but not a specimen occurred on the Sau Alpe, the ridge flanking the opposite side of the Lavant Thal, and in a bee-line some 15 miles distant. Contrariwise, *Erebia arete* was widely distributed over the Sau Alpe, and apparently abundant in places, without having any foothold on the Kor Alpe. *Erebia eriphyle*, on the other hand, was found on suitable sheltered slopes on both Alps, but much more localised. Herr Höfner told us that this distribution was in accordance with observations extending over many years. He also said that a similar distribution occurred amongst the Heterocera, and mentioned that *Cleogene nivata*, which we saw in thousands on both Alps, was usually rather rare, but abounded at long intervals; in 1896, it had also been as abundant as we saw it. On damp meadows in the Lavant Thal, *Lycaena euphemus*, *arcas* and *amanda* were to be found, the latter, however, as usual, but sparingly. *L. euphemus* and *arcas* both settle frequently on *Sanguisorba officinalis*, L., on the seeds of which the larva of the latter feeds. *Freres* (*Lycaena*) *argiades* and *P. optilete* were captured in small numbers, but *Araschnia prorsa* was quite plentiful, and we took sundry specimens of *Neptis lucilla*, *Apatura iris*, and other commoner species. Leaving Wolfsberg, on July 21st, we moved on, *via* Lienz, to Heiligenblut (4,600 ft.), the loftiest village in Carinthia, overlooked by the Gross Glockner (12,459 ft.). This village, which takes its name from a phial of the "Holy Blood," deposited in the local church, and which is said to have been brought there from Constantinople by St. Briccius, stands in a glorious position at the head of the Möllthal, and, in fine weather, must be an excellent centre for collectors. Unfortunately, our visit was much marred by wet, which not only ruined our sport, but detracted from the beauties of this most charming region. Our collecting at Heiligenblut was consequently very limited, and, with the exception of *Polyommatus phoretes*, *Oneis aëllo*, and some interesting forms of *Erebia tyndarus*, I am afraid I have nothing of interest to report.

On July 28th we moved on to Sterzing (3,107 ft.), but here also the weather was dull and cold, and we were glad to leave, on July 31st, for Innsbruck. It had not been our intention to do any collecting at Innsbruck, but standing in that most picturesque of all streets, the Maria-Theresien Strasse, our eyes rested on the snow-capped mountains which tower over the town, and immediately thoughts of an unknown *Erebia* impelled us to make an excursion in that direction next day. Oh! what a climb was that, in a blazing sun, up through apparently interminable forests, on a rough stony path, at which any self-respecting mule would shudder, until at last we gained a steep turfy slope leading up to the foot of the precipices. Our troubles were now practically at an end, and we were able to sit down and drink in the magnificent panorama which lay stretched before us. Well, we did not find that unknown *Erebia*, but we did pick up some very interesting members of the same family in *E. manto*, *pharte*, *glacialis*, *goante*, *gorge*, *ligea*, *euryale*, *aethiops*, *cassiope*, *medusa*, *tyndarus*, *lappona*, etc., as also *Melitaea cynthia* and *Colias phicomone*. At Innsbruck I parted company with Dr. Chapman and Mr. Lloyd (Mr. Nicholson having returned home from Heiligenblut), they going to St. Anton, on the Arlberg Railway, and I going to Neuhausen, where we eventually joined company, on the 5th August.

The weather at St. Anton was not more favourable than elsewhere, so that the two days spent here gave little opportunity for collecting. *Erebia manto* and *melampus* were common, associated with *E. cassiope*, *pharte*, *euryale*, *tyndarus*, etc. *Brenthis* (*Argynnis*) *pales* was, perhaps, the only other butterfly much in evidence.

At Neuhausen we hardly expected to do much collecting, but devoted our time to admiring the Rhine Falls. It was, however, pleasant to take there *Zephyrus* (*Thecla*) *betulae*, in first-rate order.

From Neuhausen we travelled straight home. Carinthia is a charming country to visit, not only on account of its entomological riches, but for its scenery, and its pleasant inhabitants.

Living there is exceedingly cheap, and accommodation clean and good. The great blot is the extreme slowness of the local trains, which potter along in a manner highly exasperating to the British temperament.

The following list of butterflies may be of interest to collectors:—

Hesperidæ.—*Syrichthus fritillum* var. *alveus*, *S. malvae*, *Nisoniades tages*, *Thymelicus thaumas*, *T. lineola* (large form at Villach), *Pamphila sylvanus*, *P. comma*. Lycænidæ:—*Zephyrus betulae*, Neuhausen, Aug. 4th, 1897; *Z. quercûs*, Wolfsberg; *Thecla spini*, St. Paul; *Callophrys rubi*, *Chrysophanus virgaureae*, *C. dorilis*, *C. phlaeas*, *C. amphidamas*, *C. hippothoe*, *Everes argiades*, Wolfsberg; *Plebeius aegon*, Sterzing, etc.; *P. argus*, Villach, etc.; *Polyommatus optilete*, Wolfsberg; *P. pheretes*, Heiligenblut; *P. astrarche*, *P. icarus*, *P. hylas*, Heiligenblut; *P. corydon*, *P. eros*, Kor Alpe; *Cyaniris argiolus*, *Nomiades semiargus*, *Cupido minima*, *Lycaena arion*, Villach, Sau Alpe, Kor Alpe; *L. euphemus*, Wolfsberg, frequent; *L. alcon*, Wolfsberg, rare; *L. arcas*, Wolfsberg, frequent; *L. amanda*, Wolfsberg, rare. Papilionidæ:—*Papilio podalirius*, Villach; *P. machaon*, Wolfsberg; *Parnassius apollo*, Heiligenblut; *P. mnemosyne*, Lölling. Pieridæ:—*Aporia crataegi*, Lölling, July 8th, 1897; *Pieris brassicae*, *P. rapae*, *P. napi* and var. *bryoniae*, *P. callidice*, Heiligenblut; *Euchloë cardamines*, Lölling, July 8th, 1897; *Leucophasia sinapis*, *Colias hyale* and *C. edusa*, Wolfsberg; *C. phicomone*, Heiligenblut and Innsbruck; *C. myrmidone*, one specimen only, St. Paul, Lavant Thal; *Gonopteryx rhamni*. Nymphalidæ:—*Apatura iris*, Wolfsberg and Villach; *Limenitis camilla*, Wolfsberg; *L. sibylla*, Wolfsberg; *Neptis lucilla*, Wolfsberg, not uncommon; *Araschnia levana* var. *prorsa*, Wolfsberg, frequent; *Polygonia c-album*, *Eugonia polychloros*, *Aglais urticae*, *Vanessa io*, *Euvanessa antiopa*, *Pyrameis atalanta*, *P. cardui*; *Melitaea aurinia* and var. *merope*, Heiligenblut; *M. cynthia*, Innsbruck; *M. phoebe*, Villach; *M. parthenie* var. *varia*, nr. Heiligenblut, 7,500 ft.; *M. athalia*, Villach, etc.; *Dryas paphia*, *Argynnis aglaia*, *A. adippe* and ab. *cleodoxa*, *A. niobe* and ab. *eris*, *A. latonia*, *Brenthis euphrosyne*, *B. pales*, *B. amathusia*, *B. dia*; *B. ino*, Lölling; *B. thore*, Lölling. Satyridæ—*Pararge maera*, *P. megaera*, *P. egeria*, *Œneis aëllo*, Heiligenblut; *Hipparchia semele*, *H. actaea*, Innsbruck; *Enodia hyperanthus*, *Epinephele ianira*, *Coenonympha iphis*, 5,000 ft.–6,000 ft., frequent; *C. typhon*, Sahlen Osterwitz; *C. pamphilus*, *C. arcania*, frequent; *C. satyrion*, *Melampias epiphron* and varieties, 3,500 ft.–7,000 ft., frequent; *M. melampus*, St. Anton, 5,000 ft.–6,500 ft.; *M. eriphyle*, Sau Alpe, Kor Alpe, 5,500 ft.–6,000 ft.; *M. pharte*, Kor Alpe, St. Anton, Innsbruck, 5,500 ft.–7,000 ft.; *M. arete*, Sau Alpe, 5,500 ft.–6,000 ft.; *Erebia*

medusa, 5,000 ft.–6,000 ft., frequent, and var. *hippomedusa*, Stelzing, 5,000 ft.; *E. manto*, Innsbruck, St. Anton, 5,500 ft.–7,000 ft.; *E. glacialis*, Innsbruck, 6,000 ft.; *E. lappona*, 5,500 ft., frequent; *E. pronoe*, 5,500 ft., frequent; *E. tyndarus*, 4,500 ft., frequent; *E. gorge* var. *triopes*, Innsbruck, 5,500 ft.; *E. goante*, Innsbruck; *E. aethiops*, Innsbruck, 4,500 ft.; *E. ligea*, Innsbruck, 3,500 ft.; *E. eurgale*, 4,000 ft.–6,000 ft., frequent, and ab. *ocellaris*, Heiligenblut, 5,000 ft., common; *Melanargia galatea*.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

Descriptions of Lepidopterous eggs.—*Epunda lutulenta*.—The egg is rather more than half a sphere, slightly depressed at apex, and flattened at base. The egg is pale orange-yellow in colour, with irregular red-brown patches strongly developed about the equator and the micropyle of the egg. (By September 26th, the colour had become pearly white, irregularly mottled, with large purplish blotches, still, however, most prominent in the equatorial and micropylar regions). There are 26-30 longitudinal ribs running from base to apex; many of these unite in pairs just above the shoulder of the egg, and others again just before reaching the boundary of the micropylar area. The ribs are prominent, sharp-edged, very shiny, and distinctly marked where the transverse ribbing crosses them. The fine white transverse ribs, some twenty in number, run round the egg parallel to the base, and divide the depressions between the longitudinal ribs into roughly quadrangular spaces, with a rude ladder-like appearance. The longitudinal ribs are pressed very closely together toward the apex, forming a puckered rim around the edge of the micropylar area, and then pass over into the micropylar depression, on the sides of which they are gradually lost. The micropylar area itself forms a very minute shallow basin, at the base of which is a tiny raised button, containing, at its apex, another minute depression. The egg is not laid quite upright, being tilted a little towards one side. Mr. Clarke states that the ova were laid on September 11th, 1897, that they were at first pale yellow, then orange, then mottled. [The eggs were received on September 22nd, from Mr. Clarke, and described under a two-thirds lens on September 23rd.]

Pamphila sylvanus.—Three eggs laid side by side on a grass leaf. Pearly white in colour; in shape, rather less than two-thirds of a sphere, a faint yellowish shade occupying the apical area. The egg is much flattened at its point of attachment, and less so at the apex. The shell is iridescent and minutely pitted, but without the pits assuming any distinct form of reticulation. A yellowish area, which shows no iridescence, occupies the apex of the egg, and there is a minute micropylar depression centrally in this area, in which the cells are arranged circularly about a minute central depressed point (the micropyle proper). [Eggs received July 17th, from the Rev. G. H. Raynor, described under a two-thirds lens on July 19th.]

Pararge maera.—Laid on end on the sides of a box. The egg is oval in outline, being of a somewhat stumpy cylindrical shape, with rounded ends. To the naked eye the egg is of a pale green colour, but under the lens the green appearance is lost. A little less than the upper half appears to be almost transparent, and separated distinctly

by a ring from the lower portion, which is more opaque. The shell is shiny, and the sides very freely striated longitudinally. The whole of the apical portion of the egg is, however, finely, but very distinctly reticulated. The micropylar area is flattened, slightly depressed centrally, while the longitudinal ribs are seen to radiate from the edge of the depression. [Described August 13th, from an egg laid by a ♀ captured at Susa.]

Satyrus cordula —An egg was pressed from the ovipositor of a captured female. It was tall, conical in shape, but with rounded apex, the base flattened and smooth. The colour of a dead white, with 13 very distinct sharply-edged longitudinal ribs, extending from the rounded edges of the base to the apex. At the apex these ribs unite, and enclose a small circular micropylar area, which consists of rounded cells surrounding a minute central depression. The shell is finely granular, but there appears to be no trace of transverse ribbing. [Description made August 11th, from egg obtained at Susa.]

Hipparchia aretheusa.—The egg is small compared with the size of the butterfly. It is roughly globular in shape, but with the apex depressed, forming a very distinct micropylar basin. It is pale yellow in colour and shiny, and the shell is almost smooth, although there are faint traces of about 24 longitudinal striations, which can scarcely be designated as ribs. The micropylar depression is minutely pitted over its whole area, the pittings finer centrally. [The egg described was gently pressed from the ovipositor of a specimen captured at Aix-les-Bains on August 20th. The description was made on August 24th under a two-thirds lens.] A female, captured on August 20th, was kept alive in a large glass-topped box, and laid about a score of eggs before September 6th, when she died. These were loose in the box, but I had an impression that one or two were slightly attached, and were loosened by the fluttering of the female.

Argynnis ino. — A single egg was deposited on the lid of a box in which a female was confined. The egg is pale yellow in colour, somewhat conical in shape,* with slightly convex base, and 14 sharp-edged longitudinal ribs, seven of which extend from the base almost to the apex, the alternate ribs being lost just above the shoulder. The seven ribs that reach almost to the apex, fall into a minute apical micropylar depression, in the centre of the base of which is a minute raised button. The egg is very finely striated transversely. Viewed from above, the egg presents a circular outline bearing 14 well-defined sharp teeth (longitudinal ribs). [Described August 1st, ♀ captured at St. Michel de Maurienne.]

The larvæ of certain Geometrides.—The newly-hatched larvæ of the *Ennomidae*, *Amphidasydae* and *Boarmiidae*, fall into two distinct groups. In the first, the freshly-emerged larvæ are dark coloured, spotted with white, the spots having a tendency to form into rings or bands at or near the segments. In the second group the larvæ are of some shade of green or brownish-green, with light lateral or spiracular bands, and possibly with pale longitudinal lines or bands on the dorsal and sub-dorsal areas. I take it that the characters of newly-emerged larvæ are of equal value for classificatory purpose with the characters of either oval or imaginal stages. Hence, such widely different cha-

* The egg is widest at the base; it contracts slowly to about three-fourths towards the apex, then more rapidly to the apex.—J.W.T.

racters in the newly-hatched larvæ point to the possibility of there being two distinct groups of Geometrid moths included in the before-mentioned families, any one of which families contains larvæ of both forms. Unfortunately, I am not acquainted with all the larvæ of the moths comprised in these three families; but with regard to the species I have knowledge of, they can be placed in the two groups as follows:—Group I.: *Selenia bilunaria*, *lunaria*, and *tetralunaria*, *Phigalia pedaria*, *Nyssia zonaria* and *hispidaria*, *Biston hirtaria*, *Tephrosia bistortata* and *T. crepuscularia*. Group II.: *Angerona prunaria*, *Eurymene dolobraria*, *Ennomos alniaria* and *quercinaria*, *Amphidasys strataria* and *betularia*, *Hemerophila abruptaria*, *Boarmia roboraria* and probably *B. consortaria*.—A. Bacot, Bow House, Clapton, N.E.

PRACTICAL HINTS.

Field Work for January and February.

1.—During the winter, gather the seedheads of cotton-grass. *Glyphipteryx haworthana* may be bred from them in June.

2.—In winter and early spring collect the stems of wild parsnip (*Pastinaca sativa*) for the larvæ of *Cochylis dilucidana*.

3.—In January, collect a bundle of the flower-stems of *Alisma plantago*, stand them out of doors till May, then put into a cage, and *Eupoecilia udana* should emerge from June to August.

4.—Collect the seedheads of teasel (*Dipsaceus sylvestris*) and keep in a bandbox; you will breed plenty of *Penthina gentiana*.

5.—The larvæ of *Teichobia verhuellella* feed on *Asplenium ruta-muraria* from January to April.

6.—During January and February, collect oak (and other) leaves for the pupæ of *Lithocolletis*, *Nepticula*, *Incurvaria*, etc.

7.—January and February (if the weather be mild and damp) is the season to take the larva of *Tryphaena subsequa* (*orbona*). I took it first, early in January, 1874, by sweeping tufts of *Dactylis glomerata*, and afterwards at night, feeding on the common *Triticum repens*, and it was seen still feeding on grass as late as April. It is nearly half-grown when *T. orbona* (*comes*) is very small (Williams).

8.—Small holes in the stems of *Daucus carota* indicate the presence of larvæ of *Cochylis francillana*. Collect in January.

9.—In January, collect roots of *Daucus carota* for larvæ of *Argyrolepia zephyrana*.

10.—Old stems of viper's bugloss (*Echium vulgare*) should be collected in the winter, *Douglasia ocnerostomella* will often emerge from these in abundance in June.

11.—The stems of sea lavender should be collected in January for *Goniodoma limoniella* (*atriplicivorella*). The larva feeds on the flowers, eating out one of the petals, and using it as a case, in which it moves about till full-fed, in December. Then it crawls down the stem, eats its way inside, covers up the small holes with a slight web, soon after which the cases drop off.

12.—The larvæ of *Gnophos obscurata* are to be found in January on *Geranium lucidum*, by searching at night with a lantern, and may be so found until the beginning of April, when they are nearly full-fed. They then prefer flowers to leaves.

13.—In January, pull gently the last year's flower-stalks of the ragwort. If the stem breaks off readily, leaving a portion standing

about two inches high, you will find, as a rule, the lower part left in the ground slightly webbed. The part remaining in the ground contains a larva of *Cochylis aeneana*.

14.—Search the stone dykes which fence the fields for pupæ of *Arctomyscis myricae*. The larvæ spin up on the stones, the cocoons being easily seen.

15.—Collect larvæ of *Lasiocampa rubi*, on sunny days, in the early spring. Put each one separately into a small box (large enough for the moth to emerge and expand its wings) ; put the boxes into a warm kitchen, the larvæ will spin up and emerge in due course without further trouble.

16.—It is always worth while, in January and February, to search for pupæ under moss on trees. Those of *Craniophora ligustri* (on ash), and *Eurymene dolobraria* (oak), being almost certain finds.

NOTES ON COLLECTING, Etc.

Leucania favicolor near Southend.—I have to record the occurrence of this *Leucania*, described last year by Mr. Barrett, from near Southend.—F. G. Whittle, 3, Marine Avenue, Southend.

Late emergence of Vanessa io.—I met with a larva of *V. io* about the middle of October, which pupated in a day or two. I was curious to know whether it would hybernate as a pupa, but it came out on Nov. 10th. No doubt, if any frost had occurred during the pupal stage, it would have killed it, and had it emerged out-of-doors, I presume, it would have hybernated at once.—J. A. Butterfield, B.Sc., 35, Wrottesley Road, Plumstead, S.E.

Food-plant of Euchelia jacobææ.—In August, both of 1896 and 1897, I came across large numbers of larvæ of *E. jacobaeae*, feeding on *Senecio vulgaris*, by the roadside, which struck me as being somewhat remarkable, as there were several acres of common and fields within one or two hundred yards, covered with fine plants of *Senecio jacobaea*. From the latter, however, I only succeeded in obtaining about a dozen larvæ—they were all much finer specimens than those found feeding on *S. vulgaris*. — Hubert C. Phillips, M.R.C.S., F.E.S., 83, Shirland Gardens, Paddington, W.

Food-plant of Porthesia similis. — In the early part of the summer, 1897, I observed that all the larvæ of *P. similis* I captured at Kingsbury were feeding on the *petals* of *Rosa canina*, on the flowers of which they were very conspicuous.—Ibid.

Habits of Nemoria viridata.—I took, near Aix-les-Bains, on July 24th last, some specimens of a *Nemoria*, which Mr. Prout refers to *viridata*. They were taken in a field where a few bushy plants of saintfoin or lucerne (I forget which) were growing. I kicked them up by walking through the field in the afternoon. Mentioning this to Mr. Lowe, he gave me the information in the following paragraph.—J. W. Tutt.

With us, *N. viridata*, as far as I know, always lays its eggs upon the young shoots of *Ulex europaeus*. Its habitat is exclusively among furze on cliffs by the sea. It mostly abounds on those parts where there is a second year's growth, after the furze has been cut down for fuel, as is customary here.—(Rev.) F. E. Lowe, M.A., F.E.S., Guernsey.

Tortrix collecting in 1897.—*Tortrix forsterana:* I bred a nice

series of this species from pupæ found by my brother, about June 1st, spun up in ivy leaves in his garden (near Bradford). *Amphisa gerningana*: Seemed to be less common than usual in its haunts near Bradford. *Peronea caledoniana*, *Penthina sauciana* and *Grapholitha geminana*: These species occur in the utmost profusion on one of the moors near Wilsden. They seem particularly to abound on the edges of the glens running into the moor. *Penthina sauciana* is in good condition ten days or a fortnight at most, while *geminana* continues out well into September. *P. corticana* (*picana*): I get this insect in a north Kent wood, even within the L.C.C. area, but they are smaller than those from Yorkshire. *Antithesia salicella*: Bred two from pupæ found in willow leaves. *Hedya lariciana*: Was common among larch about here in the last week of June. *Mixodia schulziana*: My brother found this insect in July, on the moors near Bradford. Porritt mentions it in his *Yorkshire Lepidoptera*, as occurring at Huddersfield, but this, I believe, is the first record for Bradford. *Tortrix branderiana*: Found a few pupæ in twisted aspen leaves, in a north Kent wood. *Phoxopteryx derasana*: The larvæ were frequent last autumn here on *Rhamnus*, and the imagines were fairly abundant (locally in May) this year. *Ephippiphora fenella*: Some larva, of what I take to be this species, are feeding in roots of *Artemisia*. The roots of the latter are in a bell-jar, covered with a mixture of mould and sand, and kept moist by a covering plate of glass. The roots are alive, after two months, and the larvæ quite healthy, judging by the amount of frass they throw out against the sides of the jar. It remains to be seen whether I carry any through the winter. *Semasia janthinana*: Very abundant in the hawthorn hedges around Wisbech, at the end of July. *Carpocapsa pomonella*: I collected some affected apples last year, and spread them out on the floor of an empty room, allowing the larvæ to pupate where they pleased. They all went down between the boards, and emerged in June. They could easily be taken at the window in the early morning. *Endopisa nigricana*: Reared from pea-pods. *Stigmonota regiana*: has been very abundant this year in the various roads around Plumstead. It could be met with during the first fortnight in June, on the palings under sycamore, in perfect condition. *S. roseticolana*: From hips collected at the beginning of September, in North Kent, almost 100 larvæ have made their appearance. They seem to feed at night, as I only find them in the morning. When they come up I transfer them to a smaller glass jar containing rotten wood, into which they burrow on the second or third day. *S. germarana*: Took one from mixed hedge in North Kent. *Dichrorhampha herbosana*: My brother found it in thousands, near Bradford. It flies just at dusk. It evidently feeds on other roots besides yarrow, for though yarrow was there, it was only in small quantity, not nearly enough to support such an army.—J. A. Butterfield, B.Sc., 35, Wrottesley Road, Plumstead, S.E.

COLEOPTERA.

Leicestershire Coleoptera in 1897.

By F. BOUSKELL, F.E.S.

The year 1897 will be remembered as one of plenty, although comparatively few new records have been made. Numerous species, both rare and common, occurred in abnormal profusion, *e.g.*, the local

Phyllobrotica 4-*maculata*, which has hitherto been restricted to one or two localities, turned up in eight new places and in abundance, the food-plant, the common scullcap (*Scutellaria galericulata*) showing what the larvæ could do when in numbers. Another peculiarity of the season was the scarcity of *Toxotus meridianus* at Owston Wood, where the insect is usually abundant; black forms, which generally predominate, being exceedingly rare. *Clytus arietis*, *Rhagium inquisitor* and *R. bifasciatum* were also less in evidence than usual. Owston, however, kept up its character for surprises, a fine *Tillus elongatus* being taken (the second record for the county), and another new species for the wood. *Agrilus angustatus* turned up on young oaks; a specimen of this latter insect was also found at Buddon. *Fungi* produced a county record in *Bolitochara lucida*, and another good Staph. in *Ocalea castanea*. *Ips* 4-*punctata*, the second record from Owston, was taken at sap.

At Barrow-on-Soar, *Cryptorrhynchus lapathi*, a beetle I have met with occasionally on willows, was in plenty on the trunks of this tree, and in a few years will doubtless destroy the trees it was infesting. The larva feeds in the branches, boring galleries rather larger than a pea in circumference. The nettles beneath the infested trees were covered with frass, and numerous branches above had already fallen victims to the attack. On examining the galleries, *Soronia grisea*, a small *Homalota*, and a species of *Epurea*, were found in numbers, and one specimen of *Quedius cruentus*; this, I fancy, has never been recorded before, although, of course, *Cossus* borings are always worth investigation, as also the borings of *Leptura scutellata*. Buddon Wood was as productive as usual, the ants' nests yielding most of their previously noted species, and an addition, I fancy, in *Quedius brevis*, which turned up in numbers. *Rhynchites opthalmicus* occurred in the utmost profusion, in company with the rarer *R. alliariae*, and *R. pubescens* was picked up, as usual, singly, on oak.

A curious species, *Antherophagus nigricornis*, was taken on the low parsnip blossoms, and by sweeping; this species is supposed to be associated with various species of *Bombi*, one having been observed clinging to the leg of a *Bombus* with its mandibles. Fowler says that it is occasionally found in and about the nests of *Bombi*, but the life history and economy appear to be still open to the investigating coleopterist. The fact of the beetle frequenting flowers like the foxglove, infers a desire to be conveyed to the nest, probably for the purpose of ovipositing.

Dorytomus pectoralis was found on sallows; *Pogonochoerus hispidus* occurred under bark of oak in January, quite a surprise find. *P. dentatus* was beaten off hawthorn in June. In the neighbourhood of historic Bradgate, *Corymbites aeneus* turned up once more under stones. *Silpha thoracica* in profusion under dead rabbits. *Barynotus schönherri*, new to this well worked locality, is worth mentioning; it was taken by sweeping by Mr. Donisthorpe. I have taken it previously from flood refuse at Loughboro. *Gastroidea polygoni*, new to the Bradgate list, was in great profusion, every plant of *Polygonum* being full of them; also *Prasocuris phellandrii* and *P. junci*, both new to this locality. In the brook outside the reservoir, a few *Donacia versicolora* were picked up off *Potamogeton*, whilst, under logs, *Orectochilus villosus* was not uncommon. *Octhebius exculptus* was found on the mud and in the waterfall; the lovely *Dianous caerulescens* was plentiful in wet

moss. *Notiophilus palustris* was also not uncommon. *Galerucella nymphae* and *G. sagittariae* were swept off the margins of the brook, neither of which species are recorded by Mr. F. Bates in his Bradgate list.

The granary species have been thoroughly worked this year by Mr. Headly, and some interesting beetles have been noted. As they have never been recorded for Leicestershire collectively before, I must allude to them in detail. *Trogosita mauritanica*, an interesting species not common in the Midlands; it is found under old flour sacks, etc. *Silvanus surinamensis*, a curious little beetle, luckily scarce in Leicester, breeds in dried fruits, sugar, rice, etc., and is a great pest in many grocers' shops. *Niptus hololeucus*, the common spider beetle, found in old houses, etc. *Blaps mucronata*, the churchyard beetle, commonly distributed, breeds in bone dust and other refuse, in cellars, etc. *Tribolium ferrugineum*, a truly cosmopolitan species, occurs in mills, bakers' shops, etc. *Tribolium confusum*, a closely allied species, which is, as a rule, not nearly so common, appears to be the most abundant here. *Gnathocerus cornutus* is another meal-feeding species; the male can easily be distinguished by its horn-like mandibles and the two short horns on the vertex of the head. *Tenebrio molitor*, the meal worm, is commonly distributed, the other species, *Tenebrio obscurus* being rather rare. *Calandria granaria*, this wretched pest, unfortunately abounds, but the allied species, *C. oryzae*, is luckily rare.

The reservoirs of Cropstone, Thornton and Saddington have been well worked, with curious results. Thornton and Cropstone are on the trias marls and sandstones, whilst Saddington is on the marlstone and upper lias. Cropstone and Thornton being so near to each other, similar results would be expected, but at Saddington new things might be looked for. At Cropstone, *Bembidium obliquum*, a very local beetle, was in countless numbers, in company with *Stenolophus respertinus* and *Bembidium flammulatum*, one tread on the muddy margins displacing a seething mass of beetles. *Anchomenus marginatus* and *Philonthus quisquillaris* were everywhere on the mud, the rare var. *dimidiatus* of the latter insect, with red elytra, was to be found sparingly. This pretty variety is a new record for the county. Speaking of this insect, the type I mean, Canon Fowler says, in *The Coleoptera of the British Isles*, vol. ii., p. 275, "it has been recorded from the Manchester district, but this may have been in error, as it does not appear to occur in the Midlands, and I can find no record further north than Cambridgeshire." It is also curious how the Burton-on-Trent coleopterists could have missed it; anyhow the fact remains, it is one of our commonest reservoir beetles. At Thornton we expected to find a similar state of things, the actual result was interesting. *Stenolophus respertinus* only occurred in odd specimens, and both *Bembidium obliquum* and *B. flammulatum* were by no means common. *Philonthus quisquillaris*, the beetle of the reservoir, was there in countless numbers, the var. *dimidiatus* turning up pretty freely. One specimen of *Blethisa multipunctata* was disturbed from the mud, the second record of this insect for the county. A fresh *Bembidium* in *B. guttula* occurred. At Saddington, neither *Bembidium obliquum* nor *Stenolophus vespertinus* was to be found, and *Bembidium flammulatum* very sparingly. *Philonthus quisquillaris* was common, but not a single specimen of the var. could be found, although carefully worked for on eight occasions. *Bembidium clarki*, new to Leicestershire, was taken here. (Mr. F. Bates assures me Dr. Power's record

from Thornton is an error, as he collected there with the doctor). It is curious that the Power collection does not contain a single Leicestershire specimen. *Anchomenus micans*, also unknown at the other two reservoirs, occurred here, also *Bembidium articulatum*. *Bembidium doris* swarmed.

These results show, in a distance of about 20 miles, a completely different coleopterous fauna on an apparently similar reservoir, *viz.*, Saddington. With regard to Cropstone and Thornton, although close to each other, the results are not the same, the only inference being that some adverse influence had been at work on *Stenolophus vespertinus*, *Bembidium obliquum* and *B. flammulatum* at Thornton, whilst the opposite was the case at Cropstone. But why should the non-Midland species, *Philonthus quisquillaris*, occur at all three, and the var. *dimidiatus* fairly commonly at Thornton, rarely at Cropstone, and not at all at Saddington? The Cropstone predominant species being *Stenolophus vespertinus* and *Bembidium obliquum*, at Thornton, *Philonthus quisquillaris*, and at Saddington, *Bembidium doris*.

Coleoptera in the Hastings District.

By W. H. BENNETT, F.E.S.

In company with my friend, Mr. Jeffery, I have found a considerable number of good coleoptera in the district this year. The sandhills at Camber have produced the following:—*Harpalus serrus* in some numbers, at the roots of grass and below the surface of the sand; *H. cordatus* sparingly and very local; *Amara rufocincta* sparingly, and one or two specimens of *Masoreus wetterhalii*; other species which occurred here, principally under moss, or by searching under the plants, are *Xantholinus tricolor*, *Achenium depressum*, *Syncalypta hirsuta*, *Hyperaspis reppensis*, *Nitidula 4-pustulata* and *Saprinus metallicus*. The marshes, however, near Rye and Winchelsea, proved our most prolific hunting-ground. From the banks of one ditch we took the following:—*Panagaeus crux-major*, a nice series (one specimen only of this species had been previously recorded from the district); *Badister peltatus* and *unipustulatus* in numbers; *Stenolophus skrimshiranus* (30), this species had not been met with for many years, and then only one specimen was taken; *Hypera pollux* occurred freely, and with it the beautiful *H. alternans*, under such conditions as led us to feel convinced that it is only a var. of *H. pollux*. *Bagous collignensis* was not rare, and a single *B. limosus* turned up among them. Other things which might be mentioned were *Actobius cinerascens*, **Philonthus fumarius*, *Anchomenus puellus*, *Chlaenius nigricornis* and *Erirrhinus scirpi*. I think that is a very fine list for one small ditch, not more than 30 yards long. At other parts of the marsh we met with *Telmatophilus sparganii* in some numbers, accompanied by swarms of *T. caricis*, and one or two **T. schönherri*, *Coccidula scutellata*, *Bagous frit*, and *B. subcarinatus*, not uncommonly, *B. alismatis* and *B. tempestivus* in large numbers, one **Gymnetron villosulus*, *Limnichus pygmaeus* on the muddy banks of a ditch, which also yielded two *Bledius crassicollis*, the first for some years, and plenty of *Ceuthorrhynchidius rufulus*. Guestling Wood and the immediate vicinity was not worked so much as usual, but several nice species were obtained, one *Cacnopsis fissirostris*, and *C. waltoni*, commonly, *Tropiphorus carinatus*; one *Liosoma troglodytes*, under moss; ten *Deronectes*

latus, under stones in a stream; *Thymalus limbatus*, under bark and bred from fungi; *Lathridius testaceus*, *Agathidium rotundatum* and *Liodes humeralis* from powdery fungus on an old trunk, and *Trachyphlocus aristatus*, at the roots of grass. At Fairlight, the best things met with were *Choragus sheppardi*, several from old hawthorn; *Notiophilus 4-punctatus* in a sand-pit, and *Lixus algirus* from thistle stems, in its old locality. Among the *N. 4-punctatus* was one striking aberration, with three punctures on one elytron and two on the other. I have previously met with an example which had two punctures on one elytron and only one on the other.

The well-wooded district near Battle was rather prolific of good things. At sappy oak stumps we were lucky enough to get a long series of **Xyleborus dispar* ♀, and a few **X. saxeseni*; a single *Callidium violaceum* turned up, and beating produced *Rhynchites pubescens*, *R. nanus* and *R. populi*, *Mordellistena abdominalis* and *Dorytomus costirostris*. From a dead oak we obtained a few **Anitys rubens*, but, as usual, they were all dead, and accompanied by *Dorcatoma flavicornis*, also dead. A single **Mycetophagus piceus* occurred on the same tree. Evening sweeping was not a great success, considering the amount of time devoted to it. *Colon brunneum* was not rare, and *Anisotoma calcarata* was common, but the better species were very scantily represented; *A. nigrita* (one), *A. litura* (one), *A. badia* (several), *A. ovalis* (two), *Colenis dentipes* (common), *Cyrtusa pauxilla* (not rare), *Hydnobius strigosus* (one), *Rhinoncus denticollis* (two), *Tetratoma ancora* (one), **Sibinia potentillae* and *Orchestes pratensis*. Those marked thus * have not been previously recorded for the district.

The egg-laying of Metœcus (Rhipiphorus) paradoxus.—With reference to the interesting note of Dr. Chapman about *Metoecus*, I can scarcely subscribe to his ingenious theory that the female deposits her eggs in rotten wood on the chance of some wasp coming in contact with the grubs. To maintain my theory, I may state that, at the end of July, I once found a nest of wasps deep in a bank in an elder-stub, which had been found by some boys, who had commenced to stone it, and as I wanted some wasp-grubs at the time for fishing and for the poultry, I took the nest at once. In about half-an-hour, the small garrison were all dead in a bunch outside and inside the entrance where I had put my rag. On digging out the nest, which which was some way in the bank, I found, as I expected, only about a fifth of the early combs empty, and these were being filled with eggs by the old queen wasp, who, with an old and worn female *Metoecus*, were the only living occupants of the nest. The beetle was very busy running about the empty cells, and evidently intent upon depositing her eggs. In the usual course, I should have found the full-grown beetles in about eight weeks. *Vespa vulgaris*, which only makes use of rotten wood, generally, I notice, selects quite a fresh piece each year to work from, and, although we frequently see *Vespa germanica* at work upon sound wood-gates and palings, the other wasp is not very often seen at work, as it frequents less exposed places.—W. H. Tuck, M.A., The Press Club, Fleet St., E.C. December 16th, 1897.

Information required.—I should be glad of information as to distribution and variation of British *Aphodii*, localities for all species, with dates.—Frank Bouskell, F.E.S., Market Bosworth, Nuneaton.

Variation in the abundance of Coleoptera.—I am collecting

notes on the variation in the abundance of Coleoptera in a sequence of years, and should be obliged for information relating to the special abundance or scarcity of any species which may have been observed in past, or may be observed in future, years.—E. G. Burgess Sopp, Saxholme, Hoylake.

Obituary.

GEORGE CHRISTOPHER DENNIS, F.E.S.

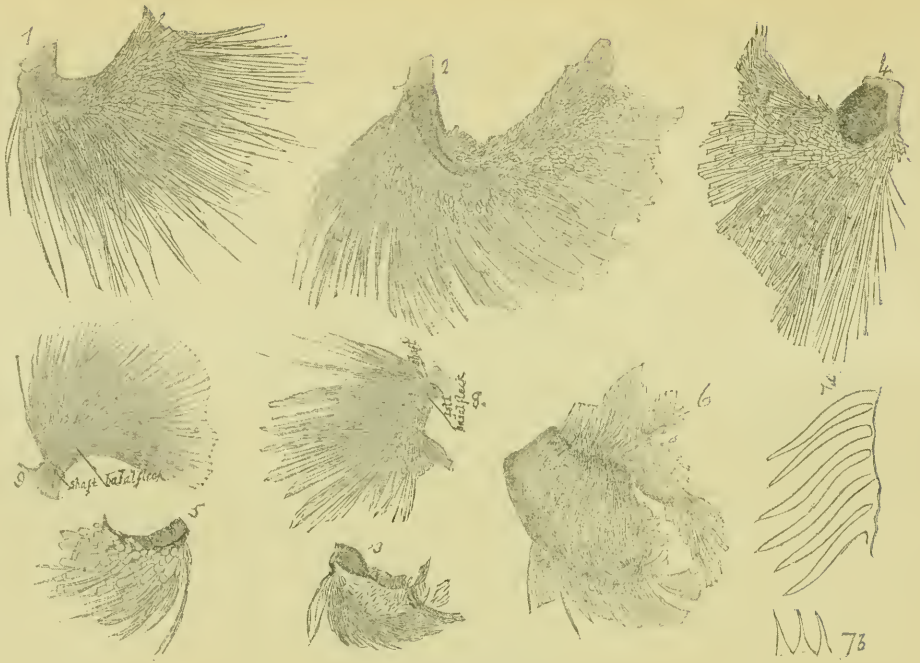
Born March 11th, 1848, Died December 22nd, 1897.

On the morning of December 21st, Mr. G. C. Dennis, the president of the York and District Naturalists' Society, was at entomological work, setting exotic or European butterflies; in the afternoon he went out, apparently in his usual health and spirits, to attend to some business connected with the city charities, and whilst thus engaged in the vestry of the church, he suddenly became unconscious, slipped from the chair upon which he was sitting, and, although he was at once removed to his home, he never recovered consciousness, but died at three o'clock the next morning.

For the greater part of his life he was connected with the well-known firm of wholesale confectioners, Sir Joseph Terry and Sons, in which business he eventually became a partner. About two years ago, however, he retired, and has since spent his time in out-door pursuits—fishing, entomology—of which he was passionately fond.

Mr. Dennis was a born nature-lover, a field naturalist in the truest sense of the word, a good lepidopterist, and latterly he showed much interest in the Neuroptera and Trichoptera. He first found, in abundance, the hitherto rare *Halesus guttatipennis*. He was intensely interested in the York Museum, and had been frequently re-elected to the post of president of the York and District Naturalists' Society. He was on the council of the York Philosophical Society, also on that of the York Horticultural Society. At one time he was, for some years, secretary of the entomological section of the Yorkshire Naturalists' Union, but, although repeatedly urged to become president of that section, he always declined. He was a life-member of the Entomological Society of London, and a member of the South London Entomological Society.

Quiet, unassuming and modest, it took some time to find out what a good naturalist Mr. Dennis was. In the field he was ever alert—shell, insect, fish and bird—everything claimed his attention and awakened his interest. Only we, who have spent our holidays with him, who have roamed the Deal sand-hills, and climbed the chalk downs, who have sat at night and looked across the silent sea, and watched the moonlight sparkle on the waves, when thought has been too strong for words, only we know how excellent a man has gone from among us. It is too early yet to recognise that the old times have to be eliminated from the recurrent present and future and be numbered with the past; it is hard yet to recognise that the social, witty and genial companion is gone for ever from among us, and that his place will know him no more. Memories of an unselfish life will live after him, and will be his epitaph in the recollection of those of us who will mourn his loss for many days. For the loss of such a man, our sincerest sympathies will be but as ashes to the gentle lady who, more than all, mourns her husband and our friend; but such as they are, they are hers, heartfelt and ungrudgingly tendered.



PALPI OF RHOPALOCERA.

Figs. 1-6 and 8-9.—Inner side of basal joint of labial palpi.

Fig. 1.—*Pieris brassicae*, Linn.
Fig. 2.—*Catopsila argante*, Fab.
Fig. 3.—*Eurybia juturna*, Feld.
Fig. 4.—*Charaxes jasius*, Linn.
Fig. 5.—*Chrysophanus hippothoë*, Linn.
Fig. 6.—*Thracides salius*, Cram.
Fig. 8.—*Maniola medea*, Schiff.
Fig. 9.—*Dismorphia praxinoe*, Doubl.
Fig. 7*a*, proximal, 7*b*, distal, chitinous cones of *Aglais urticae*, Linn.

The Entomologist's Record AND JOURNAL OF VARIATION.

VOL. X. No. 2. FEBRUARY 15TH, 1898.

On a New Classification of the Rhopalocera.

(Illustrated by Plate.)

By ENZIO REUTER, Ph. D.

At the request of the editor of this magazine, I here give a brief summary of my method of using the palpi of butterflies for classificatory purposes, as well as of the principal phylogenetic result arrived at in my book on the palpi of Rhopalocera.*

It may first be stated—as I pointed out in a brief note in 1888†—that the labial palpi of all butterflies and moths present a well-marked scaleless area, called the "basalfleck," or basal spot. This is situated at the lower end of the inner side of the basal joint, and exhibits a great number of peculiar dermal appendages, more or less conical in shape, and a few cavities or pits. It is also, sometimes, transversely striped or rippled. The cones and pits suggest sensory organs, analogous to those described by Kraepelin, Forel, Hauser and others.

The basalfleck, which is pretty uniform in the different groups of Heterocera, shows, in the various Rhopalocerous families, great variations in extent and form. It also varies considerably in the shape and arrangement, as well as in the degree of development, of its chitinous appendages, and I have, consequently, limited my investigations to the butterflies only.

When studying the palpi of the Rhopalocera, I have taken into consideration, mainly, three circumstances, *viz.*, (1) The external shape of the entire palpi, as well as the proportions of the single joints. (2) The scale-covering. (3) The basalfleck.

The two former characters, especially the first, frequently used as generic and specific characters by systematists, are of comparatively little taxonomic value. As to the scales, the slender hairlike form, according to the view of Kellogg,‡ is considered to represent the more generalised condition, whereas the flattened, short and broad, symmetrical form of the scale indicates a more specialised condition. Consequently, the long, hairlike, projecting scale covering, on the lower part or front of the palpi, which occurs in some members of every

* Uber die Palpen der Rhopaloceren. Ein Beitrag zur Erkenntnis der verwandtschaftlichen Beziehungen unter den Tagfaltern. Helsingfors, 1896, xvi. + 578 pp 4to.

† Uber den Basalfleck auf den Palpen der Schmetterlinge. *Zool. Anz.*, xi., No. 288, 1888, pp. 500-504.

‡ "The Taxonomic Value of the Scales of the Lepidoptera."—*Kans. Univ. Quart.*, vol. iii., No. 1, 1894, pp. 55.

Rhopalocerous family group, especially in those which are also characterised by a somewhat generalised condition of other characters, may, as a rule, be considered, in every group, as a relatively primitive character; on the other hand, the inclined or depressed covering of short and broadly expanded, blade-like scales, represents a higher degree of specialisation.

The basalfleck affords a good subject for comparative morphological investigation, since it is variable in form and structure, and indicates different lines of specialisation. So much the more important does the study of this structure become, if we consider that its concealed position does not render it liable to adaptation under the direct influence of varying conditions of environment. It is, therefore, more likely to indicate the true affinities, which may be more or less disturbed and obscured in other structures. In my endeavour to ascertain the different ways in which the primitive type of the basalfleck has been modified in the various, more or less, specialised forms, *i.e.*, to make out the lines of descent, and thereby the phylogenetic relationships, I have examined the whole of the greater and smaller systematic groups of the Rhopalocera.

The primitive type of the basalfleck is characterised by: (1) Its covering a somewhat large area, reaching from the proximal end of the basal joint to the middle of the same, or even further, and occupying in its basal half, almost the entire breadth of the inner side of the joint; (2) By the tapering form of its distal end, which is somewhat irregularly and vaguely limited by scales; and (3) By the slender, straight chitinous cones, which, although but slightly developed, are somewhat equally spread over the entire area of the basalfleck, and do not form a distinctly marked area. Such a primitive, or scarcely more specialised, condition is very common in the Heterocera, and is also to be found in some lower members of the different Rhopalocerous super-family groups, or *Gentes*,* as I have called them, *viz.*, the *Papiliones*, *Lycaenae*, *Danaidae*, and, in a somewhat less pronounced form, even in a few *Satyri*. In the *Libytheae* the basalfleck is not very specialised, but in the *Nymphales* the degree of specialisation, even in the most generalised members, is tolerably high. It may here be mentioned that, for many reasons, this highly specialised form is *not* to be derived from any form already specialised, as represented in the modified members of any other family, but must have been developed *independently from the generalised type form described above.*

(*To be continued*).

* As to the systematic value of these and the family groups, see below.

Relationship of Callimorpha hera and Euthemonia russula as exhibited by their early stages.

By J. W. TUTT, F.E.S.

I was fortunate this year in being able to compare the eggs and young larvæ of these two species side by side. The result was sufficiently interesting to give my notes to our readers. Although I described the egg of *C. hera* on August 6th, under a two-thirds lens used as a hand glass, yet when I made that of *E. russula*, I had several hundreds of those of *C. hera*, in various stages of development, under

observation. Within a day or two I added notes to the description of the egg of *C. hera*, made, when properly mounted, under a two-thirds lens.

Eggs.—*Callimorpha hera.*—The eggs are laid side by side very regularly, in parallel rows. The batches, however, vary greatly in number, some comprising as many as a hundred eggs. When newly laid the egg is very pale yellow in colour, inclining to pearly-white under the lens. In shape it forms not quite two-thirds of a sphere. The egg-shell appears at this stage to be quite smooth, except in the micropylar area, which shows an indistinct polygonal reticulation. [Described August 6th, from eggs obtained from a ♀ captured at St. Michel de Maurienne.] On August 28th, I made further notes from eggs obtained between August 16th–18th, at Susa (in Piedmont). The shell is covered with an irregular polygonal reticulation, some of the divisions being quadrangular (diamond-shaped), others pentagonal, the latter being the more frequent shape of the cells. The micropylar area is not depressed. The shell is perfectly transparent, and the embryo can be distinctly seen within. The embryo escapes at the upper side of the egg, by eating an oval hole in the shell. After it has escaped, the larva eats away the rest of the egg-shell, which is highly iridescent.

Euthemonia russula.—The eggs are laid side by side in contact with each other in small clusters. Each egg forms rather less than two-thirds of a sphere, with a very flattened base. It is of a pale yellow colour, very shiny and pearly-looking under a microscope, the surface being covered over with a very fine and delicate irregular polygonal reticulation, tending to hexagonal and pentagonal divisions. The micropylar area is very slightly depressed, but with the exception of the reticulation being finer, the polygons formed smaller, and the arrangement stellate in character, there is very little difference between the appearance of this and the remaining surface of the egg. [The description was made under a two-thirds lens on August 24th. from eggs laid by a ♀ captured at Aix-les-Bains on August 20th]. On August 29th, I noticed that the eggs had become dark grey in appearance. The embryo was observed, under a lens, to be fully matured, and the shell shiny and transparent. Just before hatching, the dark hairs form distinct rings round the basal half of the egg. On August 30th the eggs began to hatch.

Larvæ.—*C. hera.*—The newly-hatched larva of *C. hera* is quite white in colour, with the exception of the very pale brownish head, the intensely black ocelli, and a pale flesh-coloured tint tinging the transparent dorsal prothoracic plate. The hairs are quite white, and look as if divided into distinct segments, contracted at their union with the adjacent segments. These glassy-looking hairs rise from transparent glassy-like tubercles, which occupy a very great part of the body surface. An hour after the hatching of the larva the head is pale brown, not so wide as the prothorax, into which it is slightly retractile; ocelli black; the face sprinkled with pale brown hairs. The body is of a creamy colour, with large grey tubercular patches, the dorsal almost semi-circular in shape. *Dorsal view.*—The prothorax is tumid, with a large brown lunular, dorsal plate, along the front edge of which are four large tubercular warts in a straight line, and four smaller ones (forming a curve) behind; each tubercle bears a grey hair. The

meso- and meta-thorax have the posterior (ii) and anterior (i) tubercle on the same side united into a prominent boss; the hairs representing the anterior trapezoidals being placed a little behind the ones representing the posterior. The abdominal segments, 1–8, are each subdivided into three sub-segments, the first carrying the anterior trapezoidals (i), placed close together and towards the front of the segment, the second subsegment carrying the posterior trapezoidals (ii), which are more separated. Each carries a single pale (changing afterwards to a black) hair. The anterior and posterior trapezoidals are united, on either side of the 9th abdominal segment. *Lateral view.*—Each abdominal segment carries three lateral tubercles on either side. Each consists of a simple black wart, bearing a single black hair (except the subspiracular, which carries a pale hair), placed on a large grey-coloured boss. These tubercles are the supra-, post- and sub-spiracular. The spiracle is exceedingly minute, but with a greyish rim, that renders it distinguishable. The prothorax carries only two lateral tubercles, the pre- and sub-spiracular, the spiracle minute with a blackish-grey rim. The two lateral tubercles on the meso- and post-thorax are similarly situated. The true legs and the prolegs almost transparent. (August 30th, 1897).

E. russula.—The newly-hatched larva of *E. russula* is white, with a black head and yellowish triangular clypeus. *Dorsal view.*—A pale brown corneous plate occurs on the centre of the dorsum of the prothorax, the plate bearing two pale hairs, centrally; whilst four long black hairs arise from the front of the segment before the plate. The meso- and post-thoracic segments also bear four dorsal tubercular warts, those representing the anterior trapezoidals (i), being shifted back so as to fall just behind the normally posterior trapezoidals (ii). Each of these bears a single long black hair. On the abdominal segments the anterior and posterior trapezoidals are normal in position, the anterior (i) rather close together and very small, the posterior (ii) rather more separate. Each of these consists of a small black wart, the anterior (i) bearing a rather short pale hair, the posterior (ii) bearing a long black one. On the 9th abdominal segment the anterior tubercles are wanting. *Lateral view.*—There are three rows of lateral tubercles. (1) The supra-spiracular, placed at the front of the segment, and each of the tubercles in this row bearing two separate black hairs (the upper hair much the shorter, and placed in a line with the anterior trapezoidals, the other just in front of the line of the posterior trapezoidals). (2) The post-spiracular, each bearing also a long black hair. (3) The sub-spiracular row of tubercles, each of which bears a long white hair. The marginal series of tubercles, running along the base of the prolegs, also carry white hairs. The spiracles in this stage are almost indistinguishable. *General notes.*—The tubercles in this newly-hatched larva form large transparent glassy-looking bosses, on which the black warts, and the black hairs they carry, are very conspicuous. The true legs and prolegs are also very transparent. The anal prolegs carry a number of small black warts, each bearing a glassy-looking transparent hair. In a few hours after hatching the transparent bosses become dark grey, and the young larva gets quite a dark appearance. (August 30th, 1897.)

Resemblances between the newly-hatched larvæ of C. hera and E. russula.—The newly-hatched larvæ resemble each other in the

following particulars.—(1) Both have the body entirely white in colour. (2) Both have a swollen or tumid prothorax, bearing a prothoracic plate that is at first transparent, with a faint flesh-coloured tint, but becoming dark in an hour or two. (3) Both have the dorsal tubercles on the meso- and meta-thorax so arranged that the anterior trapezoidals (i) are placed slightly posteriorly to the normally posterior trapezoidals (ii). (4) Both bear glassy-looking hairs. (5) The dorsal hairs are darker than the lateral hairs, the sub-spiracular hair of each being the palest. (6) The tubercules are, in this newly-hatched stage, quite glassy-looking and transparent. (7) The dorsal and lateral tubercules are almost identical in position and arrangement. (8) The tubercles and the bosses that unite them soon become darkened. (9) The larvæ of both species devour their egg-shells—*C. hera* most energetically and completely.

Differences between the newly-hatched larvæ of C. hera and E. russula.—(1) The head of *C. hera* is very pale brown, that of *E. russula* is black with a pale yellowish triangular clypeus. (2) The dorsal hairs of *C. hera* are not so dark as those of *E. russula*. (3) The tubercles of *C. hera* are united transversely by glassy-looking bases, and the hairs look as if arranged transversely; in *E. russula* they are not so united, and the hairs and markings (darker areas) look as if arranged longitudinally. (4) The supra-spiracular tubercle bears a double hair in *E. russula*, a single one in *C. hera*. (5) The spiracles of *E. russula* are minute and black, and placed towards front of segments; in *C. hera* they are equally minute, but scarcely distinguishable, being pale in colour with a greyish rim.

The British Liparid Moths.

By A. BACOT.

This group of moths forms, at least as far as our British species are concerned, a small, compact and homogeneous family, in fact (with one exception), a model division from the now obsolete point of view of the fixity of genera and species. It appears to be a perfectly natural division, and the characters common to the family occur at least in three stages of the life-history of all the British representatives. The affinities of this family to the rest of the Lepidoptera are somewhat uncertain, but, with the one exception already mentioned, *viz.*, *Demas coryli*, the relation of the species to each other is well marked. I can only lay claim to having treated the subject in a superficial manner, and my knowledge is particularly weak, both as regards the distribution of certain species, and the habits of certain of the imagines.

The family Liparidæ is represented by only eight existent, and two extinct, species in Britain, the latter being *Laelia coenosa* and *Ocneria dispar*. The former was captured in the Fens, by many collectors now living; Porritt, I believe, being the last, in 1877. It is doubtful whether *O. dispar* was ever really firmly established in this country, although it appears to have flourished for some years in the Fens of Norfolk; it is still bred freely, being kept by many collectors as a domesticated species, but the origin of these races is not known, although certainly not British.

Of existent species, one, *Porthesia chrysorrhoea*, is now very rare,

and until last summer (1897) was supposed to be extinct; *Orgyia gonostigma* is scarce and local; *Dasychira fascelina* is still plentiful in some seasons, where it occurs, the north-west coast of England being its best known locality; *Psilura monacha* is local, but, I believe, fairly widely distributed in the south of England. Of the remaining species, *P. similis* is widely distributed, and common in the south and east of England, but I am uncertain as to its distribution in the north and west; in Scotland, I believe it to be rare. *Orgyia antiqua* is very abundant in the south of England (especially in the London district), and probably throughout the country. *Leucoma salicis* is generally distributed around London, and in the south and east of England. *Dasychira pudibunda* is really, I fancy, a woodland species, though it is said to be abundant in hop-fields (the larva in Kent being known as the "hop-dog," that of *O. antiqua* as the "hop-cat"); it appears to be widely distributed, and fairly common wherever it occurs.

Another species, *Leucoma v-nigra*, is included by Stainton as British, but it seems to have very slender grounds for ever having been considered British; it is dropped by Newman, but in Kirby's *European Butterflies and Moths* is still mentioned as occurring in the south of England. One other species must not be forgotten, *viz.*, *Demas coryli*, the position of which has recently been discussed by certain eminent authorities.

Kirby gives the following particulars as to the distribution of the British species outside Britain: *Ocneria dispar*, abundant in most parts of Europe, and northern and western Asia, as far as Japan. *Psilura monacha*, a common and often destructive insect throughout Europe. *Leucoma salicis*, common throughout Europe and northern Asia. *Porthesia similis*, common in southern and central Europe, and northern and western Asia. *P. chrysorrhoea*, common in central and southern Europe, north Africa, and western Asia. *Dasychira pudibunda*, common in most parts of Europe. *D. fascelina*, common in Europe and the Altai Mountains; there is also a var. *obscura* of this species found in Lapland. *Orgyia gonostigma*, common in most parts of Europe and Siberia. *O. antiqua*, abundant in Europe, also occurs in America and north Africa. *L. coenosa*, widely distributed throughout central Europe, in marshy places, but extremely local everywhere.

I have, as a matter of convenience, adopted a provisional re-arrangement of the family, based on the larval characters. The British representatives I thus divide into five genera: (1) *Ocneria—monacha, dispar* and *salicis*. (2) *Porthesia—similis* and *chrysorrhoea*. (3) *Dasychira—pudibunda* and *fascelina*. (4) *Orgyia—antiqua* and *gonostigma*. (5) *Laelia—caenosa*. The latter might, perhaps, be included in *Orgyia*, judging from larval characters alone, but the imago differs in such a marked manner that I have placed it in a separate group.

Ova of the various species.—The ova of *O. monacha, dispar* and *salicis* are, in shape, very like a tangerine orange; the shell is nearly transparent after hatching; they are laid in batches. Those of *monacha* and *dispar* are dark grey, or grey-brown, the former squeezed into crevices and cracks in a tree trunk, the latter covered with down from the body of the ♀. The eggs of *salicis* are covered with a white frothy-looking substance, which looks very similar to "cuckoo-spit,"

but is composed of some glutinous secretion, which becomes tough, and dries on exposure to the air.

The ova of *P. similis* are, speaking from memory, very similar to those of *O. dispar*, but smaller; like those of the latter species, too, they are laid in patches, and covered with down from the abdomen of the female. I can find no description of the egg of *P. chrysorrhoea*; they are, however, laid in patches, and are covered with down.

The ova of *Dasychira fascelina* are rounder than those of *Oeneria*, but each still forms a flattened sphere, which is of a delicate white porcelain appearance. The eggs are laid in small patches, and covered with dark grey or dusky down. Those of *D. pudibunda*, so far as I remember, are laid in large, close patches, are of an opaque whitish or grey coloration, faintly ringed with darker grey, like the egg of *O. antiqua*.

The eggs of *Orgyia antiqua* are laid in a large patch, usually on the old cocoon. Each is shaped rather like a kettle-drum, spherical, but with a flattened top, the latter having a broad raised edge; it is opaque, with a porcellanous appearance, of a pale brown colour, with the exception of the raised rim, which is white. The egg of *O. gonostigma* is white, and of a delicate porcellanous appearance. I am not quite certain as to its shape, but I believe it to be spherical, or nearly so. The ova are laid in large loose masses, mixed with down from the body of the female. The natural place of deposition appears to be between the inner and outer cocoon. I can find no description of the egg of *L. coenosa*.

It is remarkable how different are the ova and the egg-laying habit of the various species, closely as they are allied. Of nine species mentioned, six cover their eggs, five with down and one with a gelatinous secretion. The most closly allied forms differ widely from each other in this respect, *e.g.*, *D. pudibunda* and *D. fascelina*, *O. antiqua* and *O. gonostigma*, *O. monacha* and *O. dispar*, the former of each pair laying its ova without, the latter with, a covering of down; in the case of the Orgyias the structure of the egg also differs considerably.

(To be continued.)

On the habits and aberrations of Melitaea aurinia.

By JOSEPH MERRIN.

Among a number of *Melitaea aurinia*, taken in a spot known as Kimberland, a large swampy meadow, bordered by a small wood, chiefly of oak, between three and four miles from Gloucester, during the last five or six years, I have obtained a few good aberrations. They have been captured at the normal time of emergence for this species, and swarms of the species are, in most seasons, to be taken there. The herbage consists largely of devil's-bit scabious and plantain, with many other "weeds." Broods of the larvæ in their webs are visible amongst these during the winter, and they scatter in the spring when about half-fed, and may be picked up while sunning themselves on the herbage. I have fed many up into the perfect state, but never obtained any aberrations, which seem to occur only occasionally. Attempts to naturalize the larvæ into the adjoining fields have failed. The butterflies are remarkable for confining themselves to the meadow in question, although the scabious is dotted

about in the adjoining fields, which are, however, pretty closely grazed, while Kimberland itself has been only partially grazed. The imagines fly very gently, and may easily be taken by the hand in dull weather. After a storm of rain, on the sunshine appearing, they often rise in a beautiful cloud. The place is getting more unfavourable every year for insects, owing to agricultural "improvements," although it yet produces a good number of other local insects. It is now about to be enclosed.

Among the aberrations that I have taken may be mentioned the following:—(1) The ground colour of the upper side uniformly fulvous = ab. *artemis*, Fab. Some of these are remarkable, having, in spite of the uniform colour of the upper sides, quite normal undersides, *i.e.*, with cream-coloured bands, whilst others have the ground colour of the underside also uniformly fulvous. (2) The type form = ab. *aurinia*, Rott. (3) The ab. *praeclara*, Kane. One of this form is very fine, the lower of the series of sub-marginal creamy spots on the upper side of the fore-wings, uniting with the wide, basal, inner-marginal creamy spot, making a large ⌊⌋-like mark.

The undersides of some of the specimens captured have the fulvous colour uniformly spread, even over the usual creamy parts. Others show the basal fulvous patch practically obliterating the central cream-coloured band, and with the cream-coloured patches in the basal area very nearly obsolete. One specimen, indeed, has these patches obsolete, the basal fulvous area extending beyond the centre of the wing, whilst a large creamy unspotted band extends from this to the margin of the wing, and crosses the wing from the middle of the costa to beyond the anal angle, its inner margin being edged with dark fuscous.

On the occurrence of Tephrosia bistortata and T. crepuscularia in Wales.

I am decidedly of opinion that *T. crepuscularia* and *T. bistortata* are distinct species. *T. bistortata* normally occurs at Swansea at the end of February and commencement of March, and is usually of a more or less ochreous tint. *T. crepuscularia* appears normally about May 10th, in the same locality, and is grey or black, never of an ochreous hue. [I have taken *T. crepuscularia* in Hants (Winchfield) in the second week of April, in a very restricted locality, amongst larch growing in a large mixed wood, but have never seen *T. bistortata* within miles of the locality. I used to take *T. bistortata* freely near Reading, about fourteen miles from the last-named locality, also in larch plantations, but never *T. crepuscularia*. In the *Entom. Record*, vol. i., p. 62, I record the taking of both *T. crepuscularia* and *T. bistortata* on the same day (May 2nd, 1890) in the same locality, but this is quite unusual.] In 1892 I bred my first *T. bistortata*, on March 20th, but did not find it in the Clyne Woods until April 19th. In that year I first took *T. crepuscularia* on May 13th, whilst my last *T. bistortata* was taken on June 4th, and my last *T. crepuscularia* on June 6th; but this was a very unusual date for *T. bistortata*. Although occurring together, I have never known them to copulate. In 1893 I took my first *T. bistortata*, on March 8th, and my first *T. crepuscularia* (a pure black one) on March 25th, which is the earliest date for this

species I ever remember, but this was an exceptional year. My last *T. bistortata* was taken on May 1st, and my last *T. crepuscularia* on May 17th. The elevation at which the Swansea captures were made is about 220 feet above the sea-level. The average winter temperature of Swansea is 45·5°, summer 60·6°, mean for the year 53·7°; which is warmer even than Penzance. Mr. Holland and myself also took a number of melanic *T. crepuscularia* at Port Talbot in 1893.—(Major) R. B. Robertson.

The earliest date on which I have taken *T. crepuscularia* here is April 15th, 1893. This year was remarkable for a very early and hot spring. On the 19th and 20th of that month I took 18 specimens, of which 16 were black, and the two typical ones were not ochreous. I captured more on April 25th, May 2nd, 5th, and 28th (37 specimens in all), of which 35 were black, but I did not always take typical specimens. In 1893, at a place about 15 miles from here, but off the coal measures, and where the black form does not occur, I took, on March 13th and 23rd, also on April 18th, five specimens which were ochreous, and which I considered to be *T. bistortata*. In the same place I took two not ochreous, on June 15th, which I consider to be *T. crepuscularia*. In 1894 I took here five specimens (on April 15th, 26th, 28th, 29th and May 25th), of which the first three were black. In 1895 I took three here (on May 13th and 21st) of which two were black. [At Brandon, in Suffolk, in 1889, I took 70 specimens of the non-ochreous form, on May 16th, 19th, and 25th.] I have never searched particularly for these species, except for the black form in May. I take the specimens chiefly sitting on beech trunks. The wood in which I take them lies from about 50 to 200 feet above the sea level, and near the sea. The climate is wet, but fairly mild.—H. W. Vivian, B.A., F.E.S., Glanafon, South Wales.

I incline strongly to the belief that the species are distinct, and having collected where they were both plentiful (Chepstow), I noticed that, in my case, I always took *T. bistortata* about a fortnight before I came across *T. crepuscularia*. The only black specimens I have seen of either species were black *T. bistortata*. These came from Swansea. I have never found either species double-brooded where I have been, and while *T. crepuscularia* undoubtedly varies, I have seen no variation in *T. bistortata*.—Allan Nesbitt, Portishead.

I went to live with Sir John Llewelyn, Bart., in 1867. At that time he was very busy collecting, and, being very fond of entomology myself, I selected some very fine typical females of *T. bistortata* (*crepuscularia*), and fed up a number of them. Some emerged typically coloured, others were much darker. These dark ones I inbred, until I produced a black race. It took about five seasons to do this. I had only one year's trial with *T. crepuscularia* (*biundularia*). I found a fine male *T. crepuscularia*, very dark, with an almost white female. She laid me a few ova, and they hatched out well, and when they came out there was a fair proportion of dark ones; some were almost black with only one white line, most beautiful specimens. I have a couple of large moth traps, and I get a few male specimens of the two species now and again. The late broods are very much smaller than the spring broods, but very beautiful. We are now 13 miles from Ynisygerwn, where I first bred *T. bistortata*, and in not nearly so good a place for mothing. I feed the larvæ of both *T.*

bistortata and *T. crepuscularia* on larch. Both are double-brooded, but not many come out in the autumn. I have taken dark varieties of both species from the trap on the same morning. We usually, however, get *T. bistortata* on the trunks of larch. Some years ago, Sir John Llewelyn and myself, on February 6th, took several typical *T. bistortata*. I never get *T. crepuscularia* until quite the end of April, but it then occurs throughout May. I find both species very easy to rear. I have some bags a yard long, which I fix on a larch branch, high up out of reach. I do not interfere with them for a month, but I then put them into my larva boxes, where they soon feed up.—Robert Stafford, Penllergare, Swansea.

The Rhone Valley in June.

By R. B. POSTANS.

Last June, Mr. Merrifield and I paid a short visit to the Rhone Valley, on butterflies intent. We reached Aigle on the afternoon of the 19th, and the next morning walked up the Sepey Road in the hope of meeting with *Limenitis camilla*, which I once found there in some abundance. With the exception, however, of two *Spilothyrus lavaterae*, in fine condition, and a few *Aporia crataegi* and *Melanargia galathea*, we really saw next to nothing, and this, although the weather was not unfavourable. We therefore moved on to Sierre, where we stayed two or three days.

Our first walk—through the Pfyn Wald to Leuk—afforded us examples of the following species: *Melitaea athalia*, *M. didyma*, *M. dictynna*, and the beautiful *M. phoebe*, *Dryas paphia*, *Argynnis lathonia*, *A. aglaia*, *L. camilla*, *L. sibylla*, *Apatura ilia*, *Lycaena arion* (very fine), *Polyommatus meleager* and *Cyaniris argiolus*, and—close to Sierre—*Satyrus dryas*; though in some cases we saw only a single example of the species. We were, evidently, rather too early for the summer insects. During a subsequent walk, on the other side of the valley, to Leuk, we got some fine specimens of *Argynnis daphne*, a species which I had never before seen in that neighbourhood, though I once found a considerable number of it at Martigny. Whilst we were resting in the garden of the little inn opposite Leuk station, I caught a beautiful ♀ of *L. camilla*. The result of our experience at Sierre was such that we resolved to go over the Simplon to the south side of the Alps, and about the 24th or 25th of June, we moved on to Bérisal, walking up from Brigue. On our way up, we saw *Colias hyale* in the fields near the town, together with some commoner species (such as *A. crataegi*), but all along the well-known piece of road between the second refuge and Bérisal, a road which, in July and August, is so rich in insect life, hardly anything was stirring. At Bérisal we found a few *Parnassius mnemosyne*, in the meadow opposite the Hotel dependance. This butterfly was evidently just coming out, for the specimens were in perfect condition. We saw hardly anything else. *Chrysophanus gordius* was not to be seen, although it is abundant in the middle of July in that gorge, below the hotel, which leads up to the Bortel Alp.

We determined, therefore, to go on at once to Iselle, and endeavour to get *Libythea celtis*, of which curious species we saw three rather worn

examples two years before, at about the same time of year. But we entirely failed in this quest, for we did not see even one specimen. I think we must have been too early for it. In walking down from Simplon to Iselle, we took the short cut through the meadows (just below Simplon), and saw and took a fine fresh ♂ of *Chrysophanus hippothoë*, but this was the only one we saw. It was, no doubt, just coming on.

We slept at Iselle, and in the morning walked down to Crevola, with the result (as already said) that we did not find *L. celtis*, but we did—just above Crevola—meet with a considerable number of that very distinct "blue," *Polyommatus orion*, all of them in splendid condition. *M. galathea*, too, was abundant, and we obtained a few remarkably fine dark examples of this pretty butterfly. *Leucophasia sinapis*, also, was seen in fine form, with very dark blotches on the apex of the fore-wings. *C. gordius*, too, was fairly abundant, most of them showing the beautiful purple gloss which is generally seen on specimens taken on the south side of the Alps. *Vanessa io* and *Eugonia polychloros* were not uncommon, and were in fine condition, though, curiously enough, we found two or three well grown broods of the larvæ of the former. We did not come across any *Euranessa antiopa*, but we found a fine lot of larvæ, which my companion sent home for experimental purposes. We took about a dozen *Polygonia c-album* in good condition, and Mr. Merrifield believed he saw *P. egea*, but I think it may have been a very bright ♂ *P. c-album*. In 1895, on about the same date, we saw a number of *Erebia crias* on the Simplon road, but this year we did not see a single specimen. The season was evidently an early one, for *Saxifraga cotyledon*, which was in full flower in 1895, was quite over last June.

We returned to Sierre about the 1st of July, again stopping a night at Bérisal, and walking down to Brigue in the morning. As before, we saw no *C. gordius*, and, in fact, butterflies were still very scarce all the way down. We did, however, get two or three fine examples of *Satyrus alcyone*, and one or two *M. phoebe*, *Polyommatus escheri*, and a ♂ *P. damon*. On our way we paid a visit to the well-known locality for *P. lycidas*, and were so fortunate as to get about a dozen fine fresh specimens. In spite of the circumscribed area of this locality, and of the numbers annually taken, this species does not appear to be any scarcer now than it was when re-discovered by the late Mr. Tasker.

The day after our arrival at Sierre we paid another visit to the Pfyn Wald. On this occasion Mr. Merrifield got a male *P. meleager*, and between us we caught six or seven specimens of *A. ilia*, which was just emerging, and consequently in very fine condition. One, after flying round me several times, alighted on my waistcoat, and was easily netted. As regards *P. meleager*, it may be worth noticing that, some years ago, I caught a pair of it in the Pfyn Wald, and that the ♀ is apparently the var. *stereni*, which Kane says is found on the "mountains of S. Russia and Greece," and he adds, "S. Tyrol" with a ("?").

As I, some years ago, took three specimens of *P. iolas* at Sierre, we, of course, looked for it carefully this year, but altogether in vain, so far as making any captures; though I believe I did get a glimpse of one as it flew up from the food-plant into the plantation above. I have just heard from a friend whom, five or six years ago, I told of

the exact spot where I had taken mine, that he, in June, 1894, also took three specimens at the same place. Now it is a most curious fact that Kane says of this insect, "three specimens at Jäcki, near Sierre."

We took nothing else of any particular interest at Sierre. I saw one *Pieris daplidice*—I once saw it very abundant in the hotel grounds —and I caught two or three *Thecla w-album*, and one or two *Cyaniris argiolus*. This species is fairly abundant in that part of the valley, though I could never find either holly or ivy on which it could feed; and further, though *L. camilla* and *L. sibylla* are by no means rare in the Pfyn Wald, there is, so far as I could discover, no honeysuckle in that forest.

Mr. Merrifield left for home about the 2nd or 3rd July, and the next day I walked over the Gemmi and on to Frütigen, and thence to St. Beatenberg, but with the exception of one *Erebia glacialis*. caught near the inn at Schwarenbach, a few *M. athalia* further on, and a number of *E. ceto*, just before reaching Kandersteg, I saw extremely few butterflies of any kind. At St. Beatenberg, with the exception of swarms of *Pieris brassicae* and a few *A. crataegi*, I saw hardly anything whatever in the butterfly way.

I found, however, two or three interesting plants on the mountain behind, and though, on the whole, I do not think the expedition was altogether a success from a lepidopterist's point of view, yet the beautiful weather, the charming Alpine plants and the exhilarating mountain air made our short visit to Switzerland extremely enjoyable.

On the value of Larval Characters.

By HARRISON G. DYAR, Ph.D.

Professor Grote, in the December number of the *Entomologist's Record*, seems to challenge the entire value of larval characters in classification. In reality, he does not question the validity of my super-family groups, but attacks rather certain family groupings, on which I am not inclined to insist strongly. I have tried to make clear that the natural family characters do not come out strongly in the larvæ; not so well as in the imagines, as a rule. The definite larval characters are of a higher grade, and define the super-families with some exactness, better, I think, than the neuration. There exist many larval characters for family definition, but they are comparatively recent, and are often blurred by special adaptations.

After this general statement, I will join issue with Professor Grote on the special point which he has raised. Professor Grote divides the Saturnians into two groups:—1.—*Aglia*, *Citheronia*, *Automeris*. 2.—*Attacus*, *Saturnia*, *Hemileuca*, using as the basis of division a single neurational character, *viz.*, the degree of approach that nervure IV_2 has made to the apex of the cell. He uses this character to establish dichotomous divisions, but improperly so, for it is not here a matter of two different tendencies, such as there would be if nervure IV_2 moved toward IV in one group, and toward IV_3 in another. Here the nervure is either stationary, arising in the middle of the cell (as in *Automeris*), or approaches more or less toward nervure IV_1 (as in *Aglia*, *Saturnia*, *Hemileuca*, in ascending order). It is thus simply a

character of specialisation, which Professor Grote has wrongly interpreted.

Another character of specialisation may be found in the number of anal nervures in the hind-wings. Thus *Citheronia* and *Hemileuca* have two such nervures, *Automeris*, *Aglia*, *Saturnia* and *Attacus*, one. By combining these characters with the specialisations of the fore-wing, as deduced by Professor Grote, we get: Group 1 (generalised)—containing *Citheronia* and *Hemileuca*, with two anal nervures, and *Automeris* with but one, yet with nervure IV_2 of fore-wings stationary; Group 2 (specialised)—containing *Aglia*, *Saturnia*, and *Attacus* with but one anal nervure, *Aglia* the lowest, as nervure IV_2 is less intimately related to IV_1 than in *Saturnia*.

This exactly corresponds with my larval classification, which I restate in tabular form below. Thus the neurational characters, more broadly interpreted, confirm, instead of contradict, the larval ones :—

I.—A single dorsal tubercle on 9th abdominal segment, the primitive first stage present.
- Anal plate tubercular; tubercles unarmed ... ... *Citheronia*
- Anal plate smooth; tubercles covered with modified urticating setæ.
  - Tubercle i with long shaft ... ... *Automeris*
  - Tubercle i with short shaft ... ... *Hemileuca*

II.—No single dorsal tubercle on 9th segment; anal plate tubercular.
- Primitive first stage present, spines unequal; mature tubercles atrophied ... ... *Aglia*
- No primitive first stage; spines sub-equal.
  - A dorsal tubercle on 8th segment ... ... *Attacus*
  - No unpaired dorsal tubercles ... ... *Saturnia*

COLEOPTERA.

The Coleoptera of Wicken Fen and District.

By HORACE DONISTHORPE, F.Z.S., F.E.S.

Wicken Fen has always been a favourite resort of entomologists, and justly so, as among its insects it comprises some of our finest species ; many also are confined to it. This paper will treat it from a coleopterist's point of view. I have visited it pretty regularly since 1888, and have now taken nearly all the local species. I have worked the Fen from both ends, as also the surrounding neighbourhood, having stayed both at Upware and Wicken. I found my stay, this year, when there last August, the most productive I have ever had, taking many species I have never seen there before. Others that have only occurred sparingly, were to be seen in profusion. The fens are too well known to require description, and all entomologists who have not been there should go and see for themselves, they will find it quite different from anything they have tried before. I, personally, prefer collecting at Wicken to any other place I know ; you can always find something fresh, and something to work for, wet or fine, in the day-time or at night. For convenience sake, I give the list of species in generic order, with notes as to how they were captured, etc. It is not intended as a complete list of all the species to be taken there, but a list of all the species I and my friends have taken :—*Carabus granu-*

latus, L.—On paths, under cut herbage, and at sugar and light at night. *Leistus rufescens*, F.—At the roots of grass, under damp refuse. *Clivina fossor*, L.—Under stones, rubbish, etc. *C. collaris*, Herbst.—Under débris of reeds and cut herbage, in damp places. *Panageus crux-major*, L.—Mr. Bouskell and I took some specimens in 1896, under a stack of cut herbage. *Badister bipustulatus*, F.—At roots of grass, under refuse. *B. sodalis*, Duft.—Under dead leaves. *Chlaenius nigricornis*, F.—Under stones and refuse in damp places. *Oodes helopioides*, F.—Under vegetable refuse in damp places, also by sweeping. *Bradycellus placidus*, Gyll.—I took a series of this species with Mr. Chitty, in 1892, by shaking bundles of cut reeds over paper. I have not met with it again since. *B. harpalinus*, Dej.—Under refuse, at roots of grass, etc. *Harpalus sabulicola*, Panz.—I took a specimen of this insect on the path of a cornfield, near the Fen, this year. Said to be "apparently confined to the south-east of England." It is a curious fact that I should take this more southern species in Cambridgeshire, and the Cambridgeshire species, *Harpalus obscurus*, F., in Dorsetshire. *H. punctatulus*, Duft.—Under stones, at roots of grass, etc. *H. ruficornis*, F.—Under vegetable refuse. *H. aeneus*, F.—Under stones. *H. puncticollis*, Payk.—Under cut herbage, and by sweeping. *Pterostichus niger*, Schall., *P. vulgaris*, L.—Under stones, etc. *P. anthracinus*, Ill., *P. nigrita*, F.—At roots of grass in damp places. *P. diligens*, Sturm.—Under damp cut herbage. *Amara apricaria*, Sturm.—Under stones. *A. spinipes*, Auct.—This species is always to be taken by sweeping in the Fen. *A. convexiuscula*, Marsh.—Under cut herbage. *A. familiaris*, Duft.—Under stones, etc. *A. communis*, Panz.—Under cut herbage. *Calathus cisteloides*, Panz.—Under stones, etc.—*Anchomenus albipes*, F.—At roots of grass in damp places. *A. oblongus*, Sturm.—Under cut herbage, and by beating bundles of cut reeds. *A. viduus*, Panz.—At roots of grass and wet herbage, at sides of ditches; var. *moestus*, Duft.—At roots of grass, under refuse, etc. *Bembidium biguttatum*, F.—Under cut herbage. *B. quadriguttatum*, F.—Banks of ponds, etc. *Odacantha melanura*, Payk.—Among reeds, in the bottoms of boats, etc. *Demetrias unipunctatus*, Germ.—Under cut herbage. *Dromius linearis*, Ol.—In vegetable refuse. *Haliplus obliquus*, Er., *H. confinis*, Steph., *Laccophilus obscurus*, Panz., *Hyphydrus ovatus*, L.—In pools and ditches. *Coelambus versicolor*, Schall., *C. inaequalis*, F.. *Deronectes assimilis*, Payk.—In shallow pools. *Hydroporus pictus*, F., *H. lepidus*, Ol., *H. lineatus*, F., *H. longulus*, Muls., *H. piceus*, Steph.—In pools and ditches. *Agabus chalconatus*, Panz., *A. bipustulatus*, L., *Ilybius ater*, De G., *Rhantus exoletus*, Forst., *Colymbetes fuscus*, L., *Dytiscus punctulatus*, F., *D. marginalis*, L.—In pools, ditches, and ponds. *D. circumcinctus*, Athr.—Mr. Bouskell and I took several examples of this species out of some small pools last year; curiously enough, we each got a female with the smooth form of elytra. *D. dimidiatus*, Berg.—Mr. Bouskell also took a specimen of this rarity out of the same pools. This capture is very noteworthy, the insect having become exceedingly rare, and not having been taken in the Fen for a number of years. *Acilius sulcatus*, L.—In ponds and pools. *Gyrinus natator*, Scop., *G. marinus*, Gyll.—In ditches and pools. *Hydrophilus piceus*, L.—I took a specimen of this insect whilst standing in a pond examining the leaves water-lilies for *Donaciae*. It was just underneath a leaf. *Anacaena*

limbata, L., *Laccobius sinuatus*, Mots., *Berosus signaticollis*, Charp.—In pools, etc. *B. luridus*, L., and *Hydrochus elongatus*, Schall.—In pools, etc. *Megasternum boletophagum*, Marsh.—By evening sweeping. *Aleochara fuscipes*, F.—In fish refuse. *A. lanuginosa*, Grav.—In vegetable refuse. *Hygronoma dimidiata*, Grav.—Under cut herbage, shaking bundles of reeds over paper, also by sweeping. *Conosoma pedicularium*, Grav.—In vegetable refuse. *Mycetoporus longicornis*, Kr. —Under a stack of cut herbage. *Quedius molochinus*, Grav.—Under débris of reeds. *Ocypus olens*, Müll.—Under vegetable refuse, etc. *O. fuscatus*, Grav.—Under cut herbage. *O. cupreus*, Rossi., and *O. morio*, Grav.—Under stones, etc. *O. compressus*, Marsh.—Under a stack of cut herbage. *Xantholinus tricolor*, F.—Under cut herbage, in vegetable refuse. *Lathrobium brunnipes*, F.—Under vegetable refuse. *Stilicus rufipes*, Germ.—In vegetable refuse, etc. *Paederus littoralis*, Grav.—Under cut herbage. *P. riparius*, L.—At roots of grass. *Stenus palustris*, Er., and *S. flavipes*, Steph.—By sweeping. *S. pubescens*, Steph.—At roots of grass. *S. similis*, Herbst.—By sweeping. *S. pagánus*, Er.—Under cut herbage. *S. speculator*, Er.—In vegetable refuse, at roots of grass. *Oxyporus rufus*, L.—Professor Beare took a specimen by sweeping. *Falagria obscura*, Grav.—Under cut herbage. *Anisotoma ovalis*, Schmidt., *A. calcarata*, Er., and *Colenis dentipes*, Gyll.—By evening sweeping. *Necrophorus humator*, Goeze, and *N. vespillo*, L.—In fish refuse. *Necrodes littoralis*, L.—I took a fine male and female under a cod's head that I had deposited as a trap. *Silpha tristis*, Ill.—On paths and at roots of grass. *S. rugosa*, L., and *S. sinuata*, F.—In fish refuse. *Cholera angustata*, F.—At roots of grass. *Colon serripes*, Sahlb., and *C. brunneum*, Latr.—By evening sweeping. *Bryaxis juncorum*, Leach, *Phalacrus corruscus*, Payk., *P. caricis*, Sturm., *Hippodamia mutabilis*, Goeze, *Coccinella variabilis*, Ill., and *Halyzia* 22-*punctata*, L.—By sweeping. *Chilocorus similis*, Rossi.—By beating sallows. The pupa is often found in the dried larval skin attached to a sallow leaf. I have reared specimens taken in this way. *Rhizobius litura*, F.—In cut herbage, by sweeping. *Coccidula rufa*, Herbst.—By sweeping reeds, etc. *Triplax russica*, L.—I took one specimen by sweeping, a very unusual way of taking this insect. It is generally found in rotten wood and fungoid growth on trees. *Hister cadaverinus*, Hoff., *H. neglectus*, Germ., *H. carbonarius*, Ill., and *Saprinus nitidulus*, Payk.— Under fish refuse. *Cercus rufilabris*, Latr., and *C. bipustulatus*, Payk. —By sweeping. *Epuraea aestiva*, L.—In dog-roses. *Nitidula bipustulata*, L., and *N. rufipes*, L.—On old bones. *Pria dulcamarae*, Scop.—By sweeping. *Meligethes rufipes*, Gyll.—In dog-roses. *M. aeneus*, F., *M. viridescens*, F., and *Lathridius lardarius*, De G.—By sweeping. *Coninomus nodifer*, Westw., and *Melanophthalma transversalis*, Gyll.— In vegetable refuse. *Psammoechus bipunctatus*, F.—In the stems of reeds, by beating bundles of cut reeds over paper. *Telmatophilus caricis*, Ol.—By sweeping, and in stems of *Typha*. *Antheropagus nigricornis*, F.—By sweeping. *Atomaria fuscipes*, Gyll., and *A. atricapilla*, Steph.—In vegetable refuse. *Anthrenus varius*, F.— By sweeping. *Limnius tuberculatus*, Müll.—By dragging in small pool, not running water. *Parnus prolifericornis*, F., and *P. auriculatus*, Panz.—In pools, ditches, etc. *P. nitidulus*, Heer.—I took a specimen of this very rare species this year in a half dry ditch. Only

three other British specimens have been taken before, one by Dr. Sharp in Scotland, and two by Mr W. F. H. Blandford, at Braunton Burrows. *Aphodius fossor*, L., and *A. rufipes*, L. — At light. *Melolontha vulgaris*, F. — By beating. *Phyllopertha horticola*, L.— In dog-roses. *Throscus dermestoides*, L.—By evening sweeping. *Lacon murinus*, L.—Under rubbish, by sweeping, etc. *Athous niger*, L., and *Agriotes sputator*, L.—By sweeping. *A. obscurus*, L.— Under stones, etc. *A. lineatus*, L., *A. sobrinus*, Kies., *Corymbites tessellatus*, F., *Dascillus cervinus*, L., *Helodes marginata*, F., *Cyphon nitidulus*, Thoms., and *C. pallidulus*, Boh.—By sweeping. *Scirtes hemisphaericus*, L.—By sweeping, beating sallows, etc. *Lampyris noctiluca*, L.—I have taken the female under rubbish, and the male has flown into my room at night, and comes to light. *Silis ruficollis*, F.—By sweeping. I have only taken single specimens since 1888, till this year, when it occurred in profusion. *Telephorus rusticus*, Fall., *T. lividus*, L.—By sweeping and beating. *T. lividus* var. *dispar*, F., *T. nigricans*, Müll., *T. bicolor*, F., *T. lateralis*, L., *T. flavilabris*, Fall., and *T. thoracicus*, Ol.—By sweeping. *T. thoracicus* is abundant in the Fen. *Rhagonycha fulva*, Scop., on Umbelliferæ. *R. testacea*, L., *Malthodes mysticus*, Kies., and *M. sanguinolentus*, Fall.—By sweeping. *Anthocomus sanguinolentus*, F.—By sweeping; especially on *Spiraea ulmaria* (meadow-sweet). This purely fen species is very abundant. *Anthocomus fasciatus*, L.—By sweeping. This insect occurs earlier in the year than the preceding, and is not so abundant. *Anthocomus terminatus*, Mén.—Professor Beare, Mr. Bouskell and I took this species sparingly this year, by sweeping in the Fen. I believe it has not occurred there, till this year, since 1888. Dr. Power took it in 1870. *Corynetes coeruleus*, De G., *Anobium domesticum*, Fourc.—By sweeping. *A. fulvicorne*, Sturm.—On *Umbelliferae*. *Aromia moschata*, L. — On willows. This insect is not so common in this neighbourhood as it used to be. When I first went to the Fen, in 1888, and stayed at Upware, it occurred in profusion there, now I am told it is hardly ever seen, and I have only seen an odd specimen or two since then. *Clytus arietis*, L., and *Toxotus meridianus*, Panz.—On dog-roses. *Pogonochaerus dentatus*, Fourc.—Sweeping under plum trees at Upware. *Agapanthia lineatocollis*, Don.—This is another species I have only seen singly till this year, when it occurred in some numbers by sweeping. *Saperda carcharias*, L.—The poplar beetle, as it is locally called, like *Aromia*, was much commoner than it has been of late. It used to be found in plenty on the big poplar tree at Upware, but is very scarce indeed there now, and at Wicken we have not seen it for the last two years. *Oberea oculata*, L.—This beautiful Longicorn is, no doubt, the prize that all who visit the Fen after beetles desire most to take, and it is certainly one of our finest species. I took my first specimen in 1890, and had not taken it again till this year. Our party were most successful; Professor Beare and Mr. Bouskell each took a specimen, and I took three, and lost a fourth, that dropped into the herbage as I was trying to bottle it, and escaped. It is found on and about the sallow bushes in the Fen. *Bruchus rufimanus*, Boh., and *B. atomarius*, L.—By sweeping. *Donacia dentata*, Hoppe.— Common in the Fen on the Arrow-head (*Sagittaria sagittifolia*). *D. sparganii*, Ahr.—On bur reed (*Sparganium*). *D. limbata*, Panz.—

On the yellow iris (*Iris pseudacorus*). *D. bicolora*, Zsch.—On the Arrow-head (*Sagittaria sagittifolia*). *D. simplex*, F., and *D. vulgaris*, Zsch.—On reeds, etc. *D. clavipes*, F.—On marsh trefoil (*Menyanthes trifoliata*). *D. sericea*, L.—On reeds, etc. *Zeugophora subspinosa*, F.—By beating *Viburnum opulus*. *Lema puncticollis*, Curt.—By sweeping. *Chrysomela staphylea*, L.—Under cut herbage. *C. graminis*, L.—On hairy mint (*Mentha aquatica*). This insect occurs freely, but I have never been able to find the other species. *C. menthrasti*, Suffr., which is also said to occur in Wicken Fen. *Melasoma populi*, L.—In profusion on young poplars. *Gastroidea viridula*, De G.—On the dock (*Rumex*). *G. polygoni*, L., and *Phaedon betulae*, Kust.—By sweeping. *P. cochleariae*, F.—On herbage in ditches, etc. *Phyllodecta vitellinae*, L.—On poplars, etc. *Hydrothassa marginella*, L.—By sweeping. *Luperus rufipes*, Scop.—By beating alders, etc. *Galeruca viburni*, Payk. By beating *Viburnum opulus*. *G. lineola*, F., *G. calmariensis*, L., *G. tenella*, L., *Adimonia tanaceti*, L., *Phyllotreta vittula*, Redt., *P. nemorum*, L., and *P. sinuata*, Steph.—By sweeping. *P. exclamationis*, Thunb.—On herbage in ditch. *Apthona nonstriata*, Goeze.—On *Iris pseudacorus*. *A. atro-coerulea*, Steph.—By sweeping. *Sphaeroderma cardui*, Gyll.—By sweeping thistles. *Mantura rustica*, L., *Crepidodera transversa*, Marsh, *C. ferruginea*, Scop.—*Plectroscelis concinna*, Marsh.—*Psylliodes chrysocephala*, L., *P. napi*, Koch., and *P. cuprouiteus*, Forst.—By sweeping. *P. chalcomera*, Ill.—On cress (*Nasturtium*) in ditch. *P. picina*, Marsh.—By sweeping. *Cassida vibex*, F., and *C. viridis*, F.—By sweeping thistles. *Lagria hirta*, L.—By sweeping. *Cteniopus sulphureus*, L.—I have never taken this species in the Fen till this year, when Professor Beare, Mr. Bouskell and I each swept several specimens. It is a curious locality for this so-called "coast species." *Rhinosomus ruficollis*, Panz.—Under loose bark of a dead ash tree. *Pyrochroa serraticornis*, Scop.—By sweeping. *Mordellistena brunnea*, F.—On *Umbelliferae*. *Anaspis frontalis*, L., *A. forcipata*, Muls., *A. ruficollis*, F., and *A. melanopa*, Fourc.—On flowers, etc. *Anthicus floralis*, L.—By sweeping. *A. antherinus*, L.—In vegetable refuse. *Apion vorax*, Herbst.—By sweeping. *A. carduorum*, Kirby.—I took it in plenty by beating sallows; it is generally found on thistles. *Otiorhynchus picipes*, F.—By beating, etc. *Sitones hispidulus*, F., *S. lineatus*, L., *S. sulcifrons*, Thunb., *Hypera rumicis*, L., *H. nigrirostris*, F.—By sweeping. *Lixus paraplecticus*, L.—On the water parsnip (*Sium latifolium*). This interesting species passes its early stages in the stems of this plant. When full-grown, about the end of July or beginning of August, it bores a hole through the stem, and comes out on to the plant. When the plant is shaken, it immediately drops, and alights on the water with its legs expanded. Great care should be taken in capturing, killing and mounting this insect, as it is covered with a sulphur-yellow dust which is easily rubbed off. This dust or powder, it has the power of renewing during life, in common with other members of the family. It occurs plentifully in one part of the Fen. *Orchestes rusci*, Herbst.—By beating sallows. *O. pretensis*, Germ.—By sweeping. *Dorytomus salicinus*, Gyll.—By beating sallows. *Bagous tempestivus*, Herbst.—By sweeping in ditches, etc. *Anthonomus rubi*, Herbst.—By beating brambles. *Nanophyes lythri*, F.—By sweeping. Very com-

mon in the Fen. *Coeliodes cardui*, Herbst., *Ceuthorhynchus quadridens*, Panz., *C. melanostictus*, Marsh.—By sweeping. *C. litura*, F.—By sweeping thistles. *C. troglodytes*, F., *Rhinoncus pericarpius*, L.—By sweeping. *R. gramineus*, Herbst.—In vegetable refuse. *R. perpendicularis*, Reich., *R. brachoides*, Herbst., *Limnobaris T-album*, L.—By sweeping. *Balaninus brassicae*, F.—By beating sallows. *Magdalinus aterrima*, F.—By beating hedges, etc. *Scolytus multistriatus*, Marsh.—In the bark of plum trees. *Hylesinus crenatus*, F.—In plenty, under the bark of a dead ash tree; all the specimens were dead. *H. oleiperda*, F.—By sweeping.

Notes on Irish Coleoptera.

By (Rev.) W. F. JOHNSON, M.A., F.E.S.

The year 1897 did not prove a very productive one for the coleopterists here. The excessive rainfall in this country had the usual effect of at once checking insect life, and preventing the collector from carrying on his work with proper vigour.

In the early part of the year I obtained some specimens from moss, and the refuse left after removing a haystack. These were not, however, very striking, and I need only mention the following:—*Homalota longicornis*, *Tachyusa atra*, *Hypocyptus ovulum*, *Encephalus complicans*, *Quedius boops*, *Philonthus splendens*, *Lathrobium quadratum*, *Staphylinus erythropterus*, *Silpha opaca*, *Anatis ocellata*, *Ephistemus gyrinoides*, *Typhoea fumata*, *Longitarsus ater*, F., *L. suturalis*, March, *Barynotus mocrens*, and those essentially Irish forms, *Tachyporus obtusus* var. *nitidicollis*, and *Silpha atrata* var. *subrotundata*. Among the water beetles I obtained *Hydroporus umbrosus*, *H. obscurus* and *Agabus unguicularis*, in a drain close to my house. In the canal, *Noterus clavicornis* is to be met with, as well as *Coelambus quinquelineatus*. It is noteworthy that I have never yet met with *Coelambus versicolor*, Schall, (*reticulatus*, F.), in Ireland, though it is recorded by Haliday from the neighbourhood of Belfast, and by McNab from the Dublin district, and has been taken by Mr. J. J. Walker at Carrickfergus.

Two beetles have been recently added to the Irish list, *viz.*, *Agabus arcticus*, Payk., recorded by Mr. J. N. Halbert as captured by Mr. E. C. Farran on Kippure Mt., co. Wicklow; and *Tachypus pallipes*, taken by Mr. C. Langham, at Coolmore, co. Donegal. My mention of the Irish list may suggest to some readers of the *Entomologist's Record* the thought that there is no extant general list of Irish coleoptera. I have, however, for several years been collecting materials for an Irish list, and have secured the valuable co-operation of Messrs. G. H. Carpenter and J. N. Halbert, of the Science and Art Museum, Dublin. We are now busy preparing the list for the press, and hope to have it in print next year. Any reader of the *Entomologist's Record*, who has collected coleoptera in Ireland, will greatly oblige by sending a list of captures, with localities, either to myself or to one of my collaborators.

An interesting addition to the British beetle fauna was made by the capture of *Otiorrhynchus auropunctatus*, Gyll., by Messrs. Cuthbert and Halbert, at various places on the coasts of Dublin, Meath and Louth. This fine weevil was identified by Mr. G. C. Champion, who

states that it is a Pyrenean species, another instance of identity of Irish and Spanish fauna. It was taken by beating shrubs and trees. Mr. Cuthbert took it on birch and alder. I had intended trying for it this summer, but the bad weather made me give up all idea of the excursion. Last month I spent a few days at co. Meath, and though it was so late in the season, managed to pick up a few beetles. In *Sphagnum*, on the mountain, I obtained an unicolorous specimen of *Dolopius marginatus*, also *Notiophilus aquaticus* and *Lathrobium fulvipenne*. On a fine morning I picked up a couple of *Haltica palustris*, sunning themselves. At Greenore, under seaweed and stones, I took *Calathus fuscus*, *Quedius impressus*, *Xantholinus punctulatus*, *Stenus similis*, *Homalium rivulare* and *Cassida nobilis*; this last had evidently retired into winter quarters, for they were clinging to the underside of stones. The shore at Greenore is, in the summer, a capital place for the coleopterist. I have taken there *Amara fulva*, *A. bifrons*, *Bembidium saxatile*, *Dichirotrichus pubescens*, *Cercyon depressus*, *C. littoralis*, *Aleochara nitida*, *A. grisea*, *Heterothops binotata*, *Melanophthalma fuscula*, *Cassida flaveola*, *Anthicus scoticus*, *Hypera polygoni* and *Sitones humeralis*.

I have not been able to explore this immediate neighbourhood very well yet, and my researches so far have not met with much success, but there are many promising-looking places, and I hope to make good use of my moss bag during the present winter.

Bembidium lunatum, Duft, in the South of England.

By G. A. LEWCOCK.

Some ten years having elapsed since the publication of the first volume of "*The Coleoptera of the British Islands*," by Canon Fowler, it will probably appear strange if I again revert to this subject; but although, in 1887 and 1888, I exhibited a series of *B. lunatum*, at the South London Entomological Society, and also at the City of London Society, and stated the locality from whence I obtained them, it is evident that some doubts still exist as to the occurrence of this species in the south of England. The remarks in the above volume would naturally give rise to this misconception. In the work in question, under the heading *Bembidium*, p. 102, *B. lunatum* is included in Group VII—beetles having elytra with yellow or orange markings. A further tabulation splits the genus into twelve divisions, with regard to coloration, and *B. lunatum* is classed under No. 9, "elytra with two distinct crescent-shaped patches at apex, *and no other markings* (one of the largest species)." It would thus appear that no mistake whatever, in respect to its identity, could occur with such precise distinctions as are here laid down. At page 115 of the same work, the author states that: "Two specimens have been recorded as taken at Shooter's Hill, Greenwich, but there is no record from the London district, and none at all from the southern district of England, where it must, at all events, be very local, if it occurs at all." In the footnote referring to the Greenwich locality, the author adds: "Since writing the above, I have found reason to believe that there is very probably some mistake with regard to this record." It does seem rather remarkable that this insect has escaped the keen eyes of our foremost

southern coleopterists, but it is nevertheless a fact, and this may be due to the limited season of its occurrence. On referring to my notes, I find it recorded, on June 19th, 1884, also in the year 1885 (on August 13th), two specimens captured at Rainham, Essex, and I well remember the occasion; the insects appeared like two sparks of fire dashing about among the *Aster tripolium*. Since that date I have taken as many as I required. In September, 1889, or thereabout, I took Mr. Cripps down, and enabled him to get his series, and later, Mr. Heasler also. In company with the latter gentleman, some twenty or thirty specimens were captured, and the beetle has since been taken by Mr. Heasler, at Barking Reach, and at various spots from that locality, down to Rainham. It has also been taken on the opposite banks of the Thames, in quantity, by Mr. West (Greenwich), who informed me that he considered it common. Mr. Newbery captured four specimens in flood refuse at Plumstead, on June 26th, 1895, and Mr. Heasler has likewise taken it in the same locality. The latest capture was made during the second week in August of the present year, by myself, at Rainham. This specimen was decidedly immature, the lunules being quite indistinct. Knowing Mr. Donisthorpe's capabilities in maturing beetles, I sent it to him alive, with the result that he recently returned it in splendid condition, the lunar patches standing out boldly. With regard to the rarity or otherwise of *B. lunatum*, there is no doubt of its being a common beetle when once found, and I consider the best time for searching its locality is from middle of August to middle of September. Wherever *Aster tripolium* is growing, that will be the likeliest place to find *B. lunatum*, as it has always, in my experience, been found associated with that plant.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

Note on the egg extrusion of H. furcata (elutata).—The extruded ovipositor of *H. furcata*, with contained egg, is covered with many projecting hairs on the membranous sac, which terminates it. This sac is yellow in colour, and is covered with the same fine polygonal reticulation with which the pearly-white partly extruded egg is covered. The depression (on what is the upper surface of the egg when laid) is to the right hand side whilst still in the ovipositor. The egg, therefore, is extruded sideways, as it were, when compared with its normal position as laid. [Observation made on August 8th, when setting the specimen at Lanslebourg.]

Descriptions of Eggs of Lepidoptera.—The following notes were made from eggs laid by moths captured at Aix-les-Bains, from July 26th-28th. The descriptions were made with a two-thirds lens used as a hand glass:—

Acidalia rubricata.—Usually laid in heaps, sometimes, however, singly; a few of the latter lengthwise, but some on end. Those laid in heaps upright, in contact with each other, and the micropyle upwards. The egg is long, the length : breadth : : 2 : 1, somewhat cylindrical in shape, but broader at the micropylar end, narrowing towards the end opposite the micropyle. The eggs are bright green when first laid, changing to greenish-yellow with purple lines, which

run parallel with the ribbing, in a few hours. The egg is very distinctly ribbed longitudinally with about 16 ribs, some of which, however, unite before reaching the top. There are many fine transverse ribs crossing the longitudinal ribs, and the spaces between. The apex of the egg is very rounded, and formed of concentric rings of delicate cells, in the centre of which is the micropyle. The latter forms a very distinct stellate structure, even when observed under a low power. [Described July 29th.]

Acidalia immutata.—The eggs of a delicate greenish-yellow colour when first laid, with 10-12 prominent shiny, transparent, longitudinal ribs. In two days the eggs become of a bright coral colour when observed with the naked eye, but of a delicate pink, with scattered crimson spots, under a lens. In shape the eggs form an almost perfect cylinder, with ends only slightly rounded ; length : breadth : : 5 : 3. There is no trace of a depression on the upper surface, and the transverse ribbing is exceedingly fine. The longitudinal ribs form around the edge of the micropylar area an external ring of raised points, enclosing a series of concentric cells, with which the micropylar area is covered. [Described July 29th.]

Acidalia caricaria.—Oval in outline, the micropylar end much broader and more flattened than its nadir ; length : width : : 5 : 3. Some of the eggs are laid on the long side, others are attached by the narrow point, the micropyle at the top of the egg. The colour is of a pale apple green ; the shell is shiny, with 9 or 10 longitudinal ribs reaching from base to apex, and crossed by many fine transverse ribs. The termini of the longitudinal ribs form a raised boundary surrounding the micropylar area. The micropyle is very finely reticulated, and is composed of radiating cells. [Described July 27th.] By July 29th, these eggs had changed to a pale straw colour, with a slight greenish tinge, speckled with bright red.

Zygaena carniolica.—Eggs laid on side of box, in close contact with each other, on their long sides. Oval in outline, length : breadth : : 3 : 2, with a large shallow oval depression in centre of upper surface. Colour, dull yellow, with traces of longitudinal ribbing evident. No other structure can be made out with a two-thirds lens used as a hand glass. [Described July 29th.]

Zygaena transalpina.—Eggs laid on long side in close contact with each other, as a lower layer, a second layer being placed above. The eggs are bright yellow in colour, somewhat oval in outline ; length : breadth : : 3 : 2, with an oval depression on the upper surface. The eggs are somewhat plumper (fuller) than those of *Z. carniolica*. Under a two-thirds lens the eggs look almost uniformly pale yellow, but rather brighter towards the micropylar end, and somewhat transparent towards its nadir. [Described July 29th.]

On the pupa of Chrysophanus amphidamas (helle).—I have some twenty-five pupæ of this species before me, which I received from Herr Voelschow, of Mecklenburg. Two are attached by the cremaster to a slight silken pad, spun on a piece of leaf ; the others are quite free of attachment. There is no trace of a girth, and the ventral surface is so flat that the loose pupa almost always rests on that surface. There appears to be considerable variation in the depth of the ground colour, some being of a pale, almost transparent, grey, ventrally, and dorsally on the thoracic segments, the abdominal segments being

opaque creamy white. Intermediate forms occur until, at the other extreme, the grey portions are quite black-grey, and the abdominal portions also much suffused. Viewed dorsally, too, some individuals have seven longitudinal rows of black spots—the medio-dorsal, two sub-dorsal and two lateral strongly marked, with two other rows (one on each side), between the medio-dorsal and sub-dorsal, of smaller, but still well-defined, spots. In other examples, the two latter rows are somewhat obsolescent, and the spots, forming the other five rows, are considerably less in size. The wing-markings, too, show considerable variation, some being strongly marked with black longitudinal dashes near the costa and outer margin, others being almost devoid of them.

The pupa is of typical Lycænid shape. The skin is shiny and roughened with minute points, that give a suspicion of hairs, even under a very low power. *Dorsally*: The prothorax is prominent, extending frontally much beyond the meso-thorax. The prothoracic spiracle whitish, forming a linear closed lip, in the intersegmental incision. The meso-thorax swollen centrally, with a pronounced median ridge. The meta-thorax and 1st abdominal segment form a waist medially; the post-thorax ill-developed centrally, but much widened out laterally at the base of the hind-wings, the intersegmental division between the meso-thorax and meta-thorax forming a curve, convex to the latter. The 2nd-5th abdominal segments gradually swell out, whilst the 6th-10th contract, the latter segments being very narrow longitudinally. The dorsal black spots, arranged on each of the abdominal segments as ·.·.· , appear to be slightly depressed and very rough. On the 7th abdominal and following segments the small spot is united with the larger lateral one. On the meta-thorax and 1st abdominal segment the same arrangement holds good, but the central spot is shifted back somewhat, and the outer spots are smaller. On the meso-thorax a modification takes place, and the five characteristic spots are large and arranged thus: .·.·. . Laterally: the prothorax is prominent, the inner margin of the forewing prominent and ridged, the abdominal spiracles on segments 1-8, forming a minute, opaque, flesh-coloured, rounded knob, in a tiny saucer-like brown depression, the latter being edged ventrally with a large black spot (similar to the dorsal ones). *Ventrally*.—There is a very definite head-piece (bounded by the bases of the antennæ, the glazed eye, and the bases of the maxillæ and legs), the skin of which is wrinkled transversely. The transverse eye forms a well-defined lunule, conspicuously smooth, and extending from the base of the antenna to the base of the 1st pair of legs. The antennæ are segmented, and extend to the apex of the wings. The maxillæ extend to about half the length of the antennæ, when they disappear. The 1st pair of legs is very short, but wide at the base, the second pair terminates at the point of disappearance of the maxillæ, but vanishes beneath the first pair at the base. The skin of the wings is roughened, the black markings consisting of longitudinal inter-neural streaks, extending from Poulton's line towards the base, and varying much in length. The wings reach to beyond the front margin of the 5th abdominal segment, the 6th-9th abdominals are reduced ventrally to mere lines. The sexual organs are practically obsolete, being covered by the cremaster and anus, which form a large prominent rounded mass, turned back ventrally, pale brown in colour, and bearing a large

number of orange-coloured hooks. There are two black spots on each side of the 6th and 7th abdominal segments ventrally, the outer of which is also present on the constricted 8th and 9th. The pupa appears to be quite solid, that is, has no movable incisions. [Described December 19th, 1897].—J. W. Tutt.

Some remarks on the winter moth: Cheimatobia brumata.— On June 4th, 1897, I found on wild rose, near Painswick, some Geometrid larvæ, I could not remember having seen before, and until the imagines emerged I had no idea of the species. These larvæ were about three-quarters of an inch long, and my rough notes say: "Cylindrical, no humps, green, with medio-dorsal darker line, and on either side of it, three fine whitish lines; spiracular lines rather wavy and spiracles darker, also a whitish interrupted ventral line." I fed these larvæ on wild rose until I left home, on June 17th. On July 12th, I found the pupæ, some pale yellow and others greenish, at the bottom of the large glass-topped card-box in which I had kept them. One or two were naked, and others spun up among the leaves in corners, etc. These pupæ I placed aside in a smaller box, and, on November 12th, was astonished to find a ♂ and ♀ *C. brumata* had emerged, and several eggs of a greenish-white colour scattered among the cotton wool, on which I had placed the pupæ, also some laid by this *very active* and spider-like insect among the leaves and pupa-cases, and even on an Ichneumon (?) cocoon, bred with them, and which I trust will prove to be parasitical on this dreaded species. These eggs have been kept in the same box, and in my sitting-room, and have lately (Dec.) changed colour to the shade (orange), preparatory to the final shade (brown) before hatching. Their shape, etc., is accurately described by Miss Ormerod, in her valuable *Manual of Injurious Insects*, 2nd edit., p. 339, where descriptions of the young larvæ are given, while the adult larva is well described by Newman, to which Miss Ormerod refers. She also refers to the good accounts of Dr. Taschenberg in *Praktische Insekten-Kunde*, and Kollar's *Insects injurious to Gardeners, etc.* I enclose eggs, moths, pupa-cases, and cocoon of supposed parasite. (The last winter moth, a ♂, I noticed alive on December 17th). *All* were reared under unnatural conditions, as the larvæ, during their nearly adult state, were famished, and no earth in box in which to pupate, thus showing their remarkable power of bearing a very unsatisfactory environment. — C. J. Watkins, King's Mill House, Painswick, Gloucestershire.

SCIENTIFIC NOTES AND OBSERVATIONS.

The hybernating stage of Pararge egeria.—It may be remembered that I wrote a paper on the "Hybernating stage of British Butterflies" (*Entom. Rec.*, viii., pp. 97–102), in which I gave the experience of Hellins, Wolfe and others, that this species hybernated as a larva in Britain. This led to some discussion, in which Messrs. Merrifield, Carpenter and Williams (*Ibid*, pp. 168-169 ; 181-182) showed pretty conclusively that it could hybernate in this country also as a pupa. Recently I saw pupæ of the species advertised by a German collector, Herr A. Voelschow, so I at once wrote for specimens and information. I have the specimens, of which three are of a bright apple-green

form, two of a grey form, one intermediate between the grey and green, and one with the dorsal area quite red, and the wings grey. Herr Voelschow writes :—"*P.* var. *egerides* winters in a cold room in the pupal stage" (2/12/97).—J. W. Tutt. [I have, since writing the preceding, come across the following notice (*Intell.*, iv., p. 59), in which Mr. G. F. Mathew records that, in November, 1857, he found, at Barnstaple, a full-fed larva of *P. egeria*, which turned to a pupa in a few days, and emerged on April 26th following, more than a month later than specimens had been captured out of doors. At the time of finding this full-fed larva he saw another larva about a quarter grown. This led Mr. Mathew to suggest that the species might hybernate both in the larval and pupal stages.]

Hybernation of Gonepteryx cleopatra.—Pour *G. cleopatra* j'ai trouvé l'indication suivante, qui confirme votre opinion. M. Maurice Sand signale l'espèce en juillet (dans le dépt. du Cantal versant Sud du Massif Central) et ajoute "hiverne et reparait en mars-avril." Je tacherai d'avoir d'autres renseignements auprès de personnes familières avec cette espèce.—L. Dupont, 3, Rue de l'Orangerie, Le Havre, France.

VARIATION.

Aberration of Polyommatus icarus.—In August, 1896, I captured an aberration of *P. icarus*, ♀, at Bognor (on a common by the sea-shore), in which the two spots near lower border of upper wing are joined, and very much elongated, so as to form a curved line, with the convexity towards the head. I believe this to be a not uncommon aberration.—Hubert C. Phillips, M.R.C.S., F.E.S., 83, Shirland Gardens, Paddington, W.

Aberration of Spilosoma fuliginosa.—I have a pair of *Spilosoma fuliginosa*, bred from a female taken wild, near Wisbech, which have the hind-wings yellowish buff where they ought to be pink. Is not this very unusual? I have never heard of such an aberration.—M. A. Pitman, Park Lane, Norwich.

Aberrations of Arctia caia.—During 1897, I bred a considerable number of *Arctia caia*. I captured about sixty larvæ in the spring, and got them very forward by forcing. Two rather good specimens resulted, one a ♀ with the upper-wings almost entirely white, and the under-wings with very few black markings; the other (also a ♀) just the reverse, the upper-wings with only a few very minute white markings, the under-wings very dark, with exceptionally large, black blotches, and the body also very dark. I bred from some good specimens of this early brood, and only one aberration resulted in the second brood (a ♂). This had yellow-tinged markings on the upper-wings, while the under-wings were distinctly yellow-ochre. I am sorry to say I did not breed from the two aberrations above mentioned.—L. W. Newman, Meadow View, Bexley, Kent.

Aberration of Lasiocampa quercûs.—During the spring of 1896, I bred a nice aberration of *Lasiocampa quercûs*, the fore-wings being entirely of a dull smoky colour, the transverse bar being also dull brown, and not of the usual bright yellow colour; the hind-wings are of a very distinct pale brown.—Ibid.

Aberration of Odonestis potatoria.—I bred a very nice aberration

of *Odonestis potatoria* during 1896 (the larvæ of this species and of *Lasiocampa quercûs* were both captured in lanes round Darenth). It is a ♂ of yellow coloration, somewhat similar to that usually found in the ♀s, the antennæ. also, are of the same colour. I have been told that this aberration is taken in the Fen district, but I have not heard of it elsewhere. I hope that these notes may be of interest. I shall be very pleased to show the specimens to anyone.—Ibid.

PRACTICAL HINTS.

Field Work for February and March.

By J. W. TUTT, F.E.S.

1.—The larva of *Epunda lichenea* is to be found at night, from the middle of February to the end of April, resting on the top of grass stems, in sheltered spots at Portland, Torquay, and other localities.

2.—During the last week in February the larvæ and pupæ of *Ephippiphora scutulana* are to be obtained in thistle heads and stems.

3.—Oak galls, collected in the winter, give *Ephippiphora gallicolana*, *Coccyx splendidulana* and *Hæsimene fimbriana*.

4.—During the winter, stems of *Stachys sylvatica* should be collected for larvæ of *Ephippiphora nigricostana*.

5.—The larva of *Cochylis dipoltana* feeds on a web among the seeds of yarrow, in the autumn and winter.

6.—The roots of corn woundwort (*Stachys arvensis*) should be collected in February for larvæ of *Orthotaenia antiquana*.

7.—Shoots of currant bushes that were cut in January and February of the previous year should be collected in March. The winter cocoon of *Sesia tipuliformis* will be found not far from the end of the shoot. Keep the cut twigs in damp sand.

8.—The larvæ of *Tortrix forsterana* can be found in March, between two leaves of ivy, spun flatly upon one another.

9.—In February, where one knows osiers or sallows are being cut down, look over the cut sticks for the burrows of *Trochilium crabroniforme*. The larvæ rarely get more than a foot or so from the root. Keep the cut sticks in sand, with holes downwards. The moths emerge the first fortnight in June.

10.—The pupæ of *Sesia formiciformis* should be obtained by cutting off the tops of osier stumps, during April and May.

11.—Beating and searching for larvæ by night - both in spring and autumn—is much more profitable than beating by day.

12.—In March, the larvæ of *Heliophobus hispidus* are to be found by night. The larvæ of *Stilbia anomala*, *Agrotis lucernea*, *Epunda nigra* and *E. lichenea*, and other species, are also to be found at the same time, in suitable places. Torquay is a well-known locality for all these species. (See also 1).

13.—During February and March, the larvæ (some almost full-fed) of *Scoparia angustea* are to be found by pulling off the moss on the surface of rocks and old walls.

14.—The larva of *Cleora lichenaria* is always worth looking for in February and March (as well as later) on the lichen-covered fences and trees it loves to haunt. It is rather fond of sunning itself on bright days. (See also 17).

15.—Those who are near a locality for *Stilbia anomala* should collect the full-fed larvæ in February and March.

16.—The pupæ of *Hypsipetes ruberata* should be searched for on willow trees. The angles made where the boughs branch from the trunk are the favourite places for pupation.

17.—Beat lichen-covered thorn bushes and the low branches of oak, apple and beech trees for larvæ of *Cleora lichenaria*, and search the long hoary lichens on old beeches for larvæ of *C. glabraria*. From the thorns will also be beaten larvæ of *Miselia oxyacanthae* (Moberly).

18.—Beat Scotch fir, which will yield larvæ of *Thera variata* *Ellopia prosapiaria (fasciaria)* and, in some localities, *Boarmia abietaria* and *Arentia flexula*. Imagines of *Panolis piniperda* and *Asphalia ridens* will also occasionally fall into the beating tray (Moberly).

NOTES ON COLLECTING, Etc.

Notes from East Tyrone.—The sallows were in bloom until the middle of April, 1897, and only produced a few *Taeniocampa gothica*, *T. stabilis* and *T. instabilis*. In April I got a few *Larentia multistrigaria*, and nice series of *Cidaria suffumata*. On May 14th, *Spilosoma fuliginosa* and *Ematurga atomaria* were taken during May. *Euchloë cardamines*, *Pararge egeria* and *Pieris napi* were common. On June 9th, the following Geometrids, among others, were taken:—*Eubolia plumbaria*, *Cabera pusaria*, *Emmelesia albulata*, *Melanippe montanata* and *Cidaria russata*. On June 12th, *Melanthia albicillata* was taken in fair numbers, among wild raspberry canes. Towards the middle of the month insects came very freely to the flowers of the raspberry; among others, *Apamea basilinea*, *Xylophasia rurea* and *Hadena dentina* were taken. On June 17th, on the mountain, *Saturnia carpini* was common, though worn, and very difficult to capture. At sugar, during the month, the following insects appeared:—*Thyatira batis* and *Gonophora derasa*, *Xylophasia polyodon* and *rurea*, *Leucania comma*, *Mamestra brassicae* and *M. sordida*, *Hadena thalassina* and *H. oleracea*. At the beginning of July, *Plusia pulchrina* was common, with a few *P. festucae* at flowers of knapweed. *Noctua rubi*, *N. festiva*, *N. brunnea*, *Graphiphora augur* was common at sugar; whilst *C. umbratica* was taken sparingly at flowers of honeysuckle. Among the Geometrids, this month, the following were taken:—*Metrocampa margaritaria*, *Pseudoterpna pruinata* and *Camptogramma bilineata*. *Enodia hyperanthus* flew in large numbers over the damp meadows throughout the month. In August, an excursion to the mountains resulted in a few larvæ of *Saturnia pavonia (carpini)*. At sugar, the same month, *Viminia rumicis* and *Amphipyra tragopogonis* only appeared; whilst *Cerigo matura* was taken at light sparingly. In September, *Pyrameis atalanta* was taken in some numbers at dahlias, and three specimens of *Calocampa vetusta* at ivy.—T. Greer, Tullylagan, Dungannon, co. Tyrone.

London Lepidoptera.—During 1897, I captured specimens of the following species of Lepidoptera in my garden, or within a few hundred yards of my house:—*Pieris brassicae*, *P. napi*, *P. rapae*, *Aglais urticae*, *Smerinthus populi*, *S. tilae**, *Arctia caia*, *Spilosoma lubricipeda*, *S. menthastri*, *Leucoma salicis**, *Orgyia antiqua*, *Pygaera bucephala*, *Triaena psi*, *Apatela aceris*, *Pharetra megacephala*, *Leucania impura*, *Hydroecia nictitans*, *Axylia putris*, *Xylophasia*

polydon, *Mamestra persicariae*, *Apamea didyma*, *Miana strigilis*, *Agrotis exclamationis*, *A. nigricans*, *Triphaena pronuba*, *Noctua xanthographa*, *N. festiva*, *Polia flavicincta*, *Brotolomia meticulosa*, *Euplexia lucipara*, *Hadena trifolii*♀, *H. oleracea*♀, *Plusia chrysitis*, *P. gamma*, *Amphipyra tragopogonis*, *Naenia typica* (♀larvæ only). *Uropteryx sambucata*, *Rumia crataegata*, *Crocallis elinguaria*, *Biston hirtaria*, *Amphidasys betularia*, *Hemerophila abruptaria*, *Boarmia gemmaria*, *Halia wavaria*, *Abraxas grossulariata*, *Eupithecia oblongata* (*centaureata*), *Melanippe fluctuata*, *Camptogramma bilineata*, *Scotosia dubitata*, *Gonophora derasa*, *Pyralis costalis*, *Hydrocampa nymphaeata*♀, *Botys verticalis*, *Ebulea sambucalis*, *Pionea forficalis*, *Aciptilia pentadactyla*, *Hyponomeuta padella*, *Harpella geoffrella*, *Gracilaria auroguttella*.—Hubert Phillips, M.R.C.S., F.E.S., 83 Shirland Gardens, Paddington, S.W.

Partial double brood of Pericallia syringaria.—On July 15th, 1896, I captured a ♀ *Pericallia syringaria*, which laid 60 ova. The young larvæ hybernated in the usual way, and, on March 1st, I took about twenty of them from the tree (privet) where they had passed the winter, and fed them up in a kitchen, where there was always a good fire. The first larva spun up on April 11th, and emerged on the 29th, the last spun up on July 10th, and emerged on the 28th. I bred from some of the early ones, and when the ova hatched (May 25th) I sleeved them on lilac. Thinking I should get a double brood, I watched them closely, and was very surprised to find that some fed up fast, and were getting full fed, while others did not seem to grow at all. On July 25th, I had this insect in all stages—larvæ, pupæ, and imago, from the 1896 batch of ova; and ova, larvæ, and imago from the second brood.—L. W. Newman, Meadow View, Bexley, Kent.

Notes of 1897.—*Selby*.—The spring collecting of 1897, which promised well, was completely spoiled by the inclement weather at the end of March, which completely destroyed the sallow bloom, and also interfered with larva collecting. Spring larvæ were scarcer than usual, and, owing to cold nights, difficult to get, *Agrotis agathina* and *Scodiona belgiaria* especially yielding poor results. From the middle of June until August, the season was a good one—moths swarmed at sugar, in a way I have not seen for years. Flowers also were attractive. The moth of the season was *A. exclamationis*, which swarmed in considerable variety. Two species also turned up, new to my local list, *Hadena dissimilis* and *Plusia festucae*. In August, *Cirrhoedia xerampelina* occurred rather more plentifully than last year. I also took at sugar a ♀ *Aplecta occulta*, from which I obtained ova, and have reared a partial second brood. Since August the season has been hopelessly bad, and neither moths nor larvæ to be obtained, except in very small numbers. I did not see a single *Scopelosoma satellitia*, *Anchocelis rufina* or *Brotolomia meticulosa*, and only two *Polia flavicincta*, and even of *Orrhodia ligula* (*spadicea*) and *Anchocelis litura*, there were rarely more than four or five on a single night. *Miselia oxyacanthae* was generally to be found, but not a specimen of the ab. *capucina* (usually plentiful) turned up. Mines of *Lithocolletis sorbi* were decidedly scarce, and the only common *Lithocolletis* mines were those of *spinolella*, *alnifoliella* and *spinicolella*.—(Rev.) C. D. Ash, M.A., Skipworth Vicarage, Selby.

Portland.—On the few occasions that I went to Portland in 1897,

I found moths by no means abundant. I took about six *Agrotis simulans* (*pyrophila*) on one night in July, which is an unusually large number of this species, but there was very little else worth mentioning, and even the commonest Noctuids were scarce. *Pieris brassicae*, which has of late years been rather few in numbers, has this year been plentiful.—N. M. Richardson, B.A., F.E.S., Monte Video, near Weymouth.

York.—From April to August, 1897, I collected two or three days a week, and with good results. Larvæ in May were abundant; I took a great number of those of *Taeniocampa populeti*, and at the same time *Tethea subtusa* from poplars; larvæ of other species feeding at this time were in large numbers also. Sugar, in the early part of the season was productive, and the swarms of *Agrotis exclamationis* exceeded anything I have ever before seen of this species at sugar. *Acronicta leporina* was out each night, but scarce; *Hadena dissimilis*, at Askham Bog, however, was common, and from several females I obtained good batches of ova, which fed up rapidly, the larvæ pupating early enough, I thought, to produce a second brood; none, however, emerged in the autumn. The females laid freely when fed with honey, but those kept without food would not deposit. *Abraxas sylvata* (*ulmata*) was taken here in beautiful variety. On June 21st, I carefully inspected all the specimens that I came across, but there were very few "pale" or "bone-coloured" aberrations. On July 1st, however, in the same wood, the species was out in numbers, and the leaden-blue form was not uncommon, as well as intermediate forms. The extreme "pale" form with only the four scorched blotches, and these much reduced in size, was picked up here and there. The great number of cripples of the "blue" aberration was very noticeable. I must have counted more than twenty, and this crippling was mostly on the left fore and hind-wings.—S. Walker, 15, Queen Anne's Road, York.

Clevedon.—*Cyaniris argiolus* appeared at Clevedon last year in fair numbers in both broods, the second brood being remarkable for its long duration. I did not see a single *Vanessa io* this autumn, and *Pyrameis atalanta* and *P. cardui* were both scarce. I saw a single specimen of *Colias hyale* (or *C.* var. *helice*) on August 2nd, but failed to capture it. *C. hyale* is very rare in this locality, the last specimen I noticed being in 1881. The common Pierids were less abundant than usual. I may add that on one bright sunny day last March, I saw a good-looking specimen of *P. cardui* alight in a crowded thoroughfare in Bristol. Insects were scarce at ivy; I only observed a few each of *Scopelosoma satellitia*, *Orthosia macilenta*, *Anchocelis pistacina* and *Brotolomia meticulosa*.—J. Mason, Cleveden Court Lodge, Somerset.

East Devon.—Few insects have been attracted by ivy this season (1897), scarcely, I should say, a sixth of the usual number. Only on one or two nights were any *Xylina socia* seen (three on one, and one on the other). I have noticed before that they only seem to feed on certain occasions, though the weather may be apparently favourable at other times. My son took one ♀ *Dasycampa rubiginea* in our garden; the first we have taken at ivy, and the second during seven years' residence in East Devon. I am trying to mate it, but have heard nothing yet of a ♂. A couple of *Sarothripus undulanus* also turned up. Can anyone tell me when it lays its eggs? Though the weather was warm

and suitable, towards the end of October, very few insects came to light—a few *Himera pennaria*, one *Thera firmata* (very unusual), and two *Asteroscopus sphinx*, in perfect condition, on October 28th and 29th, both evidently only just emerged, and both, as usual, males.—W. S. Riding, M.D., F.E.S., Buckerell Lodge, E. Devon.

Prestbury.—I started my moth trap on October 14th, and took half a dozen *Asteroscopus sphinx* (this insect does not come until after midnight), a few *Cidaria miata*, *Himera pennaria* and *Anchocelis pistacina*. The larvæ of *Uropteryx sambucaria* were common on ivy. As the result of pupa-digging, I obtained, among many others, three *Cymatophora ocularis*, *Smerinthus tiliae*, three *Poecilocampa populi*, four *S. populi*, and two *S. ocellatus*. I have reared second broods of *Acidalia aversata* and *A. bisetata* on knotgrass.—(Major) R. B. Robertson, The Priory, Prestbury, Gloucestershire.

King's Lynn.—At the end of June and beginning of July, I was at Bournemouth, whence I visited the New Forest, and found occupation in renewing my series of *Dryas paphia*, *Argynnis adippe* and *Limenitis sibylla*. The latter was, as usual, in plenty. I saw, but did not capture, a beautiful black aberration of this species. My best captures among the smaller fry were: *Tortrix piceana*, *Phycis abietella*, *Stigmonota coniferana*, *Ephippiphora tetragonana*, *E. signatana*, *Gelechia alacella*, and *G. leucatella*. *Tortrix crataegana* was not uncommon in the Forest among oaks, and I saw *Oxyptilus teucrii* abundant, on one occasion, amongst a small patch of *Teucrium scorodonia*. *Crambus uliginosellus* occurred plentifully in a bog at Bournemouth, and *Œcophora lambdella* amongst old furze bushes. The commonest *Eupithecia* was *pumilata*. *Nemoria viridata* occurred here and there amongst heather, with an occasional *Euthemonia russula*, and *Eubolia palumbaria* was quite a pest. The local *Retinia sylvestrana* and *Sericoris bifasciana* were abundant amongst fir trees, the former attached to *Pinus strobus*, and *Butalis grandipennis* was in abundance on the heaths. *Plebeius aegon* did not appear in its usual numbers, but *Endotricha flammealis* swarmed on heathy ground. *Acidalia subsericeata* was not uncommon, but mostly worn, and the same remark applies to *Pempelia palumbella*. A few *Acidalia inornata* were secured, also *A. straminata* and *A. emutaria*. At the end of June, and beginning of July, *Gonepteryx rhamni* was still on the wing, and at the same time a few full-grown larvæ were taken from the buckthorn.—E. A. Atmore, F.E.S., High Street, King's Lynn.

Doncaster.—To me, the most interesting item of the year 1897, was finding *Eupoecilia rectisana* near here, this and Wicken being, I believe, the only inland localities known in Britain for this species. Another remarkable feature of the year was the great abundance of the larvæ of *Phycis betulella*; many birches were quite disfigured by them. During the autumn I worked for larvæ of leaf-mining species with very poor results, except in the case of *Lithocolletis cerasicolella*. This species was very abundant, a cherry leaf with five or six mines being not uncommon.—H. H. Corbett, M.R.C.S., 9, Priory Place, Doncaster.

Information wanted.—I am thinking of going to Bosnia for next summer, and should be much obliged for any information about the butterflies of Bosnia, Herzegovina, or Dalmatia, or the addresses of any entomologists living there. I am especially anxious to take

Erebia afer var. *dalmata*. Can anyone give me locality and date for this insect?—(Mrs.) M. Nicholl, The Cottage, Merthyr Mawr, Bridgend. [We have an idea that advertisements from Dalmatian entomologists (and, therefore, their addresses) appear occasionally in the *Insekten-Börse*, and *Societas Entomologica*, *Rühls Gross-schmetterlinge Paläarktischen*, etc. (Heyne, Leipzig) has many localities, and probably contains information on this point.—Ed.]

CURRENT NOTES.

The Leicester Society (under the able presidency of Mr. F. Rowley, and the enthusiastic secretary, Mr. F. Bouskell) is doing excellent entomological work. Like all societies, however, that do not wish to fall into a mildewy condition, this Society combines the social with the scientific. The result must be very gratifying to the officers, and certainly repays them for the extra trouble. Professor Beare, and Messrs. Donisthorpe and Tutt, were the London members present at the latest social function on January 13th, and to say that these gentlemen have taken away an excellent impression of the generous hospitality of their Midland friends, is to put the matter very mildly. At the speech-making after the dinner, Mr. Dixon bore remarkable testimony to the excellence of the secretary. He said: "Mr. Bouskell does not ask one to do so and so, but writes, 'You are down for so and so,' and thus you have to do it." Here's a secretary after our own heart. The entomological *menu* was excellent. At the ordinary meeting on the following evening, Mr. Donisthorpe read a paper on "Ants' nest beetles," and Mr. Tutt another paper on "The scientific aspects of Entomology."

On the evening of January 18th, in the "Entomological Salon" of the Holborn Restaurant, Mr. Verrall gave his annual supper in connection with the meeting of the Entomological Club. Many eminent entomologists were present. Among others, we noticed Mr. Trimen, F.R.S., Professor Meldola, F.R.S., Professor Poulton, F.R.S., Mr. Distant, F.Z.S., Dr. P. B. Mason, F.L.S., Mr. Sam. Stevens, F.L.S. (carrying his years with more ease than many of us half his age), Colonel Swinhoe, F.E.S., Mr. J. J. Walker, R.N., F.L.S., Dr. T. A. Chapman, F.E.S., Mr. Herbert Goss, F.L.S., Mr. Stanley Edwards, F.R.S., F.Z.S., F.L.S., and very many others. We regret much that Mr. R. Adkin, a prominent member of the Entomological Club, was absent through indisposition. Mr. Jacoby again played some excellent selections on the violin. Only two toasts were proposed, one, by Mr. Verrall—"The Entomological Club," the other, by Mr. Trimen—"Our Chairman, Mr. Verrall." We liked one remark in Mr. Trimen's speech, "I have only been to two of these suppers, I hope to attend many in the future," and so say all of us. When will there be a social side to the Entomological Society of London?

A short sketch of Entomological Serial Literature in Britain.*

By SAMUEL J. CAPPER, F.L.S., F.E.S.

On the 21st of February next, the Lancashire and Cheshire Entomological Society will have attained its majority, an event

* The Annual Address to the Lancashire and Cheshire Entomological Society.

which is usually considered as a most important epoch in individual life-history, the babe having grown to manhood. In my address last year I endeavoured (though very briefly) to review the work done by our society since its formation, and hope I was successful in showing that it has been far from an idle one, and that we have accomplished useful scientific work, which will compare favourably with that done by other societies. The past year has left an encouraging record. The papers read have been excellent, and the discussions most interesting, while at the same time the number of our members has increased. We should have liked to see a more regular attendance at all the monthly meetings, for while some have been crowded, others have been quite the reverse: and when a paper, the preparation of which has involved considerable time and thought, is presented, a meagre attendance is highly discouraging to all. Do try to remember this in future, engrave on your memories that our meetings are held on the 2nd Monday in each month, and by your presence evince your interest in the prosperity of the society. The exhibits are always a most important feature at our gatherings, and these during the past year have been quite as numerous and interesting as heretofore.

Insects which, twenty years ago, were not known as British, or were of the greatest rarity, have been exhibited, not only in single specimens, but often in considerable numbers, till we have wondered what would be the next surprise, and we have begun to question whether there is such a thing as an insect rarity, or whether our limited knowledge of its habits and life-history lead us to consider a given example as such. It may be interesting, and will support what I say, to mention a few of the lepidopterous insects which have been exhibited during the past twenty years:—*Sphinx pinastri*.—This was, twenty years ago, quite a doubtful British species (although the capture of some larvæ in Suffolk by the Hon. Mrs. Carpenter was recorded in 1879), but, in the year 1892, Lord Rendlesham and his son captured 11 specimens in the neighbourhood of Woodbridge, Suffolk, and since then they have been taken yearly in the same locality. Whether they were originally introduced into this country by planting foreign trees, on which the insect existed, as by some people is thought probable, I cannot say, but it is certainly now established as a British species. *Zygæna exulans*.—Twenty years ago this species, and even *Z. meliloti*, were comparative rarities, though Mr. Tugwell drew attention to the latter in the *Entomologist*, as a new species, no longer ago than 1872. Well do I remember my delight in adding a few specimens of this then novelty to my collection, through the generosity of Mr. Gulliver (father of the present Mr. Charles Gulliver). He kindly sent my friend Mr Owen and myself, as a present, a series of these insects, though at the time they were worth several shillings each. *Callimorpha hera*.—Previous to 1882, only two or three recorded; now plentiful in South Devon. *Cidaria reticulata*.—Several specimens were taken at Windermere in 1856, by Messrs. Allis and Hodgkinson, then it was lost sight of until Mr. Hodgkinson took a specimen in 1876. You will remember the interesting paper we had read to us about this insect some months ago by the Rev. A. M. Moss. At Mr. Hodgkinson's sale, in November last, some of these insects realised only a few shillings each. *Crymodes exulis*.—Mr. Cooke captured this insect at Loch Laggan in 1876, and Mr. Bond exhibited it at the Entomo-

logical Society of London, October 4th, 1876. This species can no longer be called a rarity. *Pachnobia alpina*.—Only one or two records by Carrington, Eedle, etc., till 1876, when it was taken in considerable numbers in Scotland, since which time it has ceased to be looked upon as really rare. Time will not admit of more than just mentioning a few others: *Sesia chrysidiformis*, *Acidalia immorata*, *Eupithecia extensaria*, *E. irriguata*, *E. togata*, *Jochaeara (Acronycta) alni*, *Tapinostola elymi*, *Dianthoecia albimacula*, *D. irregularis*, *Plusia chryson*, *P. moneta*, *Nascia cilialis*, *Crambus myellus*, *Tortrix piceana*, *Penthina postremana*, and *Retinia resinana*.

The aberrations brought for our inspection have been most numerous and extraordinary, noticeably whole drawers full of such species as *Arctia caja*, *Spilosoma lupricipeda*, *S. mendica*, *S. menthastri*, *Abraxas grossulariata*, *Agrotis tritici*, etc., each specimen being unique. Indeed, it is quite exceptional to attend a meeting at which some interesting aberration is not exhibited. Without thus drawing attention to the subject, we do not realise how much is done in twenty years, and how important it is to have a society like our own, where the members have the opportunity of seeing novelties, either in new species, or varieties, or aberrations.

The question on these annual occasions is how to select a subject for our consideration, and it has occurred to me that to devote the short time at our disposal to a chat about the entomological literature prior to the birth of our society, and that published during the last 21 years, may be interesting to all present. Of course, we cannot do more than briefly allude to, or mention most of, the works written on the subject, and, indeed, I would suggest that we should confine our remarks more particularly to the consideration of the literature relating to Lepidoptera, regarding such volumes as valued friends with whom each one of us is more or less intimately acquainted. As I sit in my library, which contains a considerable number of entomological works, I feel, as it were, surrounded by so many friends and acquaintances, and prize the privilege of being able to take down a volume and consult with its author on the subject which demands my special attention at the time. The study of insect life is so stupendous and exhaustive that, without such aid, few of us would be prepared to give an answer to some of the simplest questions brought before us; and, indeed, those who know the most on any subject will generally be the first to acknowledge how little they do know, and how much they have to learn. A few years ago it was my privilege to entertain at a garden party several of the most eminent authorities on special orders of entomology, and I shall ever remember the reply made to a remark by one present: "Mr. ———, I understand you know all about the *Ichneumonidae*?" To which the gentleman addressed made reply: "I have devoted fifty years of my life to their study: if I live another fifty years, and continue my investigations, and this question is again put to me, I may then say, 'I am beginning to know something about them.'" Dr. Goodwin, Bishop of Carlisle, a true son of science, said, a few days before his death: "The longer I live, the more I feel the burden of my ignorance, but I pray God, I may have the strength of mind to die learning."

Previous to the last few years, entomological literature has been almost wholly devoted to systematising, and further, the various

systems of classification that have from time to time been brought out, have been nearly always based upon imaginal structure; the earlier stages of the insects, until quite recently, were greatly overlooked. Some of the earlier writers certainly paid considerable attention to larvæ, and this was a step in the right direction. For instance, Denis and Schiffermüller (1776), in the *Lepidoptera of Vienna*. But even in the few cases where larvæ were utilised in classification, it was the adult larvæ that were examined. Any system of classification which is based upon imaginal structure alone is sure to lead to error. Latterly, another branch of entomological literature has sprung up, and, by it, the true relationship of species is sought by examining and comparing the whole life-history of the insect, from the egg just laid to the completion of the cycle by the laying of another set of eggs by the imago. The consequence of this more scientific entomology is that in this, as in all other sciences, the "Specialist" has been developed; indeed, the "Scarabee" of Oliver Wendell Holmes is no longer a caricature, but a *portrait*. Magazine articles of recent years also show this tendency. For example: such articles as "The Genus *Acronycta* and its Allies" (T. A. Chapman), "The Xanthias" (J. W. Tutt), "The early stages of *Nepticulae*" (Dr. Wood), etc. From the host of specialists now at work, generalisations on a sound basis may be formed and in fact are now forming, and although it may appear at first sight to be making "confusion worse confounded" to have to unlearn much that we have been taught by our former masters in our science, we must remember that the words of Tennyson, "The old order changeth, yielding place to new," applies as much to entomology as it does to other matters, and that the end and aim of all science should be Truth. Latterly, the spread of evolutionary ideas, with their influence on all scientific thought, has directed entomological literature into an entirely new channel; and, guided by this light, the true relationship of species is sought. What is said of entomology applies to all branches of natural history. The Linnean system of botanical classification which we learned in our boyhood, though wonderfully ingenious, has long since given way to what is styled the natural arrangement; while the conchologist no longer classifies the animals he studies by the secretions they exude. The periodical literature of entomology has played an important part in the progress of the science, and, more than anything else, has helped to make it a popular study; and a few words must be devoted to it in order to make my sketch of our literature at all complete.

Like everything else, it was not brought to its present state at once, but grew up gradually. Stephens' *Illustrations*, and Curtis' *British Lepidoptera* were issued in parts at intervals, and such general works as the *Annals and Magazine of Natural History* had appeared; but the first publication that could properly be called "periodical" was the *Entomologist's Annual*, the first volume of which appeared at Christmas, 1854-5. This publication, edited by the late H. T. Stainton, proposed to give systematic notices of all the new species found in this country in the past year, and, at the same time, to intimate which once rare species had been taken in plenty. The volume gave an account of the Lepidoptera discovered in Britain subsequent to the publication of Stephens' *Illustrations* in 1835, of Hymenoptera, since Kirby's *Monographia*, and Shuckard's *Fossorial Hymenoptera* and of

Coleoptera, since Stephens' *Manual*, 1839. Other orders were worked up to date in subsequent issues, and where, as in the case of the British dragon-flies, no work had appeared suitable for a standing point, a full monograph was given. This eminently successful publication was continued for twenty years, generally with a coloured plate of the most interesting of the species then introduced as British. Lists of entomologists, captures of rarities, and other interesting matter filled up the various volumes. Stainton's *Manual of British Butterflies and Moths* appeared in monthly parts, at fourpence each, at this period, and on April 5th, 1856, was issued the first number of the *Entomologist's Weekly Intelligencer*—the "dear old Intelligencer," another of Mr. Stainton's popular productions. This, more than anything before or since, seemed to draw entomologists together, and largely to increase their number. Mr. Stainton wrote in an attractive, chatty style, free from the technicalities that mar so much of our modern entomological literature; and he always contrived to make himself perfectly understood, even by those who had no previous knowledge. *The Intelligencer* was intended to be a weekly paper, issued during the collecting season only, and at the end of September, 1856, Mr. Stainton bade his readers "Good-bye" till the following April. *The Intelligencer* was printed by Edward Newman, and on its cessation he immediately announced *The Substitute*, an imitation in every respect of *The Intelligencer*. In the pages of *The Substitute* appeared the first portion of what was afterwards completed and published under the title of the "Insect Hunters," a descriptive poem in the peculiar metre of Longfellow's *Hiawatha*, in which he gives a brief account of the distinguishing characteristics of the various orders of insects. Whether *The Substitute* was successful financially I do not know, but copies are now very scarce. After the first year *The Intelligencer* appeared continuously, and there was no need for a substitute. It was continued until 1861, the last number appearing in September of that year. Mr. Blackburn made an attempt to continue it on the same lines, but he had not Mr. Stainton's attractive style, and though *The Intelligencer* was greatly missed by the young and rising entomological world, the attempt was not successful, and after the first year it was discontinued.

In 1864 appeared the first number of the *Entomologist's Monthly Magazine*. Mr. Stainton was the editor-in-chief, and associated with him were Messrs. Blackburn, McLachlan, Rye, and Dr. Knaggs. At the end of the second volume Mr. Blackburn's name disappeared from the title page, though he continued to be a contributor. Since than many changes have been made, chiefly as death carried off the members of the staff. Mr. McLachlan, however, still remains at his his post, and is now editor-in-chief, after more than 33 years' connection with the undertaking. Since its establishment this magazine has maintained its place in the fore-front of British entomology. Mr. Newman had long been conducting *The Zoologist*, a magazine of general natural history. He applied for the printing of *The Entomologist's Monthly Magazine* when it was first projected, but the preference being given to Messrs. Van Voorst, he retaliated by issuing the second volume of *The Entomologist*, to which the entomological matter of *The Zoologist* was transferred. The first volume of *The Entomologist* had been published in 1842, but subsequently dropped

until this period. Newman was both proprietor and editor of the new venture, and its object was stated to be, "To work out the life-history of all insects injurious to agriculture and horticulture, to suggest remedies for their ravages, and publish full details of successful experiments for their destruction." Special attention was given to exchanges among entomologists, and the magazine was kept up by Newman until his death, in June, 1876. His son decided to continue the publication. Mr. Carrington was appointed editor, and under his care it was very considerably improved, and soon took first rank. It was subsequently sold to Mr. Leech, who wanted a medium in which to describe new species he was receiving from collectors abroad. His curator, Mr. R. South, was appointed editor, and, subsequently, Mr. Leech gave the magazine to Mr. South entirely, under whose editorship it has continued to the present time.

The Yorkshire naturalists, along with those of our own counties of Lancashire and Cheshire, were, in the early sixties, a very numerous body of hard-working field naturalists. In time, an organ of their own appeared to be a *sine quâ non*, and *The Naturalist* was commenced in 1875. This, which was not exclusively entomological, was at first edited by Messrs. Porritt and Hobkirk, who continued at their post until 1884, when *The Naturalist* became the property of the Yorkshire Naturalists' Union, with their secretary, Mr. W. Denison Roebuck, as editor, a post which he still retains. In 1879, two of our members, Messrs. Mosley, of Huddersfield, and Robson, of Hartlepool, commenced *The Young Naturalist*. This was done avowedly with a desire to revive the days of *The Intelligencer*, of which, at first, it was a close imitation. For three years it appeared as a weekly paper, and then monthly for another eight years. The leading idea was to assist beginners, but though it was called by a general name, it was chiefly devoted to entomology, of which both the editors were votaries, though Mr. Mosley had considerable knowledge of other branches of natural history. In order to do away with the idea that it was only intended for children, the title was changed, at vol. xii., to the *British Naturalist*. Mr. Robson had had sole control for some time, with a staff of assistants, and his health, now giving way after repeated attacks of influenza, he suddenly announced its termination. Our Warrington friends, Messrs. L. Greening and J. Smith, conceived the idea of continuing it, but the suddenness of its termination threw great difficulties in their way. They made a gallant attempt to overcome them, but at the end of their first volume it ceased to appear.

During the latter days of Mr. Carrington's editorship of *The Entomologist*, a series of articles "On the variation of the British Noctuæ," from the facile pen of Mr. J. W. Tutt, were in course of publication. When the magazine changed hands, he refused to continue the publication of these papers in it, and they were almost immediately afterwards published as a separate work in four volumes. Almost immediately afterwards the publication of the *Entomologist's Record*, with which most of you will be familiar was commenced. You will also know that Mr. Tutt has conducted it alone to the present time.

The Naturalists' Journal started in London in 1892, as a penny monthly. In 1894, Mr. Mosley became joint editor, in 1896 sole editor,

and in 1897 proprietor. It is now issued as a monthly in two forms, a plain copy at twopence, and a thick paper coloured copy at fivepence. Special features are plates of varieties, and papers on economic subjects. Since the coloured figures of varieties were transferred from a separate publication to this journal it has become very popular with lepidopterists. Several of these plates have been devoted to figures of varieties in my collection.

Such is a brief review of the periodical literature dealing with the Lepidoptera. The subject is a most interesting one, and its consideration has extended to far greater length than I at first intended, still its importance will, perhaps, be ample apology. It has, however, greatly encroached upon the time at my disposal, and I must therefore content myself with a mere glance at some of the more important general literature.

In some of my former addresses I have alluded to the paucity of entomological literature in my early school-days. At that time very few such books existed, and those of an elaborate and expensive character, and, as a rule, quite beyond the reach of a school boy. Amongst the few books, which then existed, may be mentioned Curtis' and Stephens' *British Entomology*. The former appeared between 1824-40, in 16 volumes, and the latter between 1827-46, in numerous volumes, of which four were on Lepidoptera. Even now we have to look back to them with some degree of humiliation at the very beautiful figures they contain, far surpassing the great majority of those presented to us at the present time; indeed, of the former Cuvier said that the figures had "reached the ultimatum of perfection." In saying this I would also add that the figures in our present works are all that we can expect for the money, and their execution in a cheaper style brings the books within the reach of many who otherwise would not be able to obtain them. Thus, in those days the study of entomology was confined to the few, and the first impetus which scattered a knowledge of insect life among the people was that memorable work (1815), Kirby and Spence's *Introduction to Entomology*, written in so popular and attractive a manner, and embellished with so many amusing anecdotes, it appealed to the popular mind, and soon found a lodgment in the hearts of the people, and was received gladly, and caused many to turn their attention to the study of the little creatures made famous by these two writers. But the interest aroused by Kirby and Spence was a *general* interest, and it was not until 1832 that much attention was bestowed on any special department, when Rennie's *Conspectus* came out, a small pocket volume, which gave descriptions of all the then known species of Lepidoptera. I here wish to acknowledge my indebtedness to this book, which was such a help to me at that time; and from it I compiled a table, showing under each species, the time of imago, time of larva, food-plant, and place where found, on which I spent considerable labour. It will be interesting to quote a few references from this book, and compare them with our present knowledge. Of butterflies he enumerates 108 species, of which he says 24 are *doubtfully* British, and 12 more are probably only varieties of other species, which brings the number to about the same as that at present admitted into our lists; though some of our present species—such as *Thymelicus lineola*, *Lampides boetica*, and the questionable *Anosia archippus* were not known

as British in Rennie's time. Of moths, when we see him write of such things as *Noctua festiva*, *Anchocelis litura*, *Caradrina morpheus*, *Hydroecia nictitans*, *Apamea basilinea*, *Graphiphora augur* as "rare," "scarce," or "very scarce," it makes us wonder whether, indeed, anything at all is rare? May it not be now as it was then—simply that we do not know how to find or take them? What a wonderful knowledge in this respect "sugar" has revealed to us, and how many Noctuid species would have remained "rare" or "very rare" had it not been for the discovery, by the late Henry Doubleday, of this means of capturing this group of insects. Another thought which occurs to one now, in looking over this good old book, is that insects are found, in a great measure, where they are looked for! Species after species, for pages together, especially among the *Tineina*, are given as "London," "near London," etc., simply because no other part of the country had been worked; and, in reading our more recent literature, the frequent mention of certain places sometimes induces us to think these places are "good localities," when often the secret lies in the one fact that some energetic collector has lived there, who has looked for things and found them; and probably future entomologists will have to erase the words "rare" and "scarce," in many instances, from the books now being written. But Rennie's was only a pocket manual, without figures of any kind, and when Jardine's *Naturalist's Library* appeared, with coloured plates, at a cheap price, it was quite a joy to those who had begun to collect. This work, as you are aware, consisted of 40 volumes on all branches of Zoology, two of which were devoted to British butterflies and moths. We owe a great deal to the energy of such men as Rennie and Jardine for the introduction, no doubt under many difficulties, of cheap books on this subject. Jardine's volume on the butterflies, for instance, contained 34 beautiful copper plates, hand-coloured, giving 176 figures and 246 pages of letterpress for 5s., which will compare very favourably with our present day productions. We are all glad of the enterprise of Messrs. Lloyd, in recently bringing out a still cheaper edition of this work, in which the volumes are only 2s. 6d. each, but the plates are not equal, as, indeed, we cannot expect them to be, to those in the original edition.

In 1839, Mr. Wood published the *Index Entomologicus*. It contains 1,944 figures, each beautifully coloured by himself, reduced where necessary to a small size, but with a degree of accuracy that will enable the entomologist to fix at once upon any particular species he may wish to define. At that time there was no work that figured even a quarter of the species known to inhabit this country. The book, which consisted of 218 copies, was subscribed for by 137 gentlemen and ladies, among whom are the well-known names of J. G. Children, Rev. H. R. Crewe, J. Curtis, J. C. Dale, J. B. Hodgkinson, J. F. Stephens, and Mr. Wailes. Of the Diurnals he figures 82, of which 19 are either named varieties or doubtfully British. Of Hawk moths there are 36; stout-bodied moths (including the Psychids), 448; Geometrids (including hook-tips), 309; Pyralids 83; Tortricids, 321; Tineids (including *Eudorea* and *Crambus*), 462; Pterophorids, 30 species. To the Diurni he adds three new species, none of which are now included in the British list. In his list of doubtful species he gives, in additon, 18, none of which are now included; though he mentions as doubtful among the stout-bodied moths *Procris globulariae*,

Gastropacha ilicifolia, and *Ennomos alniaria*, which are now well-established. In 1841, the first edition of Humphreys and Westwood's *British Moths* appeared, and two years later their volume on *Butterflies*. Every entomologist of that day will remember the eagerness with which we used to look for the successive parts of this work as they came out. The plates were beautifully drawn and coloured, and the letterpress comprehensive, and completely up to date, and the impetus given to the study by the above mentioned cheap books, caused the first edition to be soon out of print, and subsequent ones were brought out; but the first is that still prized by lepidopterists, for the artistic excellency of the figures.

But the world had not yet seen the man, who above all others, was to give such a fillip to the study of our British lepidoptera, as to set it going with a bound from which, even to-day, it has not ceased to move. It has been said that there is only room for one great man in one line in one generation, and the "great man" in his generation, if not in all generations, in our line, was the late Henry Tibbatts Stainton. In the first place, he was a man of wealth, always a great power, and he used it to spread a love of what he himself loved—the study of Lepidoptera. He was a man of kindly disposition, and by his manner won the affection of those who came in contact with him, and by this means got hold of people, especially young people, and bound their minds into this particular groove. He used to call his followers together at his house, and throw his collections open to them, and on Saturday afternoons meet them for out-door work. Some entomologists still living remember those happy meetings in Burnt Ash Lane, preparatory to starting on these collecting expeditions. Stainton had another wonderful gift—that of accurately describing in a very few words what he saw. His first published work was *The Natural History of the Tineina*, which he began in 1855. The object of this work, as stated in the preface, was to give—in word and picture—the life-histories of our smaller moths, and to combine the labours of collector and student. The first volume depicted the life-histories of 21 species of *Nepticula*, and three of *Ceriostoma*. The plates were excellent, and the letterpress printed in four languages. In the preface the author makes the offer that if anyone would send him 20 species of micro-lepidopterous larvæ, previously unknown to him, he would present him with a copy of the entire work. This offer, with the beauty of the plates, and the plain, attractive, one might almost say, fascinating style of his writing, caused many to turn their attention to this hitherto neglected group of moths, and subsequent volumes appeared yearly for 13 years, when the work abruptly came to a termination, much to the regret of every lepidopterist; and what is still more to be regretted, no one else has ventured to give us the continuation. Two years after *The Natural History of the Tineina* had begun to appear, Stainton started his famous *Manual*, and in this work his power of accurate concise description is seen at its best. That was a book which marked an epoch in the study of our British lepidoptera. Students sprang up on every side, the crooked path was made straight, and Stainton's *Manual*, which came out in monthly numbers, was eagerly looked forward to, and greedily devoured, by scores of collectors, who, by it and *The Intelligencer*, were made enthusiastic in their pursuit. The edition of this book must have been very large, numbers were sold, and though forty years have passed since it issued from the press, the publishers still have it for sale. In 1859, the

appearance of Wilkinson's volume on the *Tortrices* showed much patient labour, but, probably from the lack of figures, it did not give that stimulus to the study of this group of insects which Stainton's work did to that of the *Tineina*. I can only mention the series of half-guinea volumes published by Messrs. Reeves, all of them good in their way, and illustrated with plates, amongst which are Rye's *Beetles*, Shuckhard's *Bees*, Stainton's *Lepidoptera*, and Staveley's *British Insects*, the latter a general treatise on all orders. This, I believe, suggested to me the first idea of making my educational collection, which, as I have told you in a previous address, gave the birth to all that kind of work more recently done by our member, Mr. Mosley.

If Stainton was a star of the first magnitude Edward Newman was certainly not far behind in his interest in entomology. And when, in 1869, he began to publish his *British Moths*, it was at once felt that it supplied a pressing want, by giving accurate figures, though not coloured, of all our larger moths; and the success of the work caused him to re-issue his *Butterflies* in uniform size, which had previously appeared in a publication called *Young England*. Such works as Morris' *Butterflies and Moths*, Owen Wilson's *Larvae*, with plates painted by Mrs. Wilson, and Kirby's *European Butterflies and Moths*, we have not time to more than mention, and with the many publications of the Ray Society, several of which are on entomological subjects, you are already acquainted. The one which most concerns the members of this society is that on *Larvae of British Lepidoptera*, being the embodiment of the labours of half a lifetime – the taking of portraits of larvæ by the late Wm. Buckler. We are indebted to the late Mr. H. T. Stainton, and latterly to Mr. Porritt, for the able manner in which they have edited this work, of which seven volumes have appeared, the eighth being now in the press, and the ninth and last we are promised shortly.

Among the promised books to be brought out by this valuable society, we must make mention of a work on the British *Coccidae*, by our deserving and much respected member, Mr. Robert Newstead. It is to be in two volumes, and, I am sure, we shall all rejoice at the honour which has been justly paid to one who has done so much for our own society.

In connection with the periodical literature, I have already mentioned the name of our member, Mr. Mosley, and in 1877, he issued the first number of his *Illustrated Varieties of British Lepidoptera*, the figures in which were entirely hand-drawn and hand-painted by himself. The number of subscribers was very limited. The object was to represent the aberrations in private collections not otherwise known to the public. The numbers were rather erratic in their appearance, partly owing to the difficulty of obtaining information as to where the aberrations existed, and permission to make use of them, so that it took many years to complete one volume, and owing to deaths of subscribers, and other causes, very few copies exist. It is my privilege, however, to be the possessor of one of them, and I am proud to say many of my own aberrations are therein conspicuous. The figures are now being continued in a cheaper form in *The Naturalists' Journal*. In 1881, he commenced his *European Butterflies*, which occupied three volumes, completed in 1894. Also hand-drawn and hand-painted. Every European species is figured, except about three, which Mr. Mosley found it impossible to procure by any means. There are about 1,000 figures in this work, and they are so accurately

drawn and naturally coloured, that it is invaluable to those who, like myself, desire their acquaintance without keeping a collection. Of this work also, very few complete copies exist. Barrett's *Lepidoptera*, was begun in 1893, and has continued to appear in monthly parts up to the present time, but we are all looking forward with anxious expectation to those parts which shall contain the smaller moths, upon which Mr. Barrett is acknowledged on all hands to be an authority.

There is one branch of our subject which I cannot pass over—the economic part. We are greatly indebted to our honorary member, Miss Ormerod, for the prominent part she has taken in this work, and for the painstaking care with which she has followed it out. Her yearly reports began to appear in 1877, and have continued and grown in size, interest, and usefulness, up to the present time. *The Manual of Injurious Insects*, by the same lady, first appeared in 1881, and a second and enlarged edition in 1890. The very useful *Guide to Methods of Insect Life*, first came out in 1884, and an enlarged edition in 1892, under the title of *A Text Book of Agricultural Entomology*. She has also liberally distributed many leaflets on various important subjects—such as the "Warble Fly," "Turnip-flea Beetle," etc., which must have done a great deal of good.

At the same time, we would gratefully acknowledge what the Board of Agriculture has done in this way, by the publication of separate reports and leaflets, and by papers in the *Journal of Agriculture*, the most accurate of which are those which have received Miss Ormerod's revision.

When I commenced the subject of this address my object was briefly to allude to and record the principal entomological literature of my time, but "of the making of books there is no end," and I find that even when I confine my attention to the literature of Lepidoptera alone, this task is too great to be completed in the time at our command. I must, therefore, ask your indulgence for omitting to mention many well-known works and authors, whose names will at once occur to you as worthy of record.

But there is one author, Mr. Tutt, already mentioned in connection with *The Entomologist's Record*, whose works I must not omit to mention, not only for the evident care with which he deals with any subject he undertakes, but also for the exhaustiveness of all his writings. It seems wonderful how one man, having other daily duties to attend to, can bring out book after book in the quick succession in which they are given to us by Mr. Tutt. One of the first and most important of these works is his *Varieties of British Noctuae*, begun, as already stated, in the pages of the *Entomologist*, but subsequently brought out in four volumes. This of itself is a monument of patient labour. His treatise on *Melanism and Melanochroism in Lepidoptera* is another evidence that every corner and every available source has been ransacked for all the information that could be given on this particular subject. His *Notes on the Zygaenidae* bears the same stamp, while his popular books ——— but time fails me! It really seems hopeless for one to read the books as fast as he writes them, and if I attempt to keep up with his activity my task will never be ended.

To deal even briefly with his works alone, would extend this address far beyond its prescribed limit. Since the task of further reviewing, to any adequate extent, the vast field of entomological literature would assume almost herculean proportions, with this short reference to Mr. Tutt's unwearied activity, I may fittingly conclude.

The Entomologist's Record
AND
JOURNAL OF VARIATION.

Vol. X. No. 3. March 15th, 1898.

Collecting in the Forest of Fontainebleau, in June, 1897.

By J. W. TUTT, F.E.S.

To get out of the crush of Jubilee week, Messrs. S. Edwards, Tunaley and myself, started for Fontainebleau on the night of June 18th, 1897, and left there again on the morning of June 26th. The magnificent forest surrounds the town for about eight miles in every direction, and hence a week was hardly sufficient to discover the species that existed just round one's hotel. We were fortunate to be able to call on Monsieur A. Finot, the veteran orthopterist, and accomplished author of *Fauna de la France: Insectes Orthoptères.* With him we had two or three delightful outings, and were introduced to localities that would have been unexplored had we been left to our own resources. We cannot, however, recommend Fontainebleau as a place where one can spend a cheap holiday. It is a show place, and one has to pay for accommodation at a rate much higher than in most parts of France.

Fontainebleau has a great reputation as an entomological centre, and no doubt deserves it. We were there between seasons, and laboured under the disadvantage of not knowing the parts of the forest noted for special Lepidoptera, and, in the latter particular, M. Finot unfortunately could give us but little help. Still, we went for a holiday, and yet our collecting boxes made a fair show before we closed them, and said "good-bye" to the town.

The number of species of Rhopalocera observed was very few, and consisted of *Syrichthus carthami, S. alveus?* (two worn), *Pamphila sylvanus, Thymelicus thaumas, Papilio podalirius, Aporia crataegi, Pieris rapae, P. napi, P. brassicae* and *P. daplidice, Colias hyale, Thecla w-album, T. ilicis, Chrysophanus phlaeas, C. dorilis, Plebeius aegon, Polyommatus astrarche, P. icarus, P. bellargus, P. corydon, Melitaea athalia, Dryas paphia, Argynnis aglaia, A. adippe* and ab. *cleodoxa, Pyrameis atalanta, Aglais urticae, Limenitis sibylla, Epinephele ianira, Enodia hyperanthus, Coenonympha pamphilus, C. arcania, Pararge achine, Melanargia galathea.* Besides these, a very worn specimen of *Callophrys rubi* was noticed. This will strike one at once as a very meagre list, and indeed it must be acknowledged that it is.

The most abundant species were *M. athalia, C. arcania* and *M. galathea.* These were in great abundance, and *P. aegon, S. carthami, E. hyperanthus* and *T. ilicis* were only somewhat less abundant. Still, one feels, considering how local some of these species were, that if more

ground could have been covered, more common species would have been observed.

The following species interested me more particularly:—*Syrichthus carthami*.—I had never before seen this species alive. The specimens were large and finely marked. Some individuals much sprinkled with yellowish from the base to the middle of the fore-wings. The undersides exceedingly pale. One specimen with the white spots on the fore-wings much reduced in size. *Thecla ilicis*.—This species occurred abundantly with *T. w-album*, on the privet-blossom, in the clearings of the woods. Some very fine examples of the ab. *cerri*, with a large brown patch on the fore-wings, near the outer margin. There appears to be every intermediate form between the specimens with a well-developed patch extending over five interneural spaces, and those with only a slight tinge, and so on, to the forms with no trace of it. In the neighbourhood of Cannes, Millière says that the abs. *cerri* and *aesculi* are less rare than the type. He also says that this species passes the winter in the pupal state, but as he avers that the caterpillar of *w-album* is to be found "sur l'orme en juillet et août," after the imago has appeared in May and June, and that the caterpillar of *Zephyrus quercûs* occurs "en juillet sur le *Quercus robur*," after the appearance of the imago in June, one suspects that he may be wrong, and that the statement wants corroboration. *Melitaea athalia*.—This was the most abundant butterfly, and was very generally distributed over large areas of the Forest. The minor variation was very remarkable. The tendency for the males to have dark bases to the wings (=ab. *basalis*), the union of the two median, black, transverse lines in the lower half to form a band (= ab. *transversa*), the yellower ground-colour of some of the females (= ab. *leucippe*), the widening of the black outer marginal line on the fore-wings, the increased depth of the markings on the underside of the fore-wings, and a tendency to pallid coloration on that of the hind-wings, the central band becoming almost pearly in some specimens, are remarkable.

Pararge achine.—This species was abundant in the shady portions of the Forest, and in spite of the earliness, as it seemed to me [the insect was common at Mendel (Tyrol) in July, 1894], of its appearance, only a few perfect specimens could be obtained. Freshly emerged individuals were often disfigured by a slit extending almost throughout the length of one of the wings. What alliance has this species really with *Pararge*, as represented by *P. egeria* and *P. megaera*?

Coenonympha arcania.—This species was in the greatest abundance throughout our stay, the females in much better condition than the males. I have never seen it in such numbers before. The specimens exhibit considerable sexual difference, the males having a darker margin, and darker and more continuous nervures to the fore-wings, and more smoky hind-wings. The male, too, has rarely the ocellated spot situated towards the apex of the fore-wings. This is usually present in the females, and the latter generally have some spots on the hind-wings, but there is considerable difference in the number of these spots. On the underside the apical spot may be absent = ab. *obsoleta*, or even occasionally double = ab. *bipupillata*. The width of the pale band on the underside of the hind-wings varies much, and the number of spots in this band is also variable.

The moths of Fontainebleau proved much more interesting than the

butterflies. Of the Adelids we found only one species, *Nematois scabiosellus*, flying in the afternoon sun over scabious flowers. There were several species of *Psychidae*, represented by their cases, from one of which Mr. Edwards bred a fine ♂ *Psyche vilosella*. Of the Zygænids we saw only *Anthrocera* (*Zygaena*) *filipendulae*, pupæ of *A. transalpina*, and two or three female *Adscita* (*Procris*) *statices*; evidently we were too late for the latter and too early for the former. Among the Pterophorids we saw many *Aciptilia tetradactyla*, a few *Mimaeseoptilus fuscus* and *Oxyptilus pilosellae*, the latter species loving the grassy openings of the woods, whilst among the Alucitids a late specimen of *Alucita hexadactyla* was on the wing. Among the Gelechiads, *Depressaria costosa*, *Pleurota bicostella*, *Sophronia parenthesella*, whilst the Crambids, *Crambus chrysonuchellus*, *C. pratellus* and *Phycis subornatella* were common, and *C. falsellus*, *C. pinetellus*, *C. myellus* and *Homoeosoma sinuella* were rare. *C. myellus* came from a heathy piece of ground, to which we were introduced by Monsieur Finot. Of the Pyralids, *Botys fuscalis*, *Ennychia ostrinalis*, *Endotricha flammealis*, *Ebulea verbascalis*, *Cledeobia angustalis*, *Spilodes verticalis* (*cinctalis*), *Hydrocampa nymphaealis*, *H. stagnalis*, and *Scoparia crataegella* were captured. Of the Noctuids, a few *Agrotis exclamationis* were disturbed by day, as also were *Tryphaena subsequa* (*orbona*) and *Lycophotia strigula*. *Erastria fasciana* was beaten with the Deltoids, *Herminia derivalis* and an allied species from the undergrowth in the woods. *Banksia aryentula* and *Agrophila trabealis* turned up here and there, the former on the grassy edges of the woods, the latter on dry sandy fields. Among the Arctiids, *Euchelia jacobaeae* was rare, *Euthemonia russula*, in both sexes, very common. *Lithosia mesomella*, common one showery morning, when they were easily disturbed from the dwarf oaks, and one or two *Calligenia miniata* were obtained in the same way. The most interesting species of this family, though, was *Naclia ancilla*. This insect could be disturbed on sunny afternoons, but it was in the bright morning sunshine that it liked best to take its short swift jerking flights over the long grass. The specimens were of large size, compared with others I have captured (probably of a second brood, in August, much further south). The females have a distinctly yellow banded hind-wing, and are thus conspicuously different from the males. Among the Sphingids we saw only the broad-bordered *Macroglossa fuciformis*, flying in the afternoon sun at the bugloss (*Echium*) flowers, and *Macroglossa stellatarum*, everywhere. Mr. Edwards also obtained a *Sesia*, which he has not yet determined. It was, however, among the Geometrids that the best collecting was done. Among the Fidoniids a small race of *Lythria purpuraria* occurred not uncommonly in one or two sandy fields, flying best in the afternoon, whilst, in the same locality, *Ematurga atomaria* was going over. In the long heath, *Aspilates strigillaria* was not uncommon, the large white form, similar to those from our Kent woods, and quite unlike the "heath" form from the Midlands and Scotland. *Minoa murinata* (*euphorbiata*), both yellow and drab forms occurred among the undergrowth in the woods. Of the Acidaliids, a very fine lot was obtained. *Acidalia inornata*, a dark form from the heath. This is, I believe, the ab. *suffusata* of Treitschke. Then came a fine grey form of *A. strigilata*, with a distinct facies when compared with the Folkestone specimens, and having a different habit, for this species did not seem to be attached

to clematis, as it is reported to be in the "Warren," but was disturbed from the long grass. *Acidalia humiliata*, in thousands. It was to be found over a large area of ground, covered with long grass and short scrubby bushes of about two or three feet in height. From the grass and bushes the specimens came out in swarms. I once thought this was a rare insect on the Continent, my first two or three attempts to get it proving failures; but there is no doubt that in France and North Italy it is abundant almost everywhere, and double-brooded. *A. dimidiata* (*scutulata*), one or two specimens. *A. ornata*, not uncommon, *A. rubiginata* (*rubricata*), fairly common on the same ground as *L. purpuraria* and *A. trabealis*, but going over. This species is also double-brooded in Southern France. *A. straminata* was rare, but the few obtained were disturbed by day. *A. dilutaria* (*holosericata*) was common the last morning we were at Fontainebleau. I was glad to get this insect again, and find the specimens much more like those I got in the Tyrol (*Ent. Rec.*, vol. vii., pp. 124-126) than the Bristol specimens. Here, however, the specimens were only to be got by raking at the bases of bushes forming the undergrowth of the wood, an exceedingly different locality from the grassy precipitous slope where it occurred in the Tyrol, and on the Mendelstrasse, although at the latter place it hid at the base of the bushes in the same way. *A. macilentaria*, was not uncommon behind the château, but going over. It was a new species in nature to me, and hence interesting. *A. herbariata*, one specimen came to light at the hotel door. *Hyria auroraria*, the bright yellow and red form of the south of England, could be disturbed at the close of the afternoon from the long grass in the wood, but was exceedingly local. Besides these, we obtained a fair number of *Pseudoterpna pruinata*, some very fine, and just emerged, resting on the broom. A single specimen of *Geometra papilionaria*, disturbed from a small birch on one of the heaths; a single specimen of *Macaria liturata*, and one of *Ellopia prosapiaria* from the pines, whilst a single *Eupithecia plumbeolata* and one *Emmelesia albulata* were disturbed from the herbage, where *Acidalia humiliata* was so abundant. Bright yellow *Camptogramma bilineata* were abundant everywhere.

Notes on the Yorkshire aberrations of Abraxas sylvata (ulmata).

By SAMUEL WALKER.

As supplementing the notes by Messrs. Hewett and Tutt (*ante*, vol. ix., pp. 304-307) on these aberrations, the following observations may be interesting. My first visit last year to search for the aberrations of the species under notice was made on June 21st, and, although quite a couple of miles of the wood was traversed by three of us, nothing but forms with which we expected to meet were found. These consisted of the very light form, which was in fair numbers, and the "bone" or "greasy" aberration (ab. *obscura*), which was scarce; the species was, however, fairly well out, and no dwarfs were seen. A week later (June 28th), the first really dark form (ab. *suffusa*) turned up, and from that date to July 13th, when I last visited the wood (I found, so late as this date, three of the ab. *suffusa*), the slaty-blue aberrations were taken on each visit. The species was now evidently disappearing fast, and was in a very worn condition. I understand

the larvæ were in great profusion in the autumn of 1896, and malnutrition is suggested as being responsible for the occurrence of this unusual and rare form here. I remember, however, a similar abundance of larvæ eight years ago, when the elms were stripped in a great measure, and larvæ in numbers might be seen hanging from the leaves and branches, but my visit to the wood the following year revealed nothing out of the ordinary amongst the specimens I examined at rest. We ought to have found, had malnutrition worked out as it usually does in reducing the size of the imago, many dwarfed examples, but this was not actually so; they were the exception, and very few were noticed, the specimens being generally of the normal size. The very large percentage of cripples of the ab. *suffusa* has been already referred to, but what was very striking was the inability of the fully-developed examples of the darkest form to fly to any extent. I believe only one or two were actually taken in flight; the superabundance of what appears to be slaty-blue pigment seemed to make them more sluggish than the type form, which generally took wing when disturbed, and made off. Mr. Tutt remarks that apparently the best of Mr. Dutton's specimens had undergone a flattening out by the setting brace, as the wings appeared more or less crumpled. This was exactly the case with my specimens of the extreme form, and, when on the board, the wings when pressed in one part bulged out in another, just as if air or liquid was being pressed. Aneurism was not uncommon, and in one specimen, which I accidentally punctured with the setting-needle, the bleeding was very apparent. The suffusion of the slaty-blue colour is not, as Mr. Tutt points out, caused by an increase of the area of the usual shading of the wings, but by the spread of the leaden colour, which permeates the body as well, and is not readily rubbed off the wings like the ordinary scales, but remains a dirty blue when the wing scales have been removed.

In considering the abnormal appearance of the aberrations under notice, the fact of dark forms appearing side by side with an unusually large number of the extremely light form, and both of normal size, should not be lost sight of by those who study the probable causes of variation. I need not add to the speculations indulged in as to the immediate continuance of this grand form and its intermediates by descent, as time will soon settle that point.

Habits of Abraxas sylvata (ulmata).

By J. E. ROBSON, F.E.S.

The notes by Messrs. Hewett and Tutt in *The Entomologist's Record* (vol. ix., pp. 304-7), suggest to me that the habits of this species are not well known. Stainton (*Manual*, vol. ii., p. 65) says: "*Abraxas*—pupa in a slight web amongst trees." This is correct in respect of *A. grossulariata*, the larva of which spins a sort of hammock, in which it changes to a pupa. The larva of *A. sylvata* (*ulmata*) behaves very differently, and also differently from the larvæ of most tree-feeding species. These generally descend the tree-trunk when full-fed, and enter the ground, in close proximity to the trunk, to pupate. When the larva of *A. ulmata* reaches maturity, it attaches a thread to the twig on which it is feeding, and descends by this to the ground for pu-

pation. The exposed pupa of *A. grossulariata* is bright shining black, with pale yellow segmental rings. The underground pupa of *A. ulmata* is of the usual dull brown colour.

Species which pupate near tree trunks contrive, when the imagines emerge, to make straight for the trunk, up which they climb, for wing-expansion. The wings of *A. ulmata*, on the other hand, expand whilst the insect is resting on a stem of bracken or other low plant. It then sits perfectly exposed on the upper surface of a leaf, resembling in a remarkable degree the droppings of a wood-pigeon, or other bird. This curious resemblance is shared by the imago of *Cilix spinula*, and by the larva of *Jocheaera alni*, prior to its last moult. When evening comes, *A. ulmata* flies up to and about the elms, and does not descend again to the lower herbage.

This species is easy to rear in confinement, but I have never succeeded in producing imagines of normal size. Elm leaves are exceedingly dry, and most difficult to keep in a natural condition. Possibly the "poor physique," spoken of by Mr. Tutt, may have resulted from the difficulty of keeping the leaves soft and moist.

Here, though a variable species, it rarely runs to extreme forms. My wife once found one in Castle Eden Dene, almost devoid of markings. This was figured in Mosley's *Illustrations*. I have never met with any with the ground colour all slaty, such as I have seen from Yorkshire, but a row of the lightest and a row of the darkest forms we get, present a considerable contrast.

Aglais urticæ, with some notes on a third brood.

By W. GROVER.

Taking the season of 1897 as a whole, this species was much less common than is usual here, where in most years it occurs in considerable abundance. I have never previously met with any indications of a late brood of either larvæ or imagines; in fact, until this year, I have no record of finding larvæ later than the middle of August. It will, perhaps, be best to give a brief record of the species throughout the season. Hybernated examples were (like nearly everything else) very late, the first not being seen before April 13th; they quickly became fairly common, however, and numerous examples were observed pairing on April 26th, and others on various dates during the first fortnight in May. Small larvæ were taken on May 25th; these fed up rather quickly, and pupated June 13th-16th. These larvæ were much infested with dipterous parasites, nearly half of them failing to pupate from that cause. Freshly emerged imagines were observed out of doors on June 18th, but none were bred until June 30th, the last of the batch emerging on July 3rd. Half-grown larvæ were noticed again on July 25th. A few freshly emerged imagines were observed on August 14th; they were more numerous on the 18th, and continued on the wing in fair numbers until the end of the first week in September, after which the species became scarce. In point of numbers the second brood was quite equal—if not superior—to the first, which is the reverse of the general rule.

I was surprised to find two broods of larvæ on September 10th. The first brood—seventy in number—were the most advanced, the

majority of them being nearly full-fed ; they pupated from September 13th-17th. One remarkable point in connection with the pupæ was the unusually large proportion of the golden form, no less than 31 being wholly of that var. These could not have been influenced by surroundings, etc., as all the larvæ pupated after attaching themselves to the wooden top of the breeding-cage, and the golden pupæ were mixed up with those of the typical colour, indiscriminately. In spite of what has been said to the contrary by various observers, every one of these golden pupæ produced an imago in due time, and of the whole brood only two were infested with parasites. The first imagines emerged on October 13th, and the rest of the brood on the 14th-15th-16th. The total number of specimens was 64, all of which were typical in size, colour, and markings. The second brood—which numbered 42—on the other hand, were all very small—in first skin. They fed up very slowly, and were distinctly undersized when the first pupated on October 12th. The rest followed at intervals, until the 20th, nearly a third of them died during the process of changing. All the larvæ of this brood were wholly black, there being no trace of the usual yellow markings. Several of the pupæ changed colour on November 16th, and on the morning of the 18th it was observed that dehiscence had taken place in the usual manner, but all the imgaines failed to emerge. They only succeeded in freeing the head and antennæ, the back of the thorax, the first—and rarely the second—pair of legs, and in one instance only, the left fore-wing. The larvæ and pupæ were kept in a basement apartment without a fire, but where it is always considerably warmer than out of doors. (A small number of larvæ of *Pyrameis atalanta* were reared side by side with them, and these all produced imagines in due time, some emerging as late as November 3rd. No doubt a second brood !). The next morning the remaining pupæ were placed in the greenhouse in the sun, where the temperature stood at 65° to 70° Fah. during several hours in the middle of the day. Here others attempted to emerge with slightly more success, but as none were able to withdraw the abdomen from the pupa-case, the wings only partially expanded, and, of course, all were hopelessly crippled. As several of the pupæ which were left seemed to be alive, the cage was brought into the kitchen on the morning of the 20th, and placed close to the fire ; the thermometer in the cage showing a fairly constant temperature of 80° to 85° Fah. during the day, and, I think, it did not sink below 75° Fah. during the night. After five hours of this (at 3 p.m.) a practically perfect imago emerged. It evidently had had considerable difficulty in freeing itself from the pupa-case, as all the wings are slightly rubbed. No more emerged on that day, but another emerged at about the same hour on the 21st. This is, however, less perfect than the above, the right hind-wing being imperfectly developed both in size and colour. The red ground-colour is very dingy in both specimens, and the blue marginal spots are nearly obliterated. They are otherwise typical in markings, but, of course, rather undersized, the first being $1\frac{3}{4}$ in., and the second $1\frac{5}{8}$ in. in expanse, and both present a very starved appearance. This cannot be from lack of food in the larval stage, as special care was taken that the supply was both fresh and abundant ; neither does cold seem sufficient to explain why the imagines—although fully formed within the pupa-case—failed to emerge, even when placed in the sun. It is true that two specimens

did succeed in emerging when exposed artificially to a much higher temperature than that to which it is probable even the summer brood is exposed in a state of nature in this country, and, perhaps, if heat had been applied to the pupæ earlier, the whole brood would have emerged successfully.

But the numerous experiments which have been conducted with the present species, show conclusively that it is able to withstand a much greater amount of cold than this particular brood was subjected to at any time. To quote only one or two, Weismann* records that a number of eggs and small larvæ were found on July 6th; a portion of these were reared throughout in a cellar at a temperature of 15°C. (59° Fah.). Pupation began on August 7th, and the butterflies emerged on August 27th and 29th. It is not recorded that any of the imagines failed to emerge, or were otherwise injured by the low temperature. Standfuss† says that pupæ kept in a refrigerator for 32 days, produced imagines after being 9-10 days in a room at normal temperature. Further, that pupæ were kept upon ice for no less than 42 days, and these produced imagines after 13-14 days in the room.

These experiments show that the species is able to withstand a very considerable amount of cold without fatal result, and suggest that the direct action of cold could not have been the cause of failure in the present case. It is not improbable that there may be pathological influences of which little or nothing is at present known, and that very late—or otherwise abnormal—broods are more open to such than those which occur at the usual time, and under normal conditions.

It is remarkable that so little has been hitherto recorded of the third brood. Mr. Wolfe records the finding of larvæ in September at Skibbereen (*Ent. Rec.*, iv., 270), and Mr. Tutt received full-fed larvæ from Cambridge; these pupated at once, the imagines emerging during the second week in October. Another batch from Darlington were small, and did not produce imagines until October 20th-22nd (*Ibid*, p. 291).

Although these late broods are rarely observed in this country, they must be much more frequent—if not the rule—in the southern area of its distribution. A note by Mr. Tutt (*Ent. Rec.*, ix., p. 225) is very suggestive. He found larvæ abundantly at Digne in April. The earliest of these produced imagines on May 5th at Brighton, that is to say nearly five weeks earlier than the normal time of emergence in England.

Cannot entomologists who reside in the south of Europe—and are thus able to observe the species throughout the year—give us a little information? It is curious that nearly all authors (with the exception of Tutt, *Brit. Butts.*, p. 339) ignore the existence of a third brood altogether, and are by no means agreed in respect to the other two. A few notes may be instructive. Newman was aware that the species sometimes occurred very late, for after quoting a note by Mr. Doubleday, he says, "Thus there are evidently two broods in the year, and June and September may be given as the dates for their appearance. Some of the second brood remain until October in the chrysalid state, and Mr. Clogg has observed the emergence of specimens on the 22nd and 25th of December" (*Brit. Butts.*, p. 54). It is

* *Entomologist*, xxix., pp. 174-175. † *Ibid*, xxviii., p. 107.

remarkable that so acute an observer failed to connect these latter with a third brood, but, at the time Newman wrote there seems to have been a doubt if the species was really double-brooded even. Barrett says, "Double-brooded, the first generation emerging in the middle of June, the second in August and September" (*Brit. Lepid.*, i., p. 133). Kirby says, "The larvæ live gregariously on nettles in June and July" (*Europ. Butt. and Moths*, p. 12). This statement is most remarkable, as it suggests that the species has but one brood in the year. In his latest work, he dismisses the species with the very general remark that "it hybernates, and has a succession of broods" (*Butterflies*, i., p. 90). It is not stated, however, if this refers to the British Islands only, or to its whole area of distribution. Hofmann, speaking of the larva, says, "in June and August. The butterfly appearing in 14 days" (*Die Raupen Schmett. Europas*, p. 14). This is about the usual time in this country, but cannot be the rule in the south of Europe, where we have seen the larva is often nearly full-fed in April.

The British Liparid Moths.

By A. BACOT.

(*Continued from* p. 31.)

Larvæ: Generalised characters.—The following are the most generalised characters to be found in the larvæ of the Liparid moths: 1.—*Eversible glands.*—These occur after the first moult, on the dorsal area of the 6th and 7th abdominal segments of all the British species except *Dasychira pudibunda*; in this species only one eversible is present, namely, that on the 7th abdominal segment. 2.—*Greater prominence and size of posterior trapezoidal tubercles* (Dyar's ii).—The anterior pair (Dyar's i) are, as a rule, much smaller than ii, and in certain species are only discoverable after careful search. 3.—*Great prominence and size of sub-dorsal or pre-spiracular tubercles on pro-thorax.*—These ear-tubercles, as I have usually called them, are very striking. This feature is also noticeable in the early stages of some Lasiocampid larvæ. 4.—*Shape in 1st stage.*—In 1st stage all the larvæ are short, flattened, and square-ended, the incision of the segments being very distinct. 5.—*The weakness of certain segments.*—Most of the species have certain segments weak. These are usually one or more of the following: 2nd and 3rd thoracic, and 4th and 5th abdominal. Weak segments are also characteristic of the genus *Acronycta*, in its wider sense (see Dr. Chapman's paper in *Entom. Record*, vols. i.-iv.). 6.—*The hairs of all the species are thorny, branched, or plumose.*—Hairs of this character are common to many species of lepidopterous larvæ.

Larvæ of Psilura monacha and Ocneria dispar.—1st stage, dark coloured; anterior trapezoidals very small, bearing one small hair only; posterior large, bearing numerous hairs. In *P. monacha* the meta-thorax is weak, and bears smaller tubercles than other segments; this does not apply to *O. dispar*. Both species bear hairs of two different kinds: (1) Short spines with slight traces of thorns, and a bulbous swelling about $\frac{1}{3}$ up from base; the single hair on anterior trapezoidals is of this character. (2) Long and more slender hairs, many of them very thorny. Messrs. Forbush and Fernald, in their monograph of the Gipsy moth, consider that these bulbed or balloon

hairs serve to buoy up the larva when it drops on a thread, and allow of its floating to a greater distance than it otherwise could. They are not present in the larvæ of any other British Liparids, and the only other larvæ that I am acquainted with, in which similar hairs occur, are those of *Lithosia complana* and *L. griseola*. The bulbs on the hairs of these species are, however, not so well developed as in *P. monacha* and *O. dispar*, and are not attained until *after* the 1st moult. It is also significant that in their 1st skins the tubercles of *L. complana* and *L. griseola* are single-haired, whereas, after the moult, the arrangement of hairs corresponds closely with that of *P. monacha* and *O. dispar*, the anterior trapezoidals being single-haired, and the posterior many-haired. After the first moult, both *P. monacha* and *O. dispar* lose these bulbed hairs. The anterior trapezoidals are, if anything, smaller, relatively to the posterior ones, than before; they, however, bear several weak hairs instead of one. In addition to the large eversible glands, *P. monacha* and *O. dispar* have a small yellow gland on either side of the medio-dorsal band, on each of the 1st to 4th abdominal segments. These are very similar in appearance to the eversible glands, but are much smaller and relatively taller. I have not observed any movement of these glands, such as takes place in the latter. In their later stages, there are practically no structural alterations of any moment, and the larvæ are so well known that it seems unnecessary to describe them in detail. *P. monacha* larvæ, when young, are probably protected by their resemblance to a bird's dropping, and in their later stages by their lichen-like coloration. The larva of *O. dispar*, though far from noticeable on rough bark, has, at close quarters, a repulsive appearance, and hardly suggests an appetising morsel, even to a bird.

Leucoma salicis.—1st stage, dark coloured, tapering slightly from head to anus. I have not succeeded in tracing the anterior trapezoidals in this skin; they are probably present in some larvæ, at any rate, as I have found them in a few larvæ in later stages, but they were exceedingly minute. The posterior trapezoidals and lateral tubercles are large and well developed, bearing numerous hairs; pale spots are present where the dorsal glands are afterwards developed. The larva spins leaves together, and feeds between them in this stage. A slight cocoon is spun, in which to undergo the moult; in later stages this is usually spun in a crevice of the bark. 2nd stage: The head is relatively smaller, and the larva, after feeding, is somewhat slug-shaped. A pale dorsal band is present, in the centre of which is a narrow black streak, both band and line being interrupted on pro-thorax, 1st, 2nd, 6th and 7th abdominal segments. In addition to the usual eversible glands, *L. salicis* possesses a pair of small, round, flask-shaped glands, placed close together near the centre of 1st and 2nd abdominal segments. In later stages a drop of clear viscous-looking fluid is exuded from the top of these glands. The larvæ endeavour to roll in a ring if disturbed. In the 3rd skin considerable variation in colour occurs, some larvæ being almost entirely black, while others have the white dorsal band well developed. 4th skin: The larvæ now attain their well-known adult coloration, which Poulton considers to be a good example of warning coloration. One larva of a brood I reared in '96, possessed only one white dorsal spot, that on the meta-thorax and 1st abdominal segment, all the remaining spots of the chain being of the same tint as the ground-colour. In its last stage, this

larva had all the spots faintly marked, except that between the 2nd and 3rd thoracic segments.

Porthesia similis (auriflua).—1st stage, dull yellowish in colour. Tubercles large, bearing a number of long, stout, thorny, black hairs; 2nd and 3rd thoracic segments bear smaller tubercles than any of the others. The dorsal tubercles of 6th and 7th abdominal segments bear, in addition to other hairs, one very stout hair or bristle; these extra stout hairs slope towards centre of segment, their points, nearly or quite, meeting over the centre of segment. 2nd skin: In this stage the larva practically attains its adult coloration. Dorsal hairs are black, lateral hairs white. The 1st abdominal segment bears a hump, and the 2nd a slight one. The tubercles (? posterior trapezoidals) on 1st abdominal are very large and close together; they bear, in addition to the long hairs, a stiff short brush or tuft of thorny black hairs, and a few pure white branched hairs thickly covered with slender thorns, giving them a furry appearance. The branches, taken separately, remind me of nothing so much as a white cat's tail. Tubercles on the 2nd abdominal also bear a few of these white branched hairs, and in some larvæ they are present on other segments as well. 3rd skin: This differs but slightly from the previous stage. The orange deepens into scarlet, and the white plumed (cat's tail) hairs are more numerous on 1st, 2nd and 8th abdominal segments, and a few are present on the tubercles of other segments. There is no change, of which I am aware, in the later stages, save that the white plumed hairs become more numerous, and the colours, if possible, more brilliant. A pad of silk is spun on which the larvæ rest when about to moult. The eversible glands are very active in these larvæ, and are far more frequently seen in operation than is the case in *P. monacha*, *O. dispar* and *L. salicis*. The urticating hairs are very similar to those of *P. chrysorrhoea*.

(*To be continued.*)

On a New Classification of the Rhopalocera.

By ENZIO REUTER, Ph. D.

(*Continued from p.* 26.)

Starting from the primitive type of basalfleck as previously defined, we can, within the different gentes and families, trace out various lines of development. It would occupy too much space to describe all these in detail. I will, therefore, give only a few general sketches of the modifications that the basalfleck undergoes in its change from a generalised, to a more or less specialised, condition.

The basalfleck itself often tends to become diminished, in its most modified forms (in some *Satyridae* and more frequently in the *Nymphalidae*), by being reduced to a rather small space on the hind and upper angle of the inner side of the basal joint (Pl. I., fig. 4). The distal end usually becomes rounded, or well-defined transversely by regularly arranged scales, and the hind border of the basal-fleck, which, in the *Papilionidae*, *Pieridae*, and in most of the *Lycaenidae* and *Erycinidae*, is continued immediately backwards (fig. 9) upon the hind, tapering part of the basal joint (which may be called the "shaft" of the palpus), so that the hind part of the basal-fleck passes over to, and is continued upon, the "shaft" of the palpus, is no longer so continued. In the more specialised families, then, the hind part of the

basal-fleck is not continued upon the shaft, this being quite excluded from the area occupied by the basal-fleck, and is, indeed, more or less distinctly separated from the hind border of the latter by a fold (fig. 8). Thus, a reduction of the basal-fleck takes place in the more specialised families.

The differentiation of the structure of the basal-fleck always begins with a reduction of size and number of the distal, or, in general, the peripheral cones; the proximal ones (ordinarily standing closest together) become, on the other hand, more highly developed (fig. 7). In consequence of this, the form of the area, occupied by the cones, undergoes many changes. In the less modified members of several groups it represents a wide cuneiform, or somewhat gradually tapering, area, along the middle of the proximal, and widest, portion of the basal-fleck (Pl. I., fig. 1). A further reduction of the distal cones and an increase in the size of the proximal ones lead to a still greater contrast between them, the result often being an entire obliteration of the former, while the latter only remain; the area itself is, in this case, though variable in shape, generally well and distinctly defined.

At the same time, the proximal part of the basal-fleck, which on the whole exhibits a high degree of plasticity, often becomes more or less distinctly swollen. This swelling, in the various groups of Rhopalocera, is dissimilar in form, and presents varying degrees of development, frequently, as in the more specialised members of the *Danaidinae*, *Morphinae* and *Nymphalinae*, being very strongly differentiated and conspicuous, and occupying almost entirely the basal-fleck area (Pl. I., figs. 2-4). Sometimes, as in the *Lycaenidae*, the process of differentiation gives rise, not to a swelling, but to a transparent area, which is often very sharply defined, and as clear as water (fig. 5.) Now and then a secondary reduction of the swelling takes place, but after this the swelling is never re-developed.

Where a swelling has been strongly developed (even though afterwards reduced), and the distal cones obliterated, as, for instance, in the more specialised *Danaidinae*, *Morphinae*, *Brassolinae*, and, above all, in the higher *Nymphalinae*, the proximal cones, restricted to the swelling only, often attain a very high degree of development, being robust, and somewhat curved in shape, sometimes regularly arranged in parallel form, and directed upwards. Rarely, as in *Euselasia* and *Methonella*, the process of reduction, beginning with the distal cones, results also in the entire disappearance of the proximal ones. The pits, few in number, situated on the middle or distal half of the basal-fleck, sometimes (in some *Nymphalinae*) enter into the distal portion of the swelling, but, being concealed by the overrunning cones, are then rather difficult to detect.

We find, thus, that all the gentes in their least modified, *i.e.*, in their lowest, members, differ slightly from the primitive type described above, and also from each other. From this type different lines of development proceed, diverging more and more, and often leading, in the most specialised branches of the different gentes, to very dissimilar forms, unless a secondary convergent process of differentiation has taken place, as is sometimes the case. Another very remarkable fact connected with that just stated, is, that the extremes, *i.e.*, the most specialised and the most generalised forms of the *same* gens, differ, on the whole, much more strongly from each other than do the most primitive

members of the *different* gentes between themselves. This fact indicates that the process of differentiation is (1) to a great extent, brought about within the range of the gens itself, and (2) exhibits, in this respect, a very high degree of energy; the energy, however, being unequally strong in the different gentes.

Notwithstanding these divergences in the various gentes, some remarkable parallels exist in the process of differentiation, one of them consisting, as we have seen, in an obvious tendency to the obliteration of the distal and the peripheral cones, and, at the same time, to the further development of the proximal ones. Another parallel that also takes place independently in the different gentes, is the general tendency for a proximal swelling to be differentiated. It is also a very noticeable fact that this condition of things occurs, so far as I am aware, neither in the *Heterocera**—at least, not having the same significance—nor in the *Hesperidae*, generally referred to the Rhopalocera, but exclusively in the gentes of the remaining or true Rhopalocera, and in every one of them.

In my work, quoted above, I have pointed out that each different gens of the true Rhopalocera is referable to a similar primitive and fixed type, not only with regard to the structure of the basal-fleck and the scale-covering of the palpi, but also in several other characters of moderately great taxonomic value; further, that these gentes also exhibit certain parallels in the differentiation of other characters, being, so to say, directed by a similar tendency. Such parallels occur, likewise, only in the true Rhopalocera. These facts indicate that the gentes of the true Rhopalocera (to which I do not refer the *Hesperidae*) have a common origin, a conclusion which is confirmed by several other characters discussed in my work. In these parallels we find an illustration of the statement made by Chapman, that "of similar structural developments taking place independently in different families, the common inheritance is not of the structure itself, but of a tendency, or at least a capacity, to develop it."† We can, further, conclude that the different gentes, originally standing comparatively close to each other—as they all descend from the same primitive type—very early, *i.e.*, long before the specific characters had become differentiated in any of them, had taken an independent line of development. In consequence of this, it may be considered that the different gentes, if not simultaneously, at least shortly after one another, have branched off from the common stem.

(*To be concluded*).

* In the genus *Castnia*, the basal-fleck appears to be slightly swollen. This swelling, however, cannot be directly compared with those of any Rhopalocerous group.

† "Notes on Butterfly Pupæ, with some remarks on the Phylogenesis of the Rhopalocera," *Entom. Record*, vol. vi., No. 6, 1895, p. 130.

PRACTICAL HINTS.

Field Work for March and April.

By J. W. TUTT, F.E.S.

1.—The sickly-looking plants of dock and sorrel found along the slopes of Folkestone Warren, on the sea-face of the cliffs, give larvæ of *Sesia chrysidiformis* in early April. The presence of a larva may be readily discovered by the mines and frass in the root-stocks. Plant

again the roots dug up which do not produce the desired larvæ, as such disturbed roots are always productive the next year. Plant the affected roots in a fern case; water well, and keep in sun.

2.—The end of March and early April is the time to beat pines for the larvæ of *Thera variata* and *Ellopia prosapiaria (fasciaria)*.

3.—At Penmaenmaur, in early April, the full-fed larvæ of *Agrotis ashworthii* are to be found (Porritt).

4.—In early April, rake the sand at the roots of marram grass for larvæ of *Leucania littoralis*.

5.—The larvæ of *Dasychira fascelina* are to be obtained on dwarf sallows, on the coast sandhills of Lancashire (and probably elsewhere), in early April.

6.—The larvæ of *Cirrhoedia xerampelina* can be found in March and April, with a lantern, feeding at night on the blossoms of ash.

7.—The cage in which the larvæ of *Trichiura crataegi* are kept, should be placed where the morning sun can shine upon it, as they love to bask in the sunshine.

8.—During the last week of March and first week of April, search for the cocoons of *Apamea unanimis*, in the stems of thistles or under the bark of willow trees.

9.—The first week in April is the time to sweep *Erica cinerea* for larvæ of *Agrotis agathina*. This should be done by night or in the early morning. The larvæ should be fed on *Erica cinerea* or *E. tetralix*.

10.—In March and April, the alder trunks should be carefully scanned for the cocoons of *Cerura bicuspis*.

11.—This is a good time for beating. All the larvæ (mentioned by me last month, p. 50) may still be obtained, and from stunted alders and larches may be beaten larvæ of *Geometra papilionaria*. Oaks will yield larvæ of *Boarmia roboraria*, *Phorodesma pustulata* and *Hylophila quercana*. Sallows will yield young larvæ of *Trichiura crataegi* and *Poecilocampa populi*, and, very rarely, of *Apatura iris*. The lowest and most unpromising-looking bushes are often productive of these larvæ (Moberly).

12.—The imagines of *Stigmonota leplastriana* may be bred from stems of wild cabbage, collected in April. They are to be detected by the little heaps of brownish frass sticking out of the new shoots and leaf stalks.

13.—The larvæ of *Aydistis bennettii* feed on the leaves of sea-lavender in April and May (and again in July). The large pieces eaten out of the leaves are a good guide as to their whereabouts.

14.—The larva of *Colcophora juncicolella*, in its little brown case, as also that of *C. pyrrhulipennella*, are to be obtained by beating heather into an umbrella, in March or April. Place the *débris* in a hatbox with close muslin top.

15.—The larvæ of *Lampronia praelatella* should be collected in early April from wild strawberry.

16.—To obtain the cases of *Psyche villosella*, I search, during the months of March and April, the trunks of fir trees. The cases are generally to be found from one to two feet from the ground. This appears to be the favourite position taken up for pupation. They are also to be obtained from the ends of twigs of *Ulex europaeus* (Fowler).

17.—The larva of *Tortrix teucriana* is to be found in March and April, in rolled-up leaves of *Teucrium scorodonia*, in Folkestone Warren.

18.—Roots of *Stachys sylvatica*, collected in March, give imagines of *Ephippiphora nigricostana*, in June and July.

19.—The larva of *Retinia buoliana* feeds on the young buds and shoots of firs, in the early spring, eating out the entire centre of the shoot.

20.—The larva of *Retinia sylvestrana* feeds in the shoots of stone-pine (*Pinus picea*) and other pines, in March and April. It may be detected by the pellet of frass which is ejected from the tunnel by the larva, and which remains attached outside.

21.—In April, the shoots of Scotch fir should be collected for the pupæ of *Retinia turionana*. A shoot containing a pupa does not commence to grow in the spring, and can thus be readily distinguished.

22.—The larvæ of *Grapholitha geminana*, *Peronea caledoniana* and *Penthina sauciana* feed in spring in the tops of bilberry (*Vaccinium myrtillus*), the tops being sometimes quite blighted by the larvæ.

23.—The seedheads of teasel should be gathered in March and April, and put into bandboxes. The imagines of *Penthina gentianana* will emerge without further trouble.

24.—In March and April, collect sallow catkins for larvæ of *Grapholitha nisella*.

25.—The larva of *Tortrix forsterana* is common in gardens in March and April, between ivy leaves fastened one upon the other.

26.—Larvæ of *Œcophora unitella* (*fuscoaurella*) have been found in April, under the decaying bark of elm.

N.B.—For series of similar hints for the same time of the year refer to vol. ix., pp. 67-68, vol. iv., pp. 78-79, and vol. ii., pp. 44-45.

NOTES ON COLLECTING, Etc.

Winter emergence of Abraxas grossulariata.—Last October, I procured many young larvæ of *Abraxas grossulariata*, from a currant bush, from which most of the leaves had fallen. The larvæ were placed in a breeding-cage, and all hybernated with the exception of one solitary example, which ate greedily, pupated in November, and emerged on December 20th. The only difference I can find, on comparison with the ordinary specimens, is an almost complete absence of yellow scales on the fore-wings.—Hubert C. Phillips, M.R.C.S., F.E.S., 85, Shirland Gardens, Paddington, W.

Early emergences.—So mild has been the present winter until now, that we are not surprised at many moths emerging from the chrysalis before their usual date. But some have put in an appearance with me extraordinarily out of time. In the middle of January, *Cabera exanthemaria*, whose usual assumption of the winged state is seldom earlier than May, began to emerge from pupæ kept in a living room, without any attempt at forcing; and before the end of the month, five or six had appeared in perfect condition, as well as *Smerinthus tiliae*, *Phigalia pedaria*, and *Eriogaster lanestris*. The two latter are, of course, expected with the advent of February; but *S. tiliae* and *C. exanthemaria* seem to have broken the record.—J. Merrin, Gloster. *February* 1st, 1898.

Notes of 1897 (Contd. from p. 53).—*Orton*.—Some few things, *e.g.*, *Callimorpha hera* and *Zephyrus quercûs*, were unusually abundant. Sugaring in this neighbourhood one evening in August, with Mr. Bower, produced *Caradrina ambigua* freely, with *Agrotis vestigialis* and *A.*

tritici sparingly. The insects of the year were undoubtedly *Clisiocampa neustria* and *Poecilocampa populi*. I found larvæ of *Agrotis agathina* plentiful in spring, and tubbing them out as advised by Mr. Ash, in the *Record* (ix., p. 96), I bred a nice series. I also bred, thanks to the kindness of Dr. Riding and Mr. Bacot, a long series of *Tephrosia* hybrids—*bistortata* crossed with *crepuscularia* var. *delamerensis*—but, unfortunately, all were ♂ s, so I was unable to perpetuate the brood. Mr. Ash kindly sent me some larvæ of *Aplecta occulta*. Two or three of them were precocious, and fed up rapidly, and one emerged in my study on October 30th. Two or three more were then in pupa, but the rest are, I believe, hybernating, having disappeared in the cocoa-fibre. I fed, and am feeding, them on knot-grass. I have tried one or two days' pupa-digging, but the results have been practically *nil*. This is never a good locality for digging, but I never found pupæ so scarce before, not even common Tæniocampids turning up at favourite trees. I took two *Hypenodes costaestrigalis* here at sugar in autumn, a new insect to me. A visit to Sidmouth on August 4th, after *Thymelicus actaeon*, was a failure, only a few worn specimens being seen. I got, however, a nice example of the second brood of *Leucophasia sinapis*, and a good series of *Melanargia galathea*, including one very fair ♀ of a rich cream colour. *Zygaena filipendulae* was out in swarms, lots of ♂ *Lasiocampa quercûs* flying about, and we saw one *Colias edusa*, and a butterfly which we could not determine, though we got close to it, but failed to catch it. I get both *Cheimatobia boreata* and *C. brumata* here. The ♂ s are quite distinct, and very easily distinguished at a glance by anyone who knows both species. The ♀ s are, no doubt, more difficult, but, I believe, the ♀ of *C. boreata* always has more ample and also more rounded wings. The ♀ s of *C. brumata* certainly vary much *inter se* in size and shape, but I do not think they ever quite come up to *C. boreata* in wing development. Owing possibly to the very mild weather, I have *Hadena pisi* emerging now from pupæ kept in my study, and bred in November *Noctua rubi*, *Pachnobia rubricosa*, and several male and female *Larentia multistrigaria;* the two latter species from ova of females taken here last spring.—E. F. Studd, M.A., B.C.L., F.E.S., Oxton, Exeter.

Rannoch.—I spent the first ten days of May, 1897, at Rannoch with Mr. Reid. Unfortunately, the weather was unfavourable for successful day work. It was surprising to watch how eagerly *Anarta melanopa* took advantage of every little gleam of sunshine; every time the sun's rays fell on our bait we were sure to find a few specimens. We had a lot of weary waiting, and some days did not get a glimpse of the sun at all. However, we utilised the time in searching for pupæ of *Psodos trepidaria*, and in finding which I was fairly successful. It does not appear to be generally known that this insect, like *Retinia resinana*, appears only every alternate year in the perfect state. I should like to know if it has the same habit in other countries. We found no trace of *Pachnobia alpina; Anarta cordigera* darted about here and there—usually *there*, when I tried to net them. They inhabited lower regions than *A. melanopa*, and were not so local. *Fidonia carbonaria* were not uncommon in similar places, but they had seen the light of other days, and I only managed to get a few really fine specimens. Sugar was an utter failure, only a solitary *Hadena adusta* turned up. Larvæ of *F. brunneata (pinetaria)* were common and easy to rear. *Aplecta occulta* and *A. tincta* were also to be had rather freely in the

larval state, but they are difficult to rear; the result in imagines was very disappointing. I may here remark how very "spotty" insects are at Rannoch. If it had not been for my friend's able guidance, I should have had even less to record.—A. Horne, F.E.S., Ugie Bank, Beaconsfield Road, Aberdeen, N.B.

South-west Scotland.—The season of 1897, in the west of Scotland, was a very disappointing one; especially the autumn months, when, from the beginning of August till the end of the season, Lepidoptera were very scarce and difficult to obtain. The spring produced *Phigalia pedaria* and *Hybernia marginaria* a little earlier than usual, as on February 20th, I boxed ten specimens of the former in the Johnstone Castle Woods, while ♀ s of the latter might have been taken plentifully from the trunks of the oaks; but very few ♂ s were to be seen on the wing in the evening; a fine specimen of *Asinopteryx aescularia* was also captured. On March 8th, at the same place, I boxed a freshly emerged *C. flavicornis*, whilst *P. pedaria* and *H. marginaria* were still in evidence. *Tortricodes hyemana* was beginning to appear, but it simply swarmed on the 20th. During April and May, I did very little out-door collecting; the evenings were wretchedly cold, and a strong east wind prevailed during the greater part of both these months. I set, however, a nice lot of *Eupithecia helveticata* reared from larvæ obtained the previous autumn. The first specimen emerged on April 3rd, and the last on May 23rd. On May 15th, I bred a fine full-sized specimen of *Plusia bractea*, the sole survivor of a large brood I had the previous year, and which were carried successfully through the winter; but immediately they commenced to feed up, mortality set in at an amazing rate from diarrhœa (or some such cause), and my expectations at rearing a nice series received a sudden check, when I found myself with a solitary larva doing duty to the fresh supply of food (given as directed twice daily). Towards the end of the month, *E. pulchellata* commenced to emerge in my breeding-cage, and a single specimen of *Drepana falcataria*, on the 23rd. On that day I ran up to Arrochar with the hope of obtaining a few *Scopula decrepitalis*. The day was fine and bright, but a cold east wind was sweeping the hillside, and the result of my journey was one. June brought about a desirable change, the climatic conditions being much more favourable for collecting, and insects could then be taken in numbers. On the 12th I visited the Waas Hill, in Renfrewshire, with my friend Mr. Stewart, of Kilbarchan. We each obtained some nice specimens of *Larentia salicata*, *E. satyrata* var. *callunaria*, *C. rusticana*, while *Ematurga atomaria* and *Eupithecia nanata* were in abundance. Mr. Stewart boxed a fine ♀ *Saturnia paronia*, which was sunning itself on the heather. A week later, at Gourock, I obtained a fine lot of *Larentia salicata*, and a few *Coremia ferrugata*. *Hepialus velleda* appeared at Possil Marsh on the 22nd, where also *Apamea basilinea*, *Xylophasia rurea* (some very dark forms), and *Dicrorhampha herbosana*, could be taken abundantly. On the 22nd I revisited Gourock. *Pieris napi* and *Coenonympha pamphilus* were very common, and a specimen of *Chrysophanus phlaeas* was netted. *C. ferrugata*, *E. nanata*, and *E. satyrata* were still on the wing. Single specimens of *Amphidasys betularia*, *Hadena dentina*, *Spilosoma menthastri*, and a couple of *H. velleda* were boxed from walls. *Mixodia schultziana* was common at dusk, as was also *Elachista rhynchosporella*, and one specimen of *Coccyx vacciniana* was captured. On the 26th, I had an afternoon at Bishopton, and took

Thera variata, *Eupithecia indigata*, *E. vulgata*, *Cabera pusaria*, *Phycis carbonariella*, *Phoxopteryx unguicana*, *Gelechia confinis*, and a single specimen of *Anarta myrtilli*. During July, I spent the week ends, and a few extra days at the fair time, at Glen Mallan, Loch Long. The butterflies observed there were *C. pamphilus*, in abundance ; the three common whites occasionally, *Brenthis selene* and *Polyommatus icarus* were also in evidence. A couple of *C. darus* fell to the net, and a fine specimen of *Argynnis aglaia* did not. *H. velleda*, *H. hectus* and *H. sylvinus* could be taken freely. *Lasiocampa quercus* var. *callunae* and *L. rubi* were often seen, and a few of the latter were obtained drying their wings suspended from their cocoons, having just emerged ; while several large ♀ s of the former were picked up at rest on the heather. Single specimens of *D. falcataria* and *Lophopteryx camelina* were dislodged from birches, and two or three *Cymatophora duplaris* in the same manner. *Triaena psi* was taken at rest on a tree-trunk. *Noctua festiva*, *Apamea gemina* and *Xylophasia rurea* came to sugar. *Lycophotia strigula* occurred commonly flying over the heather in the evening. *Chortodes arcuosa* and *Leucania impura* amongst rushes; and *Euclidia mi* and *Phytometra viridaria* still lingered on the hillside. I spent a whole forenoon making several suicidal attempts to procure *Plusia interrogationis* in its wild flight over the broken ground, and was rewarded after much exertion in taking some seven or eight nice specimens. Two or three *P. pulchrina* were taken at rest during the daytime ; a single *P. iota*, which had wandered into the house, was discovered reposing on a curtain, and consigned to a pill-box. Of the Geometrids I took a long list, though nothing startling. Some very pretty reddish forms of *Melanippe montanata* occurred at a high elevation. *Cabera pusaria*, *Metrocampa margaritata*, *Boarmia repandata*, *Melanthia ocellata*, *Camptogramma bilineata* and *Cidaria pyraliata* were prolific by the road-side. *Larentia caesiata*, *L. salicata*, *Coremia munitata*, *Cidaria russata*, *C. immanata* and *Anaitis plagiata*, could all be taken from the rocks on the hills. *Acidalia fumata* and *Emmelesia blandiata* were very local, being taken at a spot far up the glen. *Larentia pectinitaria*, *Eupithecia nanata* and *Hypsipetes elutata*, on the heathery slopes. *Melanthia bicolorata* (*rubiginata*) and a few of the ab. *plumbata*, wherever there were alders. *Halia wavaria*, *Cidaria prunata*, *Eupithecia assimilata* and *Cidaria fulvata*, in the garden. *Acidalia aversata*, *Coremia designata* and *Larentia olivata* turned up occasionally ; and *Venusia cambricaria*, *Cidaria silaceata* and *Eupithecia pulchellata*, singly. The Pyralids were represented by *Scoparia ambigualis*, *S. dubitalis*, *Botys fuscalis*, all common ; *Scopula oliralis* and *Pyrausta purpuralis* in lesser numbers. Of the Crambites—*Crambus pascuellus*, *C. pratellus*, *C. culmellus* and *C. hortuellus* occurred numerously, and *C. pinetellus* singly. Collecting round Glasgow during the month, principally at Crookston, resulted in *H. velleda* being taken in quantity, with a few of the ab. *carnus*. There seems to be a decided falling off of this aberration in the district the last year or two. *Leucania conigera* and *Plusia festucae* occurred rather commonly one evening, and a few *Orthotaenia antiquana* and *Ephippiphora inopiana*. The afternoon of the 31st, at Gourock, produced a nice lot of *L. olivata*, *Dasydia obfuscata* (a couple), about a dozen *Carsia imbutata*, and several *C. immanata*, *L. caesiata*, *Tortrix viburniana* and *Pamplusia monticolana*. My holidays were spent with my brother at Ballantrae, South Ayrshire. The weather was anything but congenial, and especially so for col-

lecting purposes, as almost all the evenings were exceptionally cold, with a bright poetical moon shining overhead. I am not a poet, therefore the moon might have been dispensed with to the advantage of obtaining more insects. Sugaring was tried almost every evening, but nothing but the common and vulgar herd ventured forth to revel at the feast, which resulted in the majority being allowed to drink their full—*Xylophasia monoglypha*, *Triphaena pronuba*, and *Noctua xanthographa*, as a matter of course, were there. *Amphipyra tragopogonis*, *Agrotis nigricans*, *Luperina testacea*, *Naenia typica*, *Miana fasciuncula*, and *Apamea didyma* (*oculea*) did not forget to present themselves. Half a dozen fine specimens of *Mania maura* were discovered, and boxed, while carousing at the sweets. This last I was very much elated at having taken for the first time, and also in consequence of their being very richly coloured specimens. *L. conigera*, *M. literosa* and *M. furuncula* were taken from the ragwort. A few specimens of *Polia chi* were observed on the walls. *Hipparchia semele* was common at Bennane Head, flying about the roadside. *Epinephele janira* and a few *Polyommatus icarus* also occurred there. *Pyrameis atalanta* and *Aglais urticae* were sometimes observed flying about the weeds by the banks of the river. *Eubolia mensuraria* was everywhere abundant. *Emmelesia affinitata* was also plentiful, but in very poor condition. *Acidalia bisetata*, *Melanippe sociata*, *C. fulvata*, and *C. immanata* could also be taken. In September, I took about two dozen *Phibalapteryx lapidata*, the result of four separate journeys for it to both the Kilsyth and Lanarkshire Hills, also a single specimen of *Celaena haworthii*; *Tapinostola fulva* was not uncommon on one or two of these evenings at Bridge-of-Weir, towards the end of the month. *Chesias spartiata* was exceptionally common; and there, also, I took several *Anchocelis litura*, *Plusia gamma*, and *C. phlaeas*. During October, I made a bold endeavour to improve my series of *Oporabias*, but, though I saw the insects in plenty, the wind prevented my taking many. I managed a few on the 2nd and 9th. On November 6th, I took a few *Cheimatobia brumata*, *C. boreata* (one), and a single *Oporabia dilutata*, at Milngavie, and there ended my year's collecting.—Andrew Adie Dalglish, 21, Princes Street, Pollokshields, Glasgow.

Orkney.—On the whole, collecting in Orkney was not a success last season, and treacle was a failure. I have never seen the Noctuids so scarce as they then were; even *Xylophasia rurea* and *Mamestra brassicae* were rarely seen. Geometrids, on the other hand, have been fairly well represented. I have taken one or two good aberrations of *Melanippe montanata* and *Coremia munitata*, also the Shetland form of *Cidaria immanata*. I bred two or three of what appear to be very like the Shetland *Noctua conflua* (the wings are perhaps scarcely so narrow), from larvæ found on whin. I captured the first *Hepialus velleda* that I have seen in Orkney, this season, in Hoy, at the top of one of the crags, about 1,200 feet above the level of the sea. Does not Newman say they swarm at Stromness? I have never seen them. I bred a nice series of *Nemeophila plantaginis* this spring, from larvæ found on the hills around Stromness. Between sixty and seventy emerged; only one of the ab. *hospita* among the lot. Taken as a whole, I notice they are much darker than those from the south, the light ground colour being much more broken up.—E. M. Cheesman, Stromness.

Prestbury, Tenby and Milford.—Last season was doubtless the worst I have ever experienced, and, inland, sugar was an utter failure.

I obtained some nice aberrations of *Agrotis exclamationis* at Tenby during June, one having a long black bar across the upper wings; A few *A. ripae*, *Leucania littoralis*, *Mamestra albicolon*, *Miana strigilis*, *M. fasciuncula*, *A. corticea*, *Grammesia trigrammica*, etc., also put in an appearance. Day work produced *Plebeius aegon* (fine, just out), *Macroglossa stellatarum*, *Spilosoma mendica* ♀ and *S. urticae*; the last, taken by Mr. Graves, laid a few eggs. I also saw *Pyrameis cardui*, *Eupithecia oblongata*, etc. I was at Swansea in March and April, and everything was scarce except *E. abbreviata*, which swarmed on the oak trees. I could have taken 500 on some days. I only got 2 or 3 black *Tephrosia bistortata*. I was at Milford Haven during May, but did not have much time for entomology, and there did not seem to be much about. I saw a few *Anaitis plagiata* and *Aspilates citraria* inside the forts, and hundreds of nests of *Clisiocampa neustria* on the blackthorn bushes on the cliffs outside the forts; they were young when I left, but later on they must have simply stripped the bushes. When I came back to Cheltenham, in July, I went out on the hills around on every fine day with the Rev. E. H. Todd. We took a few *Argynnis aglaia*, *Arge galathea*, *Acidalia ornata*, *Melanippe procellata*, *Zygaena lonicerae*, *Thymelicus thaumas*, *Polyommatus astrarche*, whilst *Tanagra atrata*, *Eubolia bipunctaria*, *Ennychia cingulata*, and *Aciptilia tetradactyla* were common. I also took two or three *Hypochalcia ahenella*, *Polyommatus corydon*, *P. bellargus* (very scarce this year), *Pamphila sylvanus*, *Gonepteryx rhamni*, *Scotosia rhamnata*, *Epione apiciaria*, *Toxocampa pastinum*, and bred *Dianthoecia carpophaga*, *Eupithecia venosata*, *Triphosa dubitata*, and *Depressaria heracleana* (abundant). *Acidalia aversata* was pretty common in the Pitville Gardens in the town, but worn. I put some females up for eggs, and bred some beautiful banded aberrations, 2nd brood, also four *Timandra amataria* and *Acidalia bisetata*, 2nd brood. I now have larvæ of all three out in the open, hybernating. My moth-trap produced, during October, a few *Asteroscopus sphinx* (very pale compared with the Swansea ones); *Himera pennaria* and *Cidaria miata*. Such common things as *Oporabia dilutata*, *Hybernia defoliaria* and *H. aurantiaria* only put in an appearance occasionally. On November 20th, which was very mild, I went round the gas lamps, and took about thirty *Poecilocampa populi*, ♂s and one ♀, which has laid a lot of eggs. Mr. Todd and myself tried our luck at pupa-digging, my share being about 120, mostly species of *Taeniocampa* I am afraid, though there were a few *Smerinthus tiliae*, *S. populi*, *Cymatophora ocularis* (3), *P. populi* (since emerged), *S. ocellatus*, and *Pharetra megacephala*. I captured a pair of *Ennomos quercinaria* (*angularia*), *in cop.*, on August 17th, from which I have eggs, also a few *Catocala nupta* and *Polia flavicincta*, at rest. A pupa of *Acherontia atropos* was dug up in a garden in the town; this I tried to rear, but it died just before it ought to have emerged.—R. B. Robertson, The Priory, Prestbury, R.S.O., Gloucester.

Portland.—The few nights I spent at Portland, in July, were not satisfactory, except that, on one of them, I took five or six of that most uncertain species, *Agrotis simulans* (*pyrophila*)—little else, however. One night in September produced *Heliophobus hispidus*, but none of the other species which usually occur at that time, except one or two *Anchocelis lunosa*. The larvæ of *Euzophera cinerosella* and of *Chauliodus dauncellus* were both commoner than usual, and emerged well. I do not think that either of these species suffers much from ichneumons, if, indeed, there are any parasitic on them, in this neigh-

bourhood, and I have never bred one from *Cucullia absinthii*, with the larvæ of which I have had considerable experience.—N. M. Richardson, B.A., F.E.S., Monte Video, nr. Weymouth.

Castle Moreton.—The season of 1897 was very poor round here. I worked the sallows a little, and found *Taeniocampa opima* fairly plentiful. In May, *Leucophasia sinapis* was plentiful in the West Malvern woods, but the Geometrids ordinarily found there—*Selenia lunaria*, *Numeria pulveraria*, *Zonosoma omicronaria*, *Minoa murinata* (*euphorbiata*), *Acidalia remutata*, *Asthena candidata*, etc.—were scarce; whilst *Abraxas sylvata*, which sometimes swarms, was almost entirely absent. One afternoon, between 3 and 4 o'clock, *Eupithecia plumbeolata* was abundant. During June and July, sugar was an almost failure—*Aplecta advena*, a few *Agrotis exclamationis*, and a few common things were the only visitors. The absence of *Agrotis exclamationis*, in any quantity, was remarkable, because this species swarmed in many parts of the country this season. Geometrids were also scarce. *Nudaria mundana*, for a few nights, was very abundant; *Lithosia griseola* also turned up again this year. Autumn was terribly bad, and, although I sugared almost every night, I only took four *Epunda lutulenta*, and common things were only conspicuous by their absence. Light was absolutely useless, all through the season, in this district.—E. C. Dobrée Fox, M.A., Castle Moreton, Tewkesbury.

Acherontia atropos in Orkney.—I obtained a very good specimen of *Acherontia atropos* on September 3rd, which makes the third one I know to have been captured at Stromness. I am almost sure I saw a specimen of *Sphinx convolvuli* hovering over some flowers in the garden; however, I failed to net it, and although I kept a sharp look-out for it, it never came back.—E. M. Cheesman, Stromness.

CURRENT NOTES.

It is with the greatest regret that we have to inform our readers of the death of Mr. John N. Young, of Rotherham, on February 13th last, in his 67th year. He has been for very many years a keen and active lepidopterist, and was well-known, both personally and by correspondence, to many entomologists. He has recently been interesting himself in certain hereditary problems relating to the in-breeding of the various forms of *Spilosoma lubricipeda*, and other species. Of the specimens bred he exhibited a very large number, some 12 months ago, at one of the meetings of the South London Entomological Society. We understand that his son will continue the entomological work so ably carried on hitherto by his father.

We learn from a cutting from *The Western Morning News*, that Mr. G. C. Bignell, F.E.S., delivered, on January 20th last, an excellent lecture on "The Ichneumonidæ," at the Plymouth Institution.

The following Fellows have been elected as Officers and Council of the Entom. Soc. of London, for 1898:—President, Mr. R. Trimen, F.R.S.; Treasurer, Mr. R. McLachlan, F.R.S.; Secretaries, Mr. W. F. H. Blandford and Mr. F. Merrifield; Librarian, Mr. G. C. Champion; and as other members of the Council, Mr. W. Bateson, F.R.S., Dr. T. A. Chapman, Sir G. F. Hampson, Bart., Mr. M. Jacoby, Mr. A. H. Jones, Dr. P. B. Mason, Mr. O. Salvin, F.R.S., Mr. J. W. Tutt, Mr. G. H. Verrall, and Mr. C. O. Waterhouse. The President nominated as Vice-Presidents, Sir George Hampson, Mr. McLachlan and Mr. Verrall.

The following have been elected Officers of the South London Entomological Society for 1898 :—President, Mr. J. W. Tutt, F.E.S. ; Vice-Presidents, Mr. R. Adkin, F.E.S., and Mr. H. Tunaley, F.E.S. ; Treasurer, Mr. T. W. Hall, F.E.S.; Corresponding Sec., Mr. S. Edwards, F.Z.S., F.L.S. ; Rep. Sec., Mr. H. J. Turner, F.E.S. ; Librarian, Mr. H. A. Sauzé ; Curator, Mr. W. West.

The City of London Entomological Society has elected the following officers for the current year :—President, Mr. J. W. Tutt, F.E.S. ; Vice-Presidents, Messrs. J. A. Clark, F.E.S., F. J. Hanbury, F.L.S., F.E.S., and L. B. Prout, F.E.S. ; Treasurer, Mr. C. Nicholson, F.E.S. ; Secretaries, Mr. H. A. Sauzé and Mr. L. J. Tremayne ; Librarians, Mr. L. B. Prout, F.E.S., and Mr. D. C. Bate ; Curators, Mr. E. M. Dadd and Mr. W. I. Cox.

Our readers will be pleased to hear that Mr. Arkle (*Entom.*) has settled the *Tephrosia* difficulty. This will save a great deal of trouble in the future.

The capture of *Hydrilla palustris* by the Carlisle lepidopterists, in their own neighbourhood, is rather surprising. Mr. Routledge exhibited a couple of female specimens at the meeting of the Ent. Soc. of London, on February 16th. The range, as given by Staudinger for this species, is a wide one : Germany, Switzerland, England, Sweden, Lapland, Finland, and the Ural.

The Huddersfield Naturalists' Society celebrates its jubilee this year. We understand that this will be marked by an exhibition, or something of the kind, later in the year. The society has taken a very wise step in making Mr. Porritt, F.E.S., President for the year. He was president nearly 30 years ago.

Our readers will be pleased to hear that Sir Archibald Buchan Hepburn, Bart., has returned well-pleased with his trip to Central Asia. He met Dr. Raddé, who is in charge of the collection, at Tiflis, and says that, as a collection in all branches for Caucasia and Transcaspia, it is an admirable example of what a museum should be. There is much of interest in both the Lepidoptera and Coleoptera, but much remains to be done, especially in the Micro-lepidoptera, a department which the Grand Duke Nicholas takes under his especial charge.

The specimens of the genus *Erebia*, exhibited by Mr. H. J. Elwes, F.R.S., in illustration of his remarks at the meeting of the Entomological Society of London, in February last, will, by arrangement with Sir William Flower, Director of the British Museum (Natural History, South Kensington), be on view at that institution for a few weeks. The series contains, almost without exception, representatives of all the known species and more prominent varieties, and should be seen by all students of this difficult and interesting genus.

Monsieur A. Suchetet, of Anteville, par Bréauté (Seine-Inférieure), wishes us to make known among our readers that he is anxious to receive magazine references and data as to hybridity, not only in Lepidoptera, but in all orders of insects.

COLEOPTERA.

Anthicus scoticus, Rye, and other Coleoptera in Cumberland.—The records for *Anthicus scoticus* have hitherto been exclusively Scotch, I was, therefore, pleased to find a specimen among some insects taken

by Mr. G. B. Routledge, and sent to me for names. It was found under a stone at Allonby, last May. Mr. Routledge also sent the following local insects:—*Philonthus scutatus*, *Quedius umbrinus*, and *Cholera angustata* ♂ (=*sturmi*), all under refuse on the banks of the Gelt river, and *Megacronus inclinans*, under a stone in a wood close by. These were all taken last November.—E. A. Newbery, 12, Churchill Road, N.W. *February*, 1898.

Longicorns of the Cardiff District.—Most local lists show a sad lack of these fine insects, and ours is no exception to the rule, but as last season was—here at least—so much more prolific than usual, a few notes may prove not uninteresting. *Grammoptera*, hitherto only represented by the ubiquitous *ruficornis*, also produced *tabacicolor*, at Porthkerry, in June, close by the sea. *Aromia moschata* was only found dead, and I do not think *Polyopsia praeusta* occurred at all. We generally take a few on hawthorn blossoms at Llandaff. It was, however, in the woods above Castell Coch that the best things occurred. The name is best known as the site of the Marquis of Bute's vineyards, which annually produce a considerable amount of wine. These woods abound with bushes of the mealy guelder-rose, the flowers of which seem most attractive to beetles. *Pachyta octomaculata* was by no means uncommon, and several forms of *Toxotus meridianus* occurred, including the black aberration. On one occasion I took five species simultaneously, on a single bush, *viz.*: *Toxotus meridianus*, *Clytus arietis* (rather scarce in the district), the *Pachyta*, *Grammoptera ruficornis* and *Strangalia armata*. The last is fairly common everywhere. In rotten wood, at Castell Coch, *Rhagium inquisitor* and *bifasciatum* were not uncommon. *Strangalia quadrifasciata* occurred once or twice on *Hieracium*. *Pogonochaerus hispidus* is beaten from hedges rarely, and to complete the list I must not omit *Astynomus aedilis*, which has probably been introduced in timber, and is occasionally picked up alive in Cardiff.—B. Tomlin, F.E.S., Llandaff.

Hylastes angustatus, Herbst, from Bournemouth. — Whilst staying at Bournemouth, last December, I went out one day with Mr. W. C. Jackson, of that town, to see what Coleoptera could be found. I took out of some fir-posts, stuck in the beach as "break-waters," *Hylastes angustatus*, *Tomicus laricis*, *Ischnoglossa prolixa*, *Phloeopora reptans* and *Homalota cuspidata*. The *Tomicus* was in numbers in the bark of the posts, and the *Hylastes*, in fair numbers, underneath the bark, where also I obtained the "Staphs."

Hylastes angustatus is a rare species. Canon Fowler (*The Coleoptera of the British Isles*, vol. v., 1891) records one specimen from Holme Bush, taken by Mr. E. C. Rye, and that Mr. Blatch records it from Mickleham. Since then, however, Mr. Champion has taken it at Esher and Woking, and Mr. Walker at Woking. What struck me as curious was, that both the *Tomicus* and the *Hylastes*, and their larvæ, were in the base of the posts, which were washed by the sea at high tide, the bark being soaked with sea-water. Of course, *Codiosoma spadix* likes wood impregnated with sea-water. I have taken it in "break-waters" at Lancing; but I think this habit has not been noticed before with any of the *Scolytidae*.—H. St. John K. Donisthorpe, F.Z.S., F.E.S., 73, West Cromwell Road, South Kensington.

A plan for maturing beetles.—Mr. Lewcock, in his interesting note on *Bembidium lunatum*, in the last number of the *Entom. Record*,

mentioned the fact that he sent a specimen of that insect to me, as it was immature, and that I succeeded in getting it into good condition for him. I thought it might be of use to record my plan for maturing beetles, as I daresay most coleopterists have experienced the annoyance of taking rare species that were immature, and which, when mounted, have shrivelled up in drying, and become useless for the cabinet. I place the beetle in a glass-topped box, and put in with it a piece of wet blotting paper, and keep the box in a warm place. The beetle sucks up the water from the paper, and in a short time becomes hard. The blotting paper should always be kept moist. Of course, carnivorous beetles, or those that will fight or bite each other, such as the Longicorns, should be kept separate, but other kinds can be put in the same receptacle. I once took a number of *Melandrya caraboides* out of posts in Darenth Wood, which were all immature. I put them into a large glass jam pot, with some wood and plenty of damp blotting paper, and stood it in the sun. The beetles were running and flying about in the steam, and in two or three days all were hard enough to kill and mount. I have tried this plan with success with *Carabidae*, *Longicornes*, *Chrysomelidae*, etc.—Ibid.

Collecting in East Dorset in 1897.—Taking advantage of a visit to the South of England during last autumn, I had the pleasure of a little collecting at Ferndown, in East Dorset, where, altogether, over one hundred different species of beetles were noted, whilst larvæ were numerous under bark, in decaying fir stumps, fungoid growths, and various other places. Considering the lateness of the season (early October), and the small extent of ground covered, I cannot help thinking that the extensive pine woods and large tracts of heath lying to the west and south-west of the river Avon, from Ringwood, might prove a veritable "Klondyke" to the ardent coleopterist, somewhat earlier in the year. Amongst the Geodephaga were *Harpalus sabulicola* and *Pterostichus oblongo-punctatus*, the latter fairly common in the plantation bordering the road to the West Moors Railway Station, in a portion of which most of my collecting was done. Some "flashes" at the bottom of the wood produced several species of water beetles, amongst others *Dytiscus punctulatus* and *Hydroporus lepidus*; *Stilicus rufipes* and *Oxyporus rufus* were the most noticeable of the *Staphylinidae*, both obtained from pine stumps, whilst *Olibrus bicolor* (*liquidus*) occurred rather freely, by sweeping the bank of a field from which clover had evidently been gathered. Of other Clavicorns, *Cholera nigricans*, *Coccinella hieroglyphica* (with one *black* aberration), *Chilocorus renipustulatus* and *C. bipustulatus*, were swept from under firs, the two latter in quantities. *Geotrupes mutator* appeared to be not uncommon, and one *Pogonochaerus dentata* was beaten from holly. Amongst the *Cyclicae*, which were fairly numerous, were *Timarcha violaceonigra*, *Phyllotreta cruciferae* and *Psylliodes chrysocephala*, the two latter from the clover field. The Rhynchophora were well represented in quantity, especially the genus *Apion*, of which mention may be made of *A. urticarium*, *A. confluens* and *A. minimum*. *Trachyphloeus scaber*, *Gronops lunatus*, *Pissodes notatus*, by beating young firs. *Coeliodes rubicundus* and *Mylophilus piniperda* occurred in the pine wood, where I also captured a single specimen of *Calandra oryzae*, a somewhat singular locality for a beetle, whose usual habitat is in rice and grain stores.—E. J. Burgess Sopp, F.E.S., Saxholme, Hoylake.

The Entomologist's Record AND JOURNAL of VARIATION.

Vol. X. No. 4. April 15th, 1898.

Contributions to the fauna of Piedmont.

I.—The Mont Cenis Pass—Susa—Collecting grounds at Susa—The butterflies of Susa—Lampides boetica—Two races of Pieris rapæ—Flight of P. daplidice—Polygonia egea—Intermediate Pararge egeria—Hipparchia arethusa—Variation of Erebia æthiops—Habits of Erebia neoridas—Notes on E. neoridas and E. zapateri.

By J. W. TUTT, F.E.S.

I do not know of any record of captures of Lepidoptera made in Susa, except two references in Kane's *Handbook*. There is a note in the *Ent. Mo. Mag.*, vol. xvi., pp. 256 *et seq.*, where the place is mentioned in a tour made by Messrs. Forbes, Elwes and Salvin, at the end of June and in early July, 1879, although no insects appear to have been taken near the town. Susa, however, has an entomological reputation. It is one of the habitats of the local *Neptis lucilla*, which, however, I was too late to find.

On the 10th August, 1896, I left Lanslebourg, and drove over the Mont Cenis Pass. A few specimens of *Erebia aethiops*, *E. tyndarus*, *Argynnis aglaia*, *A. lathonia*, *Aglais urticae* and *Colias hyale*, were almost all the Rhopalocera observed during the delightful drive, although the day was absolutely cloudless. At the very summit of the pass, I saw a *Colias edusa* scudding along as if all the winds of heaven were in its wings, but two hours' stay on the pass did not enable me to find a single lepidopterous insect. Yet the labourers were at work, at least 500 feet above the pass, mowing the pastures in every direction, and the vegetation was magnificent. Possibly it was too highly cultivated at this level (6-7,000 feet) for insects to flourish. In the afternoon, the interesting descent to Susa was accomplished, and ere evening I was comfortably installed in the Albergo del Sole. So well did I like my quarters, and so suited to my temporary fit of laziness was the surrounding country, that it was nine days before I left Susa, and then only the urgent necessities of being back in London without delay, dragged me from this charming spot. Susa is about 33 miles west of Turin, situated at the entrance of that branch of the Dora Valley that comes down from Mont Cenis into the plain, and is continued onwards to Turin. The river runs through the middle of the town, and five minutes' walk in any direction carries one into the country. It is a delightful old place, and the old-world, early-morning fair, that was held in the square facing the Albergo, was charmingly picturesque.

Susa, however, is not particularly cheap. My collecting grounds were three in number. (1) The rough hill-sides along which the railway runs from Bussoleno to Oulx. (2) A charming little hill that lies directly behind the town. To reach this I had to follow a footpath through a vine-yard, and over some fields. This led into a charming wooded gorge, and the whole district here was swarming with insects. I have no doubt this is private ground, but I was never challenged, so assumed no objection was made to my presence. (3) The road leading up to the Mont Cenis Pass. I did not try this until my last day; I have no doubt it is a splendid district, although difficult to work. (4) One dull morning I walked down the main road to Bussoleno, but, with the exception of swarms of *Plebeius aegon*, a single *Apatura iole*, several *Pieris daplidice* and *Leucophasia sinapis*, saw nothing of importance. I should say July is a better month than August in this locality.

HESPERIDES—Hesperiidæ.—*Spilothyrus alceae*.—This species, a rather small and brown form, was not at all uncommon, and pretty generally distributed. *Nisoniades tages*.—A second brood was not uncommon locally. *Syrichthus sao*.—A few specimens, with very small spots. *S. alveus*.—Worn, and altogether passé. *Pamphila sylvanus* and *P. comma*.—Both, rare, apparently over.

PAPILIONIDES — Lycænidæ. — *Zephyrus quercûs*.—The only Theclid captured or seen. Several were flying about the chestnut trees, where I noticed no oaks. *Chrysophanus phlaeas*.—This species varied much in tint. Some specimens were very bright, others intermediate, whilst others were quite dark, ab. *suffusa*, the ordinary southern form. *Lampides boetica*.—For the first time I saw this species in its native haunts in fair abundance. I saw a dozen, at least, on two days, flying over the bushes of *Colutea arborescens*, which, with its swollen pods, was quite a feature of the little gorge. Two or three of the bushes still had a few late flowers. That the butterfly was egg-laying I am satisfied, but I could find no eggs, although I searched. In habit, the species is very Theclid-like, and flies swiftly over the tops of the bushes, often returning, if disturbed, to the same bush. Mrs. Nicholl tells me that in Spain she found great numbers everywhere during the whole of the two months she was there, the district in which they were found extending from Barcelona to various places 5,000 feet above the sea. She further suspects that there may be a succession of broods all the summer, at different elevations, two, or even three in the hot plains, and only one in the mountains. *Cyaniris argiolus*.—One specimen only captured, evidently just emerged. *Everes argiades*.—Rare, only one or two specimens observed. *Plebeius aegon*.—The commonest blue of the district. It was in hundreds along the roadside between Susa and Bussoleno. The specimens are large, and with no dark margin. The females are not washed with blue. *Cupido minima*.—A few in the little gorge, evidently of a second brood, occurred with *Polyommatus hylas*, *P. meleager* and *Everes argiades*. *Polyommatus bellargus*.—A few freshly emerged specimens only. *P. corydon*.—Abundant, and generally distributed all round the town. *P. hylas*.—Local. Some of the specimens were very fine, others exceedingly small. The latter I have labelled as ab. *minor*. I have also specimens with a number of extra spots on the underside, ab. *addenda*. This is a common form of aberration in *P. bellargus* (but not in this locality). *P. icarus*.—This species was

not at all common. The females quite brown on the upper side, but with orange marginal spots. Two or three specimens of ab. *icarinus* were also captured. *P. meleager*.—A few worn specimens of this fine insect were taken in two or three localities, but it was quite over. I caught a few at Aosta, in August, 1894, and a solitary female at S. Michel de Maurienne, last July.

Papilionidæ.—*Papilio podalirius* and *P. machaon*.—Rare, not more than half a dozen specimens of each species taken. Evidently we were between broods, or too late for the summer brood.

Pieridæ.—I am not quite sure whether I saw *Pieris brassicae* ; at any rate, I have not brought a specimen home. *Pieris rapae*.—Two forms occurred, one in the wooded gorge, and one in the gardens around the town. The former was not unlike that occurring normally with us ; the second, probably ab. *messanensis*, was remarkable for the intensity of the apical spot, the continuation of the latter down the outer margin, the general suffusion of the fore-wings of the female, and the presence of an extra black spot on the hind-wing, in a line transversely with the costal spot. This latter form was to be seen in dozens, sucking the moisture that oozed through the walls of the vineyards, or at the gutter streams, or at any chance puddle in the road. *P. napi*.—A large form, ab. *napaeae*, with scarcely any trace of the green veins on the undersides. *P. daplidice*.—I have before remarked that this insect can fly. I never had such an excellent illustration of its capacity as this year. It moves much more like *Colias edusa* than any other Pierid. There were plenty of individuals about, but they were exceedingly wary as well as active. *Leucophasia sinapis*.—Local. There was a fair number of males in the wooded gorge, but only two or three females. The apical spot of the males was not particularly rounded nor black, and therefore not very unlike our spring form. I also saw a few specimens in the meadows on the Mont Cenis road, also in those towards Bussoleno. *Colias edusa*.—Strange to say, here, this species was much commoner than *C. hyale*, a very unusual occurrence. The specimens were fine, and evidently just emerging. *C. hyale*.—Not uncommon, and offering no special characteristics. *Gonepteryx rhamni*.—So rare, compared with its abundance at Aix-les-Bains, three weeks earlier, that, either the species had hybernated, or a second brood may have been feeding up. It would be interesting to have decided information as to an actual second brood in nature, in southern Europe, of this species.

(To be continued.)

The British Liparid Moths.

By A. BACOT.

(*Continued from* p. 75.)

P. chrysorrhoea.—Unfortunately, I have no notes on the 1st stage of this larva. In the 2nd stage it is dull yellowish in colour, with the exception of the 8th and 9th abdominal segments, which are almost black. The anterior trapezoidals (on abdominal segments) are either very minute or absent; I could find no trace of them; the posterior are large and many-haired. On the meso- and meta-thorax, four dorsal tubercles are present, the anterior (i) well separated from the posterior (ii)

trapezoidals, but the base of the trapezoid is in front, instead of at the back, of the segments; that is to say, tubercle i (anterior) is outside, and only slightly in front of ii (posterior), which are close together and wedge-shaped. The laterals are—the supra-spiracular (iii), large, iv and v; usually the sub- and post-spiracular are consolidated into one long narrow tubercle. On 1st and 2nd abdominal segments there is a double tuft of bright brown hairs, rising from between the dorsal tubercles (posterior trapezoidals). Hybernating skin (? 3rd). The larvæ are smaller and duller than those of *P. similis*. Tubercles very large. On 1st and 2nd abdominal segments, there is a sparse dorsal tuft of thorny, reddish-coloured hairs, springing apparently from between the tubercles, and another of rather more scattered hairs on the 8th abdominal. No white-plumed hairs are as yet present, but from the outer margin of the dorsal tubercles there spring two or three pale brown or yellowish hairs of medium length and of a feathery appearance. The ground colour of the larva is almost black. Long bright brown thorny hairs spring from the tubercles, and, in addition, some of the tubercles bear a dense coat of very minute needle-shaped darts, the bases of which end in three short prongs. It is these latter hairs which, becoming detached, penetrate the skin and give rise to irritation. The webs containing cast skins and the cocoons are far more dangerous to handle than the living larvæ, as the hairs are more readily detached from the dried skins, and in the cocoons are lying loose; the slightest draught causes them to float about in the air, so that the danger of them entering eyes, nose or mouth, is greatly increased. In the adult plumage of the larva, the tuft of white-plumed hairs of the dorsal tubercles forms a row of conspicuous white spots down either side of the back. The larvæ are gregarious, and live in a web until nearly fully grown.

Dasychira fascelina.—1st stage: dark coloured, nearly black; tubercles large and bear many hairs; on the 5th and 6th abdominal segments the anterior trapezoidals are very small, and only bear one hair. The 2nd and 3rd thoracic, and the 4th and 5th abdominal segments, all weak, and, except the 4th abdominal, have light patches dorsally. Hairs long, thick and thorny, those on dorsal area black, on the lateral areas white, on the pro-thorax and the anal segment they are very long $\frac{1}{3}$ to $\frac{1}{2}$ the length of larva. There are some curious little club-shaped processes arising from the posterior trapezoidals on the 6th and 7th abdominal segments. In their adult plumage the larvæ are dark coloured, and have dorsal tufts arising from each of the 1st to 5th abdominal segments, each tuft being composed of a dense mass of black thorny hairs in the centre, with a smaller white tuft of similar hairs on either side. There is also a stout black tuft or pencil on the 8th abdominal segment.

D. pudibunda.—I have no notes on the early stages of this species, and only remember that it is pale green, with immensely long hairs. Dr. Chapman, in his paper on "The Genus Acronycta and its Allies" (*Ento. Record*, vol. iii., p. 274), mentions that the 2nd and 3rd thoracic and 5th abdominal segments are weak, whilst the larva in its first stage is beautifully figured (*Ento. Record*, vol. iv., plate ix., fig. 8), and clearly shows the usual Liparid features, large tubercles bearing several hairs, the anterior trapezoidals being smaller than the posterior, segments very distinct, and larva, as a whole, appearing wide and

square-ended, although this last mentioned character would be more noticeable if the larva had been drawn soon after hatching, instead of nearly full-fed in 1st skin. In its adult plumage the larva is usually lemon-green, with strongly-developed dorsal tufts on the 1st to 4th abdominal segments, and the incisions between these segments all velvety black. A long pencil of pink hairs arises from the 8th abdominal segment.

(*To be continued.*)

Some Notes on Oporabia autumnata, Bork.

By LOUIS B. PROUT, F.E.S.

Following up my very fragmentary notes on the dubious forms of *Oporabia*, structurally related to *filigrammaria*, and dealt with in the *Entomologist's Record*, vol. ix., pp. 315–318, as 2*a* var. (?) *addendaria*, and 2*b* var. (?) *approximaria*, I may say that a good deal of material has come into my hands since my paper was written ; and, although it does not definitely set at rest the question, "Have we a third species of *Oporabia?*" yet it is of sufficient importance to call for publication, and is especially satisfactory as clearing up, and somewhat simplifying, a very tangled piece of synonymy.

As I proposed (*tom. cit.*, p. 284), I obtained a good many specimens of so-called *dilutata* from the Continent, and found the true *dilutata* and the suspicious-looking specimens, with angulated second line, to be in about equal proportion. By the kind help of my usual referee, Mr. F. N. Pierce, I was able to prove that the males of the latter were structurally of the *filigrammaria* type; in other words, that they were perfectly distinct from *dilutata*. Amongst these was a specimen of the whitish form which I mentioned as being "no doubt the *autumnata* of Borkhausen," and, therefore, my suspicion and hope were confirmed. It remains for me to point out my grounds for accepting this form as Borkhausen's *autumnata* (Staudinger only quotes it with a query), and to claim the recognition suggested by No. 28 of the "Merton rules" (Lord Walsingham and J. H. Durrant), that "the decision of the author first dealing with the question shall be accepted as final, unless his conclusions can be proved erroneous."

Borkhausen (*Naturg. Eur. Schmett.*, v., p. 293 [1794]) described his *autumnata* as "Silberweisser, blassbraunstreifigter Spanner," as being about the size of *rhamnata*, white with some gloss, with pale brown lines standing in four groups, and forming, as it were, four bands—namely, a single line at the base, then two close together, then three together, finally again two, the commencements of these lines on the costa being more strongly expressed ; as having some little black strokes on the nervures, and a black spot in the third band ; and as having been found in a birch wood in October. Now it would hardly be too much to say that the definition of the insect as "silver-white," would be sufficient for its determination, so excessively rare are really white forms of *dilutata*. Probably nearly every old diagnosis could be called in question if every possible and abnormal colour-variation needed to be taken into account. But Borkhausen does not leave matters here. On pp. 564-565, in a supplement, he gives some further notes on the Oporabias, based (as he

himself tells us) on the subsequent study of a large amount of material. He sinks two of his species, *quadrifasciata* and *affiniata*, as varieties of *dilutata*, and then adds the following note on *autumnata*: "I also caught, last autumn, several specimens of this fine Geometer . . . Some resemble in colouring, and also in size, the largest and lightest examples of *dilutata*, but the broader wings, formed after altogether a different shape, distinguish it sufficiently as a species from that Geometer, as the comparison of the two in nature immediataly shows at first glance." This last statement, from one who is often spoken of by his countrymen as a "sharp observer," and who had studied the group closely enough to unite the various forms of *dilutata*, *notwithstanding slight differences of shape* (which he earlier mentioned), is surely conclusive, when taken along with the description I have already quoted; the German representatives of our "*filigrammaria* group," it must be borne in mind, are large and very ample-winged.

In Treitschke's time, the suspicion was still expressed from time to time, that this silver-white insect was a good species; but Treitschke, by a careless oversight, tells us it is the var. *quadrifasciata* of Borkhausen, and he sinks it as a mere variety, on the same dangerous grounds on which he sinks *spadicearia* to *ferrugata*—that he possessed examples which appeared to him to be transitions.

Autumnata, Bkh. = *quadrifasciata*, Tr. (*nec* Bkh.), is therefore the earliest indisputable name in the *filigrammaria* group, and represents the extreme white form, with ample wings. I believe, with Dr. F. B. White, that Newman's lower figure (*British Moths*, p. 108), shows this insect, though the basal patch is nearly always more angulated; *pallescens*, Ckll. (*Entom.*, xxii., p. 3) thus becomes a synonym. I have seen Rannoch and Enniskillen examples agreeing with the continental type, and the palest of the late J. B. Hodgkinson's Cumberland examples also differ but little therefrom. On the whole, our Scotch examples are probably smaller, less white, and more glossy, and may provisionally retain the name of var. *addendaria*, B. White; but it is most probable that name will have to be abandoned when more material, British and Continental, has been compared; it will certainly not be available for any particular aberration, as Dr. White applied it comprehensively.

As Doubleday informed Guenée more than 40 years ago, and as Dr. White repeated in 1878, that *autumnaria*, Weav. = *addendaria*, B. White, was common in Scotland, I suspected that the lack of knowledge regarding it to-day was due to some difficulty in determination on the part of the present generation of entomologists; and now that several of my correspondents have kindly sent me their series of supposed *dilutata* for inspection, I am able to say positively that such is the case. From Aberdeen, 27 *autumnata* and 10 *dilutata* have reached me, the former being mainly of the smaller and darker forms, referable to *approximaria*, Weav. From Rannoch, Mr. W. M. Christy sent some grand varieties (of *autumnata*), quite as large as the Continental average, and some agreeing well with certain Continental examples. From Glasgow, Mr. A. Adie Dalglish sent a long series, mainly *dilutata*, but comprising three *autumnata*, nearer the Aberdeen forms. Should these notes catch the eye of any Scotch entomologist who may feel interested, I should deem it a great pleasure to be allowed to look through his series. It is curious that *autumnata* should,

after all, have got mixed up with *dilutata*, from which it is entirely distinct, structurally, rather than with *filigrammaria*, with which Doubleday united it in his second catalogue; but of course the explanation lies in its habits and time of emergence (a woodland insect of late autumn), and in its ampler wings, as compared with *filigrammaria*.*

I have three batches of eggs from Aberdeen and Kincardineshire females of *autumnata*, kindly supplied by Mr. Horne, and hoped to find some difference from *filigrammaria*, the imagines seeming so different. But I find they (the ova) differ less from those of *filigrammaria* than do those of two races of *dilutata*, the one from the other. Of these *dilutata*, which are greatly puzzling me, the present is not the occasion to speak; nor have I in this note reverted to *autumnata*, Gn. (*vide*, *Ent. Rec.*, ix., p. 248), as I have no further definite light upon it; I would only suggest, now that the right use of the name *autumnata* has been made out, that Guenée's insect, whether a species or a variety, be re-named *gueneata*, n.n.

The now ascertained existence of two species, side by side, in many parts of the Continent, has left the Scandinavian determination of *nebulata*, Thnb., doubtful, and I incline to ignore it for the present. Six examples, kindly sent me by Prof. Aurivillius, are undoubted *autumnata*, Bkh., of very varying forms; and this fact, combined with some indications as to the larvæ in Norway and Finland (*vide*, *Ent. Rec.*, ix., p. 249) and some expressions in Thunberg's type description, leads me to strongly suspect that *nebulata*, Thnb. = *autumnata*, Bkh., and that it was at least premature to accept Lampa's identification thereof with *dilutata*. So far as I can summarise the state of our knowledge at the moment, our principal forms work out as follows :—

1. *Dilutata*, Bkh. (♂ genitalia, with a hook on the harpes).
2. *Gueneata*, n. nom. = *autumnata*, Gn., *nec* Bkh. (spec. dubia.)
3. *Autumnata*, Bkh. (♂ genitalia, with no hook on the harpes).
   - *a*. Silver-white, light brown bands = the type.
   - *b*. Glossy, silvery-grey tinged, sometimes infuscated = *addendaria*, B. White.
   - *c*. Smaller, and generally darker, perhaps somewhat less glossy = *approximaria*, Weav.
4. *Filigrammaria*, H.S., praec. var. ? (♂ genitalia as in No. 3), smaller, with more pointed wings (especially in the ♀), generally more inclining to suffusion of markings, etc., etc.

* Since writing the above I have also seen a most interesting lot of *autumnata*, from Enniskillen, Ireland, bred by Col. Partridge and Capt. E. W. Brown.

On a New Classification of the Rhopalocera.

By ENZIO REUTER, Ph. D., F.E.S.

(*Concluded from p.* 77.)

I subdivide the suborder Rhopalocera, from which, as stated above, the *Hesperiidae* are excluded, into six principal groups or gentes. These are distinguished as follows: I.—Gens: Papiliones (including the families *Papilionidae* and *Pieridae*, the latter with the sub-families *Pseudopontiinae* and *Pieridinae*). II.—Gens: Lycænæ (including the families *Lycaenidae* and *Erycinidae*, the former with the sub-families

Lipteninae and *Lycaeninae*, the latter with the *Nemeobiinae* and *Lemoniinae*). III.—Gens: Libytheæ (with the family *Libytheidae*). IV.—Gens: Danaidæ (consisting of the family *Danaididae*, with the sub-families *Danaidinae*, *Clothildinae*, *Hamadryadinae* and *Ithomiinae*). V.—Gens: Satyri (consisting of the family *Satyridae*, with the sub-families *Satyrinae*, *Brassolinae* and *Morphinae*). VI.—Gens: Nymphales (with the family *Nymphalidae*, and the sub-families *Acraeinae*, *Heliconiinae* and *Nymphalinae*).

Of these, the gens Papiliones is considered to have first branched off from the main Rhopaloceran trunk. The five other gentes then follow, in the order indicated above, their points of origin being considered to have taken place from the main trunk near each other, but on different sides from the main Papilionid branch. For a consideration of the branching that gave rise to the various families and sub-families, as well as of the stirpes, tribes and subtribes, into which the sub-families are divided, it is necessary to refer the reader to my work, on account of the limited space now at my disposal. In this, these points are all thoroughly discussed, and a genealogical tree exhibits diagrammatically and in detail, my views of the phylogeny of the different groups. It also shows the origin and subdivision of each of these gentes, families, sub-families, stirpes, tribes and sub-tribes.

The family *Hesperiidae* is, on account of several circumstances (discussed in detail in my work), separated as a distinct suborder, *Grypocera*, from the true butterflies, or *Rhopalocera*. As to the basal-fleck particularly (pl. i., fig. 6), it differs very markedly in structure from that of the *Rhopalocera*, always occupying a much larger area, whilst the chitinous cones, which are unusually small and irregularly and diffusedly distributed, are covered with very peculiar modified hair-structures, which occur only in the *Hesperiidae*.* None of the different characters already mentioned as specially characteristic of all the Rhopalocerous gentes, are found in this family. The basalfleck, indeed, as well as the palpi of the *Hesperiidae*, represents a type quite different from that of the Rhopalocera, a view which is confirmed by several other characters.

The Rhopalocera of former authors is, therefore, considered as a heterogeneous group, but *in sensu strictiori, i.e.*, the *Hesperiidae* being excluded, forms a natural one, having a monophyletic origin. The phylogenetic branches, representing the Grypocera and the Rhopalocera, have not risen very close to each other from the lepidopterous genealogical tree. As to the probable ancestors of the Rhopalocera, I cannot say anything for certain; it may, however, be stated that neither *Castnia* nor *Cossus*, both sometimes suggested as progenitors of the Rhopalocera, on account of the structure of the palpi, at all satisfy the necessary requirements, nor present the requisite characters that are indispensable in the presumed ancestors of this group. The Rhopaloceran type is considered, in accordance with the view of Scudder, to have been fully developed at least in the beginning of the Tertiary epoch.

It may here be mentioned, that these phylogenetic conclusions are by no means based on my studies of the palpi only; I have, on the contrary, always taken into consideration other characters, from the different stages of development, affording any test of relationship;

* These hair-formations are not to be compared with those, apparently similar ones, occurring in *Miletus* and *Eurybia*.

even using the data pointed out in purely descriptive works, as far as possible, from a morphogenetic point of view. I have then compared the results arrived at by my own researches, with those of other morphological investigations, and, where they have differed, discussed them closely. It may, however, be strongly insisted upon that the true phylogeny of several groups is yet doubtful, and can be cleared up only by a critical comparison and compromise of the results of further morphogenetic investigations of different characters.

The following is an abstract of the new classification of the Rhopalocera, proposed in my work, so far as it applies to the British species :—

Subordo : **GRYPOCERA.***
Gens : **HESPERIÆ.**
Familia : HESPERIIDÆ.
Subfamilia : *HESPERIINÆ.*
Stirps : HESPERIINA.
Tribus : Hesperiidi.
Nisoniades, Hb., *tages*, L.
Syrichthus, Bdv., *malvae*, L.
Tribus : Pamphilidi.
Pamphila, Fab., *sylvanus*, Esp.
comma, L.
Thymelicus, Hb., *actaeon*, Esp.
lineola, Ochs.
thaumas, Hufn.
Tribus : Cyclopidi.
Carterocephalus, Ld., *palaemon*, Pall.

Subordo : **RHOPALOCERA.**
Gens : **PAPILIONES.**
Familia : PAPILIONIDÆ.
Subfamilia : *PAPILIONINÆ.*
Stirps : PAPILIONINA.
Tribus : Papilionidi.
Papilio, Linn., *machaon*, L.
Familia : PIERIDIDÆ.
Subfamilia : *PIERIDINÆ.*
Stirps : PIERIDINA.
Tribus : Pieridini.
Subtribus : Picridini.
Aporia, Hb., *crataegi*, L.
Pieris, Schrk., *brassicae*, L.
rapae, L.
napi, L.
daplidice, L.
Tribus : Teracolidi.
Subtribus : Anthocharidini.
Euchloë, Hb., *cardamines*, L.
Tribus : Catopsilidi.
Colias, Fab., *hyale*, L.
edusa, Fab.
Gonopteryx, Leach, *rhamni*, L.
Stirps : DISMORPHIINA.
Tribus : Dismorphiidi.
Leucophasia, St., *sinapis*, L.

Gens : **LYCÆNÆ.**
Familia : LYCÆNIDÆ.
Subfamilia : *LYCÆNINÆ.*
Stirps : LYCÆNINA.
Tribus : Lycænidi.
Lycaena, Fab., *arion*, L.
Cupido, Schrk., *minima*, Fuess.
Nomiades, Hb., *semiargus*, Rott.
Polyommatus, Latr., *corydon*, Poda
bellargus, Rott.
icarus, Rott.
astrarche, Bgstr.
Plebeius, L., *aegon*, Schiff.
Everes, Hb., *argiades*, Pall.
Cyaniris, Dalm., *argiolus*, L.
Lampides, Hb., *boetica*, L.
Chrysophanus, Hb., *dispar*, Haw.
phlaeas, L.
Tribus : Thecldidi.
Zephyrus, Dalm., *quercûs*, L.
betulae, L.
Callophrys, Billberg, *rubi*, L.
Thecla, Fab., *w-album*, Kn.
pruni, L.
Familia : ERYCINIDÆ.
Subfamilia : *NEMEOBIINÆ.*
Stirps : NEMEOBIINA.
Tribus : Nemeobiidi.
Nemeobius, St., *lucina*, L.

Gens : **DANAIDÆ.**
Familia : DANAIDIDÆ.
Subfamilia : *DANAIDINÆ.*
Stirps : DANAIDINA.
Tribus : Danaididi.
Anosia, Hb., *archippus*, L.

Gens : **SATYRI.**
Familia : SATYRIDÆ.
Subfamilia : *SATYRINÆ.*
Stirps : SATYRINA.
Tribus : Lethidi.
Pararge, Hb., *megaera*, L.
egeria, L.

* The further division of the *Grypocera* is omitted in my work. I here accept, in the main, the grouping of Tutt ("The Classification of the British Butterflies," *Entom. Record*, vii., 1896, p. 300), and in the genera and species I follow the nomenclature—although in some respects differing from that used in my work—assumed in the same paper.

Tribus: Maniolidi.
Erebia, Dalm., *aethiops*, Esp.
Melampias, Hb., *epiphron*, Knoch
Tribus: Satyridi.
Melanargia, Meig., *galathea*, L.
Epinephele, Hb., *janira*, L.
tithonus, L.
Enodia, Hb., *hyperanthus*, L.
Hipparchia, Fab., *semele*, L.
Tribus: Ypthimidi.
Coenonympha, Hb., *tiphon*, Rott.
pamphilus, L.

Gens: **NYMPHALES.**
Familia: NYMPHALIDÆ.
Subfamilia: *NYMPHALINÆ.*
Stirps: NYMPHALINA.
Tribus: Argynnidi.
Subtribus: Argynnini.
Dryas, Hb., *paphia*, L.
Argynnis, Fab., *lathonia*, L.
adippe, L.
aglaia, L.
Brenthis, Hb., *euphrosyne*, L.
selene, Schiff.
Tribus: Melitæidi.
Melitaea, Fab., *athalia*, Rott.
cinxia, L.
aurinia, Rott.
Tribus: Vanessidi.
Subtribus: Vanessini.
Pyrameis, Hb., *cardui*, L.
atalanta, L.
Aglais, Hb., *urticae*, L.
Vanessa, Fab., *io*, L.
Eugonia, Hb., *polychloros*, L.
Eurvanessa, Scud., *antiopa*, L.
Polygonia, Hb., *c-album*, L.
Tribus: Apaturidi.
Apatura, Fab., *iris*, L.
Tribus: Limenitidi.
Subtribus: Limenitini.
Limenitis, Fab., *sibylla*, L.

Protective Mimicry as Evidence for the Validity of the Theory of Natural Selection.*

By PROFESSOR EDWARD B. POULTON, M.A., F.R.S., F.Z.S., etc.

Several suggestions have been put forward to account for the superficial resemblances between animals, especially insects, occupying the same geographical area. It has been suggested, and indeed strongly maintained, that food, climate, or some other chemical or physical influence of the locality may have supplied the cause. On the other hand, many naturalists consider that the facts cannot be interpreted by any of these suggested causes, and only receive an intelligible and probable explanation in the theory of natural selection. This theory supposes that the resemblance is advantageous in the struggle for existence, the weaker forms being shielded by their resemblance to the strong and well-defended species (mimicry of H. W. Bates), or the latter gaining by a resemblance which enables their local enemies more easily —and thus with a smaller waste of life—to recognise and avoid them (mimicry of Fritz Müller). The present paper directs attention to certain facts commonly associated with mimetic resemblance which receive a ready explanation upon the theory of natural selection as the efficient cause, but, on the other hand, constitute a serious difficulty in the way of any other theories as yet brought forward.

Natural selection, as is well known, acts upon *any* variations, whatever they may be, which are in the advantageous direction, and are at the same time not injurious in themselves. When the end to be gained (in this case the attainment of a superficial resemblance) is common to a variety of distantly related species possessing entirely different constitutional tendencies, we may feel confident that an approach brought about by natural selection will be by extremely diverse paths of variation. Under natural selection we might predict that such a

* Abstract of a paper read before Section D of the British Association, at Toronto, on Aug. 23rd, 1897. (Printed by permission of the Council of the British Association).

common end would be reached by great diversity of means, while under the other hypotheses mentioned above, a result of the kind is inexplicable. Hence the facts of the case should act as a convenient test between these rival suggestions.

First as to colour. We know but little of the chemical nature of the pigments made use of in mimetic resemblance. One case, however, has been investigated by Gowland Hopkins—*viz.*, the bright tints by which certain S. American *Pierinae* have come to resemble *Heliconinae* and *Ithomiinae* in the same locality. Gowland Hopkins has shown that these close resemblances in colour and pattern are produced by pigments which are characteristic of the *Pierinae*, and of an entirely different chemical nature from those of their models.

Another very interesting case is that of resemblance to ants. Ants are mimicked more or less closely by a great variety of insects and by spiders. In some cases we find the resemblance brought about by actual alterations in the shape of the body (spiders and many insects), which is modified into a superficial resemblance to the Hymenopteron. In an Acridian—*Myrmecophana fallax*—the shape of an ant is, as it were, painted in black pigment upon the body of the insect, which is elsewhere light in colour, and, as it is believed, inconspicuous in the natural environment. In a certain group of Homoptera—the *Membracidae*—some of the S. American species closely resemble ants. The *Membracidae* are characterised by an enormous growth from the dorsal part of the first thoracic segment (pronotum), which spreads backwards and covers the insect like a shield. In these insects the form of an ant is moulded in the shield beneath which the unmodified body of the insect is concealed. These facts are only explicable by supposing that some great advantage is to be gained by resembling an ant, and that very different species have attained this end, each by the accumulation of those variations which were rendered possible by its peculiar ancestral history and present constitution—in other words, by the theory of natural selection.

A more elaborate case, which I have recently investigated, is afforded by a large group of tropical American Lepidoptera—moths as well as butterflies—which closely resemble certain common wide-spread species of the Ithomiine genera, *Methona* and *Thyridia*. The appearance thus produced consists of a transparent ground with a black border to both wings, the fore-wing being also divided by black transverse bars into three transparent areas—the hind-wing usually into two. From a comparison with other species of various families, etc., not altered in this direction, we know that the transparent wings are not ancestral. When we investigate the manner in which transparency has been attained, it is found to be by different methods in the different constituents of the group. Among the numerous genera of *Ithomiinae* (*Methona*, *Thyridia*, *Dircenna*, *Eutresis*, *Ithomia*, etc.), the result has been attained by the reduction of the scales to a very minute size, so that they hardly interfere with the passage of light. This reduction affects the two kinds of scales which alternate with each other in the rows upon the wings of this sub-family, a common result being (*e.g.*, in *Methona* and *Thyridia*) the alteration of the more slender scales into hairs, and of the broader ones into minute bifid structures, still retaining scale-like proportions, in spite of their extremely small size. In others, again, the two kinds of scales are reduced respectively to simple

and Y-shaped hairs, which regularly alternate along the rows. In the *Danainae* proper, represented by the genus *Ituna*, the transparency is chiefly due to the great diminution in the number of the scales, and those which remain are neither much reduced in size nor altered in shape. In the *Pierinae*, represented in this group by only a single species, *Dismorphia orise*, the scales are greatly reduced in size, but are neither greatly altered in shape nor diminished in numbers.

Hence, in these three sub-families of butterflies, transparency is attained in three different ways, *viz.* (1) by reduction in size and simplification in shape; (2) by reduction in number; and (3) by reduction in size alone.

When we examine the moths which fall into the group, we find a much greater difference in the methods, corresponding to the wider divergence in affinity. In the several species of the genus *Castnia* the scales lose their pigment, although undiminished in size, while they are at the same time set vertically upon the wing, so that light can freely pass between their rows. In the widely separated genus *Hyelosia* the arrangement is nearly the same, except that the vertical scales are much attenuated. In the genus *Anthomyza*, which furnishes the group with many species, the scales retain the normal size, shape, and overlap, but become so completely transparent that the light freely passes through them.

In all the numerous constituents of this large group of Lepidoptera a very close resemblance has been produced by entirely different methods; a result which, it has been argued above, is only consistent with the view that natural selection alone, among all the explanations which have been suggested, has been the cause of the observed phenomena.

I owe to the kindness of Mr. Godman and Mr. Salvin the opportunity of studying all the butterflies of this large transparent-winged group, while Mr. Herbert Druce kindly lent me those moths which are not represented in the Hope Collection in the Oxford University Museum.

The Butterflies of the Chatham District.

By J. J. WALKER, F.L.S., F.E.S.

Out of the 68 species recognised as British in the most recent work on the subject, by Mr. J. W. Tutt, F.E.S., no fewer than 54, or 79 per cent. of the whole number, have been taken within six miles of the L.C. and D.R. station at Chatham. During the last forty years, five of our most beautiful and interesting species have been almost entirely exterminated; but even now an energetic collector may reasonably expect to meet with 40 species within this area in a single fairly good season.

The 54 species of butterflies which have been recorded from this district may be classified as follows:—A—Generally distributed and common in most years—21 species:—*Pamphila sylvanus*, *Thymelicus thaumas*, *Chrysophanus phlaeas*, *Polyommatus icarus*, *P. astrarche*, *Callophrys rubi*, *Pieris brassicae*, *P. rapae*, *P. napi*, *Euchloë cardamines*, *Gonepteryx rhamni*, *Brenthis euphrosyne*, *Vanessa io*, *Aglais urticae*, *Pyrameis atalanta*, *Pararge egeria*, *P. megaera*, *Epinephele ianira*, *E. tithonus*, *Enodia hyperanthus*, *Coenonympha pamphilus*. B—Common in some years, but uncertain in appearance—3 species:—*Colias hyale*,

C. edusa, *Pyrameis cardui*. C—Local, but more or less common where found—15 species:—*Nisoniades tages*, *Syrichthus malvae*, *Pamphila comma*, *Thymelicus lineola*, *Cupido minima*, *Polyommatus corydon*, *P. bellargus*, *Plebeius aegon*, *Cyaniris argiolus*, *Zephyrus quercûs*, *Thecla w-album*, *Argynnis aglaia*, *Eugonia polychloros*, *Hipparchia semele*, *Melanargia galatea*. D—Local and scarce—4 species:—*Zephyrus betulae*, *Nemeobius lucina*, *Argynnis adippe*, *Brenthis selene*. E—Rare stragglers only in the district—6 species:—*Papilio machaon*, *Dryas paphia*, *Argynnis lathonia*, *Euranessa antiopa*, *Polygonia c-album*, *Anosia archippus*. F—Formerly found in plenty locally; now almost or quite extinct in district—5 species:—*Aporia crataegi*, *Leucophasia sinapis*, *Melitaea athalia*, *Limenitis sibylla*, *Apatura iris*.*

I now proceed to state a few facts concerning each species. Hesperides:—*Nisoniades tages*.—Common in May and June, on sunny chalky banks. The larva feeds on leguminous plants. *Syrichthus malvae*.—Occurs in May and June, in woods at Chattenden, where also the ab. *taras* has been taken. *Pamphila sylvanus*.—Common in all the woods and lanes from May to August, being partially double-brooded. *Pamphila comma*.—Common in most seasons, on Cuxton Downs, in August. Is also met with at Paddlesworth, Boxley Warren, and other localities. *Thymelicus lineola*.—Has been met with not rarely in July, on the marshy banks of the Medway, below Strood. *Thymelicus thaumas*.—Common in all our woods and lanes, in July.

Papilionides: Lycænidæ.—*Chrysophanus phlaeas*.—Common everywhere, from the end of April until October. *Cupido minima*.—Found on nearly all our chalk downs in June, and again more rarely in August; but it cannot be called a common insect in any part of the district. *Polyommatus corydon*.—Partial to chalky situations, but less local than *P. bellargus*, stragglers having been taken at Chattenden, and other unlikely localities. At one time it was not rare in the Isle of Sheppey, on the stiffest of London clay. Appears on wing at end of July, and in August. *P. bellargus*.—Very local species, and confined to the chalk. Generally plentiful in June, in a few favoured spots, such as Queendown Warren, Blue Bell Hill, and Cuxton, and again in August, sometimes lasting on to October. *P. icarus*.—Found in every meadow, and on every grassy hillside, throughout the summer. I took a very fine gynandromorphous specimen on Darland Hill, in May, 1873. *P. astrarche*.—Common in May, and again in August, all over the district, but most plentiful on the chalk. *Plebeius aegon*.—Essentially a heath-frequenting butterfly, but a large and bright form is also found on chalky hillsides, and in this district is not uncommon in July, at Holly Hill, and on the Halling Downs. *Cyaniris argiolus*.—Flies wildly round holly bushes, and walls covered with ivy, in April and May, and again in July and August. It is widely distributed, though somewhat local in this district, and is often seen in numbers about the ivy-clad walls of Rochester Castle. *Callophrys rubi*.—This species is common in all our woods in May, and again in August, being double-brooded; the larva feeds on broom, and allied plants. *Zephyrus quercûs*.—Has its headquarters at Chattenden, and may be seen in July and August, flying round the oak trees; also occurs at Wigmore, and other woods in the district. *Z. betulae*.—Found rarely in

* Possibly still existing.

Chattenden Roughs, in August. *Thecla w-album*.—Larvæ taken on elm in June, but is less common than formerly. *Nemeobius lucina*.—Has been recorded by Miss C. E. Pye, in the *Rochester Naturalist* for January, 1896, as having been taken by Mr. Adams, at Shorne. PAPILIONIDÆ:—*Papilio machaon*.—Its claim to a place in this local list rests on the capture of a single specimen by Mr. W. Chaney, at Darland Hill, in August, 1857. The specimen is still in Mr. Chaney's collection. As a schoolboy, I saw a fine specimen of this butterfly at Sheerness, one Sunday afternoon, in 1862. PIERIDÆ:—*Aporia crataegi*.—This is, unfortunately, one of our lost species. Up to 1866 it occurred commonly in several places in the district, but was always very local. It used to be found in profusion at Chattenden, in June, and the larvæ, Mr. Tutt has informed me, were to be met with feeding gregariously in May, on the hawthorn hedges, almost in the town of Strood itself. About that time it almost suddenly died out. The last specimen taken in this district was in 1872. *Pieris brassicae* and *P. rapae*.—Abundant in most seasons; in some years quite rare by comparison, notably so in 1894. *P. napi*.—More of a woodland butterfly, and prefers rather damp situations, and is especially common at Snodland. *Euchloë cardamines*.—Occurs in abundance at Snodland, in May and June. *Leucophasia sinapis*.—Another extinct species in this district, as Mr. Chaney says, it was found commonly in the Wigmore Woods up to 1850, when it became very scarce, and disappeared entirely after 1857, when the last specimen was taken. *Colias hyale* and *C. edusa*.—Both uncertain and erratic in appearance, being common in some years; in others, *e.g.*, 1897, hardly a solitary specimen is to be seen. The damp, rather than the cold, of our winter, seems always to be too much for the continuance of the species. The former is always the rarer of the two species, but in some years (as in 1868, 1875, 1893) the August brood is fairly common. *Gonepteryx rhamni*.—I have seen this species on the wing, near Blue Bell Hill, as early as January 20th. Is common in all our woods and lanes at end of July and during August. NYMPHALIDÆ:—*Dryas paphia*.—Has only occurred as a rare straggler in the Wigmore Woods. *Argynnis lathonia*.—This has found a place on the local list from the capture of two specimens, in August, 1857, between Upnor and Chattenden, by Lieut. Crozier, R.E. *A. adippe*.—Has been found very sparingly at Chattenden. *A. aglaia*.—Appears at beginning of July, and is a common and beautiful ornament to the flowery chalk slopes. It is plentiful at Halling, Holly Hill and the south side of Cobham Park, as well as on the Burham Downs. *Brenthis selene*.—Occurs very sparingly at Chattenden. *B. euphrosyne*.—Common at end of May and in June, in nearly every wood in the district. *Melitaea athalia*.—In the early "seventies" this pretty species was found in plenty in one grassy glade at Chattenden Roughs. Between 1875 and 1880, it was gradually, yet surely, "wiped out" by the "professional exchanger" of insects, aided by the "dealer." It finally vanished in 1880, a clear case of extermination. *Vanessa io*.—Usually common enough in the latter half of the summer; but for the last two seasons it has been very scarce. *Euranessa antiopa*.—In 1872, specimens were taken at Chattenden, Rochester, Strood and elsewhere in the district. Mr. Tyrer records (*Entom.*, Feb., 1889), a specimen as having been taken at New Brompton in Sept., 1888. *Aglais urticae*.—Found everywhere in gardens, fields and waste

places, from June to October. *Eugonia polychloros.*—Widely distributed in the district, but is scarcely common, except in some years at Chattenden. *Polygonia c-album.*—Represented only by a solitary straggler, taken at Chattenden in July, 1887, by a friend of mine, now deceased. *Pyrameis cardui.*—In suitable years, the last of which was 1891, it is found all over the district. *P. atalanta.*—Is one of our common butterflies. *Limenitis sibylla.*—Until 1859 was fairly common in Chattenden Roughs. The terribly cold and damp summer of 1860 was fatal to the species in this district. It vanished suddenly, and has never been seen at Chattenden since. Danaidæ:—*Anosia archippus.*—The third specimen recorded in England (by the late J. Jenner Weir, F.L.S., in the *Entom.*, vol. xix., p. 12), was caught by a schoolboy at Snodland, on Sept. 21st., 1881. Apaturidæ:—*Apatura iris.*—This is, or rather "was," the pride of the local list. Chattenden Roughs was its headquarters, where it could be seen soaring round the tops of the oaks on sunny days in July and August. In 1881, more than 200 were taken—a persecution which no species could possibly endure. Chattenden is now closed to collectors, and as *A. iris* has been seen at intervals in the Cobham district, it is just possible that it may find its way back again, and re-establish itself in its old haunts. Satyridæ:—*Pararge egeria* and *P. megaera.*—Both common throughout the district and are double-brooded, appearing in May and June, and again in August and September. *Hipparchia semele.*—One of our more common butterflies, although it is very local, and found only on the chalk at Cuxton, Holly Hill, Blue Bell Hill, etc., where it can be taken at end of July and in August. *Epinephele ianira.*—Seen in every grassy spot. *E. tithonus.*—More restricted to hedgerows and bushy places. I have seen it in July, on rough ground at Tower Hill, on the west side of the Medway, flying in absolute clouds over the blossoming bramble bushes. *Enodia hyperanthus.*—More of a woodland butterfly, and is found flitting quietly about in grassy openings at Cobham Park, Chattenden and elsewhere in the district, in July, but it very soon becomes worn. *Coenonympha pamphilus.*—Seen in every grassy field and waste place, from June to October.—*Melanargia galatea.*—Appears at the end of July and in August, and though always local, is found in several places on the left bank of the Medway, but much less commonly than was the case in years gone by. It has certainly been over-collected at Chattenden, where it was formerly abundant. It still occurs at Cobham Park (where I saw it last summer), and along the Halling and Cuxton Downs, as well as near Upnor.

COLEOPTERA.

Coleoptera in 1897.—Of the Coleoptera captured in the past year, the following appear to be the most worthy of notice. I have arranged them in the order of the catalogue, rather than giving the chief species obtained in each locality separately:—*Licinus depressus* and *L. silphoides*, occurred, not uncommonly, under stones in Headley Lane; *Harpalus caspius* appeared at Sheerness and Box Hill, and, at the latter locality, *Panagaeus quadripustulatus* and *Lebia chlorocephala* occurred in small numbers. *Pogonus luridipennis* was taken on the Berrow Sand Hills (Burnham), in company with the other two species of the genus, whilst one *Polystichus vittatus* fell to my lot under stones at Queenboro'.

Of the water-beetles, *Hydaticus transversalis* (in small numbers) and *Dytiscus dimidiatus* (one ♀) near Brent Knoll, Somerset, are about the best, and with them occurred *Hydrophilus piceus* and *Hydrous caraboides*, the former plentifully; *Ochthebius lejolisi*, at the bottom of Brean Down, Weston-super-Mare, occurred in some numbers; *Oxypoda spectabilis*, at Chesham, *Prognatha quadricorne*, in numbers, under bark, at Richmond Park, and *Microglossa gentilis*, in numbers, at Brent Knoll, are the best of the Staphs. *Clavigev testaceus* occurred sparingly at Box Hill, and in the old nest of a mouse, under a barn near Dorking, six examples of *Leptinus testaceus* occurred; *Anisotoma brunnea*, one specimen, at Ackworth, York; *Pocadius ferrugineus* and *Thymalus limbatus*, not uncommon in the New Forest; *Hyperaspis reppensis*, common, in moss, on Box Hill, in early spring; *Endomychus coccineus* (16), under willow bark, at Dormans, Surrey; *Laemophloeus bimaculatus*, one, New Forest, and *L. ater*, one, at Wimbledon, under bark, and with the former three specimens of *Synchita juglandis* occurred; *Diphyllus lunatus* was also taken in the New Forest, in black fungus, on ash; *Opilo mollis*, one, under bark, Richmond Park; *Anobium denticolle*, in some numbers in a dead oak near Brockenhurst; *Corymbites aeneus*, *cupreus*, and *pectinicornis* (3 ♀), Malvern, and *Trachys pumila*, Mickleham, were the only *Sternoxi* worth mentioning. *Phaleria cadaverina* occurred pretty commonly with the *Pogoni* at the Berrow Sand Hills. *Tetratoma ancora*, one, by sweeping at Bookham, and at the same time, *Mordella fasciata*, *Mordellistena abdominalis* and *M. humeralis*, occurred freely. *Rhytidosomus globulus* in small numbers, on aspen, at Wimbledon; *Ceuthorhynchus urticae*, *C. crux*, *C. trimaculatus* at Mickleham; *C. chrysanthemi*, at Malvern, in profusion; *Ceuthorhynchidius horridus*, Mickleham; *Brachytarsus varius*, Brent Knoll, and *Choragus sheppardi*, at Mickleham, are the most noticeable of the *Rhynchophora*; of the last named species I found as many as seven under one small piece of beech bark not an inch square. Of the Longicorns (chiefly conspicuous by their absence), may be mentioned *Asemum striatum*, a few at Bookham, from the same stump as those recorded last year; *Callidium violaceum*, at Headley, and *C. alni*, at Wimbledon; *Pachyta octomaculata* and *P. collaris*, at Malvern, all in numbers; whilst with the *Pachyta*, both species of *Molorchus* occurred sparingly, *Haemonia curtisi*, at Sheerness, one; *Chrysomela goettingensis*, sparingly at Mickleham; *C. distinguenda*, two, at Brighton; *C. hyperici* and *Cryptocephalus moraei*, at Mickleham, both in the utmost profusion. —Bertram G. Rye, F.E.S., 212, Upper Richmond Road, Putney, S.W. *February*, 1898.

Chrysomela gloriosa var. superba at Southwold.—A friend of mine, who is not a coleopterist, sent me, along with other beetles of no particular interest, a specimen of *Chrysomela gloriosa* var. *superba*, taken alive on the cliffs at Southwold, in June last. Mr. Newbery kindly identified the insect for me. This species is not uncommon on the Continent.—B. Tomlin, F.E.S., Llandaff.

Captures near Llandaff.—I should also like to record *Mordella aculeata*, *Pyrochroa coccinea* and *Trichius fasciatus*, from Castell Coch Woods, near here, in July last.—Ibid.

Coleoptera at West Wickham.—Having the opportunity of spending an afternoon at the above locality, in March, I went in the hope that the sun might have tempted some few beetles to wander from

their hybernacula, but, although fine, the wind was far too cold to find anything wandering about, and all captures had to be made by diligent search. Five of the pretty *Scaphidium 4-maculatum* were discovered underneath a rotten oak log, 2 ♂s and 3 ♀s; the ♂s showing well their characters of the depressed and pubescent metasternum, and projecting 7th abdominal segment. Thoroughly wet and rotten logs, half sunk or buried in earth or rubbish, seem to be the favourite habitat of this insect. It is not at all particular as to what wood it is, so long as it is wet enough and rotten enough. I have taken it from logs of birch, pine and oak. A smaller branch of oak, overgrown with moss, produced six *Agathidium varians*, including 2 ♂s, showing fairly well the peculiar enlargement of the left mandible. It is difficult to suggest a way in which an asymmetrical character like this is produced, and, although a variable character, it is not only in this species, but in several others of the British members of the group, that it occurs. This group is also peculiar in the way that the number of the tarsal joints varies, not only in different species, but in the ♂s and ♀s of the same species. One would think this a very unstable character amongst our Coleoptera, judging by this group, whereas the very reverse is the case. The other captures worth mentioning were *Homalota marcida*, *Euplectus nigricans*, and from two small pieces of dry *Boletus* I found a large colony of *Enneartbron affine*, one of our British *Cissidae*, which I have not seen since I took it in a similar way at Loughton, about six years ago.—H. Heasler, Danby Street, Peckham. *March* 3rd, 1898.

Interesting Coleoptera captured in 1897.—The following species of Coleoptera, obtained by me in 1897 (my first year with this order), appear to be worthy of record. By some fatality, most of my best insects occurred singly. My first capture of any note was a single specimen of *Aphodius conspurcatus*, found in horse-dung, near Chingford, on April 19th. My own district, the Lea Valley, produced the following, of more or less interest, during the season :—*Amara acuminata* (1) in flood refuse at Chingford Ferry, May 2nd; *Megatoma undata* and *Corymbites quercûs*, one each, Cheshunt, May 23rd, the former out of nettles close to a house, the latter on an Umbellifer; *Clytus mysticus* (3), two by beating a hawthorn hedge, the third found perched on the top of a high paling, apparently taking a look round—all at Edmonton, May 30th; *Hedobia imperialis* (1), crawling up a willow trunk at Chingford Ferry, June 13th; *Cionus tuberculosus*, Scop. (*verbasci*, F.), in some numbers on *Scrophularia*, in June, in company with *C. scrophulariae*, *C. blattariae* (commonly) and *C. hortulanus* (two only). *C. tuberculosus* also turned up in quantity on a fine plant of *Scrophularia aquatica*, growing alone at Chingford Ferry; this plant, which I visited at regular intervals, supported probably over 100 individuals during the season; *C. tuberculosus*, judging from my experience with correspondents, is badly represented in British collections; *Donacia crassipes*, a few specimens at the end of July, on the leaves of *Nuphar lutea*, growing in a backwater at Cheshunt; the insects were obtained with some difficulty, by reason of their provoking readiness to take flight to more inaccessible positions on the too near approach of the collector; *Heledona agaricola*, several specimens out of a fungus on a willow stump, Edmonton, July 24th; *Plagiodera versicolora*, Laich. (*armoraciae*, F.), in profusion on sallows and willows, near Roydon, Aug. 21st;

they were mistaken, at the time, for one of the common species of *Phaedon*, and consequently only a few specimens were taken. I spent Whitsuntide (June 5th–7th), with other members of the North London Nat. Hist. Soc., in the New Forest, when the following beetles were taken:—*Calosoma inquisitor*, a few specimens out of various trees and bushes; *Notiophilus rufipes* (1) and *Pterostichus oblongo-punctatus* (1), under dead wood; *Trox sabulosus*, two specimens under an old rag, at a spot which had evidently been the site of a gipsy encampment; *Asemum striatum* (1), caught by Mr. C. Nicholson, flying in the evening in the garden of "Lynwood," and kindly given by him to me. The interest attaching to the introduction of this northern Longicorn into the south of England, has already been commented upon by Mr. G. C. Champion and Mr. Donisthorpe. *Anoplodera sexguttata* (1) on a paling; *Cryptocephalus bipunctatus* var. *lineola* (1), on ling on White Moor, Lyndhurst; in the same locality, a *Geoptrupes*, which appears to be referable to *G. pyrenaeus*, was picked up crawling on a path; *Erirrhinus bimaculatus* (1), Matley Bog, where I also had the good fortune to meet with a fine example of the beautiful exotic-looking Syrphid Dipteron, *Spilomyia speciosa*, Rossi, which is apparently confined, in Britain, to the New Forest. In a sand-pit at Gomshall, Surrey, on Sept. 7th, I found a specimen of *Staphylinus stercorarius*, and another occurred to me a few days later, running over sand on the north-east Essex coast, in which latter locality also *Hypera murina* (2) and *Helops pallidus* (1) were obtained. I was much disappointed in the Box Hill district as a coleopterous locality, although, as recorded elsewhere, it yielded me some very fair Hemiptera.—F. B. Jennings, 152, Silver Street, Upper Edmonton, N. *March 17th*, 1898.

SCIENTIFIC NOTES AND OBSERVATIONS.

Assembling of Lasiocampa quercûs.—On April 6th, 1896, I came across eight small larvæ of *L. quercûs*, feeding on a clump of low growing ivy. I have somewhere seen ivy mentioned as a food-plant for this species, but think it cannot be a generally known one. These larvæ were reared on hawthorn, and all spun up, the first on May 30th. On July 7th, a female emerged, and being very dubious as to the actual amount of truth in the matter of assembling, more especially as on one occasion, at Oxshott, I had experimented with *Saturnia pavonia* without success, determined to give *L. quercûs* a trial, and, for this purpose, proceeded out early on the 8th, armed with a muslin cage, and having the female in a larva collecting tin in my bag. Arriving at what appeared to be a suitable spot, the cage with the female inside was hung on the branch of a tree, about four feet from the ground, and developments awaited with anxiety. Half-an-hour passed, no signs of any males, an hour likewise, then shortly afterwards two males flew around, and after a cursory inspection dashed off, not to again return, frightened possibly by the white muslin cage. After some considerable further time had passed, the erroneous conclusion was arrived at that there was evidently not much in "assembling" after all, and the female having been replaced in the tin, I started to return, somewhat disappointed. During my walk back, about 3 p.m., a male suddenly appeared, and buzzed round my black leather bag so persistently, that, quietly opening it, I was enabled to put a cyanide bottle over him without the intervention of a net. Encouraged by

this, I laid the larva tin containing the female on the ground, and to my astonishment, within about half-an-hour thirteen males had fallen victims through the extraordinary charms of the unseen female. On the 10th (fourth day after emergence) this female still attracted a few males. On July 11th, another female emerged, and wishing for further experiments in the same direction, took her out the following morning. Walking towards Leigh, I had not proceeded far before one male put in an appearance, flying wildly round and round me, followed immediately by a second. To appreciate the wonderful sense by which they were guided, it must be borne in mind that the bag I carried was a tightly closed leather one, the female inside being in an ordinary larva tin, one side only of which was made of perforated zinc. Arriving nearer Hadleigh Castle, I then walked along with the tin in my hand, and it was a never to-be-forgotten sight to see the males, coming up against the wind, one after the other, dashing round me, sometimes three or four at a time, or one, now and again, even settling on the tin as I held it still. The sport was fast and furious, and I took back with me fifteen absolutely perfect specimens, having examined and rejected about three times that number, and, without exaggeration, a hundred or more could easily have been captured, if required. What appears even still more remarkable, is that, on July 20th, I was carrying my bag, the tin inside, *but empty*, no female having been in it since the Leigh experience (over a week previously), when, in the course of the afternoon, many males were attracted, and, when the bag was placed open on the ground, some actually went inside to investigate. This seems to prove that the mysteriously alluring charm of the ♀ *L. quercûs* is temporarily retained in a strong degree by a metal box in which she may have been contained, and that this power is not of an especially evanescent character, may be gathered from the fact that the empty box was so attractive after its late occupant had been removed therefrom for over a week. — Herbert Williams, Southend. *January*, 1898.

Zygæna exulans with additional wings.—I took this specimen in August, 1895, at Oberalp. As seen from above, it looks an ordinary example of the species, the usual wings being quite normal. The legs also are normal, and in their usual positions, but between the left anterior wing and the meso-thoracic leg, are additional wing structures; the distance between the wing and the leg seems to be a little greater than usual. At a distance below the wing of about a millimetre, and parallel to it, is a supernumerary wing. In length, it is barely a third of that of the wing above it, but structurallyit represents the basal half of a normal upper wing, all the nervures being present up to nearly the end of the discoidal cell, and the colours of the scales covering it fairly correspond. The costa terminates in a small crumpled process, apparently representing the costal margin of the wing as far as the apex; the rest of the wing terminates abruptly, without any definite fringe, which one usually finds on the margin of congenitally abbreviated wings. A second supernumerary wing arises about half a millimetre below the first, still on the meso-thorax. It is too defective and crumpled to admit of any certain resolution of its structure, but it presents several folds of wing-structure, that would, if they could be straightened out, probably show it to be as long as the other supernumerary. It is clothed with small red scales.—T. A. Chapman, M.D., F.E.S., Elmscroft, Redhill.

PRACTICAL HINTS.

Field Work for April and May.

By J. W. TUTT, F.E.S.

1.—Towards the end of April, the striped grass in gardens shows a drooping or faded leaf. Find the bottom of the infected shoot, and pull, avoiding pressure as much as possible. In the stem lies the larva of *Apamea ophiogramma*.

2.—In May, the larvæ of *Lasiocampa trifolii* and *Lithosia caniola* have been found at Romney Marsh, on the tufts of a wiry grass, growing on the shingle just above high-water mark.

3.—April is the month to search the birches for the larvæ of *Geometra papilionaria*. Search, don't beat. Look for catkins (larvæ) growing at the extreme end of the twigs of birch, about five or six feet from the ground. Eaten leaves are a good guide to the whereabouts of the larva.

4.—*Lobophora halterata* emerges in May, and has no objection to sitting in the full rays of the sun on aspen trunks. It flies naturally after dusk, the males searching up and down the trunks of the aspens for the females, and only flying at a short distance from the trees.

5.—At the beginning of May, the full-fed larva of *Eupithecia debiliata* spins two or more of the young spring leaves of *Vaccinium myrtillus* together. It lives within the chamber thus formed.

6.—Where the bark joins the wood of an oak stump (cut down two years previously), the frass thrown out indicates *Sesia cynipiformis* (*asiliformis*). Dig out the cocoons about the middle of May, or saw off about four or five inches of the stump earlier in the year.

7.—In late April, sallows should be beaten for the larvæ of *Apatura iris* (*ride*, Hewett, *Ent. Record*, vi., pp. 146-147, for full details as to the best methods to adopt).

8.—Searching for larvæ by night, in April and May, is sometimes exceedingly profitable. Large numbers of those of *Triphaena ianthina*, *T. fimbria*, *Xylophasia scolopacina*, *Noctua baia*, *N. brunnea*, *N. triangulum*, *Aplecta nebulosa*, *Boarmia repandata*, and smaller numbers of *N. ditrapezium*, may still be captured on hawthorn, sloe, or the low plants that carpet our woods in the neighbourhood of London. Many woods in which the Rhopalocera and day-flying Geometrids have become practically exterminated, still produce many Noctuids in abundance.

9.—During April and May, the larvæ of *Cirrhoedia xerampelina* may be found under moss on ash trees. They go up the tree and feed on the blossoms at night.

10.—The larva of *Scodiona belgiaria* is to be obtained by sweeping the heath in April ; the imagines rest on the ground in June. Common on the Greetland Moors (Porritt).

11.—Search the trunks of trees in woods for *Nola cristulalis* and *Tephrosia consonaria* (Moberly).

12.—In April, search the plants of stitchwort (*Stellaria holostea*) for cases of *Coleophora solitariella*.

13.—The twisted heads of bramble, collected in May, produce *Aspis udmanniana*.

By NELSON M. RICHARDSON, B.A., F.E.S.

14.—The larva of *Lita* (*Gelechia*) *instabilella* makes a greenish-white mine in the fleshy leaves of *Atriplex portulacoides*, and is full-fed about the middle of April. It leaves its mine to pupate.

15.—The larva of *Lita* (*Gelechia*) *plantaginella* burrows in the root of *Plantago coronopus*, and changes therein to a pupa. Its presence is indicated by a small heap of pale brown frass on the crown of the plant, sometimes partly hidden by the leaves; full-fed at end of April or early in May.

16.—The larva of *Lita* (*Gelechia*) *suaedella* spins down the small fleshy leaves of *Suaeda fruticosa* to the stem, thereby concealing its presence. It is full-fed about the middle of May, and pupates in the sand or mud below the plant.

17.—The larva of *Lita* (*Gelechia*) *leucomelanella* feeds in the shoots of *Silene maritima*, sometimes spinning them down to the stones below, or burrowing down them for a short distance. It leaves its burrow before pupation, and is full-fed in May.

18.—The imago of *Steganoptycha subsequana* should be looked for amongst silver fir or spruce at the end of April. In the day-time it seems most inclined to fly in the early afternoon, when it may be beaten out of the trees, and it also flies naturally at dusk.

19.—The time to get the nearly full-fed larvæ of *Coleophora anatipennella* is at the end of April, when the leaves of the sloe are beginning to shoot. They are then most easily seen.

20.—The larvæ of the first brood of *Botys asinalis* may be found on *Rubia peregrina* in May, but require a little searching for, though their eating is conspicuous. They will eat *Galium aparine* in confinement, if their food-plant is not procurable.

21.—The larva of *Ephippiphora cirsiana* may be found through the winter in the old flowering stems of *Inula dysenterica*, just below the surface of the ground, as well as in other plants.

22.—Roots of yarrow, collected in April or earlier, may contain the larvæ of *Dicroramphe politana*, *D. plumbana* or *D. plumbagana*.

23.—The small cases of *Tinea rinculella*, resembling in shape unusually well-made cases of *T. pellionella*, may be found up to the end of May, on the undersides of stones, feeding on a microscopic lichen, but are hard to see, as they are so like their food in colour. This species occurs in Portland and Purbeck, and will not improbably be found elsewhere on limestone rocks on the coast, if carefully looked for. The imago is hardly ever seen at large.

24.—The larva of *Psychoides verhuellella* mines in the leaves of hartstongue fern, especially amongst the sori, in April and May. Also in *Ruta muraria*.

25.—The green spindle-shaped larva of *Plutella annulatella* lives amongst the flowers or buds of *Cochlearia*, spinning them slightly together. It is very inconspicuous, but very lively when touched.

26.—The larvæ of *Bucculatrix cristatella* nibble the leaves of yarrow, causing the bitten edges to turn brown, which betrays their presence. The beautiful ribbed whitish cocoon is spun irregularly across the front of the leaf, and may be found in May.

27.—The larva of *Lacerna ochraceella* mines longitudinally in stems of *Epilobium hirsutum*. About May it leaves the main stem, and mines up a leaf-stalk into a leaf, where it makes a long and rather tough cocoon in its mine, which may easily be found by examination.

N.B.—For series of similar hints referring to the same time of the year, refer to vol. ix., pp. 95-97, vol. viii., pp. 20-21, vol. iv., pp. 51-52, vol. i., pp. 23-24 and pp. 47-48.

NOTES ON COLLECTING, Etc.

Occurrence of Hydrilla palustris in Cumberland.—There appears to be no doubt of the two Noctuids, kindly exhibited by Mr. G. B. Routledge, on my behalf, at recent meetings of several of the London entomological societies, being females of *Hydrilla palustris*. In asking for particulars concerning their capture, Mr. Tutt writes, "I have no hesitation in referring them to *H. palustris*." This obscure little moth, in addition to being one of our rarest Noctuids, is very local in its distribution. Wicken Fen has yielded the majority of British specimens. Newman (*Brit. Moths*, p. 312) mentions a specimen being taken "at Compton's Wood, near York, flying over grass in a damp place." Carlisle must now be added to the localities for this species. Between Wicken Fen and Carlisle lies nearly two hundred miles of country, and in an extensive range like this it is surprising that more specimens have not been turned up in the intervening country. It is a species, however, easily passed over. My first specimen was taken late in the afternoon of May 30th, 1896, flying low down over the herbage in a marshy meadow, on the outskirts of a wood near Carlisle. The sun was shining brightly at the time. It is much worn, and the markings are hardly decipherable. The fore-wings are greyish-brown, with indications of two transverse lines, one near the base and the other almost parallel with the hind margin. The space between these lines is of a somewhat deeper shade than the remainder of the fore-wings. A small, dark spot marks the reniform. This specimen measures an inch across the wings. The second specimen, taken on June 12th, 1897, is similar to the first, but is an eighth of an inch less in expanse. Though in much better condition, the markings are still very obscure. It was taken in the same locality as the other, but on another side of the wood, and again the habitat was a marshy meadow. I well remember the occasion. It was about 7 o'clock in the evening of a scorching day, and though the sun was setting, it was still warm work collecting. In the shadow thrown by the wood, *Hepialus hectus* was on the move, and an early Geometrid moth or two reminded one of the coming dusk. Out in the open, crowds of *Crambus pratellus* and *C. hortuellus* flitted, and from among them I was engaged in netting *Eupithecia plumbeolata* and *E. pygmaeata*, when a dark-hued insect, flying rapidly in a straight line, like a *Zygaena*, caught my eye. In a trice it was netted, and as I transferred it to a pill-box, I saw that my unknown capture of May 30th, 1896, had been duplicated.—F. H. Day, 6, Currock Terrace, Carlisle. *March 8th*, 1898.

Note on Zygæna loniceræ.—I have only found *Z. loniceræ* in one small field, of about half an acre, in this district. It is, however, very abundant in that restricted area, and the imagines may be seen in dozens, booming about, or resting quietly on the flowers of the upright purple thistle. It appears regularly from year to year throughout July.—T. Greer, Tullylagan, co. Tyrone.

How to find Thecla pruni—The carpet-beater abroad.—I feel constrained to add yet another growl to the columns of the *Entomologist's Record*. I went, last season, to the happy hunting-ground of *Thecla pruni*. On arrival I was filled with disgust and contempt. Some one, who evidently is well "in the know" of at least one good

locality for this insect had beaten the bushes most unmercifully, for not only were the terminal and lateral shoots of the stems broken off, but the bark and part of the stout stems themselves were cut off with the stroke. Such having been the effect upon the wood, what must have been the result to any larva or pupa that was in the line of the stroke? I say emphatically, that, of so local an insect as *T. pruni*, not one ought to be wasted, and yet, for all this individual knows, and probably cares, he killed several, if not many, of the very insects he wished to obtain. Some one may say: But you cannot obtain *T. pruni* without beating. Persons cannot, of course, if they are blind, and if they are, they ought not to be entomologists. To refute such a remark, I may at once say that I found both larvæ and pupæ, and did not beat a stroke. I found as many as I wanted. I used my eyes, I learned where the larva rested, and where it pupated. I did not kill an insect, nor damage a single bush, and I found all my treasures near the spot where the "thresher" had been at work. If I owned woods, I would expel, if not prosecute, every person who so damaged my property. If such an entomologist (?) as he who visited the spot in question, must thrash something, let him use his strength on his wife's carpets. When on his hunting expeditions, let him use his eyes as I did, and by so doing may he be rewarded with success.—George B. Dixon, S. Peter's Road, Leicester. *January 24th*, 1898.

Callimorpha hera in Devon.—Last season *Callimorpha hera* was much more abundant than I have ever known it, and it has spread much, being found in several new localities. On one occasion I had three alive in my net at once, and saw another, which I subsequently obtained, flying. I took seventeen on that day in about an hour and a half. Several batches of ova were obtained, and three duly hatched, but most of the larvæ died off young.—E. F. Studd, F.E.S., Oxton, Exeter.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

Eggs of Lepidoptera.—*Hypsipetes furcata (elutata).*—The newly-laid egg is pearly white, quickly becoming pale yellow in colour, tinged with bright rosy over the micropylar area, the micropyle proper being quite red. The egg is laid on its long side, oval in outline, and much flattened; length : breadth : height : : 3 : 2 : 1. It is less rounded at the micropylar end than at its nadir. There is a distinct but shallow depression on the upper surface. The shell is finely covered with a very delicate polygonal reticulation, which becomes much rougher and more distinct at the micropylar end. The micropyle itself, owing to its red colour, is very conspicuous. [Described August 6th, from an egg obtained at Lanslebourg.]

Larentia caesiata.—The eggs are yellow in colour, laid singly on long side. The egg forms a somewhat distinct ellipsoid, with flattened base. The ends are rounded, and the top flattened, but without noticeable depression. Length : breadth : : 5 : 3. The surface of the shell is shiny, and is covered with a very fine reticulation. The micropylar end is very finely pitted, the pits arranged concentrically around the micropyle, which appears to be slightly depressed. [Described August 8th, from eggs laid by a ♀ captured at St. Michel de Maurienne.] By August 10th, the colour of the eggs had changed to bright orange, almost red.

Larentia didymata.—Some eggs laid singly, attached to the box in which a ♀ was confined; other eggs deposited loosely. The egg is pale yellow in colour. It forms a flattened oval disc, length : breadth : : 4 : 3. The ends are rounded, the surface smooth and shiny. No further detail can be made out by using a two-thirds lens as a hand lens. [Described August 8th, from eggs laid by a ♀ captured on Mont Cenis (Lanslebourg)].—J. W. Tutt.

REVIEWS AND NOTICES OF BOOKS.

British Orthoptera.—(By Malcolm Burr, F.Z.S., F.E.S., with 6 plates by S. L. Mosley, F.E.S. : Huddersfield, 1897, 8vo., 168 pp., Plates i-v).—We welcome a work that will create increased interest in an order so neglected in the British Isles as Orthoptera, for this little book will enable the student to identify any species he may capture in this country; it gives also some interesting notes on the insects and their habits, with full lists of the localities in which the various species have been hitherto taken. We are sorry that we cannot give unstinted praise to all the figures; the colouring is very poor. In Pl. i., the colouring is scarcely correct, *Forficula auricularia* is not uniformly testaceous, and *A. maritima* and *A. annulipes* should be shining black. There are surely several errors also in the explanation of this plate. Again in Plates iii. and iv., the colouring is scarcely correct, and in this latter plate the drawing is inaccurate; the ovipositor of *M. varium* is not of the right shape, and we do not see the spots that characterise the elytra of *D. verrucivorus*. It is a pity that the proofs have not been read more carefully, as we see several errors that might have been avoided. *Forficula lesnei* is included in the "Notes and Additions," but the points which separate this species from *F. pubescens* might have been given, to clear up the doubt which surrounds the claim of the latter to be regarded as British. On the whole, in spite of faults which might have been avoided, and for which the author is frequently in no way responsible, the book will prove useful to entomologists who wish to turn their attention to an interesting but neglected order, and we hope to see a great increase of attention paid to the Orthoptera, now that there is a means of identifying the species.

INFORMATION WANTED.

I shall esteem it a great favour if every reader of the *Entomologist's Record*, who has ever captured any species of *Micropteryx* (*Eriocephala*, Curt.) or *Nepticula*, either in the British Islands, *or abroad*, will give me as full particulars as possible on all or *any one* of the following points: Locality, dates (years, months and day, if possible), habitat, variation of imago, description of larva, mine, cocoon (and where placed), pupa, mode of dehiscence, etc. The species wanted are:—(1) *Micropteryx calthella*, *seppella*, *aruncella*, *aureatella* (*allionella*), *thunbergella* and *mansuetella*. (2) Any species of *Nepticula* that has occurred in Britain. If any of our readers in Scandinavia, Finland, Germany, Austria, France, Switzerland, Italy, Spain and Portugal, or any other country where these occur, will send me a list showing the distribution of these species in their country, I shall be very grateful.—J. W. Tutt, Westcombe Hill, London, S.E.

The Entomologist's Record AND JOURNAL OF VARIATION.

Vol. X. No. 5. May 15th, 1898.

Theories of Mimicry, as illustrated by African Butterflies.*

By Professor EDWARD B. POULTON, M.A., F.R.S., etc.

H. W. Bates, in his epoch-making paper (*Trans. Linn. Soc. Lond.*, vol. xxiii., 1862), first gave an intelligible theory of mimicry, and accounted for the superficial resemblances which had been known for so long by supposing that the most dominant, well-defended, and conspicuous forms in a country become the models towards which natural selection leads many of the weaker hard-pressed species in the same locality. The material on which Bates' theory was formed was confined to tropical America, and his generalisation remained incomplete until it could be applied to the other great tropical regions. This want, however, was soon supplied by A. R. Wallace for the East (*Trans. Linn. Soc. Lond.*, vol. xxv., 1866), and by Roland Trimen for Africa (*Trans. Linn. Soc. Lond.*, vol. xxvi., 1870).

In Bates' original paper a certain class of facts—frequently mentioned and abundantly illustrated—cannot be explained under his theory of mimicry. This is the strong resemblance which is apt to exist between the dominant forms themselves, and which is as minute and as remarkable as the resemblance of the weaker for the stronger species. Bates pointed out that this was unsolved by his theory, and both he and Wallace were compelled to suggest the direct action of some unknown local influence as the possible cause. There the matter rested until Fritz Müller, in a paper published in *Kosmos* for May, 1879, suggested an explanation, *viz.*, that the dominant forms gain an advantage by this resemblance, inasmuch as it facilitates the education of their enemies by giving them fewer patterns to learn. The necessary waste of life by which the education of young birds, etc., is brought about, is here divided between the various species of a closely convergent group, instead of being contributed by each member independently. The chief sub-families of butterflies which in tropical America appear to be specially distasteful to insect-eating animals, and which are specially mimicked by others, are the *Danainae*, *Ithomiinae*, *Heliconinae*, and *Acraeinae*. Of these the second and third are confined to this part of the world. The resemblances which Fritz Müller explained are those which occur very commonly between the *Danainae*, *Ithomiinae*, *Heliconinae*, and less commonly the *Acraeinae*

* Abstract of a Paper read before Section D of the British Association at Toronto on Friday, August 20th, 1897. Reprinted by permission of the Committee of the British Association.

of any locality. In order to complete this theory it was necessary to test its application in other parts of the world.

In the East the butterflies which take the place of the four above-named sub-families belong almost exclusively to the *Danainae*, the *Acraeinae* being represented by very few species. The *Danainae* are, however, extremely rich in species, and F. Moore first pointed out in *Proc. Zool. Soc. Lond.*, 1883, p. 201, that there is the same relationship between the species of this dominant group that obtains between those of tropical America. Not only do *Danainae* of very different genera closely resemble each other, but there is often a strong likeness between the species belonging to the two chief divisions of the sub-family—the *Danaina* and *Euploeina*. As in America, these resemblances are always between the species of the same locality.

While, however, Müller's theory received full confirmation from the facts observed in India and the tropical East generally, no attempt has been made until now to apply it to the African lepidopterous fauna. I have therefore examined this fauna from the Müllerian standpoint, and find that in it, too, the same relationships can be traced.

The dominant distasteful groups of Africa are the *Acraeinae*, which have their metropolis here, and the *Danainae*. The latter are chiefly represented by the species of the peculiar African genus *Amauris*, and by the abundant and wide-spread *Danais* (*Limnas*) *chrysippus*. I first looked for evidence of convergence between the *Acraeinae* and (*Limnas*) *chrysippus*, and soon found what appeared to be evident traces of it. Such species as *Planema esebria* (certain forms of), *Acraea petraea* (female), *A. oppidia*, and, above all, *A. encedon* (*lycia*) bear a considerable resemblance to *L. chrysippus*, inasmuch as all of them possess a dark tip to the fore-wing crossed by a white bar, as in the Danaine butterfly. Looking at the near allies of these species, and at the *Acraeinae* as a whole, we may feel confident that this black-and-white tip is not an ancestral character of the group, but a comparatively recent modification. Again, the fact that this character is sometimes more strongly developed in, and sometimes confined to, the female sex agrees with the corresponding relationships in other parts of the world, and furthermore supports the conclusion as to the recent acquisition of the markings.

Convergence between the *Acraeinae* and *Danainae* of the genus *Amauris* was next looked for and many examples found. Thus *Acraea johnstoni*, of East Central Africa, certainly suggests the appearance of one of the *echeria* group, such as *A. hanningtonii*, found in the same locality; while in West Africa *Acraea lycoa* resembles the black-and-white *Amauris damocles* and *A. egialea*. Similar resemblances in the West are to be seen between the large black-and-white females of the numerous species of the Acræine genus *Planema* and other Acræas in the same locality, such as *A. carmentis* (female) and *A. jodutta* (female), while the species referred to, of both Acræine genera, bear some considerable resemblance to an abundant West African black-and-white Danaine—*Amauris niavius*. Similar relationships occur in the South-East, where Acræas, such as *Planema esebria* (white form of female) and *P. aganice*, bear considerable resemblance to the abundant black-and-white Danaines—*Amauris ochlea* and *A. dominicanus*.

It was of great interest to prove that the members of these con-

vergent groups occur, not only in the same place, but at the same time. Mr. Guy A. K. Marshall has kindly done this work, sending me several groups captured at one place in a single day. At Malvern, near Durban, Natal, on March 6th, and again on March 30th, 1897, he captured *Limnas chrysippus* and several species of *Acraea*, with the black-and-white tip to the wing. On March 27th he captured, in the same locality, the black-and-white Planemas (*Acraeinae*) *P. esebria* and *P. aganice*, together with an abundant black-and-white *Neptis* (*N. agatha*) and a closely similar day-flying moth, *Nyctimeris apicalis*. It is very probable that these latter forms do not mimic in the Batesian sense, but are themselves specially defended and fall into a Müllerian group. Mr. Marshall did not, on that day, capture any of the black-and-white *Danainae*. Mr. D. Chaplin, however, on April 5th, 1896, obtained at Berea, a suburb of Durban, *Amauris ochlea* and *Planema aganice*, as well as *Limnas chrysippus*, with two species of convergent Acræas (*A. encedon* and *A. petraea*). Mr. F. D. Godman and Mr. O. Salvin have kindly presented these specimens to the Hope Collection at Oxford.

I think it must be admitted that there is now strong evidence for the same convergence between specially protected abundant African species from the same locality as that which is already well known in the tropical East and in tropical America. Various degrees of perfection exist, and it is in every way probable that the resemblance of some members to the standard of their group is not of long standing, and will improve in the future.

Other facts in the colouring of African Lepidoptera also support this interpretation. Thus certain *Lycaenidae* of the genera *Pentila* and *Alaena* are known to fly very slowly, and in the case of the latter to feign death when captured—characteristics of unpalatable forms. While they thus differ in habits from Lycænids generally, they also differ entirely in their appearance, which rather suggests that of an *Acraea*. The same is true of moths belonging to many groups, and perhaps of the abundant butterflies of the genus *Byblia*. Similarly the large group of Lepidoptera which has for its centre the abundant day-flying moths of the genus *Aletis*, appears to be moulded upon the colouring and pattern of *Limnas chrysippus*, differing only in an even greater conspicuousness, due to the white spots or rings on the black body, and the highly developed black-and-white border to the hind-wing. It is probable that the common species of the genus *Euphaedra*, which form some of the most conspicuous members of this group, are themselves specially protected. To take one more example, certain species of the Pierine genus *Mylothris* are rendered specially conspicuous by the interrupted black border to the hind-wings, the interruptions extending along the hind margin of the fore-wings. A white butterfly with such a border becomes an extremely conspicuous object, and this appearance of *Mylothris* is mimicked, more or less perfectly, by species from a number of Pierine genera, such as *Nepheronia*, *Belenois*, *Callosune*, etc. This is usually explained as an example of true Batesian mimicry, but it is, perhaps, more probable that the *Pierinae* are very largely a specially protected group, many of the genera of which, so to speak, combine their advertisements, and thus share between them the loss of life which must necessarily ensue during the education of each generation of their enemies.

I think sufficient evidence has been brought forward to show that the theory of mimicry, or rather of common warning (synaposematic) colours, which will always be associated with the name of Fritz Müller, may claim abundant examples in Africa as well as in the other parts of the world in which it has already been proved to hold.

Some notes on the pupal moult of Lepidoptera.

By T. A. CHAPMAN, M.D., F.Z.S., F.E.S.

It occurred to me last summer to endeavour, if possible, to learn something more of a curious action in connection with the spiracles in the pupal moult of *Charaxes jasius* (*ante*, vol. ix., p. 220). This was a remarkable action like a continuous winking, performed by the spiracular valves.

The difficulty in this observation is in being present just when the moulting takes place, and a considerable number of examples seems to be the best means of getting over the difficulty, so that if one misses one, one manages just to hit off another. There is also this advantage, in having a large number, that one learns what hour of the day is most likely to present an example. I tried several species, and succeeded in making observations on *Sphinx ligustri*, *Smerinthus ocellatus* and *S. populi*, *Phalera bucephala*, and *Scolioptery.r libatrix*. In the case of *P. bucephala*, moulting was much the most frequent from about 8 to 10 a.m., but in all the species it appeared to occur at all hours.

In addition to the spiracular phenomena, I met with one or two other facts that may be worth reference. One of the most curious of these was the colouring of the larval skin of *S. libatrix*, over the wing areas, preceding the moult. This has been well described, and figured by Professor Poulton (*Trans. Ent. Soc. Lond.*, 1887, p. 302). As soon as the larva begins to spin its cocoon, the cuticle over the fore-wing begins to darken, and then that over the hind-wing, until, before the moult takes place, the position of the wings is marked by two quite black patches, very conspicuous on the green larva. The colour is entirely in the superficial layer of the larval skin, and is moulted with it. The questions as to how and why these curious patches of pigment arise puzzled me very much, and I have not been able to formulate any theory about them that I can advance with any confidence. The colour of the pupa of *S. libatrix* is a sooty-black, and it pupates in a cocoon of leaves on a spray of the willow tree, on which it feeds. Is the blackness of any use to the pupa? I can hardly think it is; but if it is, it must be by its absorbing all radiant heat that reaches the pupa, and so forcing forward its development. This would, no doubt, be an advantage to the insect in two ways. It would diminish the period during which the insect occupied so exposed and therefore dangerous a habitat, and, in the cold and exposed positions often occupied by its food-plant, it might be useful in enabling the moth to emerge safely, and find a hibernaculum before the season became too far advanced. This is all clear enough, my difficulty is to believe that any very important amount of radiant heat would reach it through the leaves with which it is surrounded. If a black colour is useful to the pupa, it would, no doubt, be useful to the larva, but then would it be of much use only over so small an area, and do the wings require special forcing?

Of this, however, there can be no doubt, that the pupa is black, that it is not black by any intensity of the ordinary brown colour of chitin, but by the presence of a special pigment, and that it must be so with some special useful object in view. There can, further, be little doubt that the larval pigment we are considering is similar to that of the pupa, and is connected with it in some way. We may be tolerably certain of one other fact, *viz.*, that the material for this pigment is present in the superficial layer of the chitinous covering of the pupa at moulting, whilst it is still green and soft, and that the pigment is formed from it by some chemical change on exposure to air and light, probably by oxidation. This material for the formation of pigment is probably formed from some constituents of the epidermic cells that break down to liberate the effete superficial layer from the dermis beneath, and is probably at once absorbed by the new layer of epidermal cells forming on the surface of the dermis. I have just used the word "probably" a good many times, but the chemistry and physiology of the matter is so likely to be something similar to that I have sketched, that one "probably," if I could have properly spread it, would have, I think, met the case. Assuming this to be so, I think we may be able to explain the occurrence of these black patches.

During the larval life, the wing lies in an invaginated pocket of the dermis, but at the date of the change to pupa it does not do so, but lies immediately beneath the effete skin that is about to be thrown off, and, therefore, one of the changes that occur at the end of larval life is the disappearance of the double fold of dermis, between the epidermis and the wing. Now, when the outer layer of this frees itself from the epidermis, it no doubt does so by the same process as that which develops pigmentary material elsewhere, but here the dermis below has itself also to disappear, so that this material is not at once appropriated by the proper new cells beneath, and there is a certain excess of it, so to speak, free. This then permeates the effete cuticle, reaches the surface, and undergoes the oxidising, or other process, that converts it into pigment. There is no other portion of the larva where pigmentary material might thus be set free. But in this situation it is difficult to see how it could be avoided, without a different physiological process having been evolved for this little area. If we knew the precise date at which the wing became disencapsuled, we could better judge as to the probability of this being the correct hypothesis. It would also throw light on the subject to know if other instances of the same coloration of the larva were confined to cases in which the pupa has pigmental colouring, and does not occur where the ordinary chitinous brown only is the pupal colouring.

In *S. libatrix*, and other transparent larvæ, certain portions of the pupa are seen, before moulting takes place, to have already assumed a brownish chitinous colour, and, in many pupæ, immediately after the moult, there are portions already brownish, whilst the greater part of the pupa is green and soft. In *S. libatrix*, before the moult, a slight ruddy tint is observable over the prothorax, and a pink spot appears on the second thoracic segment, just behind the first spiracle. During, and just after, the moult, the colouring of the prothorax is seen to affect precisely that part of it that is exposed in the pupa, whilst a slight tinting exists over both the meso- and metathorax. The pink spot is seen to be the posterior lip of the thoracic spiracle, as

usually seen and described in the pupa. In the pupa of *P. bucephala* the portions coloured at the moult are only the anal spines, and the adjacent margins of the two last abdominal segments, where they are sculptured. In *Sphinx ligustri*, the mesothoracic margin, at 1st spiracle, was already coloured brownish at the moult, as well also as certain flanges along the sides of the 5th, 6th and 7th abdominal segments. It seems to be very usual for the posterior margins of the 1st spiracle to be already slightly matured. In *S. ocellatus*, the posterior margin of the 7th abdominal segment is already getting brown. I think, in these, and in other, instances, two points appear, the first is that no portion of the pupa can be allowed to harden and colour before the moult, that has to undergo any expansion or contraction during the alteration in form that occurs just after the moult. The second is the special case of the first spiracles. What we call the thoracic spiracle in the pupa is not the spiracle itself, which has the same structure, or nearly so, as the other spiracles, and is buried deeply in the fold between the pro- and mesothorax, and communicates with the surface by a narrow slit, but is the opening on the surface, and is between the two segments close to the antenna. The margin of one, or of both segments, here, is very often, indeed usually, specially wrinkled, striated, or otherwise characteristically and beautifully elaborated, affording, in many Micro pupæ, an excellent detail for the microscope.

It is very important, therefore, that these margins should, on the moult to pupa, fall exactly into their right places, and as this would often be apt to fail, if they were as soft as the rest of the pupa, we can understand why they are so usually (always ?) coloured and hardened to some degree before the moult takes place.

Contributions to the fauna of Piedmont.

By J. W. TUTT, F.E.S.

(*Continued from* p. 91.)

Nymphalidæ.—*Dryas paphia*.—Abundant, but worn to shreds, as also was the var. *valesina*, of which I saw three or four specimens. *Argynnis adippe*.—Worn to shreds. *Argynnis lathonia*.—Rare, in poor condition generally, although one or two fine specimens were captured. Probably we were between two broods. *Melitaea athalia*.—A few odd specimens occurred here and there all over the district, on the *Eupatorium* flowers. I found no spot that exhibited the appearance of a full second brood, as at Aix-les-Bains, three weeks earlier. *M. phoebe*. —I only saw this species on the Mont Cenis road, on the last morning of my stay, where it was evidently just appearing. It was in grand condition, the males bright red—one particularly fiery—the females dull orange. *Pyrameis atalanta*.—I saw, perhaps, a dozen specimens altogether, certainly not more. I do not remember seeing a single *P. cardui*, *Vanessa io*, or *Euvanessa antiopa*, and only one or two *Aglais urticae*. *Polygonia egea*.—The insect of this group was *P. egea*, and this was rather rare, and going over. It was very easy to catch on the *Eupatorium* flowers, and did not want stalking with the same care as did the spring specimens at Digne. Even when it sunned itself on the rocks, it was not particularly difficult to approach. The condition of these specimens, and the way the females haunted the *Parietaria*,

growing on the walls by the roadside, made it quite evident that these specimens were not to be the hybernators. The males are smaller, and, when in fine condition, brighter than the females. *P. c-album.*—One specimen only, netted whilst on a head of *Eupatorium*. Evidently just emerged, and with dark underside. Have all hybernating *P. c-album* a dark underside? *Limenitis camilla.*—This charming insect was not at all common, but its graceful flight along the edge of a wood, or as it sailed round a head of *Eupatorium*, already covered with *Callimorpha hera*, was delightful in the extreme. Specimens, otherwise in the very finest condition, almost always had a tooth nipped out of one of the hind-wings.

Apaturidæ.—*Apatura ilia.*—One male specimen taken on the road to Bussoleno, during a gleam of sunshine, on an otherwise dull morning. It settled on the damp road, and at first I thought it was a fritillary, so brown was it, but as soon as it moved so that the sun shone on its wings, the purple iridescence disclosed its identity. I saw no other specimen.

Libytheidæ.—*Libythea celtis.*—It would appear as if I am doomed not to take this insect. I had a view of a specimen of this species as it flew within a yard of me. I hesitated a moment, and the butterfly was gone.

Satyridæ.—*Pararge egeria.*—A few specimens only in a wooded gorge. Of an intermediate form between the bright fulvous form of southern Europe and the northern form, as exhibited by our British specimens. *P. megaera.*—Abundant and brightly tinted. It occurred along the roadsides, and occupied exactly the same ground as the following species. *P. maera.*—Very abundant on all the roads just outside the town, but difficult to obtain in fine condition. The female specimens were particularly well-marked with fulvous on the upper side, some having this colour carried almost to the base. On the other hand, some of the males were small and dark. *Epinephele ianira.*—Rather abundant on the bramble blossom here and there, a few of the yellow aberration of the female occurred. *Hipparchia semele.*—The form here is very large, the underside of the male white-banded, of the female covered with grey marblings; the male very uniformly tinted above, the female of the *aristaeus* form. This species abounded on the road leading up to the Mont Cenis pass; I saw many hundreds on the flower heads one morning. *H. statilinus.*—This beautiful fellow was rather rare. At Aosta it loved dry rocky watercourses; here it was found occasionally on the *Eupatorium* flowers by the roadside that is crossed by the railway, whilst on the Mont Cenis road it kept to the ground where it was most difficult to see. *H. arethusa.*—Kane gives Susa as a locality, and I, at first, thought I had missed the species. He also says the form taken here is the var. *boabdil*, diagnosed as "darker brown with tawny band much obliterated and underside paler, with whitish rays very distinct." All I can say is that the female has a very pale yellow band, the males a well-marked orange one; with a small spot in the third interneural space above the inner margin. The underside has the nervures outlined with pale, about as strong as is usual in the specimens that I have captured at Aix-les-Bains. This species is excessively local, and occurs, so far as I could discover, only on the steep slopes on the Mont Cenis road. Here it settled with swarms of *H. semele* on the flowers (greenish) of a kind of thistle, that is very attractive to insects of all kinds. *Callimorpha hera* swarmed, in 1894, on similar

flowers at Aosta. *Satyrus hermione*.—Occurred on the same ground as the last species, but, with the exception of one or two specimens, would not come within reach of the net. It also occurred in the wooded gorge above the town, where it settled on the tree-trunks. *S. cordula*.—Going over; a male, in poor condition, reminding one much of *Enodia dryas*, was captured; two or three females were also taken, and were remarkably well ocellated. *Coenonympha pamphilus*. —A few specimens only, some with a good broad band, ab. *lyllus*. *Erebia aethiops*.—The insect, perhaps, of the locality. I never saw such grand fellows as the specimens taken here—large, rich, and well ocellated. The male androconia were specially fine. It loved the *Eupatorium* and thistle blossoms, and occurred even along the sides of all the roads that led to the mountains. The undersides in the direction of ab. *leucotaenia* were magnificent, and those of ab. *ochracea* were also very fine. *Erebia neoridas*.—Kane says that this species occurs at a greater altitude than *E. aethiops*. I had supposed this was correct, but at Susa the two species overlap in every direction. I was surprised at the fact, but there was no doubt about it. I first found the species here on a stony slope covered with lavender, very similar to the La Grave and Romanche Valley localities. Then I found it on the steep slopes of a chestnut wood, where the males loved to sun themselves on the leaves of the trees, and where they flitted about quite out of the reach of the net. This habit of flying over the bushes, I am informed by Mrs. Nicholl, is also characteristic of the allied *E. zapateri* in Spain. Lastly, I found it on the steep dry slopes of the Mont Cenis road, where it flew restlessly up and down, but where it was almost impossible to follow it. I was, however, successful, in getting a few females this year. The species is very distinct, not only in the character of the band on the fore-wings, the shape of the wings, and the markings of the underside, from *E. aethiops*, with which some entomologists are inclined to unite it, but also in having an exceedingly different egg. Mrs. Nicholl tells me that she only took *Erebia zapateri* in any numbers between July 29th and August 1st, when she left Aragon. She found it a very sluggish insect, and says that it haunts thin woodlands, where the undergrowth consists of *Uva ursi* (the grouseberry), which in Spain never grows at a less elevation than 4,500 feet; she never saw any number of the insect except on *Uva ursi*. Comparing this with *E. neoridas*, Mrs. Nicholl says: "I took *E. neoridas* close to La Grave, and for some distance below. It is rather like *E. zapateri*, but differs in its habits, I think. I used to get the former close to rocks, whereas *E. zapateri* does not seem to like either grass or stones, but only the *Uva ursi*." It would appear from my Susa observations that the habits of *E. neoridas* vary much in different localities. Oberthür says that *E. neoridas* is found in the Pyrénées-Orientales, around the ruins of the old monastery at Saint-Martin-du-Canigon, at the end of July and commencement of August, but does not differ from the form in the Basses-Alpes. Looking over Elwes' "Notes on the genus *Erebia*" (*Trans. Ent. Soc. Lond.*, 1889, p. 329), I see that he queries it as a doubtful species or var. of *E. aethiops*, but gives *E. zapateri* specific rank. On the other hand, whilst I consider there can be no doubt whatever of the specific distinctness of *E. neoridas* and *E. aethiops*, I must confess that *E. zapateri* appears to me to run very close to *E. neoridas*. *Melanargia galatea*.—A few worn specimens. The insect was altogether passé.

Notes on Hemerophila abruptaria.

By W. G. PEARCE.

On the evening of May 14th, 1895, a lad in my employ captured, outside the front of my house, and probably attracted by the light, a magnificent dark female aberration of *Hemerophila abruptaria*. Though enclosed in his hands, it was then uninjured, but whilst I hurried into the room for a chip box, the moth escaped, and flew three times through a gas flame, and was picked up scorched and apparently lifeless. I tried to revive her with sweetened water, and after about twenty minutes the insect showed faint signs of life, when she was enclosed in a chip box and left for the night. Next morning the moth was dead, but had deposited 18 eggs before dying. The eggs hatched in about a fortnight, and the larvæ were carefully tended in a pot on a mantel-shelf. All went well for a couple of weeks, when they were knocked into the fireplace, 9 only being recovered. Of these, two subsequently died, and seven pupated, the latter producing three dark aberrations, and four normal light forms, in April and May, 1896.

The probability of the first capture having come from my own garden at once occurred to me, and I commenced a nightly search of the lilac bushes there. Several ordinary forms occurred, but on May 23rd, 1895 (nine days after the first capture), I found a dark ♂ *in cop.* with an ordinary ♀. From this pairing I obtained a batch of eggs, which hatched in due course, and finally produced 30 to 40 imagines in the spring of 1896; the first dark specimen, a ♀, emerged on April 26th, 1896. This female was paired with a small dark male (one of the three mentioned above as coming from the captured female). Fertile eggs were obtained, but the resulting larvæ were mixed with those obtained from other pairings, and their identity was lost. Many of these mixed larvæ fed up more rapidly, and produced a partial second brood, the imagines appearing in August, 1896. These were all smaller than the spring form. Some of these were again paired, though it seemed rather difficult to induce them to do so. Eggs resulted, some larvæ fed up rapidly, but the majority seemed to hang about whilst quite small. When the lilac was bare I gave them privet, which they ate readily for a time, and late in December, 1896, some tried to spin up, only two, however, being successful in doing so. The remainder that were full-fed died, whilst the smaller ones nibbled a little now and again, until the end of January, 1897, when most of them died. Half a dozen produced pupæ, imagines from which emerged in April and May, 1897, the last one to emerge doing so on May 26th, and being the only dark aberration obtained from the hybernating larvæ. The hybernation of a species in the larval stage that normally passes the winter in the pupal stage is very interesting.

Larvæ of *H. abruptaria* were remarkably abundant in the autumn of 1895. Of these, I collected a large number, feeding them up out-of-doors in a large breeding cage. Several of these produced dark specimens in the spring of 1896. I also captured several dark aberrations in my garden in May, 1896, and three, on different dates, in the house, where two had apparently emerged since I found the empty cocoons under a shelf. Since the autumn of 1895, larvæ have been very scarce in my garden. I have an idea that the abundance of earwigs (*Forficula auricularia*), in 1895 and 1896, had much to do with

their rarity, as I found them eating both the eggs and pupæ of *H. abruptaria* with great gusto.

I must not omit to mention that on April 13th, 1897, I bred a specimen which, to all appearance, was a female, but which had a strongly pectinated male antenna on the left side.

Some observations on Hemerophila abruptaria.

By W. A. SOUTHEY.

On May 22nd, 1896, I took a dark ♀ in the garden of Mr. Pearce, at St. James' Road, Holloway. This I paired with an ordinary ♂, and in due course obtained a batch of eggs, from which larvæ hatched and fed up, about half producing imagines in August, 1896, including one black specimen, the remainder going over until the spring of 1897 when five more dark examples emerged.

As far as my experience goes the sexes do not pair so readily when both are dark, and the batch of eggs is usually smaller in number. The typical form of the male and female pair more than once. I have found the same pair *in cop.* on three consecutive evenings, eggs being laid each night; one female, which I kept for a week with a black male, laid eggs, I believe, every night—114 eggs being deposited altogether. These produced a strong healthy brood of larvæ. The larvæ from a dark female are certainly always weaker than those from a typically coloured specimen, some always dying about the first moult, otherwise *H. abruptaria* is one of the easiest species to breed.

In 1897, second-brooded specimens did not put in an appearance until October 12th, a dark crippled ♂ appearing on that date, the last emerged about December 6th. I believe this second brood would have gone over until next spring but for the very mild October which we experienced, the remainder of my pupæ, about two dozen, going over. As far as my experience goes, there is always a partial second brood in confinement, but some of the same brood will always remain as pupæ until the next spring.

In 1896, I paired some of the second brood (which emerged during August), and obtained many eggs, which hatched during September. I fed the larvæ on privet during October, November and December. They all fed up and pupated, with the exception of eight; seven of these were full-fed in December and attempted to pupate, but seemed too weak to do so, for they gradually dried up. The one larva which had not changed its last skin, hybernated and went through its last moult in February, and fed up and spun its cocoon in March. The moth not emerging in due course, I pulled the cocoon to pieces and found a dried-up, half-changed larva. The larvæ which did pupate during December seemed very weak, some making no cocoon and taking about three weeks to make the change; they would hold on by their hind-legs for some days after they had finished feeding and then fall to the bottom of the cage turning to pupæ upon the bare earth, and it seemed very difficult for them to do even this. The parents of this third brood were all typically coloured specimens, but I believe that some of the dark forms that emerged in 1897, were from this lot (which altogether numbered about 400), but I had about twenty eggs laid by a black female and given to me by Mr. Pearce, the larvæ from which

were fed on privet with the larger lot. I bred, however, too many dark aberrations altogether for them to have all come from the eggs received from Mr. Pearce, and, therefore, I feel sure that some of the dark forms were the produce of my ordinary types; we must bear in mind, however, that even these ordinary coloured specimens came from the garden in St. James' Road, and, therefore, most probably contained the dark strain of variation. Altogether, I bred a remarkable series of specimens in the spring of 1897, one would have supposed from the late feeding (Oct.–Dec., 1896), that they would have emerged small. Certainly the males are rather undersized, but some of the females are as large as any captured specimens.

With the exception of the third brood of 1896, all the larvæ were kept under the same conditions, being fed-up indoors on a landing, with a window looking due north, the third brood of larvæ were kept in my workshop under the bench.

The dark forms seem very weak. I have bred so many cripples and they are so easily damaged, that, even with the greatest care, the setting-brace nearly always leaves a mark upon the wings, so easily do the scales come off; I have not noticed this so much with captured specimens.

The moth emerges from pupa nearly always during the evening from 6 to 11 p.m., very seldom coming out during the day, and rarely after 12 midnight.

In the wild state the ♀ lays her eggs, sometimes in a broken line along the lilac twigs, sometimes singly. They are considered a great delicacy by earwigs, and I have often found the latter busily engaged feasting upon them.

The British Liparid Moths.

(Continued from p. 93*).*

By A. BACOT.

ORGYIA ANTIQUA.—1*st skin*: The 2nd and 3rd thoracic and 5th abdominal segments are weak; all the other segments and the head are dark. The anterior trapezoidals on the 5th and 6th abdominal segments only bear one small hair. All the other tubercles bear several hairs. The hairs are thorny, and some of them are fully as long as the larva. 2*nd skin*: A slight reddish lateral band is now present. The anterior trapezoidals are only about half the size of the posterior, and on the 5th, 6th and 7th abdominal segments, they only bear a single hair. A few of the long hairs rising from the ear-tubercles (sub-dorsal on prothorax) are now finely branched or feathered at tip. 3*rd skin*: Dorsal tufts are now present on the 1st, 2nd, 3rd and 4th abdominal segments, also a pencil on the 8th, some larvæ have already developed pencils on the prothoracic segment (rising from ear-tubercles). The dorsal tufts on the abdominal segments 1 and 2 are black, and arise from both pairs of trapezoidals. On abdominal segments 3 and 4, they are white and arise from the anterior pair only; the pencil on the 8th abdominal rises from the posterior pair. In the adult larva the dorsal tufts are all of the same tint, whitish- or yellowish-brown. The single pencil on the 8th abdominal and the two on the prothoracic segments are black. Lateral tufts are present on the 1st and 2nd abdominal segments. Dr. Dyar mentions a larva which had additional tufts on the 3rd abdominal as well.

O. GONOSTIGMA.—Unfortunately I have no notes on the early larval stages of this species. In its hybernating stage (about the 4th skin), it has practically attained adult plumage, although the colours do not show up so brilliantly as in the full-grown larva. In this stage (hybernating) it is not unlike the larva of *Porthesia similis* in general appearance, but the resemblance is only superficial; possibly some protection may accrue to it, even from a rough likeness to so well-protected a larva as that of *P. similis*. The sub-dorsal pencils on the pro-thoracic segments are present; the 1st, 2nd, 3rd and 4th abdominal segments bear pale brown dorsal tufts, the 8th abdominal bears a bushy dark brown dorsal tuft, with a slender pencil of black hairs rising through the tuft. In addition to the long thorny hairs which arise from all, or nearly all, the tubercles, the outer dorsal tubercles (? posterior trapezoidals) on the 2nd and 3rd thoracic, and the 4th, 5th, 6th, 7th and 8th abdominal, segments bear a number of white or pale yellowish, short, plumose hairs. It is the contrast between these and the brilliant red of the dorsal area which chiefly produces the superficial likeness to the larva of *P. similis*. *O. gonostigma* has no lateral tufts.

LÆLIA CŒNOSA AND LEUCOMA V-NIGRA.—I have no personal knowledge of the larvæ of either *Laelia coenosa* or *Leucoma v-nigra*, other than that to be obtained from blown specimens. The larvæ of both species are tufted, those on *L. coenosa* being arranged like those of the larva of *O. gonostigma*, while *L. v-nigra* possesses eight dorsal tufts, one on each of the abdominal segments 1 to 8.

DEMAS CORYLI.—The larva of *Demas coryli* has a superficial likeness to a Liparid larva, but it differs in some very important points, and, in my opinion, certainly ought *not* to be included in the family. In the 1*st skin* it is longer and more slender in appearance; the anterior trapezoidals are larger than the posterior and bear 3 or 4 black thorny hairs, while the posterior only bear one. The ear-tubercles are not nearly so prominent as in the Liparids, and there are no weak segments. No eversible glands are developed at the 2nd, nor at any subsequent stage. In the 3*rd skin*, the trapezoidals are more equally developed, but the anterior are still the more important, the anterior pair on the 8th abdominal are very large and close together, and this segment is rather stronger than the others. In the 4*th skin*, the anterior trapezoidals on the 1st and 2nd abdominal and the tubercles on the 3rd thoracic give rise to slight tufts of brown hairs, while the 2nd and 3rd thoracic segments bear similar lateral tufts. In the 5*th skin*, the anterior trapezoidals on the 8th abdominal bear pencils of black hairs. The brown dorsal tufts are still present on the 1st and 2nd abdominal segments. The lateral tuft on the 2nd thoracic segment is black. Thus *Demas* differs from the Liparids in having no eversible glands, no weak segments, and in the fact that the anterior trapezoidals are larger than the posterior.* The dorsal and lateral

* Dr. Chapman in his epoch-making paper on the "Genus Acronycta and its Allies," has made a slight slip with regard to this point. He writes: "The abundance of hairs and their length, the character of the tubercles, the anterior being more important than the posterior, the colouring, all point to *Liparis* rather than of *Acronycta* as the nearest affinity" (*Entom. Record*, etc., vol. iii., p. 250). In *Liparis* it is the posterior, not the anterior, which are the more important, see *Ent. Record*, vol. iv., Pl. IX., fig. 8, where the larva of *Dasychira pudibunda* in the 1st stage is figured.

tufts, which are the characters chiefly responsible for the similarity of appearance, are present on the 2nd and 3rd thoracic segments, which are usually weak in Liparid larvæ, and, in no case of which I am aware, do they bear tufts. The importance of the anterior over the posterior trapezoidals, the strength of the 8th abdominal segment, the close proximity of the anterior trapezoidals and their great size on this segment, and the possible greater importance of the 2nd and 3rd thoracic segments (judging by their bearing both dorsal and lateral tufts), are traits which are frequently developed in species arising from the Lasiocampid stirps.

(*To be continued.*)

Tephrosia bistortata and T. crepuscularia in the Northern Counties.

I have only taken two specimens of *T. crepuscularia* (*biundularia*) in this neighbourhood. This was about eighteen years ago, and I believe they were taken between May 20th-24th. Strange to say, I have collected over the same piece of ground every year, many times in the season, since, and I have never seen another specimen of the species, nor have I seen one in any of the collections in this neighbourhood of either of these species, therefore they must be extremely scarce in this locality.—J. Finlay, Meldon Park, Morpeth. (This note was written Sept. 15th, 1896.—Ed.).

I took *T. crepuscularia* (*biundularia*) at rest on the moor at Wolsingham, in June, 1895. This was in the immediate neighbourhood of large pine woods.—W. Milburn, Darlington.

The following are the dates on which I have captured the species. In 1895, April 29th, 4 *T.* ab. *delamerensis*, and 1 typical; April 30th, 2 *T.* ab. *delamerensis*, and 5 typical; May 2nd, 1 *T.* ab. *delamerensis*, 3 typical: May 3rd, 4 typical; May 6th, 1 *T.* ab. *delamerensis*, 2 typical; May 8th, 2 *T.* ab. *delamerensis*, 1 typical; May 9th, 2 *T.* ab. *delamerensis*, 2 typical, 1 pale; May 14th, 4 *T.* ab. *delamerensis*, 2 typical, 1 pale. These all occurred in a small space, less than 100 yards in length and 80 in breadth. In 1896, *T. crepuscularia* (*biundularia*) was very scarce. I made several expeditions, but the total number seen was: —2 males, type form, 1 female very pale, 1 dark male and 1 female. I find the species almost invariably on fir or alder, generally from one to two feet from the ground, the pale forms generally on fir and the dark on alder.—(Rev.) C. D. Ash, B.A., Skipworth Vicarage, Selby.

I do not think that both species occur in the neighbourhood of Rotherham. Our specimens occur from the latter end of March until late in July, and the late ones are usually the darker. I have bred from both the light and dark forms, and have obtained dark and light specimens from both forms of the female. My cabinet series of *T. bistortata* is from N. Devon; the specimens are certainly much browner than those we get here. Referring to actual dates, I find I have taken *T. crepuscularia* (*biundularia*), at Edlington, as early as March 2nd, and as late as July 29th, but should say the middle of April to the middle of May is about the time when the insect is most plentiful in average years. Although July 29th is an abnormally late date for this species, my observations lead me to believe that there is only one brood in this district; there is no interval that I have observed, and we

find odd ones every time we go for the species. Such late specimens are never in good condition.—J. N. Young, Rotherham.

I have gone through my note books, and find the following are my records, dates, and localities for *T. crepuscularia* (*biundularia*). I have visited Edlington in March and April, and have never then found the species, and as recently as 1895, I was there in July and August, but never saw a *Tephrosia*. The dates I have are as follows: At Edlington. —1871: May 19th; 1873: June 12th; 1874: May 10th, 26th and 31st; 1875: May 9th; 1876: June 6th-24th (I began this year to take darker ones); 1877: May 22nd (only saw one specimen this year); 1880: May 2nd–June 5th (plentiful); 1884: June 6th (scarce); 1887: June 7th, 15th and 17th (plentiful); 1888: May 26th, June 13th-25th (plentiful); 1890: June 5th; 1894: June 18th (some nice dark aberrations); 1895: May 24th (some nice dark abs.). At Lambwood, Barnsley.—1881: May 23rd. At Thorne.—1890: May 26th. At Doncaster—1891: June 12th (some dark specimens); 1892: June 6th (dark, but worn); 1893: May 9th-12th (some dark aberrations). —J. Harrison, F.E.S., Barnsley.

I generally get *biundularia* about the middle of May. In 1893, I saw it as early as the middle of April, but this is very unusual. The species that I take on the tree trunks at the same time as *T. crepuscularia* (*biundularia*) are *Dasychira pudibunda*, *Odontopera bidentata*, *Cidaria corylata* and *C. silaceata*.—H. H. Corbett, M.R.C.S., F.E.S., Doncaster.

COLEOPTERA.

Coleoptera taken in the Carlisle district in 1897.

By F. H. DAY AND JAMES MURRAY.

The species mentioned in this paper have all been taken within a few miles of the city of Carlisle, with the exception of some few which have occurred at Allonby, on the Solway Firth, Keswick, and one or two other places, which are duly given with the species to which they apply. Many species, probably abundant, have only been noticed sparingly, as during the most productive part of the year our attentions were taken up with the Lepidoptera. The water beetles were quite neglected. To Mr. E. A. Newbery our best thanks are due, for assistance in determining some of the more obscure species.—*Cicindela campestris*: Locally common in peaty and sandy situations. *Cychrus rostratus*: One, under a stone. *Carabus catenulatus*: Several, at "sugar." *C. violaceus*: One, taken on the wing, and another dug up in a garden. *C. nemoralis*: Several dug up at tree roots, etc. *Notiophilus biguttatus*: Common at tree roots, etc. *Nebria brevicollis*: Common under stones. *Leistus fulvibarbis*: Among dead leaves, and under stones near woods. *L. rufescens*: Two, among dead leaves. *Elaphrus cupreus*: Scarce at tree roots, and among damp refuse. *Clivina fossor* and *C. collaris*: Common under stones. *Broscus cephalotes*: Common among refuse on the coast. *Badister bipustulatus*: Uncommon under stones. *Bradycellus verbasci*: One, at root of a tree. *B. cognatus*: One, at roots of reeds. *B. harpalinus*: Not uncommon at roots of reeds, and in flood refuse. *Harpalus ruficornis*, *H. aeneus* and *H. latus*: Common on paths and under stones. *H. rufibarbis*: One,

under a stone. *Anisodactylus binotatus*: Several, on dry paths. *Pterostichus cupreus*: scarce on paths. *P. versicolor*, *P. madidus*, *P. nigra*, *P. vulgaris* and *P. nigrita*: Common under stones, etc. *P. strenuus*: Abundant at roots of grass, etc. *P. striola*: Common under rotten wood. *Amara apricaria* and *A. communis*: Common under stones and on paths. *A. ovata*, *A. plebeia* and *A. spinipes*: Uncommon under stones. *Calathus cisteloides*, *C. melanocephalus*: Common under stones, and at tree roots. *C. flavipes*: One, on the coast, at Allonby, under a stone. *C. mollis* and *C. piceus*: Scarce under stones. *Anchomenus dorsalis*, *A. parumpunctatus* and *A. angusticollis*: Common at tree roots, etc. *A. albipes*: Among dry river refuse. *A. marginatus*: One, on banks of a stream. *A. fuliginosus*: One, at root of a tree. *A. gracilis*: Several at tree roots. *Olisthopus rotundatus*: Scarce under stones. *Bembidium guttula*, *B. littorale*, *B. biguttatum*, *B. lampros* and *B. rufescens*: Generally common at roots of grass, and in refuse. *B. prasinum*: One, at root of a tree. *Trechus minutus*: Common in flood refuse. *Lebia chlorocephala*: One, at roots of grass. *Dromius linearis* and *D. melanocephalus*: Common in grass tufts. *D. quadrimaculatus* and *D. quadrinotatus*: Under bark. *Sphaeridium scarabaeoides*: Common in dung, and among refuse. *Cercyon flavipes*: Common in refuse and dung. *C. haemorrhoidalis*, *C. unipunctatus* and *C. melanocephalus*: Sparingly, in refuse. *Megasternum boleotophagum*: Several, in flood refuse. *Aleochara fuscipes*: On the coast, in carrion. *A. nitida*: In flood refuse. *A. moesta* and *A. lanuginosa*: Scarce in refuse. *Oxypoda opaca* and *Ischnoglossa prolixa*: In flood refuse. *Ocalea latipennis*: Several, in flood refuse. *Homalota vicina* and *H. gregaria*: Sparingly, in flood refuse. *Autalia impressa*: One, in flood refuse. *Conosoma pubescens* and *C. littoreum*: Not uncommon in flood refuse. *Tachyporus obtusus*, *T. hypnorum* and *T. chrysomelinus*: Very common everywhere. *T. pusillus* and *T. brunneus*: Moderately common in flood refuse. *Tachinus rufipes*: Common everywhere. *T. collaris*: In flood refuse. *T. subterraneus*: One, at Allonby, at foot of a gate-post. *T. marginella*: Common among bones. *Megacronus cingulatus*: One, at root of a tree. *M. analis*: Two, in flood refuse. *Quedius tristis* and *Q. fuliginosus*: Common under stones, etc. *Q. mesomelinus*: Uncommon in grass tufts. *Q. molochinus*: Under stones. *Q. rufipes*, *Q. boops*, *Q. attenuatus* and *Q. semiaeneus*: In flood refuse. *Creophilus maxillosus*: Common in carrion. *Staphylinus erythropterus*: Very local at tree roots, burrowing to some depth. *Ocypus olens*: Among decaying vegetable matter. *O. brunnipes*: One, under a stone. *O. morio* and *O. cupreus*: Moderately common under stones. *Philonthus splendens*: One, under rotting wood. *P. politus*, *P. varians* and *P. trossulus*: In refuse. *P. laminatus*, *P. decorus*, *P. aeneus* and *P. sanguinolentus*: Sparingly, under stones, and among vegetable refuse. *Xantholinus linearis* and *X. punctulatus*: Common in flood refuse. *X. tricolor*: One, among vegetable refuse. *Baptolinus alternans*: Common under bark on Scotch fir stumps. *Othius fulvipennis*: Moderately common under stones, etc. *Lathrobium fulvipenne*: Common under stones. *L. brunnipes*: Uncommon under refuse. *Dianous caerulescens*: Not uncommon in flood refuse. *Stenus bimaculatus*: In grass tufts, etc. *S. similis*, *S. juno* and *S. tarsalis*: In grass tufts, and at tree roots. *Oxytelus rugosus*: Common under moss, on trees, etc. *Platystethus arenarius*: One specimen, under moss.

Trogophloeus arcuatus: In flood refuse. *Lestera pubescens*: In flood refuse. *Lathrimaeum unicolor*: In fungi. *Omalium rivulare* and *Proteinus ovalis*: Common in fungi. *Necrophorus humator*, *N. ruspator*, *N. vespillo* and *N. mortuorum*: In carrion. *Silpha rugosa* and *S. thoracica*: Common in carrion. *S. nigrita*: One, under a stone. *S. 4-punctata*: Beaten from oak. *S. atrata*: Very common at tree roots, etc. *Cholera spadicea*: One among dead leaves. *C. tristis*, *C. nigricans* and *C. nigrita*: In carrion. *Potomaphagus sericeus*: One, at root of a tree. *Hister cadaverinus* and *Saprinus nitidulus*: In carrion. *Adalia bipunctata*, *Coccinella* 10-*punctata* and *C. hieroglyphica*: Common on various plants. *Mysia oblongoguttata* and *Anatis ocellata*: Common in fir woods. *Coccinella* 11-*punctata*: Among refuse on Burgh Marsh. *C.* 7-*punctata*: In grassy places, scarce. *Halyzia* 14-*guttata* and *H.* 18-*guttata*: Beaten from various bushes. *H.* 22-*punctata*: In flood refuse. *Chilocorus bipustulatus*: Swept from heath, near fir woods. *Rhizobius litura*: Common in grass tufts. *Coccidula rufa*: Among reeds, etc. *Epuraea aestiva*: Beaten from reeds. *Meligethes aeneus*: Common in flowers. *Tenebrioides mauritanicus*: Several in a flower mill. *Cerylon histeroides*: Under bark. *Rhizophagus bipustulatus*: Under bark. *Micrambe vini*: Among hay. *Parmecosoma melanocephalum*: Several in flood refuse. *Byturus tomentosus*: Beaten from mountain ash. *Byrrhus pilula*: Under stones, etc. *Cytilus varius*: One at Whitehaven. *Sinodendron cylindricum*: In rotten wood, near Ulleswater. *Aphodius fimetarius*, *A. prodromus* and *A. merdarius*: Common in dung, etc. *A. fossor*, *A. depressus* and *A. rufipes*: Odd specimens in various places. *Geotrupes putridarius* and *G. sylvaticus*: Common. *Hoplia philanthus*: One specimen on the wing. *Serica brunnea*: Common at light, etc. *Melolontha vulgaris*: Seldom met with. *Phyllopertha horticola*: Common on hazel, near Keswick. *Cryptohypnus riparius*: Common, river banks, etc. *Elater balteatus*: In wood and at "sugar." *Melanotus rufipes*: One specimen at sugar. *Athous niger*: By beating. *A. haemorrhoidalis*: Very common on bilberry, etc. *Limonius cylindricus*: Several taken on the wing. *Adrastus limbatus*: By beating. *Agriotes obscurus*: Abundant everywhere. *A. sputator*: One swept from bilberry. *Dolopius marginatus*: By sweeping *Corymbites pectinicornis*: In flowery meadows. *C. tessellatus*: One in company with the preceding. *Lampyris noctiluca*: Common in damp meadows. *Ancistronycha abdominalis*: Two fine specimens taken on fern in a damp wood. *Telephorus rusticus*, *T. lividus*, *T. nigricans* var. *discoideus*: Common throughout the district. *T. bicolor*, *T. flavilabris* and *T. haemorrhoidalis*: occasionally taken. *Rhagonycha fulva* and *R. pallida*: Beaten from various shrubs. *Malachius bipustulatus*: Two from oak. *Ptinus fur*, *Niptus hololeucus* and *Gibbium scotias*: In houses. *Cis boleti*: Common under bark on a dead tree. *Rhagium bifasciatum* and *R. inquisitor*: Under bark. *Strangalia melanura*: Beaten from hemlock. *Donacia simplex*: Common on yellow iris. *D. comari*: On marsh marigold. *Lema cyanella*: Under bark and in grass tufts. *Clythra quadripunctata*: Among hazel near Keswick. *Chrysomela staphylea*: Common by sweeping. *C. polita*: Under moss. *Melosoma aeneum*: About a dozen swept from grass and bracken in a damp wood. *M. populi*: one at Allonby. *Phytodecta olivacea*: Beaten freely from broom. *Gastroidea polygoni*: One in a garden. *Phaedon tumidulus*: In grass tufts. *P. betulae*:

Common in grass tufts and at tree roots. *Phyllodecta vulgatissima*: Locally common on sallow. *P. vitellinae*: Abundant on osier. *P. cavifrons*: Several along with the last. *Hydrothassa aucta*: In grass tufts. *H. marginella*: Common in grass tufts and under bark. *Prasocuris phellandrii*: One in flood refuse. *Luperus rufipes* and *L. flavipes*: Common by beating. *Lochmaea suturalis*: Very common on heath. *Galerucella lineola*: Common in grass tufts. *Phyllotreta undulata*, *P. nemorum* and *P. brassicae*: In grass tufts. *Longitarsus luridus*: Common by sweeping. *Sphaeroderma testacea*: Beaten from thistle. *Mantura obtusata*: In grass tufts. *Crepidodera ferruginea*: Common in hay. *C. aurata*: Beaten from sallow. *Plectroscelis concinna*: By sweeping. *Psylliodes chrysocephala*: One from Penrith. *Cassida viridis*: On various plants. *Heliopathes gibbus*: Taken at Silloth. *Tenebrio molitor*: Several from a flour mill. *Melandrya caraboides*: Several from burrows in an oak gate-post. *Rhinosimus planirostris*: under bark. *Anaspis frontalis*, *A. maculata* and *A. ruficollis*: Beaten from various plants. *Rhynchites aeneovirens*: One from birch. *R. uncinatus*: From sallow. *Deporaüs megacephalus*: From sallow. *D. betulae*: From birch. *Apion ulicis*: Common on furze. *A. haematodes*, *A. dichroum*, *A. violaceum*, *A. apricans*, *A. nigritarse*, *A. stolidum*, *A. loti*, *A. seniculum* and *A. affine*: In grass tufts. *A. striatum*: from broom. *Strophosomus coryli*: Common on various plants. *S. lateralis*: Common on heath. *Sciaphilus muricatus*: Several swept. *Tropiphorus mercurialis*: In flood refuse. *Polydrusus pterygomalis* and *P. cervinus*: By beating. *Phyllobius oblongus*, *P. calcaratus*, *P. pyri*, *P. argentatus* and *P. maculicornis*: By beating. *Philopedon geminatus* and *Atactogenus exaratus*: Several swept. *Barynotus schönherri* and *B. moerens*: In flood refuse. *B. obscurus*: By sweeping. *Alophus triguttatus*: In flood refuse. *Sitones regensteinensis*, *S. tibialis*, *S. lineatus*, *S. sulcifrons* and *S. flavescens*: Beaten from various plants. *Hypera punctata*: One swept. *H. nigrirostris*: In grass tufts. *H. polygoni* and *H. plantaginis*: Sparingly in flood refuse. *Hylobius abietis*: Common in fir plantations. *Orchestes stigma*: By beating. *O. fagi*: Under bark. *O. saliceti*: One in flood refuse. *Erirrhinus aeridulus*: In flood refuse. *Dorytomus vorax*: Under bark. *D. maculatus*: Common on sallow. *Anoplus plantaris*: Several swept. *Elleschus bipunctatus*: Two from sallow. *Mecinus pyraster*: Common under bark and in grass tufts. *Anthonomus pedicularius*: Several swept and beaten. *Cionus scrophulariae*: Locally abundant on figwort. *Coeliodes quercus*: Beaten from birch. *C. 4-maculatus*: By sweeping. *Ceuthorrhynchus pollinarius*, *C. contractus*, *C. ericae* and *Balaninus salicivorus*: By sweeping.

SCIENTIFIC NOTES AND OBSERVATIONS.

The origin of the stemapoda of Cerura.—I can support the views held by Messrs. Packard and Tutt, that the stemapoda of *Cerura* are modifications of the anal prolegs and not simply modified anal spines, similar to those of the Satyrid larvæ, as supposed by Buckler. After reading some recent statements by Mr. Tutt on the subject, I looked up some notes I made some time ago on the anal prolegs of *Phalera bucephala*. These read as follows: In the 1*st stage of larva*, the anal prolegs are lengthened and stretched backwards, are black in

colour, and have a shining horny appearance, similar to that of the scutellum. They also bear long thorny hairs pointing backwards, and are not used for progression. In the *2nd and 3rd larval stages*, they are relatively shorter; in the *4th stage*, they are still shorter and less noticeable. In the *5th (or 6th) stage*, the prolegs are sometimes used to a very slight extent in crawling. The foot is retractile and only protruded when the larva is crawling, and even then is retracted at each step. Its grip seems weak and of little service to the larva.—A. Bacot, 154, Lower Road, Clapton, N.E.

CURRENT NOTES.

At the meeting of the Entomological Society of London, held on March 16th last, a paper by Mr. E. E. Green, of Punduluoya, Ceylon, entitled "Further Notes on *Dyscritina*, Westwood," was read, and illustrated by specimens and drawings. The author had discovered two distinct species of *Dyscritina*, which he was able to keep in captivity, and rear from the early larval stage to that of the imago. The characteristic abdominal cerci increased in length with successive moults, until in *D. longisetosa* they became much larger than the body. In the penultimate stadium they were lost without a moult, being probably bitten off by the possessor, the long basal joints alone remaining. The imago was a typical earwig, the forceps being developed within the basal joints of the cerci. Sensory organs on the antennæ and palpi were described, as well as the habits of both species. In the ensuing discussion Mr. M. Burr referred the imagines to the genus *Diplatys*, that of Mr. Green's new form being, he believed, a known species. The genus *Dyscritina* must therefore be sunk. Mr. Gahan observed that the fact of the forceps being developed within the basal joints of the cerci alone did not prove that they were not homologous with the entire cerci; perhaps the internal structure of the latter was retracted by a histolytic process before amputation. In *Forficula* he had found evident traces of meristic division in the forceps of embryos which were nearly on the point of hatching. Mr. Burr, at the meeting on April 6th, stated that *D. longisetosa* was a good species, Mr. Green's new form proving to be *D. nigriceps*, Kirby.

At the same meeting Dr. Chapman read a paper entitled "Some remarks on *Heterogyna penella*," giving a full account of its life-history. The female was destitute of all appendages whatever, and only left the pupal case for pairing, returning within it about ten minutes later. It possessed an organic connection with the pupal case in the situation of the legs. The larvæ were hatched within the case and devoured the remains of the mother. On anatomical characters he assigned to the insect a place near the Zygænidæ.

Lord Walsingham (*E.M.M.*) describes a new Tortricid, under the name of *Lozopera beatricella*, after Mrs. Carpenter, who bred a good series in either 1879 or 1880 from larvæ found at Leiston (Suffolk) in April, in stems of an umbellifer believed at the time to be *Pastinaca sativa*. The species is nearest *L. francillonana*, the fasciæ, however, being broader and less oblique than in that species.

The sale of the collection of Lepidoptera made by Mr. G. Elisha, took place at Stevens' sale-rooms, on April 25th. It was probably one

of the finest collections of Lepidoptera that had ever come under the hammer, both as to the condition of specimens and the excellence of the setting. There were, however, no localities given and no attempt to name the various aberrations. The result of the sale, therefore, from a monetary point of view, must be considered most unsatisfactory, scarcely a single lot fetching anything like a fair or even moderate price. A poor and small specimen of *Chrysophanus dispar* went for 13/-; 6 bred *Deilephila galii* for 22/-; 5 *Sesia sphegiformis* and others for 7/-; 6 *Nola centonalis*, 21/-, another similar lot, 22/-; 2 dark aberrations of *Arctia caia* and one with yellow hind-wings (with 47 other specimens), 4/6; a pair of *Laelia coenosa*, 10/-; 6 fine bred *Phorodesma smaragdaria* (with 49 other specimens), 7/-; 12 *Psodos trepidaria* and 1 *Boletobia fuliginaria* (from Wellman), 9/-; 3 *Cidaria reticulata*, 7/-, and three other lots of 2 each, 10/-, 17/-, and 18/- respectively; 2 *Xylina conformis*, 10/-. Large lots of perfectly set Tineids, mostly bred, from 150 to 200 in number, sold for 4/- and 5/- per lot, the highest being 42/-, for the Argresthias, and the Coleophorids 20/-, 35/-, 11/-, 24/-, 27/-, 6/-, 42/-, 12/-, per lot; whilst the Nepticulids produced 25/-, 18/-, 45/-, 18/-, 35/-, 50/-, and 55/- per lot. A 40-drawer cabinet produced but £15, and a 20-drawer cabinet sold for 5 guineas. Altogether the result must prove most disappointing to the vendor.

NOTES ON COLLECTING, Etc.

THECLA W-ALBUM.—EYES VERSUS STICK.—I would add one more plea to that published, *ante* pp. 110-111:—Will lepidopterists cease using the stick when working for larvæ of *Thecla w-album?* Against "beating," when such is necessary, I have not one word to say, but in the case of the insect in question, it is absolutely unnecessary—nay more, I will use my eyes and find *two* pupæ or larvæ for every *one* found by the beater. Further, I will search a tree to a height of, at least, 14 feet (and a "beater" cannot reach that distance), and scan the same quite as quickly as he of the stick completes the circuit, and as I look much higher than he reaches, consequently I cover more space. If too high, "beating" secures none, though they are on the tree. The beater will probably kill or injure some of his pupæ, while I shall neither waste life nor endanger it. I imagine someone will be saying ere this—Yes, but how do you do it? When you know the locality pretty definitely, stand under the outer edge of the lower branches of the wych elm, look up, and there, when you have found the right tree, you will see what appears to be a beetle resting on the underside of the leaf, pull down the branch with your stick, and you have secured a pupa. When the sun is shining, you may even see the shadow of the pupa through the leaf, when it has pupated on the upper instead of the lower side of the leaf, which, however, it rarely does. You will be astonished to find how a very little practice will make you quite an adept at finding them. Now I know the locality, I can get about a score of pupæ in an hour if I want them. I never beat for the larvæ or pupæ, I find both by searching. I never trouble to take specimens on the wing, they are, as a rule, not nearly equal to bred ones. From what I have said it will be seen that beating is absolutely unnecessary. Should this, on being printed, raise the ire or contempt of a number

of doubting ones, I authorise the Editor of the *Ent. Record* to select one of these to visit me early on Saturday, June 25th, to put to the test what I have stated, with only two conditions imposed, *viz.*, he must be a *bona fidê* lepidopterist, and he shall print the result in the next issue of *The Entomologist's Record*, whether it be for or against me. I think this is fair. Some one may say, but the pupæ may be too high to see! Granted. But if so, they are too high to "beat," but my experience shows me that there will be more pupæ within reach than any true lepidopterist will ever want to take. Here briefly is the result of my first attempt with "eyes *versus* stick." Plenty of pupæ were discovered at a height of from 7 to 14 feet. Those out of reach were secured thus: an ash sapling was procured, the blade of my pocket knife was fastened open with string at an angle of 30°, and tied to one end of it. With this I easily severed the stalk of the leaf, which sailed quietly down to the ground or into my net ready to receive it.—GEORGE B. DIXON, S. Peter's Road, Leicester.

A HITHERTO UNRECORDED SPECIMEN OF DEIOPEIA PULCHELLA.—It may possibly interest your readers to know that Mr. M'Lean, of Harrow school, took a fine female specimen of *Deiopeia pulchella* at the end of June or beginning of July, 1896, near Harrow.—N. C. ROTHSCHILD, F.Z.S., F.E.S., Trinity College, Cambridge.

STRANGE RESTING-PLACE OF ASPHALIA FLAVICORNIS. — Yesterday, while searching in one of our large oak woods (where birch is quite scarce) for *Amphidasys strataria*, my wife found a freshly emerged specimen of *Asphalia flavicornis*, at rest on an oak trunk. This tree was in the midst of thick brushwood of five or six years' growth. Surely this is a somewhat unusual place to find this moth.—PERCY C. REID, F.E.S., Feering Bury, Kelvedon, Essex. *April 1st.*, 1898.

THE EARLY SPRING OF 1898.—The season here was early until things were checked by the recent spell of cold weather. I find the following first appearances noted:—Jan. 20th: *Hybernia leucophaearia*; Jan. 21st: *H. marginaria* (a very worn ♂); Jan. 22nd: *Phigalia pedaria* (♂), *H. rupicapraria* (3 ♂), *Tortricodes hyemana* (males); Jan. 26th: *Larentia multistriyaria* (♂); Feb. 10th: *Asinopteryx aescularia*; Feb. 11th: *Amphidasys strataria* (♂); Feb. 12th: *Dasycampa rubiginea* (hybernated), *Nyssia hispidaria* (♂); Feb. 14th: *Taeniocampa gothica* (♂); Feb. 16th: *Xylina areola* (3 ♂ and 1 ♀); Feb. 18th: *Diurnaea fagella* (♂); March 15th, at sugar: *T. munda*, *T. pulverulenta*, *Xylina ornithopus*, *Orrhodia vaccinii*, and *Scopelosoma satellitia*; March 16th: *Eupithecia abbreviata*; March 17th: *Selenia bilunaria* (♂); March 18th: *Pieris rapae*.—E. F. STUDD, M.A., F.E.S., Oxton, Exeter.

LEPIDOPTERA IN SOUTH DEVON IN 1897.—Last season was undoubtedly a good one in South Devon. I went down on the first Monday in August, and remained for three weeks, the last fortnight being the most productive. *Caradrina ambigua* occurred in some numbers. Is this species becoming more common, or has it remained undiscovered in its Devonshire haunts all these years until Mr. Woodforde and myself turned it up in 1896? It must be more than 30 years since I first worked South Devon, and have been working it at intervals ever since, but then I have generally been there in July, and, until 1896, never after the first week in August, so that I cannot give any opinion on the subject. I was talking to an old entomologist

who lives in the neighbourhood, and who, when I first knew South Devon, was a most zealous collector, and a keen observer, and also a thoroughly good entomologist, especially with regard to local Noctuids; and it seems strange that such a man should never have observed *C. ambigua* before if the insect had been there. Taking all things into consideration, I am inclined to come to the conclusion that the species must have been there in very small numbers for some years, and that now, from some cause or another, has rather rapidly increased. My old friends, *Leucania putrescens* and *Agrotis obelisca*, both put in an appearance, but I am inclined to think that the former is getting scarcer than it used to be in olden days; the latter, however, was more abundant than I have known it before. *Heliothis peltigera* and *Leucania albipuncta* both turned up, but were scarce. My best capture was *Laphygma exigua*. Comparing 1896 with 1897, it was interesting to note that although the latter was undoubtedly a better year than the former in Devon, yet two species, *viz.*, *Agrotis exclamationis* and *Hydroecia nictitans* were scarcer in 1897, whilst they were both very abundant in 1896, the aberrations of the latter being very beautiful. Another thing worth noting, perhaps, is that *Acontia luctuosa* was certainly a week earlier in 1897 than in 1896.—(Rev.) E. C. Dobrée Fox, M.A., Castle Moreton Vicarage, Tewkesbury.

PRACTICAL HINTS.

Field Work for May and June.

By J. W. TUTT, F.E.S.

1.—In May the flowering stems of *Cardamine pratensis* and *Alliaria officinalis* should be collected for the orange-coloured eggs of *Euchloë cardamines*, which are usually laid (one on each flower-head) on the pedicel of a flower nearly over.

2.—The pupæ of *Sesia cynipiformis* should be searched for, in May, in oak stumps that have been cut down two years previously. They are to be found just beneath the bark.

3.—"The larvæ of *Setina irrorella* feed on a ground lichen, which grows amongst the grass, just outside the tide-mark. They afterwards fed fairly well on the gray lichens, which are not uncommon on apple and other trees" (Crewe).

4.—In June the larva of *Asphalia ridens* can best be obtained by looking up into oak trees, when the larvæ may be seen on the outside branches, lying half-curled under two leaves drawn slightly together.

5.—In the first week of June (or last in May), dusking over flowers of *Silene*, in the neighbourhood of Folkestone and Gosport, produces *Dianthoecia albimacula*.

6.—At the end of May, the larvæ of *Dyschorista upsilon* may be collected in dozens under the loose bark of willows, during the day; they only feed at night.

7.—The larvæ of *Noctua ditrapezium* should be obtained about the middle of May. They feed by night, and have been taken by searching with a lantern in almost all the woods on the outskirts of London.

8.—In late May and early June, *Hydrilla palustris* comes to light in Wicken Fen. It is generally supposed that that part of the Fen nearest to the village is the most productive for this species.

9.—*Chortodes morrisii* (*bondii*) has been bred from larvæ found in June, feeding in the grass tussocks of *Arrhenatherum avenaceum*. The sickly-looking stems break off close to the roots when gently pulled, and usually below them a larva or pupa is to be found.

10.—In June the flowers of *Cotoneaster microphylla* are very attractive to Noctuid moths.

11.—Imagines of *Drepana hamula* may be passed over for *Orgyia antiqua*. They fly in the hot sunshine up to midday around young oak trees, and are sometimes common.

12.—The eggs of *Drepana unguicula* may readily be obtained by enclosing a captured female, in a muslin sleeve, on a branch of a growing beech tree.

13.—In May, search or beat *Genista anglica* for larvæ of *Pseudoterpna pruinata*, *Depressaria costosella* and *Coleophora genistaecolella*.

14.—In the last week in May the maple flowers should be searched or beaten for larvæ of *Eupithecia subciliata*.

15.—The larvæ of *Eupithecia sobrinata* are to be beaten in great abundance in May and June, from juniper.

16.—Beat nettles into a newspaper at the end of May and beginning of June. You will obtain larvæ of the Plusias, and a pea-green, very un-Geometer-like, caterpillar with humped back. This is the larva of *Eubolia limitata* (Arkle).

17.—The larvæ of *Œdematophorus lithodactylus*, when young, are to be found in the terminal shoots of *Inula dysenterica*; later on they hide during the daytime, but may easily be got after dark, when they feed, exposed, on the surface of the leaves (South).

18.—At the end of May the blackish larvæ of *Phycis betulella* should be collected from the rolled-up leaves of birch.

19.—The larva of *Rhodophaea marmorea* feeds on dwarf sloe in May and June, generally choosing low, stunted bushes, and spinning the leaves together in a web.

20.—The larvæ of *Rhodophaea consociella* make little bunches of the terminal shoots of oak bushes in June. The larvæ of *Rhodophaea tumidella* feed between several united oak leaves on the higher oak trees during the same period.

21.—The larvæ of *Ditula semifasciana* feed in united shoots of sallow in May and June, generally preferring dwarf and stunted bushes, and the imago appears in July.

22.—By beating whitethorn hedges into an umbrella in early May, the pupæ of *Spilonota suffusana*, *Sideria achatana*, *Sciaphila nubilana*, and other Tortricids, may be obtained in abundance.

23.—The larvæ of *Coleophora genistaecolella* are to be found abundantly in June on *Genista anglica*.

24.—By nipping off suspicious-looking *Lychnis* (*L. diurnea*) buds in May, the larva of *Gelechia viscariella* is to be obtained.

25.—The larvæ of *Depressaria atomella* are to be found in the shoots of *Genista tinctoria* about the beginning of June.

26.—The larvæ of *Anarsia spartiella* are abundant in early June, feeding on the flowers of furze.

27.—Towards the end of May, the larva of *Depressaria nanatella* draws the two edges of a leaf of the carline thistle together, and feeds in the roll thus made. The white, shiny under-surface of the leaf being exposed makes it conspicuous.

28.—At the latter end of May, at Farington, twisted shoots of *Lotus corniculatus* produced larvæ, from one of which, at the latter end of June, appeared a *Gelechia*, which Mr. Stainton pronounced to be probably *G. cincticulella*, which feeds on the Continent on *Genista* (Threlfall).

29.—The larvæ of *Butalis grandipennella* are to be obtained on the furze-bushes, at Wanstead (and elsewhere), about the middle of June. They make a web, placed along the stems of some years' growth, and a strong pair of cutting-pliers should be requisitioned for cutting off those portions of the stems containing the webs.

30.—The larvæ of *Eidophasia messingiella* spin a few strands of silk across the young shoots of *Cardamine amara*, drawing them together. They should be collected in the middle of May.

31.—The larva of *Argyresthia andereggiella* is to be found in June, beneath a web, spun near or at the end of the twigs of the crab-apple.

N.B.—For series of similar hints referring to the same time of year consult vol. ix., pp. 95-96, pp. 120-121; vol. viii., pp. 20-21, pp. 43-44; vol. i., p. 47, etc.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

The ovum and young larva of Cirrhœdia xerampelina. — In November, I received from Mr. Hewett, ova of *C. xerampelina* from York, which had been laid several weeks. They were in irregular masses on roughish cardboard, closely touching one another or overlapping, or, here and there, heaped together. In shape, the ovum is about two-thirds of a sphere, slightly flattened. The surface has a granulated appearance, being dusted with *débris* and some scales and hairs of the parent. It is dull pale brownish-yellow, becoming leaden in colour before hatching. The transverse diameter measures ·792mm. There are ten prominent primary ribs arising about ·099mm. from the micropyle, and intermediate ones from half-way between the micropyle and the equator. These vertical ribs are crossed by a number of very distinct transverse ones, giving a honey-combed appearance. A small rosette of silvery ridges, 12 to 16 in number, each forming a loop externally, surrounds the micropyle, the area about the latter being somewhat depressed. The young larvæ nibble through a round hole near the edge of the micropylar area, and seem occasionally to eat part of the shell. They hatch out in succession, during two or three weeks in the present case. When examined the day after hatching, the larvæ are noticeable for their large, smooth, shining black heads, which have some scattered pale hairs about the sides and mouth, and are $1\frac{1}{2}$ to $1\frac{3}{4}$ as broad as the body. The latter diminishes perceptibly towards the posterior extremity, and is pale yellowish-brown with well-marked segmental divisions. The true legs and four pairs of abdominal prolegs are well developed. The latter are all of equal size and of the colour of the body. The antennal projections are strongly marked, and a large shining black plate on the prothorax extends well down its sides. On the abdominal segments, tubercles i, ii, iii, iv and v (anterior and posterior trapezoidals and supra-, post- and infra-spiracular) are easily distinguished, but not conspicuous, each black with a single hair. On the thoracic segments, the tubercles are in nearly transverse rows, and inconspicuous.

On abdominal segment 8, tubercles i and ii are in one longitudinal line, i being no longer approximated to the median. On abdominal segment 9, tubercles i have become further separated, and ii approximate more closely. The spiracles are outlined with black, that on the prothorax is large and conspicuous (as is that on abdominal segment 8 and on the same level with it) and situated at the posterior part of the prothorax a little below the chitinous plate. It has one tubercle above and two in front. As usual, these are both on a slightly higher level than the abdominal spiracles. I was unable to quite satisfy myself as to the number of the hooklets, but there appeared to be an inner row of six on the two anterior pairs of abdominal prolegs, and eight on the two posterior and the anal claspers. — W. S. Riding, Buckerell. *December 28th*, 1897.

Foodplants of Gnophos obscurata.—I found larvæ of *Gnophos obscurata* last year, feeding on flowers of thrift, at Douglas, Port Soderie and Port Erin, in the Isle of Man.—C. D. Ash, B.A., Skipwith Vicarage, Selby.

I find the larva of *G. obscurata* on the wild thyme only in this district.—J. Mason, Clevedon Court Lodge, Somerset.

Eggs of Lepidoptera.—*Melanippe tristata.*—Laid singly, some on flat side, others somewhat on end. The egg is oval in outline, with a distinct deep oval depression occupying almost the whole of the upper surface. It is pale yellow in colour, the shell apparently smooth, and the micropylar end (?) appears to be somewhat transparent. [Described August 6th, from eggs obtained at St. Michel de Maurienne.]

Larentia rerberata.—The eggs are laid loosely in a box. They are of a bright green colour, somewhat oval in outline, and rather narrower at one end than the other. The egg forms roughly a flattened disc or ellipsoid, with an oval depression on the upper surface occupying almost the whole of that surface. The shell appears under a two-thirds lens (used as a hand lens), as being quite smooth. The egg becomes yellowish as it advances in age. [Described on August 6th, from egg obtained from a ♀ captured on Mont Cenis (Lanslebourg).]

Nemoria viridata.—Eggs laid on flat sides singly; each egg has an oval outline, green in colour. The shell of the egg is very finely reticulated, and there is a very large oval depression on the upper surface of the egg. [Description made August 6th, from eggs laid by a ♀ captured at St. Michel de Maurienne.]

Lythria purpuraria.—The eggs are laid singly on long side, the length : breadth : : 5 : 3. The egg forms a narrow oval in outline, with somewhat blunt ends. It is of a pale whitish-yellow colour when first laid, becoming afterwards slightly greenish. A deep oval depression occupies more than three-fourths of the upper surface, the micropylar end being the fuller and rounder, and less affected by the depression. The surface of the egg is very finely though distinctly covered with a polygonal reticulation, small raised points appearing at the corners of the polygons. These points are arranged in rows, and run along the egg lengthwise from the micropyle to its nadir. Viewed laterally, the points appear to form curves running obliquely across the surface of the egg. The attached part of the egg is flattened, but pitted similarly to the upper part. [Description made August 1st, from eggs laid by a ♀ obtained at St. Michel de Maurienne.]—J. W. Tutt.

The Entomologist's Record AND JOURNAL OF VARIATION.

Vol. X. No. 6. June 15th, 1898.

An Easter Holiday at Hyères.

By H. ROWLAND BROWN, M.A., F.E.S.

The journey from London to the Riviera, nowadays, occupies so short a time, and the entomological attractions of that favoured coast are so manifold, that probably there is no more remunerative journey to be made at the season of the year when spring has hardly commenced in England. At any rate, this was the idea which occurred to me one bitter afternoon in February, when I happened to be thumbing that delightful manual, Kane's *European Butterflies*, and calculating the possibilities of an Easter holiday abroad. The third day of April, consequently, found me with net and pill-boxes *en route*, in that pleasant anticipation of breaking new ground, which appeals so strongly to all lovers of nature, and not least to the bug-hunter. Leaving Charing Cross at eleven o'clock, twenty-five hours later I descended from the train at Hyères, and found that in the night I had passed from winter to midsummer, from leafless trees and flowerless meadows to the abundant beauty of the southern spring, and of a spring full of surprises, and entirely different from any I had previously enjoyed, even in Italy. The impressions of the first sight of the slopes above the pretty little Provençal town are not likely to soon fade from the memory. The hills that compass the plain to the north, and the east, are quite unlike any I have seen, both in their contour, their red and white soil, and the abundance of wild flowering shrubs, which fill the air with the aromatic perfume of purple lavender, rosemary, and endless pine woods. Then there are the cork trees—a new wonder—the verdant undergrowth of Mediterranean heath and prickly oak, among which you may chance upon a dozen different species of wild orchids blooming in thousands, since they are of but little account in the eyes of the gardeners who have cultivated the valleys and the plains, with such a wealth of roses, violets, anemones and carnations, as the markets of northern Europe require to fill up the long interval between the falling and the budding of the leaf. Then, again, there is the tall pink cistus, with its tender ephemeral blossom, the white cistus, beloved of the bees, and an endless variety of golden brooms, which, with the grey stems, the vivid young green of the apple and quince trees in the orchard terraces, and the groves of fruited almond, are of themselves the very spirit of "la belle saison—la saison immortelle," of which Pierre de Rousard and his Provençal poet brethren have sung since summer first was leafy! Look in whatever direction you will, it is all one beautiful garden, nature

stepping in to assist art, and art hardly disfiguring nature here as so often elsewhere. Above, the cloudless blue sky: in the distance the deep blue sea, and here and there the golden islands lazily shimmering in the delicate haze of the morning. Such was the prospect which greeted me as I pocketed my net on the Monday morning after my arrival, and sallied out to investigate the woods about Costabelle in general, and the quarries which scar the hillside in particular. I had not then the advantage of the kind information given me later by Mr. Raine, who has worked the district these eleven years. But I had evidently hit upon the right spot to make a beginning, and, as events subsequently proved, the quarries were among my best hunting grounds. Here, on the flowers of the broom, *Callophrys rubi* was flitting about in the sunshine, and persistently attacking another little brown butterfly, which I did not at once recognise to be the local and interesting *Thestor ballus*. This insect, when netted, at a distance, looks uncommonly like *Chrysophanus phlaeas*, but on closer inspection it is easily distinguishable by the delicate arsenic green fur with which the wing bases on the underside are plentifully adorned. Though not occurring, I believe, at Cannes, or further east of it, *Thestor ballus*, from the middle of March until the middle of April, is the commonest insect in the woods and in the quarries, but, as Mr. Buckmaster (*Ent. Record*, vol. ix., p. 303) did not meet with it after the 28th of the month, it is probable that its flight is limited to six weeks at the outside. The sexual dimorphism of this species is exceedingly interesting, and I do not suppose any species, even among the variable Lycænida, present a more pronounced difference in the coloration and marking of the two sexes. Owing, however, to the prevailing wind, I suppose, which blows at Hyères night and day, it is not easy to procure perfect specimens on the wing, and my series is more remarkable for quantity than quality. With *T. ballus* I found both *P. baton* and its ab. *panoptes* in profusion, the coloration and size in the male varying wonderfully, from almost black to light dusty slate blue. *P. icarus*, a few early stragglers; *P. astrarche* (April 5th), and to my great satisfaction, *Nomiades melanops* in fine condition, which I thus took for the first time with my net. Mr. Raine told me that it was not usually common, but I found it more or less distributed throughout the district. On the pink valerian, meanwhile, *Gonopteryx cleopatra* was engaged in ceaseless combat with the all-pervading "Cabbagers," and I was able to take a perfect series of both male and female. With respect to the latter, it certainly is very much like *G. rhamni*, but I think that the colouring is far more vivid, the angles of the wings more sharply defined, and the size considerably in excess of the typical female of the allied species. As to their identity, there could have been no manner of doubt, for the whole time I was at Hyères I did not come across a single male of *G. rhamni*, though I kept a careful look out for it, and I observe that Mr. Buckmaster does not mention having taken it either. But perhaps as plentiful as both *G. cleopatra* and *P. brassicae* was *Anthocaris belia*, varying much in size, and the females distinguishable by the creamy pigment which pervades the hind-wings, the males everywhere in excess. Mr. Raine tells me that *A. tagis* var. *bellezina* is not found at Hyères. There *Colias edusa*, fresh as the proverbial daisy, would dash past, evidently no hybernator, but the first of an early brood, disporting with the "brimstones," and occasionally

stopping to do battle with a nodding hawkweed or other golden flower. Passing on towards the Costabelle Woods, I found *Pararge egeria*—the southern form—flitting restlessly in and out of the ilex trees, and it was on the trunk of one of them that I saw and captured the sole specimen of *Polygonia egea*, which fell to my bag. In the pine woods a little higher up the hill, I passed what I take to have been the same butterfly which was seen careering wildly down the rides, though I was never quick enough to net a specimen and make sure of its identity. On the following day, at the summit of the Colline des Oiseaux, I first noted *Papilio machaon*, but Mr. Raine informed me that the species at Hyères often puts in an appearance as early as the second week in March. *Papilio podalirius* was also to be seen flitting about the cultivated slopes of the hills, but in a woful plight, and the only undamaged specimen I captured was on the top of Mont Paradis, where, as I anticipated from Mr. Buckmaster's paper aforesaid, I found the swallow-tails in some abundance, despite the tearing wind which swept the pleasant altitude. The day I climbed its scrubby slopes from Carqueranne will be marked with a white stone in my entomological memory. Mr. Raine had told me that if I wanted *Thais rumina* var. *medesicaste*, I must work up from that village through the allotments. So to Carqueranne I went by the omnibus at eight o'clock, to be on the ground betimes, knowing the peculiar wisdom of the adage "early to rise" in the pursuit of southern insects, which at Hyères are often about as early as five in the morning, and almost entirely disappear in the great heat of the afternoon, *Thais* being an exceptionally early riser and early sleeper. However, not knowing the ground, and having mistaken my directions, I went off in exactly the opposite direction to what I afterwards discovered to be the particular haunt of this beautiful insect. The wind was blowing great guns by this time, so I naturally thought that my ill-luck was due to the fact, and amused myself with whistling "Cease rude Boreas," to no effect, as I pounded up the slippery sides of Paradis. There I found *Cyaniris argiolus*, a very splendid and big example; *Pararge megaera* (the sole observation of this insect); *Pararge megaera* (the commonest thing about); and for the first time, as I began to descend, came upon that most beautiful of all the Euchloës—*E. euphenoides*, well named the "Glory of Provence." The wind had now somewhat abated, and I thought I would return to Hyères over the hills. Happily, I changed my mind, and was plodding back to Carqueranne, when I nearly stepped upon a fine *T. medesicaste*, settled on a clump of wild thyme. As it turned out, I had come upon the right place for it by accident, and I took half-a-dozen before the afternoon was over, together with one very battered *Thais polyxena* var. *cassandra*, which I hardly expected to find in this particular place, though there is plenty of aristolochia about, a plant once *smelt* never forgotten! In the woods, that day, I also observed *Euchloë cardamines* and *Leucophasia sinapis*, while *N. melanops* again turned up with *Thestor ballus*, wherever the thyme was growing. A second visit to Carqueranne a week later added three or four more *T. medesicaste* to the box, but no further new species, and I was evidently too early for the female of *E. euphenoides*, which I heard was taken at Costabelle the day before I left (April 17th). Having secured *T. medesicaste*, my thoughts were turned to *T. cassandra*, which was reputed to abound in

the Beau Vallon, a very sheltered valley lying to the N.E. of the town, and much affected by market gardeners. A little spring trickles through this veritable garden of Eden, and in the tall bamboos by its side I caught the first specimen, while on a plot of grass sloping to its starry periwinkle-studded banks, *Melitaea cinxia* was to be found in profusion, together with an occasional *Argynnis lathonia*, small but in perfect condition. Revisiting this stream on the 15th, and following it up to its source in the hills, beside *T. polyxena*, I saw, high among the young oak trees, *Eugonia polychloros*, *Euvanessa antiopa* (much worn), together with *Vanessa io*, *Pyrameis cardui*, *P. atalanta*, *Polygonia c-album*, and, in a favoured corner, where the wild clematis, the white roses, and many sweet flowering shrubs formed a scented maze of foliage, I made my first acquaintance with *Limenitis camilla*, while over the trefoil *Syrichthus alceae*, and *S. sao*, fresh from the chrysalis, were to be taken in some abundance. In addition to the insects already noted, which, it will be observed, are entirely of the Rhopalocera, I took a pair of *Lampides boetica* on April 3rd; one fine *P. daplidice* var. *bellidice*, three days later, in the Costabelle Woods; and one *Nomiades cyllarus* on April 15th. Thus, comparing my captures with those of Mr. Buckmaster, made practically a month later than my earliest, I am able to add the two following species to the list compiled by him, *Thestor ballus* and *Thais polyxena* var. *cassandra*, while Mr. Raine said that *Polyommatus orion* occurred at Les Arcs, a few miles off, and that *M. aurinia* var. *provincialis* (the Hyères form) might be expected any moment at the time of my departure, which took place on April 17th, after a cloudless fortnight, save for the thunderstorm which broke over the district on the 6th.

The British Liparid Moths.

(Continued from p. 125*).*

By A. BACOT.

Cocoons.—*Psilura monacha* and *Ocneria dispar*: The larvæ of these species spin a few silk threads in a crevice of the bark, or between two or three leaves. The anal armature of the pupa is entangled in the threads, and the pupa is either suspended as though in a slight hammock, or simply hangs free, possibly the latter method is more or less accidental. *Leucoma salicis*: The larva of this species makes, perhaps, more pretensions to a cocoon when spun up between leaves, but this is due rather to the more skilful use of the threads in drawing the leaves together, than to the quantity of silk used. When the larva of *L. salicis* spins up in a crevice of the bark, which not infrequently happens, the web or hammock is almost as light as that of *P. monacha* or *O. dispar*.

Porthesia similis (*auriflua*): The outer cocoon spun by this larva is made of whitish silk of close texture, the long black larval hairs being woven into the silk. The inner cocoon is slight, and loose in texture, and the minute brown larval hairs lie in dense masses within. *P. chrysorrhoea*: The larva forms an outer cocoon composed of whitish flossy silk, very loosely spun, but of considerable thickness, and can hardly be called textile in character. The inner cocoon is very similar, but it has a brownish hue, due to the immense number of minute brown hairs,

which are mixed (but not spun) with the silk. As with the cocoon of *P. similis* (*auriflua*), these hairs fly about like dust the moment it is opened. The bird which experimented on the cocoon of either species would fare no better than with the larvæ, and would run the additional risk of getting the hairs into its eyes as well as mouth.

Dasychira pudibunda : The outer cocoon is composed of a delicate web of white flossy silk. The inner is similar, rather thinner, and closer in texture; but so thickly felted with larval hairs that its thickness is greatly increased, the transparency of the silk obscured, and its colour altered to a dull yellow. Only a few hairs appear in the outer web, and these seem to have been pushed through from within at an abrupt angle. A slight space is left in certain directions between the inner and outer walls. *D. fascelina* : The cocoon of this species closely agrees with that of *D. pudibunda*, the chief differences being that it is dusky-brown in colour, and that the larval hairs are freely used in the construction of the outer web.

Orgyia antiqua : The cocoon of this species is really double, but so little space separates the walls, that it has the superficial appearance of a simple cocoon. The silk used is fine and white, but so freely economised by the use of larval hairs, that the latter impart their yellowish tint to the cocoon. It is usually attached to leaves and twigs, although the wandering habit of the full-fed larvæ often leads them to spin up beneath the ledges of walls and fences in suburban districts. The ♀, after emergence, usually remains on the cocoon, and oviposits on it. *O. gonostigma* : The outer and inner coats of this cocoon are quite distinct; in a favourable situation the outer web may be of great size, and it has a number of small circular openings in the otherwise closely spun, but gauzy web. These holes vary in size from that of a medium to large pin's head. The inner cocoon is very similar to that of *O. antiqua*, and thickly felted with larval hairs. After emergence, the ♀ rests on the inner cocoon, and does not quit the shelter afforded by the outer web. I believe copulation is effected by the ♂ thrusting its abdomen through one of the openings in the outer web. The eggs are laid between the inner and outer walls of the cocoon, the holes probably affording the young larvæ a convenient means of exit.

Pupæ.—*Generalised characters.—Presence of hairs* : In the hammock spinners (*P. monacha*, *O. dispar* and *L. salicis*) all, or some of the hairs, are slightly thorny. In the cocoon spinners (all the remaining British species) they are simple, or ribbon like, not thorned. *Anal armature* : Anal segment ends in a tolerably long, stout horn, surmounted by a group of hooked or spirally curved spines.

Psilura monacha : Colour, bronzy-brown; surface, polished; humped dorsally on the 1st to 3rd abdominal segments. Groups of short, slightly thorny, bright red hairs are present on abdominal and thoracic segments, ventral and dorsal head-piece, and there are also a few hairs on the eye-covers. The arrangement of these groups on abdominal segments is suggestive of larval tubercles, both anterior and posterior trapezoidals, supra-, post- and sub-spiracular groups being present. The anal armature is black, it consists of a largish horn, slightly flattened on the ventral side, and longitudinally fluted or striated. The top is rounded, and bears a mass of long spines or bristles, spirally curved at tip.

Ocneria dispar : Colour, very dark brown, nearly black; surface dead,

roughened; groups of short, slightly thorny, pale brown or yellowish hairs are present, as in *P. monacha*. On the abdominal segments, the hairs fringe the slightly raised central bosses, probably scars of larval tubercles. The anal armature is very similar to that of *P. monacha*. There is a depression at the ventral base of horn, which is not only flattened, but slightly grooved on ventral side, the spines at the top being nearly as long and curled as in *P. monacha*.

Leucoma salicis: Colour, black; surface, polished; hairs larger and more numerous than in either *P. monacha* or *O. dispar*, of a bright yellow colour; they are of two forms: near the anus there are groups of round and slightly thorny hairs, by far the greater number are round and simple, at base becoming flattened, ribbon-like, and twisted at the top, while a few appear to be ribbon-like and twisted for the whole or greater portion of their length. The anal armature is larger, and rather more slender than that of either of the previously mentioned species. The hooked bristles at the summit are smaller, more regular in size, and better formed than in either *P. monacha* or *O. dispar*.

Porthesia similis (*auriflua*) and *P. chrysorrhoea*: These differ considerably from the other species in appearance, chiefly on account of the hairs being less noticeable. *P. similis* (*auriflua*): Colour dark, paler on free abdominal segment; surface smooth, but can hardly be called polished. The dorsal hump is very slight. The hairs are comparatively few and small, ribbon-like, and somewhat twisted; none are present on ventral head-pieces. Numbers of the short irritating larval hairs are mixed with them, and scattered over the surface of the pupa. The anus ends in a smooth conical horn, and the armature consists of a large number of long bristles or spines, each having the top curved almost into a spiral; these spines arise from the extremity of the horn in a dense sheaf-like mass. The form and arrangement of these hooks make an admirable means of obtaining a firm attachment to the cocoon, and if once caught in the silk, the pupa can only be detached by breaking either hooks or silk. *P. chrysorrhoea*: Colour a paler and redder brown than in *P. similis*; surface smooth, and inclined to be polished, except on wing-cases. The case (skin) is more fragile than with *P. similis*, and portions are almost transparent. Hairs as in *P. similis*, but not twisted, as with this species the irritating larval hairs are scattered over the surface and mixed with the pupal hairs. The anus is prolonged into a tapering tube-like horn, very smooth and fragile; from the top arise a number of medium length spines, with spirally curved ends.

Dasychira pudibunda: Colour pale brown, dark on 1st to 3rd abdominal segments; surface smooth and polished; dorsal hump apparent. Hairs simple, colour yellowish; they are few and small on ventral area, but very numerous on dorsal, and of medium length; so closely are they set on dorsal area that they form bands right across the segments, and no trace of the trapezoidal groups can be discerned. On the first four abdominal segments the surface is slightly raised and roughened, apparently scars of the dorsal tufts on larva. On the lateral area, supra-, post- and sub-spiracular groups can be made out. Hairs are present on dorsal head-piece, but I cannot see any on ventral head-pieces or eye-covers. The anal segment ends in a gracefully tapering horn, smooth and polished, and slightly flattened on ventral and dorsal surface. Its top is black and rounded, covered with fine, short, hooked

spines, rather scattered in comparison with the sheaf-like mass of them on *P. similis*.

D. fascelina : Colour, jet black; surface, polished; dorsal hump present, but not pronounced. Hairs are bright brown, and simple (not thorned), very long and very thickly set on dorsal area; supra-, post- and sub-spiracular groups can be traced, but not the trapezoidals, as the dorsal hairs are too long and thickly set. Scars of the larval tufts are present on the first few abdominal segments. The dorsal head-piece bears numerous long hairs, but I cannot trace any hairs on the ventral head-pieces. The anal horn is long and comparatively slender, much flattened on ventral side. It shows traces of longitudinal fluting or striations. The top is covered with hooked bristles or spines, which are small and slender.

Orgyia : The dorsal hump is more marked in the ♀ than in the ♂ pupa. The wing-cases (of ♀ pupa only extend to end of 3rd abdominal segment, in the ♂s to end of 4th. *O. antiqua* : Colour pale brown; shell very thin and transparent; surface smooth and polished. Hairs are fine and weak, almost colourless, but rather numerous, ribbon-shaped and twisted. Both anterior and posterior trapezoidal, supra- and sub-spiracular groups are present. There is no post-spiracular group, but a minute tubercle is present in this position, bearing a single small hair! Hairs are also present on dorsal head-piece, but not on ventral. On (?) 1st, 2nd and 3rd abdominal segments there is a patch, divided along median line, of whitish circular scales. These are not quite so well developed as in *O. gonostigma*, and I have more fully described them in that pupa. Anal horn is small, smooth and conical, situated on the dorsal side of anal segment, rather flattened on ventral side; its armature consists of a mass of rather short and much curled bristles. *O. gonostigma* : Colour black, except intersegmental area, which is orange; surface smooth and shiny. Hairs are numerous, longer, and not so weak as in *O. antiqua*, their colour pale yellow, flat or ribbon-shaped, and twisted. Their arrangement is similar to those of *O. antiqua*, but not so easily traced on account of their greater length and number. The scales which, as in *O. antiqua*, occupy the position of larval tufts, are discs of a more or less circular shape; they appear to be attached at the centre, and occasionally overlap one another. They have a semi-transparent opalescent appearance, and are wrinkled or fluted in a more or less regular spiral pattern; the flutes or crenulations starting from a central button curve outwards to the circumference. The anal horn is smooth, cone-shaped and cylindrical, with a group of much curved bristles on top, as in *O. antiqua*.

Demas: The pupa of *D. coryli* is figured and described in Dr. Chapman's paper on the genus *Aeronycta*, already referred to (*vide*, Pl. ix., figs. 5 *a. b. c.*). It lacks the hairy character of the Liparid pupæ, but has an armature that is not unlike that of a Liparid, though it differs in that it terminates in a bulb, and also in the number, shape and length of the terminal bristles.

Final notes on the Tephrosia hybrids of 1897, with a further account of ab. delamerensis (York).

By W. S. RIDING, B.A., M.D., F.E.S.

From the pupæ of the hybrids, 2nd generation (*a*)—[♂ (♂ *T.* ab. *delamerensis* + ♀ *T. bistortata*) + ♀ (♂ *T. bistortata* + ♀ *T.* ab. *dela-*

merensis)] only two more imagines emerged (continued from *Ent. Record*, vol. ix., No. 12, p. 319), on November 17th and 19th, making 46 in all. The rest died. A few larvæ of the first fertile pairing of the 2nd generation (*a*) were full-fed early in November, and most had pupated by November 17th ; those remaining were fed on privet, and went down early in December. From these pupæ 2 imagines, both ♀ s (3rd generation, *a*), appeared before December 28th, and, having been overlooked, were then so rubbed as to be unfit to set. On December 29th, another ♀ emerged, and between January 1st and 27th, 1898, 14 came out—(11 ♂, 3 ♀). The imagines are small, pale brownish-white or greyish-brown in colour, with some ancestral markings more or less defined, but only 4 can be referred to a distinct form (*T. biundularia*). Four were paired, and one ♀ deposited 2, the other 6 ova. These, except 1, were fertile, and hatched in January, but the larvæ refused to feed on either fir, pine or privet, and died within a few days. The 2nd fertile pairing of the 2nd generation (*a*), produced a fair batch of ova on October 21st-22nd, which hatched on November 13th-14th. The larvæ were given spruce fir, Scotch pine, privet, and a few half dead leaves of sallow. Some nibbled the privet for a few days, but by November 23rd only one larva was alive, which seemed to hybernate in its first stage, but died towards the end of January, 1898.

The hybrids, 2nd generation (*β*), ♂ and ♀ (♂ *T. bistortata* + ♀ *T. biundularia*) [*Ent. Record, loc. cit.*] kept emerging during November and December, 1897, till January 19th, 1898—34 imagines in all (23 ♂ s, 11 ♀ s). These are paler than the parents, varying from pale brownish to brownish-grey, some approaching the 2nd brood of *T. bistortata* in appearance ; others, the ♂ s of *T. biundularia* : some few might be classed with the latter, but most have very mixed characters. Six of these were paired in November, and small batches of ova were laid by each of the ♀ s within a few days. About half hatched during the second week of January, and though supplied with fir, pine and privet, refused to eat, and died shortly afterwards. The rest hatched a few weeks later, with a similar result.

It may be noted, that in the third generation the hybrids seem to be losing their power of reproduction, scarcely any ova being laid. The 2nd generation (*β*) would probably have produced a third generation, had not the ova hatched during the winter, and at a time when there was no supply of the usual food-plants.

During the spring of 1897, I paired two typical ab. *delamerensis* (York). Ova were obtained in somewhat diminished numbers (probably due to interbreeding). These hatched, and the larvæ fed up and pupated in due course. The first imago appeared on February 5th, 1898 (pupæ brought into warm room), and was a typical York *biundularia*. In all 18 have emerged, less than half the pupæ, the rest dying. Four of these, besides the first, are typical York *T. biundularia*, and 4 others, though of the *delamerensis* type, are paler than the parents. There is, therefore, reversion to the grand-parents. It will be remembered that the original stock was a wild York ab. *delamerensis* ♀, and a ♂ parent unknown, and that the ova produced the typical York *biundularia*, and the ab. *delamerensis* in equal proportions in 1897.

I also paired, in 1897, two typical York *T. biundularia*. The pairing produced, in 1898, 16 imagines, all taking after the parents, though the original stock was a wild typical York *biundularia* ♀ and

a ♂ parent unknown, which produced, in 1897, imagines both of the typical York *biundularia* and ab. *delamerensis*. These formed only a small proportion of the larvæ that pupated, the rest dying.

From the above facts, it is evident that *delamerensis* is only an aberration in the York district, though it is stated that it breeds true in some other localities.

On closing these notes of the *Tephrosia* hybrids of 1897, I should like to enter a protest, if not too late, against the substitution of the name *T. crepuscularia* with its previous association, for that of *T. biundularia*—it cannot but cause confusion. I would recall the pregnant words of Darwin, in some of his letters—"I do not think more credit is due to a man for defining a species than to a carpenter for making a box," and again—"I have come to a fixed opinion that the plan of the first describer's name being appended for perpetuity to a species has been the greatest curse to natural history."

Classification of the Saturniades.

By Professor A. RADCLIFFE GROTE, M.A.

Dr. Dyar claims (*ante*, p. 36) that the neurational characters, "broadly interpreted," do not contradict but confirm his classification of the SATURNIADES. It depends upon what is meant by "broadly." Under a loose interpretation the neurational characters may contradict no, and confirm any, possible classification. But, interpreted with exactness, they absolutely oppose themselves to Dr. Dyar's classification, and the notion that they do not, I believe, springs from a want of appreciation of their showing. *Hemileuca* is a generalised Saturnian, because it retains vein viii of secondaries, but it is a Saturnian because on the primaries iv_1 and iv_2 are produced upon a stem. *Aglia* is a specialised Automerid, because, while iv_1 and iv_2 are not so produced, and never can be, the movement of the median series is slightly more progressed. To graft *Hemileuca* on the Automerid stem we have to associate a form with greatly and differently advanced specialisation of primaries, as compared with *Automeris*, and generalised secondaries, with a form which has specialised secondaries and a primary wing developed on a different line or pattern. We must suppose that *Automeris* has developed out of Hemileucid-like ancestors on account of the retained vein viii in the latter, while this prototype has a primary wing developed after the fashion of *Saturnia*, a fashion which it seems physically impossible can have given birth to a structure like *Automeris*. No one can, I think, fail to see the contradiction involved in Dr. Dyar's classification. I conclude, finally, that the structure of the wings calls for the classification as established by me, and that it is a clear matter of two different tendencies; one of these is, that the two upper branches of the median, iv_1 and iv_2, furcate upon a long stem, morphologically the upper part of the cross-vein, and the other is, that vein iv_1 advances towards the radius, to be finally absorbed by it in *Citheronia*, while iv_2 remains central or nearly so, and shows no disposition to furcate with iv_1. The character of vein viii is one upon which *Hemileuca* and *Citheronia* converge. It is not here of phylogenetic importance, binding the two otherwise disparate forms. All the other imaginal characters contradict the bringing of *Hemileuca* and

Citheronia into one group. By this character of the retained vein viii on secondaries, *Hemileuca* proves itself a generalised Saturnian, and, equally, *Citheronia* a generalised Automerid. *Automeris* and *Aglia* have both apparently been thrown off from the main Citheronian stem before the absorption of iv by the radius took place. In this respect *Citheronia* had subsequently independently advanced, while retaining vein viii of the secondaries which *Aglia* and *Automeris* have alike lost, just as the Parnassi-Papilionidæ have lost the same vein as compared with all the other butterflies. *Aglia* cannot, from my point of view, be looked upon as a generalised Saturnian.

In conclusion, I do not challenge the entire value of larval characters in classification. I believe it possible that the value of the absence or presence of the single dorsal tubercle on the 9th segment has been over-estimated by Dr. Dyar, as this seems to be the obstacle to an agreement. I believe also that this discusssion, warmly conducted upon both sides, may ultimately lead to a gain in our comprehension of the value of structural characters, and is not to be regretted. I take it for granted that a classification of Lepidoptera is warranted upon features of the imago alone, and this from the necessities of the case, and that where a clear contradiction, such as I have tried to establish here, occurs, it is the larval rather than the imaginal characters which need re-examination and fresh study. Of the value of Dr. Dyar's discoveries as to the position of the larval tubercles in defining the limits of the superfamily groups, I have elsewhere expressed my full appreciation; but I do not believe that the absence or presence of a larval tubercle can outweigh the evidence which it appears to me is offered by the wings of the SATURNIADES. No greater mistake can be made, I believe, than to classify *Hemileuca* and *Automeris* in one "family," as is done by Comstock and Dyar. That this mistake was originally committed by me in 1866, makes me glad that I have lived to recognise it as such and tried to redress it.

I am sorry that Dr. Dyar does not see the contradiction which I have been at some pains to demonstrate. To me it is so manifest, that I do not hesitate to conclude that it is fatal to one or the other of the two systems of classification. I am encouraged to believe that I am right by the fact that the female antennæ (which should be preferred as a basis to the male organs) in *Aglia* are Citheronian in character and also Automerid, while the antennæ in *Hemileuca* are of the Saturnian type. Other characters, such as coloration, agree or are indifferent. It is perhaps beside the question of the present controversy that Dr. Packard also claims the affinity of *Aglia* to *Citheronia*, and that I can fall back on Hübner to sustain the relationship of *Hemileuca* to *Saturnia*, under which latter genus the type is recorded in the "*Verzeichniss.*"

COLEOPTERA.

Coleoptera of Richmond Park.

By Professor T. HUDSON BEARE, B.Sc., F.E.S.

Richmond Park has long been noted for the many interesting captures made in it in years gone by, but the gradual encroachment of bricks and mortar, which have effaced so many of the localities in

the immediate neighbourhood of the metropolis made famous by Power, Rye, and others, has not been without its effect on Richmond Park. Though a very large area is covered by the park, some eight or nine square miles, still much of the once open ground outside its boundaries is now covered with villas and rows of suburban houses. From one corner, however, open ground still stretches away, the well-known and equally famous coleopterous locality, Wimbledon Common, at one point being only separated from the park by the main Kingston and London road. Many of my best captures have been made in the connecting strip of hawthorn-covered, somewhat boggy, portion of the Common, strictly speaking, outside the park limits, but really forming a part of it, entomologically speaking.

There is another and more powerful reason, however, why the park is no longer the collecting ground it once was—it is now one of the most popular resorts close to London, especially since the outbreak of the cycle craze; its roads are every day crowded with cyclists, anxious to find good roads comparatively free from all vehicular traffic, where they can get a 10 or 12 mile spin without going over the same ground twice. The result is, that the old peace and quietness, and the neglect of appearance, are gone for ever; the keepers now look after it as carefully as if it were a London park, dead and fallen timber is removed at once, dead leaves are swept up, ponds are scraped out, and general havoc played with everything from the collector's point of view. There are still a few large game enclosures, where, probably, the old wood-feeding specialities linger on, but I have never had the pleasure of access to them—the public are rigidly excluded from these choice spots of thick undergrowth. One has, therefore, now but scant chance of taking any of the more valuable rarities of old days, the records of which make one very disgusted at the present scanty fauna.

The park is fairly well wooded with oaks, beeches and chestnuts, but they are mostly too solid and substantial for wood-feeding beetles at present. Wild flowers are very scarce, most of the open ground being covered with a dense growth of bracken, in fact, I have seen very few flowers in the park, except the wild hyacinth, and a few lowly herbs. Such plants as the Umbelliferæ, however, are only conspicuous by their absence, hence general sweeping is practically quite unproductive; I have often tried the bracken, but found hardly anything worth bottling. The soil is mostly sandy and light in character, perfectly free from stones of any kind, so stone turning, a fertile source of so many *Carabidae* in spring and autumn, cannot be practised.

In fact, most of my captures have been made (*a*) by working at the few decaying old hawthorns scattered over the slopes of the ridge which looks out over the Thames valley, (*b*) by water work in the pond, and the small brook which enters the park from Wimbledon Common, (*c*) by working at moss and roots of rushes in a small damp wood near the Ham Common Gate, or lastly (*d*) by working the deer and other animal droppings. I will deal briefly with my best captures in the various great divisions.

Geodephaga.—Of course, on such a sandy soil, *Cicindela campestris* occurs freely, but its brother, *sylvatica*, though found freely not a dozen miles off, in similar conditions, does not favour us.

On the banks of the largest sheet of water, "Penn Pond," *Elaphrus cupreus* occurs in plenty, along with several of the smaller

black *Pterostichi*; all the species of *Leistus* (excluding the mountain form), and *Chlaenius vestitus* also occur, while on Sheen Common, only separated from the park by a low wall, I have taken sparingly, *Stenolophus teutonus* and *Acupalpus dorsalis*. The only *Harpali* I have ever seen in the park are the universal species, *H. aeneus* and *H. ruficornis*. The *Pterostichi* and *Amarae* are equally scarce. Out of rabbits' burrows I have taken, at times, *Pristonychus terricola*; I have also taken this insect fairly freely at Wimbledon Common. In the small damp wood mentioned before, *Anchomenus angusticollis*, *dorsalis* and *oblongus* all occur in profusion. while, of course, that ubiquitous species *albipes* occurs everywhere. Of the *Bembidia*, I have taken *rufescens* under bark, freely, and in damp spots, 4-*guttatum*, 4-*maculatum*, *femoratum*, *bruxellense* (sparingly), *littorale*, *bipunctatum*, and also *Tachypus flavipes*, this latter always in moss at one spot; three or four of the commoner *Dromii* are abundant under bark, but *agilis* is very scarce, I have only once found it in the park. There are a number of ponds, and the brook, mentioned before, well stocked with water beetles; in fact, I have taken nearly half the English species in the limits of the park; many of them are most curiously local, found in one pond, and one only; of *Haliplus*, I have taken seven species out of the eleven, including *cinereus* and *fluviatilis*, while *Cnemidotus impressus* also occurs, though very sparingly. The squeaker *Pelobius tardus* occurs to me every spring in one pond, rarely elsewhere, though it is found in the Penn Pond; it always announces its presence in the net by its persistent squeak, and is a most awkward beetle on its long wiry legs. The smaller *Hydropori* are well represented, and one or two nice species occasionally turn up, such as *Coelambus parallelogrammus*, *Hydroporus umbrosus*, *discretus*, etc. Of the *Agabi*, *guttatus* is very scarce, *paludosus* and *didymus* very common in the brook, *sturmii* and *bipustulatus* equally so in the ponds. *Ilybius fuliginosus* and *fenestratus* are common in two ponds, *ater* and *obscurus* occur with them, but in very scanty numbers; not a single *Rhantus*, though diligently sought for, has, so far, rewarded my industry. *Dytiscus marginalis* is fairly abundant, but *punctulatus* I have only once taken, in a pond in which *Colymbetes fuscus* and *Acilius sulcatus* occur in plenty. Only *Gyrinus natator* occurs, though I see no reason why *Orectochilus villosus* should not turn up some day on submerged logs in one of the larger ponds.

Hydrophilidae are not very numerous or choice, the best is *Enochrus bicolor*, while *Cyclonotum orbiculare* occurs in the *débris* around "Penn Pond." I have certainly taken water beetles much more freely than any others, perhaps they have been less worried by the cleaning-up operations.

It will be wearisome to go in detail through the *Staphylinidae*, so I will just mention a few of the better things I have turned up from time to time, mostly in moss or in dead leaves. *Alevochara cuniculorum* is to be found fairly commonly, at any rate, in one warren, by raking out the *débris* in rabbit burrows; I should say the burrows are its true habitat. It is, perhaps, worth noting that Mr. Donisthorpe and I found in a rabbit burrow, last year, a *Homalota*, which ultimately proved to be *Homalota occulta*, but which gave considerable difficulty in its identification, and for a time we lived in hopes of adding another new beetle to the British list. *Autalia impressa*, *Gyrophaena gentilis*, *Jachinus humeralis*, etc., and many other fungi feeders occur freely in the autumn, but the park is

never very rich in fungi, as far as my experience goes. A few days ago, in the portion of Wimbledon Common adjoining the park, I turned up *Tachyporus pallidus* in profusion and *transversalis*, both good species. Of *Quedii*, I have taken *mesomelinus*, *fulgidus*, *puncticollis* and *cinctus*, *fuliginosus*, *nigriceps* and *suturalis*, some very sparingly, others commonly, with many *Philonthi*, the best being *decorus*, *sanguinolentus* and *nigrita*. *Baptolinus alternans* is very common in rotten wood stumps, along with two or three of the commoner *Xantholini* and *Lathrobii*. *L. multipunctum* is the only good one of the latter I have come across so far.

Lately I have been taking *Cryptobium glaberrimum* out of some thick strong moss in the same locality as *Tachyporus*, in scanty numbers, and *Stilicus rufipes* and *orbiculatus*, the latter in numbers in the park preserves. Many of the common *Steni* and *Oxyteli* occur freely, but so far I have never met with any of the *Bledii*. *Prognatha quadricornis* I have found, on several occasions, under bark of dead or decaying trees, generally in very wet, sappy stuff; it is a handsome and striking insect. Of the Clavicorns—*Amphicyllis globus*, once only, a few *Necrophori* and *Silphae*, with occasionally an abundance of some common *Cholera*, are all the *Silphidae* I have seen in the park. *Coccinellidae* are singularly scarce, except for two or three of the very common species.

The best Histers have been *H. bimaculatus*, *Paromalus flavicornis*, *Gnathoncus nannetensis* and *Onthophilus striatus*, except the last, all of them anything but numerous. *Nitidula* 4-*pustulata*, said to be rare, has several times turned up commonly in dried-up dead rubbish, with many of its commoner allies. *Rhizophagus cribratus*, two autumns ago, occurred in profusion in a mass of wet rotten fungi on a tree stump, with them one or two *R. parallelocollis*. *Triphyllus punctatus*, the same autumn, occurred in plenty in "poor man's beef" fungus. *Attagenus pellio*, I have taken flying in the park, and last year I bred out several of the pretty *Megatoma undata* and *Tiresias serra*, from larvæ which occur in plenty under dry hawthorn bark. The larvæ are brownish creatures, with a long tail of stiff bristly hairs at the end of the abdomen, and four tufts at the sides: these they can move up or down with a curious fan-like motion. I fed them on dry crusts. Last December I took several *Cytilus varius* in moss, with *Simplocaria semistriata*.

Of the Lamellicorns, *Lucanus cervus* occurs, but not in plenty, I have taken it in the garden of my house, which is about a quarter of a mile from the park wall, and also *Dorcus parallelopipedus*, but the former is scarce compared with its abundance in Kent.

I have worked the *Aphodii* very thoroughly, and taken several of the better ones, such as *foetens* (always in small colonies in early spring), *constans*, *porcus* (always in autumn, and in one spot only); *pusillus* and *contaminatus* in thousands in the autumn; *zenkeri*, in deer dung, always in autumn or late summer, and *Heptaulacus testudinarius*, this latter in horse dung, in early spring, in scanty numbers, with *Oxyomus porcatus* at times. In the early spring, *Geotrupes typhoeus* is to be found all over the park, a little later in the season its dead body is common enough to attract general attention, on account of its formidable horns.

In the trees in the open ground between my garden and the park, *Melanotha vulgaris* and *Rhizotrogus solstitialis* both occur in abundance in the summer, they constantly fly into the house, but have not met with them in other parts of the park or neighbourhood.

The *Sternoxi*, in spite of records of *Ludius ferrugineus*, *Megapenthes tibialis*, etc., in old days, I have found very scarce, and have nothing worth chronicling. Of the *Telephoridae* I have taken many in the park, the best being one *Rhagonycha unicolor* (one of the very few things worth having my sweeping net has produced).

Of the Serricorns I have found a few only, but these mostly good, one decidedly so, *Ptinus* 6-*punctatus*, *Lyctus canaliculatus*, and, best of all, in fact the capture I value most, *Anobium denticolle*. I believe I was the first to turn this insect up again after the lapse of many years since the last record. I took two in mid-winter some four years ago, out of decaying hawthorn, shortly afterwards finding another, and last spring, Mr. Donisthorpe and I worked this locality with much care, and each secured, with some labour, a nice series; at the same time I dug out two *Clytus mysticus*, not before, I believe, recorded from the park. All these *A. denticolle* came from old hawthorns, and from one very restricted part of the park, so it is very local and scarce there. It is a fine and very distinct insect.

The only Longicorns I have found in the park, in addition to that mentioned above, are *Prionus coriarius* (one fine specimen sitting on an oak trunk), *Clytus arietis*, *Callidium alni*, *Grammoptera ruficornis*, and *tabacicolor* and *Leiopus nebulosus*, all these latter really occurring in the adjoining piece of Wimbledon Common, and not in the park proper. This scanty record, and the absence of *Sternoxi*, show how scarce wood-feeders have become through the persistent cutting down and destroying of the old timber.

Of the *Phytophaga*, again my record, on account of the comparatively complete absence of all flowers, is very scanty. Last December, I found *Donacia bidens* hybernating in dead leaves, twenty or thirty feet away from the water's edge, and *D. thalassina* occurs freely on *Carex*, in June, in Penn Pond, with *D. simplex*, but no other species of this genus seems to occur in the park. Besides several of the commoner, *Halticidae* and *Chrysomela polita*, often hybernating under bark, there is nothing else to mention.

Heteromera.—*Tetratoma fungorum* was fairly common in fungi in the autumn of 1896; once before it occurred in a fungus in my own garden; *Phlocotrya rufipes* in decaying willow, and *Rhinosimus planirostris* in plenty under birch bark, are the only other ones worth recording; of course, nearly all the species of *Anaspis* occur in profusion on the hawthorn blossom, but I have never found *A. garneysi* in the park. *Rhyncophora* are equally scanty, and need but a few lines, as I have never found any but the commonest and most universally-distributed species.

From this brief and rather dry record, it will be seen that the park, except in one or two groups, is no longer the paradise for collectors it once was.

VARIATION.

Description of Dianthœcia (Luperina) luteago var. lowei.—The Rev. F. E. Lowe kindly sent me a pair of specimens of a new form of this exceedingly variable species, which were bred on June 15th and 16th, 1897, from pupæ found at the roots of *Silene maritima*, in Guernsey. These I have exhibited at the various London entomo-

logical societies, under the name of var. *lowei*. A description, therefore, of the form becomes necessary. This is as follows :—

Male smaller than the female, ochreous in tint, not unlike the hue of *Erebia ochroleuca*. Fore-wings with abreviated basal line, followed by complete basal line; these with the angulated and subterminal lines, pale whitish grey, edged with fuscous. The costa marked with pairs of short fuscous streaks, one on either side of the commencement of each of the transverse lines. An ochreous yellow patch (below the cell) between the base of the abbreviated, and the complete, basal lines; the orbicular pale and conspicuous, an ochreous patch below it. The reniform also moderately well marked, pale greyish in colour. These look more conspicuous because of the dark fuscous colour that fills up the central area of wing between the complete basal and the angulated lines. Between the angulated and subterminal lines the wing is also fuscous, with three small yellow ochreous blotches, one towards tip, and one on inner margin, the third just above the latter. The wing beyond subterminal line of the pale ground colour. The fringes alternately light and dark. The hind-wings dark grey, basal area lighter (more especially in male), cilia ochreous grey. Antennæ of the male ciliated with a single row of tooth-like projections almost to the tip, those of ♀ not ciliated, but very distinctly segmented. The male is paler than the female, both on the fore-wings (having less fuscous) and hind-wings (towards base).

This will be well known to our readers as a very variable species. The general variation of the species, and a detailed description of three named forms, *viz.*, var. *barrettii*, Dbdy., var. *brunneago*, Esp., and var. *olbiena*, Hb.-Gey., are given in the *British Noctuae and their Varieties*, vol. i., pp. 134-136. Since then Major Ficklin has captured a somewhat grey form—var. *ficklini*, in Cornwall, and Mr. Lowe's makes another addition to the varietal list.—J. W. Tutt.

Aberration of Melanippe sociata.—In 1886 I captured here a good aberration of *M. sociata*, on which the central band is reduced to a dark discal lunule. A broad dark grey band crosses both wings parallel to hind margin of fore- and hind-wings, just within the subterminal, which is white.—(Rev.) Frank E. Lowe, M.A., F.E.S., S. Stephen's Vicarage, Guernsey.

PRACTICAL HINTS.

Field Work for June and July.

By J. W. TUTT, F.E.S.

1.—During the last week of June, search the plants of *Cardamine pratensis* and *Alliaria officinalis* for larvæ of *Euchloë cardamines*.

2.—*Thecla pruni* affects the privet blossom in Barnwell Wold. The blossoming of the privet is usually a good sign as to the date to obtain this species.

3.—In July, sweep *Lotus corniculatus* in the early morning or late afternoon (after 5.30 p.m.) for *Sesia ichneumoniformis*.

4.—During the first fortnight of July, search the seed-pods of the various species of *Silene* for the larvæ of *Eupithecia venosata*.

5.—The pupa of *Boarmia abietaria* is sometimes found in profusion at the roots of fir trees during the last week in June.

6.—In late June, the larvæ of *Cleora glabraria* are to be found feeding on lichens on oak-trunks.

7.—The imagines of *Acidalia emutaria* begin to fly directly after sunset, settling on the herbage as soon as it is quite dark; they are then easily found with a lantern. I have found them as early as the second week in June, and as late as the second week in August.

8.—In June and early July, *Agrotis simulans* can generally be found in certain parts of Scotland—Forres (and probably elsewhere) within doors. Norman visited the various rooms and outbuildings just after dark, and found the moths fluttering on the inside of the glass windows.

9.—In July, the birch should be carefully searched for larvæ of *Asphalia flavicornis*.

10.—During July, the larva of *Pharetra alborenosa* is not at all difficult to find by searching the reeds in Wicken Fen.

11.—Towards the end of July and in early August, the yellow-leaved reeds that show signs of dying and have a hole in the stem, should be cut low down for pupæ of *Nonagria geminipuncta*.

12.—In July, collect the seed-capsules of *Silene inflata* for larvæ of *Dianthoecia conspersa*. Southern collectors would be glad if the Scotch collectors could supply them with more of their forms of this species.

13.—During July, collect the unripe seed-heads of *Silene nutans* for larvæ of *Dianthoecia albimacula*.

14.—During July, the larvæ of *Dianthoecia capsophila* feed at night upon the capsules of *Silene maritima* (S. R. Fetherstonhaugh).

15.—Rolled leaves of maple, collected in July, give larvæ of *Gracilaria semifasciella*.

16.—The larvæ of *Larerna raschkiella* mine the leaves of *Epilobium angustifolium* in July, whilst those of *L. conturbatella* feed in the shoots, drawing them together with a slight web.

17.—"*Nephopteryx angustella* was not uncommon, but very local, on horse-chestnut trees at Hampstead in June" (Machin).

18.—*Crambus furcatellus* occurs on the scanty turf which covers the highest parts of Helvellyn and the adjacent mountains, early in July. Most of our specimens of late years have come from Scotland and Wales.

19.—On June 27th, in the fens round Norwich, in a part of the fen ankle-deep in water, creeping up from the tufts of a small rush, and fluttering among the reeds, was *Schoenobius mucronellus* in swarms —hundreds of them—nearly all males, their flight lasting from 6-8 p.m. (Barrett).

20.—The larvæ of *Enicostoma lobella* may be beaten from black-thorn in June. Loughton used to be a well-known locality.

21.—During the first and second weeks of July, the deep green larvæ of *Depressaria capreolella* are to be found feeding on leaves on the higher shoots of *Pimpinella saxifraga*. Through the plant being buried amongst taller herbage, the larvæ are difficult to find.

22.—The larvæ of *Peronea permutana* feed in united leaves of the lateral shoots of *Rosa spinosissima* in June, July and early August, spinning a white silken web among the leaves.

23.—The larvæ of *Grapholitha minutana* may be obtained in June, feeding between flatly united leaves of black poplar.

24.—The imagines of *Peronea shepherdana* are to be bred from rolled-up leaves of *Spiraea ulmaria*, collected in June.

25.—The larva of *Semasia janthinana* feeds in the berries of *Crataegus oxyacantha*, uniting them in twos or threes by means of a gummy substance, so that it can pass from one to the other without exposing itself. It eats the pulpy part of the fruit only without

touching the skin. It pupates in August (Lafaury). Probably occurs later in Britain.

26.—"On June 22nd and July 4th (1827), I took a large number of larvæ and pupæ of *Psyche fusca* on the leaves of the hazel and young oaks growing in Hornsey Wood. I have also found them in Highgate Wood" (Ingpen). So many species still exist in these woods, that one might almost hope that the cases of this insect would again be found.

N.B.—For series of similar hints referring to the same time of year, consult vol. ix., pp. 153-153, vol. viii., pp. 116-118, vol. i., p. 117, etc.

NOTES ON COLLECTING, Etc.

SPRING NOTES.—*York.*—During March the weather was sometimes quite wintry, but my first *Lobophora carpinata* (*lobulata*) appeared on the 19th, with several *Asphalia flavicornis*.—S. WALKER, Eddercliffe, York. *March* 28th, 1898.

Weymouth.—The first specimen of *Pieris brassicae* observed this year was seen on April 26th, which is, I think, rather early for the species.—N. M. RICHARDSON, F.E.S., Weymouth. *April* 29th, 1898.

Selby.—We are having a most unfavourable season here. The sallows have been ruined by the cold and storms of late March, and two nights' collecting at them gave very poor results. Searching for larvæ, too, has proved a failure so far. Several *Eupithecia venosata* have emerged in my cages from Shetland pupæ that have lain over from last year.—(Rev.) C. D. Ash, B.A., Skipwith Vicarage, Selby.

Oxton.—The season here has been disastrous since the spell of cold weather in March. I have taken nothing but *Tephrosia bistortata*, with a few odds and ends. *Cyaniris argiolus* and *Pararge egeria* have hardly been seen. I was lucky enough, however, to fall in with a colony of *Micropteryx thunbergella* a few days ago, among birch. Larvæ of *Agrotis agathina* have been very plentiful.—E. F. C. STUDD, M.A., F.E.S., Oxton, Exeter. *May* 4*th*, 1898.

Clevedon.—Insects were very scarce at "sallow" this spring. *Cyaniris argiolus*, however, has been fairly plentiful, as also has *Euchloë cardamines*. *Pararge megaera* and *P. egeria*, on the other hand, have been very scarce. Larvæ, too, are scarce. I have seen none of *Tiliacea* (*Xanthia*) *citrago*, although the limes are in full leaf.—J. MASON, Clevedon Court Lodge, Somerset. *May* 26*th*, 1898.

Burnley, etc.—On Feb. 8th I captured, at Beverley, *Hybernia leucophaearia* and *Phigalia pedaria*, on tree trunks; March 19th, *Hybernia marginaria* (*progemmaria*) ♂, *P. pedaria*, ♂ dark aberration; April 8th-16th, several *Larentia multistrigaria*, in various situations (on grass, walls, at light, etc.), at Burnley. I was much struck by the close resemblance of *L. multistrigaria* to *O. filigrammaria* in its resting habits, especially when on walls or glass, they both sit with the wings very drooping, and thrown much further back than usual among Geometrid moths. I took about half-a-dozen *L. filigrammaria* last autumn on the same piece of ground, all of them sitting on the rocks. I have bred a fair number of species, of which the following may be mentioned:—*Taeniocampa incerta*, emerged Feb. 22nd-March 11th, larvæ fed on alder and oak, and found at Burnley; several *Phigalia pedaria* (all females, 2 of the dark aberration), emerged Feb. 24th-March 21st,

from Burnley larvæ; *Taeniocampa stabilis*, Feb. 26th-March 7th, larvæ on oak, taken at Burnley; *Amphidasys strataria*, March 6th, from Farnboro', Kent; *Taeniocampa gothica*, March 7th, from Burnley; *Eriogaster lanestris*, March 17th-April 7th, larvæ from Lancashire coast; *Dianthoecia cucubali*, March 22nd-27th, pupæ found at alder roots, Burnley; *Odontopera bidentata*, March 24th-April 15th, from Manchester; *Spilosoma lubricipeda*, March 30th-April 13th, larvæ from E. Suffolk; *Eupithecia fraxinata*, March 31st, larvæ on ash, at Burnley. I saw, last year, in the *Entom. Record*, a query as to hybernation of *Crocallis elinguaria*, and as a captured ♀ laid me some eggs, I kept them to see when they hatched. I found, as I had expected, that it was not until spring. I missed the first day or two, but by April 15th about a dozen had hatched, and they are still appearing.—W. G. Clutten, Burnley. *April*, 1898.

Note on Porthesia chrysorrhœa.—Since 1894 I have been practically cut off from all connection with entomological matters, and with the return to some extent of facilities for collecting, I have read with much interest your "Retrospects," for the last few years in the recent volumes of the *Entomologist's Record*. In No. 1 of the present volume (*Ent. Rec.*, x., p. 2) I notice that you refer to the re-occurrence of *Porthesia chrysorrhoea*, at Sheerness, after many years' absence, and it would appear that the species has been considered as practically extinct in this country for some years now. I do not know when or where the last recorded (that is prior to last year) capture took place, but in the *Ent. Mo. Mag.* for last year, p. 185, Mr. J. J. Walker, in recording the re-occurrence of the species at Sheerness, mentions that he had not previously seen the insect alive in any of its stages since 1872. It may, therefore, be worth while mentioning that I took a male specimen at Broadstairs in September, 1885, at light. I took the insect from a lamp under the railway arch which crosses the main road at Broadstairs, just outside the station. With the exception of the thorax, which is rubbed, the specimen is in perfect condition.—H. Ainslie Hill, F.Z.S., F.E.S., 9, Addison Mansions, Kensington, W. *April 27th*, 1898.

Biston hirtaria with rudimentary hind-wings.—I have taken this season a female *Biston hirtaria* with but one pair of wings. The under-wings of the specimen are of the most rudimentary character possible, and only just discernible to the eye. It is not a failure of expansion of the hind-wings after pupation, noticeable in crippled specimens, but practically a suppression of the wing altogether; the left fore-wing is slightly contracted along the inner margin, otherwise the insect is normal. The specimen was taken from a lime tree in Well Street, South Hackney.—E. W. Lane, 9, Teesdale Street, Hackney Road, N.E. *April 17th*, 1898.

Habits of Erebia neoridas.—The note on this species in your "Contributions to the fauna of Piedmont" (*ante*, p. 120), reminds me of my experiences last August. I found it in two localities, first at the head of the valley, above Voiron (Isère), August 24th, going towards St. Laurent du Pont, and again in the "Col du cheval blanc" (Savoy), just beyond Napoleon's tunnel—route Les Echelles—Chambéry (August 25th). At both places it was in company with *E. aethiops*, but while *E. neoridas* preferred the stony slopes, *E. aethiops* was generally nearer the road. I might easily have taken a long series of both

species at either place. Unfortunately I did not recognise *E. neoridas* —I thought it was merely a race of *E. aethiops*. I am glad to know the confusion of the species was not confined to myself. On looking over my captures, I find I took 11 *E. neoridas* and 8 *E. aethiops*, the latter are mostly in poor condition ; it was evidently nearly over, but *E. neoridas* was apparently just emerging. In neither locality did I observe *E. neoridas* flying over bushes, but I have seen *E. aethiops* do it at Tonnérre (Yonne), where the road was bounded on either side by thick woods. When Kane says *E. neoridas* "occurs at a greater altitude than *E. aethiops*," perhaps he means it does not descend to so *low an altitude* as *E. aethiops*.—Harry Moore, 12, Lower Road, Rotherhithe. *May* 23*rd*, 1898.

Early Coleoptera.—I was surprised to find *Bembidium testaceum* out the other day, with *B. punctulatum* and *Philonthus fulvipes*. Two specimens of *Heptaulacus testudinarius* occurred, and *Haliplus confinis* rather plentiful, with *H. fulvus* and *H. flavicollis*, in other years very rare ; also one specimen of *Rhantus bistriatus*, all near Llandaff. I took a pair of *Scaphidium 4-maculatum*, in rotten wood, with *Sinodendron cylindricum*, at Castell Coch.—B. Tomlin, F.E.S., Llandaff. *May* 19*th*, 1898.

Rearing and Pairing of Tephrosia bistortata. — I find no difficulty in pairing this species in confinement, placing the insects I wish to pair in a small cardboard box with a muslin top. The insects, as a rule, are found after emergence resting flat on the sides or top of the breeding-cage ; I do not force them, but allow them to come out in a cool room. I also place in the cage a piece of moistened blotting-paper, re-moistening it as required, as I find the wings of insects expand better if this is done. With this treatment the males remain alive for a week at least, and the females some days longer.—W. S. Riding, M.D., F.E.S. *May* 21*st*, 1898.

CURRENT NOTES.

We have again to welcome another of Mr. Luff's local lists, this time, *The Insects of Alderney*. The list comprises all orders, and is excellently annotated throughout by the author.

On Tuesday, May 3rd, an interesting paper was read before the City of London Ent. Nat. Hist. Society, on "The Coloration of Beetles," which was treated by the author, Mr. H. Heasler, in the paper, under four headings : (1) The physical causes of beetle colour. (2) The importance of colour in showing the past history of a group. (3) The importance to the beetle of the physical laws which govern metallic colours. (4) The importance of protective coloration to the individual insect. Under the first heading were shown the main causes of beetle coloration due to interference, dispersion and absorption of light waves. Under the second heading it was shown how it is possible, by the careful study of the colours of beetles, to obtain an insight into the past history of a group, and the *Staphylinidae* were taken as illustrating this interesting side of the question in a very marked manner. Under the third heading, the protective importance of the varying appearance of metallic colour was shown as affording a double protection, not only from birds, which look down on their prey, but also from lizards and other insectivorous animals, which look at their prey

on about the same level. Under the fourth heading, the paper dealt with the advantage of mimicry and protective coloration to the individual insect, from the personal observation of the author.

We have received some interesting papers, entitled "Contributions to the theory of warning colours and mimicry," by Mr. Frank Finn, B.A., F.Z.S. In these the author gives detailed results of experiments, made by himself, with Indian birds and lizards on supposed "protected" and "non-protected" species of insects.

The third Annual Congress of the South-eastern Union of Scientific Societies was held on June 2nd, 3rd and 4th, at the Town Hall, Croydon. The Congress proved most successful, and has evidently come to stay. Based on the lines of the British Association meetings, the leading scientific men of the neighbourhood in which the Congress is held offer hospitality to the delegates, and hence many acquaintances between well-known scientific men and those of the district are made. On Thursday evening the Presidential address, by Professor G. S. Boulger, F.L.S., F.G.S., was delivered. Friday morning and afternoon were devoted to the reading of scientific papers, of which one only was distinctly entomological, "The scientific aspects of Entomology," by J. W. Tutt. On Friday evening, a public reception by the Mayor and Corporation took place at the Town Hall, which was tastefully decorated, and certain rooms devoted to the exhibition of natural history specimens (one by Mr. P. Crowley, F.Z.S., F.E.S., was occupied with magnificent exotic lepidoptera). After the reception Mr. Enock gave his excellent illustrated lecture, "The tiger-beetle," with his usual success. Saturday morning was devoted to papers, and in the afternoon two out-door excursions were arranged, one to Beddington, the other to Addington. Mr. P. Crowley's house was the centre of the entomological section socially, and the members of that section desire to express to him their hearty thanks. Among the entomologists present were Dr. T. A. Chapman, Mr. F. Enock, Mr. R. Adkin, Mr. H. St. John K. Donisthorpe, Mr. Stanley Edwards, Mr. J. A. Clark, Mr. L. B. Prout, Mr. L. J. Tremayne, Mr. J. W. Tutt. The Congress next year is to be held at Rochester, when the ancient city will no doubt seek to establish a record, for the Rochester Naturalist's Club is not only an exceedingly flourishing institution, but it includes in its membership many of the leading citizens. Still it has much to do to beat Croydon, although we doubt not the grand old city will attempt to do so. The Congress for 1900 will probably be held at Brighton, as the delegates from the "queen" of the south coast also brought an invitation for next year. Membership (to non-members of the affiliated societies) is only 5/-. Particulars from Dr. Abbott, 33, Upper Grosvenor Road, Tunbridge Wells.

Mr. L. Upcott Gill, Strand, W.C., is bringing out, by subscription (price 10s. 6d.), a work on "British Dragonflies," by W. J. Lucas, B.A. The work will be a complete and up-to-date handbook, illustrated (eggs, nymphs, and structural details) in Mr. Lucas' own inimitable way, and will consist of 8 separate chapters, besides a full seriatim account (and coloured illustration) of each British species belonging to the Odonata. On publication, the price of the book will be raised to 15s., and after publication will be again raised to 21s. net. What Mr. Lucas writes on British Odonata ought to be read by everyone interested in the order. We wish the work every success.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

NOTE ON THE LARVÆ OF CARADRINA QUADRIPUNCTATA (CUBICULARIS) IN THE ISLE OF MAN.—On the 30th day of March, 1898, I received from Mr. Thomas Crennell, of No. 47, Athole Street, in the town of Douglas, a box containing many hundreds of the larvæ of *Caradrina quadripunctata* (*cubicularis*), mostly full fed, which were taken by him the previous day from a warehouse situate on the North Quay, in the town of Douglas, occupied by a Mr. Beck, flour merchant. The larvæ were all spun up in *webs*, and so peculiar an appearance did these webs present, that I accordingly sent a section of them to my friend, Mr. J. W. Tutt for his acceptance. In a communication received by me from Mr. Tutt, dated the 1st inst., he stated, *inter alia*, that, "he never saw anything like this collection of larvæ," and requested me to give him some information bearing thereon, for publication. I therefore wrote to Mr. Crennell on the 3rd inst., asking for particulars, etc., and in a letter to me, dated the 13th inst., he writes that the warehouse where the larvæ were obtained is well ventilated and warm, and contains many thousands of these larvæ every year. In the summer, and early autumn months, great quantities of newly-mown hay from various districts of the island are stored in such warehouses for retail purposes, and multitudes of the young larvæ become "housed." They feed on the new hay, clover heads, and other plants that are among the hay, as he has seen them repeatedly feasting thereon, and subsequently ascend to the crevices of the beams and joists, and spin up in a web or cocoon, composed chiefly of seeds and other matter that lie on the beams, the walls of the warehouse being sometimes practically covered with the webs. It is of common occurrence to find them (the webs) from 15 to 18 inches wide, and, on the average, each of them contains upwards of 200 full-fed larvæ. Mr. Crennell goes on to say that it must be clearly understood that such webs are a combination of cells, and each cell has one tenant only, that the caterpillars remain all the winter therein, and about May, turn to bright red chrysalides. The larvæ of this species will also spin up on the sides of flour sacks in company with a little "meal worm," and sometimes even amongst the flour itself, the dust apparently not giving them any trouble about settling down. He has repeatedly seen the perfect insect, about Christmas, on the wing, and odd specimens have this year been flying about up to the present (April 13th). Frequently the windows of the warehouse in question are darkened by the numbers of imagines settled on the glass. In September, last year, Mr. Crennell "forced" a great number of the full-fed larvæ by putting them into a wooden box on a mantleshelf in a room where a fire was burning every day, and in eight weeks the perfect insects all emerged. He says: "There is no soil required for the larvæ to pupate in, only a dry box and a hot room is all that is wanted to force the species out." Some time ago he gave his friend, Mr. William Garrett, of Primrose Cottage, Douglas, about 200 of the larvæ to force, and he put them into a cupboard near a range, but they escaped, and in a few weeks "the insects were all over the house."—H. SHORTRIDGE CLARKE, F.E.S., Sulby Parsonage, Lezayre, Isle of Man. *April 19th*, 1898. [The imagines from the larvæ received by us from Mr. Clarke are now (May 29th) emerging, rather dark, but otherwise quite typical *C. cubicularis*.—Ed.]

Habits of a brood of Noctua rubi.—From a batch of ova obtained from a ♀ *N. rubi* last June, I bred several moths in the autumn. The remaining larvæ hybernated and moths are now emerging, whilst some of the larvæ are still feeding. No attempt was made to force any of these.—(Rev.) C. D. Ash, B.A., F.E.S., Skipwith Vicarage, Selby. *May 2nd*, 1898.

Notes on the habits of the larvæ of Xylophasia scolopacina.—Though I have always been assured by those who have regularly worked for the larva of the above species, that it is only to be found by night, I felt convinced in my own mind that the cause of its being so frightfully ichneumoned must be traced to its resting exposed by day. On the 14th May last I was able to prove that my surmise was correct, for I found the larvæ resting as at night on the very top of the grass culms. While searching thus, I was delighted to discover the head of a larva protruding from a hole in a grass stem, and shortly afterwards saw another issue from a similar hole. This, I think, places beyond all doubt the fact that in its earlier stages it is an internal feeder. I felt sure it must be so, as we never find larvæ until they have attained nearly half-an-inch in length, by which time their quarters in these small stems must be getting somewhat restricted. Possibly all this is "ancient history," but I have never come across its life-history in any works to which I have had access. I hope this autumn to be able to ascertain when the egg is deposited, and in what stage it passes the winter.—(Colonel) Chas. E. Partridge, 20, Hornsey Rise Gardens, N.

Eggs of Lepidoptera.—*Crocallis elinguaria*.—The eggs are large, laid singly on long side, and almost brick shaped. Length : breadth : height : : 4 : 3 : 1. There is a shallow depression occupying the greater part of the upper surface. The egg-shell of the newly-laid egg is shiny, and the egg appears (under the lens) of a pearly white colour, with irregular greenish-grey shading. The micropylar end contains an oval greenish depression, occupying almost the whole of that end, the shell forming a slightly raised white rim around the depression. On this rim, and for some distance over the shoulder, are traces of very fine longitudinal reticulation, which becomes less distinct as it reaches farther down the egg (*i.e.*, recedes from the micropylar end). Two eggs out of 16 are laid edgewise (not on the end that forms the nadir of the micropyle). [Described August 8th, from eggs obtained from a ♀ captured at Lanslebourg.] By August 15th, the eggs had become of a pale purplish-white colour, with darker purple markings occupying the originally greenish areas. The longitudinal ribbing is still very indistinct.—J. W. Tutt.

REVIEWS AND NOTICES OF BOOKS.

Books from the American Masters.

When we took up the three books mentioned below, and were about to write a short review of each of them, it struck us whether entomologists in England ever gave our American friends full credit for the enormous work they have done, and still do. This aspect of

the matter was brought to our attention by recently reading, as we were turning over the pages of the *Entomologist's Weekly Intelligencer*, vol. vii., pp. 14-15, a letter from a gentleman who was then Alpheus S. Packard, Jun., and who dated it on Sept. 13th, 1859, from the Boudoir College, Brunswick, Maine, U.S.A. In this letter, addressed to the editor of the *E.W.I.*, we read :—

"You cannot but be aware of the difficulties that beset the American entomologist in a country where so slight a degree of attention is paid to this branch of natural history; more particularly in regard to the young entomologist, who has no large and accurately labelled collection to which to refer, nor any complete and standard work to consult. In no order of insects has so little been done as with the Lepidoptera, and in no order am I so much interested as the moths, in which, I must confess, your *Manual* has led me to take a deep interest. The Rev. Dr. J. G. Morris, of Baltimore, is now engaged on the Noctuina; I want to make the Geometrina my speciality for the present; now can you (or some of your acquaintances) supply me with as complete a collection of European species as possible, and receive in exchange some fifty species of Lepidoptera, and with insects of all other orders (save the Hymenoptera) making some five to eight hundred species in all? You see our moths have not been worked up at all yet, and I must wait a year or two before sending any away. If others of your acquaintance would like to exchange with me, I should be most happy to do so, receiving in exchange any European Lepidoptera."

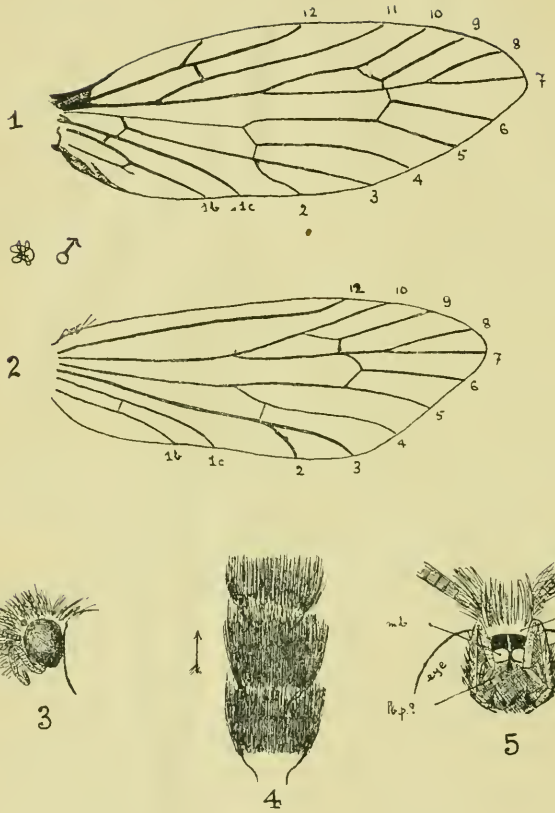
Since then what have the writer of that letter and his colleagues not done? We have had a *Monograph of the Geometrid Moths of N. America*, a *Monograph of the Bombycine Moths*, text books on general entomology, and essays innumerable on particular genera and species. There have been Scudder's *Butterflies of the Eastern States of N. America and Canada*, and Edwards' inimitable monograph of the butterflies. Fernald has reduced the *Crambidae* and *Pterophoridae* to order, and at the present time American entomology stands probably at a higher level than that of any other country, both as to the output and quality of the work done. There is, of course, an enormous amount of refuse, where there are so many "professionals," but it appears to us that full credit should be given to those who have produced sterling work, and who have been able to write such books as those mentioned, whilst we in Britain have got no further than the *Manual*, which still remains the most concise technical book that we have in this country. Fortunately, American lepidopterists have had a higher view than we of what constitutes entomological science, and their good books are as great a credit to their knowledge as to their industry and energy.

A TEXT BOOK OF ENTOMOLOGY, INCLUDING THE ANATOMY, PHYSIOLOGY, EMBRYOLOGY AND METAMORPHOSES OF INSECTS. By Alpheus S. Packard, M.D., Ph.D., etc. (729 + xvii. pp., 654 woodcuts and illustrations). London: Macmillan and Co., Ltd., 1898.—Without doubt this is the best summary of modern entomological science yet offered to the public. The various chapters are exceedingly well worked out and thoroughly up to date, and although the author can scarcely hope to enhance the high reputation he has already well earned from all classes of entomologists, he has taken care in this volume to sustain it, and the excellent arrangement of the compiled parts of the book is only equalled by the original deductions drawn by the author from his facts. The book is divided into three parts: I. Morphology and Physiology. II. The Embryology of insects. III. The Metamorphoses of insects. Each of them is treated with the fullest detail,

and a full list of authors and the works referred to is given at the end of each chapter. It is out of the question to enter into a detailed criticism of the work, if, indeed, that were possible; we can only recommend it to all scientific entomologists as a book that should be on their bookshelves, and as one to which they can turn with a certainty of clearing up most of the difficulties that may present themselves in those branches of the subject with which the book treats. We heartily congratulate the author on having produced a work which must prove a distinct success, and will afford many entomologists much food for reflection for a considerable length of time.

Revision of the Orthopteran group Melanopli (Acridiidæ), with special reference to North American forms. By Samuel Hubbard Scudder (422 + iv. pp., 26 full-page plates). Washington: Government Printing Office, 1897.—This revision is practically a revolution of that group of Orthoptera dealt with by the author. The known species have been overhauled, and systematically arranged. A large number of new species are described for the first time, and many of the old species are split up into their component parts, forming two or more species, the whole being supplemented by (1) an analytical key to the genera of the North American Melanopli (including the Old World forms); (2) analytical keys to the species belonging to the various genera. Each genus is described at considerable length, and each species, besides having figures of the genital organs, has a detailed synonymy, description of the insect, an account of its geographical distribution, etc. The book must undoubtedly form the basis of all future work in this field, and the full descriptions, as well as the excellent plates both of the tegmina and male genitalia, will undoubtedly render easy the task of any future workers who may have occasion in the years to come, when knowledge has once more accumulated, to again revise the group that Dr. Scudder has so well brought up to date in the present work.

The Pterophoridæ of North America. By C. H. Fernald, M.A., Ph.D. (80 pp., 9 full-page plates). Massachusetts, U.S.A.: The Massachusetts Agricultural College.—Professor Fernald has again laid all lepidopterists under an obligation, for although his little brochure deals with the North American *Pterophoridae*, many of the species are also Palæarctic, or have very near Palæarctic relatives, whilst the general remarks on the family are as important to Old World lepidopterists as to their New World brothers. A systematic work of this kind was much wanted, and we have no doubt that the orderly arrangement of the Plumes in a little work of this description, pointing out as it does the many gaps in the natural history of many of the species, will be an incentive to many American lepidopterists to devote their leisure to breeding these delicate and interesting insects. Step by step the various groups of Lepidoptera are being reduced to order in America, and whilst others have taken in hand the superfamilies comprising the larger species, Professor Fernald is working at the smaller "fry," and bids fair to become the "Stainton" of the N. American Continent. The plates, which illustrate the general structure, the neuration and the genitalia, are quite worthy of the excellent letter-press, and the general get-up of the little work is altogether praiseworthy.



Jno. Hartley Durrant, delt.

Epimartyria pardella, Wlsm.

1. Fore-wing. 2. Hind-wing. 3. Head in profile. 4. Joints of Antenna. 5. Head from beneath.

The Entomologist's Record AND JOURNAL OF VARIATION.

VOL. X. No. 7. JULY 1ST, 1898.

Descriptions of a new Micropterygid genus and species, and a new Eriocraniad species from N. America.

(*Illustrated by Plate*).

By the Rt. Hon. LORD WALSINGHAM, M.A., LL.D., F.R.S., etc.

A re-examination of my North American *Micropteryx pardella* and *M. auricrinella* shows them to belong to a new genus, for which I propose the name *Epimartyria*. It resembles *Eriocrania* in general appearance, but has the jaw structure (without tongue), of a true *Micropteryx*, and very peculiar antennæ. *Epimartyria*, therefore, is the American representative of *Micropteryx*, Hb. (*Eriocephala*, Crt.), with developed mandibles.

PROTOLEPIDOPTERA.

MICROPTERYGINA.

EPIMARTYRIA, gen. n., Wlsm.

('επιμαρτύρία = testimony).

Type: *Epimartyria pardella*, Wlsm. (United States).

Antennæ ($\frac{3}{5}$) moniliform, each bead with a fringe of long hairs from the circle of its widest diameter, projecting forward as far as the middle of the bead above it. *Mandibles* developed. *Haustellum* absent. *Labial Palpi* (not observed with certainty, ? absent). *Maxillary Palpi* strongly developed, 5-jointed, scaled, hairy on the basal joints, curved inward. *Maxillæ* distinct. *Ocelli* present. *Head* and *Face* very rough. *Fore-wings* with the costa somewhat excavate at the base, thence slightly arched, apex rounded; somewhat widened across the middle. *Neuration* 1*b* furcate at base, connected by a bar with 1*c*, which has a small fork at the extreme base; vein 2 out of 3 immediately beyond angle of lower cell, 2 + 3 (= cubital) continued to near the base, but becoming furcate before the bar from 1*b* to 1*c*; the lower limb of the fork is almost obsolete, and goes to 1*c*, the upper is distinct, and goes to the median (4 + 5 + 6); 4 furcate, one limb going to cubital before origin of 2, the other limb to median at about $\frac{2}{3}$, at which point 5 is bent down to unite with it; 5 and 6 separate, and almost parallel, 6 furcate at base, connecting median with radial; 7 and 8 stalked (7 to slightly above apex), and continued through cell to about midway between 11 and 10; the transverse veins joining 10 to 9, 9 to 7 + 8, and 7 + 8 to 6 are weak, and that between 9 and

10 is furcate, enclosing a small cell between its limbs on vein 10; 11 and 12 connected by a transverse bar, before which vein 12 throws out a branch to the costa; costa chitinised at base, outwardly sharply defined by a short humeral vein; jugum developed, anal margin of the wing chitinised.

Hind-wings as broad as the fore-wings, apex rounded; with flat scales. *Neuration* as in the fore-wings, but 1*b* not furcate, at base, 1*c* not connected with cubital, and cubital not connected with median towards base, transverse vein between 9 and 10 not furcate, 11 absent.

Abdomen: genital armature consisting of four lateral plates and strong bifid uncus, the lower plates with a tooth at their apex.

Legs with hind tibiæ not hairy above; median spurs moderate, apical very small: middle legs without spurs.

Intermediate between *Palaeomicra*, Meyr., and *Micropteryx*, Hb., but more closely allied to *Palaeomicra*.

The beads of the antennæ have longer stalks, and thus are more distinctly separated than those of *Micropteryx* (*calthella*); moreover, in *M. calthella* they are shaped like a small conical bullet with the base outwards, whereas, in *E. pardella*, they are more spherical, and are vase-shaped, with the mouth straight, and wider than the stem, the middle portion bulged, and almost flanged. No such structure is observable in the normally cylindrical and closely compressed joints of *Eriocrania*, Z.

Catalogue of Epimartyria.

1. PARDELLA, Wlsm.—*Micropteryx pardella*, Wlsm., Pr. Z. Soc. Lond., 1880, 83, Pl. xi., 11. U. States. S. Oregon, vi. Riley, Smith's List Lp. Bor. Am., 111, No. 6019 (1891).

2. AURICRINELLA, Wlsm., sp. n.—U. States, N. Carolina.

Epimartyria auricrinella, sp. n., Wlsm.

Antennae, fuscous. *Palpi* yellow. *Head*, bright golden. *Thorax*, golden-yellow anteriorly. *Fore-wings*, deep purple, especially so along the costa, tending to reddish-purple towards the apex; profusely sprinkled with bright golden scales, most plentifully along the middle of the wing; cilia pale golden. Underside, purplish-fuscous. *Exp. al.*, 9 mm. *Hind-wings* greenish-purple about the base, tending to dull coppery-purple towards the apex; cilia touched with pale golden. Underside purplish fuscous. *Abdomen*, fuscous. *Legs*, yellowish.

Type ♂, Mus. Wlsm.

Hab.—United States: North Carolina (H. K. Morrison), unique.

ERIOCRANIANA.

Eriocrania, Z.

Eriocrania griseocapitella, sp. n., Wlsm.

Antennae greyish. *Head* thickly clothed with long greyish hairs. *Thorax* grey. *Fore-wings* bright golden, metallic, irrorated with bright shining purple dots throughout; these are somewhat more thickly massed towards the base, and on and below the fold; cilia pale shining greyish. Underside purplish-fuscous. *Exp. al.*, 12 mm. *Hind-wings* semi-transparent, purplish-grey, more strongly tinted with purple towards the apex; cilia pale greyish. *Abdomen* fuscous, with greyish hairs. *Legs* greyish fuscous.

Type ♂, Mus. Wlsm.

Hab.—United States: Washington (D.C.), unique. A single specimen received from the late Dr. C. V. Riley.

This species, which is allied to *donzelella*, Dp. (=*fastuosella*, Z.) differs in the massing of the purple dots towards the base and basal half of the dorsum; the spots are much smaller than in *aurocyanea*, Wlsm.

Explanation of Plate.

Figs. 1 and 2. Anal veins 1*b* (=XI), 1*c* (=IX) of *Epimartyria auricrinella*.
Cubital veins 2 (=VII_2), 3 (=VII_1).
Median veins 4 (=V_3), 5 (=V_2), 6 (=V_1).
Radial veins 7 (=III_5), 8 (=III_4), 9 (=III_3).
10 (=III_2), 11 (=III_1).
Subcostal vein 12 (= II).
Fig. 3. Head in profile.
Fig. 4. Joints of antenna.
Fig. 5. Head from beneath.
Ant. = antennæ; mb. = mandibles; mx. = maxillæ; mx. p. = maxillary palpi; lb. = labium; lb. p. = labial palpi (?).

The British Liparid Moths.

(*Concluded from* p. 143).

By A. BACOT.

Imagines.—I have not yet studied the adult insects in detail, and they are too well known to need a general description. The most important structural details mentioned by Kirby are, that the tongue, palpi, legs and antennæ are short, the latter in the ♂ deeply pectinated. In an old work, *Insect Transformations*, London, 1830, allusion is made to an extensile abdominal organ, possessed by the females of *Porthesia similis* and *P. chrysorrhoea*, for the purpose of transferring the down from their bodies to the ova when laid. This organ is said to have the action of a minute pair of tweezers. A similar organ is mentioned by Mr. C. Nicholson as occurring in the females of *Ocneria dispar* (*Ent. Record*, vol. v., p. 236). *Leucoma salicis*, as an imago, is able to exude two drops of a bright green fluid, one on either side of the thorax. I have only observed this in the females, but cannot say if it is confined to this sex. *Orgyia gonostigma*, occasionally *P. similis*, and more rarely *Dasychira pudibunda*, are double-brooded in captivity, all the remaining species being, so far as I am aware, single-brooded. Food seems to be an important factor in obtaining *second* broods of *O. gonostigma*. Sallow seems especially nutritious; in warm seasons a third brood is not uncommon, if the larvæ are fed on it.

General observations.—In hybernation, as in oviposition, each species seems to be a law unto itself, paying no attention to the habits or stages of its nearest relatives. *Psilura monacha* and *O. dispar* pass the winter as fully-developed larvæ within the egg. *Leucoma salicis*, as a young larva, in 2nd skin, spinning a slight cocoon in the crevices of, or underneath, loose bark. The hybernation of *Porthesia similis* (*auriflua*), and *P. chrysorrhoea* takes place in the larval stage. The former, in 4th or 5th skin, spins a large, slight cocoon in which to moult, and a smaller and denser cocoon within this, in which to hybernate. The larva of the latter makes a smaller and denser web within the loose feeding one. The silk used in the hybernating web is grey, and much closer and more opaque than that of the summer web. Its interior is divided up into separate cells or chambers, connected by passages; all those that I opened contained from 10 to 12 larvæ each, and their cast skins in addition. This latter fact is interesting from its similarity to the habit of *P. similis*. The larva of *P. chrysorrhoea* hybernates

when about half the size of that of *P. similis*. *D. pudibunda* passes the winter as a pupa ; *D. fascelina*, as a small larva, probably in 3rd or 4th skin, spinning a slight cocoon. *O. gonostigma* hybernates in the larval stage (about 4th skin), taking shelter within a withered leaf, and spinning a pad of silk to rest upon. A few silk threads are also used to keep the leaf from unrolling or opening out flat. *O. antiqua* passes the winter as an undeveloped egg.

Food.—*P. monacha*, *O. dispar*, *P. similis*, *P. chrysorrhoea*, *D. pudibunda*, *O. antiqua* and *O. gonostigma* are pretty general feeders on forest and fruit trees, and also on many bushes and shrubs as well. *D. fascelina* and *L. salicis* feed on sallow and willow, the former will also eat cherry, apple, plum and hazel, the latter also feeds on poplar. *L. coenosa* is said to feed on reeds and sedge.

Distribution of Orgyia.—The British Museum collection contains specimens of the Orgyias from Nova Scotia, California, New Holland, Australia, Borneo, Java, Malacca, Japan, S. Africa and Abyssinia, while our English species, as previously mentioned, occur throughout Europe, one of them, *O. gonostigma*, in most parts of Siberia, and the other, *O. antiqua*, in America and Northern Africa. The apterous condition of the female holds good with all the species, clearly pointing to the fact that distribution must have taken place after this character had become firmly established in the primitive stock, otherwise it would not probably be universal, and our National collection would contain specimens from the Oceanic Islands, such as Madagascar, etc. The problem as to how this world-wide distribution has taken place with species in which the female is apterous would seem at first sight to be almost insoluble. The wandering habits of the full-fed larva hardly seem adequate alone, but the hybernating habit of the larva of *O. gonostigma* offers greater facilities within the temperate zone. The leaf in which the larva hybernates, either drops to the ground at the fall of the year, or possibly, resisting the autumn winds, is dislodged by a winter gale; in either case, the larva might be safely carried for long distances, even across rivers and straits, by this agency. During a discussion at the North London Natural History Society on this subject, Mr. A. U. Battley suggested a similar means of distribution with regard to *O. antiqua*, only, in this case, it would be the ova, instead of larva, that would be conveyed by the wind. It is also possible that birds may aid in distribution by utilising the empty cocoon,on which the eggs are laid, to line their nests. These methods of distribution would necessarily be slow, and if the assumption that the apterous character was developed prior to distribution be accepted, it follows that this genus must have existed for an enormous period of time with comparatively little change.

On the British species of Lithocolletis of the spinicolella group.

By J. W. TUTT, F.E.S.

Just previous to J. B. Hodgkinson's death he sent me some Lepidoptera to examine, and to exhibit at a meeting of the Entomological Society of London. I have since been much exercised in the comparison of a long series of Sang's original *Lithocolletis sorbi* (*E.M.M.*, vol. xxii., pp. 262-263), which I received from him, with specimens of *L. sorbi*, received from Dr. Corbett, and bred from mines of

Pyrus aucuparia. This comparison leads me to quote Hodgkinson's original notes to me on his specimens, because I am quite satisfied that our micro-lepidopterists have here a difficult matter to clear up, nor I do not think the publication of any opinion of Hodgkinson's will complicate matters, but rather cause our authorities to give the specimens the attention they deserve, and probably clear up what appears to me a distinct muddle.

I.—Hodgkinson's remarks on the specimens, and my notes to him thereon, read thus :—

(1) "*Lithocolletis padiella*.—I bred two only from bird-cherry (*Prunus padus*). One I gave to Lord Walsingham, the other I send. He considered it to be *L. torminella*, but it is evidently nearer *L. spinicolella*. I have found scores of the mines on *P. padus*, but I have bred only these two." With regard to this, I wrote that Sang (*E.M.M.*, xxii., p. 262) had bred a *Lithocolletis* from *Prunus padus*, that he had considered the specimens "identical with the mountain-ash species," that Mr. Stainton had pointed out that a Continental species fed on *Prunus padus*, and was known as *padella*, Glitz. I further suggested that if Sang was wrong in uniting the *Prunus* and *Pyrus* specimens as the same species, and that if our *Prunus* species proved identical with the Continental *Prunus* species, the name would be *padella*, not *padiella*.

(2) "*L. pyrariella*.—The larva of this is grey with a black head. It puckers the underside of the leaves of *Pyrus aria*, making a long silken white mine over an inch long. It is difficult to bring home the leaves, as they are six inches long, and bending the leaf breaks the mine I find them on only one tree at Windermere." I was not able to make any suggestion as to the single individual sent to me under this name.

(3) "*L. sorbi*.—Received from T. Wilkinson. I had four specimens, one I gave Dr. Wood, who had never seen the insect before; neither had Vine, who saw all four specimens." To this I replied that I considered this to be Sang's *L. sorbi*, from *Pyrus aucuparia*, which he said was "plentiful on the mountain-ash at high elevations." This, if any of our British species should be, is most likely to be the *L. sorbi* of Frey, but I am not at all sure that any of our species is the *L. sorbi* of Frey.

(4) "*L. aucupariae*.—The next two specimens are the true *aucupariae*. I bred several of this during the last season (1896), from mountain-ash only." On these I remarked that these appeared to be identical with the last = *sorbi*, Sang; that *L. aucupariella* (not *aucupariae*) was, I thought, Scott's manuscript name for the insect Sang called *L. sorbi*, Frey, and that both *sorbi*, Frey, and *aucupariella*, Scott (MS.) fed in the larval stage on *Pyrus aucuparia*.

II.—About the same time a discussion on these species took place in the book of one of our exchange baskets. The main points of the discussion were as follows: (1) I note one of the species of *Lithocolletis*, from *Pyrus* (*Sorbus*) *aucuparia*, is called by Mr. J. B. Hodgkinson, *L. aucupariella*, Scott (MS.), and he insists not only that this species is distinct from *L. sorbi* (also from mountain-ash), as defined by Sang, but also that the *L. sorbi* of Sang is distinct from *L. sorbi*, Frey. The Rev. C. D. Ash breeds, from mountain-ash, a *Lithocolletis* that he records (*Ent. Rec.*, ix., p. 61) as *L. sorbi*. Dr. Corbett reports that these "are quite identical with the species" that he breeds "from *P. aucuparia*," whilst Dr. Wood is reported as considering them similar to, if at all distinguishable from, *L. torminella*. (2) Mr. N. M. Richardson points

out that "the specimens bred by Dr. Corbett from *P. aucuparia* belong to the '*spinicolella* group,' with unspotted tarsi, and not to the '*pomifoliella* group,' which includes *torminella*, and has the hind tarsi dark spotted. The colour of *L. aucupariella* is also distinctly greyer than that of *L. torminella*, and the white marks duller and less striking." He states that he has not, however, "been able to make out any satisfactory distinction between *L. aucupariella* and the common, and somewhat variable, *L. spinicolella*, and should be inclined to regard it as belonging to that species, unless there are larval differences sufficient to separate the two. Dr. Corbett does not mention what the larva of *aucupariella* is like, and the mere fact of the different food-plant does not weigh much." (3) Mr. Durrant points out that Frey says of *torminella*: "Hind tarsi spotted or plain." (4) The only references to *L. aucupariella*, that I can find, are: (*a*) Frey, in describing his *sorbi*, says: "? *aucupariella*, Scott." (*b*) Sang (*E.M.M.*, xxii., p. 262), who heads a note, "*Lithocolletis sorbi*, Frey," and who says [evidently uniting *sorbi* (as he understood it) and *aucupariella*]:— "The identity of the *Lithocolletis* from mountain-ash, generally known as *aucupariella*, Scott, has long been rather a sore point with me, as I have always (though almost single-handed) maintained its distinctness from *pomifoliella*." Sang also found larvæ on *Prunus padus*, and states in the same note: "A fair proportion of these duly emerged the following spring, identical with the mountain-ash species. I forwarded them to Mr. Stainton at the end of the season. He told me that the Continental specimens were lighter and brighter in colour, but declined to give any opinion as to their distinctness from *L. pomifoliella*. Looking over these carefully one day, I noticed for the first time that the tarsi were different from those of *L. pomifoliella*, which are pale and ringed with dark, but like those of *L. spinicolella*, pale and unicolorous. Now, I never find either *L. spinicolella* in the sloe, nor *L. pomifoliella* in the hawthorn, on the high grounds where I take the mines of *L. sorbi*. I have been told that mines are common in the S. of England in the mountain-ash, and it will be of interest to hear to which group the moths produced from them belong. There are no mines in the mountain-ash here (Darlington), although *L. pomifoliella* and *L. spinicolella* are common enough, the former especially." These specimens from *Prunus padus* are evidently the *paduella* of Hodgkinson, and probably the *L. padella* of Glitz. (5) Mr. Richardson further notes: "I am not personally acquainted with *L. sorbi*, unless Dr. Corbett's specimens are that species, but from descriptions it would appear to be very like *L. spinicolella*. Mr. Stainton's statement that Continental specimens of *L. sorbi*, Frey (= *aucupariella*, Scott?) are lighter and brighter than the North of England *aucupariella*, Scott (= *sorbi*, Frey?) on mountain-ash and *Prunus padus*, together with the strong resemblance of Dr. Corbett's specimens to *L. spinicolella*, rather suggests that we may not have the true *L. sorbi*, Frey, at all in this country, but that this mountain-ash *Lithocolletis*, is either a third (unnamed?) species, or merely *L. spinicolella* on a new food-plant." (6) To this one is inclined to suggest that *L. sorbi*, Frey, has never yet been shown to occur in Britain, and that we have not yet obtained that species in this country. It is also just possible that Sang's specimens from *Prunus padus* (= Hodgkinson's *L. paduella*) and *Pyrus aucuparia* (= Scott's *aucupariella*) are not identical, as Sang suggested, and,

further, that the latter may, as Dr. Wood and Lord Walsingham have suggested, be a northern form of *L. torminella*, rather than of *L. spinicolella*.

III.—Having reached this stage, I was so far interested in the subject, that I sent on to Lord Walsingham and Mr. Durrant the specimens standing in my cabinet under the name of *L. sorbi*. These were :—

1.—Two specimens from Coverdale's collection.
2.—Ten specimens bred by Sang in 1883 and 1884.
3.—Six specimens from one of the Darlington collectors (Newman or Milburn), 1885.
4.—Six specimens from ditto, 1886.
5.—Six specimens from Dr. Corbett, larvæ, Selby, 1896, bred 1897.

Mr. Durrant writes : " Lord Walsingham and myself have examined your Lithocolletids with the following results :—

" 1.—The two specimens from Coverdale, labelled '*sorbi*,' agree with specimens received from Bower as *torminella*. These are *torminella*.

" 3.—Darlington, 1885, six specimens. Lord Walsingham considers the fourth specimen as doubtfully agreeing with the other five. This series (with the exception of No. 4) is *pomonella* (*deflexella*), Stn., *Zool.* = *spinicolella*.

" 4.—Darlington, 1886, six specimens, Nos. 1, 3, 4, 5 = *pomonella* (*spinicolella*), Stn., *Zool.* = *spinicolella*. Nos. 2 and 6 = *pomonella* (*deflexella*), Stn., *Zool.* = *spinicolella*.

" 5. Selby. Six specimens from Corbett, bred 1897. These are the same as (2) the ten specimens labelled '*sorbi*, Sang, 1883-4.' These are identical with two Merton specimens, from *Pyrus aucuparia*. These are what we call *aucupariella*, Scott, MS., and appear to be a northern form of *L. torminella*, which differs from the southern forms on the gradual lines suggested by *Polyommatus astrarche* (typifying the European form), *salmacis* and *artaxerxes*.

" An examination of the genital organs seems to be required, but we are not prepared to undertake this until the larvæ have been more particularly described. So far we have not seen an English specimen agreeing with the Continental *sorbi*, Frey " (*in litt.*, July 13th, 1897).

IV.—Wocke's synonymy (*Catalog der Lepidop.*, 1871, p. 330) of this group works out as follows :—

2853.—*Sorbi*, Frey, *Mittheil.*, 1852, 608; *Tin.*, 338. *Sorbifoliella*, H.-S., v., p. 328. *Pomonella*, H.-S., 775-6.—Larva: *Sorbus aucuparia* (inf.).—Fen., Germ., Helv., Gal.

2854.—*Torminella*, Frey, *Tin.*, 340; Stt., *Ann*, 1857, 109; *Nat. Hist. Tin.*, ii., 128, T. iii., fig. 1.—Larva : *Sorbus torminalis* (inf.).—Angl., Helv.

2857.—*Spinicolella*, Sta., *Ins. Brit.* (1854), 271 : *Nat. Hist. Tin.*, ii., 136, T., iii., fig. 2 ; Frey, 343. *Pruni*, Frey, *Mittheil.* (1855), 614. *Pruniella*, H.-S., v., p. 326. *Pomonella* var. *spinicolella*, *Zeit. Linn. Ent.* (1846 ?) i., 203 (Ann., i.). *Deflexella* (*pomonella*), Sta., *Zool.* (1851), App. 170 ; *Stett. Ent. Zeit.* (1852), 81.—Larva : *Prunus spinosa* et *P. domestica* (inf.).—Anglia, Germ., Helv., Hung.

2858.—*Padella*, Glitz, *Jahresb.* (1863), 41. Larva : *Prunus padus* (inf.).—Germania.

V.—It would appear that we may have in Britain not only the well-known species, *L. torminella* and *L. spinicolella*, but probably also *L. padella* of Glitz, a species, not yet, I believe, acknowledged as British. There is every possibility, in the face of the conclusion of Lord Walsingham and Mr. Durrant, that the insect called *aucupariella*, Scott, is not *L. sorbi*, Frey, but that it is identical with the *L. sorbi* of Sang, and that both are, as Dr. Wood and Lord Walsingham suggest,

a northern form of *L. torminella*, a possibility that had occurred to me, but which I had not before entertained seriously. I cannot too much deprecate the method we have adopted with regard to some species, of carrying on manuscript names, which are always a source of endless trouble to scientific workers abroad. It is clear that none of our known British species is *sorbi*, Frey, and this name must, as Lord Walsingham says, be dropped for any of our present known British species.

We then get as our British species :—

1.—*L. torminella*, Frey.—Larva feeding on *Pyrus* (*Sorbus*) *torminalis*.
var. *aucupariella*, Scott.—Larva feeding on *Pyrus* (*Sorbus*) *aucuparia*.
2.—*L. spinicolella*, Sta.—Larva feeding on *Prunus spinosa* and *P. domestica*.
3.—(?) *L. padella*, Glitz.—Larva feeding on *Prunus padus*.

The question still remains—What is Hodgkinson's *Lithocolletis* on *Pyrus aria* ? The larva of one of Frey's species—*L. cydoniella*, *Tin.*, 337—is said to feed on *Pyrus communis* as well as *Cydonia vulgaris*. It is said to feed in the underside of the leaves, as does Hodgkinson's on *P. aria*, and it may be this species. At any rate, it would appear possible that here we have also, another, not yet recognised, British species.

The "pomifoliella-spinicolella" group of the Lithocolletidæ.

By H. H. CORBETT, M.R.C.S.

Mr. Tutt having sent me his MS. on the British species of the "*spinicolella* group" of the *Lithocolletidae*, and asked for my assistance in clearing up the muddle at present existing on the subject, I add the following notes on the different species in this locality, together with their food-plants, etc.

Food-plants.—Near Doncaster, the following species of plants occur that serve as food for the larvæ of Lithocolletids, belonging to the *pomifoliella-spinicolella* group :—*Prunus spinosa* : an abundant woodland and hedgerow native. *P. institia* : a somewhat rare and local denizen. *P. domestica*, præc. var. : common in orchards and gardens. *P. avium* : an abundant woodland denizen. *P. padus* : very local but common native. *Crataegus oxyacantha* : abundant native. *Pyrus aria* : local denizen, much planted in parks and shrubberies, not common in woods. *Pyrus torminalis* : doubtful native and very local, we are at its northern limit, and it only occurs commonly in one wood at Wadworth. *P. aucuparia* : abundant native. *P. malus* and cultivated vars. : abundant native and planted. I have not seen any Lithocolletid mines on cultivated cherries or pears, but probably they do occur.

Characters of mines found on the different plants.—*Prunus spinosa*, *institia*, and *domestica* : Small mines, usually running along one side of the mid-rib of a leaf ; this is especially the case on the small leaves of *P. spinosa*. In the larger leaves of cultivated plants, and also in large leaves of *spinosa* and *institia*, the mine frequently is situated between two of the secondary veins, but rarely occupies the whole space, beginning at the mid-rib, but not reaching to the margin. Colour, light grey. Abundant.

Prunus avium : Long mines, between the secondary veins of the leaf. Sometimes, but rarely running along the margin. but never along one side of the mid-rib. Colour, light grey. Abundant.

Prunus padus : Very irregularly-shaped mines. Either long and narrow between the side veins, or short, and just within the margin of

the leaf. In one leaf that I have before me now are three mines; one between the margin and the side vein nearest to the base of the leaf; one on the margin at the side of the leaf; and one between two side veins. Colour, very pale, nearly white. Rare.

Pyrus aria: Long narrow mines, always between two side veins, and extending from the mid-rib to near the margin. This mine does not discolour the whitish underside of the leaf. Rare.

Pyrus aucuparia: Small deeply-puckered mines, either close to the margin, or along one side of the mid-rib. Colour, pale grey. Very abundant.

Pyrus malus: Irregularly-shaped broad mines, situated in any part of the leaf. Colour, brownish-orange. Very abundant.

Pyrus torminalis: Irregularly-shaped mines, either between the lateral veins or close to the margin. Colour, pale grey, with the central portion brownish-orange. Very rare.

Crataegus oxyacantha: Small deeply-puckered mines, generally occupying one lobe of a leaf. Colour, brownish-orange. Abundant.

The larvæ inhabiting the different mines have been examined under a 2″ objective, and I have tabulated descriptions of them, together with some notes on the time of pupation, and the formation or otherwise of cocoons. In the table is included a description of the larva on *Fagus sylvatica*, but as nobody is likely to refuse this insect specific rank, I do not futher allude to it in my general conclusions.

All the larvæ examined are so very similar, that it is difficult, if not impossible, to find specific distinctions in them, but their habits in pupation give a much better guide, by which they may be divided into the following groups:

(*a*). Hybernating as larvæ. Food-plants: *Prunus avium*, *P. spinosa* and *institia*.

(*b*). Hybernating as pupæ.

(1). Without a cocoon. Food-plants: *Pyrus malus*, *Crataegus oxyacantha*.

(2). With a cocoon. Food-plants: *Pyrus aria*, *P. aucuparia*, *P. torminalis*, *Prunus padus*.

When the imagines resulting from these groups of larvæ are examined, there are found to be: (1) In group *a* two easily distinguished species:—1. *L. cerasicolella*, H.-Sch. 2. *L. spinicolella*, Sta. (2) In group *b*1, is one species:—*L. pomifoliella*, Zell. (3) In group *b*2, are, so far as I can at present judge, two species, one feeding on several species of *Pyrus*, and known as *L. torminella*, Frey = *L. aucupariella*, Scott = *L. pyrariella*, Hodg. (?). The other feeding on *Prunus padus*, and probably being the *padella* of Glitz.

I have no material at hand to enable me to say with certainty that *L. pyrariella*, Hodg., is identical with *L. torminella*, Frey. The only imago that I ever bred from *Pyrus aria* was destroyed some years ago, but I remember that it was very similar to the specimens that I have bred freely from *Pyrus aucuparia*. With regard to the insect attached to *Prunus padus*, I am also without material. I have bred the species, and it is very similar to *L. spinicolella*, but the difference in habit of pupation is very marked, the former hybernating as a pupa, and the latter as a larva. It is more than probable that we have in Britain other species in this obscure group not yet recognised, and I have had specimens sent to me as *L. pomonae*, *L. mespiliella*, etc., but until more is known of their earlier stages, I should suggest that they be left as doubtful.

FOOD-PLANT.	HEAD.	THORAX.	ABDOMEN.	
Pyrus malus	*Cheeks*, nearly black. *Central parts*, greyish-ochreous, distinctly paler than cheeks.	*Above*, amber colour, translucent. Legs same colour as the rest of the thorax.	Pale amber, greenish on the back of segments 1-3.	Pupates in the autumn. No cocoon.
Pyrus aria	*Cheeks*, dark on their outer sides. *Central parts*, including part of cheeks, pale grey. *Below*, cheeks spotted with black, central parts very pale grey.	Pale amber. Legs the same colour.		Spins a thick cocoon and pupates in the autumn.
Pyrus aucuparia	*Whole head*, pale grey with a few black lines.	Very pale pearly grey. Legs the same colour.	Pale green, but distinctly drkr. than thorax. Segs. 7-9 amber.	Pupates early in the winter. Forms a distinct cocoon.
Pyrus torminalis	*Cheeks*, dark on outer parts. *Central parts* and the whole lower surface grey, with black lines.	Very pale pearly grey. Legs the same colour.	Green pale, but darker than the thorax. Segs. 7-9 amber.	The larvæ on *P. torminalis* were collected at Wadworth, and some *P. aucuparia* larvæ were taken at the same time and place for comparison. Pupates early in the winter. Forms a distinct cocoon.
Fagus sylvatica	*Head*, pale grey, with slightly darker cheeks. *Below*, all very pale.	Pale pearly grey. Legs the same colour.	Pale pearly greenish grey.	
Prunus spinosa	Dark grey, lined with black. *Below*, cheeks nearly black. *Central parts*, dark grey lined with black.	Pro- & meso-thorax, amber. Meta-thorax, greenish. Legs with dark tips.	Yellowish green. Dorsal vessel distinct, black.	Larva still unchanged on January 7th, 1898.
Prunus padus	Pale greenish with a few dark lines, and outer sides of cheeks. *Below*, pale, slightly mottled with black.	Pale green. Legs pale.	Rather darker than the thorax. Dorsal vessel distinct, dark.	Spins a thick cocoon, and pupates early in the winter.
Prunus avium	Dark grey with darker cheeks. *Below*, cheeks dark, central parts dark grey outlined with black.	Pale amber, very transparent. Legs with dark tips.	Pale green. Dorsal vessel not very distinct. Segments very distinct.	Larva active on January 7th, 1898.
Crataegus oxyacantha	(*Young larva*) outer part of cheeks black, inner part, clypeus, etc, pale grey outlined with black. Very transparent. (*Adult larva*) cheeks not so dark.	Very pale pearly amber, very transparent. Legs with black tips. No dark tips to legs.	Very pale amber. An orange blotch on 5th segment.	Pupates early in winter, and forms no cocoon.

The Variation of Hemerophila abruptaria.

By J. W. TUTT, F.E.S.

In order that we should have some record of the aberrations of *Hemerophila abruptaria*, bred by Messrs. Pearce and Southey, and referred to in their notes (*ante*, pp. 121-123), they have been good enough to place the specimens in my hands for description. Unfortunately, as those notes show, one is unable to deduce any generalisations bearing on heredity.

It is well known that this species in Britain offers considerable sexual dimorphism, the males presenting a much darker ground colour than the females, the latter appearing whitish by comparison. The dark markings that ornament the wings are, in typical individuals, usually confined to a pronounced dark blackish (♂) or umber-brown (♀), oblique, roughly wedge-shaped patch, commencing on the outer margin just below the apex of the fore-wings and ending about half way towards the inner margin of the wing. This is continued to the inner margin by shading that runs between the elbowed and subterminal lines. On the hind-wings there is a similarly coloured transverse band crossing from the apex to the anal angle, and bounded above by a double transverse line, and below by a curved line that leads to the outer angle of the wing.

The first stage in the development of the dark markings (as represented by these specimens) is the spread of the dark shading of the hind-wings inwards towards the base, and on the fore-wings outwards towards the anal angle, without, however, any real darkening of the ground colour of those parts of the wings not affected, both sexes retaining in the still pale portions of the wings their respective tints of coloration. One small male shows, however, such a general suffusion over the whole area of the wings, the typical marks blending, as it were, into the ground colour. Another male, quite typically marked, is of a bright brownish colour. All these specimens, however, in spite of the tendency to an increase of the darker portions of the wing, are distinctly typical in general appearance, and they do not strike one as presenting a series of slow intermediate stages leading up from the typical to the most extreme aberrant forms.

Of the dark or roughly unicolorous forms, there are two or three very distinct types:—

(1). The fore-wings of a bright brown (tending to chestnut brown) hue, the basal and elbowed lines paler, the sub-terminal line almost obsolete centrally, but forming a pale wavy line at its origin on the costa. The basal area (between the basal line and base of wing) darker brown, a blackish wedge-shaped spot lying in the second hollow of the elbowed line, and extending outwards to the subterminal line, but not to the outer margin. The fringe alternately light and dark brown. The outer portion of the hind-wings of the same tint as the fore-wings, but gradually becoming darker towards the base, which is very dark fuscous. A pale curved transverse line extends across the wing from the anal angle, almost to the outer margin; a rather darker shade between this and the median transverse line (*i.e.*, occupying the normally dark area in the type). The thorax pale (as in the type); the abdomen almost of the tint of the hind-wings. This form is confined, in these specimens, to a few females, yet it approaches more nearly the extreme

male type of coloration, and is only somewhat more strongly coloured than the extreme brown male type already referred to. This form we would call ab. *brunneata*, n. ab.

(2). The second form is a distinct advance on the colour of ab. *brunneata*. The bright brown hue gives place, in the greater number of the dark specimens, to deep, sooty-fuscous, inclining to blackish, but usually a trifle paler in the median area of the fore-wing. Otherwise the general markings of the previous form are maintained, the basal area is blacker, the wedge-shaped marking traceable, but continued as a transverse band between the elbowed and subterminal lines to the inner margin, and more nearly blended with the ground-colour; the basal, elbowed and sub-terminal transverse lines traceable, but less distinct, the pale costal portion of the sub-terminal line being less conspicuously marked. The fringes marked alternately with light and dark. The hind-wings are also sooty fuscous in colour, the upper median transverse line being represented by a black line, the outer transverse line by the curved shading directly exterior to it, but less marked than in ab. *brunneata*. This form occurs in both sexes, the thoraces of the males usually pale, but mixed with fuscous scales, those of the females always pale. The abdomen, dark fuscous in both sexes. Many of the specimens belonging to this group have the ground-colour covered with a delicate purple hue. This is traceable in some specimens belonging to Mr. Pearce, and in a whole row of 10 specimens belonging to Mr. Southey. No doubt this tinge will go off in time, but it has already lasted 12 months in some of the specimens. This dark form (with or without the purple gloss) I would call ab. *fuscata*, n. ab.

(3). The most extreme form of the species is represented only by a few males. These have lost all the pale markings except a small apical point placed towards the costal termination of the sub-terminal line. This form is practically unicolorous, the pale areas of ab. *fuscata* being absorbed by the dark ground-colour. Only traces of the black markings are visible, these being lost in the almost unicolorous sooty-black colour that is spread over all the wings. The antennæ and abdomen are equally dark; the thorax paler, but not so pale as is usual in the abs. *brunneata* and *fuscata*. This appears to be the nearest approach yet reached to an unicolorous type, and might well be called ab. *unicolor*, n. ab.

There are several points that strike one in looking over the specimens in detail. First, the specimens bred from hybernated larvæ (a most unusual method of hybernation in this species) in April, 1897. These are four in number, all much smaller (1″—1·1″) than usual, one male only, this being the most extreme specimen in the collection of ab. *unicolor*. The other three are females with a distinct excess of transverse lines, that give them a very mottled appearance.

The second brood specimens emerged October and November, 1897, from eggs laid the previous April, are somewhat remarkable. Mr. Southey has 19 specimens set, but a greater number than this emerged cripples. Of the specimens set, 10 are males and 9 females. Of these 8 males and 1 female approach the typical coloration, but these are all suffused, and very dull in tint. The dark specimens are exceptionally dark forms of ab. *fuscata*, almost reaching the extreme ab. *unicolor* in their uniformity of tint. Mr. Pearce has a few second brood specimens almost equally dark, and also below normal size. On the other hand,

another second brood, consisting of 12 specimens, bred by Mr. Southey, in August, 1896, are almost up to normal size (averaging about one-eighth of an inch less). They are also quite up to the normal in colour.

The purple tinge referred to as being present in some specimens of ab. *fuscata*, is very general in bred specimens of the typical form, in the various specimens bred both by Mr. Pearce and Mr. Southey. It is found equally on specimens of both sexes.

The coloration in the males, of what might be called the normal type, extends over a considerable range. (1) There is a bright pale form inclining to orange-ochreous, with a minimum of dark markings. (2) The normal brownish or greyish-ochreous form. (3) Similar to the latter, but dull and altogether wanting in the usual gloss. (4) The normal ground colour suffused with fuscous. (5) Bright brownish-ochreous, tending to the coloration of ab. *brunneata*. In the females, too, of the typical form, some are distinctly paler or whiter, others more ochreous.

One specimen, distinctly female in the characters of all four wings, has the left antenna male and the right female. The body, which is twisted somewhat, also looks as if female in essential characters, but it would be well to know whether the genital organs show any modification or are entirely male or female in character.

Tephrosia bistortata and T. crepuscularia in the Northern Counties of England.

T. crepuscularia occurs in a wood situate some six miles north-east of York, on peaty soil, lying on the soft Triassic sandstone. The principal trees to be found in this wood are birch, beech and pine, with a few oak, alder and sallow. *T. crepuscularia* (*biundularia*) is to be found here in great numbers. I first saw it on May 12th, 1892, and between that date and May 14th, 1896, I visited this wood on 58 different occasions, and during those visits I captured 367 *T. crepuscularia* and 223 of the ab. *delamerensis*. In 1892 I obtained 111 *T. crepuscularia*, sexes not determined; in 1893, 98 specimens, 41 males, 18 females, and 39 not specified; in 1894, 71 (57 myself and 14 Mr. E. G. Potter), 42 males, 26 females, and 3 not specified; in 1895, 36 specimens, 25 males, 10 females, and 1 not specified; in 1896, 65 specimens, 40 males, and 25 females. In 1892 I obtained 40 ab. *delamerensis*, sex not specified; in 1893, 46, 23 males, 15 females, 8 not specified; in 1894, 49 (41 myself, 5 Mr. Potter), 28 males, 17 females, 4 not specified; in 1895, 25, 14 males, 10 females, 1 not specified; in 1896, 67, 56 males, 11 females. In 1892 I captured the first specimen on May 12th, the last on June 13th; in 1893, first seen on April 10th, last on May 31st; in 1894, first seen on April 4th, last on May 22nd; in 1895, first seen on April 20th, last on June 7th; in 1896, first seen on April 19th, last on May 14th. It will be thus seen that the earliest record I have is April 4th, 1894, the latest June 13th, 1892. These dates for 1893 to 1896 may be taken as approximately the earliest and latest for this locality, as I visited the wood on several occasions, both before and after these dates. In 1892 they, no doubt, occurred earlier, but then this was my first visit to the

wood. In 1894, my friend Mr. Potter took 14 *T. crepuscularia* and 5 ab. *delamerensis*, making a grand total of 381 of the former and 227 of the latter, or 608 specimens of the species from one wood in five years. The gradual increase of the dark form will be seen by a comparison of the figures given under their respective years. That the ab. *delamerensis* is the form best adapted to survive in the struggle for existence is apparent to every one who sees both forms *in situ*, for the type is fairly conspicuous, as it sits with outstretched wings on the darkened trunks of the trees, whilst the dark form requires keen and educated vision to detect. It would appear that in this locality the type is being slowly supplanted by the variety in this district, for not only is the ab. *delamerensis* becoming commoner, but intermediate forms are now much more numerous than formerly. I have occasionally obtained both forms at rest on all the trees which occur in this wood, but I obtained the majority from beech, birch coming in a good second. They generally occur at from four to five feet from the ground, but I have taken and seen them at distances ranging from six inches to fully twelve feet. As a rule they sit on the N.E. side of the tree, but I have taken them from all sides. Their principal time of emergence is from 2 to 4 p.m. It seems to be a very hardy species, as I have taken them freely whilst snow, hail, sleet or rain has been falling. It is certainly not a double-brooded species at York. Bred specimens of the ab. *delamerensis* are much darker than captured ones. I have beaten the larvæ from birch and sallow in June, and reared them from the egg on both sallow and birch.—W. Hewett, York.

COLEOPTERA.

Collecting Coleoptera—Evening Sweeping.

By W. H. BENNETT, F.E.S.

Evening sweeping is a method of collecting Coleoptera, which no one who wishes to get a complete and thorough knowledge of all our species, can afford to neglect, at the same time it is a very unequal method. On one occasion you may do extremely well, and then many expeditions will be totally unproductive. I know of no other way of collecting which involves, at times, so much work for a very small return. At the same time, however, it must be remembered that there are many species which are hardly ever met with in any other way. The species of *Colon*, *Anisotoma*, *Colenis*, *Cyrtusa*, *Hydnobius*, *Agaricophagus*, *Triarthron*, *Thalycra*, etc., are almost exclusively known from captures made by evening sweeping. On the other hand, I have met many collectors who have told me that they rarely get anything in this way, so that a few notes on this subject may not be without interest to those who have not devoted much attention to this style of collecting.

In this paper I shall deal only with my own experiences, and these have been almost entirely confined to the districts around Hastings; so that collectors in other districts may not always employ exactly the same methods, or get the same results.

First then, as to the time at which evening sweeping should begin. This varies according to the time of the year. Early and late in the season I have found that the afternoon is often more profitable than

the evening. On one occasion in late August I remember taking a fine ♂ of *Colon dentipes*, *C. brunneum* and *Agaricophagus cephalotes*, before three o'clock. Usually, however, about an hour before sunset is a good time to commence, and on favourable evenings from then till dark may be profitably employed. In fact, some of the best things are sometimes met with when it is almost too dark to distinguish them. I have twice taken single specimens of *Eutheia schaumi*, when it was too dark to be really sure what they were. On exceptionally favourable evenings it is as well to sweep on after it is dark, and when the net gets too full, tie it up tightly, and examine it carefully at home. In this way I have taken such nice things as *Tropiphorus carinatus* and *Liosoma oblongulum*.

By far the most important point of all, however, is the sort of weather which is adapted to evening sweeping. It is no use going out in *any* sort of weather. The atmospheric conditions must be just right, or you get nothing; as far as my experience goes wind is absolutely fatal to success. No matter how bright and warm it may be, it is never any good if there is a breeze. The sort of evening that is wanted is a still, hot, close one, following either a hot day or rainy weather. If it be thundery, and the air heavy and oppressive, so much the better. On such an evening it is astonishing how many species may be swept up in a favourable locality. A little rain—if not a cold rain—is not always a drawback, although it makes it rather difficult work to distinguish what you have got when each sweep leaves the net dripping with wet. I well remember some years ago, when collecting at Shiere, I took two specimens of *Triarthron märkeli*, *Trichonyx sulcicollis* and *Thalycra sericea*, when it was so wet that under ordinary circumstances I should not have been collecting at all; but it was the last day of my holiday, and although it rained sharply at intervals, I swept on till dark, almost the last insect I took being the *Thalycra*.

I have never found evening sweeping any good until quite the end of May, and I look on July, August and September, as by far the best three months of the year for this style of collecting. If you can get the right sort of weather in the autumn, you can sweep with advantage for *Anisotomidae* until very late in the year. I once took a pair of *Anisotoma grandis*, quite at the end of September, by sweeping a grassy ride in Guestling wood in the afternoon, and I believe in some districts where *Anisotomidae* are more plentiful than they are here, many good species may be taken after most collectors consider the sweeping season has finished.

The places I have found most suitable for sweeping are grassy rides in woods, the wider and more open the better, lanes with sloping banks, particularly if on the sides of woods; edges of parks and commons, and ditch sides in marshy places. Many of the best species are found by sweeping grassy places under fir trees.

To enumerate all the species which may be met with by evening sweeping would take up far too much space in an article of this kind. The following list, all of which I have taken myself, will give some idea of what may be produced by persistent working:—*Syntomium aeneum*, *Homalium exiguum*, *Trichonyx sulcicollis*, *Euplectus piceus* and *E. karsteni*, *Scydmaenus angulatus*, *denticornis* and *powcri*, *Eutheia plicata*, and *schaumi*, *Agathidium atrum*, *Amphicyllis globus*, *Cyrtusa pauxilla*, *Anisotoma badia*, *calcarata*, *dubia*, *nigrita*, *parvula*, *oralis* and *grandis*,

Colenis dentipes, *Agaricophagus cephalotes*, *Hydnobius strigosus*, *Triarthron märkeli*, *Colon dentipes*, *brunneum* and *viennense*, *Epuraea diffusa*, *Thalycra sericea*, *Rhizophagus perforatus*, *Cryptophagus populi* and *setulosus*, *Caenoscelis ferruginea*, *Aspidiphorus orbiculatus*, *Athous difformis*, *Hedobia imperialis*, *Dorcatoma flavicornis*, *Tetratoma ancora*, *Brachysomus echinatus*, *Tropiphorus carinatus*, *Liosoma oblongulum*, *Plinthus caliginosus*, *Grypidius equiseti*, *Bagous frit*, *glabrirostris* and *subcarinatus*, *Rhinoncus denticollis*, etc.

Coleoptera at Oxshott—An addition to the British List: Hypophlœus linearis, Linn.

By H. HEASLER.

Having the opportunity of doing some collecting last Easter, I spent a day or two at Oxshott, in Surrey, with a fair amount of success. The Saturday was cold with occasional showers, and I spent the afternoon grubbing round the edges of the Black Pond. *Philydrus minutus*, *Pterostichus minor* and *Anchomenus oblongus* were common, and amongst the Staphs, I was pleased to take a series of *Stenus pallitarsis* var. *niveus*, two or three *Stenus melanarius*, and a few *Philonthus cinerascens*. A single *Donacia sericea* turned up as a harbinger of summer, now so long overdue. *Omalium planum* and *Placusa pumilio* occurred under bark on an old oak branch ; *Gyrophaena strictula* and *Tritoma bipustulata* from fungus, and *Acalles ptinoides* from a furze stump. On Monday and Tuesday, my available time was spent almost entirely in examining some felled pine trees near the railway, which had not been touched since they were cut down some time previously. *Phloeopora reptans*, *Epipeda plana*, *Omalium pusillum*, *Rhizophagus depressus* and *Tomicus bidens* simply swarmed, and, with regard to this last species, it was curious to note how regularly its burrows disappeared as soon as those of some larger wood borer put in an appearance. In working the bark from the felled tree, the top was always well supplied with *T. bidens*, but as soon as the bark was stripped off some distance down, and the burrows of *Hylesinus* or *Hylastes* put in an appearance, the *T. bidens* ceased immediately. Amongst the rarer species, I secured *Sylvanus unidentatus*, *Clerus formicarius*, *Homalota aequata*, *angustula* and *pilicornis*. (This last is, in my opinion, a misnomer, as I think *Homalota marcida* has a better claim to it, as far as the antennæ are concerned.) A nice series of *Tomicus laricis*, from a pine stump, in company with *Hylastes ater* and *palliatus*, and one or two other species.

Whilst ripping the bark from one of the felled pines, near the top of the tree, well occupied by hundreds of *Tomicus bidens*, I noticed a peculiar beetle in one of the *Tomicus* burrows, which I thought was an immature *Rhizophagus bipustulatus*, but on bottling it I noticed it was too cylindrical for this insect, so I set to work to try and find some more, and after a patient search I succeeded in taking a dozen, and then the *Tomicus* burrows ended and those of *Hylesinus* commenced, and no more of the beetle were to be had. In examining the species under the microscope, I saw it had the facies of a *Hypophloeus*, so I sent one on to Mr. Newbery for identification, and he returned it as *H. linearis*, L. It is very much smaller and narrower than either of our two British members of the genus, and the coloration also forms a

ready means of distinguishing it. It may be compared with them as follows :—

Fore-parts lighter, apical half of elytra dark, size 1½-1¾ lines, *H. bicolor*, Ol.

Fore-parts dark, elytra entirely reddish, testaceous, size 1¼ lines. *H. linearis*, L.

Species unicolorous, testaceous, or with fore-parts darker, size 2-2¾ lines, *H. castaneus*, F.

Harpalus picipennis, Duft., near London.—The localities recorded for the above species have hitherto been exclusively on the coast, with the exception of a specimen taken by Mr. Claude Morley at Lakenheath (*Ent. Mo. Mag.*, 1897, p. 9). I have made a more remarkable capture even than Mr. Morley's, since I have lately taken a specimen at Hendon, at the roots of grass near the reservoir. Although, in Britain, this has been always considered a coast species, it by no means appears to be so on the Continent.—E. A. Newbery, 12, Churchill Road, Dartmouth Park, N.W. *June 8th*, 1898.

Deleaster dichrous, Gr., associated with the water vole.—It has been my good fortune to find this insect for several years in its habitat, almost always in pairs. They occur invariably in, or near, the burrows of the Water Vole, and I am inclined to think the insect is connected in some way with the animal, probably it is a coprophagan.—Ibid.

Notes on the Larvæ of Tephrosia bistortata and T. crepuscularia.

By A. BACOT.

My enmeshment in the coils of what has been aptly termed the "Tephrosia tangle" is attributable to Mr. Hewett, who asked me, early in 1896, if I would assist him by breeding and examining the larvæ of the two species. He also kindly supplied me with two batches of ova of *Tephrosia crepuscularia*, from York parents, one of *T.* var. *delamerensis* and two of *T. bistortata*. Of these last, one was of Mr. Mason's Clevedon stock, and the other came from Major Robertson. It seems entirely unnecessary that I should again go over in detail the ground, so ably and fully covered by Dr. Riding, in describing the different larval stages (*Ent. Record*, vol. ix., pp. 243 *et seq.*). I entirely agree with Dr. Riding's notes as regards structure, and in a general sense as to colour and markings, but in one or two essential points my experience is very different.

Firstly, as regards the inverted V on the 2nd abdominal segment. My larvæ of the first brood of *T. bistortata* had, with two exceptions* the apex of the Λ closed, while in larvæ of *T. crepuscularia* the bars forming the sides of the Λ did not meet at the apex, leaving a distinct gap (thus /\). I mentioned this fact to Dr. Riding and Mr. Prout, both of whom kindly examined their larvæ of the

* This brood produced two specimens of undoubted *T. crepuscularia*, and I can only account for this by supposing that by some accident two ova of this species became mixed with the ova of *T. bistortata*. These two moths emerged in April, while the remainder of the brood came out in March

species and reported to me; Mr. Prout confirming my observations, Dr. Riding saying that in the larvæ he was rearing he did not find this difference, the ∧ in the larvæ of *T. bistortata* being frequently open at the top. I therefore made a careful examination of 102 larvæ of the second brood of *T. bistortata*, while in their third and fourth skins.

Dr. Riding had pointed out that in *T. bistortata*, the oblique lines forming the sides of the ∧ run into the dark lines, bordering the medio-dorsal band, at or near the apex of the ∧. This is quite correct; but I found that the area of the medio-dorsal band at the juncture of the lines forming the sides of the ∧, and often for a short distance above was suffused with dark umber, or, in many cases, with the same intense velvety black, as the rest of the marking, thus forming an inverted Y with a short foot, rather than a V. In a few instances, with larvæ having the apex of the mark dark umber instead of black, there is an actual opening, although it only amounts to a narrow pale streak down the centre of the medio-dorsal band. But this gap or streak of pale colour is very different from the wide and distinct gap that is present in this mark in larvæ of *T. crepuscularia*, and in no case did I find a larva of the last-mentioned species with the central area closed or extended above the apex of the ∧. The proportion of larvæ with: (1) The apex and extension of ∧ as dark or almost as dark as the sides. (2) This area distinctly paler than the remainder of marking, but still much darker than the ground colour of the larva. (3) A narrow streak through apex, as light or nearly as light as ground colour of the larva worked out as follows: (1) 46 larvæ, or 46%. (2) 49 larvæ, or 49%. (3) 7 larvæ, or 7%. The paler larvæ as a rule had the ∧ of the type 1, while those with the 2 or 3 type of marking usually had the ground colour of a darker tint. There is also a tendency with many larvæ of *T. crepuscularia* to entirely lose this mark, while with larvæ of *T. bistortata*, though present, it is less strongly developed, and applies only to a small proportion of the larvæ.

The larvæ of *T. crepuscularia* I found to be slower in feeding up, and very much more difficult to rear under unnatural conditions, and, although treated in exactly the same manner as those of *T. bistortata*, a far larger proportion died before pupation. My experience with larvæ of the two species reared during 1897, from the same stocks agrees exactly with what I have noted above concerning the 1896 broods, and the larvæ of a brood of *T. bistortata* reared from ova laid by Scotch parents, which Mr. Hewett was kind enough to forward me, agreed with those of the Clevedon stock.

My thanks are due to Mr. Christy for a batch of ova of *T. crepuscularia* laid by parents which emerged on the 30th April, the progeny of a ♀ taken on the 4th March, 1896, in West Sussex. A few of the larvæ of this brood differed greatly from the remainder. I noted, on June 18th, that one larva had the ∧ marking of the typical *T. bistortata* type, joined at apex, and with a well marked extension at this point; two or three other larvæ had traces of this character, but very faintly marked, while the remainder differed in no respect from typical larvæ of *T. crepuscularia*, having a wide gap at apex of ∧. Unfortunately this brood was rather unhealthy, and as I was unable to give them much attention, they all died. The divergence of a few larvæ in the last-mentioned brood from what I considered to be a stable feature,

tends to support Dr. Riding's contention that there is no stable character differentiating the larvæ of the two species. I would remark, however, that if *T. crepuscularia* be a new or incipient species, that has recently diverged from the *T. bistortata* stock, as Dr. Riding and Mr. Tutt point out, a conclusion with which I entirely agree and at which I arrived independently on a consideration of the larval characters last year, we need not be greatly surprised if a few larvæ in a brood occasionally show reversionary tendencies.

PRACTICAL HINTS.

Field Work for July and August.

By J. W. TUTT, F.E.S.

1.—The imago of *Nudaria senex* flies most freely just before dark, especially if there be a slight mist. It occurs in July and August.

2.—In late July and August, the imagines of *Triphaena interjecta* may be found flying over bramble blossom in the late afternoon (4-6 p.m.).

3.—In August, the larva of *Charicleа umbra (Heliothis marginata)* is sometimes abundant on *Ononis*.

4.—The larvæ of *Dianthoecia irregularis* may be swept in July from *Silene otites*. Later, in August, the full-fed larvæ are best obtained by scratching away, with the fingers, the earth near the roots of the food-plant, as here the larvæ lie hidden during the day.

5.—In early and middle August, the seed-capsules of *Silene maritima*, in the I. of Man, Ireland and the west coast of Britain, should be shaken and collected for larvæ of *Dianthoecia capsophila* and *D. caesia*.

6.—On the coasts of Devon and Cornwall, the capsules of *Silene inflata* and *S. maritima* should be collected in August, for larvæ of the dark aberrations of *Dianthoecia conspersa*.

7.—During July, search carefully the reed-beds, after dark, with a lantern. Large numbers of *Calamia phragmitidis* may be found sitting on the reeds, *in copulâ*, from 10 p.m.-11 p.m.

8.—The flowers of *Melampyrum pratense* should be collected in July and August, for larvæ of *Eupithecia plumbeolata*.

9.—In July and August, the flowers of foxglove (*Digitalis purpurea*) should be collected for *Eupithecia pulchellata*.

10.—In July and August, collect seeds of *Linaria vulgaris* for larvæ of *Eupithecia linariata*.

11.—In July, collect seed-heads of *Silene inflata* for larvæ of *Eupithecia venosata*.

12.—The full-fed larva of *Eupithecia lariciata* may be beaten from larch and spruce-fir during July. It pupates in an earthen cocoon.

13.—The larva of *Eupithecia valerianata* (*viminata*) feeds on flowers and seeds of *Valeriana officinalis*, usually growing in damp woods and osier beds. It is full-fed from the middle of July until the end of August.

14.—In August, the flower-buds of *Clematis vitalba*, showing a little black spot, should be collected and placed in a flower-pot, with earth at the bottom. In this way an abundance of *Eupithecia isogrammata* may be bred.

15.—The larvæ of *Cidaria sagittata* feed on the seeds of meadow rue in August, in Wicken Fen (and possibly elsewhere).

16.—The larvæ of *Collix sparsata* are to be found in August, on *Lysimachia vulgaris*.

17.—Larvæ of *Lithosteye griseata* in July (end), on *Sisymbrium sophia*, much resemble the seed-pods of that plant.

18.—In August, collect the seed-heads of cowslips for larvæ of *Eupoecilia ciliana*. They require cork in which to pupate.

19.—The larva of *Choreutes scintillulana* may be found in July and early August on the common skullcap (*Scutellaria galericulata*).

20.—The heads of *Centaurea scabiosa* should be collected, in July and August, for larvæ of *Catoptria fulvana* and pupæ of *Conchylis gigantana*.

21.—The larvæ of *Phyllocnistis suffusella* are to be found mining leaves of poplar in August. The mine has the singular appearance of a snail having crawled over the leaf.

22.—The larvæ of *Cemiostoma lathyrifoliella* are to be found mining leaves of *Lathyrus sylvestris*, in August.

23.—The larvæ of *Argyresthia aerariella* feed in the berries of mountain-ash, in August.

N.B.—For similar series of "Practical Hints," for July and August, read vol. i., p. 117; vol. viii., pp. 116-118; vol. ix., pp. 180-181, etc.

CURRENT NOTES.

At the meeting of the Entomological Society of London, held on May 4th, 1898, Mr. Waterhouse exhibited two burnished golden beetles, *Anoplognathus aureus*, from Queensland, and *Plusiotis resplendens*, from Panama, which he stated to be interesting examples of a similar result being attained by a process of natural selection in two species of the same family in widely separated localities. Many members of the family had a slight tendency to show metallic colours. It would be interesting to ascertain whether there was any similarity in their surroundings in the two countries, which would make this golden appearance an advantage, or whether it might be considered a "warning colour." Allied species, however, appeared to be edible.

At the same meeting Mr. Walker exhibited specimens of the rare *Philonthus fuscus*, Grav., found in a *Cossus*-eaten poplar in Chatham Dockyard, at the end of April.

At a meeting of the Entomological Society of London, held June 1st, 1898, Professor B. Grassi, M. Hippolyte Lucas, and Dr. August Weismann were elected Honorary Fellows of the Society.

At the same meeting, Mr. P. B. Mason exhibited a specimen of the rare *Lathridius filum* from his own herbarium. It had been previously taken at Edinburgh, by McNab, and he understood that an example had been found in a sealed envelope containing *Marchantia*, from Franz Josef Land. Mr. J. J. Walker exhibited a singular blue variety of *Carabus monilis*, Fabr., resembling in colour *C. intricatus*, and taken at Iwade, Kent, in flood-rubbish, in May.

SCIENTIFIC NOTES AND OBSERVATIONS.

QUERY AS TO THE POSITION OF PSEUDOPONTIA.—Will Professor Enzio Reuter kindly explain why he considers the *Pseudopontiinae* a

subfamily of the *Pierididae*? Unless something has been discovered quite recently, *Pseudopontia paradoxa*, Kirby, is the only known species of the genus, and that is probably not a *butterfly* at all. As nothing is known of its metamorphosis, and everything about it seems abnormal, it would be interesting to know whether the learned author has been guided in his conclusions by a study of its basal-fleck alone—or has "taken into consideration other characters—affording a test of relationship" with the Rhopalocera.—HARRY MOORE, 12, Lower Road, Rotherhithe. *June 13th*, 1898.

NOTES ON COLLECTING, Etc.

A DAY'S BUTTERFLY HUNTING IN PROVENCE.—A few miles from Nîmes is Remoulins whence one walks to the Pont du Gard, a fine old Roman aqueduct, that stretches over the river a few miles above the town. Between Remoulins and the Pont du Gard, a wide stretch of waste land on the low hills to the left, had been well spoken of as an excellent collecting ground by Messrs. Nicholson and Jones, so when, on April 21st last, a day had to be spent mainly on matters archæological, Dr. Chapman, Mr. Edwards, and myself pocketed our nets and pill-boxes, intent on keeping an eye open for any entomological specimens that might come in our way.

It is needless to dwell on the natural beauties of the place. Suffice it to say that the delightful Mediterranean flora still holds sway, and blossoming fields were everywhere. We had only some five hours at our disposal, in which a long walk to the Pont du Gard and back had to be negotiated, and I was more or less an invalid. Our walk resulted, however, in the following captures: *Papilio podalirius*, large, and in varying condition, some quite ragged, and others quite fresh, frequently flew past us, whilst only one *P. machaon* was observed. *Pieris brassicae* and *P. rapae* abundant, and *P. napi* not common—*P. rapae* small and poorly marked, *P. napi* of full size, and with scarcely any pale markings. But first and foremost of all the butterflies was *Gonopteryx cleopatra*. It was a common sight to see three or four females flying over a single scrubby clump of *Rhamnus alaternus* laying their eggs, with several males hovering about. Then *Colias edusa* would dash past, the specimens very small, and looking as if even here, their winter fare had not quite agreed with them; a fine ab. *helice*, Hb., was also taken by the doctor. One *C. hyale* only was seen, but not taken. As to which was the commonest "white," the doctor and I disagree. He insists that the palm must be given to *Anthocharis belia*, I as unhesitatingly award it to *Pieris daplidice*. I netted more than a score of the latter to about two or three specimens of the former; the doctor's numbers must have been just about reversed. Only a small proportion of either species was fit to set, evidently they were already going over. Flitting commonly among the underwood, quite at the base of the little hills, and in the little lateral valleys, was the charming *Euchloë euphenoides*, and with it its near ally, *E. cardamines*. No one can imagine the delightful sensation created by a sight of the first of these two beautiful insects, its sulphur-yellow and bright orange tip rendering it a most conspicuous object on the wing, and yet at rest, on a flower-head of *Biscutella laevigata*, the food-plant of its larva, it is practically invisible. The females, on the

wing, look very like *E. cardamines*, although they are less white, and their orange tips rarely reach the black discal spot. The spring brood of *Leucophasia sinapis*, in no way differing from British examples, was only just appearing, and this also was the case with *Polyommatus icarus*, *P. baton*, *P. astrarche* and *Cupido minima*. On the other hand, *Pararge egeria* and *Brenthis dia* were already going over, whilst *Coenonympha pamphilus* and *Pararge megaera* were in full flight. In the road, *Euvanessa antiopa* was seen twice, fine, white-bordered specimens, evidently recently imported from Britain, and we felt rather astonished that the British form was so abundant as to be available for importation here. Scarcely any moths were observed. *Macroglossa fuciformis* (the broad-bordered) was going over, whilst *Acontia luctuosa* was just coming on. An odd specimen or two of an unnamed *Sciaphila*, swarms of *Plutella cruciferarum* and *Nemophila noctuella* were, I believe, the only species observed. We returned to the train in haste, to catch a train at 3.15 p.m., no other being available until 8.45 p.m., and regretted much that the exigencies of the railway company did not tally better with the requirements of entomologists.—J. W. Tutt, F.E.S. *June 21st*, 1898.

Micropteryx aureatella at Burnley.—I have to record the capture of *Micropteryx* (*Eriocephala*) *aureatella* (*allionella*) on May 28th last, on a moor near Burnley.—W. G. Clutten, Burnley.

Notes from Herne Bay.—I spent Whitsuntide this year at Hythe, Kent, but with poor results entomologically. The weather on the whole was unfavourable, being exceedingly changeable. Of butterflies I noticed the following:—*Pieris brassicae*, *P. napi* and *P. rapae*, all common. *Aglais urticae*, *Pararge megaera* and *Coenonympha pamphilus*, the latter common, occurred on the rough, hilly ground, and in the meadows to the north of the canal towards Lympne. I sugared for three out of the four nights of my stay on the outskirts of a wood, about a mile along the Ashford Road, but though I experienced every kind of weather, from bright moonlight to pouring rain, not a single Noctuid came to the sweets. Dusking in the same place produced *Hepialus lupulinus* (in abundance, and I took one specimen with the fore-wings almost white, in strong contrast with the dark hind-wings), *Asthena candidata*, *Emmelesia affinitata*, *Cabera pusaria* (common), *C. exanthemata* (1), *Melanippe montanata* (common), and one *Cidaria truncata* (*russata*). Working the palings, before breakfast, secured only *Melanippe fluctuata* (several), *Eupithecia oblongata* (*centaureata*) and *Pionea forficalis* (1 each). I also took an *Apatela aceris* from a tree trunk in the "American Gardens."—H. Ainslie Hill, F.Z.S., F.E.S., 9, Addison Mansions, Kensington, W. *June 11th*, 1898.

Stauropus fagi ab. obscura, bred from autumnal ova.—Referring to my note, *Ent. Record*, ix., p. 265, I am pleased to state that I have been successful in rearing *S. fagi*, from the August pairing. Although I should not have been surprised to have bred a large percentage of the ab. *obscura*, I was surprised that every specimen was, without exception, of the dark form; some of them, especially the females, are very black, and I have a grand lot of them. As I said in my previous note, I believe this is the first time a brood has been reared from the August pairing, and Barrett says in his book, "A second generation never successfully reared in this country." I may

add that the pupæ that did not emerge last July, commenced emerging on April 10th (1), the 16th (2), 17th (1), 21st (4), etc., the last on the 29th. The August brood did not commence to emerge until May 24th, and have been emerging ever since, one out last night, and I hope to breed a few more yet.—W. E. Butler, Hayling House, Oxford Road, Reading. *June 13th*, 1898.

Breeding Caradrina quadripunctata (cubicularis).—From the small piece of web containing larvæ of *Caradrina quadripunctata*, sent to me by Mr. H. Shortridge Clarke (as mentioned *ante*, p. 157), and which only measured some 3 inches × 2 inches × 1 inch, I have bred 38 perfect imagines and two crippled specimens during the last three weeks. About 40 larvæ failed to pupate properly, presumably from the want of ventilation on their journey to me. Altogether, I calculate about 80 larvæ must have been contained in this comparatively small piece of web. The last emergence took place last night (June 21st), so that probably there are a few more yet to emerge. Still, such a large number, in so small a space, is somewhat extraordinary.—J. W. Tutt. *June 21st*, 1898.

Breeding Aphomia sociella.—Mr. Tuck was good enough to send me, last autumn, part of the wasps' and bees' nests mentioned (*ante*, vol. ix., pp. 288-289). They were all small, not more than two or three inches long, two inches or less in width, and about three-quarters of an inch in depth. From these, no less than 80 specimens have emerged since June 2nd (eight this evening, June 21st), and there are probably many more to come. The specimens vary from 12 mm. to 29 mm., both sexes varying to the same extent. Of the first 30 emergences only three were females, the proportion of the females to males has been, in the last 20, about 17 to 3.—Ibid.

Carterocephalus palæmon and Apoda avellana (testudo).—I have been fortunate in capturing *Carterocephalus palaemon* this year, and was also lucky enough to turn up *Apoda avellana (testudo)* on June 3rd. *Thecla pruni* appears to be very scarce this season.—G. B. Dixon, F.E.S., York House, St. Peter's Road, Leicester. *June 20th*, 1898.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

Eggs of Lepidoptera.—*Erebia tyndarus*.—One egg laid on, and attached to, the inside of a box in which a female was confined. The egg is not quite upright, and is very peculiar in shape. It consists of a somewhat oval outline, narrowing towards apex, and rounded both at apex and base. (This part of the egg bears a rough resemblance to a green gooseberry, but is more rounded at apex.) The base is drawn out centrally, *i.e.*, at the point by which it is affixed, until it has the appearance of a somewhat stumpy peduncle. It is of a delicate (becoming later of a much brighter) green colour, with 19 (or 20) distinct shiny, but not very prominent, white ribs, reaching from the base to the shoulder of the egg. At the shoulder some of the ribs unite, chiefly in pairs, the united ribs being carried over the shoulder, and finally ending on the edge of the central micropylar area, which consists of a small shallow depression at the apex of the egg. The micropyle proper consists of a bright green button placed at the bottom of the depression. The

upper surface of the egg, between the shoulder and the micropylar area, is covered with a distinct reticulation, with white points at the angles of the reticulation. [Described August 6th, 1897, from an egg laid by a ♀ captured at Lanslebourg.]

Erebia goante.—The egg is somewhat of a truncated cone in shape, but very rounded towards the base (although the actual base or point of attachment is flattened), and somewhat so towards the summit. It is almost white in colour to the naked eye, but of a delicate yellow, inclining to greenish, under the lens. There are 15 distinct longitudinal ribs, extending from the base to beyond the shoulder of the egg. Inside this is a double row of rounded points surrounding the central micropylar depression. These points are united by cross ribs into polygonal cells. The sides of the egg are finely ribbed transversely with very close parallel lines. The flattened base suggests that the egg is normally attached to its food-plant, but the egg described was extruded in the collecting box, and had to be detached from the ovipositor, to which it was adherent. [Described August 7th, 1897, from an egg laid by a ♀ captured at Lanslebourg.]

Erebia gorge.—In shape the egg is rather less than two-thirds of a sphere, of a pale yellowish colour with a very slight greenish tinge. It is closely ribbed longitudinally, about 28–30 moderately prominent ribs. The egg is finely striated transversely. The micropyle consists of a central hollow with about 14 radiating lines leading to alternate longitudinal ribs. [Described August 8th, 1897, from an egg laid by a ♀ captured at Lanslebourg.]—J. W. Tutt.

TUT, TUTT!

"*I'd be a butterfly.*"—Old Song.

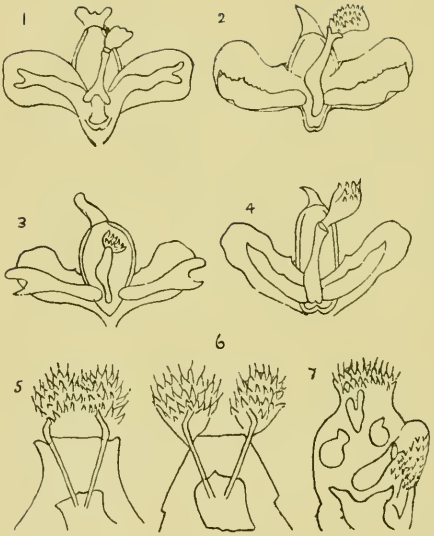
["According to Mr. J. W. Tutt, of the South London Entomological and Natural History Society, 'the male butterfly is a glutton and an immoderate drinker.'"—*Daily Telegraph.*]

Ne'er again will ladies sigh
To become a butterfly,
Now we prove the ancient song
Scientifically wrong.
Ne'er again will poets dare
To that insect to compare
Ladies whom they wish to praise
In an apt poetic phrase.

Mr. Tutt, who tells no lies,
Tells us that the butterflies
Are, alas! what do you think?
Let me whisper, fond of drink!
He has watched them on the flow'rs,
Where they'll sit and suck for hours,
Quite devoid of any motion
Save absorption of "the lotion."

Thus they spend the summer's day
While the females work away,
For this craving to regale
Is restricted to the male.
Lost illusion of our youth
In a scientific truth,
Tear-drops gather in our eyes
When we think of butterflies.—*Punch*, June 18th, '98.

A somewhat similar skit, entitled, "The bold bad butterfly," based on the same extract, is to be found in *Fun*, June 14th, 1898.



Genitalia of Smerinthids and their Hybrids, with a gynandromorphous example of hybrid Smerinthus populi-ocellatus.

The Entomologist's Record
AND
JOURNAL OF VARIATION.

VOL. X. No. 8. AUGUST 1ST, 1898.

Some notes on the Pupal moult of Lepidoptera.

By Dr. T. A. CHAPMAN, M.D., F.Z.S., F.E.S.

In the *Entomologist's Record* for May last (*ante*, p. 116), I gave some notes on the pupal colouring affecting portions of the larval skin, previous to the moult, in *Scolioptery.r libatrix*, and referred to portions of the pupal skin that tend to assume the brown chitinous colour of the mature pupa before the larval skin is cast, instead of the usual green colour. I was able to suggest no reason for this early hardening of portions of the pupal integument, except in the case of the margins of the false spiracle of the thorax, where the tube from the spiracle to the surface, being merely between the opposed surfaces of the segments, might easily fail to be formed, if these were entirely of the ordinary soft green structure. By having already some hardened chitin for the margins and lips of the tube, the due opposition of the surface is assured. A brief note of the detailed observations bearing on this subject, and relating to certain species, may be useful.

Sphinx ligustri.—The larva lies 8 or 10 days in its earthen cell, and gets very shabby and dirty-looking, from the shrivelling and darkening of the effete larval skin. Immediately on moulting, the pupa measured 1·87 in. in length, made up of (1) ·63 in., from anterior extremity to end of wings. (2) 1·24 in., to posterior extremity. The segments are all very marked and rounded, with deep incisions, the terminal is full and blunt, not tapering as in the pupa, the 5th and 6th abdominal being especially large and globular. The head stands out and somewhat apart, as it does permanently in many Tineid pupæ. The proboscis-case forms a square projection ·1 inch in length and width, but bent down somewhat already, markedly bifid, and the two lateral halves easily separated. This case assumed its permanent shape and length of about ·28 in. in about an hour. Before moulting, the relative size of the segments had much changed, the prothorax being large (from head pushed back into it ?), the first abdominal very small, etc. The margin of the mesothorax against the 1st spiracle was already brownish, as well as flanges on 5, 6 and 7 abdominal segments. After two hours the relative lengths of measurements given above—(1) = ·63, (2) = 1·24, had become—(1) = 1·1, (2) = 0·78. The abdominal spiracles were widely open, and the winking movement of a membranous fold from the posterior wall of the trachea a short distance within, was easily seen. There are in this species no dark chitinous parts in connection with these valves. These movements continued as long

as observation could be made. The period of closure became longer and longer. The movements of the valves were synchronous with the vermicular movements, but not with the pulsations of the dorsal vessel. During actual moulting the valves were quite closed. As well as the chitinous dark margin to first spiracle, the abdominal flanges and the anal spine, there was also a slight chitinous tinting of the dorsum of the mesothorax. The lateral stripes of the larva were again very bright, and there are reddish spots (non-chitinous) at the sites of the prolegs. The 8th abdominal spiracle yields as strong a tracheal lining as the others, yet seems to be quite closed and obsolete, as soon as this is withdrawn. The spiracles of the 6th and 7th abdominal segments are closed in about 15 minutes, those anterior rather later, that of 2nd abdominal segment in about 20 minutes.

Smerinthus ocellatus.—At the moult, the larval stripes are visible in dark green, as well as the sites of prolegs. The lips and the anal spine of the 1st spiracle are chitinous. The tube between the 1st and 2nd thoracic segments leading to the 1st spiracle is unusally open, and allows the spiracle to be seen at bottom, light being freely afforded through the translucent green tissues. The other dark chitinous parts are the posterior border of the 7th abdominal, and pale bands on the dorsum of the 3rd thoracic, and the 1st, 2nd and 3rd abdominal, segments, also many of the small cutaneous pits. In another specimen, the stripes and prolegs are a vivid blue, as well as the tips of the mandibles, and four spots at the base of the labrum. In this species the spiracles are closed from the moult, and the movements of the valves are not visible.

Pygaera bucephala.—The larva of this species pupates at from six to ten days after going down. When the skin has passed so far backwards that the skin of the 11th segment of the larva is at the anal extremity of the pupa, or rather, when the pupa occupies the 10 front segments only of the larval skin, the latter splits down each side, just above the ventral prolegs, a short slit in each segment, but usually continues over at least two segments. It is not very evident in what way this advances the moulting, for immediately after the skin splits in the normal dorsal situation, followed by the division of the larval head into the two lateral and clypeal portions, a tracheal tube is drawn out of the meso-metathoracic incision. The 1st spiracle is so deeply placed between the pro- and meso-thorax at the earliest moment, that it is uncovered by the receding skin as to be seen with difficulty. The margins of this spiracle at the surface are not apparently tinted or hardened. The coloured portions, besides minute hair-points, are the anal spines and the dorsal margins of the incision between the 9th and 10th abdominal segments, which have curious opposed dentated borders. There is also a trace of colour at the sites of the ventral prolegs. The wing- and appendage-cases are very short, and take about twenty minutes to pass from the margin of the 3rd abdominal segment to their permanent position at the margin of the 4th, but it takes some hours for the solid portion of the pupa (head to 4th abdominal segment) to grow from $\frac{1}{3}$ of the total length to $\frac{3}{5}$ of that of the mature pupa; this occurs not only by its own increase in length, but by the shrinking of the last six abdominal segments. The total length of the pupa is remarkably constant throughout all these changes. The abdominal spiracles on the 2nd, 3rd,

4th, 5th, 6th and 7th abdominal segments are, immediately on moulting, wide oval openings, as is that on segment 1, when the wings are turned up to expose it. With a lens, it is easy to look into the trachea as far as where the circular openings of one or more branches can be seen; the place, in fact, where the spiracular trachea joins the longitudinal trunk and gives off a bunch of branches. At a depth from the outer opening equal to about its widest diameter, is a narrowing or second opening marked by a narrow semilunar brown chitinous piece, running round, or rather, across, the anterior surface of the tube, with its free edge just standing out into the lumen of the tube. Opposite this, posteriorly, one sees nothing at first, but, at intervals, a thin fold from the posterior surface passes forward and meets this chitinous margin, closing the tube. At first the closing lasts only a second, and it remains open for five or six seconds, but gradually the intervals become more equal, and before the observation ceases the period of closure is rather the longer. The observation ceases because, in about ten minutes, the anterior and posterior lips of the external opening, or spiracle proper, become, by gradual approximation, very close together, so close that, knowing what is going on, one can still see that it is continuing, but still so little, that, without that knowledge, little or nothing could be made of it, and in from 15 to 20 minutes even this amount of view is shut out, and the outer spiracle is quite closed. In another 24 hours or so, this sinks into the bottom of a depression, such that, except in a very good light, one cannot see it at all, and might fancy the spiracle was simply a wide patent opening.

Observation of another pupa of *P. bucephala* began when the larval head had reached the 10th segment. The wings are now at end of 3rd abdominal segment—the incision between 3rd and 4th is very mobile—between 7 and 8 not so. *After* 9 *minutes*, spiracles 2nd, 3rd and 4th open, valve movements being very plainly visible, especially in 4th; spiracles 5th, 6th, 7th (abdominal) nearly closed. *After* 12 *minutes*, 2nd and 3rd closed, valve period = 2 seconds open, 2 seconds shut. The greater length of abdominal segments 4th, 5th, 6th, 7th, is due to the intersegmental membrane being exposed. *At the end of* 15 *minutes* the wings are $\frac{1}{3}$ of the way down 4th segment, movement within the spiracle of 4th segment still visible. *After* 19 *minutes*, movement in 4th still visible, period 2 seconds open, 4 shut. *After* 26 *minutes*, 4th quite closed.

In another specimen, three minutes after the vermicular movement of the larva was first noticed, the tracheæ were seen being drawn out of 7th and 8th abdominal segments. *After* 5 *minutes*, the skin split above prolegs between the 5th and 6th abdominal segments, the skin still unmoved on the 4th abdominal, *i.e.*, last six segments of pupa occupy 9th and 10th (5th and 6th abdominal) of larva. *After* 8 *minutes*, the skin splits between the 4th and 5th abdominal above prolegs. *After* 10 *minutes*, it splits between the 3rd and 4th abdominal (*i.e.*, in the incision, but longitudinal in line above prolegs). *After* 11 *minutes*, it splits between the 2nd and 3rd, the skin on the 2nd hardly moved down at all, the 6th abdominal segment having reached end of pupa. *After* 13 *minutes*, split between 1st and 2nd abdominal. *After* 16 *minutes*, trachea being drawn from 1st abdominal spiracle; the skin of the 4th abdominal segment reaches end of pupa; the skin splits dorsally down 2nd, 3rd, 4th (thoracic segments); lateral split continuous through 4th, 5th, 6th and 7th (metathorax and first three abdo-

minal) ; head splitting ; a small lateral slit on the 3rd and 4th (thoracic). *After* 20 *minutes*, the position of the 1st spiracle exposed, but it is already deeply buried between segments, and hidden, the alimentary lining being drawn out between maxillæ. *After* 24 *minutes*, the larval head at wing extremities ; the antennæ clear of head, ends still stand up free ; the times of opening and closing of spiracular valves about equal. *After* 29 *minutes*, the pupa frees itself from the larval skin ; some fluid visible on last uncovered segments ; spiracles closing rapidly, the 2nd, 6th and 7th closed. *After* 32 *minutes*, the wings reach the end of the 3rd abdominal segment ; the movement barely visible in spiracle of 4th. In this specimen, the outer spiracular valves (?) closed very soon. The dimensions were now those quoted below, and shrinkage is there reputed. The maxillæ presented both a downward extension (proboscis), and a lateral one, the latter having two lines across it, as though representing two joints of the maxillary palpus.

Notes on Hybrid Smerinthus populi-ocellatus (*Illustrated by Plate*).

By A. BACOT.

(*Concluded from p.* 8.)

I forwarded the abdomina of my three specimens of *Smerinthus populi-ocellatus* to Mr. F. N. Pierce, of Liverpool, who most kindly consented to examine the genitalia, and who, having done so, sent me the following report for insertion in the present paper. Mr. Pierce writes :—

"Description of genitalia of male Smerinthus populi.—The superior harpes are rounded and full, having an acute angle on the inner margin. The inferior harpes bifurcate at the extremity, the inner hook being elongated, the outer hook short and abrupt. The uncus is elongated and rounded at the tip. The flap is large, gently tapering to a point. The penis is irregularly curved, surmounted by about 30 or 40 spines (Pl. iii., fig. 3).

"Genitalia of male Smerinthus ocellatus.—The superior harpes broad and rounded, having an acute angle at the inner margin. The inferior harpes short and toothed on the inner margin and terminated by a single pointed hook. The outer margin is indented just past the middle, and again nearer the extremity, forming an acute angle. The uncus is abruptly elongated, terminating in a point or beak. The flap is gently pointed, almost forming a right angle, with the tip slightly rounded. The penis is bulbed, slightly produced at the base, it then ascends almost parallel, having a sharp hook on the lip, and is surmounted with a large number of short, thin spines (Pl. iii., fig. 2).

"Genitalia of the male hybrids S. populi-ocellatus.—The superior harpes are narrower, rounded, and have the acute angle on the inner margin. The inferior harpes are long and simple, gently tapering into a long thin point, straight on the outer margin. The uncus is abruptly elongated, terminating in a pointed beak. The flap is produced, roundly tapering to a point. The penis is almost bulbed at the base, proceeds in a parallel direction, and is surmounted with about 20 small spines bunched together. In point of size there is very little difference in the three (Pl. iii., fig. 4).

"Genitalia of male Smerinthus tiliæ. — The superior harpes

are short and square. The inferior harpes are bifurcate at the extremity, with two equal projections. The uncus is broad and rounded, slightly indented at the tip. The penis is long and slender, widening at the base into two lobes, surmounted by two short spines (Pl. iii., fig. 1).

"It will be noticed that in no point does the hybrid agree with this latter species. But we find the male hybrid, to a certain extent, agreeing with *S. ocellatus* in the uncus, the hook on the lip of the penis, and in the rounded portion of the apparatus at the base. The flap rather approaches (*vide*, Pl. iii.) to that of *S. populi*, the lower portion of the penis being divided between the two parent species, and partaking of the characters of both.

"It will thus be seen that the apparently male specimen possesses distinctly male organs, all of which are highly developed, and differing from those of the parents.

"Genitalia of female S. populi.—The organs consist of two lobes covered with tubercles, each of which emits a short, stiff hair, and have somewhat the appearance of a spider's spinneret; there is also the ovipositor, which consists of a short tube; this is placed about three parts of the way down the final segment (Pl. iii., fig. 6).

"Genitalia of female S. ocellatus.—The female of this species has so nearly similar organs to those of the last, that further description is unnecessary (Pl. iii., fig. 5).

"Genitalia of apparent female hybrid S. ocellatus-populi.—This proves very interesting, for besides having the lobes, similar to those in female *S. populi* and *S. ocellatus*, there are, mixed up within them in the last segment, the rudimentary and partially developed organs of the male, the whole apparatus is much smaller than that of the parents. The lobes are similar to those of the female parents. Immediately behind are some curious structures, which are apparently the rudimentary inferior harpes, then there is one superior harpe, well defined, but very small; neither the uncus nor the anal flap is separable, but no doubt both are present in some rudimentary form; the penis is very distinct; it is rounded at the base, and consists of a short tube surmounted by a large number of very small spines. Farther back, near the junction of the penultimate segment, is the ovipositor (?), scarcely smaller than that of the parents (Pl. iii., fig. 7). Ova were also discovered in the body. It is quite clear that this specimen is gynandromorphous. Whether all the apparent female hybrids are similarly constructed, further material alone will show. I should certainly say that this specimen was incapable of reproduction. The hybrid males, in my opinion, might cross again with either female parent—*S. ocellatus* or *S. populi*—when, presumably, the progeny would revert in appearance to the species of the female parent with which the hybrid male might be crossed. The genitalia of the second male hybrid (which was taken from the pupa, and which had failed to emerge) present no difference from the organs of the first specimen examined (*in litt.*, November 4th, 1896)."

These results are of great interest, but, as Mr. Pierce points out, the examination of further material is necessary before we can generalise with safety as to these characters being constant, and I trust that one result of my paper will be that ere long further material may be supplied to Mr. Pierce, so that a more definite conclusion on this point can be arrived at.

I would point out, in passing, that the male genitalia of the hybrids differ from those of the males of both parental species, and the female organs tend towards gynandromorphism. On the other hand, the abortive sexual organs of the pupæ show no tendency whatever towards a confusion of the sexes, nor do they differ in any respect from those of *S. ocellatus* or *S. populi* in this stage.

This is, I suppose, only what might have been expected, as the imaginal characters are subjected to the influences of both natural selection and intra-selection, while the rudimentary pupal organs escape all these influences, except the slow reducing action of intra-selection in the embryonic stage.

A comparison of my notes on the larvæ with those of Mr. House and Mr. Edwin Birchall, shows that there are considerable discrepancies between them. The hybrid larvæ reared by these gentlemen resembled *S. populi* more nearly than those of *S. ocellatus*, although Mr. House records that after the 3rd moult his larvæ began to lose their *S. populi* traits, and finally were more like *S. ocellatus*. There is, of course, every probability that different broods may vary considerably in their tendency to follow either parent species. With one exception I see no need either to add to or alter the remarks I made on this subject in the paper published in the *Ent. Record*, vol. vi., pp. 180-181. I there put forward as a possible cause of the non-hatching of ova resulting from the cross between a ♂ *S. populi* and a ♀ *S. ocellatus*, the theory that the small size of the eggs of *S. ocellatus* would prevent, or prematurely stop, the development of the embryonic larva; without altogether discarding this theory, I will venture to put forward as an alternative that the hatching of eggs from one cross and non-hatching of those from the other may be accounted for as follows: The female being the more conservative sex, has a larger proportion of ancestral determinants in its germ plasm than the male; so that when the more progressive male of the less specialised species (*S. ocellatus*) pairs with the conservative female of the more highly developed species (*S. populi*), the cross is between individuals that are more nearly related as regards the constituents of their germ plasm than would be the case were the sexes reversed, and there is, therefore, a far greater likelihood of fertile ova resulting. I am aware that there are two assumptions in the above explanation that require proof: (1) That *S. ocellatus* is the older or more generalised species; of this I have little doubt, but I should like the opinion of more experienced lepidopterists than myself. (2) That the female is the more conservative sex. This has been put forward in Messrs. Geddes and Thompson's *Evolution of Sex*, and has, I believe, frequently been alluded to in magazine and review articles, but I do not think the question is yet considered as definitely settled.

It seems just possible that the in-and-in breeding of the two species for several seasons before attempting to cross them, might produce better results than attempting to pair wild moths. I do not, however, feel at all certain of this, as the loss of vitality might either prevent the pairing or result in a very weakly brood.

DESCRIPTION OF PLATE III.—Fig. 1: Genitalia of ♂ *Smerinthus tiliae*. Fig. 2: ♂ *S. ocellatus*. Fig. 3: ♂ *S. populi*. Fig. 4: ♂ Hybrid *S. ocellatus* (♂) × *S. populi* (♀). Fig. 5: ♀ *S. ocellatus*. Fig. 6: ♀ *S. populi*. Fig. 7: ☿ Hybrid *S. ocellatus* (♂) × *S. populi* (♀).

Notes on the Zygaenides: Anthrocera lavandulae.

By J. W. TUTT, F.E.S.

One of the most beautiful of the South European Zygaenids (or Anthrocerids, as we must learn to call them) is certainly *Anthrocera lavandulae*, its beautiful shining blue-green fore-wings with five small black-ringed crimson spots, its similarly tinted hind-wings, with one or two red spots only, and its whitish fringes and white collar, making it a very handsome insect. In some specimens the base of the hind-wings is rayed with red, so as to join the spot or spots normally present on them. Altogether it is strikingly different from any of our British Anthrocerids, and quite deserves all the praises the French entomologists have bestowed upon its beauty.

I am not very certain as to what time it should normally appear in the imago state in its native haunts. Boisduval writes (*Monog. des Zygaenides*, p. 85) : "Cette Zygène, l'une des plus jolies du genre, éclot en juillet, et se trouve assez communément dans la France la plus méridionale et en Espagne." Milliére notes (*Cat. Lép. des Alpes-Mar.*, p. 127) : "Se montre communément en mai partout où croît les *Dorycnium*, qui nourissent la chenille," but this year I bred a beautiful specimen on June 10th. Staudinger and Wocke give as the area of its distribution : "Southern France, Liguria and Spain." Oberthür says that it flies at Vittoria, in Spain, with *A. rhadamanthus*. Staudinger gives one named aberration, *consobrina*, Germ., diagnosed as : "subt. macul. confluentibus," and recorded from Hyères.

I dare say the life-history of this species is well known. At any rate, I was so entirely ignorant of it that, when on April 14th last Mr. S. Edwards kindly handed me a full-grown larva that he had picked up during the day on the heights above Grasse, I at once took the following description of it :—

The ventral area and prolegs bright rosy, almost coral colour, the lateral areas dull purplish-grey, with the spiracles minute and black. Above the spiracles is a whitish longitudinal line, broken at the segmental incisions by a transverse yellow spot on the posterior edge of the 2nd and 3rd thoracic, and 1st to 8th abdominal, segments. Above this, again, is a dull, blackish-grey subdorsal line or band, edging a rather broad dorsal band of pale violet-grey hue, with a very slender median reddish line extending into somewhat small dots towards the posterior margin of each segment. Head black, with white markings just above the mouth-parts, and white bases to the antennæ ; ocelli black ; head retractile within the prothorax. The prothorax without the characteristic markings of the other segments. The dorsal tubercles united into a continuous wart, bearing many black chitinous points, each of the front of which bears a white, and the hinder of which bears a black, hair ; the prothoracic spiracle is black, placed low down, and well towards the posterior edge of the segment ; tubercle iii is above, but in front of the spiracle ; tubercle iv is below, and also in front of the spiracle. The meso- and meta-thoracic segments are each divided into two sub-segments. The anterior and posterior trapezoidals of the mesothorax are united into a raised wart, but are otherwise distinctly separable ; iii forms the large supra-spiracular, which bears about 20 black points, each bearing a white hair ; iv and v are united into a similar sub-spiracular wart. The abdominal segments are also divided

into two sub-segments, of which the anterior is much the wider. On the metathorax, and on the abdominal segments, the anterior and posterior trapezoidals are all placed in the dark subdorsal lines, and the black chitinous points collected in this area help to give this line its darker colour, the skin itself being rather brown than black; the anterior and posterior tubercles (*i.e.*, i and ii) are united on either side into a raised wart, of which the posterior only bears a few white and black hairs; the skin is covered with minute points, which only bear hairs on the central portion of each segment dorsally, the anal segment is, however, covered with hair-bearing bristles. The prolegs are of the same reddish colour as the ventral area of the larva, and each bears an outer flange, with minute black hooks; the chitinous parts of the true legs are black, the softer parts reddish.

After being without food some three or four days, the larva commenced to spin its cocoon on the lid of the glass-bottomed box in which it was confined. The cocoon is of the typical Anthrocerid form, 23 mm. long and 7·5 mm. wide at the broadest part, rather thin, white in colour, very shiny, and although it looks smooth to the naked eye, is seen to be somewhat coarsely reticulated, under a two-thirds lens; a considerable quantity of loose, flossy silk is apparent around the edge in contact with the box upon which the cocoon is spun.

The pupa is of a transparent greenish-black colour, emerging and dehiscing in the well-known manner peculiar to the Anthrocerids.

Notes on Hybrids obtained by crossing Tephrosia bistortata with T. crepuscularia.

By A. BACOT.

With a view to obtaining hybrids between *T. bistortata* and *T. crepuscularia*, I placed the pupæ from some of the larvæ described (*ante*, pp. 177-179) in a warm room, towards the end of January, 1897. The pupæ of *T. crepuscularia*, with which the experiment was made, resulted from the ova which Mr. Hewett sent me from York. The ♀ parents, which I received with the ova, were of the pale form, but nearly half the moths which emerged from these pupæ were of the dark form ab. *delamerensis*.

The pupæ of *T. bistortata* (which I used for the purpose of obtaining crosses) were reared from ova laid by second-brood moths from the Clevedon stock. They were kept in a cool entry facing east; its temperature is fairly even, cooler than the open air on a sunny day, but of course warmer at night.

The first specimens to emerge were two or three males of *T. crepuscularia*, early in the last week of February, and the *T. bistortata* commenced to come out a day or two later. I obtained six pairings between ♂s of *T. crepuscularia* and ♀s of *T. bistortata*: three between ♂s of *T. bistortata* and ♀s of *T. crepuscularia*; also six pairings of *T. bistortata* with *T. bistortata*, and three between ♂s and ♀s of *T. crepuscularia*. Of these, four of the first, and all three of the latter crosses, produced fertile ova; while four of the *T. bistortata* pairings, and, so far as memory serves me, two of the *T. crepuscularia* pairings also resulted in fertile eggs (*vide*, detailed list of pairings). All six pairs of ♂ *T. crepuscularia* with ♀ *T. bistortata* were seen

in cop., usually between 7 and 9 p.m., in one or two instances as late as 12 p.m. On the other hand, with the three pairs of ♀ *T. crepuscularia* with ♂ *T. bistortata*, the moths were never seen together, and consequently I left them (sometimes a ♀ with a single ♂, in other cases a ♀ with two or three ♂s) together for several days, and searched the pots for ova subsequently. With the pairings between ♀s and ♂s of the same species the moths were usually seen *in copulâ*. It seemed to me so doubtful that the ova laid by ♀s of *T. crepuscularia*, placed with ♂s of *T. bistortata* would prove fertile, that I wrote to Dr. Riding on the subject, and he most kindly forwarded to me some ova of a cross he had obtained between a ♀ *T.* ab. *delamerensis* and a ♂ *T. bistortata*. I kept the following batches of ova myself, and all my subsequent notes refer to these, or crosses obtained from these stocks :

Ref. No.	*Paired.*	♂ *Parent.*	♀ *Parent.*	*Hatched.*
(B No. 1)	Feb. 26th	*T. bistortata*	*T. bistortata*	April 3rd
(C No. 1)	Mar. 5th	*T. crepuscularia*	*T. crepuscularia*	
(X No. 1)	Feb. 26th	*T.* ab. *delamerensis*	*T. bistortata*	April 6th
(X No. 1a)		*T. bistortata*	*T. crepuscularia*	April 8th-9th
(X No. 2a)		*T. bistortata*	*T. crepuscularia*	
(X Dr. R.)		*T. bistortata*	*T.* ab. *delamerensis*	

Ova.—I was, this season, able to compare and measure the ova of the two species, and found, as Dr. Riding and Mr. Tutt have already pointed out, that the ova of the two species are quite distinct. Ova laid by three different ♀s of *T. bistortata* gave the size as—length about ·03 inches, width ·02 inches. Ova of three different ♀s of *T. crepuscularia* (these were more ovate in shape) gave—length about ·025 inches, width ·0175 inches. The ova of Scotch *T. bistortata* were of the same size as those from Clevedon stock. Mr. Prout, and myself also, carefully examined the ova of both species, to see if the position or sculpturing of the micropylar rosette could be used in differentiating the species. We had no difficulty in distinguishing the eggs of the two species from each other, size being the best guide, though differences in colour and shape were also apparent. The sculpturing around the micropyle was, however, of no use as a distinguishing mark; it was present in the eggs of both species, and its position often varied in eggs of the same species. In one egg of *T. bistortata* the rosette was on the side instead of the end, and in others it was on the shoulder of egg.

Larvæ of 1st crosses.—The larvæ of the cross (No. 1) ♂ *T.* ab. *delamerensis* × ♀ *T. bistortata* fed up very rapidly, and quite outstripped larvæ of *T. bistortata*, which had emerged from the egg three days earlier than they had. By May 9th, nearly all were in their last stage, many were full-fed, and a few had already gone down. Their coloration was rather duller and darker than that of *T. bistortata*, and they mostly took after the (larvæ of) ♀ parent with regard to the ∧ mark, only a very small proportion having it open at the apex, but these few had the gap as wide and distinct as in larvæ of *T. crepuscularia*.

Hybrid larvæ of the reverse cross ♂ *T. bistortata* × ♀ *T. crepuscularia* or *T.* ab. *delamerensis* fed up more rapidly than the larvæ of the parent species, but not quite so rapidly as larvæ of the first-mentioned cross. One brood of this cross, however, produced a large proportion of laggards, which continued feeding long after the advanced larvæ of the brood had gone down. Most of these

laggards died before pupation. The larvæ of this latter cross were much darker than the larvæ of either parent species, many of them being of a dark purple hue, with a slight bloom on the darker areas. A moderate proportion have the bar weak, but the larger number follow the ♂ parent in having the ∧ joined at the apex. In other words there seems to be a tendency with the hybrid larvæ to follow the form of the ♀ parent, and a stronger tendency to follow the *T. bistortata* form.

The moths commenced to emerge about June 5th, and by the 8th ten specimens of the cross (X No. 1) between ♂ *T.* ab. *delamerensis* × ♀ *T. bistortata* had emerged. They continued to come out at first rapidly, and afterwards more slowly, till the end of the month; none emerged during the first fortnight of July, but on the 16th they again commenced, and continued to do so at intervals until the middle of September, a last emergence about the end of the month bringing the total number of specimens up to 58, and a single pupa is lying over till the spring. The whole of this brood were ♂ s, 29 take after the ♂ parent, being dark, mostly mottled and streaked with white; the remaining half do not, to my mind, differ greatly from the second brood of *T. bistortata*, no strictly intermediate forms being present.*

Moths of the reverse cross (X Dr. R.) between ♂ *T. bistortata* × ♀ *T.* ab. *delamerensis* commenced to emerge about June 7th; the greater portion of the brood came out before the end of the month, but a few straggled out during July and August. None are lying over. Twenty-one specimens emerged, 11 ♂ s and 10 ♀ s. This brood is more varied as regards coloration than the first mentioned, some six or seven specimens being transitional between the pale whitish and brown-grey of *T. crepuscularia* and *T. bistortata* on the one hand, and the melanic hue of *T.* ab. *delamerensis* on the other.

Moths of one brood (X No. 1a) of the cross between ♂ *T. bistortata* × ♀ *T. crepuscularia* commenced to emerge at the same time as the previously mentioned hybrids. The bulk of the brood was out before the end of the month, only a few stragglers appearing during July. No pupæ are lying over. Twenty-one specimens emerged, 14 ♂ s and 7 ♀ s. Although the stock from which the ♀ parent springs produced about equal proportions of typical *T. crepuscularia* and its ab. *delamerensis*, no trace of melanic coloration is traceable on the wings of the hybrid moths.

The second brood of the cross (X No. 2a) between ♂ *T. bistortata* × ♀ *T. crepuscularia* was much later than the last mentioned. The bulk of the moths emerged late in June or early in July, two very late emergences taking place late in September. None lying over. I have nine specimens, 6 ♂ s and 3 ♀ s. The remark made with reference to the other brood of this cross applies to this brood also, no trace of melanic coloration being present. Four of the moths are excessively small, and poorly marked, and one of these is crippled in the secondaries. The larvæ of this brood were unhealthy, weakly, and, as previously mentioned, some of them were very backward.

* For a full and complete account of the forms produced, and the results obtained by hybridising the two species, *vide* the paper by Mr. J. W. Tutt, in the *Transactions of the Ent. Soc. of London*, Pt. I., 1898. My own knowledge of the species in their perfect stage is insufficient to allow of my treating this portion of my subject in detail. These notes were written last November, before the publication of Mr. Tutt's paper.—A.B.

Tephrosia bistortata and T. crepuscularia in the Northern Counties.

I only captured three specimens of *Tephrosia crepuscularia* in the year 1896, although I searched for them carefully. The species only occurs very sparingly in this neighbourhood. I captured a dark aberration in 1894.—W. Brooks, Grange Hall, Rotherham.

Neither *T. crepuscularia* (*biundularia*) nor *T. bistortata* (*crepuscularia*) occurs in my own district, although I have taken the former species at Thorne. One fact I find difficulty in getting over, if we are to consider the two as forms of one species, *i.e.*, in many woods in the south of England both forms occur, *T. bistortata* (*crepuscularia*) in March and April, and then there is a distinct interval before the appearance of *T. biundularia*, which appears perfectly fresh in May or early June.—G. T. Porritt, F.L.S., F.E.S., Huddersfield.

Mr. G. T. Porritt, in his *List of Yorkshire Lepidoptera*, published in 1883, says of this species, "of general occurrence," and gives the following localities :—" Barnsley,* Bishop's Wood,* Bramham, Blubberhouses, Doncaster,* Huddersfield, Pontefract, Richmond, Scarborough, Sheffield, Wentbridge (a very dark variety, G. T.), and York." I have also taken it in the following additional localities :— Edlington* and Wheatley Woods,* Doncaster ; Houghton Wood,* Market Weighton, Pocklington, Sledmere,* and at Strensall,* Sandburn,* Knapton, and Lingcroft, York ; whilst I know it occurs at Elvington,* near York ; Thorne Woods, near Doncaster ; Hull,* Skipwith* and Drewton Dale.* At those places which are marked * the ab. *delamerensis* also occurs. Mr. Porritt further says of *Tephrosia bistortata* (*crepuscularia*), in the *List of Yorkshire Lepidoptera* : " Is recorded from four localities, but I believe is often confounded with *T. biundularia*, Bishop's Wood (C.S.), Pontefract (B.H.), Scarborough (T.W.), Sheffield (A.D.)." During the last twenty years I have collected most assiduously in a great many different localities in Yorkshire, and for the past five years have kept a special look out for *T. bistortata* and *T. crepuscularia*, and can say that I have never met with *T. bistortata*, nor any forms which could easily be mistaken for that species. I have also seen not only all the principal Yorkshire collections, but also many little known collections, and those made many years ago by men who have long since joined the majority, and in none of these collections have I seen Yorkshire *T. bistortata*. Many Yorkshire collectors do not believe in the existence of Yorkshire *T. bistortata*, or that it ever has occurred in Yorkshire during the time they have collected. I have, therefore, no hesitation in stating that *T. bistortata* (*i.e.*, a form similar to that taken by Mr. Mason, at Clevedon, Somerset), does not occur in Yorkshire; and I will go further than this, and assert as a fact, that *T. bistortata* does not occur in the North of England. Writing on April 23rd, 1896, Mr. Tutt says : " I have a specimen which Mr. Harrison sent me years ago, with a number of *T. biundularia*, which I dare be sworn is the earlier species, although we expect, in closely allied species, occasional parallel variations, which this may well be. Those who consider the two insects to be one and the same species, must define the term 'species,' as they understand it, before they can expect their view to be accepted." On October 3rd, 1896, Mr. Tutt writes : " I have not the slightest doubt that the species sent out by the Perth entomologists,

so far as my own material goes, is the early *T. bistortata*. That is what one would expect from two causes:—(1) The resemblance between the northern Scotch and Scandinavian fauna, *T. bistortata* being not uncommon, I believe, in Scandinavia. (2) The acknowledged similarity between the north-eastern fauna of Scotland and the south of England, and the difference between it and that of the area bounded by the Clyde and Forth on the north, and the Humber and Mersey on the south. I have some four or five rows of Scotch specimens, I believe, and should doubt whether they are not the best series in existence south of the Cheviots." In a letter dated September 29th, 1896, Mr. Tutt says: "I am speaking from memory, but I do not think I have ever seen Scotch *T. biundularia*."—W. HEWETT, York.

COLEOPTERA.

Quedius kraatzii, Bris. (plancus, Er., teste Ganglebauer): A species new to Britain.

By HORACE ST. J. K. DONISTHORPE, F.Z.S., F.E.S.

The first five specimens of this interesting addition to our list were taken by Professor T. H. Beare (who was staying here with me) and myself, at Chiddingfold, on May 14th last, on the banks of a stream, by "sluicing," and out of flood refuse. I was sure the insect was something new, and being unable to identify it, having only English works down here with me, I sent it to Mr. Newbery, who at once determined it as *Quedius kraatzii*, Bris., a species new to Britain.

This very distinct species belongs to the sub-genus *Sauridius*, and with *Q. scintillans*, Gr., and *Q. lucidulus*, Er., forms a small group distinct from all the other *Quedii*, on account of having four punctures between the eyes, two of which are juxta-ocular. M. Fauvel does not take account of these latter, as they are possessed by all the other members of the genus. He points out that *Q. riparius* and *Q. kraatzii* form a transitional group between *Philonthus* and *Quedius*, on account of the shape of the head and neck, and separates these two species from the rest of the genus as follows:—

I. Tête dégagée du thorax; une série oblique de 3 gros points entre les yeux et la base—*riparius*, Kell. et *kraatzii*, Bris.

II. Tête engagée dans le thorax, et sans série post-oculaire de 3 gros points. (All the rest of the species are placed in this second group.)

He gives the habitat: "Au bord des eaux courantes." Hautes Pyrénées; Bagnères; Collioure; Algérie. Ganglebauer gives the following localities for this insect: Departement Var; Pyrenæn; Sardinien; Algier; and adds "Sehr selten" (very rare). Erichson, after remarking that the habitat is in Sardinia, says that the male is unknown, and that the female has the anterior tarsi strongly dilated. This is true, as far as the female is concerned. Having succeeded in taking specimens of the male, I find they have the anterior tarsi still more dilated, and the sixth ventral segment of the abdomen strongly emarginate.

Q. kraatzii may be known from all the British species, except *Q. scintillans*, by the before-mentioned four punctures on the head. From *Q. scintillans* it may be separated as follows:—

A. Antennæ sub-elongate; joints 7 to 10 not transverse; labrum strongly bilobed; size larger. *Q. kraatzii*, Bris.

B. Antennæ short; joints 7 to 10 distinctly transverse; labrum only slightly bilobed; size smaller. *Q. scintillans*, Gr.

It may be remarked that in *Q. kraatzii* the usual dorsal series of thoracic punctures is sometimes reduced from three to two on each side; and the abdomen, besides being more densely pubescent than *Q. scintillans*, has the patches of closer hairs on each side of the base of the segments more distinct, and of a greyish yellow colour. *Q. kraatzii* is a riparian species, but *Q. scintillans* is by no means exclusively so.

Q. riparius, Kell., has recently been added to our list by Mr. Blatch (*Ent. Mo. Mag.*, April, 1896, p. 80), and by Mr. Chitty (*Ent. Mo. Mag.*, June, 1896, p. 140), and it is not improbable that *Q. lucidulus*, Er., will prove to be British, as it is certainly not so rare as *Q. kraatzii*.

Being determined to establish its claim to our list on a sounder footing than that of five examples, I spent many days in searching the banks of the stream up and down for several miles, and at last, on June 17th, struck on a muddy ridge, stretching into the stream, covered with a *débris* of dead leaves, twigs, etc. On this I found our insect; procuring a sack, I took as much of the refuse home as I could carry on my back. By carefully searching it through I obtained eighteen more specimens.

The insect has a very beautiful appearance as it darts about over the mud and among the *débris*, and in the sunshine it readily takes to the wing.

The banks of the stream by which this insect occurs are very prolific in beetles. Other good things that I have taken here are *Trechus rubens*, *Potaminus substriatus*, *Ancyrophorus aureus* (in plenty, at Easter); *Myllaena kraatzii*, and many others.

I might mention the fact that the stream has fallen some ten feet since the first specimens of *Q. kraatzii* were taken.—Deurandesthorpe, Chiddingfold, Surrey, June, 1898.

PRACTICAL HINTS.

Field Work for August and September.

By J. W. TUTT, F.E.S.

1.—The morning twilight in September is better than the evening twilight to capture *Sphinx convolvuli*, at the blossoms of petunias.

2.—During August, the bedstraw *Galium verum* and *G. mollugo* should be searched with a lamp, after dusk, for larvæ of *Choerocampa porcellus*.

3.—In late August, the small willows that fringe the sides of ditches, streams and railway banks should be carefully searched for larvæ of *Smerinthus ocellatus*, *S. populi*, *Cerura vinula*, *Ptilodontis palpina*, *Notodonta ziczac*, etc.

4.—In early September, alder is one of the best paying trees to beat for larvæ. Visions of the fine larva of *Cerura bicuspis* are always well to the fore.

5.—The larvæ of *Spilosoma urticae* should be searched for in

marshes and fens where *Iris*, *Pedicularis*, *Trifolium* and *Mentha aquatica* grow abundantly, in the first week in September. They feed on all these plants, and are to be found, extremely low down, on plants overhanging water holes and ditches.

6.—The almost full-grown larva of *Apoda avellana (testudo)* is to be beaten from oaks, from the first week of September onwards.

7.—The larva of *Heterogenea cruciata (asella)* must be obtained by searching the beeches from the middle of September until the end of October. It is a very uncertain species, apparently absent in its best locality (Lyndhurst) in some seasons, quite abundant in others.

8.—In August, the heather must be searched with a lantern for the imagines of *Agrotis agathina*.

9.—During August, the larvæ of *Cucullia absinthii* may be obtained by beating *Artemisia absinthium*.

10.—The larva of *Cymatophora fluctuosa* may be beaten from birch, in August and September.

11.—The hard cocoon of *Cirrhoedia xerampelina* must be searched for at the roots of ash, in August and early September.

12.—Search trunks of ash-trees in late August and throughout September, from 11 a.m. to 3 p.m. (or even till dusk), for the freshly emerged imagines of *Cirrhoedia xerampelina*. The grass around the trees should also be worked. Detached trees (*i.e.*, those not growing in hedge-rows) are the best.

13.—From the flower-heads of *Angelica*, collected in September and October, you will breed *Eupithecia albipunctata* the following year.

14.—Collect the flowers of golden-rod (*Solidago virgaurea*) in October, put into a large band-box or breeding-cage, and you will breed *Eupithecia virgaureata* and *E. expallidata* the following year.

15.—Collect the flowers of yarrow (*Achillea millefolium*) in September and October, and you will breed *Eupithecia subfulvata*.

16.—In August and September the seeds of *Pimpinella saxifraga* should be collected for larvæ of *Eupithecia pimpinellata*.

17.—In August and September, the larvæ of *Eupithecia subnotata* can be obtained, sometimes in great abundance, on *Chenopodium*.

18.—The larva of *Eupithecia helveticata* feeds on wild juniper, and is full-fed from the beginning to the middle of September.

19.—About the middle of August, the larvæ of *Eupithecia campanulata* are to be found feeding in and upon the seed capsules of *Campanula trachelium*.

20.—At the end of August, examine the trunks of *Pinus sylvestris* in the afternoon, for the freshly emerged imagines of *Thera firmata*.

21.—The larva of *Botys lancealis* feeds in a web amongst the leaves of *Eupatorium cannabinum*, in August and September. When full-fed it spins a cocoon, but does not change to a pupa until the following May.

22.—The seedheads of burdock (*Arctium lappa*) should be collected in September for the larvæ of *Parasia lappella* and *Argyrolepia badiana*. The larvæ of the former pupate in the seedheads, those of the latter among rubbish at the roots of the plant.

23.—The larva of *Grapholitha microgrammana* is to be found in August and September, in the still green seed-pods of *Ononis spinosa*.

24.—The larvæ of *Bucculatrix cidarella* are to be found in September, on leaves of alder. They spin thin ribbed cocoons on the stem.

25.—The larvæ of *Gelechia triparella* feed between united oak leaves, at the end of August. They are not uncommon on scrubby oak bushes, in lanes near Wanstead.

26.—*Lyonetia clerckella* feeds on apple, pear, hawthorn, mountain-ash, birch, sallow (*S. caprea*) and *Cotoneaster affinis* (Fletcher).

27.—*Lyonetia padifoliella* turned up at Worthing in some plenty in 1893, feeding on apple, *Cotoneaster affinis* and *Prunus japonica* (*sinensis*) in August-September. On apple, the larvæ patronised the topmost leaves of the shoots of the year. The lepidopterist, therefore, should not summer-prune his apple-bushes (Fletcher).

N.B.—For a similar list of "Practical hints" for August and September, read vol. ix., pp. 208-209; vol. viii., pp. 145-146, vol. i., p. 141; vol. i., p. 164, etc.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

On the differentiation of the larvæ of Tephrosia bistortata and T. biundularia.—I have read Mr. Bacot's notes on the larvæ of *T. bistortata* and *T. biundularia* with much interest. I missed his point by directing attention especially to the end of the stadia in which the inverted V is present when the larvæ are more nearly full-fed. I have examined larvæ preserved in spirit directly after the ecdysis, in which the V first appears, and some broods again this year, and from such, together with general recollection, I think Mr. Bacot has been successful in finding a true difference between the larvæ for that period of development, *i.e.*, the earlier part of the stadia in which the mark is present. As he states, the difference between the open and closed V is then very well defined, and the few exceptions met with are capable of explanation. Perhaps some entomologists who take *T. biundularia* in the southern counties, other than Somerset and Sussex, will examine the character on the first opportunity, and note whether any exceptions are present in their broods.—W. S. Riding, M.D., F.E.S., Buckerell. *July 7th*, 1898. [Mr. Prout tells us that one of the broods which he examined (*ante*, p. 177), and which entirely confirmed Mr. Bacot's observations, was from West Wickham, Kent. —Ed.]

Emergence of the larva of Cirrhœdia xerampelina from the egg. —On the 27th of November last, five larvæ of *C. xerampelina* emerged from the egg, eleven others following them on the 28th. The box in which the eggs were placed was kept out-of-doors, but protected from the wet. The parent moth was captured at Everingham, East Yorkshire, during the last week of August last, by Mr. J. Sumner. So little is known of the hybernation of this species that every scrap of information is valuable.—W. Hewett, 12, Howard Street, York.

Hybernating larvæ.—*Acidalia emutaria* and *A. aversata*.—Both raised from eggs. The larvæ feed on knotgrass, well. They begin hybernating in August, and eat nothing until spring. They were kept in a cool place, but *A. aversata* will hybernate quite completely even if kept in a warm greenhouse.

Cerigo matura.—The larvæ eat *Poa* right through the winter, and feed up pretty rapidly if kept in a warm place.

Noctua rhomboidea.—During fourteen years' collecting here, this species has never been anything but rare until 1897, when it came freely to sugar, and I obtained a number of eggs, feeding the larvæ on lettuce. Towards winter, I put them in a greenhouse; some fed up twice as fast as others, but by the end of January, 1898, almost every one had gone down or died. On February 22nd, I turned out one pupa (not in any cocoon) and an unchanged larva, so did not interfere with them further.

Pararge megaera.—Ova in August. Larvæ fed well on *Poa* grass, which was always procurable, owing to the mild winter. When about three-quarters of an inch long they practically ceased feeding, and continued to do so until the spring.

Pachetra leucophaea.—I was indebted to Mr. Hanbury for larvæ, which fed on cocksfoot and *Poa* grass. They continued to feed slowly, but died off one by one. The last, almost full-fed, died at Christmas. Superficially the larva resembles those of the "wainscots," being striped and of the colour of dead grass.

Anthrocera trifolii.—The larvæ feed on *Lotus corniculatus*, and commence hybernating when about one-quarter of an inch long. They are of a dirty yellow colour, very like the colour of dead grass, during hybernation. They frequently die when they should commence feeding. The larvæ repeatedly hybernate a second year without any apparent cause, commencing soon after they have started to feed again in the spring, and remain in a dormant condition until the succeeding spring.

Dryas paphia.—Eggs were laid by a ♀ *Dryas* ab. *valesina* in July, and the larvæ placed on a growing plant of violet. These hatched and apparently started to hybernate at once without feeding at all. One, however, fed up completely, pupated in October, when it was placed in a greenhouse, and in due course emerged—a typical ♂.—W. M. Christy, M.A., F.E.S., Watergate, Emsworth, Hants.

Eggs of Lepidoptera.—*Crambus tristellus*.—Pale yellow in colour; cylindrical in shape, rounded at the ends, and slightly narrower at the micropylar end than at its nadir. There are 19 wavy ribs, extending the whole length of the egg from base to micropyle, and 26 transverse ribs. Treated as an opaque object, each longitudinal rib appears to be composed of bright points where the transverse ribs run over it. The space between the longitudinal ribs appears to be broken up into somewhat rectangular patches. In some cases the longitudinal ribs are united before reaching the apex, about 9 ribs only going over the shoulder, and terminating in a circular ring of points bounding the micropylar area. Within these is another ring of still smaller points, enclosing the central stella which forms the micropyle proper, the central point of which is raised.

Crambus inquinatellus.—The egg is very similar to that of *C. tristellus*, being pale yellow in colour, but is more rounded at the micropylar end. It is also of precisely the same size, although the female *C. tristellus*, is a larger moth than the female *C. inquinatellus*. There appear to be 18 longitudinal ribs, which have the same wavy appearance as have those of the last species, and about 24 transverse ribs which cross the longitudinal ribs, and divide the space between

them into very similar divisions to those described as occurring in the egg of *C. tristellus*. There is also a similar tendency for certain of the longitudinal ribs to unite towards the shoulder of the egg, and the micropylar end of the egg appears to be similar to that of *C. tristellus*, except that the micropylar area is surrounded by a waved raised margin, and not by concentric rings of points. [Both species were described August 21st, 1897, under a two-thirds lens, from eggs obtained two days previously at Aix-les-Bains.]

Larentia aqueata.—Laid on long side, singly. When a week old, bright red in colour. The egg forms, roughly, an oval disc or ellipsoid, being oval in outline, with rounded ends, the micropylar end broader, and the egg much plumper at the micropylar end than at its nadir. The length : breadth : height : : 4 : 3 : 2. An oval depression on the upper surface is placed towards the end remote from the micropyle. The egg is very distinctly marked with a polygonal (chiefly hexagonal) reticulation. The polygonal areas taking the form of pits. The micropylar area, which is somewhat flattened, is situated at the broader end, and shows a much finer reticulation than the rest of the surface. [Described August 15th, from eggs laid by a ♀ captured on Mont Cenis (Lanslebourg).] This egg suggests no alliance with *Larentia* as understood in Britain.

Strenia clathrata.—The eggs are laid very closely side by side. The egg forms an almost perfect oval in outline, length : breadth : : 5 : 3. A deep oval depression occupies a large part of the upper surface, but reaches less to the micropylar end than to its nadir The surface of the egg is covered with a very distinct polygonal reticulation, with raised points at the angles. These points form apparently two sets of lines, one crossing the egg transversely, the other crossing this set obliquely. The micropylar area can be distinctly made out even with a low power, and its stellate appearance defined, although no detail can be observed. [Described August 1st, from eggs obtained at St. Michel de Maurienne.] The colour of the eggs is bright green.

Thera juniperata.—Very small. Two eggs attached to each other, but not attached to box, etc. (this I should think unusual). Egg of a broadly oval outline, nearly as broad as long. Flattened ellipsoid in form, depressed over almost whole of upper surface. Of a yellow colour, irregularly marked with bright green (the embryo). The shell is uniformly covered with minute pits, but it is difficult to trace any distinct pattern. The shell is very iridescent. The micropylar end of the egg is much depressed, but otherwise pitted like the rest of the shell, except at the bottom of the depression which is more minutely marked. [Eggs laid Oct. 29th, 1897, in a chip box, by ♀ captured at Purley, by Mr. Washford. Described, under a two-thirds lens, Dec. 17th, 1897.]—J. W. Tutt.

Cnethocampa processionea.—Laid in irregular groups, densely covered with black scales of the moth, which are very difficult to remove. The egg is shaped like a cheese, that is, flat and circular at top and bottom, the equatorial margin between bulging out somewhat; the width is about ·95 mm., the height about ·65 mm. There is little or no sculpturing or marking, and the micropyle appears to be at the middle of the top. So far as can be seen, the egg seems to be laid rather on the flat bottom than on the edge, and belongs therefore to the upright egg section.—T. A. Chapman.

SCIENTIFIC NOTES AND OBSERVATIONS.

NOTE ON A BROOD OF HYBRID ♂ TEPHROSIA BIUNDULARIA × ♀ T. BISTORTATA.—On April 20th, 1897, I received some larvæ of a cross of ♂ *T. biundularia* × ♀ *T. bistortata*. They were labelled "Cross No. 5, dark ♂ *T. biundularia* (from York ova) × ♀ *T. bistortata* (from Clevedon ova, ♀ of 2nd brood); hatched April 15th, parents copulated March 3rd." I fed them on hawthorn. They commenced pupating on May 15th and emerged on June 3rd (6), June 4th (11), June 5th (8), June 6th (1), June 7th (6), June 8th (4), June 9th (5), June 15th (2), Aug. 23rd (1)—44 imagines in all—everyone males. They seemed very easy to rear, and I do not fancy I lost any; some of the larvæ I preserved in various stages. I also received five larvæ from W. Hewett, of York, on May 29th, from ova of ♂ *T. biundularia* × ♀ *T. bistortata*, from which I bred 5 ♂s, on June 13th (1), June 15th (2), June 26th (1), July 30th (1). In the "Bacot brood" the light form slightly predominated over the black in number. In the "Hewett brood," 4 light and 1 black. The late one, on August 23rd, was black.—E. F. STUDD, M.A., F.E.S., Oxton, Exeter. [It is remarkable that the cross ♂ *T. biundularia* × ♀ *T. bistortata* has practically, up to the present time, produced only males.—ED.]

VARIATION.

ABERRATIONS OF ARCTIA CAIA.—On August 23rd last, at Bourgoin, Isère, France, I boxed an all-but drowned ♀ *Arctia caia*. This deposited a number of ova, which hatched in the early days of September. My neighbour, Mr. Albert Cook, kindly undertook the rearing of them, keeping them in a greenhouse, of moderate temperature, throughout the winter. The young larvæ were first fed on groundsel, but that failing, cabbage was substituted, and became their sole article of diet. Some fed up more rapidly than the others, but all went off their feed whenever there was a spell of colder weather. No particular notes were taken of the periods of hybernation, but pupation became general the first few days in May. Most of them spun their webs about the cage, others on the earth among the withered food. The first dozen or so imagines to emerge were strictly normal, but at the end of the month the two aberrations described below appeared within a few hours of one another, the variation being in opposite directions.

(*a*) Dark aberration pupated on the earth, May 5th; 1898; imago emerged, May 31st, 1898. The whole of the fore-wings dark brown, save a small fleck of cream at the base. Hind-wings, the whole of the costal area and hind margin blackish-brown, the spots confluent except the one in the anal angle of left wing; the inner marginal area yellowish-red, smoked with dark scales towards the centre. Abdomen dark blackish-brown; but segments fringed with red towards the base.

(*b*) Pale aberration pupated on the earth, May 9th; imago emerged, May 30th, 1898. There is nothing very striking in this aberration save by contrast with the other. There is a diminution of the brown markings on the fore-wings, especially of the hind marginal spots, which are broken up and surrounded by scattered brown scales, giving it a somewhat rubbed appearance. The hind marginal half of the wing may therefore be

described as cream-coloured, with scattered brown spots. The hind-wings normal, if such a description is applicable to so variable a species.

The point worth noticing in these two aberrations is, that they were reared under exactly the same conditions, on the same food, in the same cage. The specimens are now in the collection of Mr. A. Cook, whom I am pleased to know has been rewarded for his kindness and trouble.—Harry Moore, 12, Lower Road, Rotherhithe. *June 27th*, 1898.

Notes on Tæniocampa gracilis vars. rufescens and brunnea.—During the spring just past, I bred a series of the New Forest form of *T. gracilis*. No doubt it is right to consider this a variety of *T. gracilis*, but superficially there are so many differences, that it is probably worth further examination. The larva feeds on *Myrica gale*, spinning together the young shoots of that plant, and living within the tent thus formed. Although several attempts have been made to find the ordinary form of *T. gracilis* on that plant, they have resulted in failure, and Tate and myself have failed to feed up the New Forest form on sallow. The only occasion on which I have heard of the latter feeding on sallow was when Mr. Christy reared some thus, but his larvæ were, I believe, almost full-fed at the time. So far as I can ascertain, the imago has never been taken at large. It will not come to sugar, or to sallow, nor, I believe, to light. Tate takes the larvæ when very small and breeds them through, but they are very delicate, both in the larval and pupal stage. The pupa is very apt to shrivel in the winter. The shape and size of the wings of the imago are more like those of *T. incerta* or *T. stabilis* than *T. gracilis*, and some of the markings of the fore-wings (especially the delicate pale line, the orbicular and reniform, and the pale transverse line) are more like those of some specimens of *T. stabilis*, than other Tæniocampid species. In colour of fore-wings, too, this form more nearly approaches *T. incerta* and *T. stabilis* than others of that genus. As a rule the fore-wings are red, but not of a brick-dust red, like the Scotch specimens. The colour is generally, especially in the ♀, of a more heavy, vinous red, and even in the paler ♂ specimens the red is of a tone rather crimson than yellow-red. The form varies greatly in colour, and to some degree in markings, the males being generally paler than the ♀. I have bred one ♀ almost black, and another very pale sandy, but the majority of the ♂ specimens are a strong red colour, and the ♀s a heavy, darker red. I have never seen the ordinary form of *T. gracilis* in the part of the forest about Lyndhurst, where this form is taken, nor have I heard of its being taken there.—J. C. Moberly, M.A., F.E.S., 9, Rockstone Place, Southampton.

Mr. Moberly's notes on the red variety of *T. gracilis* are very interesting. It is very remarkable that the type will not eat *Myrica gale*, while the variety will not eat sallow. How is one to account for this on the theory that the red variety is a local race of the type? How did it start, and why did it take to *Myrica gale*, which it evidently does not like when there is plenty of sallow in the New Forest? If the red form is a local race, it must be a very old one, and the common ancestor must have had a greater liking for *Myrica gale* than the present race of the type. Perhaps the *Myrica* tasted somewhat different then from what it does now.—A. Robinson, B.A., F.E.S., Sylvanhoe, Chislehurst.

NOTES ON COLLECTING, Etc.

Micros and mould at Ipswich.—Last April I gathered a number of plants for my herbarium, and among them a few shoots, which at the time were put down as the universal *Prunus spinosa*, but, upon returning after an absence of some weeks, I was disappointed to find that this (among other specimens) had become mouldy through neglectful drying. What was my surprise, however, upon finding that in the midst of a mass of the fungus, were contentedly feeding upon the shrivelled leaves, several grey caterpillars with black spots, that must have been brought home in the egg state. I think there is no doubt that these were the larvæ of *Yponomeuta padellus*, which is a quite common insect in Suffolk, and the sloe was probably the bird cherry (*Prunus padus*), upon which, as well as hawthorn and apple, the larvæ subsist, as Mr. Shield points out in "Practical Hints." Not only did the larvæ appear quite at ease in their uncongenial surroundings, but they had very nearly attained maturity, and must ere long have been contemplating the pupal condition.—Claude Morley, F.E.S.

Notes of the season.—*Wigtownshire.*—So far the season here has not been a very good one. On the moors I have taken some sixty larvæ of *Lasiocampa quercus* var. *callunae*. I have also captured *Macroglossa bombyliformis* (the narrow-bordered species), the first record for the species from this district. A female *Saturnia pavonia*, with the normally pale markings quite red, has also been captured. *Melanippe hastata* is fairly common, and *Coenonympha tiphon* shows also very considerable variation hereabouts.—Roger S. Gordon, Corsemalzie, Whauphill, Wigtownshire, N.B. *June 24th*, 1898.

Attacus ricini in Lombardy.—In the last week of May (1898) I was walking along the high road from Cornuda to Bassano, in Venetian Lombardy, and noticed a Bombycid cocoon hanging from a sprig in a thin hedge, where willow and ailanthus were growing. On searching further I found 18 cocoons, containing pupæ, one of which produced a moth yesterday. I thought it was *Attacus cynthia*, but Colonel Swinhoe, to whom I described it, says it must be *A. ricini*, its abdomen being garnished with rings of white tufts. I have bought the pupa of this insect under the name of *A. cynthia*, and rather think that is the name it usually goes by in trade. It is not at all likely that any entomologist lives in this very rural district. But no doubt endeavours have been made, during the last half century, to utilise this insect for silk producing in Italy, and it looks as if it had naturalised itself there. The insect is not mentioned in Hoffmann as European. Any information about its place of origin and importations into Europe would be interesting. I have no books of reference at hand.—F. Merrifield, F.E.S. *June 24th*, 1898.

Lepidoptera captured in the Orkney Islands.—It may be well to put on record the species of Lepidoptera that I have captured in the Orkney Islands during the last two or three years. There is a much more complete list published, I know, in *The Entomologist*, Nos. 2 and 4, 1888, but the species I have obtained may be of service, in some cases, as confirmation of previous records. The species I have obtained are as follows: Papilionides.—*Pieris brassicae*, *P. rapae*, *Pyrameis atalanta*, *Coenonympha tiphon*, and *Polyommatus icarus*, all common. Sphingides.—*Acherontia atropos* (one). Hepialides.—

Hepialus velleda (one), *H. humuli* (common). ARCTIIDES.—*Nemeophila plantaginis* (common), *Arctia caia* and *Spilosoma fuliginosa* (not common). LASIOCAMPIDES.—*Lasiocampa quercus* var. *callunae* (common). SATURNIIDES.—*Saturnia paronia* (common). GEOMETRIDES.—*Cheimatobia brumata* (common), *Larentia didymata* and *L. caesiata* (common), *Eupithecia venosata* (one), *E. satyrata* (not common), *E. nanata* and *E. pumilata* (common), *Hypsipetes impluviata* (not common), *H. elutata* (common), *Melanthia ocellata* (common), *Melanippe subtristata* and *M. fluctuata* (common), *M. montanata* (not common), *Coremia munitata* (common), *Camptogramma bilineata* (not common), *Cidaria russata*, *C. immanata* and *C. prunata* (all common), *C. testata* and *C. populata* (not common). NOCTUIDES.—*Triaena tridens* (not common), *Hydroecia nictitans* (not common), *H. micacea* (common), *Xylophasia rurea* and its ab. *alopecurus* (common), *X. polyodon* (common) and its ab. *infuscata* (not common), *Charaeas graminis* (not common), *Mamestra furva* (not common), *M. brassicae*, *Apamea gemina* and ab. *remissa*, *A. didyma*, *Miana fasciuncula*, *Caradrina quadripunctata* and *Peridroma suffusa* (all common), *P. saucia* (not common), *Lycophotia strigula* (not common), *Triphaena pronuba* and *Noctua glareosa* (common), *N. augur*, *N. plecta*, *N. c-nigrum*, *N. conflua*, *N. rubi*, *N. xanthographa* (none very common), *Taeniocampa gothica* (common), *Scopelosoma satellitia* (not common), *Mellinia circellaris* (common), *Dianthoecia capsincola* (one), *Epunda viminalis* (one), *Brotolomia meticulosa* (not common), *Hadena adusta* (common), *H. dentina* (not common), *Calocampa vetusta*, *C. exoleta*, *Cucullia umbratica* (not common), *Habrostola urticae*, *Plusia pulchrina*, *P. gamma* (all common). PYRALIDES.—*Botys fuscalis* (not common), *Scopula lutealis* (common), *Stenopteryx hybridalis* (one), *Scoparia cembrae* (common), *S. lineola*, *S. angustea* (not common). CRAMBIDES.—*Crambus pratellus*, *C. tristellus* and *C. culmellus* (common), *C. ericellus* and *C. inquinatellus* (not common), *Aphomia sociella* (common). TORTRICIDES.—*Tortrix rosana* (common), *T. viburniana*, *Peronea favillaceana* and *P. hastiana* (not common), *P. variegana* (common), *Teras caudana*, *T. contaminana* (not common), *Mixodia schultziana* (common), *Orthotaenia antiquana*, *Clespis rusticana*, *Batodes angustiorana* and *Ephippiphora cirsiana* (not common), *E. scutulana* (common), *Catoptria ulicetana*, *C. scopoliana*, *Xylopoda fabriciana* and *Argyrolepia cnicana* (not common). TINEIDES.—*Tinea rusticella* (not common), *Plutella cruciferarum*, *P. annulatella*, *P. dalella*, *Depressaria applanella*, *P. bicostella*, *Oecophora formosella* and *O. pseudospretella* (not common), *Endrosis fenestrella* (common), *Elachista obscurella* (not common). PTEROPHORIDES.—*Pterophorus monodactylus* (common).

The following notes on some of the species may prove interesting. *Coenonympha tiphon*: Of the typical mountain form; plentiful in the Island of Hoy; I have not met with it on the mainland. *Polyommatus icarus*: There only appear to be two broods, the first in the end of May, the second in July. *Acherontia atropos*: Apparently only a visitor; I have captured one, and only know of two others. *Hepialus velleda*: I have only seen and captured one in Hoy. *H. humuli*: Common about June 1st. I have not found the var. *hethlandica* in Orkney. *Nemeophila plantaginis*: Common; last season I bred about 70; one of these was the ab. *hospita*, 3 ♀ s, with beautiful red hind-wings = ab. *rufa*, Tutt; there were also some ♂ s, very dark. As a whole, they are much darker, owing to the light markings being more

broken up and restricted, than those found further south. *Spilosoma fuliginosa* var. *borealis* : This is not at all plentiful. *Lasiocampa quercûs* var. *callunae* : Very numerous in the Island of Hoy. *Saturnia pavonia* : Common all over the Orkney group. *Caradrina quadripunctata* : One specimen very dark, with the sub-marginal line and costal spots obscure. *Peridroma saucia* : Two specimens very pale, and rather worn. *Triphaena pronuba* : From light fawn to dark reddish-brown, and intermediates. *Noctua glareosa* : Some very beautiful forms ; one which I bred, and turned out to be a cripple, was of the dark slate-grey form usually found in Shetland, others not quite so dark, with the transverse lines very pale and conspicuous. *Noctua conflua* : Some of a very rich purple brown, others of a lighter brown, strongly marked with darker. *Habrostola urticae* : Common ; the larvæ with its peculiar humped 12th segment, is to be found on most clumps of stinging nettles. *Cheimatobia brumata* : The nervures of the fore-wings sometimes conspicuously streaked with dark brown, the insect has a much darker appearance than those from the south. *Eupithecia venosata* : One specimen from Hoy. *Hypsipetes elutata* : Imagines of all colours, from light green-brown to the small rusty black mountain specimens, are found. One specimen is of a reddish coloration, very like *H. ruberata*. *Melanippe subtristata* : Some specimens much suffused with dark grey. *Melanippe montanata* : With the typical specimens are some in which the central band is only represented by a faint blotch on the costa ; others, again, are of a fawn colour, the band being altogether absent ; others are of a fawn colour, having the band represented by a deeper tint of the same shade. *Melanippe fluctuata* : With the ground-colour nearly white, others mottled all over with brown-black, so as to almost hide the central band, and intermediates. *Coremia munitata* : Some have a very rich purple-red central band, others with a paler central band, but strongly margined with black, another form has the middle portion of the band very pale, of a whitish-pink colour, with the margins almost black. *Cidaria russata* : Varies from very light to almost black. *C. immanata* : Occurring with the type is the beautiful reddish-white marbled Shetland form. *C. populata* : One of a very washed-out appearance, another is of the var. *fuscata*. *Scoparia cembrae* : Very common, some very dark, almost var. *zelleri*. The other species do not appear to me to call for any special remark.—W. Cheesman, Old Bank House, Stromness, Orkney.

Collecting on the Broads.—On June 18th, I started for a week's boating trip on the Norfolk Broads. As I combined the duties of cook and captain to a party of seven, my opportunities for collecting were somewhat curtailed. The following notes of the principal species seen and taken may be of interest, as showing the lateness, of the season. *Hydrelia uncula* and *Acidalia immutata* were taken near Horning at 5.30 p.m. on the 19th. At dusk on the same day, near Little Hoveton Broad, *Nudaria senex*, *Spilosoma urticae*, *Leucania impudens*, *Senta maritima*, *Xylophasia rurea*, *Dianthoecia conspersa*, *Plusia festucae* (the only specimen seen during the trip), *A. immutata* and *Phibalapteryx vittata* were netted or taken at rest on the reeds. Little or nothing was taken at dusk on the 20th. On the 21st, our mast dislodged a well-grown larva of *Poecilocampa populi* from an overhanging ash tree, and a few more moths were taken at dusk near

Waxham, but nothing fresh. On the 23rd, near Horning, a few more *H. uncula* and *D. conspersa* were netted, but collecting was spoiled by a thunderstorm. Dusking produced little or nothing at Potter Heigham, on the 23rd. The remainder of the trip was spent at Waxham, on the coast. A row of willows and poplars, about three-quarters of a mile inland, was sugared on the 24th, 25th and 26th, the ragwort (not yet in flower) on the sandhills being sugared on the 24th and 26th. On the 24th but little was taken on the sandhills. A few *Agrotis segetum*, *Apamea basilinea*, one *Mamestra albicolon*, and one *Leucania littoralis* (netted) completed the catch. The line of willows and poplars produced far greater numbers. *A. segetum* and *A. exclamationis* (in numbers), *A. basilinea*, *Leucania comma*, *Miana strigilis* (very variable), *M. fasciuncula*, *Xylophasia monoglypha*, were fairly plentiful. Single specimens of *Triaena tridens*, *Neuria reticulata* (*saponariae*), *Cymatophora octogesima* (*ocularis*), *Dipterygia scabriuscula* and *Grammesia trigrammica* occurred. A freshly-emerged ♀ *Smerinthus populi* was taken, and a ♂ assembled to her before morning. On the 25th, the commoner species were again taken in some numbers, and a single specimen of *Aplecta advena* was captured. The 26th was by far the best night as regards numbers. On the sandhills the common species came in shoals, a few more *M. albicolon*, *Agrotis valligera* (*vestigialis*), *L. littoralis*, one or two *A. ripae*. *Caradrina quadripunctata* (*cubicularis*) fairly plentiful; a few *Arylia putris*, and single specimens of *Hadena thalassina*, *H. adusta* and *H. pisi*. The sugared trees were also very productive, the only new comer being *Graphiphora augur*. Heavy rain induced us to beat a hasty retreat to our boat, and we were too tired to make a second round. *Plusia gamma* was seen in some numbers at Waxham; odd specimens of *Papilio machaon* were seen near Horning, Barton and Horsey; all the common whites were in evidence, and at least one *Gonepteryx rhamni* was seen, also a few *Aglais urticae*, a single *Pyrameis cardui*, and an occasional *Macrothylacia rubi* were seen at different times during the trip. Larvæ of *Clisiocampa neustria* were fairly common but small, while the full-fed larvæ of *Porthesia similis* were to be seen in numbers in all the hedges.—A. Bacot, St. James' Terrace, Clapton. *July 12th*, 1898.

The following is a list of captures of Lepidoptera made on the broads and rivers adjacent to the river Bure, in Norfolk, and on the sand-hills between Waxham and Horsey, by Messrs. E. Heasler, N. Fuller and myself. All the specimens were captured between the 26th and 30th of June, both dates inclusive. Sugar and light were only a partial success, and most of the insects taken were secured by diligent searching and late dusking. The insects captured were: *Smerinthus ocellatus*, *Choerocampa porcellus*, *C. elpenor*, *Earias chlorana*, *Nudaria senex*, *Spilosoma urticae*, *Odonestis potatoria*, *Dicranura vinula*, *Cymatophora octogesima*, *Leucania littoralis*, *L. impudens*, *L. comma*, *L. straminea*, *Mediana flammea*, *Senta maritima* (*ulvae*) and abs., *Xylophasia rurea* and ab. *alopecurus*, *Neuria reticulata*, *Mamestra sordida*, *M. albicolon*, *Apamea unanimis*, *Agrotis vestigialis*, *Peridroma suffusa*, *Dianthoecia capsincola*, *D. cucubali*, *D. conspersa*, *Hecatera serena*, *Hadena dentina*, *H. dissimilis*, *H. adusta*, *Cucullia umbratica*, *Hydrelia uncula*, *Plusia festucae*, *Acidalia immutata*, *C. bimaculata*, *Emmelesia albulata*, *E.*

decolorata, *Collix sparsata*, *Ypsipetes trifasciata*, *Melanippe rivata*, *Phibalapteryx vittata* —W. Ilston Cox, "Zelia," Dulwich Rise, S.E. *July* 12*th*, 1898.

CURRENT NOTES.

From July 2nd-4th, the members of the Council of the Entomological Society of London were the guests of the Hope Professor of Zoology, Dr. Dixey, Colonel Swinhoe, and other entomologists in Oxford. A visit to the Hope collection showed a marvellous change in the condition and arrangement of the entomological collections compared with the old style of things, the assistants, Messrs. Holland and Hamm, ably seconding their chief, who is, by the bye, carrying on further experiments tending to throw light on the effect that varying conditions of colour surroundings have on the coloration of the pupæ of *Aglais urticae*, formed under these conditions. Among other guests who met the members of the Council at dinner, on the evening of July 2nd, at the residence of Professor Poulton, was Dr. Burdon Sanderson, the well-known biologist, and after dinner, Mr. Jacoby and the junior Proctor charmed the company with their delightful music. It was very pleasant, too, to be taken up the river next day by scientific men who have rowed for their college, aided by willing amateurs, who splashed very considerably those too lazy to aid in the necessary labour. Dinner with the Fellows at Wadham, in the evening, was followed by a very pleasant evening in Dr. Dixey's rooms. Not one of the least pleasant features of the trip was the examination of Colonel Swinhoe's marvellous collection of Exotic Heterocera, a group of insects of which the owner has probably an unequalled knowledge. Finally the thanks of the visitors are due to all those ladies and gentlemen who treated them so generously, and made their visit an unqualified round of enjoyment.

We understand that a comparatively large number of specimens of *Hydrilla palustris* has been taken in Wicken Fen this year, by various collectors.

Mr. J. J. Walker very kindly piloted the members of the South London Entomological Society round one of his old collecting haunts, near Chatham, on Saturday, July 9th. In spite of the unsatisfactory state of the weather, that prevented many Lepidoptera from moving, a very fair number of species, both in this order and of Coleoptera, was collected.

The Entomological Club held their last meeting on July 15th, at the Hand and Spear Hotel, Weybridge. In the early part of the day some out-door work was indulged in, and after the meeting the members and their friends, at the kind invitation of Mr. G. T. Porritt, had dinner at the hotel.

We would call the attention of our readers to the International Congress of Zoology, to be held at Cambridge, commencing on August 23rd next. We believe that scientific entomologists generally have received invitations to be present, but if any provincial entomologist has been overlooked, he should communicate with Mr. F. Jeffrey Bell, 3, Hanover Square, London, W.

The Entomologist's Record
AND
JOURNAL OF VARIATION.

Vol. X. No. 9. September 15th, 1898.

The Migration and Dispersal of Insects: General Considerations.

By J. W. TUTT, F.E.S.

It is well-known that many insects, at certain irregular periods, leave the district in which they come to maturity and fly to other localities. Sometimes these flights extend only to a comparatively short distance, at other times, hundreds of miles are covered. The term migration is usually applied to these movements of insects, in common with the more regular periodical movements which are carried out by birds and fishes.

The application of the term to the movements of insects must, therefore, be considered as referring to irregular dispersal movements and by no means to regular movements to and from a given locality. As a matter of fact, it has never yet been shown that the progeny of any immigrants, which have settled in new quarters, have returned to the home of their ancestors, although it has been suggested as probable in the case of certain locusts, and also in the case of one butterfly, *Anosia archippus*.

It is possible that some winged insects have greater powers of dispersal over the greater part of the earth's surface than any other highly-organised animals. The power to fly immense distances; the ability of many species to go without food in the imago state for long periods of time; the lightness of their bodies, from which cause winds and storms may aid them in flying great distances, often, indeed, over hundreds of miles of ocean; all these tend to give them a power of dispersal probably unequalled even among birds.

That insects migrate over vast distances is well known. They have been found at sea, flying strongly, hundreds of miles from land. Hawk moths and other Lepidoptera frequently fly on board ships as they approach the shores of tropical countries, and rest on ships in the open ocean. Flocks of fragile insects, *e.g.*, *Deiopeia pulchella* and *Terias lisa*, have been known to cover hundreds of miles without rest of any kind. Dragonflies, beetles and Diptera have also come on board ship when far from land, and the power of locusts to cross wide tracts of sea is well known. Instances of insects being met with at sea will be given when the subject is considered in greater detail.

Besides the remarkable powers of flight exhibited by many insects, it is evident that almost all the causes, some more or less accidental, that tend to the dispersal of the higher animals, would also be favourable to their distribution, in some cases, in a much higher

degree. The floating islands and floating trees, borne by ocean and river, would carry, probably, hundreds of insects for one mammal, and it is well-known that large numbers of insects, whose larvæ live in solid timber, have been introduced into countries thousands of miles distant from their native habitat.

Wallace observes (*Geog. Dist. of Animals*, i., p. 33): "Most insects have the power of existing for weeks or months without food, and some are very tenacious of life. Many beetles will survive immersion for hours in strong spirit; and water a few degrees below the boiling point will not always kill them. We can, therefore, easily understand how, in the course of ages, insects may become dispersed by means which would be quite inadequate in the case of the higher animals. The drift-wood and tropical fruits that reach Ireland and the Orkneys; the double cocoa-nuts that cross the Indian Ocean from the Seychelle Islands to the coast of Sumatra; the winds that carry volcanic dust and ashes for thousands of miles; the hurricanes that travel in their revolving course over wide oceans, all indicate means by which a few insects may, at rare intervals, be carried to remote regions, and become the progenitors of a group of allied forms."

The importation of certain Coleoptera into distant lands by the influence of man, leads one to point out that species of other orders of insects have been similarly introduced, and are in some instances leaving their mark on the fauna of the country. The introduction of *Sesia tipuliformis*, *Pieris rapae*, and *Porthetria dispar*, from Europe into America, are not only matters of fact, but matters of considerable economic importance, since these insects have committed considerable damage in many parts of their adopted country. The number of foreign insects that have been found in the neighbourhood of the docks of our large British ports is evidence of the importation of insects into this country. The oriental cockroaches—*Stilopygia orientalis* and *Phyllodromia germanica*—which abound in houses, are very old importations into this country, whilst *Panchlora maderae*, *Periplaneta americana* and *Periplaneta australasiae* have quite recently made their appearance, evidently introduced with imported produce. The larvæ of *Heliothis armigera* are introduced every year in tomatoes (propably from America), and from the Canary Islands the larvæ of the Noctuid moth, *Prodenia littoralis*, have also been introduced in tomatoes. Many similar cases might be mentioned, but they are rather outside the scope of our enquiry, and the examples cited have only been given to show the influence of man on the dispersal of some insects.

It might be supposed from the above that many insects would be almost cosmopolitan, and have a very wide range, but this is not so. Certainly a few insects are almost world-wide in their distribution, and others, again, have a very great range, but, as a rule, the habitat of a particular species is more or less restricted, and even in the case of dominant species with great natural powers of dispersal, their sedentary range is often of comparatively small extent. This is essentially due to two causes: (1) Food—many species of insects being restricted to a particular species, or, at most, a particular genus of plants. (2) Climatic conditions—which kill off (particularly in the winter), the progeny of those insects that migrate from subtropical to temperate regions, owing to the inability of such progeny to pass

the winter in their new home, under new conditions of environment, in the same manner as their ancestors have done for long ages in the home from which they came. Restriction of area covered by the food-plant and climatic conditions are two of the greatest barriers to the more general dispersal of insects.

It has been stated that many species of insects can subsist in the larval state on only one species of plant, and hence, whatever dispersal powers such insects may have, are rendered more or less nugatory by the fact that they have no chance of colonising permanently any district where the food-plant does not exist, and the range of the species is strictly limited by the geographical range of the food-plant. When any such species migrates, its permanent settlement depends initially upon the presence of this particular (or a very closely allied) food-plant, on which the progeny may feed. But even given the necessary food-plant, climate may be an efficient barrier. In cases where the insect is more or less polyphagous, this want of a special food-plant offers no barrier to the spread of the species; yet we often find instances in which insects with more or less polyphagous larvæ are restricted in their distribution. Climate usually proves in such cases as these, the predominating barrier determining the range of each species.

The influence of climate as a barrier is rarely applied to the migrating individuals directly, *i.e.*, heat and cold do not kill the insects that actually migrate, it is the progeny that suffers. In subtropical regions, hybernation is not known; insects in these districts are often multiple-brooded, and the dominant and migrating species are almost always so. They take their habits to temperate regions, and attempt to do there, what it has been the habit of the species to do for innumerable generations under far different conditions. They are consequently exterminated almost to an insect every time they attempt to spread. This phase of the subject will be more fully discussed hereafter.

Another factor is the dependence of certain insects on others on which they prey, or on which, in some other way, they are directly dependent. Thus the range of the parasitical Hymenoptera and Diptera is directly dependent upon the range of their hosts. The "wax" moths, such as *Galleria cereana*, *Achroea grisella*, and *Aphomia sociella*, are entirely dependent on the bees and wasps, in whose nests they lay their eggs, and on the stores of wax and honey on which the larvæ of these moths exist. All these various causes tend to show the reason why even predominant species often fail to establish themselves outside more or less local areas.

The peculiarities which are everywhere evident in the distribution of insects depend very much on their habits and mode of life, and these factors are pre-eminent in limiting the extension of their present boundaries by migration. We have already shown that physical barriers which would prove insuperable in the case of many animals are practically obliterated in the case of insects. They cross wide arms of the sea, vast tracts of ocean, and even high ranges of mountains, and such barriers as these usually form, thus, oftentimes, prove ineffectual. Their effective migration is, however, frequently limited by organic and climatic conditions to an extent unknown among other groups of animals, and their permanent settlement in a new country entails an adaptation to such a complex series of

necessary conditions that such a settlement is rarely effected. The particular food must be supplied, the temperature, rainfall, drought, etc., must accommodate themselves not only to the imago, but to the various stages of the insect, and it follows, as a matter of fact, that while no animals are so well adapted for a wide distribution, nor show so clearly the various modes by which migration and dispersal may be effected, yet none show more clearly how effectual the organic barrier may be in limiting the range of the species, and rendering nugatory the migration tendency.

It is not intended to enter here into the wide and general subject of the geographical distribution of insects, except so far as it has a direct bearing on the the more particular phase of distribution to be here considered, *viz.*, the migration and dispersal of such insects as tend to increase the present area of their habitats, either singly or in flocks, and of the possible causes which have led to the migration and dispersal habits now observed. The latter necessitates a consideration of the antiquity of insects. It must be confessed that fossil insects are far too rare to help us much in determining, or affording much aid to the difficult questions connected with geographical distribution, but they are quite abundant enough to give us a general idea of the great antiquity, not only of the present families, but also of genera, and of the rate at which the forms of insect life have undergone modification.

Compared with the antiquity of the higher vertebrates, we may state at once that the age of our present families of insects is immeasurably great. In spite of the fact that insects are, in most cases, quite unsuited for preservation by the ordinary processes of fossilisation, there are some strata in which considerable numbers of insects have been preserved. The newest rocks are, as a rule, the most prolific in fossil insects. In the Tertiary strata, the Oligocene rocks of Florissant, a small ancient lake high up in the Colorado parks has produced above fifteen thousand fossil insects, of which only eight are butterflies. From the Upper Miocene of Switzerland, in the neighbourhood of Œninghen, a large number of individuals have been obtained, about 5,000 having been examined by Heer, and these were referred to about 800 species. Insects of lower Miocene age have also been discovered near Croatia, including termites, dragonflies, and a butterfly allied to *Vanessa*. The Aix beds (chiefly perhaps Oligocene) have given other butterflies, and from rocks which are probably Cretaceous in these beds has come *Coliates*, probably the oldest butterfly known. Dragonflies, crickets, cockroaches, and cicadas have been found in England in rocks of Wealden age; a Sphingid moth, and insects of almost all orders in the Upper Oolite of Bavaria, and many fossil Coleoptera in the Lower Oolite of Oxfordshire. From the Lias of Gloucestershire, many Coleoptera, Odonata and Orthoptera have been obtained, the families and genera almost identical with those of the present day, and including *Carabidae*, *Melolonthidae*, *Telephoridae*, *Elateridae* and *Curculionidae* among the Coleoptera; *Blattidae* and *Gryllidae* among the Orthoptera; *Agrion*, *Aeschna* and *Libellula* among the Odonata. In rocks of Carboniferous age, *Ephemera*, *Blatta* and *Scarabaeus* have been found, also a large Saturniid moth, and in rocks of Devonian age Coleoptera and Neuroptera, belonging to extinct families, but distinctly belonging to these Orders, have also been discovered.

Brongniart considers that all the Palæozoic fossil insects may be

classified with the existing Orders of insects, though not belonging to existing families, and he refers the oldest known fossils to the Neuroptera, Orthoptera and Homoptera, the greater part being referable to the first-named Order. The Protephemerides, Protodonates and Protoperlides of this author may probably be looked upon as the actual ancestors of our existing Ephemeridæ, Odonata and Perlidæ.

Compared with the more highly specialisd vertebrates, then, insects have a remarkable ancestry. Many existing forms of insect life are found in the Tertiaries, and the social insects had then already taken on their present form—neuters, workers and soldiers of the Hymenoptera and termites having been found. Even the viviparity of the aphides of this age is suggested by one of the specimens from Florissant, and not only are the present tribes of gall-making insects abundant in the Tertiaries, but the galls themselves have also been found.

Going back, we find that many of the present genera of Coleoptera (and probably Lepidoptera) were in existence when Archegosaurus and Ichthyosaurus ruled the sea, and Pterodactyl the air. The main Orders of insects—Hemiptera, Orthoptera, Odonata, Lepidoptera, Hymenoptera, Coleoptera, Diptera—were differentiated long æons of time ere this, probably even before the deposition of the Silurian strata, and the ancestry of insects passes into a time, compared with which the ancestry of mammals sinks into insignificance. Our present species have probably largely originated in Pleistocene times, but the more dominant genera of most of the Orders certainly existed at the commencement of the Tertiary period, and certainly extended far back into the Mesozoic or even late Palæozoic times. The points of origin of the Orders are subjects on which the geological record is silent. We only know that many of them must have been in existence when the oldest known sedimentary rocks were deposited.

This vast antiquity of insects considered in connection with their present tendency to dispersal, makes the study of the insects of any given region a very difficult matter. We have, in almost every region, insects representing an exceedingly ancient fauna, intermixed with comparatively recently introduced forms. The former have, as it were, often been developed from the ancient forms *in situ*, the latter have spread at various times extending over a period of time dating from the present day back through Cainozoic, and Mesozoic times, into the lands they now occupy from other regions. The most recent additions are probably those representing the more cosmopolitan species and genera, which have passed at one time and another along every line of migration open to other terrestrial animals, and have also been able to take advantage of other routes, exclusively their own. The older forms have probably survived geographical changes which have caused the extinction of many of the more highly-organised animals. The study of the species that are now active in their movements may lead us to discriminate in some instances the new from the ancient fauna, and give us clues as to the districts where cosmopolitan species originated.

The position of Pseudopontia (Gonophlebia).

By Professor A. RADCLIFFE GROTE, M.A.

There exists a difference of opinion as to the classification of *Pseudopontia*. Scudder asks the question: "Is it a butterfly?" *i.e.*,

"Does it belong to the Rhopalocera?" This question Reuter answers (in the same sense) in the affirmative, and Butler in the negative. It appears to me that the trouble lies with the Boisduvalian categories, Rhopalocera and Heterocera, abstractions evidently not attended to by nature. *Pseudopontia* has unclubbed antennæ, and the secondaries have three internal veins, hence the insect will not fit the definition of the Rhopalocera; it is, therefore, according to Butler, not a "butterfly," but a "moth." In other words, it is consigned to that common receptacle, the incongruous nature of which is expressed by its title, the Heterocera. Against the employment of these two scientific titles I have had a long and up-hill fight. Perhaps *Pseudopontia* may help to show that they have no standing.

According to Scudder, the correct title of this butterfly is *Gonophlebia* (*Generic Names*, 181), and I thus call the insect by this name, and the family, of which it is the type, *Gonophlebiadae*.

The wings of this odd African lepidopterous insect are transparent, whitish, without markings, and are curiously round in shape. Here is evidently the influence of mimicry, and *Gonophlebia* possibly copies the colourless petals of some blossom which it frequents; at any rate, its unusual form has probably been acquired for the purpose of self-protection. When we compare it with the long-winged *Leptidia sinapis*, we find that the two oppositely shaped types of wing are produced with a nearly identical number of nervures. But whereas in *L. sinapis* they are straight, in *Gonophlebia paradoxa* they are curiously bent, in order to produce the circular form of wing. This bending is chiefly shown by the radial veins of the primaries, which are elbowed in an upward curve near their point of origin. These are veins III_1 and III_2. Next, vein V_2 is bent downwards in an opposite direction. Thus the wing is stretched upwards and downwards by the course of these two supports, pulling it, we may say, in two directions. On the secondaries, the radius, vein III, is bent upwards nearly at right angles, fusing with II; thence, descending gently, it reaches the external margin below the apex. Again, vein V_2 is correspondingly bent in an opposite direction, and thus the circular form of the wings is mainly attained, while all the veins assist this result by being separated widely, thus stretching, upwards and downwards, the integument. On the secondaries, vein IX is retained, and this is a generalisation no doubt held over by the mechanical necessities of the case. That the presence of this vein is not an obstacle to our considering *Gonophlebia* a "butterfly" may be seen by the following table:

Secondaries with one internal vein: PARNASSI-PAPILIONIDÆ.
Secondaries with two internal veins: PIERI-NYMPHALIDÆ, LYCÆNI-HESPERIADÆ.
Secondaries with three internal veins: GONOPHLEBIADÆ.

It is from a study of the neuration of the primaries that I have come to the conclusion that *Gonophlebia* is a probable specialised survival, reaching back to the main Pierid stem of the diurnal Lepidoptera. It is neither, strictly speaking, a "butterfly" nor a "moth," neither Rhopalocerous nor Heterocerous, according to received definitions. On primaries the radial branches have submitted to a reduction, as in the *Pieridae* (*i.e.*, *Pontia*, *Nathalis*), the radius is only 3-veined; the terminal vein we must represent by the formula III, 3 + 4 + 5. This is a secondary specialisation; one which we

meet again in the *Lycaenidae*. But what we consider as a very strong corroboration of our view is the fact that vein IV_1 ascends the radius. Not only this, but vein IV_2 follows suit, an extraordinary culmination of the Pierid movement. Only vein IV_3 remains attached to the crossvein, which closes the cell. As in the Pierids, the cell is closed, and we see no movement to open it, through a degeneration of the crossvein, as in the Nymphalids, in which latter the upper branches of the median series never ascend the radius. It remains to be stated that vein VIII of primaries forms a loop, as in the Hesperiades, among which I would place the family, considering it as a curious and modified survival of the ancestral Pierid butterflies, and having nothing at all to do with the Papiliones, with which Reuter associates it. The characteristic of the Papilionides is the presence of vein IX on primaries, wanting in *Gonophlebia*.

The structure of the Spiracles in Lepidoptera.

By T. A. CHAPMAN, M.D., F.Z.S., F.E.S.

So far as I have been able to observe, the structure of the spiracles in Lepidoptera at all stages is the same as that exhibited in the observations described *ante*, pp. 185-188, *viz.*, an inner true valve capable of movement by a special muscle or muscles, by means of which the opening may be absolutely closed. Outside this, at a distance of about the diameter of the tube, an outer false valve, that which we ordinarily call the "spiracle." I say *false* valve, since, though this is often called and described as a valve, it has no movable parts, and is really a grating, screen or sieve. This may be seated on an eminence, or more usually is on a level with the integument, or may be at the bottom of a hollow, as noted in the pupa of *Phalera bucephala*, or deeply between the segments, as in the thoracic spiracles of many imagines, or especially as in the thoracic spiracle of nearly all pupæ of Lepidoptera.

The external valve is described as being really a valve with one side or plate movable. I think this is certainly not so in lepidopterous pupæ at any rate, where this outer valve is simply a narrow chink in most species, a circular, oval, or trefoil opening in others, with dendritic processes so disposed as to act as a sieve or screen, but without any movable or articulated portions. It may be noted that the outer valve has such a sieve-like open structure, that its closing could not be of any air-tight valvular nature, even if it had any movable parts. Nor can I find any valvular arrangement within the eyelid-like valve, such as Lowne figures as existing in the abdominal spiracles of the blowfly.

Whether the outer, and this third inner, valve exist functionally or no in other stages of Lepidoptera, which, however, I very much doubt, it is certain that the valves I see at work in the newly changed pupa, and which are I think certainly those usually called the inner valves, have some definite function to perform at that stage of the insect, without assistance from any other valvular structure. The alteration of the rhythm of their movement during the short period that the observation lasts, *viz.*, the gradual lengthening of the period during which they are closed, suggests that possibly during the moulting and the preceding period of rest they have been, if not unduly stretched,

at least unable to contract and close, and that these movements are a gradual resumption of activity or of normal position, which is probably that of closure. But I still think the closing has something to do with the regulation of fluid pressure in connection with the redistribution of plasma and expansion of appendages, then so actively taking place.

The hypothesis that the inner valve is merely resuming its normal position and function, gains some support from the fact, that the outer or surface valve is at the same time undergoing a contraction to its normal aspect and form, and that both of these valves have been widely stretched by the whole process involved in the separation and removal of the tracheal linings. So far the parallel between the two valves is good, and justifies an argument from the one to the other. But the parallel is far from complete, since the surface valve is entirely a cutaneous, or rather chitinous and epidermal structure, and that which is gradually contracting to its final narrow opening, is a new structure, replacing the old which has been cast, and could not therefore take its proper position before the old one, which occupied it, was gone. The inner valve, on the other hand, is a more permanent structure, consisting of dermal, tendinous and muscular structure. What it loses at the moult is merely its epidermal lining, of no greater density than that lining the rest of the tracheal canals.

The movements are certainly synchronous, with the general muscular (vermicular) wave affecting the whole insect, and having something to do with the redistribution of fluids.

The alteration in the proportion of parts that occurs within ten or twenty, or rather more, minutes of the moult, is certainly very remarkable; for instance, I note in the case of *Phalera bucephala* immediately the moult takes place, the length of the pupa in sixteenths of an inch is 17, divided into (1) 7 from anterior extremity to end of wings, (2) 6 thence to hind margin of 6th abdominal segment, and (3) 4 more to anal extremity. At intervals of ten minutes the corresponding measurements were :

1.—At moult	...	...	7 : 6 : 4
2.—After 10 minutes	...	...	7½ : 5½ : 4
3.—After 20 minutes	...	...	8 : 5 : 4
4.—After 30 minutes	...	...	8½ : 4½ : 4
5.—After 40 minutes	...	...	9 : 4 : 4

This is caused partly by the growth of the wings and appendages, till they reach the hind margin of abdominal segment 4, partly by shrinkage of segments 5 and 6. I am not able to say how far this growth of the wings is due entirely to a process of growth, expansion, redistribution of parts, or whatever it may be occurring in the cells of the expanding part itself, or whether it depends entirely, or to a great extent, on fluid pressure from the contracting portions of the insect, produced by muscular action or otherwise, yet it would depend on this very much whether the winking action of the tracheal valves has the subsidiary function in connection with this process that I suggest.

The analogy of the expansion of the wings (and in many cases other appendages) of imagines, suggests that the fluid pressure hypothesis is a correct one, since there is little doubt that such pressure, aided by the ingestion of a large quantity of air, is the effective cause of the expansion of the imaginal appendages.

Notes on Hybrids (2nd Crosses) obtained by crossing Tephrosia bistortata with T. crepuscularia.

By A. BACOT.

Besides the hybrids described, *ante*, pp 192-194, I obtained the following cross-pairings of the hybrids themselves :—

Ref. No.	*Paired.*	♂ *Parent*	♀ *Parent.*	*Result of eggs hatching.*
(A)	June 8th	*delamerensis* × *bistortata*	*bistortata* × *crepuscularia*	Most of ova hatched.
(B)	June 8th-9th	*delamerensis* × *bistortata*	*bistortata* × *delamerensis*	Ova given away.
(C)	June 10th	*delamerensis* × *bistortata*	*bistortata* × *delamerensis*	Portion infertile.
(D)	June 10th	*bistortata* × *crepuscularia*	*bistortata* × *crepuscularia*	Portion infertile.
(E)	June 10th	*bistortata* × *crepuscularia*	*bistortata* × *crepuscularia*	Ova given away.
(F)	June 11th	*bistortata* × *crepuscularia*	*bistortata* × *delamerensis*	All fertile.
(G)	June 12th	*bistortata* × *delamerensis*	*bistortata* × *delamerensis*	No ova laid.
(H)	June 13th	*bistortata* × *delamerensis*	*bistortata* × *delamerensis*	Ova mostly fertile.
(I)	June 14th	*bistortata* × *delamerensis*	*bistortata* × *crepuscularia*	Ova mostly fertile.
(K)		*bistortata* × *crepuscularia*	*bistortata* × *crepuscularia*	Nearly all fertile.
(X No. 01)	June 15th	*delamerensis* × *bistortata*	*bistortata*	Only one or two hatched.
(L)	June 17th	*bistortata* × *crepuscularia*	*bistortata* × *crepuscularia*	Portion infertile.
(X No. 02)		*crepuscularia* (2nd brood)	*bistortata* × *delamerensis*	Nearly all fertile.
(O)	Aug. 3rd	*delamerensis* × *bistortata*	*bistortata* × *crepuscularia*	No ova laid.
(P)	Aug. 6th	*delamerensis* × *bistortata*	*bistortata* × *crepuscularia*	Ova given away.

The broods marked A, H, I, K, L, X No. 02, produced larvæ which were successfully reared, and, in most cases, a large proportion of moths emerged before the end of 1897. In the parentage of the hybrids above the first name stands for the ♂, and the second for the female Thus, "*delamerensis* × *bistortata*" means that the male parent of the hybrid was *delamerensis*, and the female parent *bistortata*.

To obtain the second crosses, the males and females which I desired to pair were simply left together for a single night, and the females boxed for ova the next morning; in those cases, therefore, where the whole batch of eggs proved infertile, it may be that copulation did not take place at all.

Inbreeding with parents of the same hybrid stock.—Four attempts [D, E, L* and K*] were made with ♂ s and ♀ s of X No. 1a (*ante*, p. 193), *i.e.*, ♂ *bistortata* × ♀ *crepuscularia*. All the females laid eggs, and of the three batches which I kept, two were only partially fertile, and all, or nearly all, the eggs of the third batch hatched. The ova of one brood were measured, and proved to be rather smaller than the average of *T. crepuscularia* eggs, giving a length of ·025 and breadth of ·015 of an inch. I lost one brood of larvæ during an absence from home, but a fair number of the remaining broods [L and K] fed up and pupated.

The larvæ of one [L] of these broods were examined, and these were nearly all of the typical *T. crepuscularia* form, with the top of the Λ-mark open at the top.

The moths of these two broods commenced to emerge on August 8th, and continued to do so during the whole of this month, and through September into October; the latest emergence, up to the end of December, 1897, being a ♀ on December 14th, from pupæ kept indoors. Twenty-three specimens (11 ♂s and 12 ♀s) of one brood [L] have emerged, and seven pupæ are going over; of the other brood [K] 10 specimens (five ♂s and five ♀s) have emerged, and five pupæ are going over. All the moths vary considerably in shade, and a few are remarkable, if not unique, in having the central and basal area of wings pale, the markings being very faint, and the coloration being, so to speak, condensed into the marginal band, which is very broad and dark. This tendency is apparent in all the moths, to a greater or less extent, but the effect is only remarkable in three, having a pale and faintly marked central and basal area. Three out of the above 23 specimens were crippled.

Two attempts [G and H] were made with ♂s and ♀s of the brood marked "X Dr. R.," *i.e.*, ♂ *bistortata* × ♀ *delamerensis*. Only one batch of eggs was laid, and these were nearly all fertile; unfortunately most of the larvæ died during my absence from home. I examined the eight or ten larvæ which fed up; some followed the *bistortata* type, but the greater number were of the *crepuscularia* form. Only two moths have emerged (a ♂ and ♀), and one pupa is going over. Both the moths are very small, but all well marked, the ♂ dark and ♀ light.

Parents of different hybrid stocks.— ♀ of X Dr. R. (♂ *bistortata* × ♀ *delamerensis*) × ♂ of No. 1a (♂ *bistortata* × ♀ *crepuscularia*). Only one attempt [F]. All the ova laid were fertile, but the larvæ unfortunately died during my absence. The ova were very small and rather ovoid in shape; length, ·023; breadth, ·013 of an inch.

Reverse cross to the above.— ♀ of X No. 1a (♂ *bistortata* × ♀ *crepuscularia*) × ♂ of X Dr. R (♂ *bistortata* × ♀ *delamerensis*). Only one attempt [I], nearly all the ova fertile. All the larvæ, save one or two, died during my absence, the only pupa is going over.

♂ X No. 1 (♂ *delamerensis* × ♀ *bistortata*) × ♀ X Dr. R (♂ *bistortata* × ♀ *delamerensis*). Two attempts [B and C], both females laid ova, but I only kept one batch [C] myself. A proportion of these ova were infertile; the larvæ resulting from the fertile eggs died while I was away. The ova of one of these batches were examined—Shape, nearly oval; length, ·025; breadth, ·015 of an inch.

♂ X No. 1 (♂ *delamerensis* × ♀ *bistortata*) × ♀ No. 1a or No. 2a (♂ *bistortata* × ♀ *crepuscularia*). Three attempts [P, O and A], three batches of eggs laid, two of these kept, one [O] did not hatch, but nearly all the eggs of the remaining batch [A] were fertile. Unfortunately, most of these larvæ died during my absence; the only pupa is lying over. Eggs were rather ovoid in shape; length, ·025; breadth, ·015 of an inch.

Crossing hybrids with parent stock.— ♂ X No. 1 (♂ *delamerensis* × ♀ *bistortata*) × ♀ of 2nd brood *bistortata*. Only one attempt. A batch of eggs were laid, but only one or two were fertile, and the larvæ unfortunately died whilst I was away.

♂ *crepuscularia* (2nd brood) × ♀ X Dr. R (♂ *bistortata* × ♀ *delamerensis*). One attempt. A fairly large batch of ova were laid, nearly all of which proved fertile. The larvæ were very robust, and fed up rapidly. Unfortunately, I was so much occupied at the time that I was unable to make any notes on the larvæ or ova of this interesting brood. Fifty specimens (38 ♂ s and 12 ♀ s) emerged during the autumn of 1897, and 18 pupæ are going over the winter. Eighteen of the moths (16 ♂ s and two ♀ s) take after the *delamerensis* strain, being of a dark suffused grey, more or less blotched and streaked with white or pale grey; 31 (nine ♀ s and 22 ♂ s) are of various shades of grey and ochreous grey, with more or less normal dark markings. A few approach rather closely to the male parent, others are nearer to the *bistortata* form or of some middle shade, while five or six females, most of which emerged late in the autumn, are very large, and closely resemble the spring form of *T. bistortata*, except that the ground colour is whiter and less suffused. The remaining specimen (a ♀) is small and poorly developed, colour dull, suffused and slightly ochreous-grey, hardly any of the usual dark markings show.

Only one point seems clear enough and important enough to call for remark. I refer to the difference in the fertility of ova of the first and second crosses. With the former, the whole of any one batch of ova were either fertile or infertile, but with the ova obtained from the second crosses, a portion of the ova in nearly all the batches laid proved infertile, the proportion varying in different batches, from one or two infertile eggs to all but one or two infertile. This surely points to some deformity of the sexual organs, or else to a want of vitality in the males.

COLEOPTERA.

Notes on the British Longicornes.

By HORACE DONISTHORPE, F.Z.S., F.E.S.

Before entering into the subject of this paper, it may be as well to consider what is a Longicorne, and what position it takes in the scale of nature.

The Longicornia form one of the largest families of the order Coleoptera, indeed, between 10,000 and 12,000 have already been described, and I should think that if one added the number of undescribed species in collections, 15,000 would be rather under than over the mark.

Canon Fowler gives the chief characteristics of the group as follows:—"Form elongate, usually more or less depressed, with the elytra almost always broader than the thorax, usually considerably so; head variable, eyes, as a rule, emarginate, rarely entire, sometimes entirely divided; antennæ usually very long, but occasionally (*e.g.*, in *Rhagium*) short, inserted either in front of or between the eyes, not clavate, filiform or setaceous, rarely serrate or pectinate, in exotic genera occasionally ornamented with brushes of hair; maxillæ with two lobes, one being occasionally obsolete, mandibles strong, labial palpi 3-jointed, thorax rarely margined, sometimes denticulate at sides; elytra, as a rule, covering abdomen, but sometimes abbreviated; abdomen composed of five free ventral segments, a sixth being some-

times visible; legs variable, sometimes rather short and stout, sometimes very long and slender, femora often clavate, tibiæ generally furnished with spurs at apex; tarsi pseudo-tetramerous, 5-jointed, but with the fourth joint very small and connate with the fifth, which is slender, third joint bilobed, joints 1-3 (except sometimes on the posterior pairs) usually furnished with thick pubescence underneath, claws almost always simple, but rarely cleft or appendiculate." They are called Longicornia on account of the long antennæ of most of them, which, in some species, exceed the length of the body by three or four times. They are all wood-feeders, and, consequently, are to be met with more frequently in wooded countries. In the tropics they play a most important part in the economy of nature. If it were not for the Longicornes the vast forests of the Amazons could not exist, as they would become choked up with fallen trees.

As soon as a tree begins to decay, or falls, the parent beetle lays her eggs in it, and the larvæ when hatched bore long galleries in the solid wood; the work of boring from these galleries being taken up by smaller species of wood-feeding Coleoptera, rain is thus allowed to freely percolate through the tree, reducing it to pulp, and instead of choking up the forest, it eventually acts as manure to the other trees. The larvæ, which are large white fleshy grubs with strong mandibles, take a long time to arrive at maturity, often extending over a period of many years.

Mr. C. O. Waterhouse had a larva of a Longicorne alive for five years. It was first given to Mr. Waterhouse by a colonel, who discovered there was something in one of his boot-trees. He had had the boot-tree in use for fourteen years, the last seven having been spent in India. Whether the larva was in the wood from which the boot-tree was made at first, or whether it got there afterwards, is hard to say; however, when the larva worked its way out, Mr. Waterhouse put it into a similar piece of wood, where it lived for five years; the last time it came out he exhibited it at a meeting of the Entomological Society of London; this appears to have been too much for it, as it died shortly afterwards. I may mention that Mr. Waterhouse reared another Longicorne, which he had in the larval state for six years.

When full-fed the larva changes into a pupa in a cell, which it forms near the surface of the wood. On hatching, the perfect insect often remains for some time in its cell before making its escape, which it does by eating its way out with its powerful jaws.

The female Longicornes are larger and broader than the males, and possess shorter antennæ; they are also not nearly so active. They have a more or less well developed ovipositor, which can be protruded to some extent like the joints of a telescope. With this instrument they are enabled to deposit the eggs in the cracks of bark and similar places suitable for the larvæ to be hatched.

This family comprises some of the most beautiful and most curious beetles in the world, more especially in the exotic species. I possess a very extraordinary Brazilian Longicorne, *Megabasis speculifer*, which has what may be described as a small looking-glass on each elytron. Then there is the harlequin beetle, a large South American species, *Acrocinus longimanus*, which has a variety of colours in squares on its back, somewhat after the manner of a harlequin's dress; the front legs in the male, moreover, are enormously developed, being two

and a-half times as long as the body. There is a specimen in the British Museum, in which the legs being spread out, measure from tarsus to tarsus exactly one foot. One could continue indefinitely mentioning curious and beautiful forms, but our present space will not permit. Some of the finest examples of mimicry and protective resemblance in Coleoptera are to be found in this group, many being coloured like the trees and other surroundings amongst which they live, others closely resembling ants, wasps and other insects, as well as beetles in other families. A most wonderful case is to be met with in Borneo, a large Longicorne, *Coloborhombus fasciatipennis*, mimics an equally large Hymenopteron, *Mygnimia aviculus*. The wing-cases of the beetle are reduced to a very small size, and its true wings are coloured, and have a white patch at the apex in exact imitation of the wasp. When flying or on the ground at a distance of six feet, it is quite impossible to distinguish the wasp from the beetle.

Many species possess the power of stridulation. The sound is produced by moving the head up and down, when the inner side of the hinder margin of the thorax is rubbed against a short neck before the scutellum, over which the thorax joins the elytra. This I have observed in *Agapanthia* and some other species when held or first secured; I also remember taking my first specimen of *Toxotus meridianus* by hearing the beetle stridulating, and tracing the sound to a branch on which it was sitting. Some species have the power of emitting a strong smell, agreeable in some cases, as with our well-known musk beetle, in others, quite the reverse.

In the last *Catalogue of British Coleoptera*, by Canon Fowler and Dr. Sharp, the number of British species enumerated is 56, and with two introduced species and one doubtful one, the total is brought up to 59.

The Longicornia are divided into three families—*Prionidae*, *Cerambycidae* and *Lamiidae*—of which we possess one species in the first family, 41 in the second (including the two introduced species and the one doubtful one before mentioned), and 17 in the last.

They may be divided as follows:—

I. Prosternum considerably produced in a blunt process behind anterior coxæ; thorax margined, with the sides armed with spines or teeth; labrum very small, usually connate with clypeus ... ...PRIONIDÆ.

II. Prosternum not or scarcely produced behind anterior coxæ; thorax not margined, with the sides sometimes armed with spines and teeth, but usually simple in our species; labrum free and distinct.

1. Anterior tibiæ not grooved on their inner side ... ...CERAMBYCIDÆ.
2. Anterior tibiæ grooved obliquely on their inner side ...LAMIIDÆ.

The *Cerambycidae* are again divided into *Cerambycina* and *Lepturina*, with eight genera in the former and seven genera in the latter, but as all the British species are quite easy to determine, it is unnecessary for us to go more fully into the classification here.

Most of the Longicornes are rare in this country. Rye, in his *British Beetles* says:—"The young collector will probably be some time before he takes more than *Toxotus*, one or two small species of *Gramoptera*, *Clytus arietis*, and a *Rhagium*."

We will now take a short view of our species, taking them in the order of the catalogue before mentioned. I should like to call attention

to the fact that I have been very careful over the localities mentioned, taking considerable pains to verify records. I have carefully gone through the Stephensian collection in the museum, as also Dr. Power's, and have consulted many coleopterists on the distribution of the rarer species. Mr. Bouskell has supplied me with the Leicestershire list, and I must say I was surprised to find it such a fine one.

Prionus coriarius, L., our first species, is a large conspicuous brown insect, with serrate antennæ, which are more so in the males. It is found about oak trees, and is not uncommon in some localities. It emerges at the roots of the trees. It is said to be found on fennel. I have taken it in the New Forest (I might here mention that, as might be supposed, the majority of our species are found in the New Forest, I have myself taken twenty-two species there). It is also to be found in Richmond Park, Windsor Forest, and as far north as Manchester, Cannock Chase, and Llangollen. It is not recorded from Leicestershire. *Aromia moschata*, L., commonly called the musk beetle, is widely distributed throughout the greater part of the country. It is of a handsome metallic green, which occasionally, more especially in the males, varies to a coppery or bluish tint. It is to be found on and about old willows, in which the larvæ feed. It delights, in common with many other species of this order, to settle on *Umbelliferae*. It emits a strong smell, which has given the beetle its name, although it is not a bit like musk. This scent can be noticed some distance away, and remains with the insect some time after death. I have taken it in the Fens, and at Sydenham and Sunbury. It is found in Leicestershire, at Quorn, Loughboro, Ashfordley, etc. *Asemum striatum*, L.—This interesting Longicorne, until quite recently, was regarded as a purely northern species, it being taken in fir stumps in Scotland; but of late years it has been found in the south, Messrs. Bouskell, Engleheart and Nicholson having taken it in the New Forest, Mr. Gorham having taken it in Lord's Wood, Southampton, and Mr. Rye, at Bookham, in Surrey. It is a rather depressed, dull black insect, clothed with thick but very fine pubescence; the antennæ are rather short and robust. *Hylotrupes bajulus*, L., is a large, black, rather shiny beetle, with a band of white pubescence on the elytra. It is very rare, and has not been taken for some time. It occurs in old posts and rails. Dr. Power took a specimen at Weybridge, and Mr. E. A. Waterhouse, one at Putney. The last capture was made by Mr. Lewcock, at Cromer, about ten years ago.

Of the genus *Callidium* we possess four species, one is very rare and perhaps doubtful, two are fairly common, and the fourth is rare, but to be met with occasionally. The first species, *Callidium violaceum*, L., is a beautiful insect, of a bright metallic blue, which varies to violet and green. It is not uncommon, and is certainly spreading. I have seen it in numbers on the sheds of the Archery Club at Lyndhurst, which are built of fir. I have also taken it at Penge and Purley. It occurs at Chiddingfold, as its borings bear evidence, but I have not seen the perfect insect this year there. It is found on fir palings, fences, etc., and its borings may be observed just beneath the bark. It occurs in Leicestershire, Mr. F. Bates having taken it in numbers at Kirby-Muxloe, and Mr. Bouskell at Gumley. *Callidium variabile*, L., is, as its name implies, a very variable species, being either blue or red, and all kinds of variations between these

occur. I have found it in stacks of wood in some numbers in the New Forest; breeding the majority of specimens from the pupa, however. It is considered rare. It occurs in the London district, and has been taken near Burton-on-Trent. This species and the following are also both Leicestershire Longicornes. The next species, *Callidium alni*, L., is one of the smallest of the British Longicornes; it is a pretty little insect, red and black, marked with white bands. It is found under bark of faggots, etc., occasionally beaten out of dead hedges, and by sweeping. It appears to be rather widely distributed, being taken in various places all over England and Wales, but is a local insect. I have taken it under bark of fences on Wimbledon Common and in Tilgate Forest. Of the last species, *Callidium sanguineum*, L., I can learn nothing reliable. It is a bright scarlet insect. It is recorded by Stephens from London, North Wales and Exeter. I should say it was undoubtedly an importation.

(*To be continued.*)

On species of Coleoptera occurring in a limited area.

By H. S. GORHAM, F.Z.S., F.E.S., etc.

The number of species of any family of insects which may be obtained on a very limited area of ground, in a good locality, has always seemed to me worthy of notice, as showing what may be done by persistent collecting and constant watchfulness. What we see represents, no doubt, a very small proportion of the rarities, which in the course of their migrations visit every part of the district we live in. It is mainly a question of eyes or no eyes. My house and garden at Shirley Warren occupy a space of about two acres. The following notes refer only to the Coleoptera, and I only note the species which appear to be usually scarce, and most of which I have only met with here in the area named. The soil is sandy or gravelly, and the neighbourhood is well cultivated and has many trees, as well as gardens, and some heathy ground. I have noted many good insects of other Orders.

In the house, especially the cellars, *Sphodrus leucopthalmus*, once only; *Pristonychus*, common; *Calathus piceus*, *Carabus violaceus*, *C. nemoralis*. In the garden: *Amara ovata*, *Oxyporus rufus* (once two or three specimens in a *Boletus*), *Acidota cruentata*, *Scydmaenus pumilio*, *Anommatus* 12-*striatus* (frequently in potato skins of the old "sets," when dry, and in hollow carrots, also in puff balls), *Rhizophagus perforatus* (abundantly flying, about the middle of June, in the evening, with a few *R. depressus* and *R. ferrugineus*), *Amphicyllis globosus*, *Elater elongatulus*, *Phosphaenus hemipterus* (abundantly, but all ♂ s, and disappearing; I have not seen it this year), *Lytta vesicatoria* (one found by my son, Lieut. A. Gorham, quite freshly emerged), *Dryocaetes coryli*, *Odontaeus mobilicornis*, ♀ (one flew in to light, July 27th, 1894; a second example, also ♀, obtained in the same way, June 15th, 1896), *Leptura fulva* (this insect has only appeared here in 1893; in that year I obtained nine examples, four or five of them in my garden), *Caenopsis fissirostris* (not unfrequently).

To note all the *common* species occurring in a given limited area would require careful collecting, and take time for their determination. This I have not done, but the number must be very large. The above list only represents, of course, casual captures.

The Fourth International Congress of Zoology.

By HORACE St. J. K. DONISTHORPE, F.Z.S., F.E.S.

The fourth International Congress of Zoology, held at Cambridge, under the presidency of the Rt. Hon. Sir John Lubbock, Bart., M.P., LL.D., F.R.S., proved a distinct success, and in response to a request from the Editor of *The Entom. Record*, who unfortunately could not be present, I offer the following notes as to matters strictly entomological that came under the notice of the members present.

Among the entomological specialists present were many well-known faces. One noticed among others: Professers T. H. Beare, E. L. Bouvier, Drs. Chapman, Dixey, Jordan, Sharp, Messrs. Adkin, Bateson, Bouskell, Burr, Carpenter, Champion, Crowley, Durrant, Fauvel, Janet, Kirby, McLachlan, Merrifield, Nevinson, Newstead, Olivier, Pearson, Piepers, Rowley, Trimen, Verrall, Vice, J. J. Walker, the Revs. O. Pickard-Cambridge and H. S. Gorham, the Hon. Charles and Hon. Walter Rothschild, and the Rt. Hon. Lord Walsingham. There were, of course, many other well-known entomologists, both British and foreign, that one cannot call to mind at a moment's notice.

Various objects of great interest to zoologists were on view in the Zoological Laboratory. Among the entomological exhibits may be mentioned: (1) Specimens illustrating the means of identifying certain coleopterous larvæ (Mr. C. Warburton). (2) Specimens illustrating the reproduction of lost parts in the legs of *Blattidae* (Mr. H. H. Brindley). (3) New Nematodes from Fiji—a cricket with spines on the hind tibiæ, that jumps on the surface of water (Professor G. Gilson).

On August 23rd, three papers relating to entomology were read: (1) "Evolution of Colour in Lepidoptera," Mr. M. C. Piepers. (2) "Expériences sur la rélation qui existe entre la couleur du milieu et la couleur des chrysalides de certains Lépidoptères," M. Bordage. (3) "Some points in the Classification of Insects," Dr. D. Sharp. The latter would arrange insects in three or four groups in accordance with the presence or absence of wings, and subdivide those with wings into divisions dependent on whether the wings undergo their growth inside or outside the body. He pointed out that the insects in which wings are developed outside the body are the only ones known with certainty to possess what may be ancestral forms in the Palæozoic epoch.

On August 24th, three other entomological papers were read: (1) "Sur la constitution morphologique de la tête de l'insecte arrivé à l'état d'imago," M. Charles Janet. (2) "Sur les Lampyrides des Antilles," M. E. Olivier. The author, in his paper, gave a general account of the *Lampyridae* of the Antilles, where six genera and 34 species are represented. (3) "Sur les caractères externes des Peripates," Prof. E. L. Bouvier.

Mr. Verrall entertained some of the entomologists at Newmarket during their stay: Messrs. Champion, Walker, Burr, the Rev. H. S. Gorham and myself, among others. At Dr. Harmer's "at home," on the evenings of August 24th-25th, for those members of Congress staying at King's College, Messrs. Beare, Bouskell, Burr, Rowley, Vice and myself represented the entomological section.

At the reception by the President of the Zoological Society of London, on Saturday, August 27th, at the Zoological Gardens, fewer members attended than might have been expected, no doubt on account of the rain. One saw there, however, the Hon. Walter Rothschild, Mr. McLachlan, Dr. Chapman, Mr. Merrifield, Mr. Bouskell, Mr. Crowley, Mr. Kirby, Mr. Lloyd and Mr. Tutt, among other entomologists present, the last-named looking much better for his recent trip to the Alps of Savoy and Piedmont. In the evening, the President of the Congress, Sir J. Lubbock, held a reception at the Natural History Museum, South Kensington. The "Bijou Orchestra" was engaged for the evening, and one noticed, in addition to many of the entomologists already enumerated, Messrs. Enock, E. Saunders and C. O. Waterhouse.

On Sunday evening (August 28th) the Royal Societies' Club held a reception at their rooms in S. James' St., W., in honour of the Congress, and very generously entertained their guests.

Tring was the final scene of what was, for most of us at least, a most enjoyable ten days, and made a very fitting finish. Nothing that could be done to make the visitors to the celebrated Museum comfortable was omitted, and all must be grateful to the Hon. Walter Rothschild for the magnificent manner in which he entertained his numerous guests at luncheon.

Several members of the Congress availed themselves of the nearness of Wicken and Chippenham Fens to do a little incidental collecting. Messrs. Beare, Bouskell and Donisthorpe observed the rare Longicorne *Oberea oculata* in Wicken Fen in numbers, over forty specimens being counted; each of the party selected a picked series for his cabinet. *Lixus paraplecticus* was also seen by them in greater numbers than usual; it is evidently spreading, as it was noted in two new localities. Messrs. Beare and Donisthorpe made a flying visit to Swaffham, where seven of the rare *Harpalus obscurus* were taken by them. At Chippenham, Messrs. Gorham, Champion and Walker took *Platycis minutus* in some numbers, and three specimens of *Staphylinus fulvipes*, whilst Mr. Gorham dug a red *Elater* (possibly *E. sanguinolentus*) out of rotten wood. They also took specimens of *Oberea oculata* at Wicken.

PRACTICAL HINTS.

Field Work for September and October.

By J. W. TUTT, F.E.S.

1.—In September and October, *Peronea lipsiana* and *P. maccana* love to sit for an hour or two in the afternoon sun, before flight, on the upper sides of bracken leaves and bilberry; *P. rufana* on the leaves of sweet gale and sallow; *P. mixtana* on the heather, etc. (J. T. Carrington).

2.—The larvæ of *Cataptria candidulana* feed on the seeds of *Artemisia maritima* in the autumn months.

3.—In late October and early November, search under bark of willow trees for the pupæ of *Poecilocampa populi*.

4.—Where there are ripe plums in autumn, find some available means of access for night work, for all the moths in the country feast by night, where flies and wasps feast by day—*Hadena protea*,

Anchocelis pistacina, *A. litura*, *Tiliacea citrago*, *Citria flavago*, *Luperina testacea*, *Gortyna ochracea*, *Polia flavicincta*, *Mellinia gilvago*, *M. circellaris*, *Miselia oxyacanthae*, etc., are the moths to be captured.

5.—The larvæ of *Eupithecia minutata* and *E. nanata* can be swept from *Calluna* in September and October.

6.—Collect the larvæ of *Eupithecia subfulvata* from leaves and flowers of *Achillea millefolium* in September and October.

7.—The seed-heads of *Angelica sylvestris* should be collected in September and October for larvæ of *Eupithecia trisignata* and *E. albipunctata*.

8.—The flowers of *Senecio jacobaea*, in September and October, give a plentiful supply of larvæ of *Eupithecia absynthiata* and *E. satyrata*.

9.—Just as we come up to the wood from Kemsing, are high banks on each side of the road. The golden-rod (*Solidago virgaurea*) on these should be carefully examined for larvæ of *Cucullia asteris* and *C. gnaphalii* (Carrington).

10.—In October, the pupæ of *Panolis piniperda* should be sought in pine woods near the roots of the trees, or by rolling back the moss under them.

11.—In October, search reed-beds for *Calamia lutosa* (Robson).

12.—The pupæ of *Eupithecia fraxinata* can be obtained all through the winter under moss and loose bark of ash trees.

13.—The cocoons of *Sesia apiformis* are to be found throughout the winter in rotten poplars and aspens (Meek). Is this correct?—Ed.

14.—In October and November, the leaves of *Orobus tuberosus* and *Vicia* should be collected for mines of *Lithocolletis bremiella*.

N.B.—For series of similar "Practical Hints," consult vol. ix., p. 240 and p. 264; vol. viii., p. 194; vol. i., p. 164, etc.

VARIATION.

Food-plants of Tæniocampa gracilis and its varieties.—With regard to Mr. Moberly's note on *T. gracilis* (*ante*, p. 203), and his statement that the larva of the red race of *T. gracilis* will not eat sallow, and the ordinary form will not eat *Myrica gale*, the following experience may prove interesting. I have fed up the larvæ of *T. gracilis* seven different times, and found them not at all easy to manage, and I think it probable that failure to rear the New Forest race has been due as much to other causes as to the fact that they do not appear to have been satisfied with their diet. That all the forms of *T. gracilis* may be fed and reared on sallow and *Myrica gale*, I have not the least doubt. I have twice reared the New Forest form. On one occasion they were sent to me when practically full-fed, and pupated almost immediately; on the other occasion, I found the larvæ when small, myself, some were very small, and I fed these at home quite successfully on sallow. I have never attempted to rear the ordinary form upon *Myrica gale*, but have found larvæ of it in the Norfolk Broads, feeding commonly on this plant and yellow loosestrife, and the Norfolk larvæ produced the palest grey imagines that I have seen, without a tinge of pink. On the other hand, the New Forest race that I fed at home on sallow, produced the special dark form, for which the New

Forest is famous. In Wicken Fen, the favourite food-plant is yellow loosestrife, but it is there also found on *Spiræa ulmaria*, the smooth-leaved dwarf willow, and probably other plants, but I have not seen it on sallow, either there or elsewhere. In confinement, I have fed it successfully upon sallow, birch, dock and lettuce. Those fed upon the latter plants produced the largest moths.—W. M. Christy, M.A., F.E.S., Watergate, Emsworth. [A later note on this subject, from Mr. Christy, will appear in our next No.—Ed.]

I once found the larvæ of *T. gracilis* in great abundance in Hertfordshire, feeding on white osier, and had no difficulty in rearing them. Some of the resulting imagines were very strongly marked. I have since found the larvæ on dwarf sallow, but have had only moderate success in getting them through to the imaginal state.—A. W. Mera, 79, Capel Road, Forest Gate, E.

Zygæna filipendulæ var. lutescens.—A quantity of pupæ of *Z. filipendulae* collected at Wrotham, Kent, on July 20th last, produced among many of the normal type, six of the yellow var. *lutescens*, the red on all the wings being replaced by yellow. These emerged on July 25th, 28th, 29th, August 5th, 7th (two), whilst the last appeared yesterday, August 28th. I have collected over the ground fourteen years, and never knew the yellow form to occur there before.—W. Smart, 29, Siemen's Road, Woolwich. *August 29th*, 1898.

CURRENT NOTES.

Lord Walsingham *(E.M.M.)* has added *Aristotelia servella*, Z., to the British fauna. The specimens on which the identification of the species as British has been based were captured by Mr. E. A. Atmore, near King's Lynn.

Mr. M. L. Thompson, Diamond Street, Saltburn-by-the-Sea, Yorkshire, asks (*Naturalist*) for the help of coleopterists in the completion of the "List of Yorkshire Coleoptera," commenced by the Rev. W. C. Hey. The group in hand at the present time is the Clavicornia, and coleopterists who have Yorkshire specimens belonging to this division are kindly requested to send particulars as to the capture as above. Of course, in compiling a list, the records of the most common, are as important as those of the most rare, species.

A most exhaustive and excellent summary of the life-history, habits, and distribution of *Cicada septendecim*, by Mr. C. L. Marlatt, M.S., is sent to us from the Government Printing Office, Washington, U.S.A.

The division of entomology of the United States Department of Agriculture has published a Bibliography of "The more important contributions to American Economic Entomology," Pt. vi., which includes the more important contributions to this branch of knowledge published between June 30th, 1888, and December 30th, 1896. This useful publication has been prepared by Mr. Nathan Banks. The catalogue runs to 273 pp., has a good index, and will be exceedingly useful to all those practically interested in the subject of economic entomology.

Mr. Kane notes the occurrence of *Platyptilia tesseradactyla* from Ardrahan, Clonbrock, and Dromoland Castle, co. Clare. He remarks that it is easily disturbed from its food-plant, *Antennaria dioica* on a sunny day.

Mr. Selwyn Image, by the capture, on July 21st last, of a specimen of *Acidalia herbariata* inside a shop in Southampton Row, Bloomsbury, has added another to the very few known British specimens of this species.

Mr. Merrifield has recently received some very fine aberrations of Rhopalocera, bred by Dr. E. Fischer, who submitted the pupæ to various temperature conditions. One very extreme form of *Aglais urticae* was produced by subjecting the pupa to a temperature of —8° to —10° C.; a fine *Eugonia polychloros* ab. *testudo* from a pupa subjected to a temperature of —6° C.; *Vanessa io* ab. *fischeri*, at 0° C. to —5° C.; an aberration, transitional between ab. *fischeri* and ab. *antigone*, at —6° C., and ab. *antigone* also produced by exposure to the same temperature. *Euvanessa antiopa* ab. *hygiaea* was produced by exposure of the pupæ from 0° C. to —3°C.

NOTES ON COLLECTING, Etc.

Lepidoptera at Hythe, Kent.—On June 21st last I went to Hythe, Kent, and stayed three weeks. The weather during my stay, though fine on the whole, was extremely changeable, the wind veering round through almost all the points of the compass in a day, and sometimes oftener. On two occasions, when the weather was bright and sunny, I went to "Cæsar's Camp," and the other chalk-hills to the north of Folkestone, and here I found *Polyommatus bellargus* in large numbers, the males considerably outnumbering the females. The majority were in excellent condition. They were accompanied by *P. icarus* (common), *P. astrarche* (a few; they seemed to be only just coming out), *Coenonympha pamphilus* (in swarms), *Nisoniades tages* and *Pamphila sylvanus*. *Zygaena filipendulae* was also abundant in the same locality, and *Z. trifolii* fairly common (one or two with the red spots coalescing) in one spot near the foot of the hill, near the rifle target. I was somewhat surprised at netting a specimen of *Agrotis exclamationis*, on the wing in the sunshine on this chalk-hill. Does this species fly by day? As far as I could judge, it flew past me from behind, while I was sitting on the ground pinning some other captures, and settled amongst the grass a few yards in front of me, flying off again when I approached, and again settling a few yards away, when I managed to secure it. I also took in this locality several *Euclidia mi* and one *Acidalia ornata*, besides *Camptogramma bilineata*, which was in swarms in splendid condition, both on the hill and in the lanes and hedges round about it. *Epinephele janira* was also common and somewhat darker than usual, and I took one *Phytometra viridaria* in splendid condition, others that I saw being much worn. On the way back, walking through Cheriton Churchyard, a fine specimen of *Sphinx ligustri* was pointed out to me by a gardener, walking over the grass. The gardener said he had disturbed it on one of the tombstones a little before I came by, and seeing my net he thought it might interest me. There is a capital privet hedge round this churchyard, but though I searched it thoroughly a few days afterwards, I was unsuccessful in obtaining either eggs or young larvæ. Can anyone tell me how the eggs of *S. ligustri* are laid—whether on the upper- or under-surface of the leaves? They must have been somewhere on that privet hedge. I found one egg of

Smerinthus populi accidentally on some poplar, which I was taking home for other larvæ, and I also found eight eggs of *S. ocellatus* on a willow bush on the banks of the canal. These are all flourishing now in the larval state, with the exception of two *S. ocellatus*, which died after their first and second moults respectively. These eggs (both *S. populi* and *S. ocellatus)* were all laid singly on the under-surface of the leaves. Sugaring produced nothing much, but what did come *(viz.*, the following) were generally in excellent condition :—*Apatela aceris* (1), *Agrotis exclamationis* (abundant), *Xylophasia monoglypha* (common), *X. hepatica* (1), *Hadena oleracea* (2), *Grammesia trigrammica* (several), *Leucania comma* (1), *Miana strigilis* (a few), and one *Eupithecia rectangulata.* I also observed the following species on the wing at dusk :—*Boarmia repandata*, *Cabera pusaria* and *Melanippe montanata* (both the latter much worn), *Cidaria truncata (russata)* (also worn), *Rumia luteolata (cratægata)*, *Plusia gamma* (very common), *Endorea ambigualis*, *Scopula olivalis* and *Aglossa pinguinalis.* On palings : *Eupithecia oblongata (centaureata)* ; and at gas lamps : *Spilosoma lubricipeda* and *Melanippe fluctuata* (the latter worn), and one *Bryophila perla* at rest on a shop window. *Pieris brassicae* and *P. rapae* were common everywhere. I found larvæ of *Orgyia antiqua*, *Leucoma salicis* and *Porthesia similis (auriflua)*, and some others which I have been unable as yet to determine, but owing to the difficulty of obtaining proper food-plants in Kensington, I did not do any systematic larva-hunting. A pupa found on the banks of the canal produced *Ebulea crocealis.*—H. Ainslie Hill, F.Z.S., F.E.S., 9, Addison Mansions, Kensington, W. *August 4th*, 1898. [Erratum.—On p. 182, line 23, for "Herne Bay" read "Hythe."—H. A. H.]

Leucoma salicis in the London district.—I hardly know whether the occurrence of *Leucoma salicis* in the suburbs is worth recording. I found a freshly emerged ♀ and empty pupa-case on a wall by a poplar, this morning. I have not seen it here before nor heard of its occurrence.—Harry H. May, Redlands, Hillbury Road, Upper Tooting. *August 19th*, 1898.

A food-plant of Callophrys rubi.—I found two full-fed larvæ of *Callophrys rubi* feeding on berries of buckthorn, at Brockenhurst, whilst searching for larvæ of *Gonepteryx rhamni.*—H. Wood, Old Grammar School House, Ashford, Kent. *July 30th*, 1898.

Abundance of Nonagria cannæ.—I have just returned from Horning, where I have obtained the finest lot of pupæ of *Nonagria cannae* that I have ever seen.—E. A. Bowles, M.A., F.E.S., Myddelton House, Waltham Cross, Herts. *August 5th*, 1898.

Abundance of Thymelicus lineola at Leigh.—On August 1st I went to Leigh, Essex, and found *Thymelicus lineola* very common, though it appeared to have been out some time. The males were more numerous than the females, the latter being in better condition than the former. *Pieris rapae*, *Epinephele janira* and *E. tithonus* were common in the same locality, with a few *Eubolia limitata (mensuraria).*—H. Ainslie Hill, F.Z.S., F.E.S., 9, Addison Mansions, Kensington, W. *August 5th*, 1898.

Notes on egglaying of Pseudoterpna pruinata.—Whilst in Epping Forest, yesterday, I captured a fair number of *Pseudoterpna pruinata (cytisaria)*, and having disturbed two, which both proved to be ♀ s, it occurred to me that I might find some ova. This

I succeeded in doing. Some laid on what I take to be the small whin, and some on some species of grass growing by the side of the patch.—J. H. Burnett, 235, St. Ann's Road, S. Tottenham. *July 28th*, 1898.

Notes on various species of Lepidoptera.—When at Capel Curig, on June 2nd and 3rd, I took *Lasiocampa quercus* var. *callunae* (?) feeding on heather, on the mountain slopes. They were from 2 to 2½ inches long. On reaching home, heather not being obtainable, I tried them on plum, which they ate readily, and are still (August 4th) feeding upon it. One has spun up, and the others seem to be getting full-fed and restless. *Adscita statices:* These were flying fairly freely at Barmouth on June 10th. *Clisiocampa neustria:* Barmouth, on June 10th, feeding in a web. I also took, at Barmouth, *Ennychia octomaculalis* (not common but widely distributed), and *M. artemis (aurinia)* in damp meadows.

When at Lincoln (July 9th) I took several *Boarmia roboraria* on oak trunks. Newman gives this as confined to the southern counties. The eggs are beautifully marked with hexagonal patterns, and hatched out in about a week, but the majority refused to feed. *Phorodesma bajularia* also taken at Lincoln on July 9th; it flies at dusk, and the ♂s assemble freely to the ♀s. The pupæ of *Thecla w-album* were found on wych elm, they are placed on the underside of a leaf, near the footstalk, and closely resemble the elm buds.—Douglas H. Pearson, Chilwell, Notts. *August 4th*, 1898.

Relaxing green Geometrid moths.—I should be much obliged if any of your readers could tell me a good way of relaxing the green Geometrids, *i.e.*, the genera, *Pseudoterpna*, *Geometra*, *Phorodesma*, *Nemoria*, *Iodis* and *Hemithea*. My usual method of relaxing, and one which I have generally found successful with other insects, is to damp the cork on one side of an ordinary zinc collecting-box, and to pin the insects on the opposite side, keeping a piece of albo-carbon or naphthaline in a small muslin bag in the box. I am afraid, however, that the damp atmosphere might interfere with the green colour of the insects referred to, and if anyone can recommend a successful method of treating these genera, I shall be much obliged.—H. Ainslie Hill, F.Z.S., F.E.S., 9, Addison Mansions, Kensington, W. *July 19th*, 1898.

Aphomia sociella.—The batch of *Aphomia sociella* referred to, *ante*, p. 183, produced in all 121 imagines, the last two emergences, one large and one small female, taking place on July 6th, 1898.—J. W. Tutt.

Tæniocampa opima in the London district.—In spite of the ground upon which *Taeniocampa opima* occurs, in this district being much trodden over, the species still survives. Last spring I captured a few imagines, and was successful also in rearing a brood, after repeated failures, extending over several years. I treated the larvæ apparently in exactly the same manner as hitherto, but, for some reason, they lived.—A. W. Mera, Forest Gate, E.

The sallows at Bishop's Wood.—Only one night's work was possible last spring, owing to bad weather. This was on April 15th, when for an hour or two moths were very plentiful. The sky cleared and—so did the moths. Three of us obtained 18 *Pachnobia leucographa*, *T. populeti* was fairly plentiful, but many species were worn; *T. gothica* was scarce, *T. incerta* almost absent, and *T. pulverulenta* the only really common species.—(Rev.) C. D. Ash, B.A., F.E.S., Skipwith Vicarage, Selby.

Abundance of the larva of Agrotis agathina, etc.—Three mild evenings, May 2nd, 3rd and 7th, were devoted to larva-hunting, and showed *Agrotis agathina* to be abundant, and those of *Scodiona belgiaria* more plentiful than usual, but no *Lycophotia strigula*, although it is possible the latter had pupated. Will some entomologist who obtains the larvæ of *S. belgiaria* tell me the best method of getting them? I fancy one misses a great many in sweeping, as they fall from the food-plant so quickly when alarmed.—Ibid.

Dianthœcia conspersa in the Broads.—I wish to record the capture of three specimens of *Dianthœcia conspersa* at Oulton Broad, last month, at light. I believe this insect has never before been recorded from Suffolk.—E. C. Bedwell, "Holmedale," Carlton Colville, Lowestoft. *July 7th*, 1898.

Lepidoptera in the Norfolk Broads.—I am just back from a fortnight on the Norfolk Broads, where I enjoyed a fair amount of success entomologically. *Leucania brevilinea* and *Calamia phragmitidis* were common and came freely to light, as did a few *Nudaria senex*. *Lithosia muscerda* was fairly numerous at dusk and light. *Helotropha fibrosa* was common, as were *Caenobia rufa*, *Tapinostola fulva*, *Cidaria testata*, and *Acidalia immutata*. *Dyschorista upsilon* came freely to sugar on some willows at Waxham. *Zygaena lonicerae* and *Z. filipendulae* flew freely in the sunshine, while *Miana furuncula*, *M. literosa*, *Agrotis tritici* and *A. nigricans* were common at ragwort. I failed, however, to take either *A. vestigialis* or *A. cursoria*, and only bagged solitary specimens of *Celaena haworthii*, *Nonagria neurica* and *Senta ulvae*, with a few specimens of *Leucania littoralis* and *L. straminea*. Three *Macrogaster arundinis (castaneae)* came to light on August 11th. I purposely omit the exact locality, but it was a very considerable distance from Ranworth; so if these were descendants of Mr. Barrett's importation in 1875, the insect is evidently now widely and firmly established. I am sorry to say I quite failed to obtain larvæ or pupæ of *Nonagria cannae*, and as I was a week too late to catch Mr. Bowles at Horning, I missed an opportunity of trying to persuade this gentleman to give me the benefit of his experience in this matter. Of course there were numbers of the commoner species which were taken in addition to the above.—Percy C. Reid, F.E.S., Feering Bury, Kelvedon. *August 22nd*, 1898.

Larva of Tethea subtusa and collecting notes from York.—I only tried the sallows once this year, *viz.*, at Bishop's Wood, Selby. The night was not a good one, and *Pachnobia leucographa*, *T. opima*, *T. populeti* and *T. munda* were the best species seen. Later, I visited the same wood and found *T. populeti* larvæ very scarce, and *Tethea subtusa*, for once, much more common. It is astonishing how rapidly *T. subtusa* larvæ grow. On May 28th, the top shoots of the poplars (the trees only being in brown leaf) were spun up, and contained tiny larvæ, not a quarter of an inch long. The larvæ at this stage differ from those of *T. populeti*, in having numerous black spots on the dorsum, which are absent in the later skins. From this size, the larva only takes three weeks to complete its full growth, as on June 16th, I found several travelling down the trees to pupate, whilst others were spun up in leaves, quite full-fed. I beat out a few *Zephyrus quercûs* larvæ on June 11th and 16th, but, excepting this species and *Phigalia hispidaria*, insects were scarce.—S. Walker, Queen Anne's Road, York.

Lepidoptera at Swanage.—I spent a fortnight at Swanage in early August, and obtained a fair number of *Thymelicus actaeon* and *Arge galatea*. *Bryophila perla* and a few *B. muralis* were also taken on the stone walls in the neighbourhood, but nothing else of importance. —John Henderson, 24, Birchin Lane, London, E.C.

Hydrilla palustris at Wicken.—I spent a few days at Wicken with my son, from June 13th-18th. The weather was very unsatisfactory most of the time, but we got several *Hydrilla palustris*. Altogether, from June 11th-18th, just over 40 specimens were taken.—E. F. C. Studd, M.A., B.C.L., F.E.S., Oxton, nr. Exeter.

Lepidoptera in Wales: Milford Haven and Swansea.—During the time that I was at Milford Haven, during June and early July, insects seemed very scarce, with the exception of *Anthrocera filipendulae* and *Epinephele ianira*, which swarmed inside the forts. Full-fed larvæ of *Abraxas grossulariata* were also abundant on sloe-bushes by the sea, whilst several larvæ were taken on bladder campion and *Silene maritima*. I also saw *Pyrameis cardui*. From May 7th to June 13th I was at Swansea, and found insects very scarce, my bag only consisting of about a dozen *Tephrosia crepuscularia (biundularia)*, half a dozen *T. consonaria*, a few *Nola cristulalis*, *Panagra petraria*, *Hydrelia unca*, *Callophrys rubi*, *Melitaea aurinia*, *Brenthis euphrosyne*, *B. selene*, *Euclidia mi*, *E. glyphica*, *Phytometra viridaria*, *Nisoniades tages*, *Lobophora viretata*, *Melanippe rivata* (an addition to the Swansea list), and *Tephrosia punctulata*, the latter common but worn. I also took a few pupæ of *Bryophila muralis*, but they were much scarcer than usual. At Cheltenham, *Smerinthus tiliae* were rather common about Whitsuntide.—(Major) R. B. Robertson, The Holt, Berkeley Street, Cheltenham.

Abundance of Euchloë cardamines.—I had never before seen *E. cardamines* so common in this district as it was in May and June last.—F. G. Whittle, 3, Marine Avenue, Southend.

Leucania vitellina at Sandown.—I have much pleasure in reporting the capture of a second specimen of this *Leucania* at sugar here on Thursday last (Aug. 25th). My first example was taken three years ago, and is recorded in *Entom. Rec.*, vii., p. 68, and *Trans. City Lond. Ent. Soc.*, 1894-5, p. 11. Unfortunately, neither is in fine condition. Are these specimens "blown over," or does the insect really breed anywhere in this country?—Louis B. Prout, F.E.S., Marine Villa, Sandown. *August 29th*, 1898.

Lepidoptera in Guernsey.—Everything was fully a fortnight late. *Melitaea cinxia* larvæ in April and May were in such abundance as I have not seen them for ten years. It was not surprising then in June to find the imagines agreeably numerous. The specimens, however, were curiously small—I saw many not larger than *Nemeobius lucina*—and, as a rule, they were of a poor colour. The species was fairly abundant on June 4th, and continued to increase in numbers for the following fortnight. Many larvæ were still feeding on the 17th, when a large proportion of the imagines were getting worn. This is a new experience to me. I again succeeded in obtaining pupæ of *Luperina luteago* var. *lowei*, the Guernsey form. I bred 14 in all, and succeeded in getting a couple to pair, but not to lay—but as I was travelling, and they were born in Paris and carried to Switzerland—this is not strange.—(Rev.) F. E. Lowe, M.A., F.E.S., Guernsey.

The Entomologist's Record AND JOURNAL OF VARIATION.

VOL. X. No. 10. OCTOBER 15TH, 1898.

Migration and Dispersal of Insects: Coccids and Aphides.

By J. W. TUTT, F.E.S.

So little is known of the dispersal and migration movements of the Hemiptera, that one rather hesitates to deal with the matter at all, yet, in the case of at least two groups, the *Coccidae* and *Aphididae*, the economic importance of a knowledge of their spread is so great, that no other excuse is needed for very briefly referring to them.

The Coccids and Aphidids both belong to the Homopterous group of the Hemiptera, the former being popularly known as "scale" insects, the latter as "plant-lice" or "green fly." The male Coccids, unlike other Hemiptera, have a complete metamorphosis and usually only a single pair of wings, the posterior wings being absent or reduced to mere hooks. There are, however, some exceptions to this, some species never developing wings, and in *Chionaspis salicis*, as discovered by Newstead, there are both apterous and winged forms, whilst in *Apterococcus* the male never develops wings. The female is always wingless, usually grublike and stationary, and naked, as in *Lecanium*, or covered by a waxy scale, powdery secretion, etc. Coccids that secrete a covering that becomes hard and brittle, are well illustrated by the commercial "lac" insect, *Tachardia laccae*, whilst the "soft" scales, *i.e.*, those that secrete a soft coating (the wax composing which may be easily drawn out into cottony-looking threads) include the genera *Pulvinaria*, *Dactylopius*, etc. The species of the genus *Aspidiotus* resemble the *Aphididae*, in being sometimes viviparous and, as in the latter, successive broods are developed with amazing rapidity. The *Aleurodidae* resemble Coccids in their immature (pupal) condition, and, in that stage, are fixed to the plants; in the adult stage, however, both sexes are winged, and then resemble small plant-lice.

The marvellous sedentary distribution of some Coccids suggests that they must have some ready means of dispersal, but there can be no doubt that man has been mainly instrumental in the distribution of others. This is exceedingly well shown by Green and Newstead, who give (*E.M.M.*, xxxiii., pp. 68 *et. seq.*) a list of the species found by them in the Royal Gardens, at Kew, in July, 1896, where in one day alone Green found 16 species, of which Newstead pronounced five to be new to Britain. These had evidently been imported, the various species having been introduced from the United States, Madagascar, Cuba, Trinidad, Malay, India, etc.

Local migration of sedentary species can take place in the larval state only, but this must be necessarily of a very limited character, and

hence we find many otherwise common species extremely local. Species which secrete cottony ovisacs, such as *Pulvinaria*, *Dactylopius*, *Icerya*, etc., are more liable to be borne away by the wind, and Newstead considers that there is little doubt the larvæ are sometimes carried away by the same agent, whilst the same authority thinks that "the larvæ may also occasionally attach themselves to birds or mammals, and thus get carried long distances, but such chances are very remote. The importation of infested plants plays the chief part in the wide distribution of many species."

Maskell gives much information concerning the distribution of many species, and his details give some idea of the marvellous distances these usually injurious insects must have travelled (or been carried), *e.g.*, *Diaspis pinnulifera* is found in Fiji and Demerara; *Gossyparia ulmi* has migrated from Europe to North America; *Aspidiotus aurantii* has been recorded from New Zealand, North America, Australia, Syria and Cyprus, and has probably spread to all these countries from the orange groves on the shores of the Mediterranean. *A. budleiae* and *A. epipendri* have spread from Europe to New Zealand; *A. camelliae* (Boisd.) from Europe to North America and New Zealand; *A. nerii* from Europe to North America, Australia, New Zealand and the South Sea Islands; whilst the American *A. cyaloniae* has been found in Samoa. The European *Diaspis boisduvalii* and *D. rosae* both occur in New Zealand and North America, the latter also in Australia, Fiji and Demerara. *Mytilaspis pomorum* also has been introduced from Europe into North America, New Zealand and Australia, and occurs too in North Africa; whilst the American *Mytilaspis citricola* has reached Fiji and South Africa, and *M. gloverii* has been discovered on oranges in Australia.

Other species belonging to various genera are also mentioned. From America, *Chionaspis citri* has extended to New Zealand and Australia, *Fiornia camelliae* (Comst.) to Australia, *Lecanium ribis* to New Zealand. From Ceylon, *Lecanium coffeae* has reached Fiji; whilst *Dactylopius cocotis* extends from Fiji to the Laccadive Islands. From Australia the well-known *Icerya purchasi* has extended to New Zealand, California, Cape Colony, the Fiji Islands, etc.; the New Zealand *Eriococcus arancariae* is now found in North America, and *Dactylopius calceolariae* in Fiji.

Of the European species, *Chionaspis aspidistrae* now occurs in India, *Parlatoria proteus* in North America and Demerara, *Lecanium hesperidum* and *Pulvinaria camellicola* in New Zealand, Australia and North America, *L. oleae* and *Dactylopius adonidum* in North America and New Zealand, *L. lauri* in New Zealand and Australia, whilst *Lecanium depressum*, *L. hemisphaericum*, *L. hibernaculorum*, *L. maculatum*, *L. mori*, have been found in New Zealand, and *L. rosarum* in Australia.

Although little is known of the migration of the Coccids, the migrations of the Aphidids have been the subject of considerable observation, not so much on account of their great extent, as from the havoc which the insects work. Little is known of the distribution of these insects south of the Equator; they have, however, been recorded from Madagascar, New Caledonia, New Zealand, etc. They occur in India, but are best known in their habitats in the north temperate and sub-tropical regions of the old and new worlds.

Their movements appear to be of two distinct kinds: (1) Local movements, which take place regularly, from one food-plant to another in spring and autumn. (2) General dispersal movements, when vast bodies of winged Aphidids move from one district to another.

Local migration of certain species of aphides takes place regularly, especially in the case of those that live on herbaceous plants during the summer. These species migrate regularly in autumn to a substitute plant, which provides them with shelter, usually a woody plant or tree, during the winter, and return to their summer pabulum in spring. Thus the hop-aphis (*Phorodon humuli*), which sometimes causes such great injury to the hop crop during the summer months, is reputed to migrate in autumn to various species of *Prunus*, growing in the near neighbourhood. When the hop-vines mature and die, the aphides fly to *Prunus*. Here the true males and females (*Phorodon mahaleb*) are produced, and true eggs are laid. The eggs pass the winter in this stage. In spring they hatch, giving birth to sexless aphides, for, although they give birth to viviparous young, they can scarcely be called females, since no corresponding male is known. The viviparous stem-mothers go on producing young parthenogenetically, and after one or two generations have been produced upon the plum, winged forms develop and migrate back to the hop-plants for the summer. We have it on Lichtenstein's authority that *P. mahaleb* is the same insect as *P. humuli*, the two representing only different stages of its existence. In America, there are parallel instances of a similar method of migration. The "melon louse" migrates from orange-trees to the melon, another aphis (*Ostrya virginica*) migrates between geranium and hornbeam; another from the common reed to the plum, whilst a fourth passes from the milkweed (*Asclepias*) to the oak-tree.

The Pemphigians or gall-making Aphidids, have also been shown to migrate from one food-plant to another. Thus the gall-louse of the *Lentiscus*, *Aploneura lentisci*, passes, when it becomes winged, to *Bromus sterilis* and *Hordeum vulgare*, and there deposits apterous young, which feed on the grass roots during the winter, and in spring become winged and return to the *Lentiscus*, where they deposit the sexuated pupæ. From these pupæ both males and females, "without rostrum," emerge; these copulate, and the female lays a single egg, from which proceeds the gall-maker, so that a Pemphigian presents the following stages: (1) The "egg" (only one laid by each female). (2) The "fundatrix" (first larval state) which forms the gall, and moults four times. (3) "The pseudogyne," which is vivigemmous, and fills the gall with its proles. (4) The "emigrant pseudogyne" (second larval state), winged and vivigemmous, which leaves the gall and flies to gramineous plants. These deposit (5) the "gemmantia" (third larval state), which have an unlimited power of apterous reproduction underground. From these, colonies of nymphs giving a winged form, are developed. The winged form is (6) the "pupifera" (fourth larval state), which carries back to and deposits on the *Lentiscus* the egg-like pupæ, from which the little apterous male and female lice emerge; these copulate, the female lays the fecundated egg, and the cycle is completed (Lichtenstein).

Kessler found the winged pupifera of *Tetraneura ulmi*, the well-known elm gall-aphis, depositing on the elms the sexual forms (without a rostrum), and later, Lichtenstein proved that the young of

Tetraneura ulmi fed on the rootlets of maize (*Zea mais*), and his observations showed that the "fundatrix" comes out of eggs deposited in the crevices of the trunks of elms in the beginning of May, and forms a gall on a leaf. He also showed that in the gall the "fundatrix" deposits a great number of young, which all acquire wings. These migrate and deposit young, which are apterous and subterranean, feeding on roots of maize for a fortnight. The descendants of these apterous forms develop wings and return to the elm trunks. Here they produce sexual forms, which copulate and lay eggs, and thus complete the cycle.

Lichtenstein later proved that *Pemphigus pallida* of the elm migrated to mint, and produced the form previously known as *Rhizobius menthae*, which in turn went back to elm. Also that *Pemphigus bursarius* migrated from poplar to *Sonchus*, producing *Rhizobius sonchus*, which in turn went back to the poplar, etc.

The migration of *Phylloxera vastatrix* is somewhat different. This species winters on the roots of the grape-vine, in an apterous condition, and the apterous form commencing to grow rapidly in spring, produces viviparous young, which are also wingless and sexless, and continue to produce young asexually. About midsummer some individuals acquire wings, and migrate to other vineyards in their vicinity. These migrants lay eggs of two sizes, the larger of which produce sexual females, the smaller, males. These sexual insects exhibit many modifications when compared with the asexual form. They cannot fly nor feed, for they have no wings, and the mouth organs are aborted. After pairing, a single egg is produced by the female, and this produces an asexual form, which will be ready to go on with the work of reproduction (and destruction) the following spring.

In these cases it will be observed that the migration of the gall-making aphides and *Phylloxera* is directly connected with the food-supply, the winged forms selecting a plant on which the asexual forms, resulting from the "stem-parent" emerging from the fertilised egg, will find nourishment for their parthenogenetic progeny.

The general dispersal movements of aphides, *i.e.*, those instances in which large numbers of winged aphides change their location in vast swarms, are of an entirely different character. These swarms are the parthenogenetic progeny of the "stem-mothers," which are produced in spring from fertilised eggs. The "stem-mother" is wingless, and grows rapidly by sucking the juices from the leaves of the plants on which it finds itself. All the young born of this "stem-mother" are also without sex, *i.e.*, they are not sexually developed females, and each is capable, in a few hours, of producing viviparous young. The fecundity of aphides is almost incredible. It has been estimated that many millions are produced from a few parents in the course of a few weeks at most, under favourable conditions. Unfavourable meteorological conditions, however, soon check their increase, and the influence of the weather in early spring is often such that it determines whether or not the insect will be a pest later in the year.

Assuming the weather conditions, however, to be favourable, viviparous reproduction goes on at a very rapid rate. By means of artificial heat Kyber kept up the viviparous reproduction of certain aphides for four years, the progeny of which, at the end of that time,

were as strong and organically capable of going on with this form of reproduction as any previous generation. We do not know whether this mode of continuous viviparous reproduction takes place in tropical regions, but it appears quite possible. At any rate, viviparous broods continue to be produced so long as a high temperature is accompanied by an abundance of food. A diminution of sap and an accession of cold are sufficient to produce, almost at once, sexual forms, when eggs are laid, and these in turn go over the winter.

It would appear that, although most of the parthenogenetic progeny are normally wingless, individuals of any brood after the first (that produced from the winter eggs) may become winged. These fly to other localities, and found new colonies wherever suitable food may be obtained. The exact cause which produces these winged forms is scarcely known, but they appear to follow directly on a long-continued drought, or (in the autumn) on an accession of low temperature. Any cause that will check the flow of sap in the plants on which the aphides feed appears to be sufficient, and hence the insufficiency of the food-supply has been assumed as the actual cause of their moving from one place to another. The area over which migration extends, therefore, is generally identical with that affected by drought or similar circumstances. The distance traversed by any particular moving body of aphides is probably not a great one, but swarms of *Phorodon humuli* and *Myzus cerasi* have been reported as crossing from Essex into Kent, and in 1885, Norris describes the aphides as migrating in "clouds," in Hunts, from July 26th-29th.

Continued periods of drought, then, are generally accompanied with the migration of winged aphides, and continued periods of drought are frequently the result of a continued east wind. In Kent, especially in the hop-growing districts, where aphides are frequently a terrible curse, the farmer insists that the east wind brings the "fly," as he terms the insects. The "fly" and the "east wind" appear together, and therefore, he argues, the wind has brought the insects. As a matter of fact, as we have just seen, the east wind has "brought the fly," but not in the way the farmer supposes.

The migration of aphides in this manner, and in this state, appears to be purely mechanical. They rise from their resting places, and the wind carries them wherever it listeth. They are borne along by the very wind, maybe, that caused their appearance, and hence we have an explanation of the usually erroneous suggestion made by the farmers as to the connection between the aphides and the east wind.

Sometimes these migrations, although apparently perfectly involuntary, take place on a large scale, myriads of these tiny voyagers being carried great distances, and giving rise to the "blights" of the farmer. In their wanderings they are sometimes accompanied by numbers of *Syrphidae* and ladybirds (*Coccinella*), which prey on them, and help to keep them in check.

Not only are these large flights of aphides frequently met with in one's walks in fields and country lanes, but they may be sometimes observed in quite unexpected localities. On one occasion the beach between Bournemouth and Poole was, for some distance, ornamented with a mossy-looking green track, which varied in width from one to four inches. This line was left at highwater mark by the tide, and extended for about a mile in length. It consisted of "millions upon millions of aphides, belonging to a species closely resembling, if not

identical with, those infesting the sycamore and other trees." It was stated at the time that the aphides had evidently only been recently deposited, because, although agglutinated together in masses, very many of them showed signs of vitality. The day previous to that on which they were found had been very calm, but the weather had changed in the night, when it became windy, and it was supposed at the time that, although probably the greater part of the number composing the flight reached the shore, yet, the rear rank was blown back by the wind into the sea. It is equally probable that the aphides came from the land, and were deposited by the wind in the sea, instead of on green fields or in orchards, and that the tide afterwards washed up and deposited the dead bodies. It is most difficult to determine whether such a flight as this is composed of would-be emigrants or immigrants.

Although these general migrations appear to be involuntary, and the aphides are, during their progress, the sport of the wind, which may deposit them in green fields or in the sea, the autumnal migration to another food-plant, when the supply of sap provided by its summer pabulum begins to fail, is far from being so. In this case the movement is due to a definite cause, and not only do the insects provide themselves with food for a longer period in autumn, but they select a home where the sexed forms (the development of which almost immediately follows this migration) find a suitable place to lay their eggs. Pairing takes place almost immediately after the appearance of the sexes, and the eggs are at once laid. The number of eggs laid by the female is usually very small; sometimes only one is produced, and this may remain within the body of the female, the shrivelling skin of the latter enveloping and forming an extra protection to the ovum.

Nor can the migrations of certain aphides which take place at the instance of ants that preserve their eggs, etc., be considered by any means involuntary. Many species of aphides have a pair of little tubes projecting from the upper surface of the end of the abdomen. These are called honey-tubes, and from them, after secretion, is poured out a sweetish liquid, termed "honey-dew." For this honey-dew they are kept by ants, who not only feed on the honey-dew when it is voided, but actually milk the aphides to make them part with it. Some species of ants collect the eggs of certain aphides in autumn, store them during the winter, carry them out and place them in favourable positions for hatching during the spring, and visit the aphides in order to obtain the "honey-dew" they secrete in the summer. Sometimes the ants move the colony from one place to another. It is quite evident that such migrations as these are governed by the ants.

There appear to be practically no records of migrating Hemiptera other than the groups already noticed. Scott records that in September, 1875, three specimens of *Cryptacrus pinguis* were captured floating on a piece of old sail at the entrance to the London Docks. As this is a species belonging to Cape Colony, there can be no doubt that the individuals in question had been introduced by shipping, as are many exotic Coleoptera and Lepidoptera almost every year. Mr. Manger has shown me an example of *Cicada mixta*, that flew on board ship 25 miles off the coast of Ceylon, which suggests that these insects may perform considerable journeys from their native place, although no systematic observations appear to have been made thereon.

On a recurring aberration of Zonosoma annulata.

By W. S. RIDING, B.A., M.D., F.E.S.

During the last seven years, I have twice netted in this neighbourhood (East Devonshire) imagines of *Zonosoma annulata*, which have lost the black ring on the fore-wings, and each year, since 1893, have bred one or more similar aberrations—10 in all—from larvæ collected in the autumn, or their progeny, but I have not been successful till this season in breeding it in any number.

In September, 1897, I collected larvæ by beating the maple in the hedges over a small area, the same as in previous years, and somewhat less than two-thirds pupated, the rest being stung by ichneumons. The pupæ produced perfect insects during the whole of the month of May, 1898, and amongst them were five of these aberrations, all ♂ s. In three others, the omicron on the fore-wings was very indistinct, though traceable, and four formed a gradation between the latter and the type here, in which the black ring is sharply defined. The aberrations were nearly 7 % of the whole brood, and three had the ring on the hind-wings very indistinctly marked as well.

For description, I shall call the aberration where the omicron is absent on the fore-wings, ab. *obsoleta*, and where it is absent on both fore- and hind-wings, ab. *bi-obsoleta*. The latter is rare, I have only one specimen, though in many the rings on the hind-wings are faint and imperfect, in some there being only a mere trace.

Some 20 or 30 years ago, Mr. D'Orville took the aberration at Alphington, near Exeter, about 12 miles from Buckerell, and described it in *E.M.M.*, but it was not named, and I cannot find any further record since. In his cabinet at the Exeter museum, *Z. annulata* is represented by five specimens, one of which only is the aberration.

In previous years, I have both bred insects in which the black ring is imperfectly developed, and captured them flying with a large majority of the type, and their constant recurrence shows that the aberration is persistent and influencing the latter. In ab. *obsoleta*, the ancestral position of the omicron is recognisable (more easily with a pocket lens) by the paler central scales which persist, though the black ring is lost.

I paired three of the May aberrations with three typical ♀ s on May 7th, 8th and 11th. Ova were laid within a few days, and hatched about May 20th, and by June 23rd the larvæ had all pupated. The first imago (2nd brood) appeared on June 30th, and the last on July 7th. There were 78 in all, 21 (14 ♂ s and seven ♀ s), or 27 % were ab. *obsoleta ;* the rest (25 ♂ s, 32 ♀ s) were typical Buckerell 2nd brood. 27 %, therefore, took after the male, and 73 % after the female parents, and, as one would expect, there were no intermediates, such as I have mentioned above, as met with amongst the insects breeding in the lanes under natural conditions.

The imagines of the 2nd brood differ considerably from those of the 1st. They are dusted with black scales over the fore-wings, more sparingly on the hind-wings, giving them a somewhat dusky hue. All the markings are well defined, but the yellowish ground colour is replaced by pale reddish ochre, which is generally diffused over the whole area of the wings.

Four of these ab. *obsoleta* (2nd brood) were paired on June 30th

and July 1st (one of the ♀ s having very imperfect rings on the hind-wings), and six others a few days later. Their ova began to hatch on July 9th, and the larvæ fed during the remainder of July, and pupated during the first week of August. The first imago of these 3rd broods appeared on August 10th, and the last on August 19th. The autumnal emergences formed 15 % of the pupæ, the majority are passing the winter in the latter stage. All the insects were ♀ s except one, and were without the omicron on the fore-wings, also with one exception. One was ab. *bi-obsoleta*, and in 14 the black ring on the hind-wings was very imperfect, in several only just traceable.

No generalisation can be made till the 3rd broods are complete by emergences from the pupa as 1st broods of 1899, but it may be noted that amongst the autumnal emergences there was only one reversion to the ♀ grandparent, and this was an aberration in other respects (1 in 32), and that all were ♀ s with the one exception.

An experimental enquiry into the struggle for existence in Aglais urticæ.

The Bristol meeting of the British Association was a great success in many ways, but entomology did not seriously contribute to the bulk or importance of the proceedings. Prof. Poulton, in fact, presented the only papers that were clearly entomological. One of these, *viz.*, "The proof obtained by Guy A. K. Marshall that *Precis octavia-natalensis* and *P. sesamus* are seasonal forms of the same species," was illustrated by the parent specimen of the red form, which laid three eggs, and the butterflies bred from two of these, one of which was of the black form, and the other a somewhat modified red one. The other paper, by Prof. Poulton and Miss Cora B. Sanders, "An experimental enquiry into the struggle for existence in certain common insects," related certain experiments on pupæ of *Aglais* (*Vanessa*) *urticae*, of which we shall probably hear more when the results have been fully worked out. The experiments consisted in exposing pupæ of *A. urticae* in various as natural situations as possible, trees, rocks, palings, etc., and noting whether they remained till emergence or disappeared. The *modus operandi*, and the many difficulties that had to be encountered and overcome in the experiments, were narrated by Miss Sanders. The total number of pupæ exposed was something like 600, about 100 in the grounds of Magdalen College, Oxford, and the remainder in Switzerland, and in the Isle of Wight. The most important result obtained was that there is most unquestionably an intense struggle for existence in the pupal state in *A. urticae*; at Oxford, amounting to almost complete extinction, only 4 % surviving. In Switzerland (Mürren), a majority escaped, whilst in the Isle of Wight there was a greater equality between those that fell a prey to enemies and those that survived. Prof. Poulton was not able to assert that the colour of the pupa had any decisive effect on the result, but in one little group of pupæ exposed on trees two light pupæ were the first to disappear, whilst golden pupæ, on nettles, were comparatively safe, and so far, the results pointed rather to such protection from colour being shown; but it remains for a full analysis of the observations to be made, before the outcome

can be definitely stated, and it must be admitted there is room for doubt. Pupæ on smooth palings were annihilated, showing form to be effective. Watch was kept on several occasions to detect the destroyers, but though pupæ disappeared during the watch in a good many instances, nothing was seen except in one case, in which a tit took a pupa. This points, perhaps, to mice rather than birds being the more active destroyers, as Prof. Meldola suggested, noting the experiences of many sugarers for moths, who have found mice searching their sugared patches. It strikes us as curious that golden pupæ on nettles should have been the safest, if this on analysis proves really to have been the case. If this were so, this should be the most usual situation for pupation, whereas it is most exceptional, so much so that golden pupæ found on nettles are almost always stung by parasites, that is, only those remain and pupate on the nettles that are too weak to attempt the journey of 20 to 100 yds., that all healthy larvæ make to find a proper place in which to suspend themselves. The experiments are most interesting, as an attempt to give us a numerical measure of what we only know generally, or, in truth, only surmise. Their importance from this aspect cannot be exaggerated, as leading the way, let us hope, to much more work of the same kind. We shall look for the full analysis promised us with much expectation, and even if the results in some aspects are not very decisive, that is perhaps only to be expected in a fresh and difficult field of research.

Entomological Subjects discussed at the International Zoological Congress, 1898.

As supplementing the interesting notes on "The fourth International Congress of Zoology," held at Cambridge during the week August 22nd-27th, in our last issue, the following, dealing with other entomological matters of interest, appear to be worthy of notice.

Experiments in the crossing of local races of Lepidoptera.—Among the various objects of zoological interest placed in the zoological laboratory were exhibits by Mr. Bateson, illustrating experiments in the crossing of local varieties. Two species were especially interesting, *viz.*, *Pararge egeria* and *Pieris napi*. In the case of *P. egeria*, the forms of the species occurring in western Europe were well illustrated by a large black-board, on which was sketched a map of western Europe, and actual specimens were pinned on the board at approximately their places of capture on the map. This arrangement exhibits at once to the eye the distribution of *P. egeria* and var. *egerides*, and did so completely for the purpose of the exhibit, though for faunistic purposes a map taking in a larger area would no doubt be necessary. (1) The southern form (*egeria*) was shown to inhabit Spain, western France, south of the Loire, and the lower Rhone Valley, the actual localities being Gibraltar, Granada, Jaen, Biarritz, Landes, Vienne, Poitiers, Avignon, Tarascon. (2) The middle form (var. *intermedia*) occupied a zone round this, *viz.*, the lower Loire Valley, Brittany, Savoy and the Riviera, the localities illustrated being Avranches, Cancale, Balleroy, Gavrinis, Chambéry, Nice. (3) The northern and Alpine form (*egerides*) occupied England, Paris,

Doubs, examples being shown from Paris, Caen, Besançon, England. It was interesting to note the influence of the proximity of the Alps in bringing the middle form to the Riviera, where the southern form would, the Alps apart, have been a more likely form. Those from Nice were almost more *egerides* than *egeria*, when compared with the representatives of these forms on the map, and must be within the influences of crossing with Alpine races. The northern form, in one of its types, is no doubt well known to most of our readers; the southern one varies somewhat from different localities. It has comparatively little black marking, and the fulvous is so bright and red that the superficial aspect of the specimens to a British eye is much more that of *P. meyaera* ♂ than *P. egeria*. Mr. Bateson shows a number of broods bred from crossing, of the extreme forms. There are no doubt many points of interest to be elucidated from these when fully studied. We noticed, for instance, in one or two broods a tendency to increase the *Vanessa*-like angle to the fore-wing, of which *P. egeria* usually shows somewhat more indication than the mass of Satyrids. The point that Mr. Bateson emphasises is that there is practically no indication of discontinuous variation in the various broods. The specimens may broadly be described as all falling within the limits of the middle form, none tending to be either of the southern or northern type, still less no tendency of any brood to divide into two groups.

The other portion of Mr. Bateson's butterflies is more interesting. These consist of numbers of broods showing the results of crossing *Pieris napi* of the Italian form with *Pieris* var. *bryoniae*. It is generally believed, and is probably true, that *bryoniae* is a single-brooded form. Mr. Bateson, however, shows a summer brood of *bryoniae*, artificially reared by him in England. These are like no forms of *P. napi* that we remember to have seen, certainly, at least, not in quantity, as a race. The most curious feature they have is a strong tendency to a dark border, on the pattern of *Colias*. This same tendency crops up in some of the crossed broods. The crosses, both between the two forms and between either form and the crossed progeny, appear to be quite fertile. Besides the number of unusual forms of *P. napi* which they present, it is remarkable that some broods appear to be fairly intermediate between the parent forms, whilst in others the specimens are fairly spread throughout the interval between them, and in one or two there is marked *discontinuity*, one portion of the brood favoring *P. napi*, the other, var. *bryoniae*, but with few intermediate specimens. These various results in crosses of the same forms are of extreme interest, and we shall await with much expectation the full details of the results when Mr. Bateson has secured and analysed the material he is now accumulating.

We had the pleasure of seeing Mr. Bateson's garden in which these experiments are carried out, and admired the simplicity and completeness of the arrangement for these experiments. He finds no difficulty in getting the butterflies to pair and oviposit. The apparatus consists of a box placed in the garden, open to the weather, and covered with gauze. The box is about 30″ × 18″, and contains a supply of flowers in a glass and of the food-plant growing in a pot. Some shade is provided by a partial covering of canvas thrown loosely over. Mr. Bateson has long ranges of these boxes and of pots of the food-plants to which the insects may be removed and on which they are sleeved after oviposition has been completed.

He exhibited also the tegumina of the ♂ s of *Anthrocera lonicerae* and *A. filipendulae*, and of the hybrids raised by Mr. W. H. B. Fletcher. These showed a great difference between the two species, whilst in the hybrid the form is intermediate.

Preparations of embryo Gryllotalpa.—Another most interesting exhibit was that of Dr. Heymons, who showed the preparations of the embryo of *Gryllotalpa*, made in 1894, and figured in his paper. They are most beautiful, and indicate every detail that his figures exhibit most completely. Similar preparations of the embryo of Myriapods of which he has yet only published a preliminary account, are equally beautiful and interesting, and show that the Myriapods are nearer the insect stem than has usually been the accepted opinion.

Collection of Termites.—An exhibit of importance was a selection from the Haviland collection of Termites, made in Malaya and Borneo (Singapore, Malacca, Celebes, Sarawak, etc.), containing an enormous number of specimens of many species, obtained apparently in each instance from the nests, and containing in each case the queen and usually the king, and numbers of the other forms making a community, and all kept together, so that no doubt could arise as to which workers, soldiers, winged forms, kings and queens belonged to each other, and eliminating all the uncertainties due to having to piece together examples taken outside the nest.

An aquatic grasshopper.—A curious specimen from Fiji, not shown so as to be easily examined, however, was a grasshopper about ¾ of an inch long, of aquatic habits. It frequents the running water of rapid streams, hopping on the surface of the water, and has a modification of the hind-legs to suit its environment. On either side at the extremity are a row of five or six long spines or filaments, making a gridiron-like structure, which must give the insect a good hold of the surface of the water, especially if, as is no doubt the case, these appendages are lubricated so as to repel the water, as in other insects inhabiting water surfaces. We could not see clearly what these filaments really were, but they seemed to be expansions of the double row of tibial spines.

Reproduction of lost parts in Blattidæ.—Mr. Brindley showed specimens illustrating reproduction of lost parts in the legs of *Blattidae*.

Larvæ of Lamellicorn beetles.—Mr. Warburton exhibited larvæ and drawings of preparations of the mandibles of sundry Lamellicorn beetles, showing that these larvæ, which are large whitish, fleshy grubs, all very much alike, may be readily distinguished from each other by the peculiarities of the stridulating surface on the inner aspect of the mandibles. *Melolontha*, *Lucanus*, *Geotrupes*, *Phyllopertha*, *Cetonia*, *Rhizotrogus*, and others, were illustrated.

Marine Dipterous larvæ.—Mr. Geo. Swainson had a very interesting exhibition of preparations, with drawings of several marine Dipterous larvæ, for a description of which our space is inadequate.

Evolution of colour in Lepidoptera.—In the sections, Mr. Piepers read a paper on the "Evolution of Colour in Lepidoptera." He merely stated his theory that the original colour in the oldest forms is red, and that this passes in a certain order to white, but gave no illustration, nor did he state by what other criteria he recognised the oldest forms. These are probably given in papers published abroad in media not familiar to English students, and there is probably a better basis for Mr. Piepers' views than we gathered from this paper.

Colour of Lepidopterous Chrysalides.—M. Bordage, Director of the Natural History Museum, Ile de la Réunion, gave the results of some experiments, showing the relation of the colour of the chrysalids of certain Lepidoptera to that of their environment. The species experimented upon were *Atella phalanta*, *Euploea goudotii*, *Danais chrysippus*, *Papilio demoleus* and *P. disparilis*. *A. phalanta* has, normally, two types of chrysalis (1) bright green, with silvery carmine-tipped tubercles, (2) silvery-white in ground colour. Metallic and bright-coloured surfaces gave a preponderance of the silvery-white forms, whilst dark-coloured surfaces gave green forms. In complete darkness, almost black chrysalids were developed, destitute of brilliant points, and from these dwarf imagines were reared. The experimenter considered that the intensity of the light was the important factor. The brilliant tubercles rendered even the green chrysalids conspicuous on the foliage, and it was found that birds rejected them after a single trial. *E. goudotii* has a chrysalis that may be (1) silvery, (2) greenish-gold in colour. The colour of the place of attachment was found to have no influence on the resultant colour, but gold surroundings gave a preponderance of the greenish-gold form, and silver of the silvery-white form. In darkness, brownish-black bands and spots were developed on the silvery ground. This chrysalis is also rejected by birds. *D. chrysippus* has three types of chrysalis, (1) pale rose, (2) bright green, (3) yellowish. The experimenter found, with Trimen, that there is little sensitiveness to colour surroundings, though Morris came to a different conclusion. Metallic surfaces, however, gave more green forms, while dark surfaces—and especially complete darkness—increased the number of the paler forms. The chrysalids of the two Papilios showed no sensitiveness to the colour of their environment. The contrary results obtained by some experimenters was assumed to be probably accidental, their conclusions being based on very few examples. These Papilios appear to have lost any sensibility to colour that they may have at one time possessed.

Mr. Roland Trimen considered that the paper of M. Bordage was of great interest. Of the five specimens, three were of wide African distribution, and two of them, *Danais chrysippus* and *Papilio demoleus*, he had himself experimented on at the Cape, and found that while the *Danais* did not respond to artificially-prepared surroundings of different colours, the *Papilio* did respond, to some extent, *viz.*, when the colours (shades of green and brown) more or less corresponded with the surroundings found in the natural environment. *P. lyaeus*, a near relative of *P. disparilis*, of Réunion, had been shown by Mrs. Barber of Grahamstown—who had bred a large number—to be highly sensitive as a pupating larva, the pupa reproducing the green of leaves, the brown of bark, the yellow of planed deal, and the red of brick.

The morphological constitution of the imaginal insect head.—M. Janet gave the results of his studies on the morphological structure of the head of the ant. After having recapitulated the criteria, hitherto employed to determine to which of the embryonic segments the different parts of the integument of the imago correspond, he attempted to show that a study of the musculature furnished an additional criterion, confirming the results arrived at by other methods, and filling up certain lacunæ which those methods had left void. After some preliminary considerations, the object of which was to show that

a muscle with its insertion belongs entirely to one and the same segment, he proceeded to examine the musculature of the head. He found that all the internal organs of the head, as seen in transverse section, fall into easily recognised groups. The upper portion is formed by the "proto-cerebral" segment, while the lower part is derived, for the most part, from the mandibular segment. But within this lower portion are to be found the derivatives of the maxillary segment, which again enclose organs developed from the labial segment.

Dr. Heymons said that M. Janet's conclusion, based principally upon a very careful study of the muscular system of the imago, that the insect head is derived from six segments, one pre-oral, five post-oral, is quite in accord with the results obtained by those who have studied the embryology and the segmentation of the nervous system in insects. Compared with this main point, the differences in matters of detail which are necessarily the result of approaching the problem by different methods, are quite unimportant. It should be remembered that even in the embryo, the boundaries of the mesoderm somites do not precisely agree with those of the ectoderm segments to which they belong, the somites always encroaching to some extent on the following segments. As the muscular system arises from the mesoderm somites, it is easy to understand that the insertions of the muscles in the imago cannot always quite agree with the boundaries of the segmental plates of the skeleton originating in the ectoderm. A thorough comprehension of the structure of the insect head must be attained by a careful comparison of all the facts given by embryological and morphological study, and it is not safe to carry too far the deductions to which one particular series of facts would seem to point.

Dr. Sharp considered that M. Janet had advanced a most able and brilliant hypothesis as to the relations of the complex structures of the imago to the simple structures of the embryo, but it would remain for the study of metamorphosis to corroborate or to contradict the details of the supposed homologies.

Classification of insects.—Dr. Sharp read a short paper giving a new classification of insects. He pointed out that there were difficulties in the arrangement by metamorphosis dividing them into those having complete, incomplete and no metamorphosis, and proposed a division into *Exopterygota* and *Endopterygota*, or those having the wings during the earlier stages as external buds, and those having them as internal imaginal discs, adding *Apterygota* for wingless insects (*Thysanura* and *Collembola*) and *Anapterygota* for forms wingless, probably from loss of wings once possessed. Dr. Sharp's selection of this wing character is probably a very satisfactory one, but we do not quite agree that the classification is a new one. The division is still into *Metabola* and *Ametabola*; but this wing character is probably a much better one for distinctly and properly separating these than those usually noted. In only one minor point does Dr. Sharp appear to us to be in error, and that is in a suggestion that the *Apterygota* (*Collembola*, etc.) may be transition forms between the *Exopterygota* and the *Endopterygota*. The characters in which the two latter agree together and differ from the former, are too numerous and important to make this possible, whilst a redevelopment of wings after an absence as complete as in *Thysanura* would have been

very unlikely to have occurred on the same lines. Dr. Sharp did not tell us how the external wing-buds became internal, nor do we know of any transitional form, but precisely the same phenomenon of external organs becoming internal (imaginal discs) may be seen within the limits of one order, as in the Hymenoptera, where *Tenthredo* has legs in the larval stage, and most of the other families have not. We have, indeed, the same phenomenon occurring in the life of a single individual, in the Coleoptera of Melöid affinities, *Melöe*, *Sitaris*, *Rhipiphorus*, *Cantharis*, *Stylops*, etc., and the question could no doubt be investigated here by modern methods with some facility.

COLEOPTERA.

Notes on the British Longicornes.

By HORACE DONISTHORPE, F.Z.S., F.E.S.

(*Continued from* p. 223.)

There are three British species of *Clytus*, the first, *Clytus arcuatus*, L., being very rare. Some of the captures have undoubtedly been importations, those from West Greenwich being from a shoe-last factory. Dr. Power, however, took it in Epping Forest, and so did Mr. Waterhouse and his brother, out of an old cherry-tree. The wild cherry may be its proper pabulum, and thus account for its rarity. It is a large glossy black insect, with yellow spots and bands. *Clytus arietis*, L., the commonest species of the other three, somewhat resembles the last insect, but is neither so large nor robust, and the yellow bands are differently arranged. It occurs in old posts and rails, and may also be taken by beating blossoms and sweeping flowers. It is generally distributed from the Midlands southwards, rarer further north. I have seen it in numbers running on fresh felled trees, from which the bark has been removed, in the New Forest, and have taken it in Leicestershire, and at Chiddingfold, etc. *Clytus mysticus*, L., is very differently coloured from the last two species, being of a black hue marked with chestnut, red and grey; it is widely distributed, but decidedly local. It is to be taken by beating hawthorn blossoms. I have taken it in the New Forest, at Darenth Wood, in Huntingdonshire, and in Richmond Park, in March, out of a hawthorn bough. It has been taken in Leicestershire by Mr. Woolley. The next little species, *Gracilia minuta*, F. (*pygmaea*, F.), is called the "Basket Beetle," being generally found in old baskets and hampers. It is a small brown inconspicuous insect. I have taken it by sweeping in a meadow at Kingstone, and in numbers by beating an old basket at Hastings (out of which, by the way, I also got a series of a small foreign Longicorne, *Leptidea brevipennis*, which has short elytra; it has been taken several times before in England). It occurs in Leicestershire. I have a specimen I took in Leicester in 1882. *Obrium cantharinum*, L., is a very rare, graceful, yellowish insect. It has only been taken by Dr. Power since Stephens' time. The doctor bred it in some numbers from aspen bark from Wanstead. It also occurs in apple-trees.

The next genus, *Molorchus*, has the elytra strongly abbreviated, with the true wings exposed. We possess two species, of which *Molorchus minor*, L., is the larger. It used to be considered the rarer, but I

should think the second species is the rarer now. *M. minor* is, however, undoubtedly rare, and also very local. It is to be taken by beating hawthorn blossom, and also on *Umbelliferae*. I have taken it by beating hawthorn blossom at Mickleham. It appears to be chiefly confined to the London district; but I understand Mr. Bouskell has taken it at Owston Wood, in Leicestershire. The other species, *Molorchus umbellatarum*, L. (*minimus*, Scop.), is smaller, and has not the white streak on each elytron like *M. minor*. It is taken on hawthorn blossom, also by beating dead hedges, and sweeping under fir-trees, etc. It likewise appears to be confined to the London district.

The species of the genus *Rhagium* have short antennæ. Of our three species, two are widely distributed throughout the country, the third, however, is chiefly confined to Scotland. *Rhagium inquisitor*, F., is common everywhere; it is found in oak, elm, ash, and other trees. It has a black spot on each elytron, enclosed by wavy yellow bands. It is fairly common in Leicestershire. I have taken it in Epping, Tilgate, the New Forest, etc. *Rhagium indagator*, Gyll., is chiefly found in Scotland; it has, however, been recorded from Shropshire, and doubtfully from two other English localities. It is easily to be distinguished from the preceding, by having the raised lines on the elytra continued almost to the base. It occurs in birch and fir. The third species, *Rhagium bifasciatum*, F., is confined to the fir. It has two distinct yellowish bands on each of the elytra, which are sometimes confluent. This species varies considerably. I have taken specimens in the New Forest with the greater part of the elytra testaceous. This insect is also not uncommon in Leicestershire. I have also taken it in Parkhurst Forest, Isle of Wight and at Oxshott. *Toxotus meridianus*, Panz., is a large, conspicuous species; it, however, varies considerably in size and colour. The type form has the head and thorax black, and the elytra, legs and antennæ rufo-testaceous. The varieties are either entirely black or with half the elytra black. Canon Fowler, in his *Coleoptera of the British Isles*, says that the legs are always black in black varieties; this, however, is not the case, as one of the most beautiful aberrations is black with red legs. I have taken this ab. at Owston Wood, in Leicestershire. Mr. Bouskell tells me that in some years, at Owston, the black abs. are by far the more abundant. It is found on *Umbelliferae* in woods, and is often to be taken flying. It is common from the Midlands, southwards, but is rarer further north. I have also taken this species at Wicken, Chiddingfold, etc.

The genus *Pachyta* includes robust insects, with broad shoulders. We possess three species. The first species, *Pachyta cerambyciformis*, Schr. (*octomaculata*, F.), is very local, but abundant where it occurs. It is a yellowish insect with four black spots on each elytron, which vary and are sometimes confluent. It is to be found on, and flying over, the flowers of *Umbelliferae*, also at holly blossom, etc. It is found in Cornwall and Devonshire, and in the New Forest, etc., and is rare in Scotland. Mr. Tomlin informs me it was not uncommon last year in the Cardiff district. I found this species in the utmost profusion at Chiddingfold this year, from June 9th to July 11th, first on the ox-eye daisy, then on the dog-rose, and finally on Umbellifers. I have seen specimens in my garden at Chiddingfold, hovering over a laurel bush, and rising and falling after the manner of Mayflies. *Pachyta sexmaculata*, L., has black elytra, with three yellow bands on each,

Its only claim to being British is based on the capture of two specimens on fir palings at Aviemore. *Pachyta collaris*, L., is a very different insect; it is smaller than the two preceding, and is black, with the thorax and abdomen bright red. It is found in hop-fields, the larvæ living in the hop-poles. The perfect insect is found on *Umbelliferae*. I have seen it in the greatest abundance on *Umbelliferae*, in a hop-field at Farnham. Mr. Bates records it from Leicestershire. *Anoplodera sexguttata*, F., is a very pretty black insect, with three yellow spots on each elytron; these spots, as in so many other species, are very variable, being sometimes confluent, and sometimes two or more are wanting. A quite black aberration occurs, which is decidedly rare. It occurs on the flowers of a small Umbellifer, and is common in the New Forest, where I have seen it in abundance. Darenth Wood is the only other known British locality.

The genus *Leptura* is a large one, of which we possess five species according to our *Catalogue*, and one species as doubtful. Of this latter species, *Leptura virens*, L., a green insect, I can learn nothing reliable, and consider it is more than doubtfully indigenous. *Leptura rufa*, Brull., is a large insect with red elytra and black head, thorax and antennæ. A single male was taken at Holme Bush, in Sussex, and I should say, decidedly, that it was imported. *Leptura scutellata*, F., is a large black insect, with the scutellum covered with thick yellowish pubescence. It is chiefly confined to the New Forest, where I have taken it in some numbers from old beech stumps. It has also been recorded from Epping and Hainault Forests and Cobham Park. The burrows of this beetle are worth working for other species of coleoptera, the very rare *Endophloeus spinulosus* having been taken in them in the New Forest. *Leptura sanguinolenta*, L., is a very rare species, in which the male and female differ considerably; the former having the elytra yellowish, whereas, in the latter they are reddish-brown. Stephens records it from various parts of the country. The only reliable specimens, however, about which anything is known, are two taken by Mr. Champion at Aviemore, and one which Mr. Gorham tells me he saw alive, that was taken by Mr. Beck at Southampton. *Leptura fulva*, De G. *(tomentosa*, F.*)*, is a black insect with yellow elytra, the tips of which are black. The underside is thickly covered with silvery pubescence. It appears to be confined to the south, and is taken on flowers, etc., and is decidedly rare. Mr. Gorham and Mr. Newbery have taken it in some numbers in the Southampton district. Dr. Power took it at Haslar. It also occurs in the New Forest, Devonshire, etc. *Leptura livida*, F., is the smallest of the British species of this genus. It is very like the last insect in appearance, but it has not got the black tips to the elytra, and is much smaller. It is found on flowers, and is abundant in some places, being common in the London district. I have taken it in numbers at Blackgang, in the Isle of Wight, and at Deal, Chiddingfold, etc. It does not appear to be found further north than the Midlands, where it is rare. It is the only species of the genus found in Leicestershire, where it has been taken by Mr. Bates. Mr. Rye took a specimen at Swanage, with one of its antennæ divided into three branches.

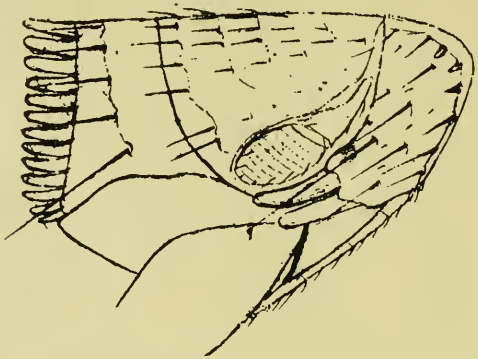
The genus *Strangalia*, of which we possess, according to our *Catalogue*, seven species, much resembles the last genus, from which the species, however, may be known by having the posterior angles of the thorax spined. *Strangalia aurulenta*, F., is one of the most beautiful

of the British Longicornes. It is a large beetle of a deep velvety black colour, with four transverse reddish-yellow bands on the elytra. Some examples have a most beautiful glossy appearance. Most of the specimens extant have been taken in the New Forest. It has also occurred at Plymouth, Barnstaple, Swansea, and in Ireland. Mr. Janson has taken it at Lyndhurst, and Mr. Jackson, of Bournemouth, near Denny Wood. It is found on flowers and sitting on logs. *Strangalia quadrifasciata*, L., is a yellow insect with four black bands on the elytra and black legs. It is allied to the preceding, but is neither so beautiful nor so large. It is more or less rare, but inhabits many localities, and is widely distributed, occurring at Darenth Wood, Hastings, Cannock Chase, Sherwood Forest, Isle of Wight, Ireland, etc. It was taken last year at Weybridge and Sevenoaks. It is found on flowers—*Umbelliferae*, ragwort, scabious, etc. *Strangalia revestita*, L., is a very rare insect. It is recorded by Stephens from Colney Hatch and various other localities, and by S. Stevens from Darenth and Birch woods. It does not appear to have been taken for many years. The specimen in Dr. Power's collection is without locality. It is a reddish insect with black elytra, the latter, however, vary to being entirely rufous. *Strangalia armata*, Herbst, is the most abundant species of the genus, being common from the Midlands, southwards; it is rare, however, in Scotland and the north. It is black, with the legs and antennæ yellow, marked with black, and the elytra yellow, with black spots and bands. It varies so much that in some individuals the elytra appear to be black with yellow markings, whereas in others they appear to be all yellow, with very little black markings. It is found on the flowers of *Umbelliferae*, etc., and may be obtained by beating and sweeping, it is also often observed on the wing. It is common in Leicestershire, where I have taken it, also in the New Forest, at Bishop's Wood, Epsom, Oxted, Weybridge, Chiddingfold, etc. I have recently noticed several specimens of this insect hovering over a wild rose bush in the same way as the *Pachyta cerambyciformis* did over the laurel bush; I had never seen Longicornes doing this before. *Strangalia attenuata*, L., is decidedly doubtfully indigenous. I can learn nothing trustworthy about it, and why it is kept in the *Catalogue*, instead of being placed amongst the doubtful species, I cannot understand. The specimens in the Power collection are not *S. attenuata* at all, but only aberrations of the preceding species. *Strangalia nigra*, L., is a small, shiny, black species with the abdomen red. It is found on flowers, etc. It is local and not common, but occurs in various localities, not further north, however, than the Midlands. It is fairly common in the New Forest, where I have swept it in numbers from flowers and herbage in open places, and have found it sparingly at Chiddingfold. Mr. Bates records it from Leicestershire. *Strangalia melanura*, L.: this species differs considerably in the sexes, the male is black with testaceous elytra, the suture of which is narrowly black, and the apex broadly so. In the female the elytra are bright red, with the suture and apex broadly black. This species is common and generally distributed, from the Midlands, southwards, rarer further north. I have taken it in the New Forest, at Oxted and other localities in the London district, and at Chiddingfold. Messrs. Bates and Bouskell have taken it in Leicestershire. It is found on *Umbelliferae*, etc., and is to be obtained by general sweeping.

(To be continued.)

A new British flea : Typhlopsylla spectabilis, sp. nov.

By the Hon. N. C. ROTHSCHILD, B.A., F.Z.S., F.E.S.



TYPHLOPSYLLA SPECTABILIS, Rothschild.

This distinct species is allied to *Typhlopsylla musculi* (Dugés), but differs from it in the following characters : The species is larger and darker in colour. The head has three instead of two strongly chitinised hairs at its anterior end. The genal spines are two instead of four in number, and are larger than those of *T. musculi*. The comb on the posterior edge of the prothorax consists of 28 teeth instead of 22. The male has one long and two short hairs on each side of the posterior edge of the 7th dorsal segment, while the female has two long and three short ones in the same position. In *T. musculi* the male has one long and two short hairs on each side of the posterior edge of this segment. The female, however, has two long and two short ones, the most lateral short hair of the female *T. spectabilis* being absent in the female of this species. The number of strongly chitinised spines on the posterior edges of the dorsal segments differs from the number of those in the same position in *T. musculi*. Individual variation, however, appears to exist in both species with regard to this character. I originally thought this species to be identical with Kolenati's *Ctenopsyllus bidentatus*, *Hor. Soc. Ent. Ross.*, ii. (1863), p. 38, fig. 9. That species, however, is said to have eighteen teeth on the prothorax. The present species is parasitic on the Bank Vole (*Hypudaeus glareolus*). I secured five specimens of it at North Berwick this September.

PRACTICAL HINTS.

Field Work for October and November.

By J. W. TUTT, F.E.S.

1.—The eggs of *Cirrhoedia xerampelina* often hatch this month. The young larvæ feed only by night, on ash, though they will eat hawthorn and guelder rose. Sometimes they attain a fair size before they hybernate, whilst others remain quite small ; occasionally the larvæ do not hatch until November or December. Then the buds of hawthorn and guelder-rose will be found useful as a substitute for ash (Merrin).

2.—Larvæ-beating is often most successful during this month. It is not yet too late for *Demas coryli*, *Amphidasys betularia*, *Cerura bicuspis*, *Drepana falcula*, and many other interesting species.

3.—Collect the seed-heads of *Bartsia odontites*, and tie up in linen bags for larvæ of *Emmelesia unifasciata*.

4.—Collect flowers or seed-heads of *Achillea millefolium* for *Eupithecia subfulvata*, golden-rod for *E. expallidata*, ragwort for *E. absynthiata*, *Knautia arvensis*, for *E.* var. *knautiata*, etc.

5.—Beat juniper for larvæ of *Eupithecia arceuthata* and *Thera simulata*.

6.—The pupæ of *Emmelesia albulata* will be found within the spun-up sepals of yellow rattle.

7.—October and November must always be the great months for pupa-digging and pupa-searching. The various enemies of pupæ have not yet had time to find a very large proportion of them. Search under moss on (or at roots of) trees for pupæ of *Demas coryli*, *Eurymene dolobraria*, *Odontopera bidentata*, *Eupithecia consignata*, *E. fraxinata*, etc.; dig round the roots for pupæ of Notodonts, *Cymatophora ocularis*, *Selenia bilunaria*, *Amphidasys strataria*, *Tephrosia bistortata*, *T. crepuscularia*, *Asthena blomeri*, etc., especially working with the fingers where the surface of the earth meets the trunk; search under loose pieces of bark for *Poecilocampa populi*, *Triaena tridens*, *Acronicta leporina*, etc., and search the trunk itself for *Cerura bicuspis*, *C. furcula*, *C. bifida*. Dead leaves about the roots of trees give cocoons of *Heterogenea cruciata* (*asella*), *Apoda limacodes (testudo)*, *Endromis versicolor*, *Eriogaster lanestris*, Ephyras (fastened by belt to leaves), *Stauropus fagi*, *Clostera curtula*, *C. pigra* (*reclusa*), *Cymatophora or*, *C. fluctuosa*, *Lobophora sexalata*, etc.

8.—Search the trunks of ash-trees, under moss, for the hard cocoons of *Bisulcia ligustri*, also under the coping-stones of walls near privet-hedges, where they are often placed.

9.—The moss at the roots of fir-trees should be carefully rolled back for the pupæ of *Macaria liturata*, *Fidonia piniaria* and *Trachea piniperda*; usually found at only a short distance below the surface of the ground.

10.—The full-fed larvæ of *Colcophora wilkinsoni* should be collected from birch in September-October. They hybernate full-fed, crawl about in early spring without feeding, then pupate, and the imagines emerge about the end of June.

11.—The larvæ of *Nepticula lapponica* feed in broad serpentine mines in birch leaves, and should be collected at the same time as those of *N. betulicola*, *viz.*, from October 1st-20th (Threlfall).

12.—During October, the yellow larvæ of *Nepticula aeneofasciella* may be obtained in the blotches in leaves of *Agrimonia eupatoria*.

13.—During October, the larva of *Elachista dispunctella* mines in *Festuca ovina*. It hybernates in old grass-stems, and pupates later in spring (Threlfall).

14.—Collect seeds of gentian, wild carrot, *Pimpinella saxifraga*, etc., in the autumn. Place in covered flower-pot and stand out of doors. *Semasia rufillana*, *Oecophora flavimaculella*, *Asychna profugella*, *Eupithecia pimpinellata*, etc., will be bred the following June and July.

15.—From October to April, the larva of *Ephippiphora nigri-*

costana may be found in the stem and root of *Stachys sylvatica*, climbing in April into the dried flower-stems, where it pupates just below a joint in the stem.

16.—From October to April, split the stems of *Impatiens noli-me-tangere* for the active whitish-green larva of *Penthina postremana*. When the affected stems can be spotted without splitting, do not do this, as it interferes with the hybernation of the larva.

17.—During the winter the dry stems of *Umbelliferae* should be opened for larvæ. Many species retire therein to pupate that feed on other plants.

18.—Larvæ of *Ephestia cinerosella (artemisiella)* feed during the winter and spring in the stems and root-stocks of *Artemisia absinthium* (Barrett).

19.—During the winter months (October to March) the full-fed larvæ of *Homoeosoma sinuella* may be found feeding in the root-stocks of plantain. They spin cocoons in March, but the larvæ do not pupate until May and early June.

20.—During the winter months the dried stems of thistles should be collected for the larvæ of *Myelois cribrum*.

21.—During the winter the hybernating larvæ of *Anerastia farrella* are to be obtained in sandy localities, where *Anthyllis vulneraria* grows, in their sand-balls, by passing the sand through a sieve (Schleich).

N.B.—For similar series of "Practical Hints" for these months, refer to *Ent. Record*, vol. viii., pp. 194-195; vol. viii., p. 241; vol. ix., pp. 264-265; vol. i., p. 187, etc.

NOTES ON COLLECTING, Etc.

Leicestershire Lepidoptera, 1898.—The following dates of appearance of Lepidoptera as noted by myself may prove interesting. Jan. 13th: *Phigalia pedaria*; Jan. 19th: *Hybernia marginaria*; Feb. 22nd: *Eriogaster lanestris*; March 5th: *H. leucophaearia*, *Nyssia hispidaria*; March 12th and 17th: *E. lanestris*; March 18th: *Taeniocampa cruda*, *T. gothica*, *T. stabilis*, *T. instabilis*, *Orrhodia vaccinii*, *Scopelosoma satellitia*; March 21st: *H. rupicapraria*; March 22nd: *T. cruda*; April 1st: *T. munda*; April 3rd: *Amphidasys strataria*, *Pachnobia rubricosa*, *Calocampa vetusta*; April 4th: *Asinopteryx aescularia*; April 8th: *Brephos parthenias*, *B. notha*; April 9th: *Melanippe fluctuata*; April 11th: *Selenia bilunaria*; April 13th: *Aylais urticae*; April 15th: *Amphidasys betularia*; April 20th: *A. betularia* var. *doubledayaria*; April 22nd: *Pieris rapae*, *Anticlea badiata*, *A. derivata*; April 24th: *Eupithecia dodoneata*, *Lobophora lobulata*; May 2nd: *Xylocampa lithoriza*; May 4th: *Noctua c-nigrum*, *Cucullia verbasci*; May 5th: *Cidaria suffumata*, *Cilix spinula*; May 13th: *Euchloë cardamines*, *Emmelesia affinitata*, *Pieris brassicae*; May 15th: *Spilosoma menthastri*; May 20th: *Cerura vinula*; May 21st: *Hadena dissimilis*; May 24th: *Xylophasia rurea*; May 25th: *Taeniocampa gracilis*; May 26th: *Selenia lunaria*; May 27th: *Odontopera bidentata*; May 28th: *Tephrosia biundularia*; May 29th: *Phibalapteryx tersata*; May 30th: *Hemerophila abruptaria*; June 3rd: *Pararge megaera*, *Polyommatus icarus*, *Nisoniades tages*, *Syrichthus alveolus*,

Macroglossa fuciformis, Euclidia mi, E. glyphica, Brenthis euphrosyne, Melanippè montanata, Agrotis corticea; June 5th: *Phalera bucephala, Mamestra brassicae*; June 6th: *Panagra petraria*; June 7th: *Smerinthus ocellatus*; June 8th: *S. populi, Selenia lunaria, Euplexia lucipara*; June 9th: *Noctua plecta*; June 10th: *O. bidentata*; June 11th: *Tephrosia crepuscularia, Asthena candidata, Cabera pusaria*; June 12th: *Larentia didymata*; June 14th: *Cerura bifida*; June 15th: *Hepialus lupulinus, A. candidata, Aplecta herbida*; June 16th: *Odonestis potatoria, P. petraria, Anaitis plagiata, Zephyrus betulae* (larva two-thirds grown); June 17th: *Spilosoma lubricipeda*; June 18th: *Hadena dentina, Cabera pusaria, Heliodes arbuti*; June 19th: *Melanthia albicillata, Melanippe galiata, Leucania pallens*; June 20th: *Choerocampa elpenor, Agrotis segetum, Habrostola triplasia*; June 21st: *Miana fasciuncula, Hadena thalassina*; June 22nd: *Caradrina quadripunctata*; June 23rd: *Phorodesma bajularia, Eupithecia debiliata, Eucosmia undulata, Aplecta nebulosa*; June 24th: *Calymnia affinis*; June 25th: *Zeuzera pyrina, Ephyra trilineata, Rumia crataegata, Euchelia jacobaeae, Geometra papilionaria*; June 27th: *Hepialus humuli, Cabera exanthemaria, Pharetra rumicis*; June 28th: *Eupithecia centaureata*; June 29th: *Cuspidia megacephala*; July 1st: *Larentia pectinitaria, Hypsipetes elutata, Camptogramma bilineata*; June 2nd: *Hadena dentina, Euclidia mi, Pyrameis atalanta, Epinephele janira, Chrysophanus phlaeas, Euchlöe cardamines, Hepialus sylvanus, Adscita statices, Anthrocera filipendulae, Abraxas ulmata, Iodis lactearia, Emmelesia albulata, Lomaspilis marginata, Hepialus hectus, Triaena psi, Thecla w-album* (larvæ and pupæ); July 3rd: *Cabera exanthemaria, Xylophasia lithoxylea*; July 8th: *L. marginata, E. jacobaeae, Cucullia umbratica*; July 9th: *Sphinx ligustri, Sesia tipuliformis, Bryophila perla*; July 10th: *Xylophasia polyodon*; July 11th: *Clisiocampa neustria, Timandra amataria, Plusia chrysitis, Cidaria silaceata*; July 12th: *Smerinthus populi, Urapteryx sambucata*; July 13th: *Thecla w-album, Triphaena pronuba, Noctua festiva*; July 14th: *Cleora lichenaria, Acidalia aversata* var. *remutata, Plusia pulchrina*; July 15th: *Melanthia ocellata, Melanippe rivata, Leucania conigera, Agrotis exclamationis*; July 16th: *Enodia hyperanthus, Boarmia repandata, Cidaria pyraliata, Bryophila perla, Zephyrus quercus*; July 17th: *Cidaria dotata, Apamea unanimis, Amphidasys betularia, Boarmia gemmaria, Smerinthus populi*; July 18th: *Cidaria populata, Plusia gamma*; July 19th: *Mamestra persicariae*; July 20th: *Cleora lichenaria, Cidaria fulvata, Triphaena orbona, Porthesia similis*; July 24th: *Lasiocampa quercus, Clisiocampa neustria*; July 25th: *Orgyia antiqua*; July 28th: *Nonagria arundinis (typhae)*; July 30th: *Abraxas grossulariata*; August 12th: *Cossus ligniperda, Porthesia auriflua, P. chrysorrhoea, Selenia bilunaria* var. *juliaria, Eubolia mensuraria*; August 17th: *Ptilodontis palpina, Hepialus sylvinus, Miana furuncula*; August 22nd: *Scotosia dubitata, Notodonta camelina, Amphipyra tragopogonis*; August 23rd: *Notodonta dictaea, Cirrhoedia xerampelina*; August 24th: *Halia wavaria*; August 27th: *Axylia putris, Luperina testacea*; August 28th: *Heliophobus popularis, Tapinostola fulva*; *Cidaria testata*; August 29th: *Crocallis elinguaria, Ennomos tiliaria, E. fuscantaria, Boarmia gemmaria, Oporabia dilutata*; September 1st: *Hydroecia micacea, Anchocelis lunosa, Citria flavago* (*silago*), *Mellinia gilvago, M. circellaris, Cosmia trapezina, C. diffinis*; September 3rd: *Trichiura crataegi, Triphaena orbona, Anchocelis lota*; September

4th: *Rumia cratægata*, *Polia chi*, *Gonopteryx rhamni*.—G. B. Dixon, F.E.S., York House, St. Peter's Road, Leicester. *July 20th*, 1898.

Leucania albipuncta and Agrotis lunigera in Guernsey.—I captured a specimen of *Leucania albipuncta* on Sept. 2nd, at sugar, in my garden (about two miles from coast), at 9.15 p.m. The weather was very hot and dry, direction of wind N.E. On September 9th, I also took two *Agrotis lunigera* in a rough field, about 500 yards from the house, also at sugar. This does not look as if it were necessary to seek this species, where it occurs, only on precipitous cliffs and in most inaccessible places, as commonly reported by the Isle of Wight sportsmen. *L. albipuncta* was taken at flowers of ragwort, in 1871, by Mr. W. A. Luff.—(Rev.) F. E. Lowe, M.A., F.E.S.

Agrotis segetum and Peridroma saucia.—The wonderful weather seems to have produced a very late brood of *A. segetum*—for I am now (Sept. 20th) taking fine forms—evidently quite fresh. Is this not unusually late? *Peridroma saucia* is in swarms.—Ibid.

A new locality for Polyommatus zephyrus var. lycidas.—Bérisal is far away, and rather expensive, hence many collectors of Swiss butterflies will be glad to hear of a new locality accessible by rail, where *Polyommatus zephyrus* var. *lycidas* may be taken. This is St. Nicholas. It was my misfortune during a ten days' stay at this delightful place, to be ill most of the time, but on July 18th I got out for a little collecting. All the neighbourhood swarms with good things, and as is often the case in Switzerland, the difficulty is to choose. On this occasion I had boxed a fine *Polyommatus baton*, and was feeling savage at just missing another, when my attention was attracted to a large blue, which seemed unlike any of its neighbours. This I secured, and by diligent search added five more of the same to my collecting-box, but all this time I did not know what a prize I had secured. Leaving that same afternoon, the insects were neither set nor identified, positively, but I was able to give Mr. Buckmaster, who was staying at the same hotel, a hasty peep at them, sufficient to arouse his curiosity and to send him on the same road next day. At Zermatt, I set and examined my captures, and discovered that I had taken five males and one female *P. lycidas*, all but one in good condition. I immediately wrote to acquaint Mr. Buckmaster, which letter crossed with one of his to me, informing me that the "blues" were undoubtedly "*lycidas*," and that he had himself secured some specimens. I look forward to renewing my hunt another year, and with specially pleasurable anticipations, because of the exceptional comfort and reasonable charges at the Grand Hotel, at St. Nicholas. It is an ideal centre for the entomologist—the host, M. Oth. Zumofen, though not a "bug-hunter," is a keen sportsman, and knows much of larger game. Madame is English, and both do all in their power to make their guests comfortable, and thoroughly succeed. Being really ill during my stay, I tested their resources to the uttermost, and cannot but speak most warmly of their unfailing tenderness, and of their well-ordered house. Those who wish to hunt this valley from Stalden to Randa, or further, but do not care for the noisy hotels, high prices, and peculiar smells of Zermatt, cannot do better than make the Grand, at St. Nicholas, their home.—Ibid.

Sphinx convolvuli in Sussex.—I am sending you two specimens of *Sphinx convolvuli*, one of which I took flying in our drawing-room,

on September 10th, the first I have ever taken about here. The second was caught on September 20th, just as I was about to post the first. The last I took previous to these was at Swansea, in August, 1887.—Malcolm Burr, F.Z.S., F.E.S., Bellagio, East Grinstead. *September 20th*, 1898. [Mr. Burr has since sent a third specimen, captured September 21st.—Ed.]

Sphinx convolvuli in Dorking and London.—On Sept. 18th, Dr. T. W. King took a specimen of *Sphinx convolvuli* on a fence at Dorking; and on Sept. 20th, Mr. H. A. King took another on the church of Allhallows, Barking, Gt. Tower Street.—F. W. Fuller.

Sphinx convolvuli at Seaford.—A specimen of *Sphinx convolvuli* was brought to my friend Dr. Evans, of Seaford, having been taken by a man in that town, on the 20th inst. It is not in good condition, the thorax having suffered considerably, probably at the time of capture. The insect has been kindly presented to me by the doctor.—H. Ainslie Hill, F.Z.S., F.E.S., 9, Addision Mansions, Kensington, W. *September 12th*, 1898.

Colias edusa in Surrey and Sussex.—As *Colias edusa* is so uncertain in its appearance in this country, it may be interesting to record a specimen which I saw at Riddlesdown, Surrey, on Saturday, the 3rd inst., and also another, which I saw yesterday, between Seaford and Bishopstone, in Sussex.—Ibid.

Autumnal emergence of Spilosoma lubricipeda.—When I was at Hythe in July last (*Ent. Rec.*, x., p. 228), I found a small batch of eggs of *Spilosoma lubricipeda*, on dock. These hatched on July 14th, and duly fed up on dock and lettuce. They pupated in the beginning of August, and I placed a few in a small cardboard box, kept in a room without a fire, and with a northerly aspect. I was much astonished, on Monday last, September 12th, to find that 15 specimens (one male and 14 females) had emerged, the females having deposited quantities of ova on the sides of the box, and on the muslin covering. I presume this is the result of the recent abnormal heat.—Ibid.

Position of egg laid by Sphinx ligustri.—With regard to Mr. Hill's query *re* the position of the egg laid by *Sphinx ligustri* (*ante*, p. 288), I may say that I have found the ova and newly-hatched larvæ by looking on the undersides of leaves on the small shoots of privet, near the foot of a hedge. I cannot say whether this be the usual position, though I believe they are always (or at least generally) laid on the underside of a leaf. All the young larvæ of the species that I have had, have rested on the midrib on the underside of a leaf. —A. Bacot, 27, Walbrook, E.C.

Abundance of Aglais urticæ larvæ in Scotland.—On a visit to the north in June last, I was much surprised to see such large numbers of the larvæ of *Aglais urticae*. I first found them at the Kyle of Lochalsh, on June 23rd, nearly full-fed. On June 27th we went by coach from Pitlochry to Kirk Michael, and in a lane near the hotel where the coach stops, I could have taken some hundreds if I had wanted them, but they were very small indeed, a fact that struck me as being rather peculiar, as I had found them almost full-fed at the Kyle of Lochalsh some days previously.—J. A. Clark, F.E.S., 57, Weston Park, Crouch End, N.

Sphinx ligustri in the Isle of Man.—On June 28th last, Mr. S. Harris, vicar-general of the Isle of Man, very kindly sent to me

two exceptionally fine specimens of this insect (male and female), which were captured that day by one of the gardeners in his grounds at Marathon, nr. Douglas. I happened to be off the Island at the time when the box containing them arrived at Sulby, and consequently did not receive them until a few days subsequently, when they were more or less damaged. The female insect deposited 38 eggs in the box, and these hatched on the 13th July. The young larvæ, shortly after emergence, took readily to the leaves of ash and lilac. They were also supplied with privet, but seemed to prefer the ash, which I thought somewhat strange, considering that privet is generally regarded as the customary food of this species. At the present time 22 of the larvæ are alive, and nearly full-fed, the rest having died off, from some unknown cause. I may say that *S. ligustri* is exceedingly local and rare here; a specimen was caught at Orry's Dale, Michael, some years ago, but until the capture of the two insects named above, I had never heard of any specimen being taken since, either in the larval or imaginal state, although I have made diligent search for the species for many seasons past.—H. Shortridge Clarke, F.E.S., Sulby Parsonage, Isle of Man. *September* 7th, 1898.

CURRENT NOTES.

Mr. W. J. Lucas, of 278, King's Road, Kingston-on-Thames, would be glad to receive well authenticated lists of localities of British dragonflies, for his forthcoming book on that group of insects. Date and notes as to quantity, where these can be given, will be of value.

We were astonished to see, in *The Westminster Gazette* of Sept. 13th (vol. xii., no. 8725), an account of the funeral of Lord Walsingham. As we knew Lord Walsingham was at the time in Yorkshire, we concluded that the name was an error for Lord Winchelsea. At any rate, the entomologists of this country are not so anxious for the death of Lord Walsingham as *The Westminster Gazette* seems to be to bury him.

Mr. F. Clark has recently been exhibiting photographs of eggs of lepidoptera at the South London Entomological Society. They are beautifully done, and we trust that those of our readers who have eggs at disposal will send a specimen or two to Mr. Clark, Paddington Infirmary, Harrow Road, W.

Mr. West, of Greenwich, has recently taken *Forficula lesnei* commonly at Box Hill and Reigate.

Mr. W. Reid, of Pitcaple, Aberdeen, has recently been engaged in breeding the various forms of *Taeniocampa gothica*, with the view of ascertaining how far the various forms show hereditary tendencies to perpetuate their own kind. He has succeeded in producing some eight or nine distinct races, that will apparently breed almost true. These were exhibited by Mr. R. Adkin at the last meeting of the South London Entomological Society. We should like to have a numerical analysis of the various broods.

Erratum.—p. 176, line 10, and p. 177, line 6, for *Hypophloeus linearis*, Linn., read *H. linearis*, Fab.

The Entomologist's Record
AND
JOURNAL OF VARIATION.

VOL. X. No. 11. NOVEMBER 15TH, 1898.

Aberration of Euchloë cardamines.

By E. H. THORNHILL.

UPPERSIDE AND UNDERSIDE OF ABERRATION OF EUCHLOË CARDAMINES.

The aberration of *Euchloë cardamines*, which the above reproduction, from a photograph, represents, was captured in May last, in the neighbourhood of Boxworth, Cambridgeshire. The insect is in many ways a remarkable one, more especially, perhaps, from the asymmetrical condition of the black markings, which make it so striking and conspicuous, and which are so unusual in specimens of this species.

The butterfly is a female, and looks as if it had been drawn through an ink-pot, so dull and smooth are the abnormal dark parts of the wings, but, under a microscope, the blackened scales are seen to be quite similar in general appearance to the white ones by which they are surrounded, and, at the base of the wings, the long pale scales lie over the darkened ones in quite a normal manner.

The right fore-wing is entirely blackened except along the costa, which is normal, and there are two or three slender broken whitish streaks running through the discoidal cell to the outer margin, another short marginal one is placed just above the anal angle. The outer

fringes are of the same dull blackish tint. The right hind-wing is quite normal, and shows no melanic tendency whatever. The left fore-wing is normal towards the costa and apex, but is blackened towards the inner margin from the anal angle to the base. Similarly the left hind-wing is normal in its upper part, but the lower half is almost entirely melanic, and the fringes agree in tint with that part of the wing to which they are adjacent. On the underside the right fore-wing (nomenclature as above) has a fine short black streak just below the apex, and a black patch from the anal angle half-way along the inner margin, the fringes alternately light and dark; the left fore-wing has a longitudinal streak almost filling up the discoidal cell, and continued from it as a fine line to the outer margin. The underside of the hind-wings proves most interesting, for, although the melanic patches and lines are limited to the discoidal cell and the margin directly beyond, they are of a dense opaque nature, entirely different from the blackness of the upperside, the yellow scales overlying this thick blackening in some places. The left hind-wing beneath has, however, in addition, a dull black streak extending from the discoidal cell to the outer margin.

One of the antennæ was unfortunately broken off in photographing the specimen, and is now fastened on with the upper surface downwards. This only in explanation of the absence of this antenna. In reality, the antennæ are quite normal.

Observations on the genus Catocala: Catocala cœlebs, C. elocata.

By E. M. DADD.

The genus *Catocala* belongs to the sub-family Quadrifinæ of the superfamily Noctuides. It is a widely distributed genus, occurring in Europe, Asia (to Japan and Ceylon), North Africa, North and South America. It is most abundant in North America, where more than three-fourths of the present known species occur. The Palæarctic area possesses about 30 species.

The Catocalid ovum is round, conical above, flattened beneath, and somewhat depressed on the micropyle. The majority have numerous vertical ribs, about a third of which reach to the micropylar area, the remainder joining these about two-thirds of the way up. Sometimes as many as five of these ribs combine before reaching the micropyle. There are also numerous, very fine, transverse ribs. *C. sponsa*, *C. promissa* (and most probably their allies, *C. diversa*, *C. dula*, *C. conjuncta*, etc.), are, however, remarkable exceptions, and what is still more curious, the eggs of the two former differ as much from each other as they do from those of the rest of the genus, for whereas they both retain the general shape of the egg of the genus (that of *C. promissa* being, however, somewhat oval), the egg of *C. promissa* has very coarse, vertical and transverse, ribs, the intermediate spaces being somewhat sunken in, giving the ovum a very curious netted appearance, while that of *C. sponsa* is almost perfectly smooth, with numerous minute raised points all over it, probably the last remnants of the ribs.

The Catocalid larva, on emerging from the egg, is very long and slender; the 1st and 2nd abdominal segments are much elongated, the 3rd and 4th less so. The prolegs are developed on the 5th, 6th and last abdominal segments only, those which appear later on the 3rd and 4th

being quite rudimentary; the 5th abdominal has a somewhat swollen appearance. The head is larger than the body segments. The tubercles are generally rather prominent, each bearing a short hair. They consist of dorsal, trapezoidal tubercles, and five laterals on each side. In the second instar they are very similar, but the prolegs on the 3rd and 4th abdominal segments are developed (though very small), and the hump on the 5th abdominal is slightly developed in all but *C. fraxini* and *C. retecta*. In the third instar the larvæ tend to be very specialised; *C. nupta* and *C. electa* then assume their first brightly-coloured coats, whilst *C. sponsa* and *C. promissa* develop the white horseshoe marks, and *C. fraxini* and *C. retecta* assume the adult pale green-grey tint, with fine longitudinal black lines. The humps are now well developed; even *C. fraxini* and *C. retecta* have the 5th abdominal swollen, and a black horseshoe mark partly on the 5th and partly on the 6th abdominals. The tubercles have now become yellow or orange-coloured. *C. fraxini* and *C. retecta* have a trace of the lateral fringe. The fourth instar is very like the last; in it, the adult markings of all the species are assumed; the humps on the 5th abdominals are well developed, but *C. fraxini* and *C. retecta* never have them as large as the rest. The lateral fringes are also developed. In the last instar the larvæ are very long and slender in comparison with their length; the head is bilobed, with a dark streak on the top of each lobe, which thins out down the side of the face. The first two abdominal segments are elongated to about twice their normal length, the 3rd and 4th to about one-and-a-half. The 3rd, 4th, 5th and 6th abdominal segments are somewhat more swollen than the rest, especially the 5th, which bears a very prominent fleshy hump, situated between the two posterior dorsal tubercles. On the 8th abdominal the posterior dorsal tubercles are much enlarged, and point backwards towards the anus, forming a sort of double hump. The body is flattened beneath in *C. fraxini* and *C. retecta* to such an extent, that a cross-section would be somewhat of the shape of a capital letter D placed on its flat side, the remainder are somewhat rounder above. The prolegs are spread out very much sideways, especially those on the 5th, 6th, and last abdominals, giving the larva a very sprawling appearance, and enabling it to press its flat underside against the twigs of the food-plant, and thus escape detection. The lateral fringe, which consists of a series of short stout filaments along each side, also aids in this deception, as when the larva is resting on a twig, the fringe is pressed against it, and no dividing line between the larva and the twig being apparent, the twig merely appears somewhat swollen. The legs are generally the same colour as the head. The larvæ are always pale coloured beneath, with large dark spots in the centre of most of the segments. These are generally of a deep crimson or brown colour, and are flushed round the edges with pink, but in *C. elocata* the crimson flush is extended over nearly the whole of the underside; in *C. fraxini*, on the other hand, there is no flush and the spots are very small. These curious spots are no doubt used as a protection to terrify enemies, for when disturbed the larvæ turn upside down, and twist themselves into circles sideways very violently. These curious spots are by no means confined to *Catocala*, as various tree-feeding Noctuid and Geometrid larvæ possess such spots, notably, *Miselia oxyacanthae* and *Metrocampa margaritaria*. The tubercles, with the exception of the posterior dorsals,

are small and indistinct; the latter are large and stand out from the skin-like warts. Each tubercle bears a short stiff hair. When full-fed the larvæ proceed to form large cocoons amongst the leaves of the food-plant. They first join a number of leaves together until no opening is left, and then spin a loose cocoon of coarse silk within.

The pupæ are rather long and slender with very rounded heads; the abdomen tapers gradually from the wing-cases to a point. They are reddish or purplish-brown in colour, and covered with a beautiful bluish-white bloom, like a ripe plum.

Having now given the general characters of the early stages of the genus, I propose to give a more detailed account of those species I have been able to rear under my own observation from the ovum. I succeeded in obtaining ova of one yellow species, *C. coelebs*. These came from Prof. Carl Braun, of Bangor, U.S.A.

C. coelebs.—Ovum of usual *Catocala* form, about ·04 in. broad, somewhat conical. The micropyle is very large and pointed, having seven rows of cells. The ribs above shoulder very large, about 17 in number, but below the shoulder they branch very numerously, there being sometimes as many as five between the main ribs. The transverse ribs are rather large and prominent.

About a dozen larvæ hatched during May, but I was unable to induce them to feed on birch (the reputed food-plant) or anything else. They looked like any other *Catocala* at this stage, the head yellow, the body dusky olive.

C. elocata.—Ova obtained from Germany. Eight eggs examined. They differed in breadth from ·045 to ·05 in., round, conical above, flattened beneath; in colour somewhat more yellow-brown than *C. nupta*, the purple rings lighter. The vertical ribs number from 34 to 38, but these seem to be very inconstant in all species, only about half reach the micropyle; the transverse ribs very numerous and irregular. The micropyle is similar to that of *C. nupta*. The egg is larger, flatter and more regular than that of *C. nupta*.

The larvæ emerged very irregularly, extending from the latter part of April until June 10th. When newly-hatched they measure about three-eighths of an inch; the head is yellow, the remainder of the body dull olive, the last three abdominal segments somewhat browner. The prolegs are, as usual, only developed on the 5th, 6th and last abdominals, the two front pairs being rudimentary; beneath the larva is pale bluish-green, and, even at this early stage, the spots are large, red, and very distinct. In the 2nd instar it measures from a half to three quarters of an inch; the head and legs pink, with numerous black markings. The body has a pale dorsal stripe, on each side of which are numerous black longitudinal lines, alternating with paler ones. The prolegs, which are fully developed on the 5th, 6th and last abdominal segments, are grey, with black markings. The tubercles are black, and very small, the posterior trapezoidals on the 8th and 9th abdominals being somewhat larger. The hump is slightly developed. The larva is pale bluish-green beneath, with very large spots. In the third instar it measures just over an inch. The head pale yellow-grey, the face tinged with red, and with black streaks down each lobe; the body is dirty yellow-brown, with a paler dorsal stripe; the hump is dull red, surrounded by a narrow circle of black, the posterior trapezoidals are large and prominent, and yellow in colour, the remaining tubercles are

very small, and can only just be made out. The posterior trapezoidals on the 8th abdominal are enlarged, and form a double hump, the legs and prolegs are yellow. Beneath, the larva is yellowish-white, with large purple spots, and flushed with crimson. In the 4th instar it measures from an inch to an inch-and-a-half. The general colour and markings are very much the same as in the last instar, indeed, *C. elocata* may be said to be practically the same in the last three instars, except as to the lateral fringe, which, unlike the other species I have examined, is not developed at this stage. In the last instar the larva measures about two inches, when full-grown about $2\frac{1}{2}$ to $2\frac{3}{4}$ inches. The head is yellow-brown, with a black streak, which tapers round the face to the mouth, on the top of each lobe. The general ground colour is smoky-brown, much suffused with black, especially on the thoracic and first three abdominal segments. The dorsal stripe is somewhat irregular and paler, but is also a great deal suffused on the anterior half of its length. On each side of it is an irregular smoky-black, longitudinal band, the lateral portions being paler; there is, however, another smoky band along the line of the spiracles. The spiracles are very distinct on the 1st thoracic and abdominal segments. The tubercles, with the exception of the posterior trapezoidals, are practically non-existent, being merely indicated by minute points. The latter are large and orange coloured, the 8th abdominal having them larger than the rest, but not so large as they are developed in other species of the genus. It also has the black streaks, pointing downwards and forwards from these tubercles, slightly developed, but they are neither so long nor distinct as in *C. nupta* and *C. electa*. The hump is large and prominent, and similar to that in the third instar. The lateral fringe is very slightly developed. Beneath, the larva is yellowish-white, with very large purple-brown spots, the latter are present, though in varying sizes, on all segments; the whole is flushed with crimson, especially down the centre and round the spots. The larva feeds on willow. When full-fed it pupates in the usual manner. The pupa measures about an inch and an eighth in length.

The moth is on the wing in August and September. It measures $2\frac{1}{2}$ to $2\frac{3}{4}$ inches in expanse. The primaries, thorax and abdomen are smoky yellow-grey, the former with several indistinct, zigzag, transverse bands, the orbicular is also very indistinct. The hind-wings are red, inclining to orange, with a broad black band along the outer margin, which is broadest at the apex, and tapers slightly towards the anal angle, where it ends. It is very much indented on the inner side. The inner band also tapers towards the inner margin, and is also somewhat irregular, there is also a red spot just below the apex, between the marginal band and the fringe. The fringe along the outer margin is white, on the inner margin brown. The general colour is whitish-grey beneath; the tip of the fore-wing is grey; there is a broad black band which extends from the costal margin to the hind angle, meeting the hind margin about the centre, and having a somewhat bent appearance. A second black band starts from the middle of the costal margin, and extends across the wing to the hind margin, where it joins the base of the first band. There is also another band starting from the costal margin, near the base, and running obliquely to join the second band on the hind margin. The spaces between these bands are almost pure white. On the

hind-wings the bands are almost exact counterparts of those on the upper side; the red is reduced to a flush, which is strongest near the hind angle, and gradually pales off to pearly-grey near the upper margin. The antennæ are long and slender, the legs black, with numerous white rings. The moth does not occur, as far as is known, in Great Britain, but it is so like *C. nupta* in general appearance, that it may possibly be sometimes overlooked. It is common on the Continent.

Stray Entomological Notes from East Devon.

By W. S. RIDING, B.A., M.D., F.E.S.

Early in the present year, as in 1896, Aphides settled on trees, shrubs and plants, especially the least vigorous, and multiplied after their kind, working destruction on the young shoots. Before long, it was difficult to find a leaf on the vegetation affected that was not glossy and sticky with honey-dew, and the summer being a rainless one, it did not get washed off, but lasted well into autumn. The total area thus supplying a perpetual attraction for sweet-loving insects must have been enormous, and our small patches of sugar were infinitesimal in comparison, so no wonder that the latter was a general failure, as I understand it to have been. Flowers generally, even red valerian, did not attract, and both light and dusking were tried with little success, most of the insects taken being rarely worth boxing. It is probable, too, that the unfavourable winter had produced a general scarcity. Strangely enough, though, I found in my garden three insects I had never taken there before, during seven years—*Aventia flexula*, *Ebulea sambucalis*, and an *Acidalia* which I cannot satisfactorily identify. The ♂s of *A. flexula* came to light, and I netted a ♀, which laid ova. *Apropos* of lichen feeders, I used to have much difficulty when breeding them in pots, owing to the contents becoming mouldy, so for the last two years I have tried the following arrangement, with success: In a damp and somewhat shaded part of the garden I suspend by means of wire, between two branches of a tree, a glass cylinder (such as those used on candlesticks) or a small garden-pot, and cover it with a large muslin sleeve tied to the wire towards both ends. In this way the food is kept healthy by exposure to air and moisture, and the larvæ can always get shelter. I bred, *ab ovo*, some fine *Cleora lichenaria* this year; they, as usual, were dark with a more or less yellowish tinge, and contrasted with some I received from Mr. Hewett, bred from larvæ taken at Hawick, in Roxburghshire, the green of which had a slightly bluish tinge, and which were considerably paler, an unusual difference between northern and southern insects. I brought back from Cornwall, last week, some of the yellow lichen (*Parmelia parietaria*), that grows so abundantly on rock faces near the coast, to try and find out if any alteration is produced in colour by feeding the larvæ on it. Eimer's statements about the influence of the food of the larva on the imago, seem to want investigation. With a similar object I have been feeding larvæ of *Arctia villica* on lettuce only, keeping the cage fully exposed to the sun. These are now (Sept. 28th) in their last larval instar, and I expect most will pupate without hybernating. Will these several causes have a tendency to produce more than ordinary variation?

In June, I sought in vain in its usual haunts for *Hypena albistrigalis*; not one was to be seen, but subsequently I took two a little worn in the garden, one on red valerian, the other flying. Both were close by a pond, and I have noticed that wherever I take this insect, and it seems widely distributed though local, water is always near at hand. I think the larva must feed on some plant requiring much moisture. My son took a third, a ♀ nearly spent, which laid two ova, but they were not fertile. At the same time I netted several *Boarmia repandata* ab. *conversaria*, but they were all worn, and the ♀ s spent; the aberration was more abundant than the type. My son also took a number of larvæ of *Platyptilia cosmodactyla*, feeding on *Stachys sylvatica* in mid-August. This insect seems to occur over a considerable area in East Devon. As usual, a large majority were ichneumoned, 85 %; it is surprising it does not get exterminated. The few that pupated produced imagines during the last three weeks; most are dark olive-green and black on a pale ground colour, with blackish hind-wings and large scale-tooth, but several have reddish-brown as the predominant colour, and a smaller scale-tooth on the hind-wings, though these are blackish, not brownish. I must confess I have still an open mind as to the affinities of *P. cosmodactyla* and *P. acanthodactyla*. The Irish specimens seem to have mixed characters, too. Again, I always find the larvæ, both green and reddish, feeding together on the same plant, having the head either black or streaked and spotted with black only, a character supposed to differentiate the two. How is it Meyrick does not mention the olive-green colour of *P. cosmodactyla*, but calls it "greyish-ochreous striated with black"? A word to breeders of *Anticlea berberata*. Leaving home for a short time, I sleeved some young larvæ on an English barberry bush, and others on one of the foreign varieties. On my return I found the former a good size and the leaves a mere net-work, but the latter were all dead and not a leaf had been nibbled.

Angerona prunaria is an insect laying a large number of ova, and pairing readily with its kind, but I have been unable to get ova from the ab. *sordiata* paired with the type both ways. Out of four pairings, only two of the ♀ s laid ova, and these were comparatively few in number, and infertile. Have others noticed that the aberration is infertile with the type, or is my experience accidental?

Sphinx convolvuli is more abundant than usual this year. My son took a perfect one on August 29th (in 1895, the first was taken on August 20th, and in 1896, on August 31st). We were then away for a fortnight, and on my return I took a second on September 15th, and since then have netted or seen one or more every evening. Most are perfect, so the insect evidently keeps emerging in mid-September. An enthusiastic young friend searched for them at dawn one morning, with visions of many on the wing, but the *Sphinx* did not put in an appearance, so his enthusiasm cooled down, and he contented himself with evening watchings afterwards.

The ova of the aberrations of *Abraxas sylvata* (*ulmata*), which Mr. Hewett kindly sent me in 1897, produced some 70 imagines this summer; 10 were crippled, 57 were of the typical form, varying, as usual, in the size and number of the bluish-grey markings, and only three were aberrations. Two of these had a triangular bluish-grey blotch, extending from base to hind margin, with apex pointing

inwards, occupying about one-third of the area of the fore-wings, and the third had a similar but much smaller mark, extending less than half way across the wing, with increased suffusion towards the hind margin. None took after the ♀ parents, which had lost the white ground colour entirely. I find the colour of the original aberrations is due to an extension of the bluish-grey scales over the whole wing area; there are no melanic scales. I expect these aberrations are caused by disease, or perhaps rather by certain meteorological conditions acting on pupæ with deficient vitality. Thanks to Mr. Hewett, I have again bred the insect this season from ova of similar parents, to ascertain if the first experiment may be considered conclusive.

Attraction of Moths by Electric Light in Switzerland.

By (Rev.) FRANK E. LOWE, M.A., F.E.S.

So many have given an account of their success among the Diurni in Alpine valleys, that I will not ask to burden your pages with a list of captures which would bear considerable resemblance to some already published, but I think my experience at electric light, especially during two nights at Aigle, is sufficiently out of the common to interest others. On the nights of July 3rd and 4th, from 9.15 p.m. to 10.20 p.m., when the light was put out, we could not work fast enough. I had been fortunate enough to make an ardent disciple, who was the best friend an entomologist could desire, since he wanted nothing for himself, and was willing to give all the aid in his power. Mr. Von Veith undertook the management of the cyanide bottles, of which we had three. His instructions were to stupefy captures, and always to try to keep one bottle empty, and wonderfully skilfully he manipulated the lethal chambers, with the celerity of a professional juggler. The lamp was situated, most favourably, a little out of the town of Aigle, and cast its light on a high, white wall at its back—this was in a way equivalent to the sheet in use in the fens; and upon this wall the greater number of moths were taken. The first to arrive were the "Tigers" and "Hawks," and after them the "Sharks," but when we had had a few minutes' play with these, the Notodontids, Noctuids, Lasiocampids, and the rest, kept up such a bewildering flutter on the wall, or dance round the circle of light, that all Micros, and even most of the Geometrids, were necessarily ignored. On July 4th, the best night, there was thunder in the distance, and one short but not heavy shower of rain. The rain seemed to add to the intoxicating fascination of the lamp—but did not improve the condition of insects, owing to wetting our net. I append a list of moths taken or observed. Many more of the commoner species might be added, but I do not wish to trust to memory, and naturally there was no time to waste on them, and therefore they are unrepresented in my boxes. To some who have had no experience of collecting in Switzerland, it will appear strange, perhaps, to find many species overlapping, and all appearing at the same date. But our English notions of the times of emergence of many kinds are considerably modified when collecting in the Alps. To some extent, I think, this happy *réunion des Noctuelles* was enjoyed by an unusually large range of species, because the cold late spring had thrown many back

in their emergence, and the sudden advent of warm weather bringing out the species then due, caused a great rush of insect life at this time. In regard to abundance of each species, where no remark is made; it may be understood that it was present in average numbers, when specially abundant, on the contrary, I have noted the fact. On two subsequent nights in the same week, after I had left Aigle, Mr. Von Veith visited the electric light, and added a few new species to the list (to these I have put the dates), besides many more of those we had taken at the earlier dates.

Sphingides: *Sphinx ligustri*, several, *S. pinastri*, 3, *Deilephila euphorbiae*, 2, *Choerocampa elpenor, ad lib.*, *C. porcellus*, 2, *Smerinthus tiliae*, 7, a beautiful rust-brown variety, without a trace of the green coloration. Chlœophorides: *Halias prasinana*, *H. bicolorana*, 1. Arctiides: *Nudaria mundana*, *Calligenia miniata*, abundant, *Lithosia lurideola*, *Oenistis quadra*, common, *Gnophria rubricollis*, *Euchelia jacobaeae*, *Arctia caia*, 2, *Plerestes matronula*, 7, July 3rd, and 1 on 7th. Liparides: *Porthesia chrysorrhoea*, fairly common, *P. similis*, not so common, *Lymantria monacha*, *Dasychira pudibunda*, 1 ♂. Lasiocampides: *Clisiocampa neustria*, *Lasiocampa quercus*, *Cosmotriche potatoria*, *Eutricha quercifolia*, 2, *Gastropacha pruni*, 2. Notodontides: *Cerura furcula*, 1, July 8th; *C. vinula*, 1, July 8th; *Stauropus fagi*, males abundant. *Gluphisia crenata*, 1, *Pterostoma palpina*, 1, *Hybocampa milhauseri*, 2, *Leiocampa dictaea*, 1, *Notodonta dromedarius*, 1, July 7th, *N. ziczac*, 2. Cossides: *Cossus ligniperda*, 1. Zeuzerides: *Zeuzera pyrina*, 3 ♂s. Cochlidides: *Cochlidion avellana* (*testudo*), 2 ♂s, 1 ♀, July 8th. Cymatophoridæ: *Thyatira batis*, few, *Gonophora derasa*, excessively abundant, quite the most common moth on the first two nights; *Cymatophora or*, 1, *C. duplaris*, 1. Noctuides: *Panthea coenobita*, 3, *Moma orion*, 1, July 7th; *Triaena psi* (and perhaps *T. tridens*), *Apatela aceris*, 2, *Pharetra megacephala*, 1, very dark, *Jochaeara alni*, 1, rather more suffused with black than the English type, *Leucania litharyyria*, *L. c-album*, *Axylia putris*, common, *Xylophasia rurea*, 1, *Neuria reticulata*, 1, July 8th; *Apamea didyma*, *A. basilinea*, *Grammesia trigrammica*, *Caradrina quadripunctata*, *Agrotis candelarum*, Hübner, 1, *A. corticea*, *Noctua plecta*, *N. stigma*, *N. ditrapezium*, 8, *N. brunnea*, 1, *Triphaena comes*, not common, *T. orbona*, 1, well marked, *T. pronuba*, *Amphipyra tragopogonis*, *Mania maura*, 1, *Cosmia trapezina*, *Dianthoecia conspersa*, *D. cucubali*, 2, *Hecatera serena*, 1, *Aplecta prasina*, 1, *Mamestra brassicae*, *M. persicariae*, abundant, *Hadena pisi*, *H. contigua*, 3, *H. thalassina*, several, *H. dissimilis*, 1, *H. adusta*, 2, *Cleoceris viminalis*, *Habryntis scita*, 1, *Euplexia lucipara*, *Cucullia gnaphalii*, 1, *C. umbratica*, common, *C. lucifuga*, 3, *Habrostola tripartita*, 1, *Plusia chrysitis*, *P. iota*, *P. pulchrina*, 2, *P. gamma*, *P. bractea*, 2, *P. modesta*, 1, *Aedia funesta*, 2, *Chariclea umbra*, 6, *Erastria deceptoria*, 1, *Ophiusa algira*, 1, *Aventia flexula*, 1, July 8th; *Toxocampa pastinum*, 2, worn. Geometrides: *Amphidasys betularia*, 1, *Selenia tetralunaria*, 1, July 8th; *Eurymene dolobraria*, 1, *Boarmia repandata*, *B. roboraria*, 5.

Thus was completed a record of over a hundred species actually taken or noted, besides the many Geometrids from which we were forced to refrain, as the larger moths knocked them to pieces in the bottle,

and we were not provided with pill-boxes. The Micros did not appear very numerous, but I am too ignorant of them to attempt any note in regard to them. *Sphinx convolvuli* was very common at flowers of *Nicotiana* a fortnight later, but, contrary to my anticipations, did not affect the light. *Deilephila euphorbiae* larvæ, in all stages, were to be found at the same time as we were taking the imagines at light. Perhaps the absence of many species is almost as remarkable as the presence of others. I was especially surprised at taking no *Callimorpha dominula* or *Arctia villica*; *Spilosoma menthastri* or *S. lubricipeda*, I believe, was seen, but I have no note of their appearance; *S. mendica* did not visit us.

Aquatic Orthoptera.

By MALCOLM BURR, F.Z.S., F.E.S.

For many years entomologists have been under the impression that Orthoptera were never, under any circumstances, aquatic in habits, but this is now known to be not strictly true. I have a distinct recollection of seeing in print the statement that *Prisopus flabelliformis*, Stoll, a large Brazilian Phasmid, spends the day under water attached to stones, and flies at dusk, but, unfortunately, I cannot find the reference. It is, however, among the Acridiodea that we have the best authenticated cases of Orthoptera taking to water. A large Acridian, *Euprepocnemis plorans*, Charp., a pretty species fairly common in Spain and Algeria, has been noticed by Señor Gogorza to move about under water, and to swim exactly as though in its natural element. There is nothing in the appearance of this species which would suggest aquatic habits. The common English *Tettix bipunctatus*, L., is frequently found swimming on the surface of a small pool, but very probably it only indulges in involuntary baths. In England and abroad I have taken this species and *T. subulatus*, L., on the mud round the sides of pools, and when frightened, they spring to a considerable distance, and so often fall into the water. They immediately start kicking vigorously and simultaneously with both hind-legs, lying half on the side. Thus they swim to the shore. Dr. Hancock has shown that the *Tettigidae* live on a mud diet by pond sides (*Ent. Rec.*, x., p. 6). No European species has the posterior legs in any way modified for swimming; but the genus *Scelimena*, Serv., much like *Tettix* in appearance but considerably larger, has a membranous border on the posterior tibiæ, and on the first segment of the posterior tarsi. This membrane considerably increases the surface opposed to the water, and turns the legs into oars or paddles. Aquatic habits have been observed in this genus by Capt. Boys, Westwood, Humbert and de Saussure. I know of no Locustodea being, under any condition aquatic, but there is at least one remarkable instance in the Gryllodea. At the Zoological Congress at Cambridge, this year, M. le Prof. Gilson, of Louvain, exhibited a curious cricket, which has the spines of the posterior tibiæ and tarsi very considerably elongated. Prof. Gilson had taken the species himself in Fiji, where he discovered it, leaping about on the surface of a pool, below a waterfall. It is worth notice that the water was by no means calm, but rather rough, below the fall, and the long spines seem to act as the long claws of *Parra*

jacana, whose spidery feet enable the bird to walk over leaves and weeds floating on the water. Other genera of crickets, *Tridactylus*, for instance, live on the soft mud by the side of pools, and no doubt often leap into the water by accident, which necessitates swimming ashore, the insects thus acquiring habits slightly aquatic in spite of themselves.

Orthoptera collected in South-eastern Europe.

By MALCOLM BURR, F.Z.S., F.E.S.

Before commencing a detailed account of the Orthoptera that I captured last summer in south-eastern Europe, an explanation of the various localities cited appears necessary, as the names are chiefly those of small villages or hills, and not given in an ordinary map. Wolfsthal is a wooded hill in the immediate neighbourhood of Buda-Pest, and a very well-known locality. Adlerberg is another hill on the outskirts of the same town, but rocky, and covered with short grass and a few stunted shrubs. The species from Bucarest were taken in a rough meadow round a pool on the outskirts of the town, where all the poorer population flock to bathe. Comana is a wooded hill due south of Bucarest, about half-an-hour by train on the Bucarest-Giurgevo railway. Bufta is a very small village, with a wood, due north of Bucarest. Orsova is exactly at that corner of the Danube, where the frontiers of Roumania, Servia, and Hungary meet. The town itself is in Hungary, but I am still uncertain whether the insects that I took at Orsova are from Serbia or Hungary. Bosna Brod (brod = "ford") is the junction for the Bosnian railway, a village on the south bank of the Save, the corresponding village on the opposite side being Slavisch Brod, which is in Slavonia. The species from Bosna Brod were taken on the banks of the Save. Kosija Cuprija ("goat bridge") is a small bridge over the Miljacka, half-an-hour's walk from Sarajevo, the capital of Bosnia. The bridge crosses the river in one arch, and was built about the year 1600. Igmán is a planina or plateau, very thickly wooded, near to Ilidze, which is a fashionable resort about eleven miles from Sarajevo. The elevation of Igmán is 4,095 feet. Trebovic is a wild and rugged hill on the outskirts of Sarajevo. The elevation is 1,740 mêtres. Lukavica is a fertile valley near Sarajevo. Konjica is a small village on the border-line between Bosnia and Herzegovina. Tisavica ("pretty") is a barren limestone valley south of Konjica, and therefore in Herzegovina, at an elevation of nearly 2,000 mêtres. Bicevica is a similar valley, not so high, about forty miles south of Konjica. Ruiste is a gendarmerie station, six or seven miles south of the last named locality. It is a barren stony valley, thickly wooded with pines and beech on one side. Blagaj is a village five miles from Mostar, the capital of Herzegovina. It is situated in a ravine between stony mountains, and is the hottest place I have ever been in. The vegetation consists almost entirely of thorn bushes, of which pomegranates are the worst. It is here that the river Buna rises out of a hole in the rock, 30 feet across at its source. Blato ("lake") is a stagnant marshy lake on the west of Mostar. Cetinje is the capital of Montenegro or Crnagora, situated in a basin surrounded by mountains. The basin is apparently the bed of an old lake, and the average altitude is 638 mêtres. Rjeka ("river") is a village on the lake of Scutari, three hours' walk from Cetinje.

From this list it will be seen that a large area was covered, and excursions made in localities very widely separated; indeed, it is a three days' journey in the train from Bucarest to Sarajevo. The results on the whole are satisfactory, though I failed to get certain species that other collectors had taken at the same spots. For instance, I searched in vain for that magnificent insect, *Psorodonotus fieberi*, Friv., at Blagaj, which is a well-known locality for it.

Forficularia.—*Labia minor*, L., was common on the wing in the afternoon in the middle of July, at Bosna Brod. *Forficula auricularia*, L.—The common earwig occurred practically everywhere. *Anechura bipunctata*, Fabr.—I searched for this species in all the mountains that I visited, but only took one immature female, beneath a stone on the top of Trebovic, July 24th.

Blattodea.—Ectobidæ.—*Ectobia lapponica*, L., was very numerous indeed, under stones, on Trebovic, July 24th; it was also common at Igmán, July 25th, Ruiste, August 1st, and Comana, July 12th, and I took one at Wolfsthal, June 28th. M. Montandon had taken the variety *erythronata*, Br., at Comana, earlier in the year. *Aphlebia maculata*, Schreb.—One under leaves, Igmán, July 22nd.

Mantodea.—Mantidæ.—*Mantis religiosa*, L.—I did not see an adult example, as the season was too young, but immature specimens were numerous at Adlerberg, June 28th, Comana, July 12th, Kosija Cuprija, July 19th, Trebovic, July 24th, Blagaj, August 3rd, and Rjeka, Aug. 13th. At Blagaj I took a large brown nymph engaged in devouring a specimen of *Platycleis grisea*, Fab. The grasshopper was as large as the Mantis and much more active. The strength of the fore-legs of the Mantis is considerable, and with them it could grip almost any insect. *Ameles*, sp. uncertain, immature, probably *A. decolor*, Charp., was not uncommon at Comana, July 12th, and Blagaj, Aug. 3rd.

Acridiodea.—Truxalidæ.—*Truxalis nasuta*, L.—Immature at Comana, July 12th, and Orsova, July 16th. Imago common at Blagaj, August 3rd. *Chrysochraon dispar*, Heyer, at Comana, July 12th, *C. brachypterus*, Ocsk., Comana, July 12th, Bosna Brod, July 17th, Trebovic, July 24th, and Ruiste, August 2nd. When living, the colour of this species is a beautiful metallic emerald green, which fades almost immediately after death. I tried formaline to keep the colour, but that changes it to red, while spirit bleaches it. *Stenobothrus lineatus*, Panz., at Wolfsthal, June 28th, Comana, July 12th, and Bufta, July 14th, Igmán, July 21st. *S. nigrogeniculatus*, Kr.—This species I only took at Comana, July 12th, and Adlerberg, June 28th. *S. nigromaculatus*, Herr.-Sch., was more widely spread, occurring at Adlerberg, June 28th, Igmán, July 21st, Trebovic, July 24th, Bufta, July 14th. The variety *istriana*, Kr., I took sparingly at Ruiste, July 22nd. *S. miniatus*, Charp., occurred sparingly at Kosija Cuprija, July 19th, and Igmán, July 21st, but was abundant at Trebovic, July 19th, and Tisavica, July 28th. The stridulation of this species is very curious. It is deep and harsh, and when the insect flies the elytra and wings make a clattering noise. It prefers high and stony places. *S. morio*, Fabr.—I took a few of this species at Igmán, July 21st, and Trebovic, July 24th. This species when alive resembles the last, but the chirp is deeper, wider, and more prolonged. It prefers woody places. *S. rufipes*, Zett.,

was common at Comana, July 12th, Bosna Brod, July 17th, Cetinje, July 10th, and Lukavica, July 23rd. *S. haemorrhoidalis*, Charp., at Ilidze, July 21st. *S. petraeus*, Bris.—One male at Cetinje, July 11th. *S. vagans*, Fieb., Bosna Brod, July 17th. *S. bicolor*, Charp., abundant everywhere. *S. biguttulus*, L., at Comana, July 12th; and Igmán, July 21st. *S. dorsatus*, Zett., was common at Bucarest, July 11th, Comana, July 12th, and Igmán, July 21st; also Bosna Brod, July 17th, and Lukavica, July 23rd. *S. pulvinatus*, F. de W., common at Bucarest, July 11th, Comana, July 12th, and Cetinje, July 10th. *S. parallelus*, Zett., Comana, July 12th, Bosna Brod, July 17th, Cetinje, July 10th. *Gomphocerus sibiricus*, L.—The only place where I took this mountain insect was at Tisavica, July 28th. It was fairly numerous at one end of the stony desolate valley, hopping about among the little tufts of grass among the stones. The stridulation is short and low, and rather hard to distinguish. *G. rufus*, L.—One male at Igmán, July 21st. *G. maculatus*, Thunb.—One male on the very top of the peak of Trebovic, July 24th. *Stauronotus brevicollis*, Eversm., was numerous in the neighbourhood of Bucarest, July 11th. *Stethophyma fuscum*, Pall.—This splendid grasshopper was very noticeable at Bicevica, August 1st, from its size and colour, and from the clattering made by the elytra and wings during flight. *S. brevipenne*, Fisch., was also common at Bicevica, August 1st, and I received a male from Travnik, in North Bosnia. *Epacromia strepens*, Latr., at Comana, July 12th, and Blagaj, August 3rd. *E. thalassina*, Fabr., was numerous near Comana, July 12th, with the above species, and occurred also at Bosna Brod, July 17th, and Blato, August 4th. They were very active insects, and take a short flight when approached, which makes them rather hard to capture.

(*To be continued*).

COLEOPTERA.

Notes on the British Longicornes.

By H. St. JOHN K. DONISTHORPE, F.Z.S., F.E.S.

(*Continued from* p. 249.)

Of our four species of the next genus, *Gramoptera*, two are common, and two are local and rare. *Gramoptera tabacicolor*, De G. (*laevis*, F.), our first species, is common in the London district and the south, and not uncommon in the Midlands, but is rarer further north. Mr. Bouskell tells me it is common in Leicestershire. It is a black insect with yellow elytra, the suture and apex of which are narrowly black. At first sight it is not unlike the male of the last insect, but may be at once known by its yellow legs, the legs of *Strangalia melanura* being black. It is to be taken by sweeping or beating. I have captured it in the New Forest, in many localities in the London district, and at Chiddingfold, etc. *Gramoptera analis*, Panz., is a black insect, with the abdomen reddish; the antennæ are entirely black. It is a rare insect, and is taken by sweeping flowers and beating oaks and hawthorn blossom. I have captured it by beating hawthorn blossom, and also by sweeping in the New Forest. It has also occurred at Darenth Wood, Westerham and Matlock. *Gramoptera ruficornis*, F., is closely allied to the preceding, but may easily be known by having

the base of the antennæ red. It is also, as a rule, a smaller insect. It is common, and generally distributed throughout England, but rarer in Scotland. It has been recorded from Ireland. It is found on flowers, *Umbelliferae*, hawthorn, etc. I have taken it all over the London district, in the New Forest, and at Chiddingfold, etc. *Gramoptera praeusta*, F. (*ustulata*, Schall.), is a rare and local insect of a golden yellow colour, with the head and apex of the elytra black. It is chiefly confined to the New Forest, where I have taken it sparingly, by beating hawthorn blossom. It has been recorded from near Southsea.

In *Acanthocinus aedilis*, L., the antennæ are very long, being four times as long as the body in the male. It is a northern insect, and is mostly found in Scotland, the English specimens taken being perhaps importations in timber. Mr. Rye has a specimen in his collection, given to him by a Mr. Percival, who took it at Brent Knoll, in Somersetshire, 1889, crawling up a signboard. Mr. Tomlin tells me he occasionally takes it in Chester, at the docks. It is a brownish insect, covered with grey pubescence. The female has the ovipositor exserted. Generally found on pine or fir logs. It is locally called "Timber Man."

Leiopus nebulosus, L., a beetle mottled with black spots and grey pubescence, is widely distributed throughout the country, being common in the London district and the New Forest. Mr. Bouskell records it from Buddon, Burdon and Owston, in Leicestershire. It can be taken by beating faggots, dead hedges, hawthorn blossom, etc. I have found the pupæ in numbers under the bark of a tree, at Wimbledon Park, and have taken it by beating at Combe Wood, and sweeping at Chiddingfold, etc. Some melanic forms occur.

Of our three species of *Pogonochaerus*, one is Scotch and the other two are found in both England and Ireland as well. They bear a superficial resemblance to each other, but may be easily distinguished, as will be seen. They are all small fuscous-brown insects, variegated with whitish pubescence, which forms a band across the elytra. *Pogonochaerus fasciculatus*, De G.—This Scotch species may be known by the fact that it has no spines to the apex of the elytra. It is local, occurring in boughs and twigs of pine and Scotch fir at Rannoch, Braemar and Aviemore, etc. The next species, *Pogonochaerus bidentatus*, Thoms (*hispidus*, *Brit. Cat.*), has two spines on the apex of each elytron; the one at the sutural angle being the smaller. It is local and not common, but widely distributed. I have taken it by beating a hazel hedge in the Hastings district, on hawthorn blossom in North Wales, and in the New Forest, and under bark of oak in Buddon Wood (Leicestershire), in January, 1897-8, where no doubt it was hybernating. Mr. Bouskell records it from Owston and Buddon Woods, and Mr. Headley from the latter locality. It is also to be found under bark of apple and pear trees. The last species, *Pogonochaerus dentatus*, Fourc. (*hispidus*, Schr.), has a spine on the outer angle of the apex of the elytra only. It is common, and generally distributed in the London district and the south, and is found in twigs, old hedges, and may be obtained by beating hawthorn blossom, etc. I have taken it freely in the New Forest, by beating hawthorn blossom, and in Cambridgeshire, by sweeping under plum trees. Mr. Bouskell records it from Owston and Buddon Woods.

Our next insect, *Lamia textor*, L., is a large, broad, conspicuous

beetle, with a few spots of yellow pubescence on the elytra. It is rare and very local, and occurs in and about willows and sallows. It is recorded from Hastings, Bath, Bristol, Bournemouth and Scotland; of these, I should say that the Hastings specimen was an importation. I do not think it can ever have been established at Bath, as the late Dr. Gillo, who lived there, and was a very good collector, never found it, and was of opinion it did not occur there. Mr. E. A. Waterhouse took a specimen in Scotland, near Rannoch, and I am informed that Mr. Shipp has taken it more recently at Clifton, but I should regard the majority of specimens in collections as importations.

(*To be continued*).

Acanthocinus (Astynomus) ædilis, Linn., in London.—On September 9th I picked up a male specimen of *Acanthocinus aedilis*, whilst crawling on a vessel recently arrived from Russia, and lying at the time in the London Docks. I am informed by Mr. Donisthorpe that this insect is local in Scotland, and has a general distribution over N. Europe, Sweden, Norway, Germany, Russia, etc., in pine forests. He also tells me that this specimen was probably imported.—E. E. Heppell, 61a, Loampit Vale, Lewisham, S.E.

The colour development in the elytra of Trichius fasciatus, L.—In the early spring I found three broad, fat, coleopterous pupæ in a very rotten oak stump, in the Castell Coch woods, near Cardiff. I thought they might turn out to be *Sinodendron*, which is common there, and put them in a glass bottle with plenty of powdered wood, amid which they soon wriggled themselves into comfortable little nests. Nothing happened until June, when to my astonishment one day I found a fine *Trichius fasciatus* in the bottle. Three imagines eventually emerged successfully from the pupæ, and I was fortunate enough to catch one in the act. In colour the perfect insect was a pure milk-white, with the wings stretched straight down longitudinally, and not folded up under the elytra. Faint traces of colour began to appear some hours afterwards on the elytral bands,—at first a very pale red, then developing into brick-red, and finally passing from a burnt sienna shade into a velvety black. This development of the colour took upwards of five days, although the bottle stood on a window-sill in a light and airy position. During this time the beetles were generally buried amongst the wood at the side of the glass. I did not find any other specimens this year, and the guelder-rose, which *Trichius* generally patronises in this district, was not so prolific as usual in other species. The only Longicorne of note that occurred on it was *Pachyta cerambyciformis*, and this was common.—B. Tomlin, F.E.S., Llandaff.

Coleoptera of the Lledr valley.—Among the divers methods employed by the coleopterist for securing his prey, none prove more efficacious than the examination of the drift and flotsam of river floods. In this way beetles are discovered which evade the most careful search, and the investigator often stands amazed at the amount and variety of coleopterous life which the overflowing waters reveal as having been inhabitants of their banks. Thus the fauna of acres, if not of square miles, may be sometimes gathered together into the compass of a haycock, and, as it were, a microcosm of an

entire district displayed in a few bushels of river drift. It may therefore prove of interest to detail the captures made in such a manner from the flood *débris* of the upper waters of the Lledr, a river, which rising high among the Snowdonian mountains, runs down the Dolwyddelau valley, and joins the Conway above Bettwys. I was fortunate enough, in company with two friends, coleopterists like myself, to strike this river, near the Roman bridge, on a gloomy morning in August last, a day which had succeeded a time of heavy rains. The thin mountain hay left in swathes along the river meadows had been carried violently down the stream, and, where its course made a sharp angle, had been heaped high in wet hummocks and tangled masses round the curve. The river was just then receding, and there had been no sun to dry the *débris* and facilitate the escape of the beetles. The situation was grasped in a moment, and the explorers, forgetful of the high mountain peaks which had been their goal, with one consent turned aside to the river bank, and were soon busily engaged in shaking out the wet hay over large sheets of brown paper. The list which follows is the result. It is interesting, as revealing a coleopterous fauna of this upland valley, which probably the most careful search, under normal conditions, would have failed to bring to light. The occurrence of some of the species in such a locality is surprising, and many of them have not, as far as I am aware, been previously recorded from North Wales.

The most interesting capture was undoubtedly a single specimen of *Lathrobium atripalpe*, hitherto only recorded from Scotland. Another rare species was *Philonthus lucens*, of which four were taken. *Adimonia tanaceti* was an unexpected discovery, as not a leaf of tansy can be found in the whole valley, and this rather confirms Canon Fowler's conjecture that the food of the larva, in such a locality, may be wild thyme. The most abundant insect in this *débris* was *Anchomenus parumpunctatus*, which literally swarmed, while *Harpalus latus*, and *Trechus obtusus* came in good seconds. *Amara aulica* and *Staphylinus caesareus* were also abundant. The following is a full list of all the species taken :—*Carabus arvensis, C. nemoralis, C. catenulatus, Nebria gyllenhali, Dyschirius globosus, Harpalus latus, Pterostichus niger, P. versicolor, P. vitreus, P. nigrita, P. strenuus, P. diligens, Amara aulica, A. acuminata, A. lunicollis, Taphria nivalis, Anchomenus fuliginosus, A. parumpunctatus, Bembidium guttula, Trechus obtusus, Patrobus excavatus, Laccophilus interruptus, Hydroporus nigrita, H. pubescens, Hybius fuliginosus, Anisotoma ovalis, Hister neglectus, Choleva morio, Colon brunneum, Silpha opaca, Homalota atramentaria, H. elongatula, Oxypoda opaca, Ilyobates nigricollis, Tachyporus formosus, Megacronus cingulatus, M. analis, Mycetoporus angularis, M. lepidus, Quedius semiaeneus, Staphylinus caesareus, Ocypus cupreus, Philonthus laminatus, P. politus, P. intermedius, P. varians, P. lucens, P. nigrita, P. trossulus, Othius melanocephalus, O. myrmecophilus, Lathrobium atripalpe, L. multipunctum, Cryptobium glaberrimum, Stenus speculator, S. providus* var. *rogeri, S. pallipes, S. brunnipes, S. declaratus, S. nitidiusculus, S. similis, Lesteva sharpi, L. pubescens, L. sicula, Olophrum piceum, Cryptohypnus riparius, Agriotes obscurus, Serica brunnea, Hydrothassa aucta, H. marginella, Adimonia tanaceti, Otiorrhynchus maurus, Barynotus*

moerens, *Mecinus pyraster*, *Hypera nigrirostris* var. *ononidis*, *N. punctata*, *Erirhinus acridulus*, *Rhinoncus castor*.—W. E. Sharp, Ledsham, Cheshire.

SCIENTIFIC NOTES AND OBSERVATIONS.

Pseudopontia paradoxa, Felder.—There is little doubt that this curious insect is the surviving representative of one of the ancestral forms of Lepidoptera; and I do not expect that much fresh light will be thrown upon its affinities until the discovery of the larva, which may, perhaps, prove to be as abnormal as the perfect insect. I founded a family (*Pseudopontiidae*) for it, and discussed it at some length in my *Handbook to the Order Lepidoptera*, iii., pp. 76-81, pl. 79, fig. 3 (1897). Felder's original generic name (*Globiceps*) was preoccupied, and he therefore renamed it *Gonophlebia*, in the *Petites Nouvelles Entomologiques* for June 15th, 1870; but as Hewitson had already called attention, in the issue of the same journal for June 1st, to the identity of *Pseudopontia calabarica*, Plötz (1870), with *Globiceps paradoxa*, Felder (1869), the priority of *Pseudopontia*, Plötz, is thereby established, even if Hewitson was only quoting from an early copy of an unpublished paper, of which, however, there is no evidence. —W. F. Kirby, F.L.S., F.E.S. *Sept. 16th*, 1898.

On the relationship of Pseudopontia paradoxa.—In Dr. Jordan's recent excellent paper on "The antennæ of butterflies" (*Novitates Zoologicae*, v., pp. 374-415), an essay that deserves the attention and serious consideration of all lepidopterists, we note the following points bearing on this subject: (1) "*Pseudopontia paradoxa*, considered by Butler and others to be a moth, has certainly Pierid antennæ" (p. 376). (2) "The aberrant Pierid, of which the last joints of the antennæ are represented by fig. 28, is *P. paradoxa*; the antennæ of this species have 27 joints only, and there is no indication of the formation of a club; the joints are basally and apically narrowed; the grooves are large and very distinct; at the apical edge of the groove the pair of bristles is visible, which is normal for most Pieridæ" (p. 382). The insect is considered as belonging to the Pierid sub-family *Pierinae*, and not to the *Dismorphiinae*, which includes *Leucophasia sinapis*, and to which, in some respects, the insect bears a superficial resemblance. I may add that Dr. Butler informs me that his present view as to this insect is in accordance with the views of Grote and others, *viz.*, that the insect is an aberrant Pierid.—J. W. Tutt.

VARIATION.

Further note on Tæniocampa gracilis var. rufa.—As an addition to my remarks in the *Ent. Record*, p. 226, about the red form of *T. gracilis*, I may add that, since I wrote my experiences there mentioned about this form of the species, I have again collected the larvæ of the red form in the New Forest. The great majority of the larvæ I found feeding upon bog myrtle, but I also found some upon sallow bushes of two kinds, and upon *Hypericum elodes*—the marsh St. John's wort—a very low-growing plant, and upon yellow loosestrife. I brought home a good many, and sleeved some of them upon sallow, on which they did well, but the majority I fed upon dock and birch,

and upon these foods they fattened up exceedingly fast, and grew very large. Most of them when found, and brought away from their home in the New Forest, were about $\frac{3}{4}$ inch long, but some were larger, and many were only $\frac{1}{2}$ and even $\frac{1}{4}$ inch long. I mention the size to show that they have been removed from their natural home and food-plants, and fed up on other food-plants for the greater part of their larval existence, and have stood it well, and appeared to like it. I should like further to add that this species is terribly subject to ichneumons. I should think from half to two-thirds of what I collected succumbed to them. The ichneumon larva leaves them when they are about half-grown, and attaches its cocoon to the dead *gracilis* larva, or the leaves of the food-plant close by.—William M. Christy, M.A., F.E.S., Watergate, Emsworth, Hants. *August 1st*, 1898.

Aberration of Abraxas grossulariata.—I have to record the taking of an aberration of *Abraxas grossulariata* this year, which may be interesting to some of the readers of the *Ent. Record*. The black markings of the insect are those of the normal type, but the striking difference in its appearance, compared with the ordinary form, is caused by the entire ground colour of the moth (body and wings, above and underneath, without a speck of white anywhere) being of a bright deep yellow. This yellow is of the tint which usually forms the colour of the body and the band on the fore-wings. The insect was taken at rest on an elm tree at Angmering, Sussex, by a son of mine, and had only just emerged from the pupa.—J. C. Dollman, Hove House, Newton Grove, Bedford Park, W.

Yellow aberration of Euchelia jacobææ.—A specimen of this aberration, of a bright yellow on all the wings, was taken at Emsworth, Hants, on June 25th last. Unfortunately, one of the lower wings is a little torn. I have met with two examples only of this aberration in the whole course of my collecting.—Joseph Anderson, Chichester.

PRACTICAL HINTS.

Field Work for November and December.

By J. W. TUTT, F.E.S.

1.—Pupa-digging should be persisted in during the month. Those of *Smerinthus ocellatus*, *Ptilodontis palpina*, *Notodonta ziczac* may be found beneath the ground at the foot of willows; *Smerinthus populi*, *Leiocampa dictaea*, *Cymatophora ocularis*, *Cuspidia megacephala*, *Taeniocampa populeti*, around poplars, *Clostera curtula*, *C. reclusa*, on leaves at foot of poplars; *Selenia bilunaria*, *S. lunaria*, *Phigalia pedaria*, *Amphidasys strataria*, *Eupithecia exiguata*, *Lophopteryx camelina*, *Notodonta trepida*, *Drymonia chaonia*, *D. dodonaea*, *Taeniocampa miniosa*, *T. munda*, at roots of oak; *Moma orion*, in crannies of oak bark; *Tephrosia consonaria*, *T. bistortata*, *T. punctulata*, *Lophopteryx carmelita*, at foot of birch trees, and *Drepana falcula*, *Cymatophora duplaris*, *C. fluctuosa*, *C. or*, *Acronicta leporina*, in spun-together leaves under birch trees.

2.—The male *Hybernia aurantiaria* sits on the leafless twigs of oak and birches, in November, after dark, and pairing takes place about 9.30 p.m. At the same time *Cheimatobia boreata* may be taken, sitting on the birches, but this species pairs earlier in the evening.

3.—About the middle of November, look on the dark supports or framework of lamps for *Poecilocampa populi*, *Asteroscopus sphinx*, etc.

4.—Fix two large lamps about 10 feet from the ground, and about the same distance apart. About 15 feet behind them hang a large *dark* sheet. *Poecilocampa populi* and *Asteroscopus sphinx*, when attracted, will rest quietly on the sheet (Holland).

5.—At ivy, *Dasycampa rubiginea* is usually found on blossoms partially hidden, and wants well searching for on bushes that cannot be beaten. It also appears to have a partiality for small detached bushes with but few heads of bloom (Mason).

6.—At the latter end of November and beginning of December it was unusually mild, and the ivy bloom over early, so I sugared regularly for a few days, and obtained four *Dasycampa rubiginea*, two on November 28th, and two on December 1st (Mason).

7.—Thatch should be beaten persistently for the many species that hybernate therein—*Depressariae*, etc.

8.—Stems of wild parsnip with little nodules of white frass showing just above the lower nodes of the stem, will contain larvæ of *Conchylis dilucidana*. Place in damp sand.

9.—To hybernate *Macrothylacia* (*Lasiocampa*) *rubi*, plant a root of heather out-of-doors, knock the bottom out of a cheese crate, put it round the heather, and cover with perforated zinc. The larvæ come up in March, and spin up without eating (Hewett).

10.—Sugar throughout October and November, if the weather be suitable. You may get *Dasycampa rubiginea*, and, if not, such species as *Xylina semibrunnea*, *X. socia*, *X. rhizolitha*, *Calocampa vetusta*, *C. exoleta*, etc., will be attracted until the end of November.

11.—The pupæ of *Smerinthus tiliae* should be searched for at the roots of elm. Hollows in an old trunk are a favourite place for the pupation of this species.

12.—*Dicranura furcula* pupæ may be found by searching the dead wood of sallows, either on the tree or littered round the roots. They are generally at the base of a divergent branch, but sometimes on the straight, and very often at the hollow where a branch has been pulled off (Hewett).

N.B.—For similar series of "Practical Hints" for this time of the year see *Ent. Rec.*, vol. i., p. 187, vol. viii., p. 241, vol. ix., pp. 294-295, etc.

CURRENT NOTES.

The widow of the late Mr. H. T. Stainton died at her residence, Mountsfield, Lewisham, in September last. At the meeting of the Entom. Soc. of London, on Oct. 5th, the president announced that the late Mrs. Stainton had bequeathed to the society such entomological works from her husband's library as were not already in its possession. This bequest was of great importance, and would add to the library a large number of works, many of which, formerly in the library of J. F. Stephens, were old and now scarce. Among the most important additions were copies of Clerck's "Icones insectorum rariorum," Say's "American Entomology" (1817)—a work of extreme rarity, Goeze's "Entomologische Beyträge"—complete, Donovan's "Insects of New Holland," Linnæus's "Systema Naturæ," ed. x,

Godart and Dupouchel's "Lépidoptères de France," Harris's "The Aurelian," ed. i, and Sepp's "Nederlandsche Insecten." There were also numerous modern works dealing with the lepidopterous fauna of Europe.

Mr. J. J. Walker exhibited, at the same meeting, a black form of *Clytus mysticus*, L., ab. *hieroglyphicus*, taken by Mr. Newstead at Chester, where about one per cent. of the specimens were of that aberration; also a black ab. of *Leiopus nebulosus*, L., from the New Forest.

A meeting of the Entomological Club was held at "Stanhope," The Crescent, Croydon, the residence of Mr. T. W. Hall, F.E.S., on the evening of October 19th. To meet the members of the club Mr. Hall invited a select party of entomological friends, who after a pleasant evening (tea and coffee being dispensed by Mrs. Hall), sat down to an excellent supper provided by the host. We noticed among others present, Dr. T. A. Chapman, Messrs. Adkin, C. G. Barrett, Edwards, Harrison, Lucas, Mansbridge, Turner, the Rev. C. Bokenham and Mr. E. A. Smith, of the British Museum. These social evenings of the Entomological Club are very enjoyable, and are becoming quite a feature in the life of London entomologists. We were sorry to find that Messrs. Porritt, South and Verrall were unable to attend, the editor of *The Entomologist* being absent through illness.

Mr. Champion adds *(E.M.M.)* *Ploiaria baerensprungi*, Dohrn, to the list of British *Reduviidae*. The captures were made at Esher, August 30th, 1874, and New Forest, June, 1894.

Mr. Bignell has succeeded in breeding *Neuroterus schlechtendali*, the first specimen emerging on August 6th last, from small galls found on catkins of the oak, towards the end of May, 1896. This confirms Mayr's record that the flies appear in the second year.

Mr. C. G. Barrett notes *(E.M.M.)* that *Lozopera beatricella* (a species allied to *L. francillonana*, and recently differentiated therefrom by Lord Walsingham by the more upright transverse lines on the fore-wings) has been captured flying over alder and privet blossoms, in the middle of July, at Folkestone, from about eight p.m. until dark, by Mr. Purdey.

Mr. E. G. Hodge records *(Entom.)* the capture of larvæ of *Macrothylacia rubi* at Castlemartin, feeding on birds'-foot trefoil. He further notes that, "As this plant is not obtainable in London during the winter, and they would eat nothing else, they had to be returned." Two queries arise—Why would these particular larvæ eat nothing else? Why do they want food in the winter? The species certainly hybernates in the larval state, but full-fed, and has been shown by dozens of lepidopterists to pupate in spring without feeding.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

Description of eggs of Lepidoptera.—*Hypena albistrigalis*.—A nearly spent ♀ laid two ova on August 15th—one on a chip box, the other being extruded, but remaining attached to the end of the abdomen. The ovum is pearly-white, and very large for the size of the insect, ·462 mm. in diameter, and ·412 mm. in height, from base to micropyle. It is nearly spherical, being a little flattened at the base, less so at the apex. The sculpturing is very superficial compared

with that of the ova of the Noctuids proper, so that the ovum looks smooth to the naked eye, but the markings are similar—36 to 40 longitudinal ribs, slightly raised, with transverse dissepiments equally distinct, giving a honey-combed appearance. The micropylar area is slightly flattened, and marked with irregular divisions, the ribs commencing ·075 mm. from the pole. The ova were infertile.

Aventia flexula.—The ova, laid July 30th, were scattered on twigs and lichen, and were pale yellowish-brown, changing to reddish-brown in a few days. They form rather more than a hemisphere, and the transverse diameter measures ·545 mm. Eight primary ribs arise from near the micropyle, and two secondary ones between the primary at ·198 mm. from the pole, so that there are 24 ribs visible on the edge at the equator. Both primary and secondary ribs are prominent, sharp-edged, and undulating, with depressed furrows crossed by transverse dissepiments intervening. The micropylar area is ·083 mm. in diameter, somewhat depressed, and marked with a pavement of 9 or 10 irregular divisions.—W. S. Riding, B.A., M.D., F.E.S., Buckerell.

Thestor ballus.—The egg is almost spherical in shape, laid among the long hairs on the upper or underside of a leaf. The empty egg-shell is pearly white in colour, exceedingly delicate, thin and transparent, covered over with a very fine, close, and conspicuous polygonal network, sometimes 6, 5, or 4 (and even occasionally 3) sided. The micropylar area, at the apex, is rather more finely reticulated. The larva escapes at the side or apex. [Described under a two-thirds lens, April 30th, 1898]. Mr. H. Rowland Brown sent the eggs on April 3rd, from Hyères, and said: "I watched a female *T. ballus* lay these ova to-day (April 3rd) on *Lotus* ? *hispidus*." I was in the south of France myself when the eggs arrived, and the larvæ had hatched and died before I saw the eggs.

Thais rumina var. *medesicaste*.—Almost spherical, of a delicate white pearly hue with a faint bluish iridescence. The shell at first sight looks almost smooth, but is irregularly marked with the finest possible polygonal reticulation. A scarcely depressed, faintly ochreous, unreticulated space at the apex marks the micropylar area. The larva escapes at the shoulder of the egg, some distance below the micropylar area. [Described under a two-thirds lens, April 30th, 1898]. Mr. A. H. Jones, who received the egg from Hyères, laid on *Aristolochia pistalochia*, forwarded it to me on April 6th, 1898, whilst I was from home. This also had hatched before my return.

Erebia epistygne.—Colour pale yellowish, in shape somewhat resembles an orange, being almost spherical, but flattened at the base and slightly so at the top. There are 36 vertical ribs, which become united together somewhat irregularly (in twos, threes or fours) towards the apex; these are very distinct, rounded at their summits, and crossed by very faint transverse ribs, which are very numerous. The base is comparatively smooth, but the micropyle could not be made out under the low power with which we had to make the examination. [The egg was gently squeezed from the oviduct of a female captured by Mr. S. Edwards, at Grasse, on April 20th, 1897, and described under a two-thirds (used as a hand) lens, the same day].—J. W. Tutt.

NOTES ON COLLECTING, Etc.

Orygia gonostigma in Kent.—While searching the young oaks in woods, at Bexley, I came across a batch of ova of *Orgyia gonostigma*,

July 10th, 1898, the larvæ from which are doing well at the present time.—L. W. Newman. Meadow View, Bexley, Kent.

Colias edusa at Otford, Kent.—On August 25th, I captured two faded specimens of *C. edusa*, at Otford.—Ibid.

Lepidoptera from the Reading district.—I took a rather worn ♂ *Cochlidion avellana* (*Apoda limacodes*) on birch, in Pamber Forest, on June 23rd last. *Boarmia consortaria* has been more numerous than usual here, and the same remarks apply to *Erastria fasciana*, *Tephrosia extersaria*, *Hypsipetes impluviata*, *Eupisteria heparata*, *Asthena blomeri* and *Phorodesma bajularia*, *Abraxas sylvata* has been fairly plentiful, but I have detected only a slight tendency to variation in the direction assumed by some of the more northern specimens of this species. On the other hand, *Boarmia roboraria* has been scarce, and *Dicycla oo* very scarce. *Mellinia gilvago* on two nights (12th and 15th September) came in small numbers to sugar, and was accompanied by a few each of *Epunda lutulenta* and *Agrotis saucia*. *Xanthia aurago* is now our best insect out.—Joseph Clarke, 26, Zinzan Street, Reading. *September 30th*, 1898.

Time of appearance of Anthrocera lavandulæ.—Referring to your remarks as to the time of appearance of *Anthrocera lavandulae* (*Rec.*, p. 191), I found it pretty common, and I should think fully out, on May 1st, last year, on a hill-top at Costabelle, nr. Hyères.—(Rev.) Charles J. Buckmaster, M.A., F.E.S., Hindley Vicarage, Wigan. *October 3rd*, 1898.

Eugonia autumnaria (alniaria) at Chichester.— On September 16th, I captured a female *Eugonia autumnaria* (*alniaria*), at a lamp. I tried for eggs, but was unsuccessful. On the 22nd I took a male of this insect from the same lamp.—Joseph Anderson, Chichester.

Eugonia fuscantaria at Chichester.—I took from the lamp a few specimens of this "Thorn" in the early part of September.—Ibid.

Note on the season from Chichester.—On the whole, lepidoptera here were very scarce during the spring and summer. They were more numerous in the autumn. Amongst Geometrids I have never known *Anticlea rubidata* more abundant. A few *Iodis vernaria*, *Epione apiciaria*, with these, were about the best species met with. On a wall near our house I noticed a fine *Bryophila perla* ab. *flavescens*, which I, unfortunately, lost in boxing. *Macroglossa stellatarum* was not uncommon in the garden. The best visitors to sugar were *Agrotis saucia* and *Mellinia gilvago*.—Ibid.

Abundance of Chœrocampa elpenor.—The larvæ of *Chœrocampa elpenor* have been unusually plentiful here this season, feeding on the various species of *Epilobium* and *Galium*, growing on the banks of the river and ditches. This species deposits its ova on the underside of a leaf of the food-plant, in clusters of about three in number.—Edward Ransom, Sudbury, Suffolk. *October 5th*, 1898.

Leucoma salicis at Sudbury.—I found a large number of the larvæ of *Leucoma salicis* here this spring. They were feeding in an "osier" bed, and some of the smaller bushes were quite denuded of their foliage by them. They were abundant last year, in all their stages, in the same place. I do not think that it has been previously recorded from this part of Suffolk (West).—Ibid.

Euvanessa antiopa at Christchurch.—A very fine specimen of this insect was taken by Mr. T. Tapsell, of Christchurch, within a few miles of the town, in the second week in August. It was disturbed in

a small plantation of oak, birch and willow.—A. Druitt, Christchurch, Hants. *October 1st*, 1898.

Colias edusa in Wigtonshire.—I have very much pleasure in recording the capture of a fine ♂ specimen of *Colias edusa*, taken this side of the border. It was caught by my brother in one of the cottage gardens on Lord Stair's estate, at Stranraer, Wigtonshire, on August 29th, and is in very fair condition, and quite fit for the cabinet, though caught with his cap.—Andrew Adie Dalglish, 21, Prince's Street, Pollokshields, Glasgow. *October 11th*, 1898.

Sphinx convolvuli in South Devon.—This moth appears to have been unusually plentiful in South Devon during September. At Wonford, near Exeter, I saw four or five specimens which had been captured at the attractive flowers of the "tobacco" plant, while from Sidmouth and Dawlish reports were to hand of similar hauls for the collector.—H. Rowland Brown, M.A., F.E.S., Oxhey Grove, Harrow-Weald.

Sphinx convolvuli in the Channel Islands.—*Sphinx convolvuli* has been exceptionally numerous this autumn. I did not notice when it first appeared, and I have not seen it since September 22nd, but it is fair to say I have not looked for it. Between September 17th-22nd, I took, with the help of a young friend, whom I set to watch, with net and cyanide bottle, over two dozen specimens at the flowers of tobacco and petunias.—(Rev.) F. E. Lowe, M.A., F.E.S., Guernsey.

Sphinx convolvuli at Nunhead.—On September 22nd last, Mr. Wood, a friend of mine, residing at Nunhead, brought to me an imago of this fine insect, which had been found on the previous day by a member of his family, at rest on the side of some stone steps leading from his house to the garden. When the insect reached me it was unfortunately in a very damaged state, owing, doubtless, to its having been confined for some hours in a small cardboard box.—A. Russell, Southend, Catford.

Sphinx convolvuli at Chislehurst.—On the evening of September 17th, I captured two specimens of *Sphinx convolvuli*, one (♂) was found flying in the dining room, having been attracted by the electric light, the second (♀) was flying around the light in the porch of the house. Both were in fairly good condition, but as I had a good series captured in N. Devon, I kept them alive in the hope that they would pair, but in this I was disappointed, as both died after spoiling their anterior wings.—W. Thornthwaite, F.R.M.S., Avonhurst, Chislehurst.

Sphinx convolvuli at Chichester. — Several specimens of this fine moth have been taken here during September, some in very fine condition. The captor of one, which was brought to me, was a kitten. It is almost superfluous to say that the condition of this insect was not all that could be desired.—Joseph Anderson, Chichester. *October 5th*, 1898.

Sphinx convolvuli at Christchurch.—Several specimens of this insect were taken during the month of September, at Christchurch.—A. Druitt, Christchurch, Hants.

Sphinx convolvuli in co. Cork.—Two specimens of *S. convolvuli*, both of which I have seen, have been captured in this neighbourhood within the last few days, one near Mallow, and the other five miles distant. Almost every year I have heard of this species turning up in

the district. I cannot believe that they are all Continental examples, but the fact remains, so I understand, that the larva is unknown in this country!—C. Bingham Newland, Killetra. *September 25th*, 1898.

Polyommatus iolas and P. zephyrus var. lycidas in Switzerland. —Owing to the kindness of Mr. Postans in directing me to the exact spot, near Sierre, where six specimens of *P. iolas* have been taken in recent years (*Ent. Rec.*, p. 35), I was fortunate enough to take three more, two males and a female, on the 26th and 27th of June last. I also saw a specimen, which eluded me on the 25th. It is a curious fact, that although the food-plant is well distributed over the plantation, the butterfly has only been seen or captured at one particular spot on its outskirts. I have, however, myself found the larva on plants at some little distance. My only other capture of interest in Switzerland, this year, was that of *P. lycidas*, not at Bérisal but at St. Nicholas, as already recorded by the Rev. Frank Lowe. The species would appear to be fairly well established in this locality, which deserves, I think, to be better known to English entomologists. Its position on the railway, midway between Visp and Zermatt (either of which places can be reached in little over an hour), makes it an excellent centre for working the district. Very comfortable quarters can be had at the "Grand Hotel, St. Nicholas," of which, from a lengthened experience, I can speak in the highest terms.—(Rev.) C. J. Buckmaster, M.A., Hindley Vicarage, Wigan.

The hybernating stage of Dryas paphia.—During the latter part of August, I observed a *Dryas paphia* ♀ hovering about in the vicinity of violets (*Viola odorata*). I was standing quite still in company with my boy, when the insect settled on his trousers, depositing two ova; they appeared small when compared with the size of the butterfly, I cut them out carefully, placing them in a glass tube, and watching them from day to day under the microscope. About September 5th, I noticed black spots at the apex of the ovum, and on September 10th, both hatched out. Excepting the head, which was black and shining, the larvæ were transparent and very small. I supplied them with fresh tender leaves of violet and iris, and continued to do so daily, but could discover no indications of their having eaten any, though they (the larvæ) changed to a darker colour, and seemed to increase slightly in size. In a few days they left the food-plant and crawled up the tube to the bottom of the cork, where they have remained ever since. The question arises as to whether the larva of this species hybernates immediately after hatching, and without partaking of food. I tried them with both kinds of violet.—C. Bingham Newland, Killetra, Mallow, co. Cork. *September 25th*, 1898. [*Argynnis aglaia* we know hybernates at once after leaving the egg. We should be glad if some of our readers could give an authoritative answer as to *D. paphia*.—Ed.].

Flowers attractive to moths.—I am about to change my residence to a place in Hampshire, situated between Liphook and Frensham. I believe the district is noted for entomology, and hope to find it more productive than co. Cork. I intend laying out the garden specially with the view of attracting insects, and should be very grateful if any readers of the magazine could give me a list of what may be considered the most attractive plants, etc., to put down. In this spot, *Choerocampa celerio* and *Deiopeia pulchella* have been taken by the late owner.—Ibid.

The Entomologist's Record
AND
JOURNAL OF VARIATION.

Vol. X. No. 12. December 15th, 1898.

August collecting in the Val d'Anniviers.

By H. ROWLAND BROWN, M.A., F.E.S.

There is one great charm about the study of lepidoptera—you can eat your cake and have it. You can go whithersoever the spirit calls, within the limits of time and opportunity, track your quarry in its native haunts, and afterwards conjure up, by the sight of the hard-won specimens in the cabinet drawers at home, the delightful associations of summer rambles and night-watches under the stars of August and September. And, I think, we bug-hunters have the advantage over our botanical brethren—the collectors of dried flowers and ferns—for whereas we both share the common enjoyment of "fresh woods and pastures new," the fleeting glories of the plant pass with the moment for the most part, while our butterflies and moths maintain, after many years, so much of their pristine delicate beauty, that only the expert eye may detect whether the object of admiration was added to the collecting-box a month or a decade since. Of course, some insects fade, however carefully preserved. But take the single example of the Large Copper, that is to be sought to-day only in Stevens's sale rooms, and such unromantic localities. The bred specimens are as fine as they were fifty or sixty years ago, when they emerged from the chrysalis, and the "wild" *Chrysophanus dispar* is no less "a thing of beauty and a joy for ever." With which remark I will proceed to "cut the cackle and come to the 'osses," in other words, to string together a few notes upon a short holiday's collecting in sunny Switzerland. Sunny, indeed, it has been this year. Too much so, perhaps, for the low-lying pasture land and lake-side forests, but certainly not for the mountain hotels and places where the tourist resorts, and the rarer hunter of the bug takes up his quarters. This year I revisited Zinal, a former visit in 1895, from the lepidopterist's point of view, having yielded nothing, as I did not arrive until late in August, when, as all who have collected in the higher alps are aware, the season for butterflies is practically over. Indeed, I have always noticed that, after the middle of the month, the Rhopalocera disappear with unvarying regularity, and the number of species in good order, on the wing, may be counted pretty well on the fingers of both hands.

Zinal lies in one of the numerous valleys that branch to the right of the Rhone valley, looking towards the Simplon, most famous of passes for its entomological treasures. At an altitude of 5,500 ft., within sight of the eternal snows, it is the last village of the Val

d'Anniviers, connected by a mule path with Vissoye, about the longest 6¼ miles I know in Bædeker. Once up the steep zigzag from Sierre, the nearest railway station, the road ascends more gently, crossing great ravines, plunging into dusty tunnels blasted in the virgin rock, and anon winding among pine forests and flowery valleys, bright with little patches of grass, rye, and cherry orchards, the haunt of most of the butterflies to be found in the Valais. The last day of July was one of stifling heat, as I descended from the train, after the through journey from London, and unfurled my Graf-krüsi preparatory to the climb up to Vissoye. There is a fine stretch of marshy ground between Sierre and Chippis, at the foot of the zigzag aforesaid, and I was anticipating at least an hour's sport before the ascent. Unfortunately, a thunderstorm came tearing down from the Lake of Geneva, and, before I had time to cross the plain, it was upon me. This is a capital locality, I know, for *Pieris daplidice*, which I did not find that day, and for *Satyrus dryas*, of which I secured a single specimen, in first-rate condition, and innumerable "Blues." Higher up, from the wind-driven dust, on which the great rain drops were crackling like small shot, occasional *Satyrus alcyone* would start and make for the nearest shelter of over-hanging rock, whither I was not long in following, to find them but shabby fellows, who appeared to have been on the road for many weeks. And though the rain soon passed off, the sky remained cloudy, with but fitful gleams of watery sunshine, disappointing in the extreme to the collector. I had just time to note that *Melitaea didyma* was evidently in full swing, with its pretty female variety *alpina*, properly located, according to the data, in Kane's *European Butterflies*. I spotted also *Spilothyrus alceae*, last seen at Hyères in April, and a few common things besides; but the clouds again closed in, and I arrived at Vissoye for the night, wondering if I was to experience a fourth wet August in succession during my stay at Zinal. Happily, this was not to be. In fact, with the exception of a rainy day or two about the 8th, the rest was such weather as the gods favour us with but seldom in these regions. Next day I was up early—too early for the butterflies—but later in the morning I came across, among others, *Chrysophanus alciphron* var. *gordius*, wasted, among the sorrels by the streams, and *Brenthis amathusia* quite the commonest of the *Argynnidi*, for this and many succeeding days. Kane gives the chapel of St. Laurent, midway between the villages, for *Polyommatus donzelii*, and sure enough I was hardly in the wood in which the tiny chapel is situated before I secured this pretty and local Lycænid, with several females, probably because of their inconspicuous markings accounted rarer than the males. So long as the pastures remained uncut I frequently collected at this place, up and down the mountain slopes, on both sides of the brawling Navigenze. Hereabouts one sunny morning I encountered *P. eumedon*, *P. eros*, *P. hylas* (very fine and frequent), with *Nomiades semiargus* and *Plebeius aegon* in swarms. The flower-heads of the *Centaurea*, too, were clustered with *Erebiidi*, mostly *Erebia euryale*, and from the damp grass in which the wild balsams grew, I picked up a battered specimen or two of *E. ceto*, quite useless for boxing. Meanwhile in every direction the larger fritillaries, *Argynnis aglaia* and *A. niobe* var. *eris*, with *B. amathusia* and occasional *B. euphrosyne*, were dashing wildly from bloom to bloom, much affecting, with *Vanessa io*

and *Aporia crataegi*, the yellow hawkweeds. Higher up, again, in the pine forests opposite Zinal itself, a few days later I made the acquaintance of *B. ino*, a gay little insect common enough where it occurred, but very local. There also, by the stream, I took one or two *P. optilete*, but they were in better condition nearer the Durand glacier at the head of the valley, where, on a saxifrage-covered slope, through which a stream of black spring water rushed to the dreary moraine, was, perhaps, the finest collecting ground of all. Coming over the Roc de la Vache, true to its name, and swarming with unwelcome kine, I chanced upon this quiet corner. Above on the wind-swept, sun-burnt sides of the Cow Rock, I had that day heated myself in pursuit of my first (and only) *Chionobas aello*, and disported on the shadier slopes, among the arnica daisies and edelweiss, with *M. cynthia*, *Pieris callidice*, *M. aurinia* var. *merope*, and, among myriads of its kind, one splendid *B. pales* var. *napaea*. Pleasant it was, then, to throw myself down on the lush green moss and drink long draughts of the pure water, by which the great white *Parnassius delius* was lazily dancing, as it were, with the nodding cotton-grass. *Coenonympha satyrion*, in every degree of puzzling affinity with var. *darwiniana*, *Melampias epiphron* var. *nelamus*, *M. melampus*, with *Syricthidi*, innumerable and indistinguishable, formed the more sober setting in which the jewelled Lycænids scintillated. For here I found *P. pheretes* literally in hundreds, a novel experience, and among them I was fortunate enough to catch a single beautiful female, properly (in my experience) designated in the manuals "very rare." The net was soon busy among such of these as I required, and to the day's bag (August 1st) I added *E. stygne* and three fair *Anthocharis belia* var. *simplonia*, which I should have accounted late had I not noticed as well *Euchloë cardamines*—surely somewhat above its accustomed altitude, for this could not be less than 6,500 ft. up, and might have been more. When I returned, however, ten days later, nearly everything had disappeared, except *P. optilete*, and again a single *A.* var. *simplonia*, whose first cousin, *A. belia*, I had also met at Hyères in March. In the space at my disposal I can only touch on the delights of the higher alps; how we walked up the Besso (12,000 ft.), noting *E. glacialis* near the summit, and lower down *E. lappona*, *E. gorge*, *E. tyndarus* and *Colias phicomone*, in search of which insects my guide assured me the circling crows haunted the highest ranges—though I had my suspicions that the birds in question preferred the fragmentary sardines and sandwiches left by the climbers to the more ethereal fare provided by nature. The number of butterflies actually met with upon the snows and the glaciers is really surprising. Under the Mountet hut, where it is rumoured that the casual lodger may discover genera of other orders of insects than those included in the lepidoptera, at an altitude of 9,500 ft., I was continually finding strong-winged species like *Pyrameis cardui* and *Colias edusa*, with less able-bodied *A. lathonia*, while the greener summits, the Point de Sorrebois (9,210 ft.), for instance, teemed with *E. lappona*, *P. callidice*, *M. cynthia*, and less commonly *C. phicomone*, with the ubiquitous *Aglais urticae*, which in its wanderings seems as much at home "upon the misty mountain top" as in the nettle beds of British fenland. But it is useless cataloguing my August captures at length—even Homer becomes tedious when he sets to work on the interminable muster of the Greek navy—and no good purpose would be served thereby. Suffice it to

say that when I retraced my steps to Sierre, on the 25th, the morning was again unfortunately overcast, and I only boxed one nice female *Plebeius* var. *aegidion*, and a couple of broken *S. dryas*, soon liberated. Later, by the lakeside, I chanced upon *S. hermione*, *E. ligea*, and *Colias hyale*, while *P. bellargus* and *Pararge* var. *egerides*, just out, came as a reminder that the collecting season of 1898 was on the wane, and that, so far as Switzerland was concerned, it was time to pack up the store-boxes and bid farewell to the happy hunting grounds. "Days dawn on us which make amends for many sometimes," says one of our modern poets. Among them I shall always reckon the August of the present year. Finally, let me cordially recommend Zinal to the attention of lepidopterists. I only pursue the day-fliers, but I know the night is full of Heterocera, as the lamps upon our balcony testified, and an earlier visit in July would even more abundantly repay the collector. The place is not difficult of access; you can post all your baggage from Sierre (itself an admirable locality from all accounts, though I have never worked it); and the hotels are cheap and good, especially the Hotel des Diablons, which is in connection with the Hotel d' Anniviers, the half-way house at Vissoye.

Protective Coloration of Lepidopterous Pupæ.

At the meeting of the Entomological Society of London, held on October 5th, 1898, Mr. Merrifield read a paper on the colouring of the pupæ of *Papilio machaon* and *Pieris napi*, caused by the surroundings on the larvæ preparing to pupate. The general opinion was that the pupa of *P. machaon* was not thus susceptible, but his experiments clearly showed that it was so. An experiment tried on a small scale upon the first summer brood of larvæ was strong evidence of this, but experiments on a much larger scale, upon the later autumn brood, placed the matter beyond doubt. As Prof. Poulton had done, he had found orange and yellow much the most effective artificial colours in producing the yellow-green pupæ, but green carrot-tops seemed equally effective. Black was very much more effective than darkness; of 16 pupæ attached to black paper or dark-coloured twigs, 15 were of the bone-coloured form, with much suffusion of blackish-brown, those in a strong light mostly very dark. Those that pupated on substances of less pronounced colours showed less definite results. Seventy-two pupæ of *P. machaon* were exhibited, all that had been obtained. The case in which these were exhibited, contained also 152 pupæ of *P. napi*, showing similar results in a marked degree; and an interesting exhibit was of the glass roof of a breeding cage in two compartments, one having had its interior fitted up with black, the other with orange and yellow; 80 larvæ of *P. napi* having pupated on this roof, 46 of them on the orange-yellow side, 42 of which were green, a few showing a little dark spotting, while four were yellowish bone-colour, mainly unspotted; 34 had pupated on the black side, and all these were bone-coloured, nearly all with much dark spotting. All the *P. napi* obtained were exhibited, except in some classes which were so numerous that only samples could be shown in the case, but the rest of them were in glass-bottomed boxes, which accompanied the others; altogether, between 300 and 400 pupæ of this species were shown. In the first case there were also 28 pupæ of *Pieris*

brassicae showing similar results, but in a less marked degree, and about 40 pupæ of *P. rapae*, showing marked results. Those of *P. brassicae* were in most cases samples only, but the rest of the pupæ of this species obtained, 50 to 60 in number, were in glass-bottomed boxes. An interesting result was that pupæ from larvæ of *P. brassicae* and *P. rapae*, placed so that clear glass surrounded them on all sides, top and bottom, considerably resembled those placed in absolute darkness, being mostly slightly darker, but the colouring in either case being not very pronounced. It appeared as if light reflected from an object of decided colour (including black and white) seemed necessary to produce a very marked result. In conclusion, he said that when he compared the pupæ of *P. machaon* and *P. napi* on black paper or dark sticks with those on natural green surroundings, such as carrot-tops and green cabbage leaves, he saw no room to doubt that the adaptation in colour is in many instances protective. The pupæ exhibited were in most cases attached to the objects on which they had pupated, but where this was impossible they were fastened with loops of thread stretched from tiny pins ; and made a very attractive exhibition.

Professor Poulton congratulated Mr. Merrifield on his success, and pointed out that in the experiments he had conducted on these lines he had dealt with Vanessid pupæ, the existence of which in this stage was of short duration, and that, although they had given excellent results in a way, they were not so marked as in the pupæ exhibited, and the observations and notes had had to be obtained in the course of the few days that the pupal stage lasted. With Papilionid and Pierid pupæ, that went through the winter, the observations could be made at leisure. He had no doubt that the response in colour to the environment was of protective value to the species.

Mr. Bateson said that he had lately bred *Pieris napi* on a large scale, and, as regards that species, he could quite confirm Mr. Merrifield's observations. His own experiments had been undertaken with a different object, but he had frequently noticed that there was a fairly close correspondence between the colour of the pupæ and that of the substances to which they were attached, though exceptions were not uncommon. He had observed that in this respect there was considerable difference between different families of larvæ. In his experiments the offspring of each pair were kept separate, and in some families many larvæ pupated on the food-plant, while in others scarcely any did so. In some families the pupal colour conformed in nearly every case, while in other families the unconforming pupæ were numerous. The pupæ are often clustered together in groups, and the individuals composing such clusters sometimes agreed with each other in conforming, or in not conforming. He did not purpose, then, to discuss the general proposition that the colour-resemblance was in these cases a protection ; but he pointed out that if a larva had the power of forming a green pupa when attached to a green plant, the conformity of colour would only make the pupa less conspicuous so long as the plant remained green. For the summer brood of *P. napi*, for instance, this resemblance might perhaps be effective, though in this case the pupal period was very short, only two or three weeks. But in order that the resemblance may benefit pupæ which over-winter, it is necessary that the green plant to which green pupæ are attached should remain green in the winter. His own pupæ had turned green

on several food-plants which wither and go brown, and in these cases the pupæ become conspicuous again. To form a sound judgment on this matter we ought to know how the pupæ occur in nature. Pupæ of *P. napi* were not easy to find. Under what circumstances were the green pupæ found in the wild state?

Mr. Tutt doubted whether many pupæ of *P. napi* did pupate on their food-plants. He had searched *Sisymbrium*, and other plants, that had evidently been well-eaten by such larvæ, and failed to find a single pupa. In his opinion the full-fed larvæ nearly always travelled some distance, and, like those of *P. rapae* and *P. brassicae*, often climbed to some sheltered position before pupating. On only one occasion had he found pupæ of *P. napi* moderately abundant, in nature, and then they were situated in crannies between the stones forming an old wall and shed on the slopes directly behind St. Michel de Maurienne. These would have been quite overlooked had not a newly-emerged imago been conspicuously drying its wings on the wall. The empty pupa-case was then quickly found, followed by several pupæ. These were all of the bone-colour, and excellently hidden in the crannies, so much so that they had to be carefully sought in order to be found. The *Sisymbrium* stems growing along the wall did not produce a single pupa.

Variation of Nonagria cannæ, with description of three new aberrations.

By E. A. BOWLES, M.A., F.E.S.

I have once again had the pleasure of breeding a good many *Nonagria cannae*, from the Norfolk Broads. It is such a variable insect that there is always a certain amount of interest attached to rearing it in any quantity, and watching for the rarer aberrations to put in an appearance. There is a great difference, both in size and colour, between the two sexes; some females being very large, measuring fully 1·5 in. across, the average male being about 1·1 in.

Mr. Tutt's description, in *The British Noctuae and their Varieties*, of Hübner's figures is good for the colour of the most plentiful form that I get, and which appears to be the type, but I think no description that I have seen quite conveys a correct idea of the markings, so I will try to furnish one. I had no notion, until I commenced, how difficult it is to describe what is apparently very plain and straightforward, in language that will leave no chance of mistake. I am afraid I cannot manage it in purely scientific terms, so must adopt a more friendly, if not conversational, style. If you will turn to the plate on p. 5 of Meyrick's *Handbook of British Lepidoptera*, you will find certain nervures of the upper wing called the lower median vein and 1*b*. I find that these two nervures are in both sexes of *N. cannae* nearly always dark grey for the central portion of their length, and this dark portion is bounded, in each nervure, by a black dot. The second line is also represented by a series of seven black dots, thus making a total of 11 black dots. In some specimens the three nervures springing from the lower median are also covered with dark scales. These markings are always distinct, except in the very dark sooty ♂s, and in one light-coloured ♀, which, so far as I have seen,

appears to be unique. The ground colour, however, varies very greatly. I should describe it in the type as reddish-ochreous in the ♂ and pale ochreous-yellow in the ♀. The hind-wings in both sexes are grey, with the fringe of the same colour as the fore-wings. The ♀s generally show the darker post-median line, followed by a lighter one, but they are only just visible in the lighter coloured ♂s.

I have, besides this type form, distinguished three distinct aberrations, *viz.*:—

α. ab. *fusca*, n. ab. ♂.—Anterior wings very dark fuscous-brown, with the markings scarcely visible. ♀. Fuscous brown, the markings distinct.

β. ab. *rosea*, n. ab.—Anterior wings and fringe of hind-wings of a warm red in the ♂s, and suffused with a rosy shade in the ♀s. This is much brighter in fresh specimens, and after drying fades away slightly.

γ. ab. *obsoleta*, n. ab.—Of this I have only seen the ♀ specimen mentioned above. Anterior wings pale yellow, wainscot markings wanting, except the two lowest black dots.

By far the greater number of the larvæ I found were in *Typha augustifolia*; but in its earlier stages it must feed a great deal in the stems of *Scirpus lacustris*, and I obtained a few pupæ in extra large *Scirpus* stems, and one out of *Sparganium ramosum* leaves. The percentage of sooty specimens is very small. I got about one in fifteen this year, but consider that wonderfully good luck.

Observations on the genus Catocala.

By E. M. DADD.

C. nupta.—Ova about ·04—·045 in. in diameter, round, conical above, flattened beneath. Colour, in general, brown with two irregular purple rings, one round the micropyle and one about the equator. The micropyle is smaller and more pointed than in *C. elocata*. The vertical ribs number about 40, only about half of which reach the micropyle.

The young larvæ emerge during April and May, and measure about ·25 in. The head is yellow, the thorax and first two abdominal segments dull green, the remainder brown. In other respects, it resembles others of the genus at this stage; the lateral tubercles are somewhat smaller than the dorsal. In the second instar it measures about ·5 in., the head and legs are brown, the body light yellowish-brown, the sides being much darker. The dorsal tubercles are very small, the laterals in this instar being larger. The hairs on the latter are also longer and finer than those on the former. The hump is not yet developed, but the 5th abdominal is somewhat darker than the remaining segments. In the third instar, the larva measures about one inch, and has become very pretty. The head and body are now orange-brown, the sides reddish-brown with a pale yellow dorsal stripe. On the 5th abdominal the hump is developed, orange-red in colour, and immediately behind it is a black transverse band, which fills the whole area between the prolegs of the 5th and 6th abdominals. This band is, however, interrupted by the dorsal stripe, which retains its normal colour. Both the legs and the prolegs are orange-yellow; the latter are now fully developed on the 3rd and 4th abdominals, but are smaller than those on the 5th and 6th. The tubercles are small and inconspicuous, except the posterior trapezoidals, which on the 8th and 9th abdominals are enlarged and pointed backwards, forming a kind of ridge. In the fourth instar the larva measures about 1·5 in. The ground

colour is variable, some larvæ being dull smoky-grey, others pale yellowish-brown; the head varies according to the ground colour, the smoky type having a pale grey head, the yellow type an orange head with a dark streak on each lobe. The hump is well developed on the 5th abdominal, and is orange in colour. The dorsal tubercles are very prominent, orange in colour, the laterals smaller and paler. Legs and prolegs orange. The pattern of the body is made up of longitudinal bands of different shades, the whole being sprinkled with minute black dots; the shades of colour seeming to be dependent upon the numbers and proximity of these dots to one another. The dorsal stripe is pale, on each side of this is a darker stripe, and then again a lighter stripe, along the sides. Immediately behind the hump there is a slight trace of the transverse band present in the last instar, but it is nearly washed out. Ventrally, the larva is pinkish-grey with the spots dull brown. The lateral fringe is slightly developed. In the 5th instar the larva measures about 2·5 in. It tapers slightly towards both head and anus, being broadest at the 5th abdominal, which bears a very large hump. The ground colour is yellowish-grey, powdered with numerous black dots, which arrange themselves in longitudinal lines, but the latter are very much broken up and interrupted. The head is orange-brown with an orange streak down each lobe, the face being beautifully and finely reticulated with black, and somewhat hairy. The thoracic and anterior abdominal dorsal tubercles are small and yellow, the posterior dorsals larger, orange-brown mottled with black. On the 8th abdominal segment they are much enlarged, and form a kind of ridge pointing backwards. There is a black streak on each side pointing forwards and downwards. The lateral tubercles are small and yellow, the post-spiracular somewhat larger. The spiracles black. The hump on the 5th abdominal is very large, orange-brown, and has on each side of it an orange mark, spreading over the 6th abdominal, the whole forming a horse-shoe mark. The lateral fringe is white and well developed. Ventrally the larva is pale bluish green-grey, with a pink flush down the centre, each abdominal segment bearing a large round spot; these are especially large on the 3rd, 4th, 5th and 6th abdominal segments, which bear the prolegs. When full-fed, the larva spins a loose silken cocoon amongst the leaves of its food-plant (willow or poplar), and changes to a purple-brown pupa covered with bloom.

The imagines measure about 2·5 to 3 in. in expanse. The fore-wings are pale yellowish-grey, with a dark smoky orbicular. Just below the orbicular there is an oblong yellow spot, and on the basal side of the orbicular a paler area, which extends across the wing, and is bounded by the basal line. There are two transverse zigzag bands, one on each side of the orbicular, the one near the base being double, the side nearest the base being pale yellow, the other side smoky; the other is between the orbicular and hind margin, this is also double, the side nearest the hind margin being distinctly paler, with a smoky margin. The hind-wings are scarlet, with a very broad black marginal band, which tapers a trifle towards the hind angle, but not nearly as much as does that of *C. elocata*. The inner band forms a sharp angle about the centre of the wing, and is also indented at several points. The fringe is white on the hind margin, smoky on the inner margin. Beneath it is very similar to *C. elocata*, the bands are, however, broader, the white being much less in proportion, the red on the hind-

wings more developed, and the inner band on the hind-wing being much indented and ending abruptly in the wing area, and not extending to the inner margin, as it does in *C. elocata*.

C. electa.—The ova are of the usual form, but more pointed than those of *C. nupta*. They measure about ·045 in. in diameter. The vertical ribs are very irregular in number, from 36 to 44, but evidently they are generally more numerous than those of either *C. elocata* or *C. nupta*. The micropyle is smaller, and not so flat as in the two former species, the cells being smaller. The lateral ribs are very fine and regular. The ova are readily distinguished from those of *C. elocata* and *C. nupta*, by being less depressed, lighter in colour, and with more vertical ribs.

The larvæ emerge during April, when they measure about ·25 in., and much resemble those of *C. nupta*. The head is yellow, as in the latter, but the body is of a more pale greenish tint, the sides being somewhat darker. In the second instar the larva measures about ·5 in. It now differs considerably from the larvæ of *C. elocata* and *C. nupta*, the colours being very pronounced. The ground-colour is of a pale yellowish-green, but this is almost confined to the dorsal stripe, as several broad black bands run along each side, which are so close together as to be hardly separated. The posterior trapezoidals are somewhat larger than the other tubercles, all being jet black. The prolegs on the 3rd and 4th abdominals are still practically rudimentary, and do not seem to be used. There is very little trace of the hump on the 5th abdominal. On moulting for the second time the larva measures nearly an inch. The ground-colour is pale yellow, but it is so thickly sprinkled with black dots that very little of the ground-colour is left. There is a broad greenish-yellow dorsal stripe down the back. The hump is now developed on the 5th abdominal, though small. It is pale yellow, surrounded by a ring of black. All the tubercles, except the posterior trapezoidals, are small, the latter on the 8th and 9th abdominals forming small ridges. They are all orange coloured. The head and legs are red-brown, the former having a black streak on each lobe, and the face finely reticulated with black. The prolegs are fully developed on the 3rd and 4th abdominals, but smaller than those on the 5th and 6th. The larva, in this, and in fact in all the *remaining*, later, stages, is strikingly handsome. The green dorsal stripe, blue-black sides, specialised hump, red head, legs and prolegs, and orange tubercles, forming brilliant contrasts. Ventrally it is lemon-yellow, with the spots very large. In the fourth instar the larva is, if anything, even handsomer than in the last; the whole ground-colour is beautifully variegated, pale yellow, dusted all over with minute jet-black dots, which latter arrange themselves in irregular longitudinal lines. There is a somewhat paler dorsal stripe along the back. The head, legs, prolegs and tubercles are all orange-red, the head having the usual streak on the lobes, and the face marked with black. Both the anterior and posterior trapezoidals are well developed, the latter, however, being somewhat larger. The laterals are very small. The hump is bright lemon-yellow at the apex, surrounded by a ring of black, and there is a transverse orange-brown band immediately behind it. In this instar it has hardly any traces of the lateral fringe, there being one or two hairs at the junction of the segments only. In the 5th instar it measures from 2 to 2·5 in. The head is reddish-orange, with faint black marking. The ground pattern of

the body is much the same as in the former instar, but the whole has now an orange-yellow tinge, which becomes duller as the larva becomes full-fed. The tubercles are rather large and conspicuous, orange-yellow, and the laterals have much increased in size, especially the sub-spiraculars. The hump is very prominent, bright yellow, with an orange ring round it. The posterior trapezoidals on the 8th abdominal segment are much enlarged, and form a ridge, the black streaks on each side, present in *C. elocata* and *C. nupta*, are well-developed. The legs and prolegs are orange-brown. Ventrally the larva is bright lemon-yellow, with an orange stripe down the middle, and a large brown spot on each segment, those on the 3rd, 4th, 5th and 6th abdominals being the largest. The lateral fringe is pinkish-white. When full-fed the larva spins a cocoon amongst willow (its food-plant), and changes to a pupa somewhat smaller, but otherwise apparently identical with those of *C. elocata* and *C. nupta*.

Cucullia gnaphalii: a successful hunt for its larva.

By W. G. SHELDON.

It is now, I suppose, some ten or twelve years since my first hunt for the larva of this curiously rare "shark," the scene of operations being a locality from which the majority of the specimens in our collections have come, Tilgate Forest. That expedition resulted in my acquiring just sufficient larvæ of *C. asteris* to whet one's appetite, but none of its rare relative.

For several years after this I regularly, each season, put in a day or two at the proper time amongst the golden-rod; but, although I beat and searched by day and by night, and tried every method of which I could think or hear, the result was always the same, *C. asteris*, once or twice in fair numbers, usually scarce. At last, however, in 1895, my eyes were gladdened by the sight of an apple-green larva with rusty-red dorsal area and blotches down the sides, which I knew was the right one. Two were obtained that year, from which, in the following June, one imago emerged. In 1896 I found three larvæ, one of which was ichneumoned, and the other two died. So far, therefore, I had only one specimen to show for my labour.

Last year (1897) I came to the conclusion that if I ever meant to do any good, I must test the accuracy of some information heard many years ago, when a friend told me that an old entomologist, well known in his day, but who had ceased collecting some 20 or 30 years back, informed him that in an out-of-the-way district of the south of England he had discovered and taken the larvæ of *C. gnaphalii* in small numbers each year, and that on one occasion he actually found *twenty-one* in one day. I accordingly procured a section of the ordnance map for the district, and started there early one morning, arriving in the afternoon, and after making arrangements at a wayside inn for passing the night, and obtaining some food, commenced looking for the object of my search, and most discouraging work it was. For seven or eight hours I wandered about a district favourable in every way for other species, but flat and with the soil a heavy clay, and altogether totally unlikely for producing *Solidago virgaurea*, and as a matter of fact not a single plant was observed during a walk of certainly not less than 20 miles.

A careful study of the ordnance map at night convinced me that if *C. gnaphalii* was anywhere in the district, which by this time appeared very dubious, it was at a place two stations further down the railway; accordingly, by the first train next morning I journeyed thither. Stray plants of golden-rod by the wayside, soon after leaving the station, looked promising, and, after walking several miles, I came across a wood which had been cut a short time previously, and which was a perfect sea of "the plant." Entering, the first patch examined contained a larva, and a further search in the vicinity produced three more; another portion of the same wood resulted in my finding a further four, and I was thus able to at last consider myself tolerably successful.

The eight larvæ, with one afterwards found at Tilgate, resulted in six cocoons, the other three being infested with parasites, and from these, in due course, four fine imagines emerged, two pupæ dying.

During the present autumn I paid another visit to the re-discovered locality, and thoroughly explored it. The season was a wonderful one for *C. asteris*, almost every plant of golden-rod had a larva, and it would have been possible to have obtained several hundreds or a thousand in the wood; *C. gnaphalii*, however, was again very scarce, and the few larvæ I did obtain entailed some 20 hours' close search.

It is curious how rare the larva is, even in its restricted locality, and how local. It will occur year after year in the same woods, whilst others around, to all appearance exactly similar, will not produce a specimen. Again, it appears particularly attached to certain spots in a wood, and if one larva be found it may be inferred that there are two or three others in the immediate vicinity. It is very subject to parasites, quite one-third of my specimens being infested, and very delicate in confinement. From the above causes, less than 50 per cent. of imagines reared seems the best result one can hope for in ordinary seasons; if not treated carefully and placed under very favourable conditions the percentage of deaths would probably be a very much higher one.

Lepidoptera in Wigtonshire, 1898.

By ROGER S. GORDON, F.E.S.

The season of 1898, in Wigtonshire, has been in some ways rather disappointing. I did not commence work until April 21st, so was too late for the sallows, although, on that evening, I observed a few *Taeniocampa incerta*, *T. gothica*, *T. stabilis* and *Pachnobia rubricosa* on the fast falling flowers. On April 22nd I collected a number of larvæ of *Cosmotriche potatoria*, of various sizes, and saw a few *Ematurga atomaria* among the heather. The next few evenings were rather cold, but I worked the wild cherry blossom, with a light, and found *Panagra petraria* plentiful, and several *P. rubricosa and T. gothica*, but not a single *T. gracilis* was seen this year. On May 1st, I saw the first *Saturnia pavonia-minor* on the wing on Whitedyke Moor, and also found larvæ of *Dasychira fascelina*; on the 8th, freshly emerged *Anarta myrtilli* were boxed as they sat drying their wings on the heather, whilst on the young heather a number of *D. fascelina* larvæ were observed moulting. The next day a single *Spilosoma fuliginosa* and a dark ♀ *Amphidasys betularia* emerged in the breeding-cages, whilst on the 10th I first saw *Rumia*

crataegata. On Luhillart Moor, on the 16th, I took 37 larvæ of *Lasiocampa quercûs* var. *callunae*, most of them about two inches long. On the 19th, a fine *Cerura vinula* emerged, whilst on the 22nd I obtained a further supply of the larvæ of *L.* var. *callunae* and *D. fascelina*. Towards the end of the month I took *Phytometra viridaria* freely, and a specimen of *Pharetra menyanthidis* on Whitedyke Moor. *Coenonympha pamphilus* and *Pararge megaera* appeared first on the 28th, and, in the evening, *Notodonta ziczac* emerged. One of two female *S. pavonia* captured on the 29th, had the usual pale markings very red. *Thyatyra batis* appeared on the 31st; this and two *Noctua plecta* were caught flying on the outskirts of a wood. I did not try sugaring until June 5th, when, however, it was quite a failure, *Thyatyra batis* and *Pharetra rumicis* alone putting in an appearance. On this date *Hadena thalassina* and *Spilosoma menthastri* emerged, and on the 6th *Smerinthus tiliae* ♀, 4 *Phalera bucephala* and *Craniophora ligustri*, whilst two more of the latter and *S. populi* emerged the following day. On June 7th, the first *Melanippe hastata* appeared; this species is very common on the moors, flying along the sides of stone walls where bracken abounds, but it does not vary. On the 9th, I saw the first *Macrothylacia rubi* of the season, *Brenthis selene*, a poor specimen of *Coremia ferrugata*, and larvæ of *Cosmotriche potatoria*, whilst in the breeding-cage a *Lophopteryx camelina* appeared. Sugar was again a failure—one *Taeniocampa gothica*, in poor condition, only appearing, and I noticed a *Plusia gamma* on the rhododendrons. On this date a batch of *Saturnia pavonia* ova hatched (the larvæ moulted for the first time on the 13th). On the 10th, *Smerinthus populi* and *Hadena oleracea* put in an appearance, and *Hepialus humuli*, *Cucullia umbratica* and *Pionea forficalis* were seen for the first time this year. On the 11th, *Cerura vinula*, *Phalera bucephala* and *Pharetra rumicis* ab. *salicis* emerged, whilst in the evening, *Eupithecia castigata*, *Hadena dentina*, *T. batis* and *S. menthastri* were netted. A walk to the shores of Luce Bay, on the 12th, showed plenty of *Aglais urticae* larvæ feeding on nettles, and imagines of *Polyommatus icarus* and *Euclidia mi*. On the 13th, *Lophopteryx camelina*, *N. ziczac* and *Habrostola urticae* emerged, whilst searching the rhododendrons produced only *Xylophasia rurea*. This species, and its ab. *combusta*, are usually abundant here, but this year the type has been rare, and the aberration not observed at all. No moths would come to sugar at this time, owing probably to the quantity of honey-dew on the trees. A journey to White Loch, on the 15th, resulted in the capture of several *M. hastata*, *Nemeophila plantaginis*, *Spilosoma fuliginosa*, a single fine specimen of *Macroglossa bombyliformis* in a meadow, which was the first example of the species observed here, *Phytometra viridaria*, *Anarta myrtilli*, *Euclidia mi*, and in a meadow near Drumdwalt some *Botys fuscalis*. In the evening, *N. dromedarius* var. *perfusca* emerged, and the following day *Craniophora ligustri*, *Pharetra rumicis*, *Notodonta ziczac* and *S. populi*, *Cucullia umbratica* and *Hepialus velleda* being observed in the evening. On the 17th, my brother went to Loch Chesnay, and on the way observed several *Nemeophila russula*, *Coenonympha tiphon*, and a number of *M. hastata*; in the evening we captured *M. rubi*, *Lithosia mesomella*, *Melanthia albicillata*, *Eupithecia satyrata* var. *callunaria*, *Xylophasia rurea* and *Cilix glaucata*. *Acronycta leporina* emerged on the 18th, whilst

Eupithecia vulgata, *E. subumbrata*, *Bupalus piniaria* and others were captured at dusk, and on the moors on the 19th, *Brenthis selene* and *Scodiona belgiaria* were netted. At Sunny Braes Woods, on the 20th, we captured *C. tiphon*, *Acidalia fumata*, *Emmelesia alchemillata* and *Euthemonia russula*, whilst the following day, nr. Kennal Wood, *Phytometra viridaria*, *E. russula* and *C. tiphon* were again taken. *M. bombyliformis* was also observed at Loch Eldrig on the 23rd, on which date I obtained some white eggs of *Lasiocampa* var. *callunae*, and imagines of *Dasychira fascelina*. By the 25th, at Sunny Braes, *C. tiphon* had become abundant, two more *M. bombyliformis* were observed, and *E. russula* (both sexes), *A. fumata* and *S. belgiaria* were netted, whilst, in the evening, *H. velleda* ab. *gallicus*, *L. mesomella*, *N. plecta*, *N. brunnea* were captured, although at sugar only *P. rumicis* and *Rusina tenebrosa* were attracted. On the 26th, *Ennychia cingulalis* was added to the fauna of this district, *Hypena proboscidalis*, *Lycophotia strigula*, *Eupithecia rectangulata* and *Cerura furcula* also being captured; the latter laid five eggs. On the 27th, nr. Brunwalt, I observed the first example of *L.* var. *callunae*, and on an island in the centre of a loch, I found the larvæ of *Trochilium bembeciforme* in some willows, all the larvæ obtained being near the outside of a tree, and also captured *N. plantaginis*, whilst my brother took a ♀ *S. belgiaria* on the way to Loch Chesnay. In the evening, *L.* var. *callunae* emerged, and *C. umbratica*, *H. urticae*, *A. fumata*, etc., were captured, whilst a dark form of *L. camelina* emerged the following morning. My brother saw *Heliodes tenebrata* on Sunny Braes, where also *C. tiphon*, *E. russula* and *A. fumata* occurred, and, later in the day, at Doonard, saw the first *Epinephele ianira*. Other captures on this day were *M. hastata*, *E. cingulalis*, *A. myrtilli*, *L. mesomella*, *Cidaria prunata*, *N. plecta*, *L. strigula*, etc. On the 30th, a ♀ *C. potatoria* was captured flying among the grass, and this laid a large batch of eggs. On July 1st, an examination of the willows by the side of a stream near home resulted in our finding the larvæ and pupæ of *T. bembeciforme*, whilst on the evening of the 3rd, *Cabera pusaria*, *Melanthia ocellata*, *Acidalia dimidiata* and *Chortodes arcuosa* made their appearance in the garden. On the 5th and 7th, several *Dasychira fascelina* emerged, and on the 8th, *Argynnis aglaia*, *Enodia hyperanthus*, *Scopula lutealis*, *Plusia pulchrina*, *P. festucae*, worn, *P. chrysitis*, *Ourapteryx sambucata*, and a small specimen of *Gnophos obscurata* were all observed for the first time; at sugar, beside *P. rumicis*, we obtained two *M. ocellata*. By the 9th, *C. arcuosa* was abundant among grass in a damp spot, whilst *C. umbratica* came freely to honeysuckle, *Cymatophora duplaris* and *Cleora lichenaria* were also taken. On the 10th, on Guillart Moss, *A. myrtilli* was abundant, as also *A. fumata* and *M. hastata*, at the same time I saw several *H. tenebrata*. A ♀ *T. bembeciforme* emerged about 1 p.m., and, in the evening, my brother took the first *Plusia bractea* at honeysuckle flowers, *Cleora lichenaria* and *P. pulchrina* were also captured. On the 12th, a ♂ *T. bembeciforme* emerged before 9 a.m., and in the morning *A. aglaia*, *Tanagra chaerophyllata*, *Hydrocampa nymphaeata*, and *Pamphila sylvanus* were added to our list of captures; *Arctia caia* emerged about 4 p.m., and in the evening *Pelurga comitata*, *Abraxas grossulariata*, *Plusia chrysitis*, *P. pulchrina*, *M. albicillata*, *C. lichenaria* and *L. mesomella* were netted, whilst *C. potatoria* emerged during the

evening. *P. rumicis* continued to come out, two putting in an appearance about 7 p.m. We added *Xylophasia lithoxylea*, *C. duplaris*, *Metrocampa margaritaria* and *Leucania impura* on the 14th, whilst the next morning a ♀ *T. bembeciforme*, made its appearance in the breeding-cage about 10 a.m., and two ♂ *C. potatoria* on the 10th, about 5 p.m. On the 14th, too, at 8 p.m., a moth was seen at a beehive at Guillart, and, from its description, I suspect it to have been *Acherontia atropos*. On the 18th, in spite of a cold north wind, we took another fine *P. bractea* at the honeysuckle, whilst at light, among other insects, we obtained *Thera firmata*, *E. alchemillata*, *A. bisetata*, and *A. aversata* ab. *spoliata*, whilst others were taken on the 19th, and on this date several larvæ of *L.* var. *callunae*, that were captured on May 16th, began to spin up, one having commenced as early as the 14th. On the 20th, *M. margaritaria* was abundant, *Xylophasia polyodon* (typical), *C. duplaris* and *T. firmata* were captured. On the 23rd, a male and female *C. potatoria* emerged, the male with much more yellow on the fore-wings than is usual here in this sex. *Porthesia similis* (three, not native) emerged in the early afternoon of the 25th, and, in the evening we captured *Plusia bractea*, *P. iota*, *P. chrysitis* and *Geometra papilionaria*, whilst the following day seven more *P. similis* appeared. A walk to Lock Chesnay produced *Anaitis plagiata*, *C. tiphon* (still in good condition), *E. ianira*, *C. pamphilus*, *M. hastata* and *A. urticae*. On the 27th, *P. bractea* was again captured, this time at sweet-william flowers, and on the 28th and 29th, a large number of *P. similis* having emerged, we set them free to see if they would establish themselves here. On the 30th, *L. conigera*, *C. bilineata* and *Caradrina quadripunctata* were observed, and the following day, *Eupithecia subfulvata* ab. *cognata*, whilst almost fully-fed larvæ of *Cerura vinula* were noticed on poplars. By August 3rd, *C. bilineata* had become very common. On this date, too, we bred *Cerostoma radiatella* ab., from larvæ obtained on elm on July 2nd. The larva is green, whitish-yellow dorsally, with two small anal points; it spun a cocoon on the 5th, shaped like an upturned boat, fastened at each end to a leaf, and was yellowish-buff in colour; we also bred a specimen of *Orthotaenia antiquana*. At sugar, only *X. polyodon*, *P. rumicis* and *Triphaena pronuba* were captured, although six *T. orbona* were attracted by the light to the window; *A. bisetata*, too, was remarkably abundant at dusk. On August 6th, we added *Carsia paludata* to our local list, and also captured *M. sociata*. On the 7th, my brother observed *Pieris brassicae*, *P. rapae* and *P. napi* abundantly, and in the afternoon *Tapinostola fulva* and *Eubolia mensuraria*, whilst, on the 16th, I took a fine *O. sambucata* and *Halia vauaria*, the first observed here, in the garden. On the 12th, we were out on the moors all day and saw great numbers of *Plusia gamma*, *Eubolia mensuraria* and *C. testata* were also common. On the 14th, a fine *Charaeas graminis* was captured on the window, and on the 16th I again observed large numbers of *C. testata*, *P. gamma* and *A. urticae*, on the heather, whilst *P. rapae* and *P. napi* were very common among the rushes. At light, on the 18th, among many other species, *Hydroecia nictitans* (? *lucens*), *N. xanthographa* and *S. lutealis* appeared, whilst on the 23rd several freshly emerged specimens of *Pyrameis cardui* were seen on White Dyke moor, where swarms of *P. gamma* and *C. testata* also occurred. This has been the poorest

season for sugar that I have ever known. I have in previous years frequently seen as many as a hundred moths on some of the trees that this year were quite deserted.

Orthoptera collected in South-eastern Europe.

By MALCOLM BURR, F.Z.S., F.E.S.

(*Concluded from* p. 269.)

Oedipodidæ.—*Sphingonotus caerulans*, L.—I took one freshly-emerged specimen at Orsova, July 16th. It was sitting motionless on sand, and extremely hard to perceive until it moved, its colour assimilating so exactly with that of the sand. *Acrotylus insubricus*, Scop., was common near Bucarest, July 11th, and I took one at Bufta, July 14th. I never saw the species outside Roumania. *A. patruelis*, Sturm.—I took one at Rjeka, August 12th. *Celes variabilis*, Pall.—One at Adlerberg, June 28th, and several in a clearing in a wood at Bufta, July 14th. All were of the red form. The spot was grassy with barren patches, and it was always on a barren patch that the insect was found. *Oedipoda miniata*, Pall.—Common at Comana, July 12th, Kosija Cuprija, July 19th, Konjica, July 30th, Borke, near Konjica, Bicevica, August 1st, Ruiste, August 2nd, Mostar, August 4th, and in Montenegro, at Njegus, Cetinje and Rjeka. *O. caerulescens*, L., was common nearly everywhere. *Oedaleus nigrofasciatus*, de Geer.—Bucarest, July 11th, also near Konjica, July 28th and at Blagaj, August 3rd. It is a beautiful insect as it flies and rather difficult to take. *Pachytylus*, sp.—A species of *Pachytylus* was seen at Bufta, July 14th, but I was unable to catch it. It would have probably been *P. migratorius*, L., which is found in eastern Europe. I also saw several specimens at Blato, August 4th, but was unable to catch one, even with a net. These are more likely to have been *P. danicus*, L. *Psophus stridulus*, L.—I found this species sparingly on the Igmán Planina. It is a very handsome creature and makes a stridulating noise when flying.

Acridiidæ.—*Caloptenus italicus*, L., was numerous everywhere, *C. brunneri*, Stål.—Fairly common at Kosija Cuprija, July 19th. Trebovic, July 24th, and Igmán, July 21st. In this genus the long cerci of the male hang down when the insect is alive, but become erect on drying. *Acridium aegyptium*, L.—One nymph, at Blagaj. *Podisma pedestre*, L., was not very numerous. I took it on Trebovic, July 24th, Igmán, July 21st, and at Tisavica, July 28th. *P. mendax*, Fisch., was common in every shrubby place, and very frequently taken by sweeping, at Comana, July 12th, Kosija Cuprija, July 19th, Igmán July 21st, Trebovic, July 24th. When alive, it is of a beautiful emerald green, but fades soon after death, and turns red in formaline. *P. alpinum*, Koll. var. *collinum*, Br.—This I took in some numbers in a path in a wood at Comana, July 12th. It is a brightly coloured insect when alive, but soon fades. We did not take the form *alpinum* with rudimentary elytra, only *collinum*, with fairly well-developed organs of flight. As it sits on the path in the wood, it is a very conspicuous insect, and is not very active. *Platyphyma giornae*, Rossi.—This little grasshopper was abundant at Bucarest, Comana, and in fact nearly everywhere, especially in Dalmatia, at Ragusa, Vecchia, Ombla and Gravosa. It was also common in the hills of Montenegro, at Cetinje, and at Rjeka.

Tettigidæ.—*Tettix bipunctatus*, L.—Abundant everywhere. *T. subulatus*, L.—Almost as numerous as the above, and taken nearly everywhere. Both species seemed especially numerous at Comana, July 12th. *T. depressus*, Bris.—I took a few specimens at Orsova, July 16th.

Locustodea.—Phaneropteridæ.—*Poecilimon thoracicus*, Fieb.—Very abundant on rough low herbage at Comana, July 12th, also at Orsova, July 16th. *P. elegans*, Fieb.—Common at Bicevica, August 1st. *Isophya rectipennis*, Br.—Fairly common at Comana, with *P. thoracicus*, Fieb., July 12th. The only other recorded locality is Brussa, in Asia Minor. My specimens were identified by Herr Brunner von Wattenwyl, who remarks that it only differs from the type form by its slightly smaller size. *I. obtusa*, Br.—Common on Trebovic, July 24th. *Leptophyes albovittatus*, Koll.—Common at Comana, July 12th, and at Bufta, July 14th; taken also at Kosija Cuprija near Sarajevo, July 19th. *Phaneroptera quadripunctata*, Br.—Common among thorny bushes, pomegranates, etc., at Blagaj, August 4th. *Tylopsis liliifolia*, Fabr.—One specimen, of the form *margineguttata*, Serv., at Rjeka, August 12th. Meconemidæ.—*Meconema varium*, Fabr.—One male at Comana, July 12th. Locustidæ.—*Locusta cantans*, Fuessly.—Nymphs at Wolfsthal, June 28th. *L. caudata*, Charp.—On the top of the Igmán Planina, but not very common, July 21st. *L. viridissima*, L.—Bucarest, July 13th; Konjica, on the borderland between Bosnia and Herzegovina, July 31st. *Onconotus servillei*, Fisch. de W.—One female at Comana, July 12th, and several males at Bufta, July 14th. Although so unlike *L. viridissima*, L., in general appearance, yet this species is closely allied structurally. The stridulation is very similar. I took all the males by stalking them down by their chirp. Once found, they were very conspicuous, their black colour at once betraying them, showing up distinctly against the thistles upon which they invariably sat. The female I took at Comana crawling slowly over the long grass in a shady place. Decticidæ.—*Rhacocleis discrepans*, Fieb.—The nymph was fairly common in the second week in August in Montenegro, in sheltered places where the grass and rough herbage grew thickly. I took it at Cetinje and at Rjeka. *Pachytrachelus striolatus*, Fieb.—Very common at Blagaj, August 4th, but difficult to catch, being very active, and taking refuge under the stones of a crumbling wall. I took the larvæ and nymphs in numbers among grass at Ruiste, on the southern slope of the hills. *P. gracilis*, Br.—Not uncommon in the thick woods of the Igmán Planina, July 21st. *Thamnotrizon littoralis*, Fieb., was very numerous in the Forest of Comana, July 12th, leaping about on the ground in the clearings. *T. chabrieri*, Charp.—One small male of this magnificent species from Blagaj, August 4th. *T. transsylvanicus*, Fisch.—Fairly common on Trebovic, June 23rd; very numerous at Bicevica and Ruiste, August 3rd. *T. frivaldskyi*, Herm.—Common on the top of Trebovic. *T. fallax*, Fisch.—Bicevica, August 3rd, in small numbers. *T. cinereus*, L.—Numerous in the Forest of Comana, July 12th. *Platycleis grisea*, Fabr.—Very numerous at Bucarest, July 11th, Comana, Orsova, Kosija Cuprija, Trebovic, Bicevica, Ruiste and Blagaj. *P. tessellata*, Charp.—One male at Bufta, July 14th. *P. stricta*, Zell.—Common at Bicevica, August 3rd. *Platy-*

cleis, sp. n. — A small new species of this genus I took at Bicevica, August 3rd, but in small numbers. *Platycleis*, sp. n. —Very numerous in a thick bed of nettles in a sheltered spot near the valley of Tisavica, July 27th, at an elevation of about 1,900 mètres. In appearance it closely resembles *P. bicolor*, or *P. brachypterus*. *Platycleis*, sp. n.—In exactly the same spot I took a pair which may be a new species, or perhaps an aberration of the last. *P. roeselii*, Hagenb.—Very common in meadows at Lukavica, July 26th. *P. modesta*, Fieb.—At Bicevica, August 3rd, and Blagaj, August 4th, but not very numerous. *P. sepium*, Yers.—Common on thick grass, at Blagaj, August 4th. *Decticus verrucivorus*, L., was numerous everywhere, at Comana, Bufta, Orsova, Kosija Cuprija, Trebovic, Konjica, Bicevica, Blagaj, etc., but I did not take it in Montenegro. *D. albifrons*, Fabr., was common at Blagaj, August 4th, and Blato, August 5th. It sits on thick shrubs and chirps, but is very hard to capture, the chief difficulty being the thorns, for it seems to choose invariably pomegranates or brambles. SAGIDÆ.—*Saga*, sp.—I took a single nymph of what is almost certainly *Saga serrata*, Fabr., at Adlerberg, by sweeping, June 28th.

GRYLLODEA.—*Oecanthidae.*— *Oecanthus pellucens*, Scop.—This slender little cricket was fairly common on the vines at Bucarest, July 13th, and numerous at Blagaj, August 4th. The nymphs and larvæ I took nearly everywhere. I also took the imago at Cetinje, August 10th. GRYLLIDÆ.—*Nemobius lineolatus*, Brullé.—Common on the mud on the banks of the Save, at Bosna Brod, July 17th. *Gryllus campestris*, L.—Numerous on the top of the Igmán Planina. *Gryllus frontalis*, Fieb.—Very numerous round Bucarest, July 10th-15th. *G. desertus*, Pall.—Numerous, with the above. *Gryllomorphus dalmatinus*, Oesk.—I saw a single specimen on a ruined stone wall, at Blagaj, August 4th, but was unable to take it.—TRIDACTYLIDÆ.—*Tridactylus variegatus*, Latr.—M. Montandon and myself saw this species on the mud by pools and streams, near Comana, but did not succeed in taking it. GRYLLOTALPIDÆ.—*Gryllotalpa gryllotalpa*, L.—I took one immature specimen on the mud, on the banks of the Danube, near Orsova, July 18th.

Notes on Hybrids (2nd and 3rd Crosses) between Tephrosia bistortata and T. crepuscularia.

(*Concluded from p.* 219.)

By A. BACOT.

Second Crosses.—Only 12 out of 33 pupæ of various broods, referred to in my previous notes, survived the winter, and produced imagines. Of these 12 specimens, two were of brood L (*vide* p. 217, for parentage), the remaining 10 being of brood No. 02. Of the SPRING EMERGENCES OF BROOD L, both specimens were females, and of fair size. One approaches the spring form of *T. bistortata*, the other tends towards the fine aberrations of this cross [L], referred to in my previous notes, with dark marginal band and pale central area to fore-wings. The SPRING EMERGENCES OF BROOD No. 02 consisted of 10 specimens, all ♀ s, four are of fair size, and follow the normal well-banded spring form of *T. bistortata*; three are of a suffused dark grey, with whitish marginal band, following the *delamerensis* strain, two of these being decidedly smaller than the *bistortata* form. Two others are very similar, but have a tendency to be speckled or blotched with white. The remaining

specimen was a very remarkable aberration, having a whitish-grey ground-colour, speckled with dark grey and yellowish-umber. This specimen I paired with a ♂ Scotch *T. bistortata*, and kept for a week or 10 days in the hope of obtaining eggs, but none were laid, and I found the abdomen of the now ruined specimen contained no ova, but only a small quantity of fluid.

Notes on Third Crosses.—Before commencing my notes on the 3rd crosses it will be necessary to give a short account of the brood of Scotch *T. bistortata* I reared in 1897. I received the ova from Mr. Hewett early in May, 1897. Their size was—length ·03 in., width ·02 in. They hatched on May 17th. On June 13th, I note that the larvæ are growing rapidly, and agree with the Clevedon *T. bistortata* larvæ in having the ∧ joined at apex. No moths emerged from this brood in 1897, and I was only successful in breeding some 12 to 18 specimens (probably not more than one-third of the number of the adult larvæ) last spring. All of these proved to be ♂s. They are mostly very dark, and strongly marked, in comparison with the Clevedon examples. I do not attach much importance to the moths all being males, as I had to leave the larvæ, when nearly full-fed, for several days, and although I left a good supply of food before starting, it probably dried up in two or three days at latest. Upon my return, all the larvæ but one or two had gone down or dried up, and, in consequence, it is probable that many of the ♀ larvæ were starved, as they grow to a larger size, and are somewhat more backward than the ♂s.

I obtained nine pairings, in which one or both of the parents were moths resulting from the 2nd crosses (*ante* pp. 217) :—

Ref. No.	*Paired.*	*♂ Parent.*	*♀ Parent.*	*Result of Hatching.*
R2		K	No. 1A	Infertile.
A2	Aug. 10th, '97	K	K	Hatched Aug. 25th, '97.
B2	Aug. 13th, '97	K	L	Infertile.
C2	Aug. 21st, '97	L	L	Infertile.
D2		X No. 1	L	Infertile.
K2		K	K	Hatched Sept. 27th '97.
O3	Sept. 26th, '97	L	X No. 02	Fertile.
No. 1 ('98)	Feb. 13th, '98	Scotch *T. bistortata*	L	Fertile.
No. 2 ('98)	Mar. 17th, '98	Scotch *T. bistortata*	X No. 02	♀ with no ova in abdomen.

Inbreeding with parents of the same hybrid stock.—Four attempts (A^2, B^2, C^2, K^2) with moths of L and K. All the females laid eggs, two out of the four batches proved fertile (A^2 and K^2). The larvæ of A^2 died during my absence from home, but I reared a few larvæ of the other brood (K^2). These larvæ, with hardly an exception, had the ∧ open, as with larvæ of *T. crepuscularia*. I found great difficulty in obtaining food towards the end of October, and in consequence of poor food most of the brood died before pupation. One moth (a male) emerged on February 16th, 1898. It was of small size, $1\frac{1}{4}$" in expanse, ground colour pale grey, much speckled with dark brown, and showing a decided tendency to the dark marginal band which forms such a conspicuous feature in some specimens of the parent stock.

Attempts to Cross the First and Second Crosses.—Two attempts (R^2 and D^2) were made to obtain a cross between hybrid moths of the 1st and 2nd crosses, but in both cases the eggs were infertile.

Notes on Third Crosses.—An attempt [03] to cross a ♂ of 2nd cross [L] with a ♀ of the ¾-bred *T. crepuscularia* [No. 02] was successful. The ova measured ·025 in. in length, and ·0175 in width, but I lost

most of the larvæ owing to inferior food, and only three or four pupated. From these I bred two moths in December or January; they are barely 1¼" in expanse, both have a pale grey ground colour, and have the markings fairly distinct, one inclining rather to the *T. crepuscularia* form, and the other towards *T. bistortata*, except that the brown tint of this species is absent or weak.

The remaining crosses, No. 1 '98 and No. 2 '98, were made in the spring of '98. The male parents in both cases being Scotch *T. bistortata*, the females being of 2nd brood crosses, L and No. 02 respectively. The last-mentioned ♀ I found *in cop.*, but, as I have previously remarked, her abdomen contained no ova. The remaining cross [No. 1 '98] between a ♂ Scotch *T. bistortata* with a ♀ of 2nd cross L (both parents of 1st cross ♂ *bistortata* × ♀ *crepuscularia*) laid a fair batch of fertile ova. On May 16th, I noted as follows: A good proportion of larvæ (about ⅓) are in last instar; some are going down, others are in penultimate instar, a few small. They vary greatly in colour, from rich dark umber (like the larvæ of ♂ parent stock) to dull putty or pale, dirty-looking grey. The tendency is for the Λ to be closed and dark, but a few have it pale and faint at the apex, while in some of the dark larvæ the ground colour is so dark that the Λ is not noticeable. All but one had gone down by May 31st. To my surprise only one moth emerged in June, and none in July. But the very warm weather in August and September overcame the influence of the single-brooded male parent, and a few more straggled out up to the number of 11 (2 ♀s and 9 ♂s); seven of the ♂s show a marked tendency to follow the ♂ parent both in colour and markings, except that they are rather duller and more suffused, and they lack (to a greater or less extent) the pale and rather marked marginal streak. Both the ♀s are paler and browner than the ♂s, and show more tendency to follow the ♀ parent (hybrid stock), one especially as regards the marginal band (a feature, as previously mentioned, strongly marked in some specimens of brood L). One male specimen is quite unique, so far as my experience of either the species or their hybrids goes. It is of a dull smoky colour (quite unlike the dark grey of ab. *delamerensis*), with a semi-transparent sheeny appearance towards the base and central area of wings. A band of this sheeny tint is continued along the hind margin of the fore-wings nearly as far as the marginal band. The outer bands on the wings are present, but rather faint and diffused. I cannot account for the cause of this coloration; it is, I should say, on a par with the melanic forms one occasionally comes across in other species, and is probably only a secondary effect of the crossing, if indeed it owes its origin to this at all. I have examined the pot which contained the pupæ of this cross, and find that three pupæ have died, cause unknown, and that 13 have been attacked by fungus.

COLEOPTERA.

Notes on the British Longicornes.

By H. ST. JOHN K. DONISTHORPE, F.Z.S., F.E.S.

(Concluded from p. 271*).*

In the genus *Monochammus*,* two species are reported as British.

* *Monochammus*, by the way, should be spelt *Monohammus*, but a mistake was made in the printing of the first catalogue in which it appeared, and so it is generally found spelt *Monochammus*.

I should think, however, that they are both importations, and I cannot understand why they are not placed under the heading of "Introduced Species" in the catalogues. They have only been taken singly, and in towns and timber-yards. The first, *Monochammus sartor*, F., is a very large insect with long antennæ, the scutellum is entirely clothed with yellowish-white pubescence. It is recorded from London, Repton, Cambridge Fens, and one or two other localities. The specimen in Dr. Power's collection was taken in a stable at Boothly Graffoe Rectory. Bates has it in his Leicestershire list. *Monochammus sutor*, L., is a somewhat smaller beetle than the preceding, and may easily be distinguished from it by the fact that the scutellum has a smooth, glabrous line in the middle, the rest being clothed with pubescence. It is recorded from Colney Hatch, Burton, Manchester, Newcastle, and from a timber-yard near Taunton, etc. Mr. E. A. Waterhouse once dug a specimen out of a stump in Battersea Park. An example, in Mr. Bates' collection, was taken on a willow at Aylestone, in Leicester, by a non-collector, who gave it to Mr. Headley, from whom Mr. Bates received it.

Mesosa nubila, Fab. (*nebulosa*, F.) is a broad, robust, short beetle, of a mottled, brownish-white appearance. It is rare, and has chiefly been taken in the New Forest; also recorded from Monk's Wood in some numbers. I took a specimen out of a small bough, in the New Forest. I think its rarity is to be accounted for by the fact that it lives in the high boughs, and one only finds such as are in boughs that have been blown down. I have broken up hundreds of such boughs in the New Forest, in the hope of finding this insect, and was very much surprised when my efforts were rewarded with success.

In the genus *Agapanthia*, the antennæ are 12-jointed; we possess one species. *Agapanthia lineatocollis*, Don. (*Saperda cardui*, Steph.), is a beautiful insect, black, thickly mottled with yellow pubescence, and has three yellow lines down the thorax. The antennæ are ringed with white, and have the bases fringed with delicate black hairs. It is very local and rare, but often in abundance when found. The larva lives in the stems of thistles. It is chiefly a Fen insect, but has been recorded from Darenth Wood, West Wickham, and near Lincoln, etc. I have taken it in numbers by sweeping thistles in Monk's Wood, and freely by general sweeping in Wicken Fen. It is said to have the power of emitting a disagreeable odour, something like that caused by blowing out a candle. I never noticed anything of the kind in the specimens I have taken.

In the genus *Saperda*, we possess three species. The first, *Saperda carcharias*, L., is one of our largest Longicornes. It is clothed with pubescence, which varies from grey to yellow. Fowler says that it occurs in and about old willows, but in my experience it is confined to the poplar, and at Wicken it is popularly known as the "Poplar Beetle." It is chiefly a Fen insect, and was formerly much commoner in the Cambridgeshire Fens than is now the case, and appears to me to be getting scarcer every year. Mr. Bouskell tells me he has seen it in great profusion on some poplar trees at Wicken. I should say the reason of its scarcity now at Wicken is the fact that the natives take every one they see. I have taken it sparingly at Wicken and Upware. The next species, *Saperda scalaris*, L., is a very lovely beetle of a shining black colour, marked with patches of yellowish-green pubescence. It

occurs on poplars, aspens and alders. It is a northern insect, most of the specimens in collections coming from the Manchester district. It has been taken at Repton and in Sherwood Forest. It was taken this year and last at Rannoch, the specimens having been given to Mr. Lewcock. Our third species, *Saperda populnea*, L., is the smallest of the three. It is a pretty little insect, mottled with yellowish pubescence, and has the antennæ ringed with white, as in our *Agapanthia*. It is said to be found on poplars, willows, sallows and aspens; I have only found it on the latter. I have taken it on Wimbledon Common in numbers, and sparingly in Darenth and Monk's Woods. It is a local insect, but not uncommon in many localities as far north as Lincoln; it is not, however, found farther north. The female deposits her eggs in the thin branches or saplings of the aspen, an oblong swelling of the twig is the result, in which swelling the insect passes its metamorphoses. There is a very beautiful show case in the Insect Gallery of the Natural History Museum, illustrating the metamorphoses of this beetle. I have found all the aspen trees at Chiddingfold possess these swollen knobs, and have opened several and found the larva, but I have not seen a single perfect insect this year. Mr. Blatch mentions, in the *Ent. Mo. Mag.*, for November, 1879, that, although this beetle was fairly common in Bewdley Forest in 1878, in 1879 he never saw a single specimen. I should say the explanation in both cases is that this insect takes two or more years to complete its metamorphoses, and thus in some years it occurs in abundance, and in others very sparingly, if at all.

The next genus, *Tetrops (Polyopsia)* consists of small beetles, which have the eyes completely divided. *Tetrops praeusta*, L. (*ustulata*, Hag.), our one species, is the smallest British Longicorne. It is very like a small *Telephorus* in appearance. The head, thorax and apex of the elytra are black, the rest of the elytra are yellow. It is to be found by beating hawthorn blossom, and may be taken towards evening, flying over the blossoms. It is common and generally distributed from the Midlands southwards, but is rarer farther north. I have taken it at Penge and in the New Forest, etc., by beating hawthorn blossom, and as late as July on Umbellifers at Chiddingfold.

Stenostola ferrea, Schr., is an elegant insect of a steel blue-black colour. It is found on flowers, and by beating limes, hazels, etc. It is both local and rare. It is recorded from Matlock and Repton, and the Manchester district. Mr. Gorham has taken it in Lord's Wood, Southampton. Last year, Mr. Janson took a specimen in Derbyshire, by evening sweeping, in June.

The genus *Phytoecia* is closely allied to *Stenostola*, but differs by having raised lines on the elytra. Our only species *Phytoecia cylindrica*, L., is a black insect covered with grey pubescence, the anterior legs are yellow. It is also a rare and local insect, and is found on flowers, and is to be obtained by beating hazels. The larva feeds in the stems of the latter. I took a single specimen by sweeping, at Dorking, and I swept it in some numbers in a glade at Monk's Wood. It is recorded from various localities in the London district, also from Cambridgeshire, Leicestershire and Repton.

The last Longicorne in the catalogue, *Obera oculata*, L., is one of the finest, and certainly one of the most sought after and prized. It is a fine beetle, with grey elytra. The head and antennæ are black, and

the body, legs, and thorax are reddish-yellow. On the thorax are two distinct black spots on the disc. I have a specimen I took this year that has two additional black spots placed behind the ordinary pair, and nearer to the sides of the thorax. I propose to call this aberration *Oberea oculata* ab. *quadrimaculata*, n. ab. I examined all the specimens of this beetle in the Natural History Museum, with Mr. Gahan, both in the British and foreign collections, and we could find nothing like it; some of the specimens had a tendency, though very faint, and not distinct, as in my specimen, to show two extra spots, but these were in front of the ordinary spots. This suggests the possibility of an aberration occurring with six spots on the thorax! As some of the other species of the genus have more than two spots on the thorax, this may be a reversion to an ancestral type. In looking through Professor Beare's specimens, I find that he also has a specimen of the ab. *quadrimaculata*, Donis., which he took this year, at the same time as I took my specimen. I have a specimen of the typical form, also taken at the same time by me this year, which has a curious symmetrical malformation of the antennæ. The apex of the third joint and base of the fourth in each are bent downwards, forming a curve, reminding one somewhat of the structure of the antennæ in the males of some species of *Meloë*. The insect is confined to the Fen districts, and is found on and about the sallow bushes, and on hot sunny days may be seen flying from bush to bush. It appears to be found from June till September. The larva feeds in the stems of the sallow. I took my first specimen in August, 1890, and three more in August, 1897, in Wicken Fen. I am pleased to say that this year it occurred in abundance. One specimen has been recorded from Romney Marshes.

Of the two species of *Cerambyx*, in the catalogue, under the heading of "Introduced Species," there can be no doubt whatever of their being importations. The first *Cerambyx heros*, Scop., is a large, shining brown insect, with large spines to the thorax. It was taken at Colney Hatch by the late Mr. E. W. Janson, who dug a dead specimen out of a hornbeam. It is recorded from Deal and Portsmouth Dockyard. *Cerambyx cerdo*, L., is a similar insect in appearance, but smaller and narrower. It is recorded from Deptford and the Isle of Ely.

Spry and Shuckard, in their "British Beetles Delineated," figure the following seven Longicornes, which are undoubtedly foreign, and introduced, but have been picked up in England:—*Purpuricens koehleri*, from near London; *Eburia quadrimaculata*, in Essex; *Elaphidion spinicorne*, at Bermondsey; *Tetraopes tornator*, from amongst timber (a North American insect); *Cylindera lutens*, from amongst timber; *Penichroa fasciata*, in abundance at Norwich; and *Arhopalus fulminans* at Kensington (another North American species). In the Stephensian collection in the British Museum are specimens of numbers five and six of the above, as also the following foreign Longicornes:—*Clytus upsilon*, *C. 4-punctatus*, *Callidium russicum*, and *Pachyta lamed*. In the *Entomologist's Annual* for 1874, the late Mr. Rye records the capture of *Clytus erythrocephalus*, a North American species, at Middleton, and *Monochammus dentator*, another North American species, from the Manchester district. He afterwards quotes some remarks which go to show how easily foreign Longicornes may be introduced into this country. In the same *Annual* he mentions the fact that he found a specimen of

Agapanthia micans, mixed with his series of *Stenostola ferrea*, to which species it bears a superficial resemblance, and he thought that it came from the Midlands. It occurs on the Continent.

Clytus mysticus ab. *hieroglyphicus*, Hbst.—As mentioned in "Current Notes" of the *Ent. Record* for November, 1898, Mr. Walker exhibited this aberration from Chester, at the meeting of the Ent. Soc. of London, October 5th. It differs from the type form in having the shoulders of the elytra black, the usual red colour of that part being entirely absent. Stephens (*Manual of British Beetles*, p. 275) says "base of elytra rarely black." There is an example of this aberration in the Stephensian cabinet.

Ephialtes carbonarius.—I have taken this ichneumon inserting its very long ovipositor into the borings of *Callidium violaceum*, in the New Forest. It appears to be parasitic also on *Cerambyx heros*, *Saperda populnea* and *Oberea oculata*.

Occurrence of Lamia (Morimus) asper, Sulz. (an introduced Longicorne), at Hackney.—In a small box of British Coleoptera, recently received from Mr. J. A. Clark, of Hackney, for the purpose of identification, I found a large black Longicorne, which I did not recognise. On taking it to the Natural History Museum, Mr. C. O. Waterhouse named it as *Lamia asper*, Sulz., a South European species. Mr. Clark writes me that the insect (which is a ♀) was "taken at rest on a tree in Well Street, South Hackney, I should say about June, 1897." As there are some large timber-yards in the vicinity, its origin is probably not far to seek. *L. asper* resembles the British *L. tertor*, Linn., in the absence of markings.—F. B. Jennings.

Notes on Irish Coleoptera.—During the past season I have been too much occupied with other matters to give as much attention to Coleoptera as I would have wished. The spring was not early, and was wet and cold, but the summer was very fine, though by no means so dry as in parts of England. In the latter part of April I met with a single *Lochmaea crataegi*, Forst., ♂. It was sitting on a blade of grass, and on my first attempt I failed to capture it, for, not having a net, I tried to catch it in my hand. In a couple of days I was at the place again, and found it once more sitting on a blade of grass, and this time captured it. In the same place I took another specimen, in June, by beating hawthorn blossom. In April, I picked up, in my own fields, *Pterostichus nigrita*, *Agabus sturmii*, *Hister neglectus*, *Alophus triguttatus* and *Mecinus pyraster*. It is noteworthy that *Hister neglectus* is tolerably common in Ireland, while *H. carbonarius* is decidedly rare. On April 28th, I took a trip down to Greenore in hopes of getting some good Coleoptera on the beach there, but a bitter east wind quite frustrated all endeavours, and places which usually are alive with insect life presented an entirely inanimate appearance. The only capture of any note was *Anthicus scoticus*, which was crawling over the shingle instead of, as on former occasions, being on *Honckenya peploides*. Besides it I took *Bembidium femoratum*, *Quedius semiaeneus*, *Cajus xantholoma*, *Saprinus aeneus*, *Cassida nobilis* and *Aphodius ater*. Early in June I got a few *Telephorus nigricans* along with *Byturus tomentosus* and *Anthonomus pedicularis*. In July, I was at Loughgilly Rectory, on a visit to Rev. H. S. M. Harper, and proceeded to

search some plants of *Scrophularia nodosa* for *Cionus hortulanus*. I did not see the beetle, but noticed some curious looking larvæ on the flowers, as well as some pupa cases attached to the stems. I secured these, and in the course of about a fortnight several *Cionus hortulanus* emerged. In my own fields I found the curious thorny-looking larva of *Cassida viridis* on thistles, and on a *Rumex* found a number of pupa cases, from which emerged numerous *Hypera rumicis*. The pupa-cases were clustered together on the stem of the plant, and were of a transparent reddish network, the beetle being quite visible inside. The pupa-cases are coloured very similarly to the stems and masses of seeds of the *Rumex*, and no doubt this acts as a protection, for at a little distance one could not distinguish the pupæ from the plant itself. The larvæ of beetles are not, as a rule, easy to rear, but my experience with those I have mentioned shows me that there are some which could be reared in captivity, and the observations of their habits would very likely lead to further discoveries, and might elucidate the habits of some of our rarer Coleoptera. The experience of the Rev. T. Wood with *Cis bilamellatus* is a case in point.—W. F. Johnson, M.A., F.E.S., Poyntzpass, co. Armagh. *November 11th*, 1898.

Lamia textor at Fairlight.—On September 4th, while hunting for *Lixus algirus*, at Fairlight, I had the pleasure of finding, amongst the herbage beneath some sallows, a specimen of *Lamia textor*, L. It is, I think, of considerable interest that this rare Longicorne should have turned up again, not far from the glen where occurred the specimen recorded by Mr. Butler, and mentioned by Canon Fowler, in his *Coleoptera of the British Islands*.—Hugh G. Jeffery, Hastings. *October 12th*, 1898. [This record is very interesting, it makes, I understand, the third specimen taken in this locality in the last 10 years. In my notes on the British Longicornes I expressed an opinion that the Hastings record was an importation. It is now clear that I was mistaken. Mr. Jeffery has also sent me what I take to be the larva.—Horace Donisthorpe.]

Notes on Coleoptera: Winter work in moss.—During the winter of 1897-8, the very scanty time other duties have allowed me to give to collecting has been exclusively devoted to working moss, mostly in my own neighbourhood, that is, entirely in Surrey. Perhaps a few notes on the results may not be uninteresting. In Richmond Park, in November, I obtained the following during two Saturday afternoons' work:—*Philonthus micans*, Grav., *Stilicus orbiculatus*, Er., this in plenty, *Apion rubens*, Steph., *Tachyporus flavipes*, L., also in plenty, and *Cytilus varius*, F., besides many commoner things. On Wimbledon Common, mostly out of sphagnum, at the end of January and during February, the following turned up:—*Cryptobium glaberrimum*, Herbst, fairly common, *Bembidium mannerheimi*, Sahl., *Scydmaenus collaris*, Müll., *Medon brunneus*, Er., *Syntomium aeneum*, Müll., *Tachyporus pallidus*, Sharp, in plenty out of dry grass tufts, and *T. transversalis*, Grav., in very scanty numbers in both tufts and sphagnum, early in March (I turned this pretty insect up again out of moss on the side of the Black Pond, at Esher), *Bryaxis juncorum*, Leach, in profusion, *Quedius fuliginosus*, Grav., in my experience, unlike *tristis*, Grav., a very scarce insect, *Philonthus nigrita*, Nord., a nice series by steady work at one spot, many *Steni*, of which the best was certainly *Stenus lustrator*, Er., very scarce, however. I omit all the

commoner forms. Early in March, when the longer days enabled me to get a little further afield in my operations, I worked the mossy banks of the Black Pond at Esher; here again I found beetles in plenty, and a few good ones—*Actobius cinerascens*, Grav., was in the utmost profusion, *Philonthus nigrita*, Nord., turned up again, one specimen only, *Lathrobium terminatum*, Grav., the unspotted variety of this insect was taken by Mr. H. Donisthorpe while working with me on Wimbledon Common for *C. glaberrimum*, Herbst, *Cyphon variabilis*, Thunb., *Olophrum piceum*, Gyll, *Bryaxis fossulata*, Reich., *Stilicus geniculatus*, Er., *Cytilus varius*, F., *Anisosticta* 19-*punctata*, L., and several species of *Steni*, of which the one worth recording is *Stenus melanarius*, Steph., which was abundant, and was one of the most interesting captures. Both in this locality and in Richmond Park I came across hybernating specimens of *Donaciae*; in the Park, *Donacia versicolora*, Brahm., a species I had not found there in the summer, at Esher they were mostly *D. sericea*, L. Though moss-collecting is frequently very cold work, and sometimes very disappointing, still my own experience is that it usually well repays the time spent on it, and when you do find a good beetle you generally find a nice series of it. Moreover, it entices one out in winter to get the exercise so badly needed by those working during the day in the fogs and dark dreary surroundings of London.—(Prof.) T. Hudson Beare, B.Sc., F.R.S.E., F.E.S.

Hydaticus transversalis in the south-west of England.—During the meeting of the British Association, at Bristol (September 7th to 14th), I got an hour or two off from official duties one afternoon, which I devoted to collecting. I tried the sandhills lying between Weston-super-Mare and Bridgewater, on the coast of the Bristol Channel, but the long drought had burnt everything up, and a strong hot wind raising clouds of sand, made collecting very unpleasant and quite unprofitable. Just before starting back I came across a little pool lying in a hollow between high sandhills. I saw it was tenanted, but had no water-net; however, by patiently watching till the beetles rose to the surface for air, I managed to scoop out a few with my hand. *Acilius sulcatus*, L., and *Agabus chalconotus*, Panz., were common, and came up frequently, but another which I saw was different from either of these, and gave me some trouble to land; when secured I recognised it at once to be *Hydaticus transversalis*, Berg. I secured, however, only the one, the insects after a time coming up always out of reach. I see that Canon Fowler, in his *Coleoptera of the British Islands*, vol. i., p. 207, queries the Devonshire record for this insect. I believe it was taken in numbers in the same neigbourhood as the above by Mr. B. Rye, in 1896, so that evidently it does occur regularly in the south-west of England, and probably the old Devonshire record is correct.—Ibid.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

Eggs of Lepidoptera.—*Gonepteryx cleopatra*.—The egg of *Gonepteryx cleopatra* is of the brightest green when freshly laid, becoming paler yellowish in a day or so. It is a long, spindle-shaped egg, like that of *G. rhamni*, rarely quite symmetrical, and usually flattened more on one side than the other, a character commonly observed in eggs of *G. rhamni*. There are 10 (not 12, as stated *ante*

vol. ix., p. 205) vertical ribs, with from 36-40 very fine horizontal ones, crossing the hollows between the vertical ribs and passing over the latter; the edges are very shiny. The apex is slightly domed, although looking quite flat when viewed from above, and forming a circular yellow apical point, the upright ribs ending on the edge of this yellow area, although when looked at sideways they appear to be gradually lost in the general surface. [Description made under a two-thirds lens, used as a hand lens, April 10th, 1898, from an egg laid April 6th, 1898, at Cannes].

Chinobas jutta.—Single egg laid on the upper side of a pine-needle. Somewhat spherical in shape, but rather narrower at the top than at the bottom, both poles, however, being somewhat flattened. Its length is ·7 mm. from base to apex. To the naked eye the egg is seen to have a purplish tinge; under a lens this appears to be due to the embryo being partially visible through the shell, which, under a lens, is seen to be shiny, probably transparent, and very delicately ribbed transversely. The shell really reflects the light, and looks as if it were a piece of silver filigree work. The most marked character of the egg, however, consists of the longitudinal ribs, 16 in number, which are bright, shining white in colour, reflecting the light so strongly as to resemble wrought silver. Each rib consists of a fine, raised, double thread, from which, on either side, irregular white patches run down for a short distance the sloping sides of the depression between two adjacent ribs. These lateral extensions emerge alternately on either side, and hence form really a zigzag rather than a central rib, carrying branches. The ribs themselves coalesce just above the shoulder of the egg, and then form a coarse reticulation of the same white shiny character as the longitudinal ribs themselves. The reticulation is irregular, and gets very fine as it reaches the micropyle, the edges of the polygons losing there, to a great extent, the sheeny whiteness so characteristic of the coarser reticulation and longitudinal ribs. The micropyle proper is very conspicuous, purplish in colour, inclined to reddish centrally. It is slightly depressed, and consists of a central stella, surrounded by the finer reticulation already described. [Description made on July 1st, 1898, under a two-thirds lens, from egg sent by Dr. Chapman, from Norway].—J. W. Tutt.

SCIENTIFIC NOTES AND OBSERVATIONS.

Parasites in wasps' nests.—In searching the cells in the nests of *Vespa vulgaris* for *Metoecus paradoxus*, the curious wasp's nest beetle, at Chiddingfold, and which, by the way, I found in some numbers in all the nests I examined, I came across some curious cocoons, hexagonal in shape, and composed of a hard, brown substance. I bred from these specimens of the ichneumon, *Chyronomon* (*Anomalon*) *resparum*. The cocoons occupy the bottom of the cell, and above them one finds, on removing the silken cap with which the wasp larva has closed the cell, what looks like a lump of transparent jelly. This, on being removed, is seen to possess the shape of the head and thorax of the wasp. The larva of the ichneumon must therefore remain in the body of the wasp grub till it (the wasp grub) has changed to a pupa, it must then devour the abdomen and make its cocoon in its place. Of other parasites I

found in the nests were many dipterous larvæ, some of the larger ones being spiny, and others with a short tail; these I hope to breed, as they have buried themselves in some earth in the vessel in which I placed them. Other Coleoptera obtained were *Aleochara fuscipes* and the little *Cryptophagus pubescens*, in numbers. Of the latter Canon Fowler says (*Coleoptera of the British Isles*, vol. iii., p. 226): "This species has occurred on the continent, in nests of *Vespa rulgaris* and *Bombus terrestris*."—Horace Donisthorpe, F.Z.S., F.E.S., Sth. Kensington.

A note on the action of the clasps in Erebia. — In this genus (and many others) the clasp is a single piece of chitin, jointed at the base to the supporting ring, but without any articulation in its continuity, and without any appendages. Whilst more analogous to the harpe than the valve in those forms where these parts are distinguishable, it probably represents both. It is, at any rate, a single claw-like chitinous process, that one would expect to move and act as a rigid rod. It is tubular, like any chitinous claw or process, wider at the base or body, narrower at the neck and head. In the species I am now more particularly thinking of, *riz.*, *embla*, *disa* and *ligea*, those namely which I had opportunity to observe alive last summer, the body and neck are of fairly equal length, the body composed of the strong chitin, except on the inner or upper side, where the surface covering is thin and delicate. Perhaps a clear idea of its structure may be given by suggesting that a (rather long) finger of a glove be taken and slit up one side half way, and the sides of the opening be separated rather widely, and the space between made good with some more delicate tissue. This basal portion, with one weak side and a greater circumference, would be the body, the remainder the neck and head. The cavity of the body is filled with muscular tissue. I had always supposed that the function of this muscular mass was to flex the clasp on the basal ring, and I have no doubt this is a large part of its function, though it is certainly unusual for the muscle for moving a distal segment to be contained in that segment. In examining the clasp, this summer, of a living *Erebia*, I was somewhat astonished, however, to observe that the clasp itself was flexed at the junction of the body and neck. I was so far incredulous that I repeated the observation many times in the species mentioned above, so that there remains no doubt that such flexure is part of the normal action of the clasp. It is most evident in *disa* and *embla*, in which the neck is comparatively long and slender. The flexure takes place at the extremity of the body, in fact, at the extremity of the opening in the more solid chitin, and apparently is possible by a certain amount of increased opening of the weak side, that is, a stretching (or straightening out ?) of the softer integument of that part of the clasp. It is indeed difficult to believe it possible that a tube of such strong chitin as the clasp is formed of, could be bent without fracture, unless it were allowed to open on one side in this way. My belief that this is how the bending can occur is, in truth, inference rather than observation, the observation being only that the bending at this point actually takes place. What may be the use of this provision is a question that suggests itself. It can hardly be to secure a firmer grip, because it would seem that that might have been obtained by a somewhat greater curvature of the clasp. I incline to think it is to obtain a more extended attachment at the time the grip is taken, the movement giving a vermiform action as between the two portions

of the clasp, and advancing the clasp as a whole, by a similar action to that by which a micro pupa emerges from its cocoon. The position and direction of the spines of the clasp are such as would agree with this view. It is, however, probable that since the clasp muscles must be in action during the whole time the grip is held, they will also cause the bending of the clasp, as observed throughout this period.—T. A. Chapman, M.D., F.Z.S., F.E.S., Betula, Reigate.

NOTES ON COLLECTING, Etc.

Lepidoptera at Burnley, 1898.—The spring was unusually cold, and at times very wet, and little could be done until the beginning of June, when there was some improvement. Spring larvæ were rather scarce, except *Plusia iota*, with which were also taken a few *P. pulchrina*, *Noctua baia* and *Triphaena comes* (*orbona*). Almost the only imagines taken in May were *Anticlea badiata*, at dusk, and *Saturnia pavonia*, on the moors. A few things appeared in the breeding-cage, of which the best was a well-marked *Spilosoma lubricipeda* (on April 27th), of which No. 76 in Newman's *British Moths* gives a good idea. The larvæ was taken at Bungay, Suffolk, at the end of August, 1897. *Ptilodontis palpina* emerged on May 1st, the larvæ taken at the same time and place. During June the weather was more favourable, and a corresponding increase in insects was observed. *Hypsipetes impluviata* began to emerge on May 31st, when they were found drying their wings on the alder trunks about five feet from the ground; they continued to come out all the following week, and by the 11th June were getting worn. The majority were dark, with scarcely a trace of the band (at the base); a few were quite typical; although some were kept a few days, no ova were obtained. A visit to the moors on June 4th, only produced *Ematurga atomaria* and *Cidaria suffumata*, while by the 11th, *Emmelesia albulata*, *Coremia ferrugata* and *Eupithecia pulchellata* had appeared, and in the same district, on the 25th, *Eupithecia nanata* and *Hadena dentina*. *Hepialus velleda* occurred on the 25th, but was not at all plentiful till July 6th, and continued on the wing till the end of the month; about one specimen in eight was the aberration *gallicus*, but all the latter were males, except three; from one of these ova were obtained very freely. From the 26th to 30th, *Melanthia ocellata*, *Coremia designata* and *Emmelesia decolorata* were taken, also on the 30th, a pair of *Dicranura vinula*, first time for Burnley district. Sugar during this month, and indeed for the whole season here, was a complete failure, not a single good moth turning up. In the breeding-cage, *Noctua festiva* emerged on June 10th-16th, *Larentia caesiata*, 19th, *Plusia pulchrina*, 19th-29th, and on the 23rd, *Miana strigilis* var. *aethiops*. July and August were both fairly good months, but after the middle of July not much was done, owing to business engagements. Early in the month (July) *Melanippe montanata* were extremely abundant, and in the woods, *Melanthia ocellata*, *Emmelesia decolorata* and *Cabera pusaria* occurred, while *Caradrina cubicularis* was plentiful in the house and gardens. *Venusia cambricaria* was first obtained on June 30th; on July 9th they were plentiful, and were about over on the 18th. One specimen, taken July 15th, was a fine smoky variety, the only one I have seen of this species. Ova

were laid on July 1st and 10th; the former lot hatched on the 13th, and two or three larvæ fed up to the middle of August, when they were unfortunately lost during my absence from home; they were then ¾ in. in length, sage-green, with rusty markings along the sides, very similar to those seen on mountain-ash leaves. July 9th, *Eubolia palumbaria* were flying among furze, and sitting on trunks in a small wood. *Larentia viridaria* were numerous; both these species laid ova in the chip boxes. On the 15th, a visit to the moors produced *Larentia caesiata* (plentiful) and *Cidaria populata* (just out). On the 18th, *Tanagra atrata* were exceedingly abundant, and *Miana fasciuncula* plentiful at dusk. July 30th, *L. caesiata* and *C. populata* still flying, and a rather curious *Acidalia aversata* was found on a rock, the lines well marked, and the first two close together. Moths bred in July were *Triphaena comes* and *Noctua baia* on the 1st, *Plusia iota*, 2nd-15th, including var. *inscripta*; on the 9th, *Hypsipetes elutata* (from bilberry); 26th, *C. populata* and *Calymnia trapezina*. August 12th-13th, dusking produced *Cidaria fulvata* (common), *Cidaria pyraliata*, *H. elutata*, and *Hepialus sylvinus* (worn), while *Larentia didymata* and *Noctua xanthographa* were swarming. The remainder of the month I was away from home. The insects bred were *C. populata*, 1st-14th; *L. didymata*, on the 12th; *Cidaria testata* (bilberry), a small, dark, moorland form, during September. On the moors, September 5th, *Polia chi*, on the walls, *C. testata* and *C. populata* (worn), *Charaeas graminis* and *Celaena haworthii*, on thistles, plentiful, but already somewhat worn, and *Tapinostola fulva*, amongst rushes. On the 10th, in the same district, there was high wind and nothing out, but on the 17th, *Polia chi*, *T. fulva* and *C. haworthii* were still out, and, in addition, a few *Oporabia filigrammaria* on the rocks. Nothing was bred in August but a few *Agriopis aprilina*, 1st-15th.

I have also bred, from various localities:—*Cucullia verbasci*, May 1st, from Beverley; *Odontopera bidentata*, May 3rd-9th, from Manchester; *Hadena pisi*, May 3rd-27th, from Methley, Yorks; *Acronycta megacephala*, May 17th to June 12th, from Manchester; *Pieris brassicae*, May 18th to June 24th, from Scarborough; *Boarmia repandata*, July 4th (nearly black), from Leeds; *Cleoceris viminalis*, July 11th-19th (dark), from Doncaster; *Leucoma salicis*, July 23rd-29th, from Southport; *Crocallis elinguaria*, July 24th-31st (ova hatched April 15th), from Shipley.—W. G. Clutten, 5, Tennis Street, Beverley. *September* 24th, 1898.

Lepidoptera in Ireland, 1898.—Insects have been decidedly scarce this year, owing, no doubt, to the drought and the abundance of honey-dew. Two nights in April spent at the sallows produced *Taeniocampa gothica*, *T. instabilis*, *T. gracilis* and *T. stabilis*, also a few *Anticlea badiata*. A visit paid to the mountains at the end of the same month resulted in the capture of a few *Ematurga atomaria*, *Saturnia pavonia* failing to put in an appearance. *Euchloë cardamines* was very common in May and early June. Towards the middle of the month of June, *Gonophora derasa* and *Thyatyra batis* were taken at sugar. At the same time, *Plusia pulchrina* came freely to honeysuckle, and *P. festucae* to the flowers of the sweet scented orchis. On the 30th of the same month, *Zygaena loniceraе* was very abundant in one locality. In July, *Graphiphora augur*, *Noctua festiva* and *N. brunnea* were taken commonly at sugar. The following Geometrids

were taken during this month—*Pseudoterpna pruinata*, *Metrocampa margaritaria*, *Abraxas grossulariata*, *Larentia didymata*, *Emmelesia alchemillata* and *E. albulata*. In August, a working man brought me a larva of *Choerocampa elpenor*, which he had found on a damp piece of land. The man was frightened by its repulsive appearance, and had tied a piece of string round its body, which unfortunately killed it, and though I visited the locality subsequently, I could only find traces where the larva had been feeding on the great willow-herb. On August 23rd, a specimen of *Macroglossa stellatarum* visited the dahlias in the garden. A visit to the mountains on the 25th, in search of larvæ, produced the following: *Saturnia pavonia*, *Lasiocampa quercûs* (2), which subsequently died, and *Macrothylacia rubi* in abundance. At light, during the same month, the following were taken: *Tapinostola fulva*, *Hydroecia nictitans*, *H. micacea*, and *Neuronia popularis*. On August 29th, I took a specimen of *Crocallis elinguaria* at rest on heather. In September, *Tryphaena ianthina* and *T. orbona* were common at yew berries, along with *Anchocelis pistacina* and *Mellinia circellaris*, whilst *Gonoptera libatrix* was taken at light.—T. Greer, Tullylagan, Dungannon, co. Tyrone.

Pupation of Aglais urticæ.—I have read with interest your report of a paper read by Prof. Poulton on the pupæ of *Aglais urticæ*. When in co. Wicklow, near Glendalough, three years ago, I found a large batch of nettles which had been almost stripped by *A. urticæ* larvæ, and which, contrary to their usual habit, had pupated in scores on the nettle stems. The majority of the pupæ were brilliantly golden, and I expected to breed a good proportion of cripples or ichneumons from the two or three dozen collected. This, however, was not the case, as no cripples were bred, and most of the specimens were exceptionally large, rather darker in colour than our English specimens, and in some cases with black veinings. This does not appear to have been a case where the larvæ had been starved, or too weakly to crawl away, or the imagines would probably have been small or crippled.—Douglas H. Pearson, Chilwell, Notts. *November 3rd*, 1898.

Lepidoptera in Devonshire and Wicken Fen.—The early spring collecting was good, then came a spell of cold weather, which destroyed all chance of successful collecting at sallows, light and sugar. In April, I took here, amongst birch, a number of *Eriocrania purpurella*, *E. semipurpurella* and *E. sparmanella*. In May, I found *Micropteryx thunbergella* in profusion, and, in early June, *M. seppella*. In early May I found, about a mile from my house, a large colony of the cases of *Coleophora solitariella*, from which I bred a large number of moths. I had long, but ineffectually, searched for this moth here. It must be extremely local, as, though *Stellaria holostea* swarms in all the hedges round, I have never found the insect elsewhere, and it was confined to a few yards of the hedge where I found it. *Notodonta trepida* was fairly common at light in May and early June, also *N. trimacula*. The best things I obtained about this time were *Lithosia sororcula* (scarce), *Cleora lichenaria* (abundant), *Zonosoma porata*, *Drepana binaria* (a few), and *Notodonta chaonia* ♀, from which I obtained a nice batch of ova. In June, up to the 11th, the weather was intensely hot, and a large number of insects were about. From June 6th, Mr. Bower was with me, and we devoted most of our time to the Micros, of which we took a large number, including *Coriscium brongniardellum*, *Coleophora*

palliatella (cases on oak), *C. siccifoliella*, *Dichrorhampha petiverella*, *D. plumbana*, *D. acuminatana*, *Asychna modestella*, *Adela rufimitrella*, *A. fibulella*, *Phoxopteryx myrtillana*, *P. mitterpacheriana*, *P. obtusana*, *Grapholitha geminana*, *Œcophora tripunctu*, *Stigmonota nitidana*, *Aplota dentella*, *Argyresthia glaucinella*, *Tricheris aurana* and *Chrysocorys festaliella* ; we also obtained a few *Callophrys rubi* and *Macrothylacia rubi* was flying in swarms over the heath. A visit to Dawlish Warren produced *Lita marmorea*, *Bryotropha mundella*, *B. senectella* (all in abundance), *B. umbrosella* (scarce), *Gelechia diffinis*, one. From June 13th-18th, I was at Wicken ; the weather was bitterly cold, except on one day, when *Papilio machaon* came out in numbers. A visit to Chippenham Fen produced *Banksia argentula*, common, *Ellopia fasciaria*, one, *Spilodes sticticalis*, one, and several *Adela croesella* (*sulzella*). Dusking in Wicken Fen was very poor, owing to the cold, but on one decent evening we obtained *Arsilonche alborenosa*, two, *Meliana flammea*, several, *Earias chlorana*, scarce, *Herminia cribralis*, *Chilo phragmitellus*, *Collix sparsata*, etc. At light and sugar we obtained, besides the *Hydrilla palustris* already recorded (*ante*, p. 232), *Apamea unanimis*, common, *Spilosoma urticae*, *Smerinthus tiliae*, *Meliana flammea*, *Notodonta ziczac*, *Macrogaster castaneae* (*arundinis*), 3 ♂ s, *Nascia cilialis*, one only, *Cerura vinula*, and other common species. We worked one day for *Hydrelia unca*, but only obtained a single specimen, just out, so the insect must have been late. In the fen itself we obtained a few larvæ of *Gastropacha quercifolia* (of which I also found larvæ here this year), *Peronea shepherdana* and *Depressaria angelicella* ; also on hawthorn, a larva of *Trichiura crataegi*, thus confirming Mr. Atmore's observation as to the food-plant of this species ; so far as I can remember there was no sallow directly near where it was found (just outside the village).

During the rest of the season I have practically been at home all the time. On the whole, I should say it has been below the average, though a few things have been commoner than usual. The better species I have taken have been :—*Stauropus fagi* (more abundant than usual), *Boarmia repandata* ab. *conversaria*, a few, *Anticlea rubidata*, *Zonosoma porata*, *Eupithecia coronata*, *Eurymene dolobraria*, *Boarmia abietaria*, much commoner than usual, *Eupithecia togata*, *Cidaria picata*, *Selenia lunaria*, *S. tetralunaria*, *Cleora glabraria*, *Hypena albistrigalis*, more abundant than usual, *Tephrosia bistortata*, second brood common, *Melanippe unangulata*, *Dianthoecia conspersa*, *Notodonta dictaeoides*, common, generally rare here, *Arentia flexula*, two, *Agrotis agathina*, a few, *Lithosia griseola*, *Callimorpha hera*, common and still spreading, *Bryophila muralis*, fairly common, *Stilbia anomala*, *Drepana cultraria*, with a specimen of the second brood, the first specimen of this brood I have ever taken, and, strange to say, although the first brood is usually common here, I did not see it this year ; *Sarrothripa undulanus*, *Lobophora viretata*, second brood, *Ennomos erosaria*, *E. alniaria*, *Zonosoma annulata*, *Luperina cespitis*, *Craniophora ligustri* and *Eubolia cervinata*, from which I have ova. During September, *Sphinx convolvuli* was common here over *Nicotiana affinis* and pink geraniums, the latter being quite as much favoured as the former. My son and I took 25, and could, no doubt, have secured more had we tried every evening ; our best take on one evening was seven. Larvæ, as a rule, have been very scarce this season, or possibly later than usual, and so were

not found when looked for. *Agrotis agathina* was an exception, it was very common, but turned out a great disappointment. I had about 200 tubbed out as last year, but bred very few, and these were small and dull in colour. My last year's specimens were very large and bright. I treated them exactly the same, and think it must have been owing to the long spell of dry weather prior to emergence. I also bred *Epunda nigra* from larvæ collected at the same time, and placed in the same tubs with *A. agathina*, but these emerged all right. In June, I bred a nice series of *Eupithecia tenuiata* from sallow catkins, collected here in spring. *Asteroscopus sphinx* is appearing well now, although I could not beat a larva at its usual time. Autumnal sugaring has been quite a failure, only one *Tiliacea* (*Xanthia*) *aurago*, and very few *Peridroma saucia* were observed, and even usual common species like *Orrhodia vaccinii* were very scarce.

Turning for a moment to the Rhopalocera, it certainly has not been a good year here for them. *Cyaniris argiolus* and *Callophrys rubi* were very scarce. Of *Pyrameis cardui* and *Colias edusa*, only one of each was seen. On the other hand, *Gonepteryx rhamni*, *Euchloë cardamines* and *Enodia hyperanthus* were more abundant than usual.—E. F. C. Studd, M.A., B.C.L., F.E.S., Oxton, nr. Exeter.

Lepidoptera in Essex.—*Thymelicus lineola* occurred quite freely this season in a field some three miles from the river marshes. *Tiliacea* (*Xanthia*) *aurago*, a scarce moth here (two were taken by Howard Vaughan, between 1860-1868), visited the sugar on September 17th, and a beautiful specimen of the same species emerged in one of my bell glasses on the following day. Between August 30th and September 4th, five fine *Cirrhoedia xerampelina* occurred at roots of ash, and a worn specimen came to my sugar on the 8th, whilst, at the end of September, numbers of common insects visited the sweets.—F. G. Whittle, 3, Marine Avenue, Southend.

Lepidoptera at Clevedon.—Insects have been very scarce at ivy this autumn, even more so than in 1897, when they were far below the average. A few specimens of *Sphinx convolvuli* have been taken at the flowers of *Nicotiana affinis*, and on one occasion I saw a specimen at the flowers of *Œnothera missouriensis*. Insects, too, have been scarce at light, yet the weather for the last few weeks has been very favourable—neither east wind nor frost.—J. Mason, Clevedon Court Lodge, Somerset. *November 10th*, 1898.

Food-plants of Trichiura cratægi.—I notice that the larva of *T. crataegi* is spoken of as being taken from hawthorn and sloe. It is remarkable that, although both plants are in plenty in the New Forest, I have never taken it on either, but invariably on sallow.—J. C. Moberly, M.A., F.E.S., 9, Rockstone Place, Southampton.

Abundance of Ephestia kühniella.—In the stores in which Mr. Clarke has recorded the abundance of *Caradrina quadripunctata* (*ante*, p. 157), the larvæ and pupæ of *Ephestia kühniella* have been recently very abundant. Last year was the first that I had seen the species, and its small size did not lead me to pay any great attention to it, as it was at the time in the larval stage and very small. They fed up in the dust collected on the outside of the sacks on which they first made their appearance. They seemed to be most careful to hide in the creases, both when feeding and pupating. The cocoon is very tough, and somewhat loose, and in this the larva changes to an amber-brown

pupa, the moth appearing towards the end of July and throughout August and September. The imagines are rarely seen on the wing, and then only when disturbed by a strong light being brought near to them. They are so sluggish that a female moth that I kept under observation dried her wings on the cocoon from which she had emerged, remained there until a male moth paired with her, and afterwards deposited her eggs in the same spot, thus never leaving the place where she first assumed the imago state. I only find them in one corner of our rooms, and they do not yet seem to have affected any other part of the building. The caterpillar is white or pale yellowish in colour, with a reddish-pink tinge along the back. There were some hundreds this year, and if the rooms were left uncleaned I am sure many thousands would be located here in a few years. In September, when the first eggs are deposited, some of the larvæ feed up quickly and pupate, the imagines emerging and the eggs that are laid later hatching out, but when quite young, the larvæ appear to hybernate more or less perfectly throughout the winter months, feeding up in the early summer and appearing as imagines in August and September, as I have before noticed. It is evident that we shall have to keep a sharp look out after the insect to prevent it becoming a regular pest.—Thomas Crennell, 47, Athole Street, Douglas.

REVIEWS AND NOTICES OF BOOKS.

British Lepidoptera, By J. W. Tutt, F.E.S..—This new work (the first volume of which will shortly be published by subscription) will contain a series of preliminary chapters (of a technical nature) on the following subjects:—

I. The origin of the Lepidoptera. II. The ovum. III. The embryology of a lepidopterous insect. IV. Parthenogenesis in Lepidoptera. V. The external structure of the lepidopterous larva. VI. The internal structure of the lepidopterous larva. VII. Variation of imagines of Lepidoptera. VIII. Protective coloration and defensive structures of lepidopterous larvæ. IX. Classification of the Lepidoptera.

Besides these chapters (which occupy 112 pp., 8vo.), each superfamily, family and genus is dealt with from the widest standpoint, containing a review of these groups in their world-wide characters and distribution. The genera are diagnosed, and the species (about 100) are each dealt with under the following headings:—

I. Synonymy. II. Original description. III. Imago. IV. Sexual dimorphism. V. Variation. VI. Comparison with allied species. VII. Egg and egg-laying. VIII. Habits of larva. IX. Larva. X. Cocoon. XI. Pupa. XII. Dehiscence of pupa. XIII. Food-plants. XIV. Parasites. XV. Habits and habitat. XVI. Time of appearance. XVII. Localities (British). XVIII. Distribution.

The preliminary chapters contain all the most recent work that has been published in the various branches dealt with, and, no doubt, much will be entirely new to British lepidopterists. The leading papers by Dyar and others have been briefly summarised, and thus the terminology so frequently used by advanced specialists in our magazines can be referred to with ease, whilst the chapter on "Classification" is an attempt to embody the views of those specialists who have attacked the subject from different points of study, relating to the egg, larva, pupa, etc. In the systematic portion of the work the help of many specialists has been obtained. For the Synonymy, Lord Walsingham,

Messrs. Durrant, Kirby and Prout have been mainly responsible. The ORIGINAL DESCRIPTION is in the original language in which it was written by the first describer of the species, and that of every insect described (with one exception) has been obtained. A student, therefore, can at once determine critically the insect that the author of any name had before him. The VARIATION of each species is dealt with (1) by a general survey of the various forms presented by the insect here and abroad, (2) by a tabulated summary of the chief forms, (3) by a translation or quotation of the original description of each named form (in small type), with critical review of its main features. For the EGG, LARVA and PUPA, the help of Dr. Chapman, Mr. Bacot and other specialists has been requisitioned (and Mr. Fenn's note-books have been kindly placed at the author's disposal). The FOOD-PLANTS have been compiled from reliable British and Continental authors (and authorities are given). The TIME OF APPEARANCE gives an accumulation of actual dates spread over many years, and compiled from more than 200 lists, supplied by collectors in various parts of the country, besides every record the author has observed in British and Continental magazines. The LOCALITIES (British) are arranged in counties, each place having the name of the observer responsible for it, following it in brackets. (No book published in this country has ever shown such a mass of information as is compiled under this and the two preceding headings, and the amount of labour in obtaining reliable data has been enormous.) The DISTRIBUTION is not a mere translation of that in Staudinger's *Catalog*, but has been compiled by taking the most authoritative lists for each country in which the species has been found, and the authority himself is quoted for his own localities. Here the author is specially indebted to Messrs. Durrant, Kirby and Prout.

The chapters on any superfamily in which there are well-known experts have been submitted to them—Lord Walsingham, Dr. Chapman, Mr. Durrant, Mr. W. H. B. Fletcher, M. Oberthür, Dr. Wood and others have been good enough to read the proofs, and make suggestions as to the groups in which they are specially interested. By this means an attempt has been made to reduce errors (unavoidable with so much detail) to a minimum.

The volume will consist when complete of more than 500 solid 8vo. pages, the descriptive tables, diagnoses, synonymy and localities being in small type. It will be complete in itself, and each superfamily dealt with will be a complete monograph so far as relates to British insects. Much of the information is condensed into the least possible limits, so as to economise space, and the above sketch of the method of the book shows that, whilst the purely technical portion of the book is as advanced and complete as our present knowledge admits, yet the general and exact data relating to Variation, Food-plants, Time of Appearance, Localities and Distribution, render it a work of the highest value to the field naturalist who does his own collecting. In fact, it is to the scientific field naturalist that the book appeals, rather than to any other class of entomologists.

The book was offered to two publishers, either of whom would have published it, if the author would have made it *more popular*. As the author had no intention of doing this, he at once communicated with some of his own immediate entomological friends, and their kind response determined him at once to take the risk of publication. To

the following ladies and gentlemen* (without whose help the book would never have been published) he desires to express his grateful thanks :—

Lord Auckland, Sir A. B. Hepburn, F.E.S., Sir J. T. D. Llewelyn, M.P., M.A., F.E.S., Hon. N. C. Rothschild, B.A., F.Z.S., etc., Hon. W. Rothschild, F.Z.S., F.E.S., etc. (2 copies), Revds. C. D. Ash, B.A., C. J. Buckmaster, M.A., F.E.S., C. R. N. Burrows, T. W. Daltry, M.A., F.L.S., G. M. A. Hewett, M.A., W. J. Holland, D.D., F.E.S., F. E. Lowe, M.A., F.E.S., A. M. Moss, M.A., G. H. Raynor, B.A., F.E.S., J. E. Tarbat, M.A., Major R. B. Robertson, Capt. S. G. Reid, F.E.S., Drs. T. A. Chapman, F.Z.S., F.E.S., R.Freer, F.E.S., M. Gunning, F.E.S., P. B. Mason, F.L.S., F.E.S., H. C. Phillips, M.R.C.S., F.E.S., W. S. Riding, B.A., F.E.S., T. Steck, Messrs. H. J. Adams, F.E.S., B. Adkin, R. Adkin, F.E.S., H. Alderson, F.E.S. (Mrs.) S. Ames, H. C. Arbuthnott, A. Bacot, R. Bankes, M.A., F.E.S., F. H. Barclay, F.E.S., R. H. Barker, C. Bartlett, W. Bateson, M.A., F.R.S., F.Z.S., etc., E. B. Bishop, E. D. Bostock, F.E.S., F. Bouskell, F.E.S., E. W. W. Bowell (2 copies), B. A. Bower, F.E.S., E. A. Bowles, M.A., F.E.S., (2 copies), T. H. Briggs, M.A., F.E.S., H. Rowland-Brown, M.A., F.E.S., B. Burnett, W. E. Butler, J. Butterfield, B.Sc., S. J. Capper, F.E.S., Neville Chamberlain, E. M. Cheesman, W. Christy, M.A., F.E.S., J. A. Clark, F.E.S., H. Shortridge Clarke, F.E.S., B. H. Crabtree, F.E.S., C. H. Crass, E. M. Dadd, A. A. Dalglish, W. Daws, F. H. Day, G. O. Day, F.E.S., H. C. Dent, C.E., F.L.S., F.E.S., H. T. Dobson, F.E.S., H. St. J.K. Donisthorpe, F.Z.S., F.E.S., L. Dupont, H. M. Edelsten, S. Edwards, F.Z.S., F.L.S., etc. (2 copies), C. Fenn, F.E.S., (Prof.) C. H. Fernald, M.A., F.E.S., etc., W. H. B. Fletcher, M.A., F.E.S., G. R. Garland, F. Glenny, R. S. Gordon, F.E.S., T. Greer, A. F. Griffith, M.A., F.E.S., G. C. Griffiths, F.Z.S., F.E.S., W. Grover, J. C. Haggart, T. W. Hall, F.E.S., A. H Hamm, F. J. Hanbury, F.L.S., F.E.S., A. Harrison, F.C.S., F.E.S., E. S. Harrison, A. Helps, H. A Hill, F.Z.S., F.E.S., A. Horne, F.E.S., S. Image, M.A., F.E.S., A. H. Jones, F.E.S., W. F. de V. Kane, M.A., F.E.S., W. J. Kaye, F.E.S., F. C. Lemann, F.E.S., A. Lloyd, F.C.S., F.E.S., R. W. Lloyd, F.E.S., W. A. Luff, H. W. Marsden (6 copies), H. T. Massey, F.E.S. (2 copies), H. H. May, W. P. Blackburne-Maze, F.E.S., F. McIntyre, F. Merrifield, F.E.S., J. C. Moberly, M.A., F.E.S. (2 copies), H. Moore, H. Mousley, F.E.S., E. B. Nevinson, M.A., F.E.S., C. B. Newland, F.E.S., C. Nicholson, F.E.S., W. E. Nicholson, F.E.S, J. Ovenden, H. E. Page, F.E.S., M. A. Pitman, G. T. Porritt, F.L.S., F.E.S., L. B. Prout, F.E.S., (Mrs.) E. Rae, E. Ransom, W. Reid, F.E.S., G. Robinson, J. E. Robson, F.E.S., G. B. Routledge, F.E.S., A. Russell, F.E.S., S. G. C. Russell, F.E.S., H. Smetham, W. Hawker-Smith, P. C. T. Snellen, Hon. F.E.S., E. F. Studd, M.A., B.C.L., F.E.S., W. B. Thornhill, W. Thornthwaite, F.R.A.S., H. Tunaley, F.E.S., W. Tunstall, F.E.S., S. Walker, C. J. Watkins, F. G. Whittle, G. Wilkinson, H. Williams, J. J. Wolfe, H. S. Woolley.

Many more subscribers are required to make the publication a success, and to save the author from actual pecuniary loss. The immediate response, however, has been so gratifying that it is probable that by the time the book is published this difficulty will have been already met. In the meantime, intending subscribers are kindly requested to communicate their wish to me, at "Bertrose," Gellatly Road, Hatcham, S.E.—H. E. Page, F.E.S.

* If any names have been inadvertently left out, I shall be pleased to hear thereof. – H.E.P.

CURRENT NOTES.

The North London Natural History Society is holding its Seventh Annual Exhibition on December 31st and January 2nd next, at the Sigdon Road Board School, Hackney Downs Junction. Mr. L. B. Prout is acting as Exhibition Secretary.

The Entomological Club held its last meeting on December 2nd, 1898, at 4, Lingard's Road, Lewisham, the residence of Mr. R. Adkin, F.E.S. After a very pleasant evening, a number of well-known entomologists sat down to an excellent supper, provided by the host.

Among others present were—Prof. Armstrong, Messrs. B. Adkin, C. G. Barrett, Beaumont, Distant, S. Edwards, Hall, Harrison, A. H. Jones, McLachlan, Porritt, E. M. Smith, South, Turner, Tutt and Verrall.

Mr. L. O. Howard, U.S. Dept. of Agriculture, Washington, D.C., wishes to obtain for the Divisional library, copies of all separata relating to entomological subjects, whether of recent date or not, and asks all authors to send copies of their papers marked "For the Library of the Division of Entomology."

On December 3rd, 1898, the sale of a part of the collection of Mr. R. South took place at Stevens' sale-rooms. One would have supposed that such a well-known collection would have been especially well-advertised, but many entomologists seem to have had no notion that the sale was about to take place. The prices as a whole ruled low, the total reaching rather above £100 (for the butterflies, Sphingids, Bombycids, Arctiids, Notodontids, Pyralids, Plumes, Crambids, Tortricids and Tineids), whilst a 32-drawer cabinet went for £16 16s., and a 30-drawer one for 10 guineas. The prices that good cabinets have recently fetched have been surprisingly low. One would have imagined that the Lycænids, which are quite historical, would have been sold *en bloc*, with a view of retaining the material on which Mr. South's well-known articles were based, but they were subdivided, and went for from 4s. to 6s. per lot of 40. A specimen of *Euvanessa antiopa* fetched £1 2s., a male *Chrysophanus dispar* £3 10s., and a female £3 3s. The Anthrocerids fetched fair prices, although Mr. Clark obtained the pick of these in Lot 63 for 10s. *Nola centonalis* appears to be one of the best species, five examples (with one white aberration) going for £1 12s. 6d. The Sesiids and Arctiids sold very well, and a pair of *Drepana harpagula (sicula)* produced 30s., whilst a single specimen of *Botys repandalis* (with a number of common insects), sold for 28s. There seems to be a fall in Tortricids, and it is a fact, not yet explained, that the species of this family have a lower average money value than any other British Lepidoptera. From a money point of view Sesiids, Sphingids, Arctiids, Lasiocampids and Notodontids seem to be the insects that have the highest value. Mr. South's Noctuids and Geometrids were not sold.

An important change is notified to take place in the council of the Entomological Society of London for 1899, Messrs. Blandford and Merrifield having resigned the position of secretaries. Their successors will be Messrs. J. J. Walker and Gahan. Mr. G. H. Verrall has been nominated as the President of this society, whilst the Revd. Canon Fowler, Messrs. Donisthorpe and Saunders, together with Messrs. Gahan and Walker, make up the five new members proposed to be elected into the council.

Mr. L. B. Prout, F.E.S., has been elected President of the City of London Entomological Society. Mr. A. Harrison, F.C.S., F.L.S., F.E.S., has been nominated for the Presidency, and Dr. T. A. Chapman for the Vice-Presidency of the South London Entomological Society.

Errata.—p. 292, line 1, for "Luhillart" read "Quillart"; p. 293, line 43 and p. 294, line 7, for "Guillart" read "Quillart"; p. 292, line 45, for "Drumdwalt" read "Drumwalt"; p.293, line 17, for "Brunwalt" read "Drumwalt"; p. 293, line 27, for "Doonard" read "Doonan"; p. 301, line 51, for "*Obera*" read "*Oberea*."

CONTENTS OF VOLUME X.

[All notices of named aberrations and varieties are placed in the "Special Index," under their correct names.]

LIST OF ILLUSTRATIONS (*WOODCUTS, Etc.*).

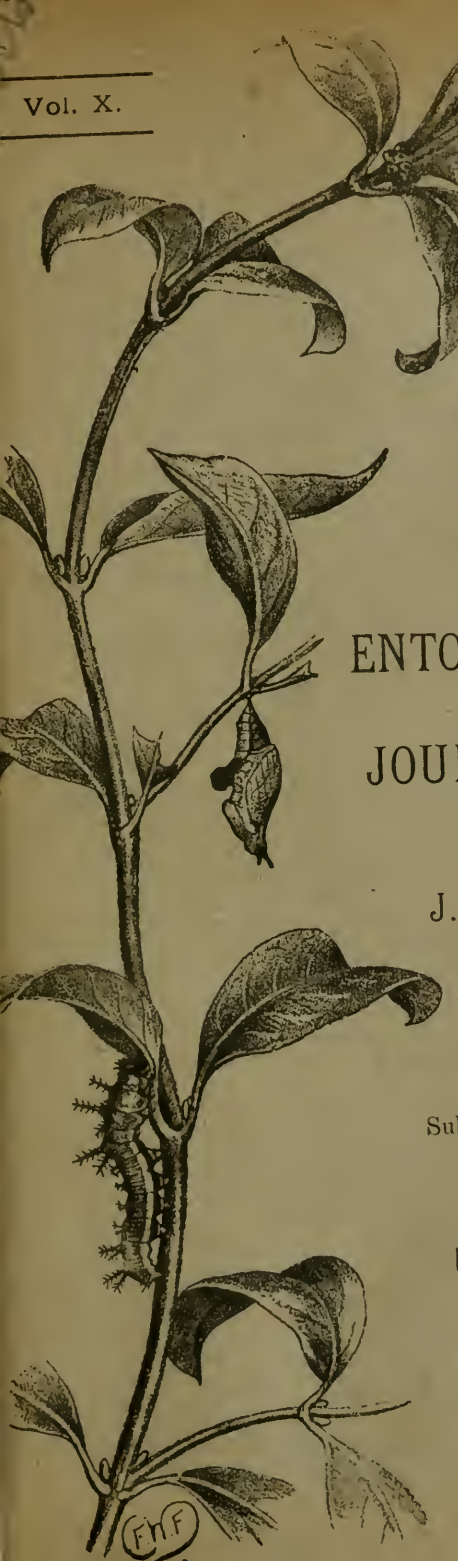
INDEX TO LOCALITIES.

LIST OF CONTRIBUTORS, Etc.

SPECIAL INDEX.

Besides the above General Index, a Special Index, containing every reference to each species, genus, family, superfamily, and named variety (or aberration) mentioned in this volume, is separately published.

Vol. X. No. 1.



THE ENTOMOLOGIST'S RECORD AND JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

JANUARY 15th, 1898.

PRICE SIXPENCE (NET).

Subscription for Complete Volume, post free

(Including SPECIAL INDEX),

SEVEN SHILLINGS,

TO BE FORWARDED TO

HERBERT E. PAGE, F.E.S.,

25, CASELLA ROAD, NEW CROSS, S.E.

LONDON:

ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.

BERLIN:

R. FRIEDLÄNDER & SOHN,

11, CARLSTRASSE, N.W.

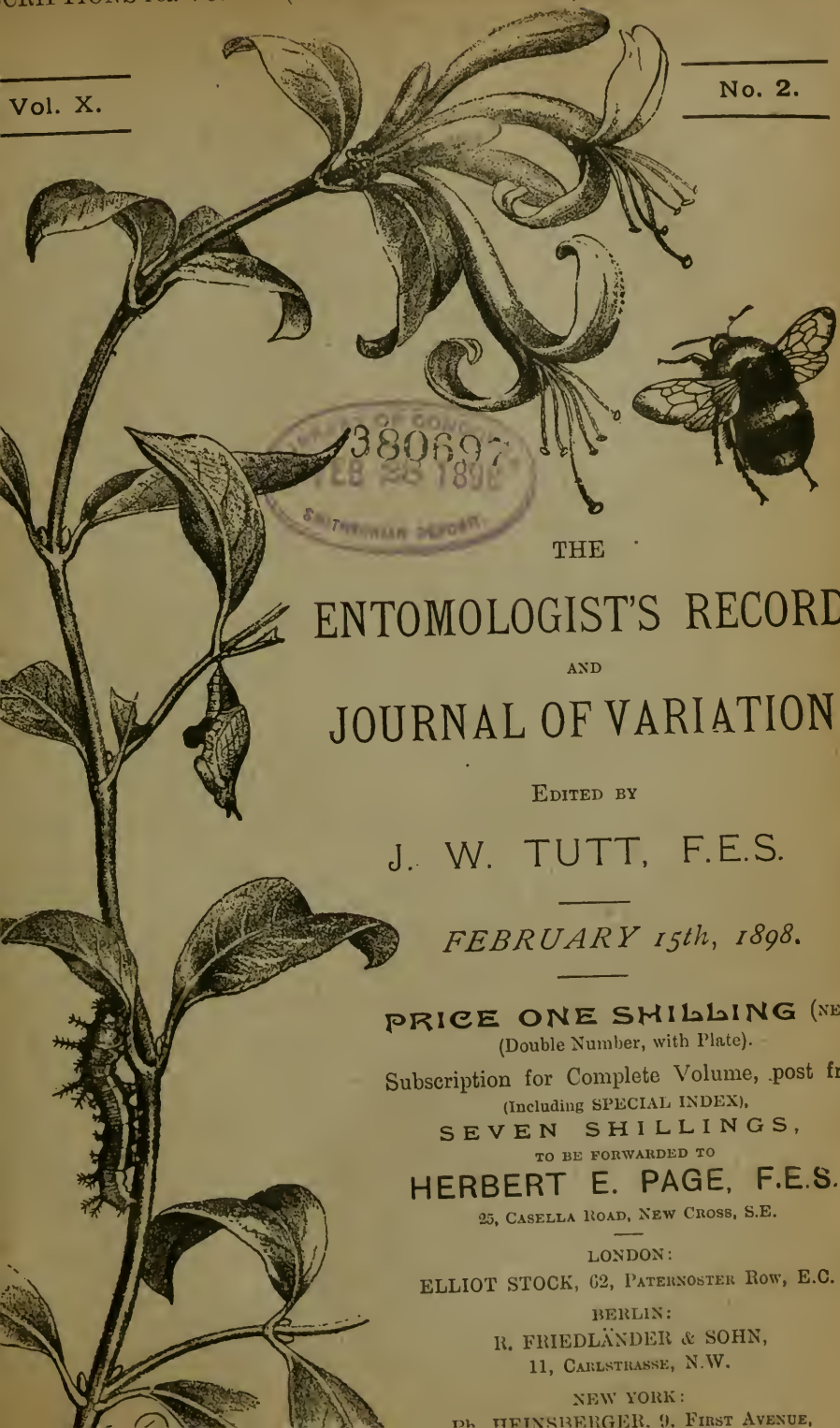
NEW YORK:

Ph. HEINSBERGER, 9, FIRST AVENUE,

NEW YORK, U.S.A.

SCRIPTIONS FOR VOL. X. (PAYABLE IN ADVANCE) ARE NOW OVER DUE.

Vol. X. No. 2.



THE

ENTOMOLOGIST'S RECORD

AND

JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

FEBRUARY 15th, 1898.

PRICE ONE SHILLING (NET)
(Double Number, with Plate).

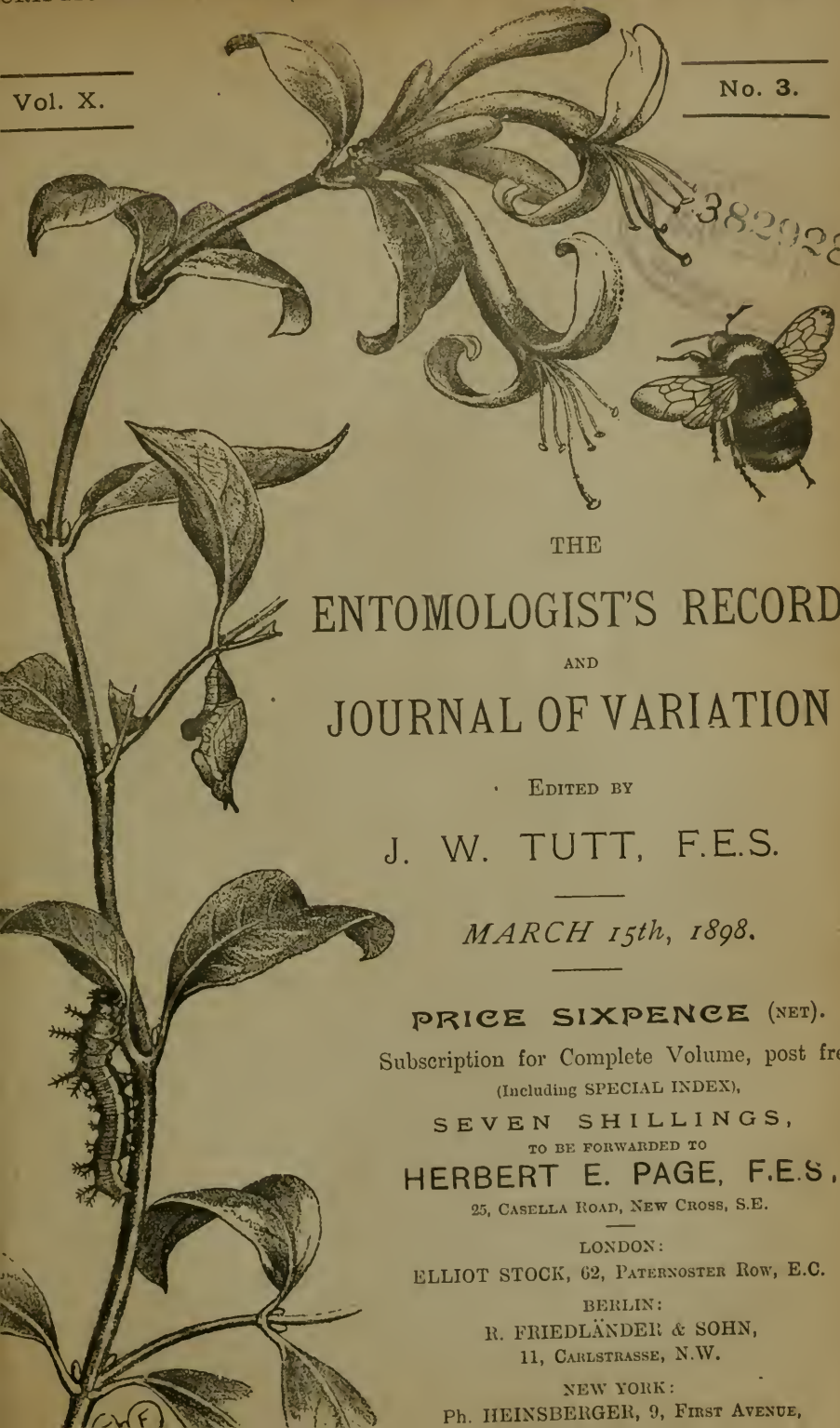
Subscription for Complete Volume, post free
(Including SPECIAL INDEX),
SEVEN SHILLINGS,
TO BE FORWARDED TO
HERBERT E. PAGE, F.E.S.,
25, CASELLA ROAD, NEW CROSS, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.

BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.

NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE.

Vol. X. No. 3.



THE

ENTOMOLOGIST'S RECORD

AND

JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

MARCH 15th, 1898.

PRICE SIXPENCE (NET).

Subscription for Complete Volume, post free
(Including SPECIAL INDEX),
SEVEN SHILLINGS,
TO BE FORWARDED TO
HERBERT E. PAGE, F.E.S.,
25, CASELLA ROAD, NEW CROSS, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.

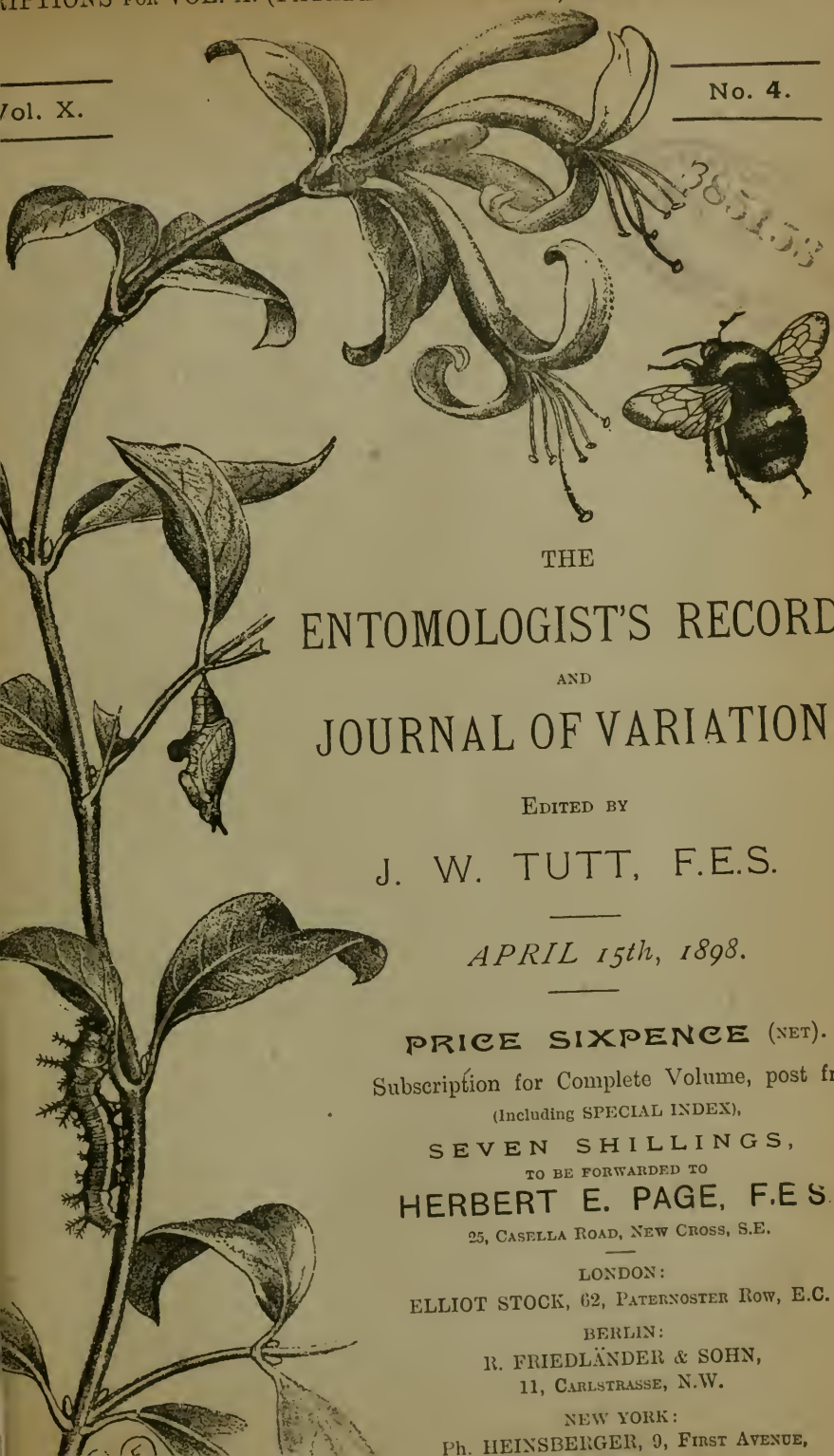
BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.

NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE,

RIPTIONS FOR VOL. X. (PAYABLE IN ADVANCE) ARE NOW OVER DUE.

Vol. X.

No. 4.



THE ENTOMOLOGIST'S RECORD AND JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

APRIL 15th, 1898.

PRICE SIXPENCE (NET).

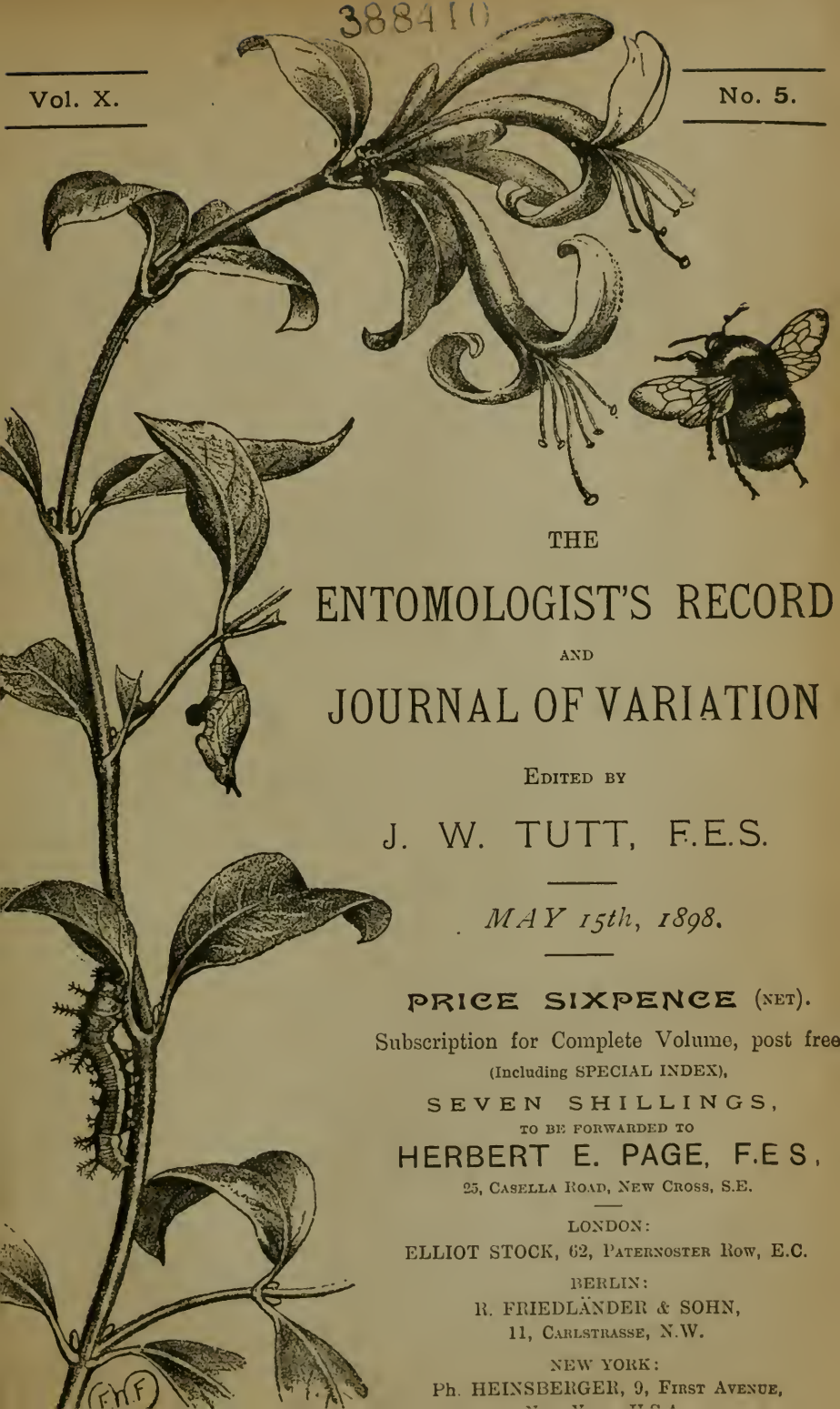
Subscription for Complete Volume, post free
(Including SPECIAL INDEX),
SEVEN SHILLINGS,
TO BE FORWARDED TO
HERBERT E. PAGE, F.E.S.,
25, CASELLA ROAD, NEW CROSS, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.

BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.

NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE,

Vol. X. No. 5.



THE ENTOMOLOGIST'S RECORD AND JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

MAY 15th, 1898.

PRICE SIXPENCE (NET).

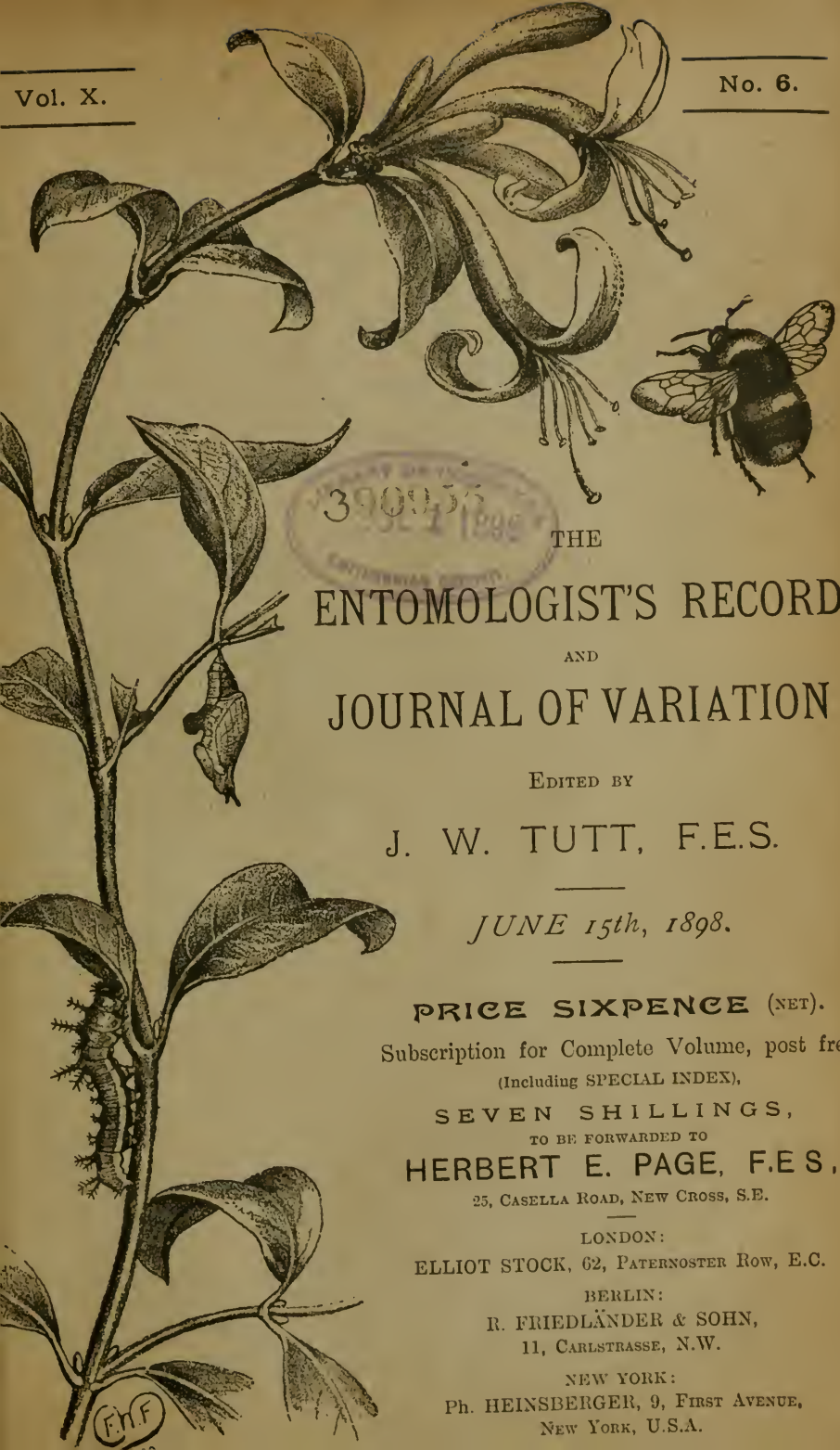
Subscription for Complete Volume, post free
(Including SPECIAL INDEX),
SEVEN SHILLINGS,
TO BE FORWARDED TO
HERBERT E. PAGE, F.E.S.,
25, CASELLA ROAD, NEW CROSS, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.

BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.

NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE,

Vol. X. No. 6.



THE

ENTOMOLOGIST'S RECORD

AND

JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

JUNE 15th, 1898.

PRICE SIXPENCE (NET).

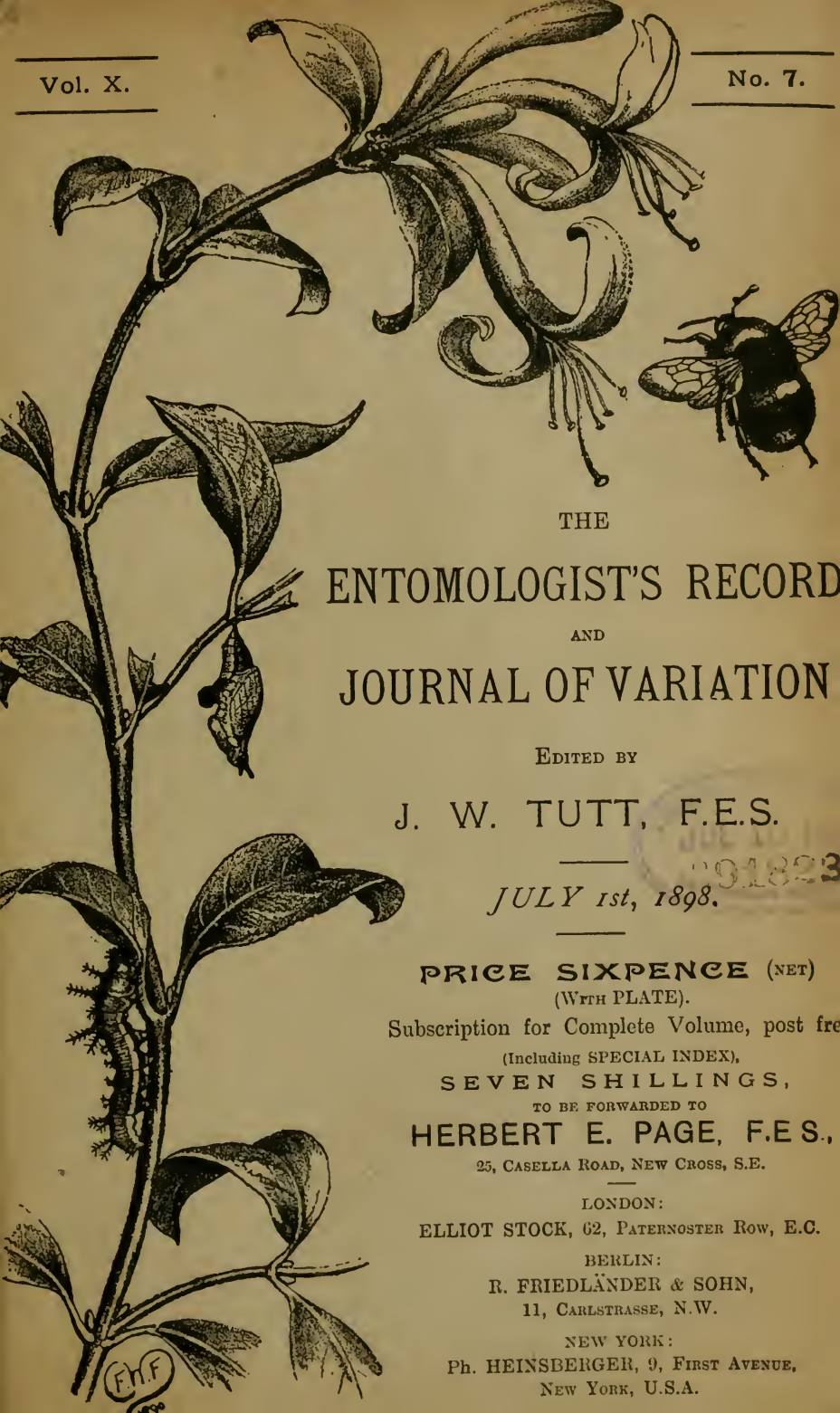
Subscription for Complete Volume, post free
(Including SPECIAL INDEX),
SEVEN SHILLINGS,
TO BE FORWARDED TO
HERBERT E. PAGE, F.E.S.,
25, CASELLA ROAD, NEW CROSS, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.

BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.

NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE,
NEW YORK, U.S.A.

Vol. X. No. 7.



THE

ENTOMOLOGIST'S RECORD

AND

JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

JULY 1st, 1898.

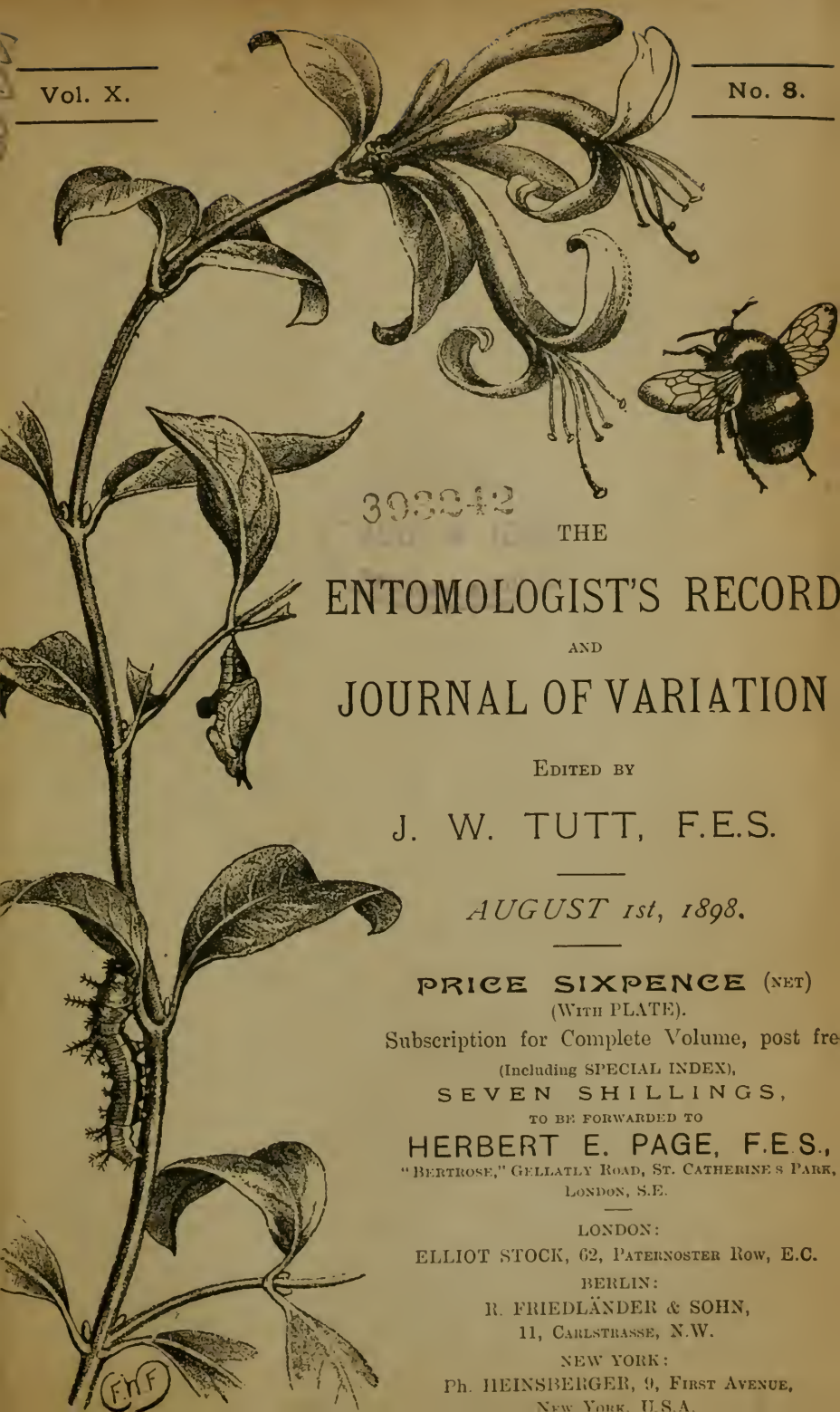
PRICE SIXPENCE (NET)
(WITH PLATE).
Subscription for Complete Volume, post fre
(Including SPECIAL INDEX),
SEVEN SHILLINGS,
TO BE FORWARDED TO
HERBERT E. PAGE, F.E.S.,
25, CASELLA ROAD, NEW CROSS, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.

BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.

NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE,
NEW YORK, U.S.A.

Vol. X. No. 8.



THE

ENTOMOLOGIST'S RECORD

AND

JOURNAL OF VARIATION

EDITED BY

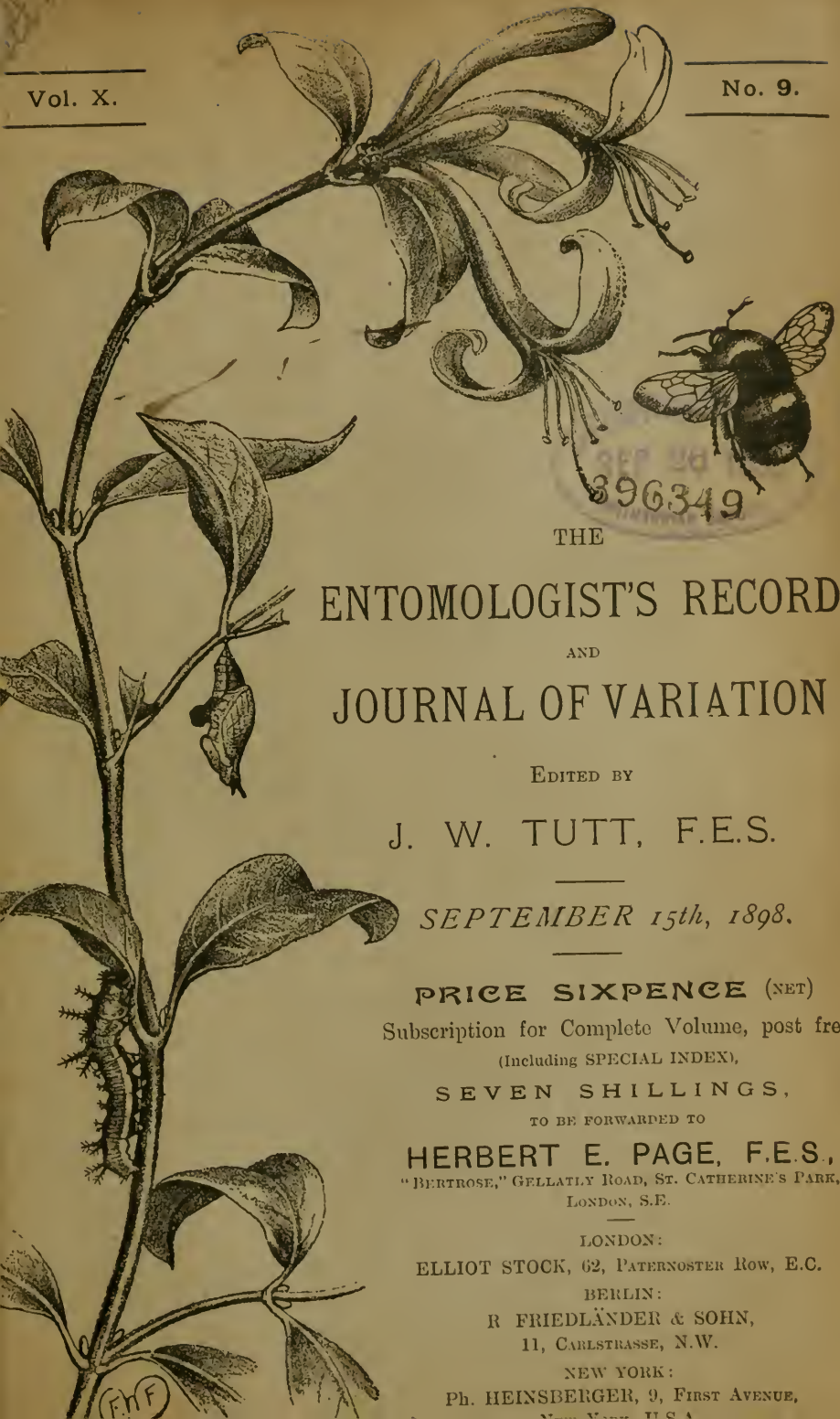
J. W. TUTT, F.E.S.

AUGUST 1st, 1898.

PRICE SIXPENCE (NET)
(WITH PLATE).
Subscription for Complete Volume, post free
(Including SPECIAL INDEX),
SEVEN SHILLINGS,
TO BE FORWARDED TO
HERBERT E. PAGE, F.E.S.,
"BERTROSE," GELLATLY ROAD, ST. CATHERINE'S PARK,
LONDON, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.
BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.
NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE,
NEW YORK, U.S.A.

Vol. X. No. 9.



THE

ENTOMOLOGIST'S RECORD

AND

JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

SEPTEMBER 15th, 1898.

PRICE SIXPENCE (NET)

Subscription for Complete Volume, post free
(Including SPECIAL INDEX),

SEVEN SHILLINGS,

TO BE FORWARDED TO

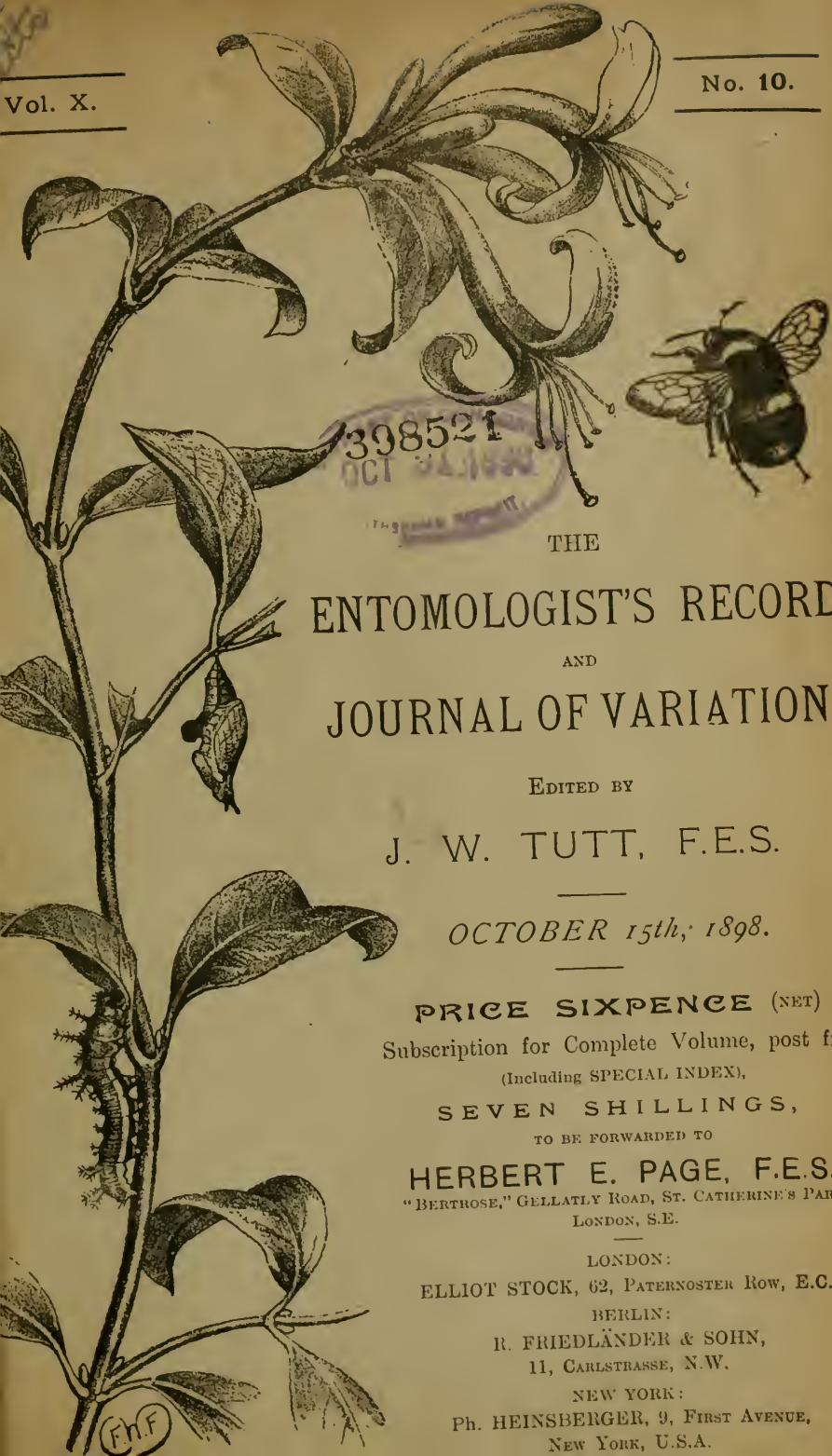
HERBERT E. PAGE, F.E.S.,
"BERTROSE," GELLATLY ROAD, ST. CATHERINE'S PARK,
LONDON, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.

BERLIN:
R FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.

NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE,

Vol. X. No. 10.



THE

ENTOMOLOGIST'S RECORD

AND

JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

OCTOBER 15th, 1898.

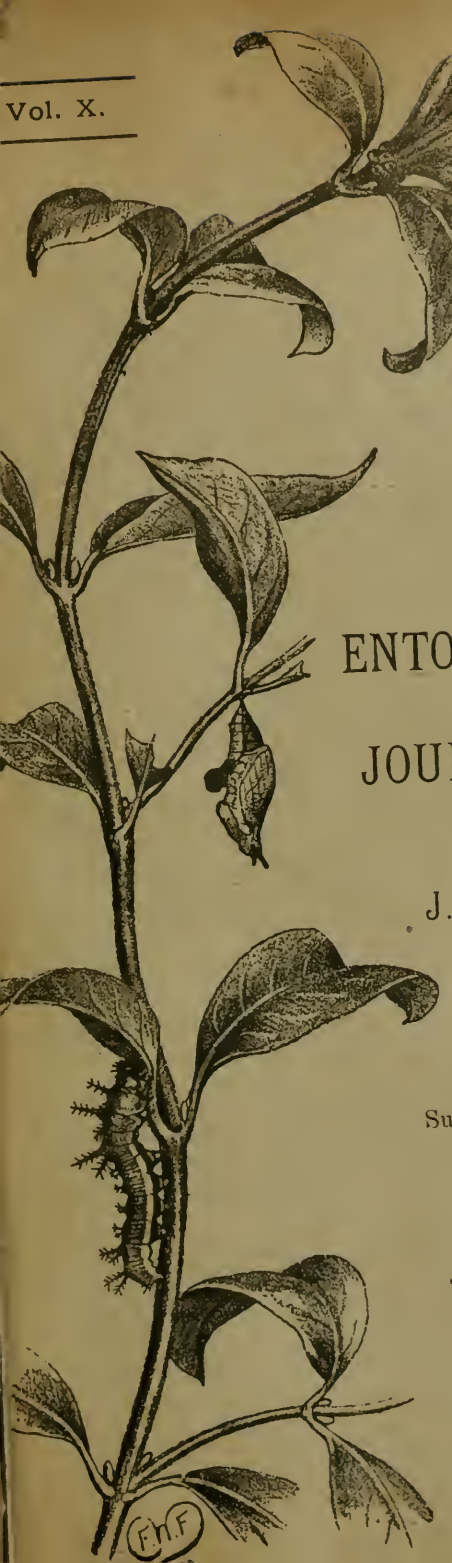
PRICE SIXPENCE (NET)

Subscription for Complete Volume, post free
(Including SPECIAL INDEX),
SEVEN SHILLINGS,
TO BE FORWARDED TO

HERBERT E. PAGE, F.E.S.,
"BERTROSE," GELLATLY ROAD, ST. CATHERINE'S PARK,
LONDON, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.
BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.
NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE,
NEW YORK, U.S.A.

Vol. X. No. 11.



THE

ENTOMOLOGIST'S RECORD

AND

JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

NOVEMBER 15th, 1893.

PRICE SIXPENCE (NET)

Subscription for Complete Volume, post fre
(Including SPECIAL INDEX),

SEVEN SHILLINGS,

TO BE FORWARDED TO

HERBERT E. PAGE, F.E.S.,
"BERTROSE," GELLATLY ROAD, ST. CATHERINE'S PARK,
LONDON, S.E.

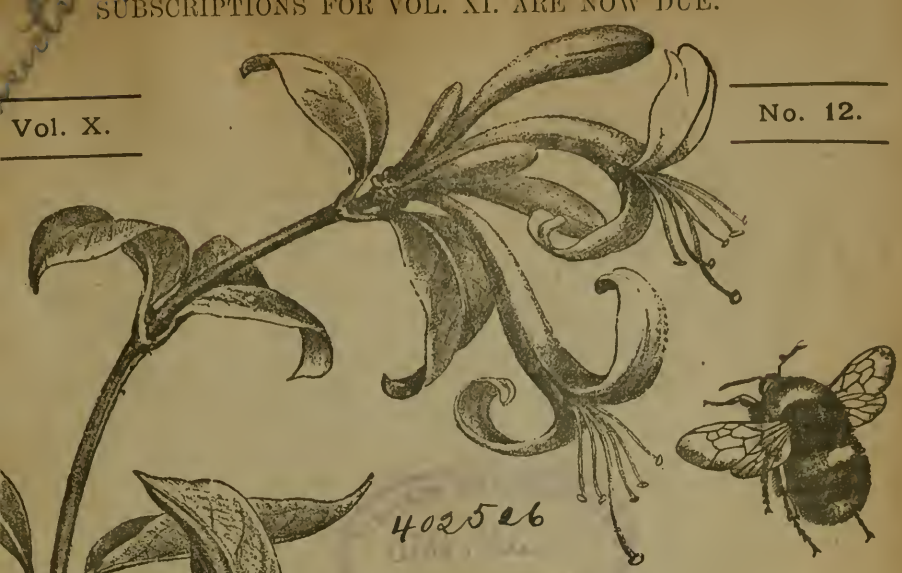
LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.

BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.

NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE,
NEW YORK, U.S.A.

SUBSCRIPTIONS FOR VOL. XI. ARE NOW DUE.

Vol. X. No. 12.



THE ENTOMOLOGIST'S RECORD AND JOURNAL OF VARIATION

EDITED BY

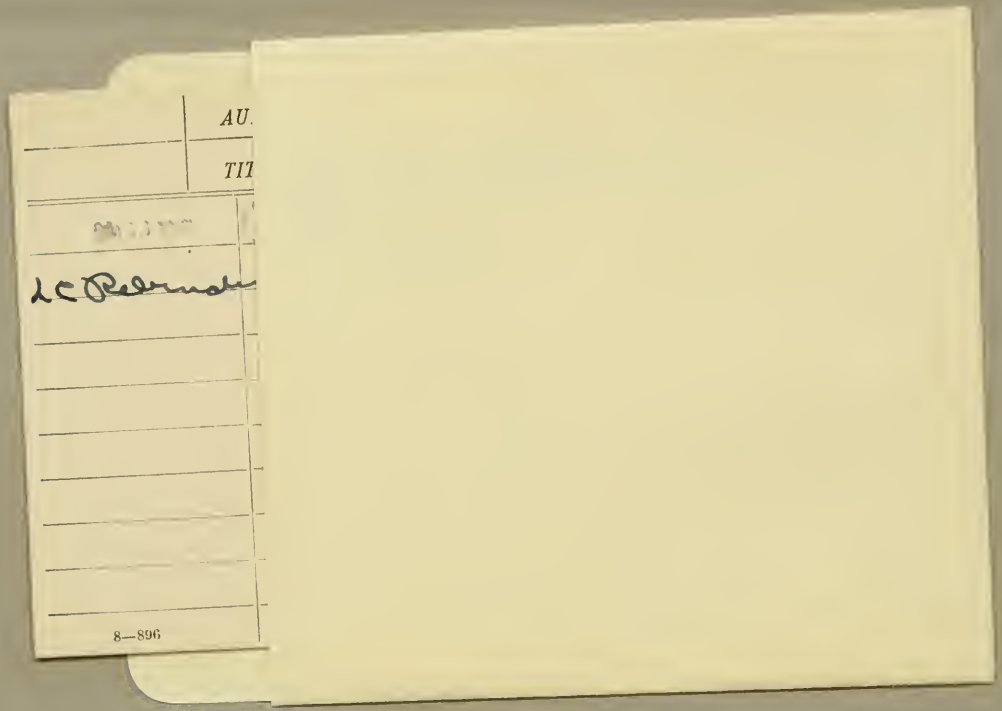
J. W. TUTT, F.E.S.

DECEMBER 15th, 1893.

PRICE ONE SHILLING (NET)
(Double Number).

Subscription for Complete Volume, post free
(Including SPECIAL INDEX),
SEVEN SHILLINGS,
TO BE FORWARDED TO
HERBERT E. PAGE, F.E.S.,
"BERTROSE," GELLATLY ROAD, ST. CATHERINE'S PARK,
LONDON, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.
BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.
NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE,


AU.
TIT
LC Rebmann
8—896