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THE BULLETIN OF THE AMATEUR ENTOMOLOGISTS' SOCIETY

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GENERAL INDEX

CONTRIBUTORS

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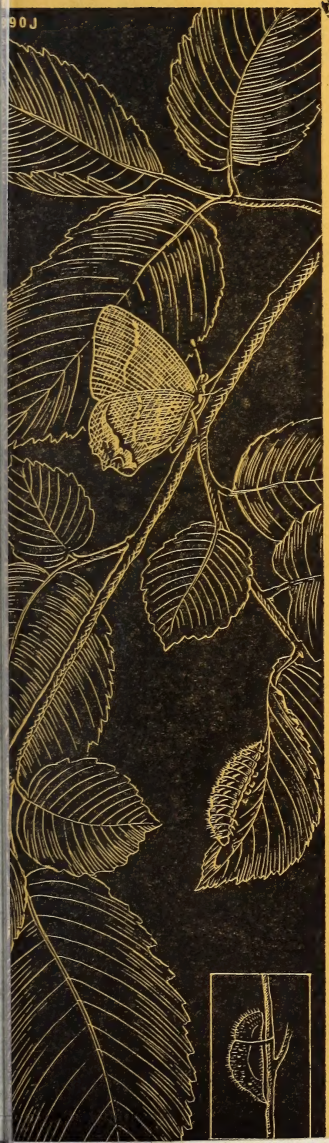

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...me of which are illustrated ...still available and may be ...F. Bretherton Esq., Folly Hill, Birtley Green, Bramley.

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AES BULLETIN No. 298

EDITORIAL

Welcome to a new Volume, an enlarged *Bulletin* and the same Editor. In spite of some wrangling between some other members of the AES Council and me about some of the advertisements carried by the *Bulletin* I am pressing on for the time being. Are members really as apathetic as they seem about the sale of dead insects? Following my comments in the August 1972 *Bulletin* on the subject, I have received only two letters, one for and one against my views.

Have you ever been on a Field Course organised by the Field Studies Council? I have been to two and can thoroughly recommend them to any member who has yet to try them. Among the courses organised for amateurs for 1973 are the following:

Entomology Course: leader—Peter Skidmore: August 29th-September 5th. The Drapers' Field Centre, Rhyd-y-creuau, Betws-y-coed, Caern.

Spiders: leader—J. R. Parker: September 5th-12th. Flatford Mill Field Centre, East Bergholt, Colchester, Essex CO7 6UL.

Butterflies and Moths: leaders—Messrs J. Heath and J. Reid: July 18th-25th. The Leonard Wills Field Centre, Nettlecombe Court, Williton, Taunton, Somerset.

Flies, Midges and Gnats: leaders—Centre staff: August 15th-22nd. Malham Tarn Field Centre, Settle, Yorkshire BD24 9PU.

Introduction to Insect Ecology: leaders—Centre staff: July 25th-August 1st. Orielton Field Centre, Pembroke, Pembrokeshire.

Insect Recording: leader—Dr M. G. Morris: August 15th-22nd. Preston Montford Field Centre, Montford Bridge, Shrewsbury SY4 1DX.

Information about these courses can be obtained from the Warden at the Centre concerned or more general information can be obtained from the Information Office, Field Studies Council, Preston Montford Hall, Montford Bridge, Shrewsbury SY4 1DX.

Paul Boswell (2853)

COLLECTING NOTES — FEBRUARY 1973

The Smaller Moths

Mr E. S. Bradford's first drawing is of *Endrosis sarcitrella* Linn. (*lactella* D. and S.). This is a very common moth in houses and may be encountered all the year round. I have taken it from haystacks in Novem-

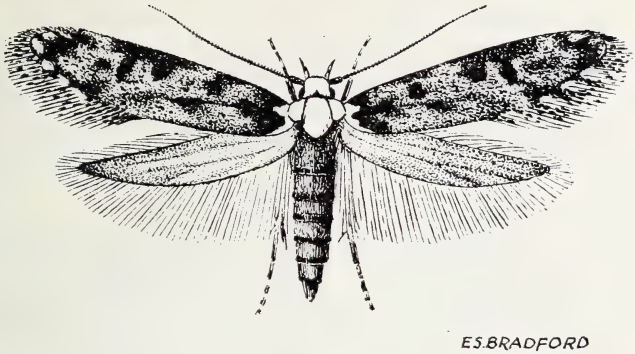
ber and February and from this I deduce that it overwinters as an imago, though our textbooks do not say so. The larva feeds mainly on stored products and household waste. It is probably not averse to your best suit but it is less culpable in this respect than *Tinea pellionella* Linn. and its relatives. I have even found it in operative bee-hives. The white head and thorax are conspicuous and make this an easy species to recognise. The forewings are grey with black markings.

The second drawing is of *Pammene regiana* Zell. The winter is the best season for finding this species. During the late summer the larva feeds in the seeds of Sycamore (*Acer pseudoplatanus* Linn.) and when it is full fed it descends the trunk to spin its cocoon under the bark at the base of the tree. Old trees with loose, segmented bark are the best hunting grounds, but care must be taken not to strip too much bark from any one tree. The cocoons are quite conspicuous and may sometimes be found in numbers; the cocoons of previous years, however, sometimes look deceptively fresh. The ground colour of the forewings of the imago is dark fuscous and the dorsal blotch is bright yellow; it is a strikingly beautiful moth.

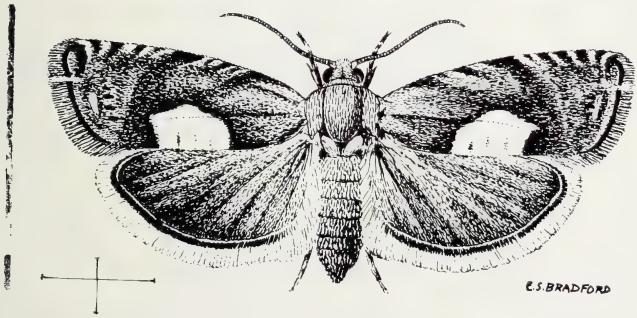
Mr Bradford's third species is *Epinotia ramella* Linn. (*paykulliana* Fab.). The imago flies in late July and August and is often common around birch trees (*Betula* spp.). The wings are whitish grey with black markings. A common variety has the whole of the dorsal half of the wing blackish fuscous, absorbing the dark markings seen in the typical form figured by Mr Bradford. The larva feeds in the spring, mainly in birch catkins.

It is certainly worth while collecting birch catkins from late February onwards, for they harbour a number of different species of larva. Usually a tenanted catkin is distorted in some way, so it is best to pick those which look twisted or bent. Amongst the moths which may be reared from this pabulum are *Cochylis nana* Haw., *Argyresthia brockeella* Hubn., *A. goedartella* Linn., *Epinotia bilunana* Haw. and *E. demarniana* F. and R. The last-named species is distinctly uncommon and you will be lucky if you come across it. Another even rarer species associated with birch catkins is *Pammene obscurana* Steph. Its life-history is not described in our English textbooks, but according to continental authors the larva is to be found feeding in birch catkins during the summer months.

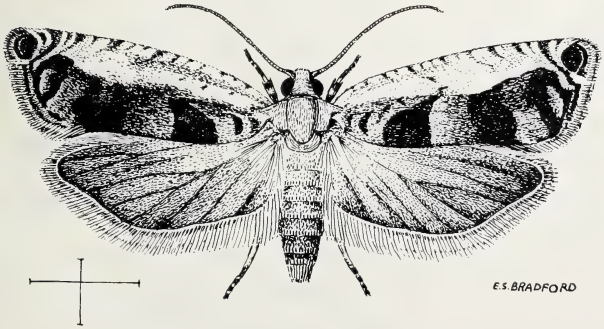
It is rather a problem to know how to manage the catkins you have collected. If you keep them enclosed, they will soon turn mouldy and their occupants will perish. I am a great believer in sphagnum moss which you can find growing round the roots of heather on most damp heaths. I suggest that you put a few inches of earth at the bottom of a flower-pot and cover it liberally with a layer of sphagnum. It is not a bad idea to add a few chunks of rotten wood so that the larvae may burrow inside, if so disposed, or find shelter underneath. Put the catkins (not too many) on top of the moss and tie a piece of nylon netting securely on top of the pot. The pots should be put in the garden, preferably sunk in the earth up to the lip to



Endrosis sarcitrella Linn.



Pammene regiana Zell.



Epinotia ramella Linn.

prevent desiccation. I usually cover part of the top of the pot with a piece of wood or polythene to prevent too much rainwater from entering. Conversely, during a dry spell I water the pots. Apart from the removal of the old catkins and an occasional topping up with freshly picked catkins while you judge the larvae are still feeding, the pot should be left undisturbed till the imagines are due.

A. M. Emmet (1379)

Coleoptera

Roughly ten years have elapsed since this feature last appeared in the *Bulletin*. I hope to continue the series with a regular article, perhaps illustrated, dealing with one taxonomic group or a particular method of collecting. Before starting I recommend all readers to purchase the Society's invaluable publication, *A Coleopterist's Handbook* edited by Messrs Walsh and Dibb, which is the best reference book covering aspects of collecting and studing Coleoptera.

By the time this note appears in print it will be February and an excellent time to collect beetles from nests of the Mole (*Talpa europaea* Linn.). Dr N. H. Joy was the first British coleopterist to study this biotype in any detail, indeed he was our authority on the beetle fauna occurring in the nests of birds and mammals. An excellent paper on this subject was written by Joy (1906) and other accounts are given by W. E. Sharp (no date) and in Walsh and Dibb (1954). These last two are based mainly on the work of Joy.

The method I use for extracting moles' nests is a variation of that given in Walsh and Dibb. After clearing away the mole-hill with the trowel it is best to use ones hands to locate the nest chamber. This eliminates the risk of disturbing the nest with the probing trowel. The thin roof of the nest chamber is best removed by pulling with both hands, if necessary cutting any roots with a knife. Enlarge the hole sufficiently to enable the complete nest to be removed and transferred to the collecting sheet in one movement. Carefully examine the loose soil at the bottom of the chamber as beetles are sometimes to be found here. Now the nest can be broken up and sieved over the sheet. The mole relies on its sense of smell to locate its prey so any animals living in association with it have to be fast movers in order to escape being eaten. This is clearly demonstrated by the great pace at which the Staphylinid occupants race across the sheet, a pooter comes in handy here. However a sharp lookout must be kept to detect any slow moving or very small beetles that may be present. It is advisable to make the examination in the field as large numbers of fleas are invariably present.

The list of beetles recorded from moles nests is quite large and Dr Joy divided the species into three categories:—

(a) Species peculiar to the nests that breed there and are only rarely met with elsewhere.

(b) Those that breed in the nest but occur in other habitats.

(c) Accidental visitors, hibernating species and those that do not breed in the nests.

Those in group (a) include *Aleochara spadicea* (Erichson), *Heterothops niger* Kraatz, *Quedius nigrocaeruleus* Fauvel, *Q. othiniensis* Johansen (=*talparum* Deville) and *Margarinotus marginatus* (Erichson).

If any larvae are present they should be placed in a tin with some nest material and their life histories studied. Otherwise it is best to replace the nest and cover it over with the top soil that formed the mole-hill. Re-examination of the nest after a few days is usually profitable as beetles may be present in the tunnels leading to the nest chamber.

In general more beetles are to be found in nests made of leaves. In early May one year (rather late for mole-nesting—the season lasting from November to March) I found ten *Q. othiniensis* and many *H. niger* in a nest made of hawthorn leaves near Lagness, West Sussex. About a mile away the next day I unearthed seven nests made of grasses and was suprised to find only three *H. niger*, hardly a just reward for my efforts.

J. Cooter (3290)

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SO YOU WANT TO STUDY BEETLES — PART V (Concluded)

IDENTIFICATION AND CLASSIFICATION

The external anatomy of the beetle

Unlike the Lepidoptera, where most identification is usually carried out with the aid of illustrations or by comparison with named specimens, the Coleoptera are often very difficult to identify even with the aid of carefully compiled keys. Although illustrations are at times a great help, for certain genera they are practically useless. In order to use keys at least a general understanding of the external structure of these insects and the particular points to observe is needed.

The body of a beetle (*Figs.* 1 and 2) is divided, as in other insects, into three parts: head, thorax and abdomen. On the head are the eyes, whose shape and position are often important in identification, and the antennae which are inserted close to the eyes. The form of the antennae (*Fig.* 3) varies considerably and is most helpful in the naming of certain species. The shape of the head itself is also useful: the elongation of the head between and in front of the eyes into the rostrum separates the Rhyncophora from all other types of beetles.

The shape of the thorax, particularly when viewed from above, is another important character: it may be square, longer than broad or

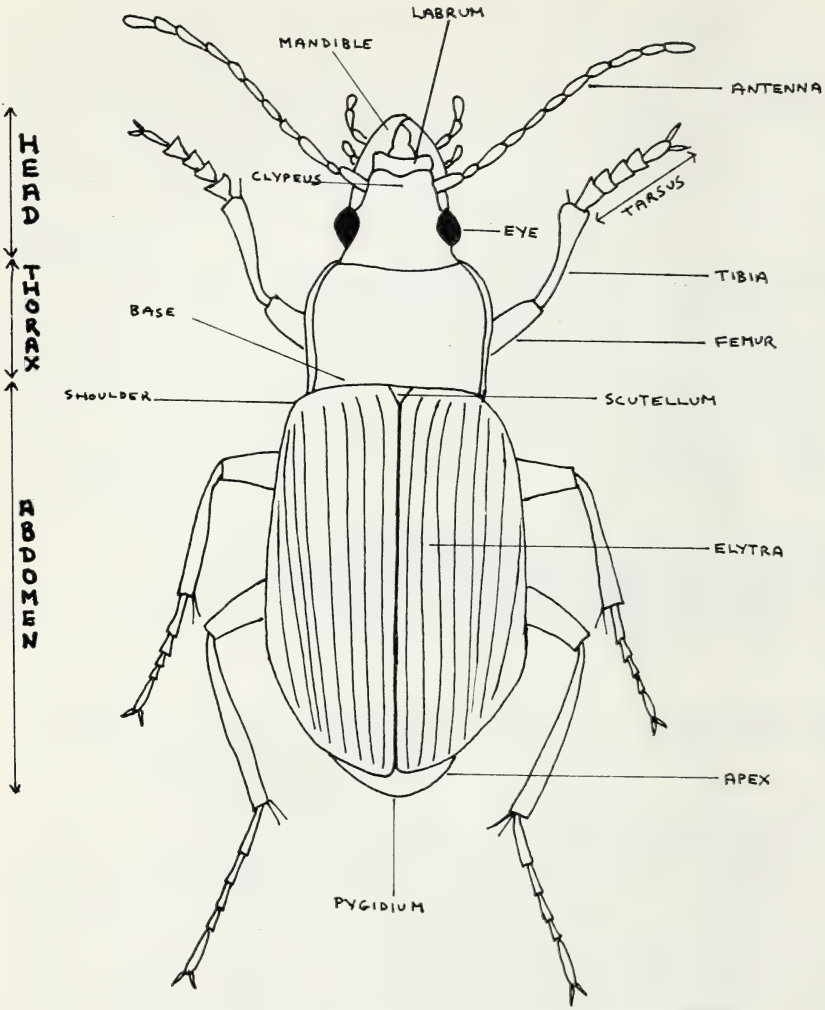

Fig. 1: Dorsal view of a beetle to show main parts of the anatomy.

broader than long. There is often great difficulty in interpreting terms such as 'thorax broader' when they occur in keys and one can only learn by experience what the author of that particular key means. I feel that the actual ratio of length to breadth of thorax should be given but this will require a great deal of work to substantiate. Also important is the shape of the anterior and basal angles of the thorax: whether they are rounded or pointed, extended or blunt is often of the greatest importance.

The abdomen is normally divided into six or eight segments (except

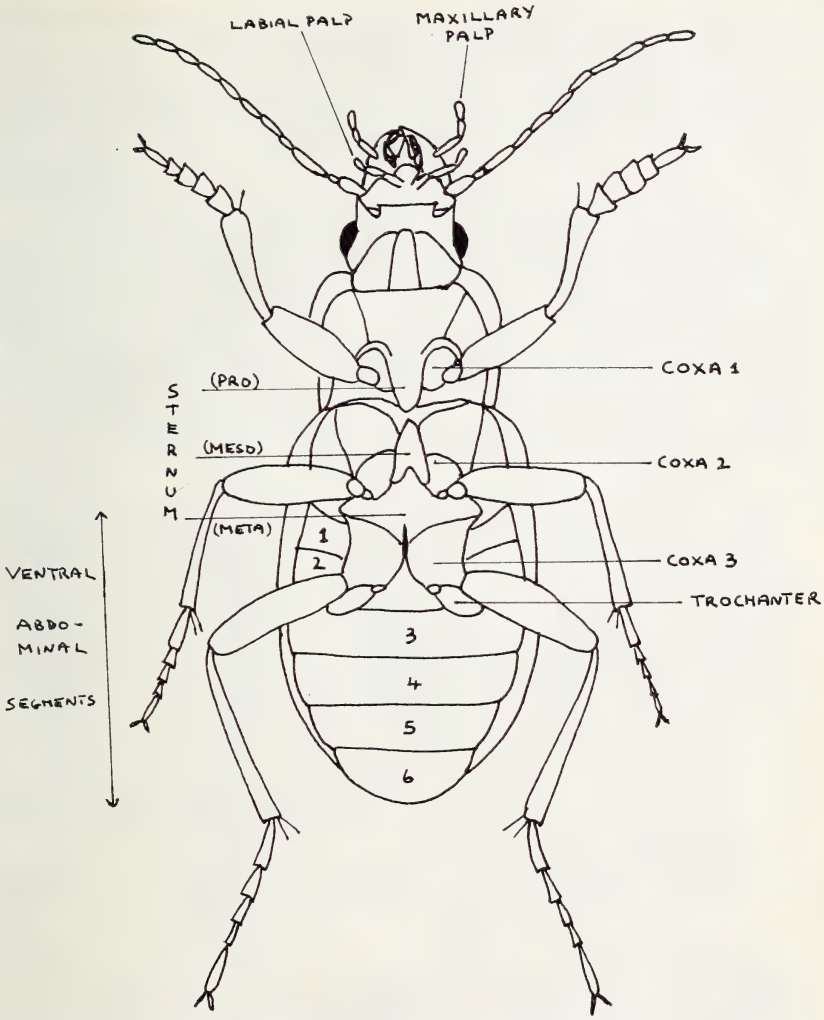

Fig. 2: Ventral view of a beetle to show main parts of the anatomy.

in the Staphylinidae) which are hidden when viewed from above by the wings. In beetles the front wings have, in the course of evolution, become chitinised into hard coverings called elytra. These protect the hind pair of wings, which are actually used for flying and are folded, and the abdomen. The elytra and the wings actually arise from the thorax.

The three pairs of legs are attached to the thorax. Each leg consists of three parts: the femur or thigh, the tibia or shin and the tarsus or foot. The tarsus is divided into three or four segments, the last of which has a small pair of claws. The shapes of the femur and tibia and whether they

have 'teeth' or serrate edges and the shape of the tarsal segments are all of importance in the separation of certain species.

Between the inner edges of the elytra at their junction with the thorax is a small, clearly visible, triangular area called the scutellum. The 'centre' of a beetle is often roughly the scutellum. Thus the base of the thorax and the base of the elytra are situated on a line which usually touches the base of the scutellum. The apex of the head is its front or anterior end and the apex of the elytra is at the rear or posterior end of the beetle.

The final step in the identification or confirmation thereof of a beetle is often the examination of the aedeagus of the male genital organ, the shape of which is often diagnostic. However the examination of genitalia should be used with great care as in some cases there is little or no difference between the organ in allied but obviously different species and also a damaged aedeagus can present a very misleading shape. In many cases however it is the only way of separating closely related species.

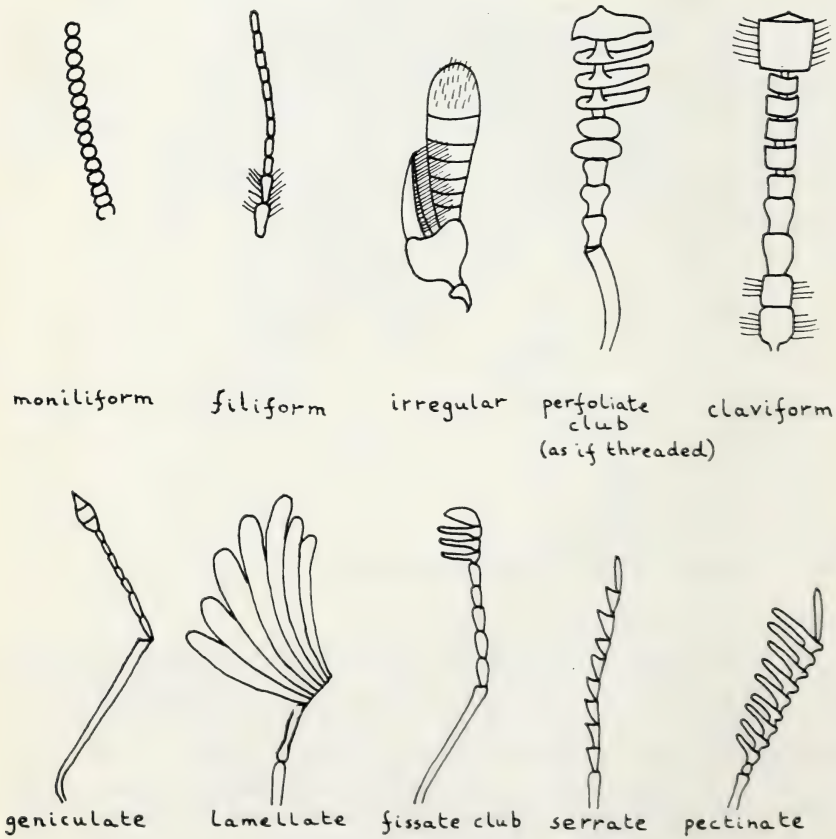

Fig. 3: Various forms of antennae found in the Coleoptera.

In a short article of this nature it is not possible to mention every anatomical detail that is on occasion diagnostic, thus the shape and size of the mandible is rarely used in a key, and for a fully-detailed description of beetle anatomy reference must be made to one of the textbooks already dealt with.

Classification

Insects belong to the group (Phylum) of the invertebrates known as the Arthropoda. This Phylum is divided into four main Classes, Insecta (three pairs of legs and a pair of antennae), Arachnida (four pairs of legs and no antennae), Myriapoda (many pairs of legs and a distinct head with a pair of antennae: including millipedes, centipedes) and Crustacea (head merged with thorax, two pairs of antennae: mainly aquatic, such as crabs, lobsters).

These Classes are divided in the most complete classification into Subclasses, which in the Insecta are the Pterygota (winged insects) and the Apterygota (wingless insects), then into Orders and Suborders. After this there may be a division into Superfamilies, which are groups of Families, and then Families themselves. Some authors do not recognise Suborders or Superfamilies and proceed straight from Orders to Families, whereas others use one division only, which may be the Suborder or Superfamily. These divisions often contain an identical group of insects but the division is named according to the authors' beliefs. Families are divided into Subfamilies, then Genera and the Genera into Species. Since the time of Linnaeus, the generic and specific names have been used to identify a particular insect.

As an example of classification the Dor Beetle (*Geotrupes stercorarius* (Linn.)) is fully classified as follows:

PHYLUM	Arthropoda	SUPERFAMILY	Lamellicornia
CLASS	Insecta	FAMILY	Scarabaeidae
SUBCLASS	Pterygota	SUBFAMILY	Geotrupinae
ORDER	Coleoptera	GENUS	*Geotrupes*
SUBORDER	Polyphaga	SPECIES	*stercorarius* (Linn.)

The correct name of an insect is the generic name followed by the specific name followed by a suffix e.g. *Geotrupes stercorarius* (Linn.) The suffix is an abbreviation (or the name in full) of the author who originally described the insect under the names in use. These are used because in the early days, when communications were poor and slow, the same insect was often described by several authors or the same name was given to several different insects. The position is sometimes very complicated and where an insect has been described by several authors the earliest name is usually kept as the correct one. However there are exceptions and the whole subject is now quite complex and is governed by international rules of nomenclature, which have been agreed throughout the world.

The classifications of the Coleoptera used by some recent authors are shown in the Table. There are obvious differences. Imms (1951) used

	IMMS (1951)	JOY (1932)		CROWSON (1956)	
SUBORDER	SUPERFAMILY	SUBORDER	SUBORDER	SERIES	SUPERFAMILY
Adephaga	Caraboidea	Geodephaga Gyrinia Hydradephaga	Adephaga		Caraboidea
Polyphaga	Staphylinoidea	Brachyelytra	Polyphaga	Staphyliniformia	Histeroidea Staphylinoidea
	Diversicornia	Palpicornia			Hydrophiloidea
		Teredilla Clavicornia		Bostrychiformia Cucujiformia (part)	Bostychoidea Cleroidea Lymexyloidea Cucujoidea (part)
		Sternoxia Malacodermata		Dascilliformia	Dascilloidea Byrrhoidea Dryopoidea Buprestoidea Rhipiceroidea Elateroidea Cantharoidea Dermestoidea
	Heteromera	Heteromera		Cucujiformia (part)	Cucujoidea (part)
	Phytophaga	Phytophaga Longicornia			Chrysomeloidea
	Rhyncophora	Rhyncophora			Curculionidae
	Lamellicornia	Lamellicornia		Scarabaeiformia	Scaraboidea
			Archostemata		Cupedoidea
			Myxophaga		Sphaerioidea

Table: Showing the classification of the Coleoptera adopted by various authors and the approximate relationships of their different groups.

two Suborders and seven Superfamilies, whereas Joy divides his classification into Suborders which correspond to Imms' Superfamilies. Crowson (1956), who has published the most recent definitive work, uses four Suborders: he then divides one of these (Polyphaga) into new divisions, Series, which are then divided into Superfamilies. In all Crowson divides the Coleoptera into twenty-two Superfamilies and 139 Families. Kloet and Hinks (1945) and Fowler (1887-1891) follow roughly the classification of Imms.

In this and the previous article I have attempted to describe how beetles are classified and identified. However it has only been possible to provide a general outline. No doubt the books already mentioned will provide further reading for those interested.

I shall finish this part of the series with a glossary of terms used in describing beetles as these are often not fully explained in the keys.

Glossary of descriptive terms

ABDOMEN	the hindmost principal division of the body
ACICULAR	terminating in a sharp needle-like point
ACICULATE	covered with small scratches which appear as if made by a needle
ACULEATE	produced to a point
ACUMINATE	ending in a more or less produced point
AEDEAGUS	the intromittent organ of the male
ALUTACEOUS	covered with minute cracks
ANAL	relating to the apex or extreme end of the abdomen
ANNULATE	ringed
ANTE-	used in combination, meaning in front of, before
APEX	extremity, in a beetle the point furthest from an imaginary point between thorax and elytra. That nearest is the base.
APICAL	relating to the apex
APTEROUS	without wings
ARTICULATED	jointed
ASPERATE	roughened (of sculpture)
BASE	see APEX
BORDERED	when a margin has a raised edge
CALLOSITY	a defined projection or elevation, usually rounded
CARINA	a keel or longitudinal elevated line
CARINATE	furnished with a keel
CATENULATE	chain-like
CILIATE	furnished with cilia or fringes of hair
CLAVATE and CLAVIFORM	clubbed or club-shaped
CONCOLOROUS	uniform in colour
CONFLUENT	running into one another, of colour patterns or punctuation

COPROPHAGUS	feeding on excrement
CORDATE and CORDIFORM	heart-shaped
COXAL	related to the coxae
CRENATE and CRENULATE	furnished with a series of small blunt teeth
CREPUSCULAR	coming out at twilight
CRETACEOUS	chalky
CRUCIFORM	cross-shaped
DEFLEXED	bent down
DEHISCENT	Gaping towards the APEX
DENTATE	toothed, furnished with toothlike prominences
DENTICULATE	with small teeth, often in a row
DEPRESSED	flattened as if by pressure from above
DIGITATE	see PALMATE
DIMORPHIC	having two distinct types
DISC	the central portion
EMARGINATE	with a notched margin
EXPLANATE	widened out, expanded (Joy uses it as a slight hollowing out of margins)
FASCIA	coloured band
FERRUGINOUS	rust red
FILIFORM	threadlike, of antennae which are elongate and of about the same thickness throughout
FOVEA	a large round depression in the surface
FUNICULUS	joints of the antennae between the SCAPE and the club
FUSCOUS	brown or tawny brown
FUSIFORM	broadest in the middle, gradually tapering in front and behind
GENICULATE	elbowed or kneed, bent abruptly upward or downward
GIBBOSE and GIBBOUS	hump-backed, very convex
GLABROUS	smooth, without hairs, scales or sculpture
GRANULATE	with very small rounded elevations
HIRSUTE	set with thick long hairs
HISPID	set with short erect bristles
HUMERAL	relating to the shoulder (humerus)
IMBRICATE	overlapping like tiles on a roof
IMPUNCTATE	without punctuation
INCRASSATE	thickened
INFUSCATE	darkened
INTERSTICES	spaces between striae of the elytra
KEEL	a fine raised line
LAMINATE and LAMELLATE	plated
LATERAL	pertaining to the side

MACULATE	spotted
MARGIN	outer edge
MEDIAN	central
MONILIFORM	as if composed of beads (of antennae)
MUCRONATE	prolonged in a sharp point
NECROPHAGOUS	feeding on dead or decaying matter
OBSOLETE	almost effaced or only slightly marked
OCELLI	small additional eyes, usually on top of the head
OCHRACEOUS	brownish yellow
PALMATE	widened and divided like a hand
PECTINATE	toothed like a comb
PHYTOPHAGOUS	feeding on plants
PICEUS	dark to very dark yellow
PILOSE	hairy
PITCHY	blackish brown
PLICATE	folded
PORES	large isolated punctures
PUBESCENT	furnished with pubescence or downy hairs
PUNCTURE	small depression in surface, usually round
PUNCTATE	with punctures
PYGIDIUM	last segment of abdomen
QUADRATE	square
REFLEXED	bent upwards
RENIFORM	kidney-shaped
RETICULATE	covered with a network of small scratches or cross striae
ROSTRUM	prolongation of the head forwards from between the eyes
RUFOUS	reddish
RUGOSE	roughened, wrinkled
SCAPE	the first joint of the antenna when it is prolonged
SCROBES	lateral furrows on the rostrum holding the base of the antennae
SCUTELLUM	the small triangular area between the elytra at the base of the suture
SERRATE and SERRIFORM	with teeth like a saw
SETA	outstanding bristle or stiff hair
SETACEOUS	gradually tapering to a point like a bristle
SETIFORM	bristle-shaped
SETIFEROUS, SETIGEROUS and SETOSE	bearing setae
SHAGREENED	covered with closely set small roughnesses
SINUATE	slightly waved
SPATULATE	narrow at base, widened out at extremity
SQUAMOSE	covered with scales

STRIA	an impressed line
STRIATE	covered with striae
STRIGOSE	scratched
SUBULATE	terminating in a fine sharp point like an awl
SULCATE	furrowed
SUTURAL	relating to the SUTURE
SUTURE	line dividing the elytra
TEMPLE	part of head behind the eyes
TESTACEOUS	yellowish, usually with a dusky tinge
TOMENTOSE	cottony
TRANSVERSE	broader than long
TRUNCATE	cut off sharply by a straight line
TUBERCULE	a small abrupt elevation of varying form
VERTEX	upper surface of the head behind the eyes

(*To be continued*) B. J. MacNulty (4528)

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INTRODUCTION TO CRANEFLIES—PART III

Spring and summer *Tipula* species

In southern England the seasonal succession of species begins in April, though in northern districts activity may not begin until May (*Tipula rufina* Meig. has been recorded in March but this species can occur in almost any month of the year). Because of geographical and yearly fluctuations in climate it is impractical to divide the species into seasonal groups as was possible with the autumn species, but date of capture can provide a useful guide to identification in some species.

Many of the species are distinctive, but there is no simple means of subdividing them into groups. The existing keys treat the genus as a whole and often scatter closely related species. It is proposed to follow the subgenera here, since once familiar with a few species, new ones are more readily recognised, especially in the males where genitalia are distinctive. This means using wing pattern as a primary character, which is reliable but not always well marked.

Wing patterns

Wing types fall into four main groups:

(a) Wings with large heavy markings. Only one species.

(b) Wings marmorate. The wings are greyish or brownish and

mottled with whitish markings. There is always a white spot or crescent shaped mark in the central or outer part of the lower basal cell.

(c) Wings streaky. Dark streaks are present, often consisting of little more than dark shadings along some of the veins. Wings with a dark costal cell are included here.

(d) Wings clear (or uniformly coloured). At most a dark stigma and/or a whitish streak running from the stigma towards the base of the discal cell and sometimes extending to the hind wing margin (a mark of this sort can occur in combination with other wing types). This character is called a prestigmatic spot or stripe depending on its shape.

Description of species

The format of the descriptions is as follows:—

(Section 1 Autumn species, already considered)

Section 2 Eliminate *Acutipula* and then consider the main groups with streaky wings.

Section 3 Clear-winged groups plus the single related streaky winged species.

Section 4 Marmorate-winged groups plus a few related clear winged species.

Section 2 *Acutipula* plus streaky winged groups.

The four species of the subgenus *Acutiplua* are very different in appearance but each one has unique characters—wings heavily marked, dark spot in centre of wing, or abdomen mainly grey with black stripes.

Giant Tipula *Tipula maxima* Poda. The bold pattern of chocolate brown markings on the wings is distinct and the golden sheen to the postnotum is a useful check (the sheen is absent in *Pedicia rivosa*). With a wing length up to 30 mm (i.e. wing span about 2½ inches) this is the largest British species. It is widespread in marshy woods where its robust larvae live in wet soil. It occurs from April till August, but is mainly seen in late May and June.

Single-spot Tipula *Tipula fulvipennis* Degeer. May-September (see Autumn species).

Twin-striped Grey Tipula *Tipula vitatta* Meigne. A large species with a grey abdomen bearing a heavy dark stripe along each side. The wings are fairly heavily marked with a streaky pattern. This is characteristically an early spring species found in April and May along shaded stream banks and occasionally pond sides, where the female is usually engrossed in probing its abdomen into wet mud (this activity may be egg laying or merely searching for suitable sites). Though widespread, it is easily overlooked.

Three-striped Grey Tipula *Tipula luna* Westhoff. The abdomen is grey with a narrow dark stripe either side and a narrow one dorsally. The male is further distinct in being the only grey species with a conspicuous tuft of gold hairs at the tip of sternite 8. (The only other grey species with a dark dorsal stripe belong to the genus *Prionocera*, which lack the side stripes,

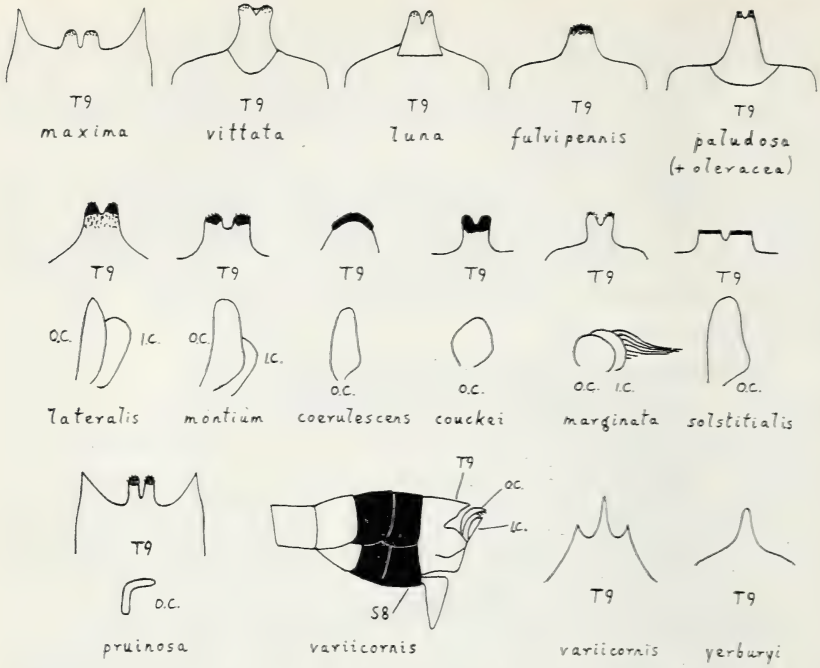

Fig. 1: Details of the male genitalia of the subgenera described in Section 2. The top row shows the dorsal view of the tip of tergite 9. The centre row shows the same and a lateral view of the outer clasper and the visible portion of the inner clasper, the anterior end is to the left. The bottom row shows the dorsal view of the tip of tergite 9 and the outer clasper of *pruinosa*, side view of the end of the abdomen of *variicornis* and the dorsal view of the tips of tergite 9 of *variicornis* and *yerburyi*. (o.c.—outer clasper, i.c.—inner clasper).

never have a golden tuft in the male and have short serrate antennae). The wings are clear greyish with a white prestigmatic stripe. This is another early species most common in May but extending from April to July. It is often common in both open and wooded marshes, a characteristic situation being a wet meadow with the rush *Juncus effusas* L.

The members of the subgenus *Yamatotipula* may be called the Lined Tipulas. The abdomen has a fairly narrow grey or yellowish dorsal line, flanked by broad dark brown stripes. In the males the abdomen is slender, giving the Cranefly a delicate build. The thorax usually has a slender dorsal black stripe in addition to the paired stripes found in other Tipulas and the wings are streaky, except in *pruinosa* where they are clear. In *lateralis*, *montium* and *solstitialis* a prestigmatic stripe runs down to the base of the discal cell. The species are mostly found by water. The only other Tipulas with a distinct central black line on the thorax are the two species of the subgenus *Oreomyza* which are woodland species with mottled wings. The male genitalia are very distinct, but since females are difficult most are omitted from this introductory account.

Illustrations (*Fig.* 1) are given of tergite 9 and the outer clasper. The latter is visible in side view at the top outer corner of the genitalia and tends to show minor variation in shape. In some cases reference is also made to the inner clasper, which in lateral view is largely hidden by the outer clasper, but the hind corner may be seen without dissection and sometimes provides useful characters. Tergite 9 is yellow in *solstitialis* and *pruinosa*, but black in the other species.

Common Lined Tipula *Tipula lateralis* Meigen. A very common species recorded from March till September, which occurs in a wide variety of situations by water, from stream and pond margins to cattle trampled seepage marsh. It is the only widespread lowland species and is also frequent in upland areas. When identifying this group, *lateralis* should be referred to first. It is a grey species, which in the male has paired processes to tergite 9 and the slender (rather variable) outer clasper is small—roughly equal in size to the visible portion of the inner clasper.

Mountain Lined Tipula *Tipula montium* Egger. This species is very similar to *lateralis*, and though it is typically associated with upland areas, it can occur locally even in lowland situations such as Surrey. It always seems to be associated with streams or small rivers where it may be seen on, or swept from, vegetation growing along the banks. The outer clasper is more strap shaped, with a backward facing bulge and it is about twice the size of the visible portion of the inner clasper. Recorded from May to August.

Grey Lined Tipula *Tipula coerulescens* Lackschewitz. Another species very similar to *lateralis* (and *montium*). It is a little known species of mountain streams and is so far only known from the Central Highlands and parts of the Pennines, though it has probably been overlooked elsewhere. The grey colouration has a very light pure quality, the sides of the thorax being conspicuously light grey. The outer clasper is rather similar in shape to that in *montium*, but the prime character is found on tergite 9 where the median paired processes are fused. Recorded in May, June and August.

Square Lined Tipula *Tipula couckei* Tonnoir. A much darker-looking species associated with the banks of small rivers. I have found it several times in the north, as far as Banff in Scotland, but I have never seen it in the south though it is recorded from the New Forest. The distinct outer claspers are squarish in outline. Recorded from May to August.

Brown Lined Tipula *Tipula marginata* Meigen. Another rather dark species, distinctive in both sexes by reason of a dark chocolate brown costal cell. The male has an oval outer clasper and a conspicuous golden streamer of hairs on the hind margin of the inner clasper. It is a little known species with a curious distribution since it is only recorded from Aviemore in the Central Highlands and Hampshire plus an adjacent area in Dorset. It has been found both along river banks and beside a lake. Recorded in June and July.

Yellow Lined Tipula *Tipula solstitialis* Westhoff. Members of this group having a yellowish, rather than grey, dorsal stripe to the abdomen

are likely to be *solstitialis*. The tergites are also golden rather than black haired. The male genitalia are quite distinct, with tergite 9 yellow and with very square ended paired median projections. It is widespread but very local and is found by the margins of ponds and lakes from April to September.

Marsh Lined Tipula *Tipula pruinosa* Wiedemann. This species is a typical for the group in many respects. The pleura are conspicuously light grey (as in *coerulescens*) and the dorsal stripe is often darker than in other species. The wings are clear rather than streaky. The male genitalia are very distinct and are conspicuously yellow; in addition to the paired median processes, the lateral corners of tergite 9 are extended into pointed triangular processes. The outer clasper is reduced to a slender bent finger. Unlike other members of the group it does not seem to be associated with streams and ponds, but wet woodland, such as marshy spots along rides, appears to be its preferred situation. It is widespread, but in my experience scarce. It is recorded from May to July.

The type subgenus *Tipula* has been discussed under Brown-edged Tipulas (see autumn group). The costal cell is brown whilst the rest of the wing is clear. The abdomen lacks stripes. *Tipula oleracea* and *paludosa* occur in spring and summer respectively, the latter also occurring in small numbers in the summer. If the costal cell is paler than usual, confusion could arise with *Dendrotipula* which has a yellow costal cell. Tergite 9 is rather similar to that of *Tipula luna*.

Having eliminated these three subgenera, there are only three other species whose wings may be classed as streaked: *Tipula vernalis*, with an orange abdomen bearing a dark dorsal stripe (see *Lunatipula* in Section 3) and *Schummelia*.

The subgenus *Schummelia* may be called Black-ringed Tipulas. There are only two species and they are very distinct from other groups. The abdomen is yellow except for segments 7 and 8 which are black; this is very marked in the male, but less so in the female whose colouration is more drab. The male abdomen in lateral view is bulbous at the end and sternite 8 bears a very characteristic triangular downward projection (*Fig.* 1).

Common Black-ringed Tipula *Tipula variicornis* Schummel. The easiest finite character is the shape of tergite 9, which has three projections on the hind margin. This is a fairly common species in marshy woods and is recorded from May till August.

Scarce Black-ringed Tipula *Tipula yerburyi* Edwards. In the male, tergite 9 only has a median projection, and the projection to sternite 8 trends obliquely backwards (instead of vertically down). Females are less easy to distinguish with certainty, but the antennae have the light parts pale brown rather than yellow and base of the knob on the halteres is blackish rather than brown: extreme caution is necessary if records are based on the female alone. This is a local species, apparently showing a preference for heavily-shaded water-filled ditches on heathland. Though it is said to

occur from May to July, my experience in the south is that *varicornis* is mainly out in June. whilst *yerburyi* is out in July.

Section 3 Clear-winged groups

The only exceptions (i.e. species without clear wings) in these subgenera are *Lunatipula vernalis* which is considered here though it has streaky wings, four species with clear wings which have already been considered, *Savtshenkia pagana* and *S. holoptera* (autumn species, Section 1), *Acutipula luna* and *Yamatotipula pruinosa* (Section 2) and *Savtshenkia subnodicornis*, a grey species of boggy ground (Section 4).

In practice most species fall into the subgenus *Lunatipula*, including all those with a conspicuous prestigmatic stripe. The other subgenera will be considered first. These have either a small prestigmatic spot (rather than a stripe reaching at least the base of the discal cell) or lack a spot altogether. A dark stigma may be present in either group.

Subsection A. No prestigmatic strip (see also *Lunatipula livida* in subsection B)

Platytipula (see autumn species, Section 1). The only group here with a yellow abdomen bearing a dark dorsal stripe which occurs between August and October.

Odonatisca. The single species of this subgenus also has a yellow abdomen with a dark dorsal stripe, but occurs between May and July and is apparently confined to Scotland. This is a much larger species with very characteristic genitalia in both male and female (*Fig*. 2). The female abdomen is very long, making the wings look short and it was presumably this damsel fly-like build which caused the subgeneric name to refer to a dragonfly (Odonata).

Scottish Dragonfly Tipula *Tipula juncea* Meigen. It is known from the large area of sand dunes at Culbin Sands (Moray) and the Aviemore area (Inverness). In Denmark the females have been observed at dusk boring their abdomen into sandy soil to lay their eggs (in rides through conifer plantations).

Dendrotipula. The single large species has a yellowish abdomen which may be completely yellow or with a narrow median yellow strip flanked by yellowish brown stripes. The most characteristic feature is a yellow costal cell (also present in *Schummelia*, but there should be no confusion). The male antennae are exceptionally long. (Note that in the species of the subgenus *Tipula*, the costal cell can be pale brown).

Yellow-edged Tipula *Tipula flavolineata* Meigen. A widespread but local species found in woodland, often around rotten logs which provide a breeding site for its larvae. The white larvae are best found in early spring (*Ctenophora* larvae look superficially similar) and during the emergence period of May and June the empty pupal cases can be found projecting from the surface of suitable rotten logs.

Mediotipula. Forest Tipulas, only known by a few specimens from the New Forest. Small species with wing vein R_2 usually not reaching the wing margin (apart from abberant specimens, this character is normally con-

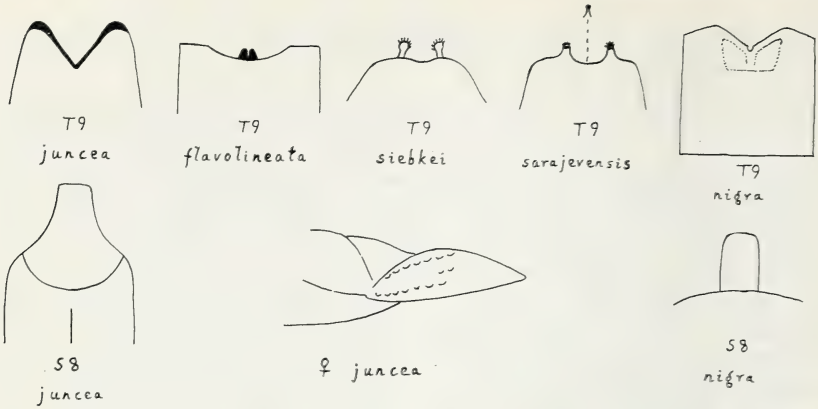

Fig. 2: Details of the genitalia of the subgenera described in Section 3A. The top row shows the dorsal view of tergite 9 in the male (in *sarajevensis* with projection of downward median process). The bottom row shows ventral views of sternite 8 in the males and (centre) the lateral view of the ovipositor of the female *juncea*.

fined to certain *Pterelashisus* species, which have mottled wings). The stigma is dark and conspicuous. The few specimens in the British Museum are too poor to provide a reliable description, so reference must be made to the genitalia (*Fig.* 2). The two species of the subgenus are *Tipula savajevensis* Strobl and *Tipula siebkei* Zetterstedt.

Nigrotipula. The single species of this subgenus is quite distinct in being black or dark brown apart from a rather paler basal half to the abdomen. The wings are a brownish colour with a slight prestigmatic spot, and in the female are rather short. A useful diagnostic character is found in the conspicuous black hairs on the postnotum. The wing length is only 9-11 mm.

Black Tipula *Tipula nigra* Linnaeus. This is a very local species mostly associated with fens and lowland river banks. When flying over wet mud or soil it is very inconspicuous. It is out from June to August.

Subsection B. Prestigmatic stripe usually present.

Lunatipula is an easily recognised subgenus whose species are usually of an orange colouration in whole, or in part, plus clear wings bearing a prestigmatic stripe (or lacking this stripe as in *livida* or having streaky wings as in *vernalis*). (Note *Tipula luna* (Section 2) is a grey species with clear greyish wings plus a prestigmatic stripe). In the males tergite 9, sternite 8 and the small outer clasper provide useful characters (*Fig.* 3). Some females are difficult to distinguish but two ovipositor types are unique amongst British *Tipula*—a short triangular ovipositor (*vernalis* and *fascipennis*) adapted for scattering eggs whilst in flight rather than inserting them in the ground, and a type with deeply cleft sternal valves giving a two-pronged appearance (*livida*).

The first four species (*vernalis*, *fascipennis*, *lunata* and *cava*) are com-

mon ones and should be checked out first; the remaining five are scarce. The prescutum is orange or yellowish in *lunata*, *cava* and *peliostigma* whilst in other species it is greyish. In the male, sternite 8 has a central tuft or tab of golden hair in *fascipennis*, *lunata*, *cava*, *peliostigma*, *helvola* and *alpina*. To a variable degree most males have lateral projections to sternite 8 bearing long spines at the ends: *peliostigma* and *selene* are especially distinct in having a band of golden hairs below the spines.

Green-eyed Tipula *Tipula vernalis* Meigen. This is one of the easiest species to recognise in the field because of its bright green eyes (rarely found in other species) which unfortunately fade to a blackish colour in a dried specimen. It has a number of diagnostic features. The abdomen is orange with a dark dorsal stripe (very broad in some specimens) and in the male has a characteristic V-shaped notch in tergite 9. The female has a very short triangular ovipositor (may be mistaken for a male) which is only otherwise found in *fascipennis*. The thorax is largely grey, but generally yellow at the sides posteriorly. It is typically a spring meadow species, and one of the few to occur on chalk grassland, but it is also found in light woodland. Records run from April to July, though late May seems to be its most favoured time in the south.

Square Celled Orange Tipula *Tipula fascipennis* Meigen. A large species with orange-brown abdomen and grey thorax and with a rather square discal cell (about as long as broad). In the male the whitish prestigmatic stripe reaches the base of the discal cell, whilst the female is distinct from others in the group in that this stripe reaches the hind margin of the wing. The female differs from all other *Tipula*, except *vernalis*, in having a short triangular ovipositor. The male genitalia are very distinct and should be checked if the discal cell character suggests this species. It is recorded from May to August, but in the south I regard this as a mid-summer species which is commonest in July. This species likes damp woodland and hedgerows.

Common Orange Tipula *Tipula lunata* Linnaeus. This is the only large all-orange *Tipula* which is common in woods and hedgerows between May and July with a peak in June. The only frequent similar species is *Tipula cava*, which is the next to be described. The genitalia are distinctive, and in addition to the notch in tergite 9, there is a small tab of golden hairs projecting obliquely downwards from the top of sternite 8, a small but useful field character. Females are difficult.

White-spotted Orange Tipula *Tipula cava* Riedel. A completely orange species very similar to *lunata*, only occasionally having a median dark line on the abdomen and the prescutal stripes are indistinct. The male is distinguished by having a white spot, a conspicuous white blister at the top outer corner of the genitalia just below the outer clasper. The females are less easy to separate from *lunata*, the dull instead of shining sternites being a useful character, but some individuals are impossible to distinguish. *T. cava* is particularly associated with dry woods, such as those

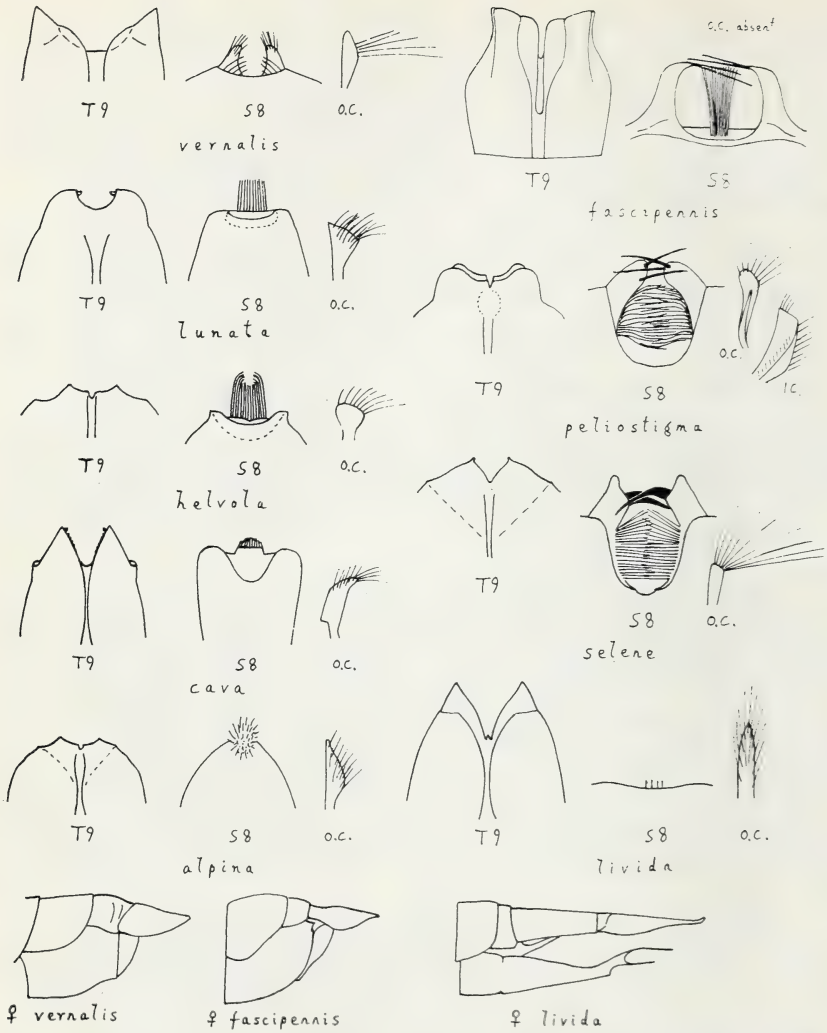

Fig. 3: Details of the genitalia of the subgenus *Lunatipula* described in Section 3B. The top five rows show details of male genitalia. T9—dorsal view of tergite 9, S8—ventral view of sternite 8 (except *fascipennis*, *peliostigma* and *selene* where view is post-ventral), o.c.—lateral view of outer clasper with anterior to left, i.c.—visible scoop-shaped process of inner clasper of *peliostigma*. The bottom row shows lateral views of the ovipositors of females.

on heathland, and though it is recorded from May to September, its main peak is in July, after that of *lunata*.

Pale Orange Tipula *Tipula peliostigma* Schummel. This is the only other large species in the group with an orange thorax as well as abdomen. In the field its rather paler colouration than *lunata* provides a useful indi-

cator. Unlike the two preceding species, at least the first two flagellar segments of the antennae are yellow in both sexes, instead of only the first one. It is a scarce species, mostly recorded from East Anglia and Hertfordshire, and has been found by streams in woodland. Though recorded from May till August, July seems the most favourable month.

Small Orange Tipula *Tipula helvola* Loew. This is a slender and rather pale species with a wing length of only 10-15 mm. The last segments of the abdomen in the male are black as in *livida* and the tab of golden hairs on sternite 8 projects directly back (unlike *lunata*). The thorax is dull grey or yellowish grey. It is recorded from Merioneth, Suffolk, Hampshire and Berkshire. In the latter county, it was found among nettles in an elm wood. July and August.

Witherslack Orange Tipula *Tipula alpina* Loew. This species is known from a small area around Witherslack and Grange-over-Sands on the north side of Morecambe Bay in N.W. England and from the Wye Valley, Gloucestershire, June and July. The only species with conspicuously grey thorax and lunate wings are this species and the following one (*selene*).

Southern Orange Tipula *Tipula selene* Meigen. A dark dorsal stripe is often well developed on the abdomen, especially in the female. Though recorded from Caernarvonshire, this species is mainly known from the southern counties where it is rare. Probably a woodland species. May to July.

Black-tipped Orange Tipula *Tipula livida* van de Wulp. Despite the sound of its scientific name this species is rather drab in colouration, with a dull orange brown abdomen, with the terminal segments black in the male. The female is a brighter orange-brown colour, with unmistakeable two pronged sternal valves. Both sexes have clear wings with a dark stigma, and lack the prestigmatic mark found in related species. This is a little known woodland species only added to the British list in 1954; it has now been found in several southern counties and Lincolnshire. It is recorded from June till August.

The species belonging to Section 4 will be dealt with in the next article.

(*To be continued*) Alan E. Stubbs

THE AES CONSERVATION GROUP

It is some time since a Conservation Group article has appeared in the *Bulletin*, and there is a clear need for AES members to be kept better informed of the Group's development. This is not a straightforward report: the AGM is the place for that, but it should provide some idea of current thinking and activities.

A brief look at the problems that we are trying to tackle might make later points more easily understood. Insects are worthy of special attention from conservationists for several reasons. They are directly attacked

(usually rather indiscriminately) by man because a tiny proportion of species are serious pests. They also fail to receive the public interest and sympathy which some other animal groups (notably the birds) receive. This means that populations of many species are at risk, with few people either knowing or caring about the situation. Like other living organisms, insects are threatened with habitat destruction and modification resulting from changes in land-use and so on, but here again, the general lack of interest in them makes their plight particularly severe. Our Group has the task of using its information pooling and its co-ordinating resources to draw attention to this general problem and to assist in local campaigns and projects.

The organisation of the Group is now capable of coping with our tasks. We have evolved from a breeding/releasing group for Lepidoptera, started by Mr. K. J. Wilmott in 1965, into one based on ecological lines and concerned (potentially) with all British insect orders. Our role within the Society has been rationalised by the formation of our AES Conservation Subcommittee. The membership of this Subcommittee is as follows: Mr P. W. Cribb (Chairman), Mr D. Lonsdale (Secretary), Mr T. G. Howarth (AES representative on the JCCBI), Mr C. J. Hamilton (Group Treasurer), Mr I. S. King, Mr S. R. Miles and Mr R. W. J. Uffen.

The development of an efficient organisation must be paralleled by the development of policies for action, and these are certainly not lacking, even though too many of them have yet to be adequately followed. The central policy is that we are a co-ordinating group. Practical work must be carried out by local interested bodies and individuals, with the Group supplying advice and information through its contacts with experts in appropriate fields, and through accumulated experience. Individual members and other entomologists must provide us with information about threatened habitats, areas worthy of special protection etc., and the Group will use its influence wherever appropriate in getting work started. The importance of local naturalists' trusts cannot be over-emphasised in this respect. One very important point I would like to make is that some entomologists have said that they will not work with the Group because they are so involved with local activities. It is these very activities which we can assist, or, where no assistance is required, which can supply us with essential experience. Even if you or your local trust don't need the Group, then the Group needs you!

There is no shortage of ideas for practical work. The protection of sites by special designation can follow the recording of interesting species. Existing nature reserves can be made more suitable for the maintenance of diverse insect faunas. Outside protected areas, people in charge of all forms of land-use may be willing to listen to advice about protection of particular insect populations and about changing certain aspects of management which could favour conditions for harmless and beneficial species. We have lists of many other ideas, including specific ones on the conservation of certain types of habitat, and the lists are growing.

It should be now clear that we, as entomologists, must make available

to others our special knowledge and opinions so that insects will receive the attention that they deserve in ecological terms. Although it is Group members who are most involved in this work, it is hoped that all members of the AES will let us know of any matters of interest in their areas. I'm sure that most of us know of some interesting area that is threatened or that deserves protection. Even if you haven't the time to help with recording work or local consultations, you are asked to send in any items of interest. The existence of a special conservation group must not deter non-group members from being involved in conservation.

Our policies cannot work well without the circulation of ideas, opinions and general advice. Both those involved in our work, and those who lack an understanding of the problems must be reached. We circulate our own bulletin amongst Group members, and we are publishing a series of special articles which may help to make up a future insect conservation handbook. We are sending information of our existence and aims to interested bodies, and some use is made of the mass media for the dissemination of our ideas. Some of those ideas helped in preparing the British Government's report to the recent Stockholm environmental conference. Many Society members will have seen our stands at AES Exhibitions, which, since 1968, have helped provide publicity and recruit new members. Much needs to be done in the field of publicity and education, but we have made a start.

The practical work done by the Group so far has not fully lived up to the pattern suggested by preceding remarks. On a general Group level we have, however, made some headway. In several interesting areas we have, with other bodies, or on our own succeeded in preserving habitats by influencing plans. In Lancashire and in Devon we are planning projects which combine conservation management of areas with educational activities. Little has been done in terms of co-ordination work on the other hand. Members have been uncertain where to begin work, partly because of our broad basis of action. Their need to see something tangible may be satisfied by our introduction of special projects. These include studying the value of trying to re-establish colonies of a butterfly species, and the effects of collecting insects from a population. There are already signs of growing interest.

I hope that readers will bear with me if I say a few words on the 'collecting versus conservation' controversy. I have come across a wide spectrum of views on the matter over the last few years and my main wish is that opinion will not become too 'polarised'. Most entomologists start as collectors, and collecting forms an essential part of certain studies. On the other hand, rare species may be endangered, and there are moral arguments against the practice. Expept where we are considering damage to habitats, collecting for pecuniary gain or collecting rare species, I would reject any idea that there are definite 'rights' and 'wrongs'. I do hope though that people will always ask themselves whether they must collect specimens, rather than photographic records, and whether any studies of numerous

specimens they are making have real meaning and validity in biological terms.

This article has just touched upon a few points which I hope will stimulate interest in the Group and its work. Anyone wanting further information is welcome to write to me, and a response to my request for all members of the Society to support our work is invited in particular. The general message, that I trust has come across, is that pooling of ideas and information from all those interested in the cause is essential if we are to achieve anything substantial.

D. Lonsdale (4137)

TWO METHODS FOR REARING LARVAE ON GROWING FOOD PLANTS

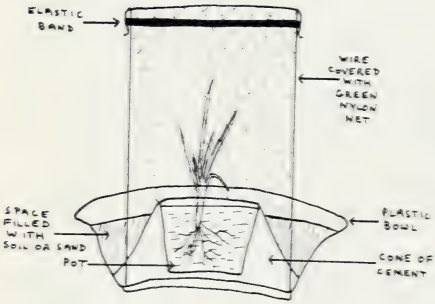

Fig. 1: Mr Payne's cage.

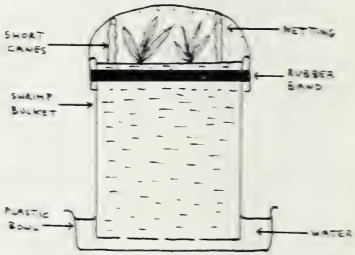

Fig. 2: Mr Tyler's cage.

(i) Mr E. S. Bradford's cages seem rather complicated and difficult to make (Bradford, 1972) and have one serious drawback: many larvae will drop off the plant if disturbed and will be unable to climb back up the sides and edge of the pot. Also I, for one, would find it very difficult to find old rims for the lids and think they are unnecessary.

Some years ago I made similar cages (*Fig.* 1) which avoid both these difficulties. Get a plastic bowl, about 12 in. in diameter and 4 in. or 5 in. deep, from any household store. I paint all my cages green outside and white inside with Humbrol enamel, which is quick-drying and non-poisonous. Plant the foodplant in a 6 in. half-pot (half the depth of a standard 6 in. pot) and embed the pot in a cone of cement and sand mixture, which must be firm enough to mould into shape round the pot. The pot can then be carefully lifted out and the cement left to harden. Any number of pots can be planted with food and replaced when eaten. Larvae that fall off will climb upwards on the cement slope, which is left

rough. A twig of the plant is bent down to lie over the edge of the pot and the larvae can then regain their foodplant.

The ½ in. wire 'sleeve' is made to fit inside the plastic bowl and is covered with green nylon net, obtainable from shops which sell dressmaking materials. The top is covered with a circular piece of net, overhanging about 2 in., and kept in place by a band of narrow dressmaker's elastic, cut and sewn to have sufficient tension to stay in place. If the net is replaced by clear polythene it is more suitable as a top for outdoor use.

The space left in the bowl is filled with sterilised soil or sand, pressed firm to hold the wire netting in place. The cage is easily carried by the rim of the bowl and the whole thing can be dismantled in a moment, using fresh, clean sand and different plants for the next type of larvae. Pieces of shrub which are too big to plant in a pot can be stood in a jar of water in the centre of the pot, the gap being filled with moss.

T. P. Payne (4688)

(ii) I have found that buckets which I obtain from my local fishmonger in which they receive fish and shrimps are useful in a method I have devised for rearing larvae. These buckets (MacFisheries charge me 6p for each) are much better in use than normal buckets as their sides are straight and the elastic band used for holding the netting in place does not slip downwards.

The figure of my apparatus (*Fig.* 2) is fairly self-explanatory but I shall add some notes on its construction and use. The bucket has some holes drilled in the bottom of it and is stood in the cheapest washing-up bowl I can buy. Water is kept in the bowl at all times which serves two purposes. Firstly it keeps the growing foodplant moist and secondly it deters ants, spiders, earwigs, etc. from getting into the cage.

Normal elastic bands are not very suitable for fastening down the netting as they tend to rot within a week. I go to my local garage and get an old car inner tube and)slice it up into bands half an inch wide. These fit round the bucket tightly and last a long time.

Using this apparatus I have reared, among others, the Duke of Burgundy Fritillary (*Hamearis lucina* Linn.), Glanville Fritillary (*Melitaea cinxia* Linn.), Speckled Wood (*Pararge aegeria* Linn.), Wall Brown (*Lasiommata megera* Linn.) and Chalk-hill Blue (*Lysandra coridon* Poda).

David B. Tyler (3865)

(Mr Tyler exhibited this apparatus at the 1972 AES Annual Exhibition. I should like to thank him for allowing me to adapt the notes accompanying this exhibit for the *Bulletin*. Ed.)

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FOOD PREFERENCE SHOWN BY LARVAE OF THE PUSS MOTH (*Cerura vinula* Linn.)

Puss-Moth larvae are reported to feed successfully on a variety of different species of trees of the genera *Salix* and *Populus* (Sallows, Willows and Poplars) (Allan, 1947: 1949: South, 1961) but apparently do not show a particular preference within these genera, and perhaps the most abundant foodplant is the one that is used preferentially at any given locality. Within this context the following simple experiment was carried out to see it the larvae would show a preference if provided with a choice of food.

Thirteen eggs of the Puss Moth were obtained on 12th June, 1972 from a female moth whose own larval food plant had been 'sallow'. These eggs were divided into two batches of six and seven respectively and the smaller batch were provided with leaves of the Lombardy Poplar (*Populus nigra* Linn. var. *italica* Duroi) whilst the larger batch were enclosed with leaves of the White Willow (*Salix alba* Linn.). All the larvae hatched successfully and started feeding on their foodplant, those on the Willow started at the margin of the leaves and ate all the leaf, whilst those on Poplar ate only the lower epidermis. Both sets reached their first moult simultaneously, all moulted successfully, and all then recommenced feeding on the same morning. At this point both sets were provided with an equal quantity of healthy poplar and willow leaves, which had been cut at the same time, and they were sealed into small plastic containers so that their food remained fresh. They were then watched continuously and their food preference recorded. The food was changed once a day for the rest of their larval life, the choice being provided until the end of the third instar after which Poplar alone was provided.

	1st instar	2nd instar
Batch 1	Poplar provided and eaten	Poplar eaten by all 6 larvae Willow eaten by none
Batch 2	Willow provided and eaten	Poplar eaten by all 7 larvae Willow eaten by none

At the start of the 2nd instar both batches were provided with both Poplar and Willow. After a short period of 'exploratory' walking, all the larvae, from both sets, chose to feed upon the poplar leaves; they continud to choose them for as long as a choice was provided, and on no occasion were willow leaves eaten. This result is summarised in the Table.

This result was compared with the expected result of each of two possible hypotheses using a X^2 test. The hypotheses are as follows:

(i) If the larvae have no intrinsic food preference and are not influenced by the food eaten in the first larval instar then it would be expected that in each batch half of the larvae would each choose one of the foodplants purely by chance. The result obtained in this experiment is significantly different from this.

(ii) If the larvae have no intrinsic food preference but are influenced by their food in the first larval instar then it would be expected that each set would choose the food which they had eaten in their first instar. The result obtained in this experiment is highly significantly different from this.

There are many factors which may have influenced the larvae in their choice of food and so may have affected the outcome of the experiment. The foodplants were both provided in the form of 'cut leaves' and perhaps poplar leaves retain their water and maintain their' freshness' more readily than willow. Possibly the structure of the poplar leaves prevents them from drooping and so they remain more attractive than willow leaves. The fact that the larvae chose Poplar within approximately ten minutes of being provided with the choice perhaps makes both of these factors unlikely in that insufficient time had elapsed to allow significant wilting to have taken place.

Certainly the number of larvae used in this experiment is too small to allow reliable conclusions to be drawn from it. To some extent the X^2 test allows for this effect in that it takes some account of the number of larvae used, but nevertheless, the results must be regarded as suggestive rather than conclusive.

It is difficult to assess the relevance of the results to the natural situation. Presumably, in the wild, larvae are not provided with a choice but must eat the foodplant which their progenitor has selected. However, in view of the certainty with which the larvae in this experiment chose poplar, it is possible that this represents a preference that would also apply to the female in her choice of foodplant.

Obviously this experiment must be repeated with more larvae and under more rigorously controlled conditions. Nevertheless I hope that it shows that interesting observations on aspects of the life histories of our moths may be made with simple equipment and using uncomplicated techniques.

The conclusions of this experiment are as follows:

(i) Within the limitations of the size and accuracy of the experiment, larvae of the Puss Moth were found to choose to eat the leaves of Lombardy Poplar in preference to those of White Willow.

(ii) Performing an experiment of this type is within the scope of any interested entomologist.

I am most grateful to the Reverend K. E. Hood who provided the ova of the Puss Moth and who made constructive criticisms of the experiment. He is in no way responsible for its shortcomings.

M. R. Young (3759)

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A REVIEW OF THE 1972 SEASON

The year 1972 in the south of England has been an unusual one in the pattern of its weather. March was warm and sunny with the result that bees were on the wing and hibernating butterflies were seen early in the month. Honey bees were breeding and building up on the early nectar from sallows and willows and by the beginning of April there were drones in the hives. Then the good weather collapsed and we had cold winds, clouded skies and drizzle. The winter had produced very few frosts so that most things in the countryside were well advanced at this stage but the change in weather brought about a standstill. The cold and clouded weather continued from then on until the beginning of July while in Middlesex we experienced a drought with no proper rain from mid-May until mid-September. At the end of June the honeybees were starving and had to be fed with syrup while some beekeepers who had not realised what was happening found some hives starved to death. May and June produced very few moths at the light trap and it was obvious that the hard ground and cold nights were making emergences very small. However at the end of the first week in July the weather suddenly turned hot and those moths which one would expect in May and June started to appear at light. I found webs of half-grown Small Tortoiseshell (*Aglais urticae* Linn.) larvae at a time when one would have expected that the new imagines would have been laying and there were very small Peacock larvae at the beginning of July also. By the end of July I observed some of the July species on the wing but the Peacock (*Inachis io* Linn.) was not observed until mid-August. The hot weather had produced a mass of flowers which had been waiting for the sun and by 14th August I was able to take 100lb of honey from a hive which had had to be fed in June. Things were catching up but many species were still out of time. The second brood of the Common Blue (*Polyommatus icarus* Rott.) did not emerge until the end of August though usually a July butterfly and many of the Hawk Moth larvae were still not full fed by the second week in October. However the fine autumn days must have done much to help these belated insects and the affects on the populations for 1973 may not be so disastrous as at first seemed likely. As I write this at the end of October I note that I observed Swallows and House Martins flying above the house, that a Small Tortoiseshell is sunning itself on the wall of the house, that a full fed Lime Hawk (*Mimas tiliae* Linn.) larva crawled across the road in front of me yesterday and that larvae of the Small Copper (*Lycaena phlaeas* Linn.) are still feeding on a patch of Docks in the garden. Generally it has been a poor season for numbers of insects but one group which exploded numerically here in Middlesex was the grass-feeding butterflies which emerged in late July and August. The Meadow Brown (*Maniola jurtina* Linn.) swarmed in the meadows around my house and for the first time in my garden I found both the Speckled Wood (*Pararge aegeria* Linn.) and the Gatekeeper (*Pyronia tithonus* Linn.)

while the Grayling (*Eumenis semele* Linn.) made a welcome reappearance on the Hounslow Heath. Both the Essex and Small Skippers (*Thymelicus lineola* Ochs. and *T. sylvestris* Poda) were in profusion at the end of July on the Heath and the very late second brood of *P. icarus* was the largest I have seen there. A new habitat has been produced for them adjoining the Heath as the old marshalling yards of British Rail have been abandoned and a mass of wild flowers has colonised the whole area, originally the site of sleepers and parked trucks.

Here are a few notes from my diary for 1972:

MAY 11th *Melitaea cinxia* Linn. starting to pupate.

18th Found small larvae of *Anthocaris cardamines* Linn. together with newly laid eggs and males still flying in fresh condition.

20th Large swarm of bees, possibly a starvation swarm. Found larva of *Strymonidia pruni* Linn. in second instar (usually full fed at this date). Saw first *P. aegeria* males (freshly emerged) and observed Brimstone. (*Gonepteryx rhamni* Linn.) laying eggs.

JUNE 17th Peacock and Small Tortoiseshell both observed in courting displays. No larval webs found as yet.

19th Larvae of *Apatura iris* Linn. (Purple Emperor) started to pupate. *Papilio machaon* Linn. (Swallowtail) hand paired but making no attempt to lay and *M. cinxia* sitting about with no attempt at pairing due to lack of sunshine

AUG. 14th Newly laid eggs of *A. iris* in Hants. Comma (*Polygonia c-album* Linn.) summer form fresh on wing. Saw first Peacock.

16th Newly emerged Chalkhill Blues (*Lysandra coridon* Poda) on South Downs flying with *M. jurtina* in same condition. No *L. bellargus* Rott. seen. *Limenitis camilla* Linn. females still on the wing.

SEPT. 17th Saw first *Vanessa atalanta* Linn. of year and one or two *V. cardui* Linn. in garden. Small White, *Pieris rapae* Linn., abundant in garden laying on cabbages.

18th First Red Underwing (*Catacola nupta* Linn.) on wall in garden, a fresh male. Half grown larvae of Poplar Hawk (*Laothoe populi* Linn.) on Lombardy Poplar. Common Blue males still on wing with Small Copper.

20th Eggs of *Lampra fimbriata* Schreb. (Broad Bordered Yellow Underwing) just hatched.

OCT. 7th Ants, *Lasius niger* (Linn.), winged males and females flying.

20th Full fed larva of *M. tiliae* found at foot of Lime at Ilford. Third instar larvae of *P. rapae* on cabbages.

23.10.1972 P. W. Cribb (2270)

JUNIOR NEWS

The 1972 Exhibition was a success as far as Junior exhibits were concerned. There were eleven exhibitors, and the AES President expressed his pleasure at the high quality of the exhibits. He found it difficult to choose a prizewinner and eventually the Society agreed to give three prizes and the three winners were chosen to represent three age groups.

Andrew Creber (4893) of Saltash was one winner for his survey of the area around his home. His exhibit included maps, specimens and other information. The second was Ian McIlraith (4621) of Surbiton for his exhibit on the Stag Beetle, and the third was K. A. Moseley (4733) of Stourbridge for his exhibit on the Social Bees. These winners were chosen for their original scientific work, and its presentation.

One remarkable thing was the distance some members came to the Exhibition. There are some very co-operative parents about! Let us hope that there will be twenty junior exhibitors at the 1973 Exhibition.

The first contribution to this News is from R. M. Parsons (4795) of Maidstone, and I am sorry that it has been delayed; it was entirely my fault. His report is, in fact, for August 1971, and is as follows:

"During this August my brother, two of my friends and I decided to collect butterflies in various parts of Kent. The first place was a local Sweet Chestnut wood. Few Lepidoptera were seen as the weather was poor, and these were: a female *Maniola jurtina* Linn. (Meadow Brown) with a double eye spot and a few *Aphantopus hyperantus* Linn. (Ringlet) in rather battered condition. Our next trip was on August 16th to the North Downs at Broad Street. The day was a glorious one and many species were seen, and the following list compiled:–

Pararge megera Linn. (Wall Brown) Ten specimens

Maniola jurtina Linn. ssp. *insularis* Thomson. (Meadow Brown) Five

Aglais urticae Linn. (Tortoiseshell) Three

Inachis io Linn. (Peacock) Six

Polygonia c-album Linn. (Comma) Two

Aricia agestis Schiff. (Brown Argus) One

Polyommatus icarus Rott. (Common Blue) Ten

Lysandra coridon Poda (Chalk-hill Blue) Four

Celastrina argiolus Linn. (Holly Blue) 1st brood. One

Lycaena phlaeas Linn. (Small Copper) One

Pieris brassicae Linn. (Large White) Two

P. rapae Linn. (Small White) Ten

P. napi Linn. (Green-veined White)

Gonepteryx rhamni Linn. (Brimstone) Ten

The next trip was to the warren at Folkstone, and we saw *Eumenis semele* Linn. (Grayling). This was of especial interest because according to the *Provisional Atlas of the Insects of the British Isles Part* 1, *Lepidoptera Rhopalocera*, it has not been recorded in that area since 1960."

Secondly here is a report from Timothy Newnham (4597) of Haywards Heath:

"Slaugham Flyover. The islands that this flyover, completed in the late 1960's, makes with the outlet roads, have a different landscape to anywhere in the vicinity, except perhaps Ditchling and Chailey Commons. This is due to the removal of the topsoil, during the building of the flyover, leaving the sandstone exposed. Three species of Lepidoptera may be found there, *Zygaena filipendulae* Linn. (Narrow-bordered Six-spot Burnet), *Callimorpha jacobaeae* Linn. (Cinnabar Moth) and *Polyommatus icarus* Rott. (Common Blue). As I have only seen these three species in this one locality, I would be most grateful if someone could please inform me as to their nearest locality. I am puzzled as to how they originally got to this spot."

Timothy also included notes on the life histories of the three species, but I felt that these should be known to most members. It shows, however, that he has studied them, and for that he is to be commended. His report is for the summer of 1972.

For those interested in the moths, keep a look out for the early ones by watching tree trunks, north facing fences, etc. Make a note of which side of the trunk you found them on, the direction of the wind, what the weather had been like the previous night (cold or mild, windy or calm), how far from the ground the moth was resting, head upwards, or downwards; the type of tree, if possible; and whether it was obviously newly emerged. You must, of course, identify the moth! Let me have a copy of the notes for incorporation in a Junior News.

In any case try to send me your observations for incorporation in this article.

D. Ollevant (1514)
AES Youth Secretary

THE SCARCE PAINTED LADY IN DEVON

Two days after the 1972 AES Annual Exhibition, 2nd October, I observed a strange butterfly feeding on a bush of Buddleia (*Buddleia davidii* Franch.) growing in my garden at Bishopsteignton, South Devon. Having a net handy I was able to capture it and found it to be a fairly fresh specimen of *Vanessa virginiensis* Drury. Owing to the very unusual summer conditions of 1972 the Buddleias were very late to flower and I was fortunate to be able to attract this very rare migrant species at so late a date. Its nearest breeding localities to Britain are the Canaries and Madeira.

W. L. Coleridge (2194)

AUGUST BUTTERFLIES OF CLASSICAL GREECE

Greece has many species and subspecies of butterflies peculiar only to this South-East corner of Europe and, on my holiday there in August 1972, I managed to secure some typical south-eastern European species.

After the flight from Luton over France and the Alps in a Boeing 720B airliner to Athens, Greece seemed very poor and barren, almost devoid of vegetation. The contrast between rainy Britain and the dry heat of Athens airport was indescribable. However, apart from finding a Bath White (*Pontia daplidice* Linn.) it was too hot to do any serious collecting that first afternoon. The second day of our stay in Athens included a tour of the remarkable museums and the ancient Greek Temple called the Parthenon sitting on top of the Acropolis. Very few butterflies flew in and around Athens but Lang's Short-tailed Blue (*Syntarucus pirithous* Linn.) and the Scarce Swallow-tail (*Iphicldes podalirius* Linn.) were not uncommon at the foot of the Acropolis. The following day a trip to two of the Greek islands proved interesting. The first island we visited was Hydra, a large, barren, ragged island which looked the last place to choose for a butterfly hunt. After disembarking from the ship, I climbed a narrow track, which hugged the bay, up to a large stony field with a hot narrow gorge heading towards the sea. Considerable numbers of *podalirius* were dancing around some fruit trees below the track, whilst in and around the area were Painted Ladies (*Vanessa Cardui* Linn.), Common Blues (*Polyommatus icarus* Rott.) and Mallow Skippers (*Carcharodus alceae* Rott.): Large Grizzled Skippers (*Muschampia proto* Ochsenheimer) were settling on some thistles. The boat departed at two o'clock for Aeginaand. From the boat, this island appeared far more wooded except for the mountain peaks. I stayed near the coast as the vegetation was very thin and scanty away from the sea. Few butterflies were flying, but, on a patch of waste ground above the village of Aghia Marina, I disturbed some Oriental Meadow Browns (*Hyponephele lupina rhamnusia* Freyer) from some bushes growing beneath the shade of a yew tree. I also saw some specimens of the Brown Argus (*Aricia agestis* Schiff.), Small Copper (*Lycaena phlaeas* Linn.) which were of the grey suffused form *eleus*, an occasional *I. podalirius* and one *M. proto*. After a quick swim in the waters of the Saronic Gulf it was time to depart for Piraeus, the port of Athens.

The next morning was spent shopping around the unique market of Athens. After lunch, we set off down the highway towards the Corinth Canal which had been painstakingly cut through the Isthmus which connects the Greek mainland with the Peloponnese. The coach stopped for a break at a cafe so that we could admire the wonderful view along the four kilometre canal. It was during this time that I netted a male *pirithous* flying around a large clump of lucerne and I also caught a somewhat worn Bath White. We continued down the main highway to ancient Corinth where we visited the remains of the Roman town which Saint Paul visited. Amongst the fallen stones, were Swallowtails (*Papilio machaon* Linn.), Red

Admirals (*Vanessa atalanta* Linn.), Small Whites (*Pieris rapae* Linn.) and several *I. podalirius*. The rest of the day was spent travelling on to the overnight stop, a fishing town called Nafplion, on the east coast. The next day, our morning destination was the colossal open-air theatre at Epidaurus. The area was a former spa used by the Ancient Greeks. Some of the area is kept green in summer by the constant use of hosepipes. To visit the theatre, one follows a path which winds through some trees and eventually emerges there. Among the trees and wooden struts, which formed the stage erected for the 'Festival of Ancient Greek Plays', were a few Freyer's Grayling (*Hipparchia fatua* Freyer) which is a local species as well as only being found in extreme south-eastern Europe. Also there were *P. machaon*, the Wall Brown (*Lasiommata megera* Linn.) in a form similar to ours and the Small Heath (*Coenonympha pamphilus* Linn.) which had enormous borders on the forewing and nearly all the hindwing grey with a pale orange underside. Also these butterflies were a good deal larger than our own Small Heath. Further down the hill around an arid path of ground were many *H. lupina* flying in and around bushes and I netted a female which settled on some gravel under a tree. There were plenty of Long-tailed Blues (*Lampides boeticus* Linn.) and a few Cleopatras (*Gonepteryx cleopatra* Linn.). I crossed the road which ran through a wooded slope to a drive leading up to a hotel. The drive had a row of oleanders and buddleias on each side. The flowers on these were well past their prime, but there were scores of *I. podalirius* and Large Whites (*Pieris brassicae* Linn.) fluttering from bloom to bloom. I also caught *C. alceae*, a Southern Comma (*Polygonia egea* Cramer) and a female Southern White Admiral (*Limenitis reducta* Staudinger). It was disappointing not to have had longer here as there would probably have been many more exciting species to observe.

After having lunch in Nafplion, we proceeded on to Olympia. We stopped at Vitina, a small town in the middle of the mountains of the Peloponnese. Here, I caught a Comma (*Polygonia c-album* Linn.) and a female Silver Washed Fritillary (*Argynnis paphia* Linn.) which had the silver stripes replaced by white. We arrived in Olympia in time for dinner. Next day we visited the site of the ancient Olympic Games and, whilst walking through the entrance gate, I found a Fritillary larva pupating about thirty cms from the ground. Amongst the pines I captured a female specimen of the Eastern Wood white (*Leptidea duponcheli* Staud.) flying slowly and near the ground in the dappled light. The running track was flanked on each side by lucerne. Here swarms of *P. icarus*, *S. pirithous* and the Clouded Yellow (*Colias crocea* Geoff.) and a few *P. machaon* flew around and over the flower heads. By midday the weather became extremely hot and all the butterflies rose up around the treetops which lined the streets of Olympia.

In the afternoon, we departed for Patras, a port on the North-West coast of the Peloponnese. The hotel where we stayed the night was surrounded by orchards where many *I. podalirius* were flying. A shady path led

through a gully at the back of the hotel. Here, several Speckled Woods (*Pararge aegeria* Linn.) were dancing around. The markings were a mixture between *P. a. tircis* Butler and *P. a. aegeria* Linn. The larva which I found that same morning pupated successfully although I detached it from the silken pad on which I found it. On the following day, we crossed from Rion to Antrion across the Bay of Corinth back to the mainland. The road was tortuous as we penetrated further into the mountains. Indeed, it was blocked in one place by road "improvements". I dismounted from the coach to see if there were any butterflies at hand and caught a glimpse of a male *A. paphia* flying past me. I captured an extremely small Blue but in a desperate rush to catch the coach with its courier anxious to set off before more obstacles appeared I left my killing jar behind. A few miles along the dusty road we at last reached our coffee stop and whilst strolling out of the doorway of the cafe I found a bagworm larva crawling across the floor. By the side of the building, the bed of a dried-up stream ran down the steep mountains. Many butterflies were attracted by some thistles and mauve flowers of uncertain identity, including *A. agestis*, *M. proto*, *C. alceae*, *P. icarus*, Tree Grayling (*Hipparchia statilinus* f. *onosandrus* Fruh.), *Vanessa cardui* Linn. and the Mazarine Blue (*Cyaniris semiargus* Rott.). The last named were all marked with orange on the underside of the forewings and hindwings. Although all the females were in poor condition, they resembled *C. helena* Staud. (Greek Mazarine Blue) quite closely. After lunch at Delphi and a siesta, we visited the ruins of the Temple of Apollo and the site of the famous Oracle but the sun had already sunk below the Mount Parnassus range so little collecting could be done.

In the morning, we left Delphi and the indistinct mountains of the Peloponnese behind and departed for Kammena Vourla where we were to spend the next seven days. The road continued to Kammena Vourla on the coastal plain which narrowed to about one kilometre in some places. The Hotel Sissy, where we stayed, is just outside the village and between the olive groves and the sea. The course of a dried-up stream dissected the olive groves and ran by the side of the Hotel giving rise to rather more lush vegetation. The main Athens-Lamia road passed by the Hotel and continued straight towards the village of Kammena Vourla. Brambles and buddleias grew on the roadside verge and here *P. machaon*, *I. podalirius*, *P. brassicae*, *P. daplidice*, Holly Blue (*Celestrina argiolus* Linn.), *L. boeticus* and *V. cardui* were all flying at high noon. More detailed exploration revealed the occasional *A. paphia immaculata* Bell. which were larger with the black markings on the upper side reduced whilst the silver stripes were virtually absent from the underside of the hind wings which were covered in a greenish golden suffusion. *C. pamphilus*, *L. megera* and the Latticed Brown (*Kirinia* (*Roxelana* Cramer) were flying under the bushes to keep out of the sun. *C. alceae*, Large Skipper (*Ochlodes venatus faunus* Turati) and Pigmy Skipper (*Gegenes pumilio* Hoff.) were buzzing amongst the pink bramble blossoms: *G. pumilio* is recorded from many coastal districts around the Mediterranean. In the village, however, there were thousands

of *P. icarus* sheltering behind the Eucalyptus trees, all the females being brown with no trace of blue whatsoever. There were also *L. phlaeas* f. *eleus* Fab. and *L. boeticus* and *S. pirithous* which flew around a large tree lupin. By a large modern Hotel, there was a bank of flowers where *G. cleopatra*, *I. podalirius*, *P. machaon* and the occasional *L. reducta* settled. Some Humming-Bird Hawk-moths (*Macroglossum stellatarum* Linn.) hovered around some Zinea flowers together with *C. crocea*. Near the foot of the mountains which backed the village grew many tall thistles and, settling on almost every head was *V. cardui*, *A. paphia immaculata* and the occasional *G. cleopatra*, Spotted Fritillary (*Melitaea didyma occidentalis* Staud.), *C. crocea* and *L. reducta* mingled amongst the trees. On a hot, dry path by the side of the road, flew several *G. pumilio* and directly above a magnificent Two-tailed Pasha (*Charaxes jasius jasius* Linn.) glided around the lower branches. On the way back to the Hotel, I found *P. daplidice* with wing spans of 20/22 mm. and the whole population around the hotel consisted of specimens thus. I also found a colony of Swallowtail larvae feeding on some fennel just outside the Hotel.

On the last day at Kammena Vourla, I caught a male *L. duponcheli* flying in the shade together with a few *P. rapae*. Along the highway, there was a small valley full of thick scrub where a male *C. jasius* and *L. reducta* glided at considerable speed towards the road. At another clearing on the wooded sides of a hill, I saw my last *C. jasius* settled on a twig of fig tree but, as I approached within a metre of it, it glided swiftly to the base of the hill.

My moth collecting adventures at night proved to be successful, most specimens being caught around some neon lights in the forecourt of the Hotel. The more noteable specimens obtained were the Striped Hawk (*Celerio livornica* Esp.), Humming-bird Hawk, Ni Moth (*Plusia* (*Ni* Hübn.), Scarce Bordered Straw (*Heliothis armigera* Hübn.) and the Vestal (*Rhodometra sacraria* Linn.). After a last look at some Swallowtails during our morning break in Thebes, we continued our journey to Athens Airport for our flight back to England.

G. R. Smith (4950j)

REPORT OF TWO 1972 FIELD TRIPS ORGANISED FOR THE AES CONSERVATION GROUP

Both trips this year were to Reserves owned by the Sussex Trust for Nature Conservation. The first one was to Amberley Wild Brooks on May 27th and the second to Duncton Chalk Pit on June 10th. It was very disappointing to find only one member apart from the leader attending each meeting, and it is hoped than any future organised field meetings will be better attended.

Amberley Wild Brooks

The Trust at present owns or leases over ten acres of the Wild Brooks, including an area of derelict raised bog. Numerous drainage dykes separate

the small fields, these possess an exceptionally rich flora and fauna. Notable plants include Adder's Tongue (*Ophioglossum vulgatum* Linn.) and Tasteless Water-pepper (*Polygonum mite* Schrank). As heavy rain had fallen early in the morning and a steady drizzle persisted up to almost midday, it was dedided that the ground would be too wet for collecting and examining the Wild Brooks, which incidently lie in a very exposed position on the alluvial plain of the River Arun. Instead, the venue was changed (after waiting for two trains from London to see if any other members would turn up) to the more sheltered Houghton Forest. About two hours were spent here but the vegetation was too wet for continued sweeping and beating, and not many species of insect were noted under the bark of Beech (*Fagus*) logs. A specimen of *Typodendron domesticum* (Linn.) (Col., Scolytidae) was captured. Although by no means rare the writer cannot remember finding this species in the Houghton Forest-Arundel Park area before.

Duncton Chalkpit

Although the sky was overcast on reaching the meeting place, the rain kept off until about midday, and was not too heavy enabling the 'party' to walk round the Reserve and through Duncton Hanger to the top of Duncton Hill, thence back to the cars by the shortest route. Again the vegetation was too wet for sweeping to be carried out. Although several species of plant were searched for beetles, only one species yielded any. This was Deadly Nightshade (*Atropa belladonna* Linn.) several large plants of which had numerous specimens of the local beetle *Epitrix atropae* Foudr. (Col., Chrysomelidae) on them. Few Sussex records of this beetle exist, most records relating to captures from Arundel Park. Fowler (1890) records finding it abundantly here on September 5th, 1879. Arundel Park appears to be one of the most widely known localities for this diminutive species.

The Reserve consists of five acres of woodland scrub surrounding the disused quarry. Several rare plants and moths have been found here including the Fly Orchid (*Ophrys insectifera* Linn.), Bee Orchid (*O. apifera* Huds.) and the Greater Butterfly Orchid (*Platanthera chlorantha* (Cust.) Rchb.) and the Plumed Prominent Moth (*Ptilophora plumigera* Schiff.). Fallow Deer (*Dama dama* Linn.) often visit the Reserve indeed one was heard calling in Duncton Hanger.

I would like to thank Mr D. T. Streeter, Honorary Scientific Officer for the Sussex Trust for Nature Conservation for giving me permission to take people round, and to collect insects from these Trust Reserves.

J. Cooter (3290)

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HENRY TIBBATS STAINTON 1822-1892

Henry Tibbats Stainton was one of the 'greats' of entomology of the nineteenth century, and the quantity and quality of his works was such that they still have their impact today. He was born of moderately wealthy parents in 1822 and was educated privately and at Kings College London. His education made him proficient in French, German and Italian and this must have assisted him greatly in his many travels on the continent and his widespread correspondence with other European entomologists. It also assisted him in utilising the store house of European knowledge on the subject. Though a scrutiny of his works, papers, articles, etc., shows that he had a wide interest and knowledge of natural history, the Micro-Lepidoptera were his great and abiding interest and it is for his works in this field that he is best known. Though engaged in commercial life and having other interests political and social, his researches and output of work were quite astonishing. He achieved this in typical Victorian fashion by sheer hard work, rising regularly at five in the morning. In 1845 he commenced to write articles in the *Zoologist*, and in 1855 he established the *Entomologist's Annual* which he edited for twenty years. From 1856 to 1861 he was one of those responsible for the *The Entomologist's Weekly Intelligencer*. Copies of these last two can still occasionaly be come across and their contents are even now of more than antiquarian value. In 1864 he was one of the founders of the *Entomologist's Monthly Magazine*, and he remained one of its editors until his death. After one hundred and eight years this fine journal is still flourishing, a tribute to the sound foundations he helped to lay.

Among his major separate works were *An Attempt at a Catalogue of the British Tiniedae and Pterophoridae*, published in 1849 with a supplement two years later, *The Entomologists Companion*, 1851-2, *Insecta Britannica Lepidoptera Tineina*, 1854 and *A Manual of British Butterflies and Moths*, 1857-59, perhaps his most popularly known work. His greatest work of all was *A Natural History of the Tineana*, published in thirteen volumes between 1855 and 1873. This was done with the assistance of Frey, Zeller and Douglas and was printed in four languages. *The Tineana of Syria and Asia Minor* came in 1864 and *Tineina of Southern Europe* in 1869. He also edited for Dr. Clements *The Tineina of North America* and produced a catalogue of the library of J. F. Stevens, as well as editing a catalogue for the British Museum on the Tineina.

His membership of, and work for learned and scientific societies was impressive and he gave liberally to them both of his time and money. He became a fellow of The Entomological Society of London (now the Royal Entomological Society) in 1848 and was one of its secretaries in 1850-1 and its President in 1881-2. He became a Fellow of The Linnean Society in 1859 and its Vice-President 1883-5. He was elected a Fellow of the Royal Society in 1867. He was a member of entomological societies in France, Belgium, Germany, Italy and Switzerland as well as many local societies in

England. He was a member of the Ray Society and its secretary from 1861-72, piloting that society during a critical period of its history. He edited part of the publication of that society which is best known to us entomologists, *Buckler's Larvae of the British Butterflies and Moths.* In 1871 he founded the Zoological Record Association to continue the publication of the *Zoological Record.* This was taken over by the Zoological Society in 1886 and is still published by them. He married in 1846 but had no children. He lived for most of his life in Lewisham and was buried in Lewisham Old Church, St. Marys.

G. Prior (3909)

LETTERS TO THE EDITOR

AES Exhibition 1972

Dear Sir,

As someone who has attended three of the four Exhibitions at Holland Park and on each occasion brought along a small exhibit, I feel justified in expressing a view on this matter.

Considerable space in the last three editions of the Bulletin has been devoted to a post-mortem on the 1971 Exhibition and an endeavour to stimulate a better Exhibition this year. The latter, I am afraid appears to have met with little success. A lot of criticism following last year's Exhibition got side-tracked into the red herring of dealer domination. The them versus us arguments are fallacious. I can see no reason why good trade exhibits should detract from the Exhibition, they should compliment good exhibits from us. The only reason the dealers dominate is because we let them by the paucity of our own exhibits.

In view of the hundreds if not thousands of members who must have attended the Exhibition, the number of exhibits was nothing short of pathetic. A large part of the members exibition area was taken up by a sort of pets corner, the entomological relevance of which is not clear to me, I can only assume that it was included to fill up the space we failed to utilise. The crowds four or five deep in front of the trade stands and the substantial sales of equipment must indicate the presence of a large number of active entomologists. Are all their labours in vain, are all their studies fruitless, have they nothing at all to show us?

It is clear that the action so far taken to persuade members to exhibit has not met with success. I would like to put forward some suggestions. If Members are to be encouraged to exhibit they must be made to feel that their efforts are appreciated and that their exhibits are of interest to their fellows. The present layout of the Exhibition militates strongly against this. Member's exhibits should be so positioned that they can be studied in comfort and leisure, this is not possible at the moment. The central position chosen for member's exhibits where they are surrounded by trade stands results in a constant flow of people passing through the exhibits to get to the trade stands or the canteen. I would like to suggest a complete

separation of the trade area and the area for the member's exhibits so that the member's exhibits are not subjected to through traffic in the way they are at present. Why not put the member's exhibits in the room now used for the canteen. With luck members could fill this area, but if not other exhibits of an educational but non-trade type could also use it. Bring the canteen into the top part of the central room, it would still be possible to service it from the back, and put the displaced trade stands into the lower area. Separation from the crowds attending the 'entomological bazaar' would enable those wishing to study the member's exhibits to do so in a more conducive atmosphere.

Secondly, as the Exhibition is, after all, the major event in the Society's year, let us treat it as such by giving it due prominence in the Bulletin. By prominence, I do not mean letters of comment but a detailed report on the exhibits. Comparisons are odious but I have just picked up a back number of the *Proceedings and Transactions of the British Entomological and Natural History Society* which reports on one of their annual exhibitions. Despite the fact that they use much smaller type than we do, the report on their member's exhibits runs to more than six pages plus three pages of photographs.

I can imagine hands raised in horror at the cost of photographs, I am sure however that one of our members interested in photography would volunteer to take the pictures and also that those whose specimens were selected would be prepared to make some contribution to the cost of publishing their portraits. Let the report contain more detail concerning the exhibits, especially items of special interest. This would make more interesting reading than our present practice which is not much more than a selected list of exhibitors. This is not intended as a criticism of the writer of the recent exhibition reports, so much as a suggestion for a change of emphasis in an attempt to stimulate more interest in the Exhibition, especially from potential exhibitors. Show them the Society feels that their efforts are worthwhile and of interest to other members.

Finally, a minor point, by giving the Exhibition a specific theme we will tend to limit rather than encourage potential exhibitors. Keep it as wide as possible, encourage all members no matter what their individual interest to show us their work, some of us may not have back gardens suited to entomology.

M. P. Perceval (3798)

Larvae of the Goat Moth

Dear Sir,

I wonder if there is any member who can tell me of the location of trees that are infested with living larvae of *Cossus cossus* Linn. (Goat Moth) in the southern part of England. I would like to know of these in connection with the making of a scientific film on the life of that insect.

G. Prior (3909)

Junior exhibits at the 1972 AES Exhibition

Dear Sir,

One of the pleasures of being President of the AES is that one judges and awards the prize for the best Junior exhibit at the Annual Exhibition. I hope that my fellow members will forgive my small conceit, when I say that this exhibition, during my Presidency, was the best I have seen. The reason I feel this was not the large attendance, but the very high standards of the exhibits put in by the Junior members. Doug Ollevant and I had the task of judging which was the best, we were so impressed by them and found it so difficult to decide, that it took two examinations and a cup of tea between them to come to a decision. One thing we decided at once, one prize was not enough, so we awarded three. May I congratulate all those Junior members who put in an exhibit and say to those who were unlucky that it was only with great difficulty that Doug and I passed you over. The exhibits all showed that their owners had spent a considerable time on them and were interested in entomology rather than just collecting. May I hope that next year even more of you Junior members will exhibit. We in the Council are going to discuss giving some added recognition to your efforts. Who knows, the seniors may follow your good example, and perhaps they may clamour for some prizes too?

G. Prior (3909)
AES President

BIRDS ATTACKING SLEEVED LARVAE

In 1972 on two separate occasions I observed birds attacking the sleeves containing larvae in my back garden. The first occasion concerned a large number of larvae of *Aglais urticae* Linn. (Small Tortoiseshell) sleeved on potted Stinging Nettle (*Urtica dioica* Linn.). The birds were House Sparrows and they were pecking holes in the sleeve and seizing the larvae which were crawling around on the muslin in preparation for pupation. Each time a larva put its head out of the pecked holes it was taken by a sparrow. I did not observe the birds eating the larvae as they flew off with them in the beak. The second occasion was this autumn. I had sleeved some larvae of the Scarce Vapourer (*Orgyia recens* Hubn.) onto a Sallow bush (*Salix* sp.). The larvae devoured the leaves inside the sleeve and then took up hibernating positions among fallen leaves and on the muslin. I observed two Great Tits attacking the sleeve repeatedly and although they had not pierced the muslin they had crushed some of the larvae through it. A secondary sleeve placed loosely over the first stopped the trouble.

P. W. Cribb (2270)

INSECT CONSERVATION AND A COUNTY TRUST

In this article I want to try and give an idea of the activities carried out by a County Trust in relation to insect conservation. I hope also to point out some of the ways in which entomologists can help with the work of County Trusts. My ideas are based largely on my experiences during the last fifteen months when I was carrying out a survey of the breeding sites of certain of the Blue butterflies in Gloucestershire for the Gloucestershire Trust for Nature Conservation. I do not know whether the part played by insect conservation in this Trust is greater or lesser than in other Trusts, but I would guess that the position is much the same elsewhere.

This particular Trust has twenty-seven reserves, but none of these are specifically devoted to insects. The primary aim of the Trust is to acquire at least one example of each of the major habitat types present in the county. Thus the emphasis is on the habitat rather than on particular species, although there are exceptions to this. The nearest approach to a reserve created because of insect interest is the recent addition of a small acreage of limestone grassland to a previously existing woodland reserve which it adjoins. This particular piece of grassland has a rich butterfly fauna and will be managed especially for the butterflies, with particular interest being shown in the Chalk-hill Blue (*Lysandra coridon* Poda) and Marbled White (*Melanargia galathea* Linn.). In this connection experiments are being carried out on the control of coarse grasses by cutting and the application of herbicides (Dalapon), and also on the re-establishment of Horse-shoe Vetch (*Hippocrepis comosa* Linn.). At only one other reserve do insects figure at all prominently in the reserve report for 1968-69. At this reserve two insects are involved, one of these is the Small Blue (*Cupido minimus* Furess.) on which ecological studies are being made, and the other is a rare Cynid Shield Bug (*Sehirus dubius* Scop.) which feeds on a locally distributed plant, Bastard Toadflax (*Thesium humifusum* DC.). Before its discovery in the Cotswold this bug was thought to have an entirely coastal distribution. At one other limestone grassland reserve knowledge that the site was once a breeding area for the Large Blue (*Maculinea arion* Linn.) played a part in the desirability of acquiring the site. Unfortunately the Large Blue has not been seen there since 1946.

Thus the consideration given to insects in Trust reserves is, as you can see, small. Of course the Trust's conservation activities are not limited to the creation of nature reserves. Another part of its work is less dramatic, but no less important. This concerns bringing to the attention of land-owners and other interested parties the presence of plants and animals on their land which might be endangered by changes in land use etc. In this way the Trust has been able to secure colonies of the Chalk-hill Blue, Marbled White and the yellow variety of the Narrow-bordered Five-spot Burnet Moth (*Zygaena lonicerae* von Schev.), and is at present interested in colonies of the Wood White (*Leptidea sinapis* Linn.) and White Admiral (*Limenitis camilla* Linn.). However we can still see that insect conservation

plays a very small part in the Trust's activities and I am sure that this is repeated throughout the country.

How can we, as entomologists, work to improve this situation? Let us first consider the organisation of a County Trust. Basically the Trust will be run by laymen with little specialist knowledge and they will be assisted by a committee or advisory panel of scientists. Laymen (and women) will predominate in most of the Trust's committees from the executive level down to the local management committees for individual reserves. Such people will not be aware of entomological interests unless entomologists take the trouble to keep them informed. It is no good looking to the scientific advisers to do this task, they will probably be specialists and may not be aware of developments outside their own field of study. Their principal function is to advise on specific matters and anyway a particular speciality may not be represented. As an example let us consider the composition of the scientific committee of the Gloucestershire Trust in 1968-69. This committee was composed of four botanists, two ornithologists, two general biologists, one conchologist, one entomologist, one forester and one zoologist. The one entomologist cannot be expected to be an expert in all branches of entomology and who is going to speak for the unrepresented groups unless information is provided from outside the committee. So the responsibility for informing the Trust of insects in need of conservation falls on you, the amateur entomologist. You do not even need to be a member of the Trust, they will be grateful for the information wherever it comes from (that's not to say that they will turn away your offer of a subscription!) and I am sure that such information will be acted upon whenever possible.

In order to demonstrate the sort of success that a determined amateur entomologist can have I will take an example from the Gloucestershire Trust. A local amateur entomologist discovered that the owner of a very good Chalk-hill Blue site was about to graze pigs on the site. He approached the Trust about this and together they were able to contact the owner who agreed to critical areas of the site being fenced off, the Trust paying for the fencing materials. This was all done in time to save the colony from destruction. The same entomologist also drew the Trust's attention to the small area of limestone grassland I mentioned at the beginning of this article and which is now included in a nature reserve. In fact the attention brought to the Chalk-hill Blue by this person together with the presence in the county of the Large Blue resulted in the setting up of the Blue Butterfly Survey which I am now undertaking. All this by one amateur entomologist, and as a guide to those of you who would like to try something similar, he was helped by two things. Firstly he was persistent and secondly he came armed with facts.

Assuming that you decide to give the Trust information, can you be sure that it will be safe in their hands? I know that many entomologists, especially those of the older generation, hesitate before giving up in-

formation on the localities of rare species. They have probably had experiences in the past of such information falling into the wrong hands. County Trusts realise this and will go to great lengths to ensure that the information remains confidential. This can be done by limiting access to the information to three of four people who will deal with the problem from the beginning and follow it through on behalf of the Trust. Even the location of, and reasons for, a nature reserve can be kept confidential. I hope that my own work has been a good example of this. Prior to my appointment this Trust had tried for a number of years to obtain information on the whereabouts of the Large Blue without success. It was hoped that the appointment of somebody specifically to look into the status of the Large Blue would persuade lepidopterists that something worthwhile was going to be done and that their information would be safe. In fact the result was quite dramatic. People who had previously withheld information came out into the open. In fact of all the entomologists I contacted only one was unhelpful. Perhaps other Trusts could adopt this line of approach.

Do not worry if you think you may have left it too late to do anything about a particular problem, there may still be a chance. If the problem is important enough or of interest to the people involved there is a chance that a last minute appeal can succeed. (Although, of course, the sooner a problem can be brought to the attention of the interested parties the better.) As an example, last year I learnt that a former Large Blue site was to be ploughed up within the next two weeks. We were able to meet the owner immediately and the site was saved for two years to enable us to find out whether or not the Large Blue was there.

In what other ways can entomologists help County Trusts? An important and largely neglected aspect is the compilation of lists of insects from reserves. Lists of plants and birds are usually readily available but insects . . . ? Again to use the Gloucestershire Trust as an example, there are lists of butterflies from only four of the twenty-seven reserves and one reserve has a list of beetles and these are the only lists of insects available. If every entomologist was to offer to draw up a list of the insects of his speciality from only one reserve the situation would be much better. If he was to offer to do this for a number of reserves, all the better. Remember it is not only the rarer orders that need attention, there is plenty of scope for the lepidopterist.

I have suggested that you should help the County Trusts, but what can the Trusts do for you? Obviously their most important function is to provide habitats where the insects in which you are interested can survive. One would also hope that reserves would provide areas where enterprising amateurs, as well as the professional scientists, could carry out their own studies. Information gained in controlling or encouraging insect populations on reserves might be applied to populations outside reserves. Also I feel that collectors should not be forgotten, for ideally a properly managed insect population on a nature reserve should be able to meet

the needs of collectors. Indeed we can look forward, perhaps rather optimistically, to the day when some degree of culling may even be necessary at some reserves.

To sum up, it is my intention to draw your attention to the small part that insect conservation plays within the County Trust organisation. Of course there are many bright spots, several Trusts have projects involving insects but these are often restricted to single species or small groups of species. What is needed is work at the 'grass roots' to provide a comprehensive framework on which County Trusts can base their decisions. Botanists and ornithologists appear to have done this, why not entomologists?

January 1971 John Muggleton (3253)

Post script

Since this talk the 1969-70 report of the Gloucestershire Trust has appeared, and it is gratifying to see that three amateur entomologists (two of them members of the AES) are preparing lists of insects from various Gloucestershire Trust reserves.

(This article originally appeared as a publication of the Conservation Group of the AES.)

FURTHER NOTES ON BREEDING THE JAPANESE OWL MOTH

I have bred the Japanese Owl Moth (*Brahmaea japonica* Butl.) for four years in succession from my own stock and would like to add some further notes to those of Mr Brock (Brock, 1972).

It is important that the peat used for pupation should be damp for two reasons. Firstly the larvae cannot move or dig properly on dry, powdery peat which gives no foothold: secondly the pupae dry out and die unless they are kept moist. It is advantageous to add half the quantity (by handfuls) of horticultural sand to the peat and damp the mixture thoroughly with warm water. Put a 3 or 4″ layer of this mixture, gently firmed down, in the cage and put the larvae in when they start wandering around and turn brown on the back. I rear them in another cage in order to keep the pupation cage clean. Keep the pupae in a cool place until the spring and, if the surface of the peat becomes quite dry to the touch, spray with a little water. I have not tried feeding the larvae on lilac leaves but will do so next season.

My pupation cage is an old meat-safe, the metal door having been replaced by a wooden one covered with clear polythene. The perforated sides give ventilation and enable the moths to climb and expand their wings. This cage is very satisfactory for all moths that pupate underground.

T. P. Payne (4688)

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BLOOD-SUCKING MOTHS

I noted while reading through Mr Stallwood's very interesting paper on the food and feeding habits of adult butterflies (Stallwood, 1972) that he did not mention the blood-sucking moths. These are a relatively recent discovery and their existence and habits are not widely known by amateur entomologists.

Stallwood states that the evolution of the proboscis for piercing has reached its highest development in the fruit-piercing moths. The blood-sucking moths have, of course, evolved from fruit-piercing Noctuids. The blood-sucking habit has the advantage of allowing adult moths to feed throughout the year, and not just when fruit is ripe. The proboscis is more heavily sclerotised and barbed and can be made to penetrate the skin by oscillating the head. After penetration the two halves of the proboscis slide in opposite directions along its longitudinal axis.

Calyptera eustrigata Hmps. has been observed to rasp out a wide shaft, six millimetres deep and to drink blood for between ten and sixty minutes (Banziger, 1968). *Lobocraspis griseifus* Hmps. and *Arcyophora sylvatica* Buttiker are also known to ingest blood (Buttiker, 1959).

Unfortunately I can only quote two references to this work because here on the continent I do not have all my notes and there is not a good library at hand. Those interested in reading more about this unique group of moths could undoubtedly find more recent papers by Dr Banziger.

L. McLeod (3534)

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BOOK REVIEWS

Drosophila by Bryan Shorrocks, BSc, PhD. Pp. 144 with 8 colour plates. Ginn & Company Ltd, London. 1972. £2·25.

This is the second in the series 'Invertebrate Types' from these publishers. It maintains the high standard set in *Woodlice* both in content and presentation. The colour plates of the British *Drosophila* and the line drawings by Hilary Burn are excellent. *Drosophila* (Fruit Flies) have considerable importance in biological studies in schools and universities and much of the reference material available has been on work in the United States. This book uses European and British information and material and should prove a useful text book as well as an introduction to the group for the amateur dipterist. There are chapters on the biology of the genus, field and laboratory ecology, genetics and behaviour. Experimental work is considered and an appendix lists the more important mutants of *D.*

melanogaster. The identification keys and distribution notes are well presented and European records for twenty-two species are tabled. There is a four page bibliography for help in further studies. Teachers and students will find this an invaluable publication and the publishers are to be congratulated on another success.

P. W. C.

Insects of the World by Walter Linsenmaier. Pp. 392. McGraw-Hill Book Company, New York and Maidenhead, Berks. 1972. Copiously illustrated with colour reproductions of paintings and photographs and line drawings, all the work of the author. £6·50.

This large volume is impressively overwhelming at first perusal, being an insect encyclopaedia, the work of one man, Walter Linsenmaier, who has used his gifts of drawing and painting for the illustration of insects and other animals. Though not a professional zoologist, his illustrating and photography led him to study entomology with a deep appreciation of the beauty and wonder that his careful observations revealed to him. In 1951, with his father, he founded a zoological museum in Ebikon, Switzerland, where he lives, and he wrote in German this comprehensive review of the whole insect world. This has now been translated into English by Professor Leigh Chadwick, late of the University of Illinois.

The first chapters deal with the anatomy and biology of insects with special reference to mimicry and colouration. Distribution, migration and classification are briefly considered and then follows a complete review of all the orders of insects under general chapter headings of Wingless and Winged Insects, Social insects and Aquatic insects. Obviously the text in dealing with so much material must have a fairly superficial approach but it still manages to give a wealth of useful and interesting information, written in a very readable style, making many hours of fascinating reading or browsing. The illustrations are obviously the most exciting feature. The sketches are excellent, the colour reproductions of paintings startlingly clear, but the photographs of set insects are often inferior by comparison. I found the identification of the illustrations a little tedious as it is necessary to turn back and forth to relate illustrations to the lists of names or illustration keys and when one wants the scientific name it is necessary to refer to the index at the back of the book.

This will prove a very useful book to the amateur entomologist with catholic interests, for the biology student and teacher and an acquisition for those who appreciate beautiful pictures. Many of our younger members (and some of the older ones) may hopefully suggest that it would make a suitable present and public and school libraries will wish to add it to their reference sections.

P. W. C.

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Vol. 19. Pieris napi in Hebrides; collecting at Aviemore, the Norfolk Broads, the French Alps, Provence; the British Coleophoridae; sugaring and collecting hints; breeding Saturnia pyri; moths of the Sussex Coast; Silver Jubilee number; Rheindalen Forest.

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EDITED BY:
PAUL BOSWELL, MB, ChB, MRCPath, FRES.

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AES BULLETIN No. 299

EDITORIAL

In order to leave as much space as possible for members' contributions I shall just tell you the names of two new members of the AES Advisory Panel. They will both help with the Arachnida:

P. M. Heath (4167), Wilson House, Epsom College, Epsom, Surrey. Pseudoscorpions.

G. Fenwick, B.Sc., M.I.Biol. (4914), 20 Abbotside Place, West Denton, Newcastle-upon-Tyne, NE5 1AY. Araneae and Opiliones (Harvest Spiders).

Will members please note my latest change of address.

Paul Boswell (2853)

COLLECTING NOTES—MAY 1973

The smaller moths

Mr. E. S. Bradford writes, "The drawing of *Opostega crepusculella* Zell. is from one of several specimens I have taken in my garden at Borehamwood, Herts in the last few years. The larva probably feeds on one of the mints growing there. As well as culinary mint, there is a bed of, I think, *Mentha arvensis* Linn. and one other mint. Ford (1949) says that '*M. palustris*' is the most likely foodplant. As far as I know the life-history has not been satisfactorily worked out and I hope to breed the moth myself eventually. This is a species members might also try to breed for themselves.

"The overall colour of the forewings, scape and thorax is whitish or creamy white. The markings on the wings are a somewhat soft brownish grey. The antennae, hindwings and cilia of the hindwings are of the same soft brownish grey. There is a black apical spot on the forewings."

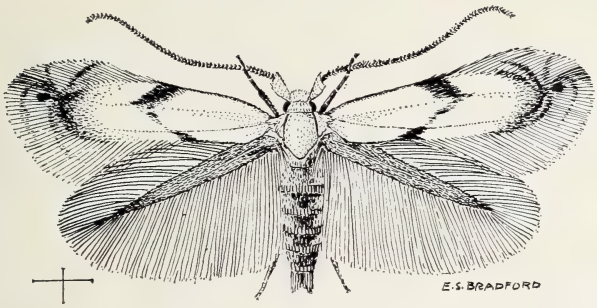
Formerly *Opostega* was treated as one of the genera of the Lyonetiidae, but now the Opostegidae have been promoted to family status and are assigned to the superfamily Nepticuloidea. In Britain the family has one genus (*Opostega*) containing four species: the other three are the relatively common *salaciella* Treits. and two rarities, *auritella* Hübn. and *spatulella* H.-S. Meyrick (1928) tells us that there are about 85 species of *Opostega* with an almost world-wide distribution and that their larvae make mines in rind or bark. Very little is known about the life-histories of the British species. *O. salaciella* has been bred fortuitiously from Sheep's Sorrel (*Rumex acetosella* Linn.) and it may therefore feed on that plant (Meyrick,

1928). What was put forward as hypothesis by Meyrick was accepted as fact by Ford (1949), without, as far as is known, corroborative evidence. Later writers do not accept his assumption, Brown (1952) and Hering (1957) both being silent over the biology of *salaciella*. Larvae sometimes spin up on plants other than those on which they feed, and the evidence that *salaciella* actually fed on Sorrel is inconclusive. Nevertheless it is worth searching Sorrel for it, though one wonders whether the stems may not be too slender to accommodate larvae in their rind.

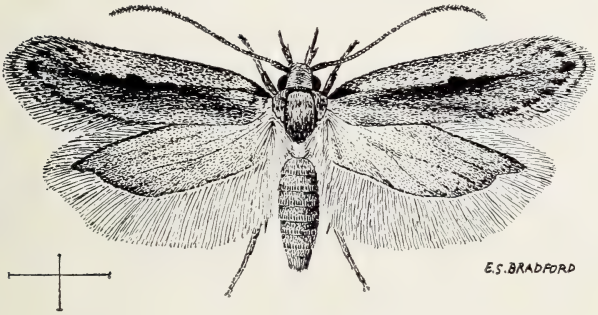
The only British species of *Opostega* for which there is positive knowledge of the early stages is *auritella*, a rare fenland moth which seems not to have been taken in Britain for many years. It has been bred from green larvae mining in the stems of Marsh Marigolds (*Caltha* spp.). Hering, who, I suspect, is quoting English sources, gives this information and adds that the mine has not yet been described in detail. The closely related *crepusculella* has been supposed to mine the stems of *Mentha* because adults have been taken, mostly at light, in wet areas where mints grow freely. The supposition may well be correct but there is no solid evidence to substantiate it. As far as I know, *spatulella* has not been associated with any definite plant. Barrett took it at North Curry, Somerset (Turner, 1955) and it was recorded during the last century from Witham and Southend in Essex (V. C. H., 1903).

Now in these notes I am supposed to be advising about how to collect microlepidoptera, but instead I have been discussing the unknown. I have not been conducting you around the well known landmarks of familiar entomology but have been inviting you to sally forth into hitherto uncharted territory. But, as Mr Bradford has hinted above, this is what the AES members are for. The professional entomologist (often to his chagrin) is tied to his laboratory bench or museum desk: it is we who have the better opportunities for research in the field. To find the larvae of *Opostega* will require an extension of our routine as collectors. Microlepidopterists are accustomed to spotting spinnings and leaf-mines, to splitting stems, opening seed-heads and digging up roots. Now we must learn to look attentively at the stems and stalks of low-growing plants and to notice ridges or lines of discolouration which may indicate underlying larval mines.

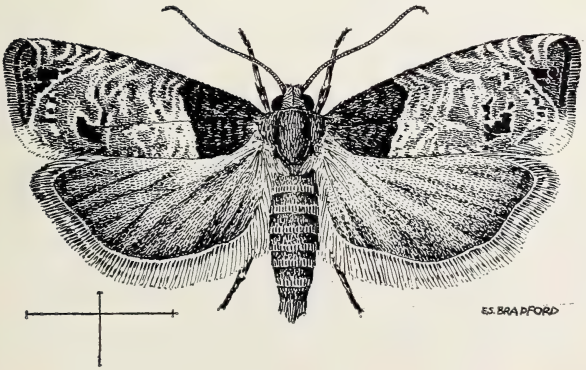
Now let us consider an easier quarry. Mr Bradford's second drawing is of *Mirificarma mulinella* Zell., a common and widespread species. Its larva feeds in late April and May in the flowers of Gorse (*Ulex* spp.) and Broom (*Sarothamnus scoparius* (Linn.) Wimm. ex Koch), betraying its presence by chewing small round entrance holes through the petals. The moths start to emerge in July and are on the wing till early September. In appearance *mulinella* is rather a plain insect. The forewings are light ochreous brown and the dark streak running from the base of the wing



Opostega crepusculella Zell.



Mirificarma mullinella Zell.



Epiblema roborana Schiff.

almost to the apex is variable in development; sometimes it is almost absent and then the black stigmata are conspicuous.

This is an easy species to find and also to rear, since the larva readily changes to fresh flowers. This is just as well, since Broom is a hard food-plant to manage; the sprays dry up if exposed to the air and go rotten if enclosed. When I bred *mulinella* from Broom, I found I had unwittingly also collected two common species which mine the bark of the twigs, namely *Leucoptera spartifoliella* Hübn. and *Trifurcula immundella* Zell. Luckily my larvae were nearly full-fed, and as they pupate externally I was able to breed the moths. However younger larvae of these species, or larvae of any age of *Phyllonorycter scopariella* Zell. which pupates in its mine, are in jeopardy if the sprays cannot be kept in fresh condition. The three bark-miners on Broom may be distinguished as follows: *spartifoliella* starts mining upwards from the egg and the larva is greenish; *immundella* starts mining downwards from the egg, the larva is yellow and it sometimes enters a leaflet, hollowing it out and turning it brown, before continuing its mining in the bark; *scopariella* spins the inner surface of its mine causing the skin to contract and fold.

Mr Bradford tells us that his third drawing, depicting *Epiblema* (*Notocelia*) *roborana* Schiff. (*aquana* Hübn.), was made from one of several moths bred from larvae collected at Arundel in Sussex in the spring of 1968; they were feeding in spinnings on an unidentified species of wild rose, but readily accepted garden rose in captivity. The larvae were reddish brown with light brown heads. He describes the adults as follows, "The forewings vary in the density and amount of grey strigulation in the lighter areas. The basal patch is dark fuscous. The triangular area before the cilia at the apex and termen is a lightish brown with streaks of black scales. There is also another area of blackish scales near the tornus. The adults are on the wing mainly in July".

Mr Bradford's drawing should help those who, like me, sometimes find it hard to separate *roborana* from its close and equally common relatives, *rosaecolana* Doubl. and *trimaculana* Haw. (*suffusana* Dup.). In *rosaecolana* the basal half of the costa is more heavily suffused with grey and below this there is a fairly broad, curved, diffused white streak running from the edge of the basal patch at the dorsum to the costa near the apex. Bred *trimaculana* present no problem since the larvae feed on Hawthorn (*Crataegus* spp.) and not rose. Moths taken as adults may be distinguished by their smaller size and narrower wings more heavily suffused with grey. Usually there are fairly distinct white areas beyond the basal patch on the dorsum and on the outer half of the ocellus. The tornal cilia tend to be darker than those of the other species. The more curved contours of the outer edge of the basal patch, used by Meyrick in his key, are generally, but not invariably, a good mark of distinction.

A. M. Emmet (1379)

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Coleoptera

The genus *Bagous* Germ. is poorly represented in many collections. This absence may not be entirely due to the rarity of these weevils: difficulty in finding them is doubtless a contributing factor.

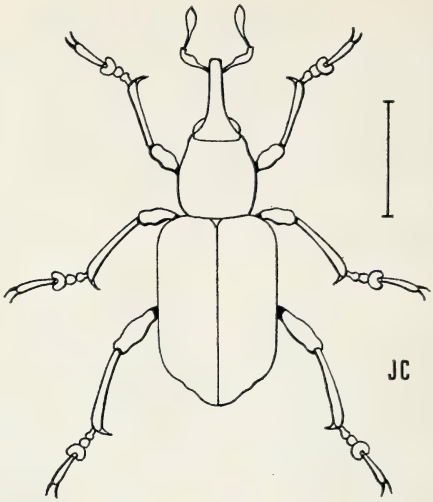
All the species are subaquatic and from late spring to early autumn may be found on certain plants, only occasionally are specimens swept from the vegetation. From late autumn to early spring *Bagous* should be looked for in moss or leaf litter near to their breeding sites. By far the most profitable method of collecting during the summer months is to pull up water plants and examine them carefully over the collecting sheet. The roots and parts underwater are more likely to harbour the beetles than those parts growing above water. Some effort should be made to return the plants so they may continue to grow. *Bagous* weevils are usually very sluggish and can easily be overlooked, especially as they are often covered in mud. Most of the species are gregarious and might be found in numbers once a colony is located.

Very little is known of their biology; observation, especially in the field, is difficult because of their subaquatic habits. Much valuable work has been done by Ruter (1937) who studied *Bagous subcarinatus* Gyll. collected at Bonneuil and Blois on the plant *Ceratophyllum submersum* Linn. in July 1935. An abbreviated account of this is given in Dieckmann (1964), the main points of which are repeated below.

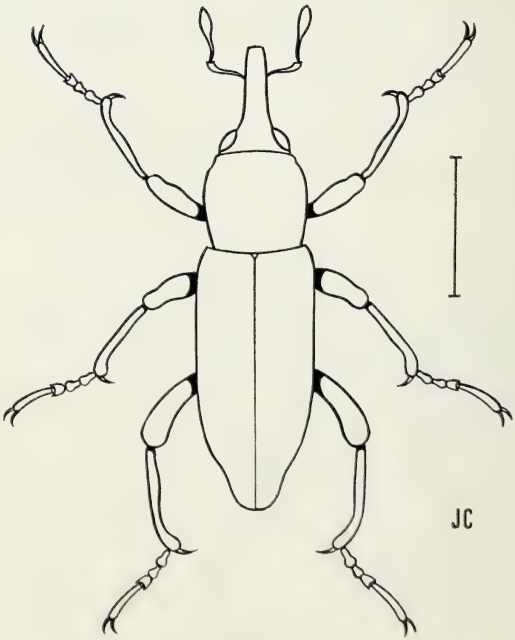
"The pores on the underside of the pro- and mesothorax secrete a water repelling substance, an air bubble extending as far as the mesothoracic epimera covers this region. The rest of the body is wetted, after death the whole body becomes wet.

"When in sunlight the beetles have been observed moving actively about the plants, it is possible that bubbles of oxygen produced by photosynthesis will join with the airbubble on the beetle. Intercellular spaces of the plant tissue may be punctured when the beetles feed, and escaping gases may amalgamate with the bubble carried by the beetle. Excess oxygen can be removed by the action of the hind legs. It is likely that *Bagous* does not need to climb to the surface to replenish its air supply."

Although the differences between some species are very slight, the majority of the species are quite well defined. This genus has always



Bagous lutulentus Gyll.
= nigritarsis Thoms.



Bagous cylindrus Payk.

presented identification problems, especially when no reliably determined material is available for comparison. Several keys and descriptions have appeared in print over the years, the most recent (1964) being Dieckmann's revision of the Central European species. All those known to occur in the British Isles are covered; the aedeagus of each species is figured.

Very few of the larval foodplants are known, those given below are from Dieckmann (1964). Fowler (1891) also mentions some plants, but there is no evidence to show that the adults, let alone the larvae, were eating them. The amateur can do much valuable work in this respect, great care must be taken to ensure that the plant has been accurately identified. The beetles may be brought home and kept in suitable tanks, thus their habits may be observed, and with luck they might breed.

Bagous cylindrus (Payk.) on *Glyceria plicata* Fr. and *Alopecurus aequalis* Sobol. (=*fulvus* Sm.) (Orange Foxtail).

B. tempestivus (Herbst) is one of the less rare species. The adult has been found on *Groenlandia densa* (Linn.) Fourr. (Opposite-leaved Pondweed), *Potamogeton pectinatus* Linn. (Fennel-like Pondweed) and *Sagittaria sagittifolia* Linn. (Arrowhead).

B. czwalinai Seidlitz (=*heasleri* Newbery) is one of our rarest species, known only from the New Forest, Hampshire.

B. collignensis (Herbst) on *Equisetum limosum* Linn.

B. glabrirostris (Herbst) on various *Potamogeton* spp. Kleine (1910) in Dieckmann (1964) gives *Tussilago farfara* Linn. (Coltsfoot).

B. lutulentus (Gyll.) (=*nigritarsis* Thoms.) on *E. limosum*.

The scale line beside each figure represents one millimetre. Most species exhibit quite a range in size. For instance Dieckmann (1964) gives 2.2-3.3 mm for *lutulentus* and 2.7-3.7 mm for *cylindrus*.

J. Cooter (3290)

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SO YOU WANT TO STUDY BEETLES

PART VI—WATER BEETLES

Introduction

Water beetles as such are easy to keep alive and not difficult to rear. I first kept them alive when I was aged eleven years. In those days I used jam jars filled with tap water and soon found that a piece of water weed and a little gravel or sand greatly improved not only the length of time that the beetles could live but also the way the beetles behaved. Not only is it possible to keep water beetles alive under quite simple aquarium conditions but they can be reared with comparatively little trouble.

Nevertheless, although a number of species have been reared, to quote Balfour-Browne (1940-1958), "With regard to the life cycle of the Hydradephaga very little appears to be known except in the few species which have been reared, and even in most of these nothing more is known than the time occupied by each stage and the total time for completing the cycle from oviposition to emergence of the imago".

The water beetles are of two kinds, carnivores and herbivores. The former are the Hydradephaga, in which both adult and larva are carnivorous, the latter belong to the Hydrophilidae, the adults feeding on vegetable matter although the larvae are carnivorous.

In all investigations on the life history of water beetles, it is important to remember that insects are essentially terrestrial animals which have invaded water at a comparatively late stage of their evolution. At no stage can they survive in the absence of air and all species pupate out of the water. When collecting adult specimens in tubes they survive much better in the absence of water. Quite a small amount of water in the tubes will lead to deaths, probably due to drowning.

Conditions for rearing

An aquarium of some sort is necessary for rearing water beetles; this can of course be a relatively inexpensive modern fish tank, but this is not necessary. Any container which has smooth transparent sides is suitable. A jam jar, a half pint or pint glass are all perfectly adequate. Place about one inch of sand on the bottom, fill up with tap water and add a small amount of pond weed and you have a crude, but efficient, aquarium for your beetles.

However, it is inadvisable to use tap water as it is on occasion chlorinated and thus may adversely effect the pond life and the beetles. It is always best to bring home a supply of the water from which the beetles were originally obtained. Loss by evaporation may be made good with tap water, but distilled water (available quite cheaply from most garages) is safer, and, best of all, rain water from an old-fashioned water butt or simply a pail left out for the same purpose.

Sand is quite good for the floors of the aquarium as it settles quickly and makes observation easy. However the bottom material should ideally be that dredged up from the site where the specimens for study were captured. This will not only contain mud, but also detritus such as decaying vegetable material. Make sure sufficient material is taken to cover the floor of the aquarium to a depth of one inch. Many minute animals will often be obtained in this manner and these provide a useful food supply.

A small amount of water weed should be planted in the aquarium. making sure that not too much is used as this will make observation difficult. A piece of weed from the original site is excellent, but Canadian Pondweed (*Elodea canadensis* Michx.), Water-milfoil (*Myriophyllum* spp.), Hornwort (*Ceratophyllum demersum* Linn.), Water-Crowfoot (*Ranunculus*

fluitans Lam.) and *Luronium* (*Alisma*) *natans* (Linn.) Raf. can all be recommended. The assembled aquarium can be used almost immediately, but, if possible, it should be left for a week to settle before use. The aquarium must be covered or one may lose the beetles, which may decide to fly off, or fully grown larvae, which may succeed in climbing out. Most water beetles oviposit in the water or on water plants, but a few oviposit in damp places near the water. Reference to Balfour-Browne's excellent works will be of help here.

All water beetles have to be fed. With luck a reasonable supply of food, in the form of small aquatic animals, will be introduced into the aquarium at the time of preparation. However midge larvae (*Chironomus* spp.) which are often common in water butts, animal water tanks in fields, etc., are a welcome diet to most carnivorous species. No doubt 'Daphnia' would also be eaten and these can at times be bought from pet shops, though a little fishing with a fine net will usually produce an abundance of these from local ponds. Cultures can be started in this manner and then used for feeding beetles. Fifteen to twenty midge larvae will usually keep three average sized beetles for about ten days, although, naturally, a large beetle such as *Dytiscus marginalis* Linn. would require considerably more. The large carnivorous beetles and their larvae when fully grown can be sustained on chopped earthworms or small pieces of meat, but care must be taken not to use too much or the water will be fouled and have to be changed unless the inhabitants are to die. If possible the experimenter should learn to recognise at least the insect and crustacean small life of our ponds and rivers so that a knowledge of any food preferences of the larvae or adults can be obtained. Beetle larvae are cannibalistic, but experience will soon show how many larvae can be successfully kept in a given volume of water with a plentiful food supply.

Since the larvae of water beetles pupate away from the water, with jam jars and similar containers it is necessary to remove the larvae to a puparium at the appropriate time. After three instars, certainly in the Hydradephaga, the larvae, when ready to pupate, cease to feed. This is easily seen since normally, except at ecdysis, the larva always has a victim in its jaws. They also become restless and are obviously trying to escape from the container. At this stage they should be removed to the puparium. Any suitable container will do. It should be filled with firmed, fine earth (dried pond or river mud is most suitable) to a depth of six inches. The soil must be well moistened and kept so. A few dead leaves, reed stems, grass and moss should be placed on top. The larvae either make cocoons in the debris on the surface or burrow down as much as four inches in the soil. The imagines may appear anytime between a few weeks and two years after pupation.

In studying water beetles one can proceed in two ways. Either one can collect larvae, bring them home and rear them or one can collect the adults and breed from them. If larvae are collected then each should be

kept separately throughout the experiment so that there is no doubt as to which larva (and records about it) belongs to which adult. When breeding from adults the original parents should all be preserved for identification and checking by experts so as to prevent errors due to breeding from cultures of more than one species. All exuvia (cast skins) should also be presevered together with full data.

This article only outlines methods to be used in studying water beetles. Further useful information on rearing can be found in Walsh and Dibb (1954) and Linssen (1959), on freshwater life in general in Clegg (1965) and on all aspects of water beetles in Balfour-Browne (1940-1958).

B. J. MacNulty (4528)

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INTRODUCTION TO THE STUDY OF CRANEFLIES— PART IV (continued)

Spring and summer Tipula species

Section 4

Marmorate winged groups plus a few related clear winged species. Twenty-one species fall into this group, of which four have already been described among the autumn group. They are distributed between six subgenera which may be separated as follows:—

(a-c works for both sexes)

(a) Median pair of thoracic (prescutal) stripes broad, with a pale centre and dark margins. The male genitalia in side view have a hook-like spine projecting upwards from sternite 9. The female cerci are upturned at the tip and have a saw margin to the lower edge *Vestiplex*

(b) Five thoracic stripes, a narrow black median stripe being present. *Oreomyza*

(c) Wing vein R_2 is short or absent, so that it does not meet the costa (occasional specimens have this vein complete, or it is shortened in other species—genitalia provide a check). *Pterelashisus*

If not above then males separated into—

(d) The hind margin to sternite 8 is simple, at the most with some scattered hairs (wings may be clear) *Savtshenkia*

(e) Hind margin to sternite 8 has

(i) lobes with tufts of hairs *Savtshenkia* and *Pterelashisus irrorata*

(ii) a W-shaped ridge *Beringotipula*

(iii) or a median forked triangular projection *Lindnerina*

Vestiplex. This is an easily recognised group in both sexes. In the males *scripta* and *montana* have a complete tergite 9, which is dish shaped, whereas in *hortorum* and *nubeculosa* this is deeply divided into two lobes. The first two have a pointed, hooked, spine-like process to sternite 9, whereas in the latter two the tip of the hook is forked (shown in dorsal view on the left side of the illustrations in Fig. 1). Both sexes of *scripta* and *hortorum* have black tips to the orange femora, whilst there is scarcely darkening in *montana* and *nubeculosa*.

Common Hooked Tipula *Tipula scripta* Meigen. This is a common species in woods where its larvae live in soil or dead wood. It is typically found from July to August, but it frequently appears in June and has recently been found in September. At the back of dish shaped tergite 9, frequently hidden under tergite 8, there is a black ridge-like process. The antennae have the basal flagellar segment shorter than the pedicel and scape together.

Scarce Hooked Tipula *Tipula hortorum* Linnaeus. A much scarcer woodland species, showing a preference for northern districts. In both sexes the basal flagellar segment is at least as long as the pedicel and scape together.

Serrate Hooked Tipula *Tipula montana* Curtis. A distinctive species of high mountains, usually over 2000 feet, but in parts of the Craven Pennines it occurs at slightly lower altitudes. It lives on barren windswept ground and is recorded from June till August. The male antennae are distinctly serrate and the female ovipositor has large blunt ended cerci with a saw-like edge.

Yellow-legged Hooked Tipula *Tipula nubeculosa* Meigen. A rare species known from the Dolgelly district of Wales, the Scottish Highlands and Killarny in Ireland. In the former it was found on the wooded banks of a stream. This is the only woodland *Vestiplex* with completely yellow femora.

Oreomyza. The only other sub-genus with five stripes on the dorsal surface of the thorax is *Yamatotipula* (with streaky wings).

Centre-lined Mottled Tipula *Tipula pabulina* Meigen. Locally frequent in woodland in May and June, usually appearing among the earliest spring species. Both sexes have the basal three antennal segments orange.

Dark Centre-lined Mottled Tipula *Tipula truncorum* Macquart. A little known species in Britain, probably restricted to woodland, and found from Scotland southwards to Hertfordshire. The wing markings are intense and both sexes have only the second, and sometimes the apex of the first, antennal segments orange.

Pterelashisus. Of the six British species, five have a reduced or absent R_2 vein, a character not normally found in any other British *Tipula* species (except as a rare aberration). This vein is complete in *T. irrorata* which is also dissimilar in the shape of the male genitalia. They are all associated with woodland.

Fig. 1: Illustrations of groups A, B and C of Section 4. These are spring and summer *Tipula* species with mottled wings and thorax as in a or h, or with wing vein R_2 absent or reduced as in k. Subgenus *Vestiplex* a-g, *Oreomyza* h-j and *Pterelashisus* k-p. b shows the side view of a female cercus, c shows the side view of the tip of the male abdomen with upturned spine on sternite 9 arrowed. The remaining figures of genitalia show details of the tip of tergite 9 in the male: d-f also show parts of tergite 8 and in f and g the left hand side shows the dorsal view of the spine on sternite 9: 1-p also show the outer clasper (oc) in side view with the anterior edge to the left (see c). (ic—inner clasper)

Black-legged Mottled Tipula *Tipula variipennis* Meigen. This is one of the common species of woods and hedgerows in June (occasionally appearing as early as April) which is distinctive in its dark appearance and with at least the apical third of the femora black. The females have rather short wings and the front and mid femora are strongly compressed and

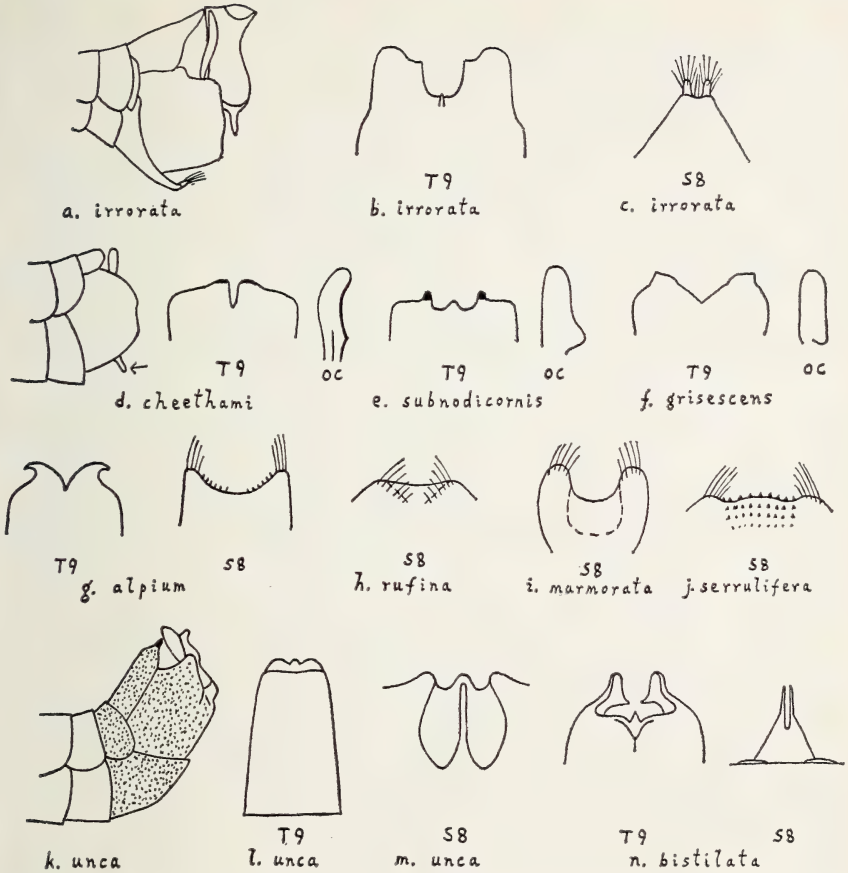

Fig. 2. Illustrations of groups D, E and F of Section 4. *Pterelashisus irrorata* a-c: a shows the distinctive wedge shaped male genitalia in side view: *Savtshenkia* d-j: d shows side view of male genitalia of *cheethami* with peg process on sternite 9 arrowed: d-f show tergite 9 and the outer clasper (where sternite 8 is simple): g-j show the hind margin of sternite 8, illustrating the processes with hairs, and g also shows the distinctive tip of tergite 9 in *alpium*. *Beringotipula* unca k-m, k shows the male genitalia in side view. *Lindneria bistilata* n.

much thickened on the apical two thirds.

Ring-legged Mottled Tipula *Tipula pseudovariipennis* Czizek. This is often thought of as scarce species, but is easily passed over as the previous species. In the south it is one of the first woodland species to appear in mid-May. It is distinguished in being less dark in appearance with the femora only black ringed at the tip. In the female the legs are not thickened. Unlike *variipennis*, there is a distinct spine on the dorsal edge of the inner clasper (clearly visible without dissection).

Yellow-legged Mottled Tipula *Tipula meigeni* Mannheims. This is another early spring species, out in mid to late May in the south. It is

much the palest of the three species and the abdomen is orange with a dark dorsal stripe. The femora are completely orange, or with at the most a faint shade at the tip. The male only has a minute spine on the dorsal edge of the inner clasper.

White-barred Mottled Tipula *Tipula luridirostris* Schummel. It is only recorded from the New Forest in August, and apart from the time of year, could easily be confused with *meigeni* since the femora are also completely yellow. The abdomen is orange with a dark dorsal stripe, but the male genitalia are darker. A distinctive feature of both sexes is a white bar across the wing, running from in front of the stigma, through the discal cell and reaching the hind margin of the wing.

Minute Mottled Tipula *Tipula mutila* Wahlgren. This is only known by a few specimens from the New Forest and Chickerell in Dorset where they were caught in May. It is very small for a *Tipula*, the wing length being only 6-12 mm., but the type of genitalia and absence of vein R_2 clearly place it in this genus. The abdomen is orange with a broad dark dorsal stripe and the genitalia are dark. The wings are only faintly mottled, the most distinctive features being a dark wing tip and a dark shade crossing the wing on the veins below the stigma (as will be described later in *Nephrotoma quadrifaria*).

Wood Mottled Tipula *Tipula irrorata* Macquart. This species is not often seen as an adult, but the grey larvae are common under bark and in the wood of dead logs and stumps. They are very easy to rear. Newly emerged adults have rather pale wings, but if kept in a dry box or tube for a day or so, the mottled wing markings will become quite intense. The male is very distinctive in side view with its wedge shape genitalia, and the small processes with pale golden hairs on sternite 8 are a further character. Both sexes have a completely dusky discal cell, which is an unusual feature and the eyes are close together underneath the head. The adult is out from May to July.

Beringotipula. Double-U Mottled Tipula *Beringotipula unca* Wiedemann. A common species of moist hedges and woods, and also locally in open marshy ground. It usually comes out in June, somewhat later than the first three *Pterelashisus* species. The male is unmistakeable—the 8th and 9th sternites are blackish and turn up at an angle to the axis of the body, and on the hind margin of the 8th sternite there is an orange double-U shaped ridge enclosing two pale golden yellow depressions clothed in fine velvet hairs. Both male and female have an orange abdomen with a dark dorsal stripe and the female has the tergal plate (tergite 10, see figure 1B) shining black. The wings are broadly rounded at the tip.

Lindnerina. The single species of this sub genus has distinctive genitalia in the male. This sex has an orange abdomen with a dark central line, and blackish genitalia. The female has a greyish abdomen with a dark central line and has a very small ovipositor. A useful character in the female is that the tergites are narrowly yellow laterally on the posterior margin.

Scottish Mottled Tipula *Tipula bistilata* Lundstoem. A rare species known from Nethy Bridge and Aviemore in the Scottish Highlands.

Savtskenkia. This sub-genus is predominant in the autumn but three species are restricted to the spring. Four of the autumn species can occur earlier in the year, since *alpium* and *rufina* appear to be double brooded, whilst *serrulifera* occurs as early as August and *marmorata* can occur as early as May in some districts. The genitalia illustrations (Fig. 2) include a side view of *cheethami*, showing the typical compact and rounded genitalia of the subgenus. Only *alpium* has a more broken outline, caused by an extension of sternite 8. The latter species also has a very distinctive tergite 9, and whilst illustrations are also given for *grisescens* and *subnodicornis*, the problem with this group is that tergite 9 tends to shrivel and warp in a dried specimen. *T. subnodicornis* has clear wings. The first three (spring) species have a simple sternite 8 whilst the four previously described have small lobes with tufts of hairs and, in two of them, minute spines.

Pegged Mottled Tipula *Tipula cheethami* Edwards. The peg like process beneath sternite 9 is distinct. *T. alpium* has a process of this type, which is a longer tab-like structure usually hidden from view, but *alpium* differs in having processes on sternite 8. *T. cheethami* is an elusive species in the field, and is confined to northern districts and Wales. The larvae live in moss. The adult is recorded in May and June.

Moorland Grey Tipula *Tipula subnodicornis* Zetterstedt. In northern and western districts this is often a common species on moorland, usually where there are rushes and wet mosses. It is an early spring species which can occur as early as March in its few southern heathland localities, but is generally found in May or June in upland districts. This grey species is clear winged apart from black veins. It is almost unmistakeable on the basis of habitat and time of year. The body is grey, lacking a median stripe, and often of a rather powdery appearance. The legs are blackish except at the base. The wings are rather short in the female.

Bog Mottled Tipula *Tipula grisescens* Zetterstedt. As the scientific name implies this is a rather drab species, of a dark grey colour and with dull mottled wings. It occurs on bogs from April to June in northern districts as far south as Oswestry in Shropshire—there are few other *Tipula* species except *subnodicornis* in such situations in the spring.

Upland Mottled Tipula *Tipula alpium* Bergroth. This is locally common as early as May in upland districts (see Autumn Tipulas).

Striped Mottled Tipula *Tipula rufina* Meigen. The heavy stripe on the side of the thorax is distinctive in both sexes (see Autumn Tipulas).

Mottled Autumn *Tipula marmorata* Meigen. Though a common late summer and autumn species, one was recently found in May in North Wales. (See Autumn Tipulas).

Long-horned Autumn Tipula *Tipula serrulifera* Alexander. A rare Scottish species appearing in August and September (see Autumn species).

Alan E. Stubbs

A PRELIMINARY SURVEY OF THE FOOD AND FEEDING HABITS OF ADULT BUTTERFLIES (Continued)

Nectarless flowers

Nectarless but otherwise insect-attracting flowers are sometimes known as 'pollen' flowers. Examples are Poppies (*Papaver* spp., etc), Dog Rose (*Rosa canina* agg.), Rockrose (*Helianthemum chamaecistus* Mill.), Wood Anemone (*Anemone nemorosa* Linn.), Traveller's Joy (*Clematis vitalba* Linn.), Gorse (*Ulex europaeus* Linn.), Broom (*Sarothamnus scoparius* (Linn.) Wim. ex Koch.), Meadow-sweet (*Filipendula ulmaria* (Linn.) Maxim.) and Elder (*Sambucus nigra* Linn.). These are visited by pollen-feeding insects and on occasion, particularly Rockrose and Elder, by butterflies.

The proboscides of some butterflies are furnished with stiff-pointed appendages which enable them to tear open delicate, succulent tissues thus allowing them to utilise the sap of flowers that do not secrete nectar. This condition is carried still further in the 'fruit-piercing' moths.

Pararge aegeria Linn., in addition to its fondness for piercing (admittedly) over-ripe fruit, has been personally observed to visit the flowers of Rockrose and Elder as well as Traveller's Joy which suggests that this insect must be furnished with an apparatus for obtaining nourishment from nectarless flowers.

Taylor (1957) has written much on the proboscides of African Lepidoptera in which *Dira clytus* Linn., the nearest relative to *P. aegeria* in his list, has "a long proboscis with stout and sharp papillae or setae towards the pointed tip."

Main flower associations

The main flower associations which attract butterflies at different times of the year can be grouped as flolows:

March and April.	*Salix* spp. and *Tussilago farfara* Linn.
May.	*Taraxacum* spp. and *Ajuga reptans* Linn.
June and July.	*Rubus fruticosus* Linn. agg., *Ligustrum vulgare* Linn. *Knautia arvensis* (Linn.) Coult., *Cirsium arvense* (Linn.) Scop., *Trifolium pratense* Linn., *Lotus corniculatus* Linn. and *Hieracium* spp. and other Compositae.
August.	*Buddleia davidii* Franch., *Pulicaria dysenterica* (Linn.) Bernh., *Senecio jacobaea* Linn. and *Origanum vulgare* Linn.
September.	*Succisa pratensis* Moench., *Aster* spp. and *Sedum spectabile* Bor.

Butterflies and orchids

The orchids are a highly specialised group of plants of which there are about fifty British species. They are visited and pollinated by insects

of many orders. It may however be concluded that those species of orchid whose flowers possess a long slender spur are adapted for pollination by butterflies and/or day-flying moths.

The Pyramidal Orchid (*Anacamptis pyramidalis* (Linn.) Rich.) and the Fragrant Orchid (*Gymnadenia conopsea* (Linn.) R.Br.) appear to be the most visited by butterflies and diurnal moths (Zygaenidae, etc.) which are attracted by their coloured flowers. The same species are also attractive by their scent to night-flying moths.

The two Butterfly Orchids, the Lesser (*Platanthera bifolia* (Linn.) Rich.) and the Greater (*P. chlorantha* (Custer) Reichb.) have greenish-white flowers which emit a powerful odour at night and are mainly visited by nocturnal moths. The Fragrant Orchid secretes free nectar which is stored in the spur but the Pyramidal and the Spotted Orchid (*Dactylorchis fuschii* (Druce) Vermeul.) do not. Sugar is however contained in the fleshy walls of the spur and can be obtained by insects with a sharp proboscis.

There is plenty of scope for observations on the relationships between orchids and Lepidoptera. The Burnt Orchid (*Orchis ustulata* Linn.), for example, is probably pollinated by butterflies and day-flying moths, but this appears never to have actually been observed. With some species of orchids it is not even known which insects visit them.

Honeydew

Aphids and some other sap-sucking Hemiptera have to imbibe far more sugar and water than they need in order to obtain sufficient proteins and other essentials of the diet. The excess sugar and water is voided as 'honeydew' which is much sought after by certain insects such as ants, bees, wasps, flies and certain butterflies and moths.

Honeydew seems especially attractive to the Lycaenidae, and the exotic sub-family Lipteninae in particular, of which the genera *Liptena*, *Epitola*, *Teriominia*, *Pentila* and *Larinopoda* are all recorded feeding on the secretions of Homoptera on the young shoots of various plants. The Lycaenid genus *Feniseca* of North America, which preys on aphids in the larval state, has been observed sucking aphid-secretion when adult. An instance has also been recorded of *Lycaena phlaeas* Linn. feeding on the froth of the Froghopper or 'Cuckoo-spit' insects (Hem., Cercopidae).

The attraction of 'dry' honeydew was noted when *Aglais urticae* Linn. was seen on the leaves of *Prunus cerasus* Linn. (Wild Cherry) in company with Diptera and wasps. The butterfly was walking over the upperside of the leaf and probing with the proboscis as were the other insects. The honeydew appeared quite dry to the touch. The undersides of the leaves were infested with small yellow aphids.

Tree-sap

The habit of feeding from sap exuded from trees appears to be confined to the families Satyridae, Nymphalidae and Lycaenidae; at any

rate this is so in Britain. In the tropics Nymphalid genera such as *Agrias*, *Prepona*, *Siderone* and *Ageronia* are well known sap-feeders, probably to the exclusion of other pabula, except, possibly, fruit.

My observations in Britain show two nearly related sources of sap to which butterflies are attracted:

(i) Trees exuding sap naturally, or due to mechanical injury, e.g. damage by storms etc., and

(ii) Exudation due to disease, "slime-flux' and infection by 'cossus' borings of the larvae of the Goat Moth (*Cosuss Cossus* Linn.).

The first source has been known to attract the nymphalids *Nymphalis antiopa* Linn., *Apatura iris* Linn., *N. polychloros* Linn., *Inachis io* Linn. and the Satyrids *P. aegeria* and *Hipparchia semele* Linn.

I made some observations on the second source over the years 1946-53, on seven 'cossus' infected trees, from one of which, a silver birch, several larvae of the Goat Moth were taken: These trees (4 oaks, 1 lime, 1 birch and 1 ash) attracted particularly *Vanessa atalanta* Linn. followed by *Polygonia c-album* Linn., *P. aegeria* and *Quercusia quercus* Linn. No other species of butterfly was seen to visit them, although diurnal microlepidoptera (in particular *Tortrix viridana* Linn.), the hornet and wasps (*Vespa crabro* Linn. and *Vespula* spp.,) and various Diptera were frequently attracted. In S.W. France, however, in 1964, a 'cossus' oak was seen to attract *N. polychloros*, *P. aegeria* in company with *V. crabro*. I have no knowledge if these trees are attractive to nocturnal lepidoptera, and I have never seen as yet either *I. io* or *H. semele* visiting a 'cossus' tree, although, as stated above, both are sap-feeders.

Several facts additional to the above emerge from observations on 'cossus' trees:

(a) The exudation is usually at the base of the trunk, or at the junction of a main branch with the trunk.

(b) The fermenting sap has an odour not unlike stale beer.

(c) No external injury is apparent.

(d) The species of tree does not appear to have any influence on the species of insect attracted.

(e) The sap is undoubtedly potent as butterflies can often be taken by hand when feeding.

(f) Insects of three Orders can be found feeding in close proximity without molesting one another.

(g) The trees are more often than not situated in very shady positions which may partly account for 'open-country' butterflies not visiting them.

Fruit-piercers and fruit-feeders

Over-ripe fruit is a great attraction for some Lepidoptera, particularly moths of the family Noctuidae, subfamilies Catocalinae Agrotinae and Noctuinae. The genera *Achaea*, *Serrodes* and *Sphingomorpha* in South Africa have some particularly interesting but destructive habits. They are mostly nocturnal feeders, and fly up into the trees when disturbed during

the daytime. The fruit preferred is that which is quite ripe but 'picking ripe' fruit is also attacked. The moths (about 2½ in wingspan) have a proboscis about one inch long with a sharp tip and saw-like cutting edges along its sides. It is capable of boring quite hard fruits. Stone fruits and citrus are mostly attacked and the moth inserts its proboscis its full length into the fruit after making a round hole in the skin. The mouthparts are withdrawn at intervals and reinserted sideways so as to get juice from a fairly wide area. In this way a dry spongy mass of tissue is found under the skin which later collapses and rots.

Unfortunately for the fruit growers the insects do not come to light and therefore cannot be trapped by that method. In America the Catocalinae appear to be the principal fruit-piercers, the genus *Alabama* attacking strawberries and grapes, etc.

Turning to butterflies: in Britain we have many species that feed from rotten fruit such as *V. atalanta*, *P. c-album*, *I. io*, *N. antiopa* but the fruit in this case is in a semi-liquid state which can be easily sucked up by the proboscis without the necessity for puncturing the fruit. However in Africa the Satyrid *Melanitis leda ismine* Cram. and *Libythea labdaca* Westwood have been observed and recorded as piercing the fruit prior to imbibing the juice. I am inclined to think that our *P. aegeria* is also capable of fruit-piercing to a certain degree; I have often seen it at ripe blackberries and the fruits of the Wayfaring Tree (*Viburnum lantana* Linn.) as well as being able presumably to obtain nourishment from nectarless flowers.

A large number of tropical butterfly genera feed almost if not exclusively on fruit in the fermented state namely *Ageronia*, *Aaretes*, *Anaea*, *Prepona*, *Catagramma*, *Caligo*, *Ospiphanes*, *Agrias*, *Charaxes* and many others, but here there does not appear to be any recorded evidence of piercing first to obtain the juice. In Africa *Charaxes* spp. are trapped using excrement as bait.

The attraction of salts ('mud puddle clubs')

The phenomenon of the attraction to wet mud by various species of Lepidoptera is well known, although the isolated occurences in Britain cannot compare with the vast congregations that are recorded from warmer countries. The Americans call them 'mud-puddle butterflies' and the associations 'mud-puddle clubs'. The situation is usually one contaminated by animals or man, such as paths, tracks and edges of riverbeds and one can assume that it is a craving for salts of various kinds that causes this behaviour. Three interesting facts emerge from the phenomenon:

(i) The congregations are usually nearly all males.

(ii) The individuals are usually freshly emerged.

(iii) The various species tend to keep together and not to intermingle with other species, although in close proximity.

Various theories have been put forward for the reason for the predominance of males in these gatherings and Klots (1958) is no doubt

correct when he says "Since the females usually do not emerge until several days later than the males, time spent seeking them during the early days would be wasted. The assemblies may, therefore, both preclude this useless effort and prevent the young bachelors from scattering too far and to spend the time usefully in replenishing the liquid lost in the meconium discharged at emergence." On the other hand Corbet (1934) suggests that the butterflies gathered at roadside puddles represent a surplus of males driven off by males already in possession of females.

The Papilionidae, Pieridae and Lycaenidae are the three main families attracted to mud-puddles although species of other families have been recorded. In Britain the phenomenon occurs mainly during hot summers and as these are few and far between it is not often noticed in this country, but there are many records for parts of Europe. My own observations over the last fifteen years are as follows. I have never seen more than five or six at a time and usually singletons or two at the most. *Pieris napi* Linn. and *P. rapae* Linn. are the species mostly seen, but I have also observed *Celastrina argiolus* Linn., *Clossiana euphrosyne* Linn., *Fabriciana adippe Schiff.*, *Mesoacidalia aglaja* Linn., *Strymonidea pruni* Linn., *Polyommatus icarus* Rott., *Thymelicus sylvestris* Poda, *Argynnis paphia* Linn., *Pyrgus malvae* Linn., *Lysandra coridon* Poda, *P. c-album*, *Cupido minimus* Fuess., *Limenitis camilla* Linn. and *Leptidea sinapis* Linn.

Human perspiration and 'pumping'

Another source of salt is human perspiration. Various species, usually Hesperiidae have been recorded as being attracted to discarded clothing, sweat-soaked shirts, etc. as well as imbibing moisture from the human skin. My own experiences amount to *T. sylvestris* drinking from the palm of the hand, *P. c-album* settling on the forearm to suck up perspiration and *Limenitis reducta* Staud. doing the same thing in France.

An interesting sidelight on this habit is that of 'pumping'. Butterflies drinking from puddles have been noticed to frequently exude clear liquid from the tip of the abdomen. A possible explanation being that they take in far more than they need to extract the necessary salts and void the surplus. I have personally noted Vanessids doing this when feeding at Buddleia, and have experienced *Ochlodes venatus* Turati settle on the forearm and deposit a minute globule of clear liquid and reabsorb it through the proboscis. This was repeated several times, the insect moving about to a fresh position each time. It is probable that this method is used to induct any food not already in a liquid state. e.g. dry honeydew, and serves the purpose of bringing the salts or sugar into solution and thus capable of assimilation.

Attraction to Boraginaceae

The attraction that one or two species of the Boraginaceae have for certain butterflies, is quite well-known, and it is interesting to collate observations made in various parts of the tropics. The two plants concerned

are *Heliotropum indicum* Linn. and *Tournefortia argentea* Linn., the former in Malaya, Brazil, Venezuela and E. Africa, and the latter in the Pacific Islands. Apparently neither plant serves as a larval foodplant, and the butterflies themselves do not visit the flowers. The attraction lies in the dead and withering leaves and twigs and not the growing plant.

H. indicum is a small shrub about 15 in high growing on river banks, whereas *T. argentea* is a tree, common on the seashore. The former is uprooted by collectors and suspended in a bunch by the roots as bait, and in a few days, when dry, it begins to attract butterflies. Little is mentioned of the insects' behaviour except that they settle with folded wings and may or may not extend the proboscis. No exudation is said to be seen on the dead twigs, which become more effective with additional drying.

The interesting fact regarding this phenomenon is that the only group of butterflies attracted is the family Danaidae, which includes the subfamilies Ithomiinae on *H. indicum* in South America, and the Euploeniae on *T. argentea* in the Pacific Islands.

The reason for this attraction is somewhat obscure. It has been suggested that the scent may resemble that of a virgin female, as males seem to predominate, However, it is a fact that some species of Boraginaceae contain potassium nitrate (saltpetre) and are frequently used in certain drinks to impart coolness. Is it too much to suggest that these plants may also produce saltpetre and that this salt is the attraction? Possibly it is assimilated by the butterfly by the means of 'pumping' and re-absorption.

Saltpetre is prepared artificially by exposing a mixture of calcareous soil and animal matter to the atmosphere. This is in fact what happens in nature and would help to explain the attraction of butterflies to wet mud, sand, etc. in areas that have been contaminated in one way or the other by man and animals, that is, of course, if it is salts of various kinds that the insects seek. My own opinion is that the craving for salt is the reason for the attraction of mud, sand, carrion, animal dropping, cement, brickdust and other unusual sources of nourishment.

An entomologist of my acquaintance told me that he had seen congregations of *P. rapae* at wet brickdust in a large brickfield. In 1955 more than 200 were seen and in 1957 over twenty on one occasion. They were easy prey for local sparrows and many were seen by him to be taken. He understood that the brickdust contained saltpetre. At the same brickfield I personally saw quite a few *A. urticae* settling on cinder heaps used in brick making and when driven off would return. However, I did not notice at the time whether or not the proboscis was extended..

Carrion and animal droppings

It comes as a surprise that an insect as attractive as a butterfly should visit such unpleasant sources for nourishment. Although all the older books attribute this habit to the Purple Emperor (*Apatura iris* Linn.), Heslop *et al* (1964) maintain that the habit is dying out with our English

species, but allied species on the continent appear to continue it if the modern literature is to be relied upon.

I have never seen a butterfly on carrion myself but there are many references to the occurrence involving species other than the Purple Emperor: *C. euphrosyne* on 'dead animal remains', *V. atalanta* at a dead rat on a manure heap, *Polygonia faunus* Edwards attracted in numbers to a dead skunk in America, Papilios and Nymphalids attracted to stale prawns in Malaya, dozens of *Papilio glaucus* Linn. crowding about fermented toads eggs, also in America, and, most unpleasant of all, various butterflies were observed on human corpses during the terrorist campaign in Malaya. Klots (1958) maintains that there is evidence that some butterflies (e.g. *Apatura*) and moths are perhaps exclusively carrion feeders.

References to Lepidoptera attracted to animal droppings are numerous in the literature, and abroad include the the genera *Charaxes* and *Morpho* among many others. In this country I have personally observed *I. io* and the geometrid moth *Pseudopanthera macularia* Linn. both at the droppings of a fox, and *P. icarus* at horse manure. There is also a reference to *P. napi* in numbers at a cow-pat.

The Lycaenidae appear to favour bird-droppings and there are reports of *Lysandra bellargus* Rott., *P. icarus*, *Aricia agestis* Schiff., and *C. minimus* so attracted, while I have myself seen *C. argiolus* similarly engaged. It was a freshly emerged male, as were the other species mentioned above. It is strange that so many (presumably) sources of salts seem to attract mainly males. *L. coridon* males were observed by P. W. Cribb on the South Downs massed on recently deposited cowpats. During the myxomatosis outbreak P. Taylor and P. W. Cribb observed several *L. bellargus* feeding on the partly decomposed bodies of rabbits on the Chilterns near Streatley.

Fungal juices

Klots (1951) refers to butterflies visiting decaying wood. In this case *Limenitis archippus* Cram. in America imbibing ". . . the apparently tasty juices, probably of fungi, on decaying wood." There is also a British reference to *P. rapae* and *P. napi* seen on wet charred wood.

My own observations in this connection are as follows:
P. napi feeding from wet sawdust in 1952 in a woodland path during tree-felling, *L. phlaeas* in exactly similar circumstances in 1955, and the following year *P. malvae* (several fresh specimens) settling on what appeared to be *dry* sawdust scattered in a forest ride. At the time of the observations I could not come to any conclusion as to the reason for this behaviour, but the juices of minute fungi is the probable explanation.

Fresh tar

The attraction of fresh tar for *V. atalanta* has been recorded by St John (1948), who states that he saw two individuals alight upon a freshly tarred and sanded road in the London area. The road was inspected for

any other food source but none was found. A few years after, I made the same observation myself, again involving *V. atlanta.* It was not possible to see if the proboscis was extended, and no explanation for this extraordinary behaviour can be offered.

Fresh cement

A reliable observer reported to me in 1947 that he witnessed "almost a dozen *A. urticae* drinking from freshly laid concrete". August 1947 was a very warm dry period, so I can only conclude that water itself was the source of the attraction.

Open water

The behaviour of butterflies drinking from wet places is well known, but little has been recorded of the insects drinking from the free surface of open bodies of water, ponds, rivers, etc. However, during the hot summer of 1947 I was watching swallows drinking on the wing by dipping into a large pond and was surprised to see *A. urticae* do the same. There were quite a few of this species flying in the vicinity of the pond, although many were merely settling and drinking from the edge. However, the individual in question after circling round for a few seconds deliberately dipped into the water. Presumably the water retained on the body was then sucked up by the proboscis. A friend who was with me at the time remarked that he had seen *Lasiommata megera* Linn. do the same thing a few days previously.

Some years later, in 1965, I was sitting by a canal in S.W. France when I saw a Brown butterfly, later identified as *Maniola jurtina* Linn., fly halfway across the canal and settle on the surface of the water. It remained there for about thirty seconds and then continued its journey to the bank where I was sitting. I can only assume that the object was to drink, as the canal was not wide enough to require rest halfway.

Kirby (1896) records a similar happening with *Papilio helenus* Linn. He states: "Flying low, as is the habit of this species . . I saw it suddenly half close its wings and dive down . . . so that the whole body and about a third of the wings, which slanted upwards, were immersed; it then raised itself again out of the water, and flew away . . ."

Chlorine

The attraction of domestic bleach on wet washing for some insects has been recorded. Cupesid beetle have been recorded attracted in numbers to laundry on a line. Tests were made and it was found to be saturated with a solution of domestic bleach containing 5% available chlorine. The species was *Priacma serrata* Lec.

Regarding butterflies, I have observed both *A. urticae* and *I. io* drinking in this manner on several occasions, but it is difficult to say whether it was chlorine that attracted them or merely the water and the whiteness of the washing in the sun.

It is said that putrid soapsuds have been used by the French in place of 'sugar' as an attractant for moths. According to Knaggs (1869) sugar made from beet has no smell, and has little, if any, power to attract.

Attraction of hot stone walls and rocks

The day-flying moth *Macroglossum stellatarum* Linn. has been recorded many times flying near and extending its proboscis to the sun-baked faces of brick walls, rocks and stone walls. The oldest record of this behaviour I have found is that of Clapton (1834) who says "They (*M. stellatarum*) frequented much a stone wall at the end of Lord Surrey's grounds (Littlehampton) along which they were constantly flying, and apparently examining it with great attention. As there were no flowers there I was at a loss to discover what their object was in so industriously haunting this spot. They were not depositing eggs . . ." More recent records tell the same story, and I have witnessed the same happening on at least two occasions in France. The reason for this behaviour is obscure, and the only suggestions I have seen are that they are seeking honey from old nests of *Megachile* spp. (Hym., Apidre) or obtaining radiated heat, but this latter suggestion would hardly cause the insect to extend the proboscis.

(*To be continued*) B. R. Stallwood (1547)

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JUNIOR NEWS

In the February *Bulletin* there is a flattering article about the Junior Exhibits at the 1972 Exhibition by Mr Prior. Let us see if you can do better this year and make the judges' job even more difficult! Remember that what is looked for is original studies.

I have had a letter from Ian Croft of 19 McCracken Avenue, Hillcrest, Hamilton, New Zealand, who would like correspondents. He is feeling somewhat isolated as his two friends are now 400 miles away as he has moved North. Anyone who can write to him would be welcome—but don't write cadging specimens as they are not all that abundant in New Zealand, anyhow. He asks for information on Bagworms, his principal interest being in the Lepidoptera. The literature on these case-bearing larvae of moths is usually expensive. They come under (in most classifications) the family name of Psychidae. If anyone can help him with informa-

tion about those in New Zealand, I would be grateful. I notice that Ian is studying their behaviour, which shows that he has the right ideas.

J. Bowman of Ayrshire writes to ask if mantids are likely to eat locusts as he is interested in breeding both. The answer is that they are—and each other. At a recent meeting of the Camberley Natural History Society it was said that full-grown mantids had been seen eating lizards. A scorpion had been offered to a hungry mantid, and had been eaten by it, the mantid biting off the sting first of all. However, when a second scorpion was offered to the now well fed mantid, the result was different, the scorpion stinging and killing the mantid.

Nigel Ball of Crewe has sent a crossword to the Bulletin Editor for publication, but Dr Boswell regrets that he is unable to publish it. However, I can use it as basis for a quiz in a future 'Junior News'.

I have had an excellent letter from I. (? Ian) Scott of Woburn Sands which I found very interesting. A few more letters like this and my job would be easier and the *Bulletin* even more interesting. Here is most of his letter:

"Although I am mainly interested in breeding macrolepidoptera last year I thought that I would also try to establish a small colony of ants in an artificial structure, thinking of performing certain experiments with them at a later time. However, unfortunately time after time I met with failure. Firstly, I introduced a colony of about a hundred ants, including a queen and brood, onto a stand made of plywood, with an artificial 'nest' on top. To prevent them escaping I used a method described in a book which entailed raising the platform on four nails; the nails having a container filled with D.D.T. at the base. This D.D.T. worked, as the ants soon learned to avoid it. However, they had a habit of exploring and they often went on the underside of the platform, promptly falling off and thus escaping. I next tried using expanded polystyrene for the platform, thinking that the ants would have a better foothold. But this did not prove the case and again the ants fell off the underside of the platform.

Next I got rid of the nails and made a barrier of D.D.T. around the platform. This, however, proved unsuccessful as the ants just wandered into the D.D.T. I also tried certain sticky substances as barriers but again the ants wandered into the barrier and died. Also the sticky substances tended to dry up after a time.

Next I tried standing a colony on an 'island'. This consisted of a concrete slab in the middle of a water container. However, again this method failed for a number of reasons. Firstly, the water quickly evaporated in the warmth and constantly had to be replaced. Secondly, the ants often fell off the 'island' and either drowned or escaped. Thirdly, small particles of debris, dust, etc. fell onto the water causing a thin film on the surface of the water, thus enabling the ants to escape. Lastly, the size of the 'island' was small as a large enough water container could not be purchased with the money available to me.

I tried each of these methods with three species of ant: the black garden ant (?*Lasius niger* (Linn.)—Ed.)—which proved to be too active and too easily scared; a small, light-coloured brown ant found in meadows (?*L. flavus* (Fab.)—Ed.)—I was unable to find a queen in any colony of this species; and a reddish-brown ant found under stones, etc, in the garden (?*Myrmica* sp.—Ed.)—I could usually find a queen, but the colonies were scarce, but this seemed the most suitable of the three species. I do not want to give up after doing so much but I am now stuck for an idea for keeping the ant colonies confined in 'open captivity'. I would be very grateful if anyone could help me in this problem."

Well, any ideas? Bear in mind that he is a Junior, and hasn't got unlimited resources at his disposal.

This article should reach you sometime in May, when, for the Lepidopterists, larvae are common. Take care to breed those you find carefully, releasing as many of the resultant butterflies or moths as you can, preferably where you found the larvae (except, perhaps, in the case of such as the Large Cabbage White!). You will notice if you look up in the text books (such as 'South') that the larvae are usually only described at one stage of their growth (usually the last). Using this description as a guide try to write down the descriptions at the other stages (instars). Also note down any peculiarities in behaviour. It is easiest, of course, to do all this when breeding from ova which have come from an identified insect, because then you know what you are dealing with and at what stage the larva is at. But notes on behaviour can be kept on any larva, and if you cannot identify it, then perhaps you will be able to do so from the perfect insect. This means carefully labelling and keeping them separate. I would appreciate copies of your notes on identified species, and I will either include them in one of these articles, or store them up so that they can be published in a future *Bulletin*.

Please write more letters, then the AES Council may not only have to give three prizes at the Exhibition, but have to publish more *Bulletins* (and supply tranquillizers to the Editor). D. Ollevant (1514)

A few notes on ants in captivity

Mr Ollevant's young correspondent has found that it is very difficult to keep ants in open captivity. The book which I think he has used for his information is *The Study of Ants* by S. H. Skaife, which was published in 1961 by Longmans and, although I think it is now out of print, sometimes turns up in second-hand book shops. The author seems to have been much more successful in the use of platforms, etc. than I have. He does however describe ways of confining the ants while still allowing them plenty of freedom to move around. I think this will be the answer to the problem.

The best species to start with, though not necessarily the most interesting, are the 'red ants' (*Myrmica* spp.). They are readily found nesting under stones and their queens are usually easy to find. *Lasius* spp. are not so suitable as queens are often difficult to find and queenless colonies do not do well. Paul Boswell (2853)

LETTERS TO THE EDITOR

Kenyan entomology

Dear Sir,

I have recently received a number of letters from AES members resident in Britain asking for my assistance in obtaining living or dead examples of East African insects, especially Lepidoptera. I believe these members obtained my address from an AES membership list, a copy of which has not yet reached me.

I find myself in a difficult position over these requests. I am a keen conservationist and am extremely alarmed at the many dangers to which the insect fauna here in East Africa is exposed. Examples are:

(a) Massive destruction of habitat as forest are felled and way made for "development". The birth rate in Kenya is extremely high and with every Kenyan hoping and expecting to own his own "shamba" (piece of land) the future for much of the unprotected countryside here is bleak.

(b) Chlorinated hydrocarbon insecticides are used in large amounts each year to kill such insects as tsetse flies and mosquitos. This frequently involves the indiscriminate spraying of forest and scrub and many inoffensive or useful insects are also killed. The overall effect of such insecticides on the ecosystem is still not fully understood but it can reasonably be assumed that it does little to enhance the survival rate of those insects affected.

(c) Commercial interests are already active here in East Africa. They range from local dealers who purchase attractive butterflies in order to incorporate them into bracelets to British and American entomological companies which solicit both common and rare species in order to sell them to entomologists. This trade is, unfortunately, growing and at present not subjected to any form of control. I hope it will be apparent from the above that is is not only the large game animals of East Africa that require strict protection if they are to survive. The invertebrates and lower vertebrates have long been neglected and it is only comparatively recently that interest has been aroused in their conservation. East Africa is changing fast and it is vital that all steps possible are taken to conserve the indigenous fauna and flora without unnecessarily prejudicing the lives and progress of the local people.

It is against this background that I have decided I cannot promise to help AES members who require 'material', whether it be alive or dead. I shall assist where I can (usually where the demand is for small numbers of the commoner species for serious scientific or educational purposes) and where applicable, I shall pass on letters to fellow entomologists here in East Africa.

I should be most grateful if you could publish this letter in the Bulletin as soon as possible. I am unable to reply personally to all the

members who have requested specimens and I should therefore like, through this letter, to explain my reasons for not offering assistance to all those who have written to me. J. E. Cooper (2343)

Eggs which hatch early

Dear Sir,

Last autumn I caught a female *Atethmia xerampelina* Esp. which laid a batch of ova. I could find no mention of the time of hatching in 'South', so I left them in a cold garage and was somewhat surprised when they hatched in early January—particularly as this species is recorded as an Ash feeder! If anyone has any experience of this moth I would like to know.

B. Coles (3533)

The Small Lappet

Dear Sir,

Could anyone please give me any information about the present status of the Small Lappet (*Epicnaptera ilicifolia* Linn.). It appeared in the '*List of Endangered Species*' published in the November *Bulletin*. I was under the impression that it was extinct in this country, but the information I have is pre-MV light and, as this family is strongly attracted to light, I wondered if any new information had come to light (sorry!).

W. Coster (4697)

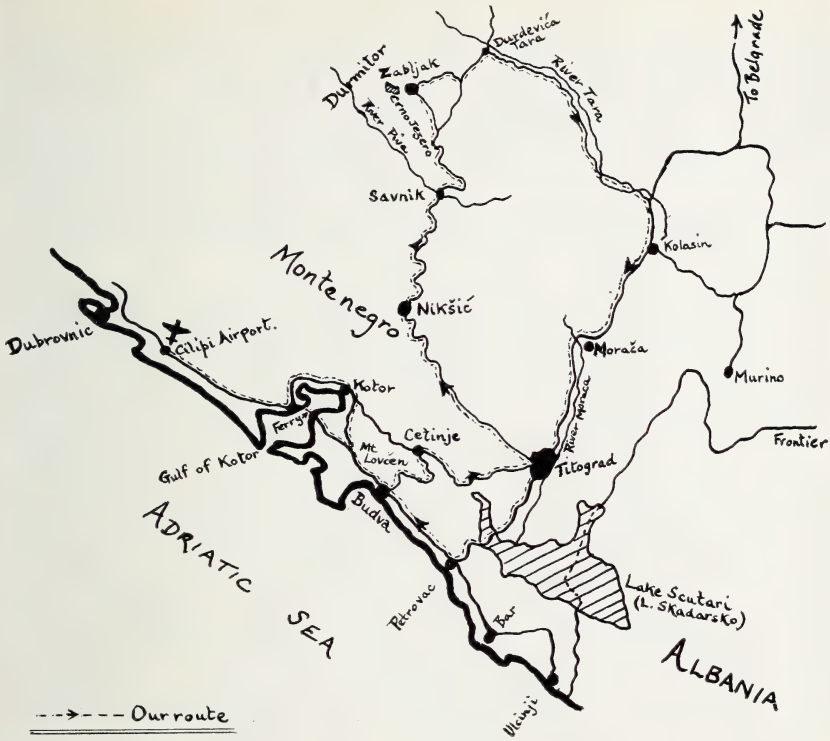
Egg-laying habits of a New Zealand Satyrid

Dear Sir,

I read with great interest the notes in the November *Bulletin* on unusual egg-laying habits in butterflies. Here in New Zealand we have an alpine satyrid butterfly, *Percnodaimon pluto* Fereday, in which oviposition occurs on the under surface of rocks. Due to the unusual egg-laying habit of *Erebia pluto* de Prun., it is not surprising that a recent worker (Dr Gibbs of Victoria University) considers that *P. pluto* appears to be an ecological homologue of *E. pluto*. R. C. Craw (4087)

EXPEDITION TO MONTENEGRO 1972

Crna Gora, the Land of the Black Mountain, is a name that conjures up a picture of a mysterious mountain people, independent, prone to vendettas, freedom fighters. Montenegro was the only Balkan state to withstand the Turkish onslaught, its people retreating into the mountain fastnesses, and when the Jugoslavs resisted the Italian and German invasion during the last war Tito chose the same mountains for his headquarters. The country is a muddle of high mountains rising out of upland plains with a narrow coastal strip lying at the foot of the ranges. This strip today forms part of the Adriatic Riviera and has become the playground of the sun-seekers, with large hotel complexes in those towns where beaches are approachable but these visitors learn little of the hinterland other than



by taking the coach trips which traverse the few good roads open to them. The highest mountain group in the Country is that of Durmitor standing above the village of Zabljak and rising to over 8,000 ft. There is little available published material on the insects of the area and after reading an article on the floral wealth I felt that it would be well worth a visit to examine the insect fauna. The mountains and upland plains experience a severe winter and in view of this and the altitude, it was decided that mid-July might be the most rewarding period for the venture. Yugotours, an official Jugoslav tourist agency in London, was most co-operative in arranging the details of the air journey, hotels and car. Messrs. W. L. Coleridge, R. F. Bretherton and myself were to join forces on the trip but unfortunately Coleridge became ill and had to fall out. So it was that on the afternoon of July 8th, Bretherton and I met at Gatwick and flew by BAC1-11 in a thick mist for Cilipi, the airport near Dubrovnik. Over Munich the cloud cleared to give us a view of the Olympic Stadium and two and a half hours after take off we landed in bright sunshine on the single runway at Cilipi, coming in over high cliffs with the mountains just beyond. A car, a Bulgar Renault, was waiting for us and after changing our currency (one is limited as to what one can bring into or out of the country) we drove off along the coastal road. This road is a reasonable tarmac surface and wide

enough to allow overtaking in safety. The Gulf of Kotor lies across the road, a fiord-like inlet almost surrounded by the mountains of which Lovcen is the highest peak. It was dusk as we reached the ferry and we were lucky to be the last car on. The ferry is two boats abreast with a platform between, though new ferries deal with heavy lorries and coaches. We arrived at Budva at 9.30 p.m. where we were to spend the night at the Hotel Slavija. This is one of a large complex of about nine hotels sited away from the ancient harbour of Budva. It proved to be extremely modern and well appointed.

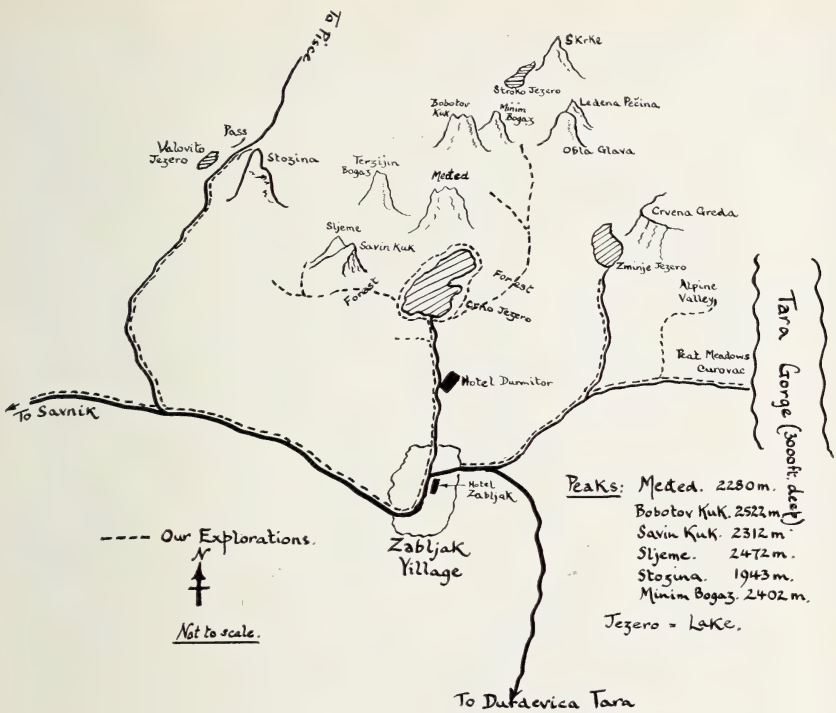
We were up next morning early and had breakfast at 7 a.m. when it was already quite hot. We drove off into the mountains immediately above Budva on the road to Cetinje, once the capital of Montenegro. The mountain slopes are covered with a 'maquis' like vegetation which includes Pomegranates, Figs and a shrub with dark green leaves and almost white fruits which were quite striking, *Paliurus spinachristi* Miller (Rhamnaceae). Even at this early hour butterflies were on the wing. After about five kilometres we stopped by the roadside and the first butterfly I netted was a new species for me, *Pieris ergane* Geyer, There were dozens of Gypsy moths, (*Limantria dispar* Linn.) flying around the bushes. One had been caught by a huge Orb Spider. These spiders were all over the slopes and their webs which spanned the paths were a continual nuisance. I netted the spider and moth and immediately several males assembled around the net. For the next few days whenever the net was produced it was certain to attract more males to it and I can only assume that the male caught by the spider had been recently mated and was still carrying the scent of the female. We drove a short distance on up the road when I spotted a large blue butterfly by the roadside. We stopped and I rushed out to catch the only specimen of *Iolana iolas* Ochs. of the trip. We saw several others flying swiftly up the slopes where we found several bushes of its foodplant growing, *Colutea arborescens* Linn., and we gathered up some of the pods in the hope that they might contain small larvae. In the small rough terraced meadows by the road there were large Ant Lions flying and the whole slope roared with the sound of Cicadas and Bush Crickets. I found a male Tortoise and subsequently we found several others, saving one from a passing car.

The pass wound up into the mountains and near the top we stopped again on some very rough slopes to collect. The mountains are of Karst, a limestone which resembles that of the Burren in Ireland. Vegetation is very thin and there are none of the streams that one usually associates with mountains as the water passes through the limestone to appear lower down as ready made rivers usually in deep gorges. Despite the lack of vegetation and moisture the area was rich in butterflies. Amongst them were *Melanargia larissa* Geyer, *Libythea celtis* Laich and *Polygonia egea* Cr. Several large Satyrs were flying over the rocks, *Chazara briseis* Linn., *Satyrus ferula* Fab., *Brintesia circe* Fab. and one specimen of *Kirinia roxelana* Cr. Several Scarce Swallowtails (*Iphiclides podalirius* Linn.) were

flying around some stunted Sloe bushes (*Prunus spinosa* Linn.) where I found one egg. A fast flying Copper was dashing around the bushes and may have been *Heodes ottomanus* Lefebvre as it was recorded from here by Epstein in 1971 (ex. litt.) but we failed to catch any. The commonest White which bobbed about along the roadsides wherever we stopped was the Wood White (*Leptidea sinapis* Linn.). Many of the females were without markings.

The road climbed down to Cetijne and then twisted up again towards Titograd, the new capital built on the old site of Podgorica, destroyed in the last war. The road overlooked the northern end of Lake Scutari (Skadorsko). Here it is dense with Water Lilies (*Nuphar* sp.) through which are cut canals for the small boats which fish the lake. Titograd lies in the plain north of the Lake and to the south are the mountains of Albania. We skirted the town and then took the road towards Niksic. The surface deteriorated and the road was narrower but worse was to come. We climbed up to Niksic where we stopped for petrol and picked up a young man who offered to show us the way to Zabljak as he was going there. Immediately the road became almost impossible. Not only was it narrow but the surface consisted of widely spaced rocks, eroded into large potholes often with a high ridge running down the centre. Shaking all over the place and followed by a large cloud of dust we drove at about twenty km.p.h., for the most part in second gear. The gear box made an infernal din and after what seemed hours we came to the village of Savnik above the River Piva where we stopped for a drink. Our passenger had a glass of the local drink, Slivovica, a plum brandy, and then proceeded to sing a dirge in the back seat for the rest of the journey. We came at last on to the vast upland plain in which Zabljak lies. Here were flowery meadows which were being cut by groups of men using scythes, cutting the grass as closely as a lawn. We stopped to explore and found the meadows almost devoid of butterflies despite the flowers. We did take *Fabriciana niobe eris* Meig. but it was clear that this area was going to prove pretty useless. The close cutting is so effective that it has the same effect as close grazing. Just short of Zabljak we suddenly came on to a metalled surface, still with a sprinkling of potholes, leading us into the village. It was now 7 p.m. and we were ready for a meal and bed. Our room looked out onto the Durmitor massif and the village square. An older Hotel, the Durmitor, lies beyond the village nearer to Durmitor and there are many new chalets constructed around the village to accommodate visitors. We had supper with an English couple, Mr and Mrs Taylor, the only compatriots we met away from the coast. Next morning, the mountains were brilliant with sunshine as we drove up the short road to the Black Lake, Crno Jezero, which lies at the foot of the massif. We gave the Taylors a lift as far as the lake and then parted company, Bretherton and I taking the track to the left through the tall firs, *Abies alba* Mill,, which form the basis of the primeval forest. The sun was already very hot and there were a few *Erebia ligea* Linn. and *E. euryale* Esp. flying in the clearings around the lake. The former were freshly

emerged and the females of *E. euryale* were very colourfully marked on the undersides. The path skirted the lake shore, rising and falling through the trees and we saw no more butterflies until we emerged onto the sunny slopes on the north corner of the lake. Here the steep slopes were open and had a fair scattering of flowers including *Solidago* sp., Viper's Bugloss (*Echium vulgare* Linn.) and a beautiful Cow-wheat, (*Melampyrum nemorosum* Linn.) which has yellow flowers surmounted by a group of purplish blue bracts. As we came to the first slope and into the sun a butterfly circled down from the trees and I was able to net it. At first I took it to be a Large Tortoiseshell (*Nymphalis polychloros* Linn.), but we were delighted to find that it was *N. vau-album* Schiff. It was a fresh male and its capture adds about 150 miles to its previously known range. The next excitement was the sight of a huge Camberwell Beauty (*N. antiopa* Linn.) which circled a Sallow bush (*Salix* sp.) and alighted on the muddy edge of the lake. I was able to photograph it before putting the net over it. The steep slopes above the lake are too much even for the local agile sheep to graze and here we found butterflies in plenty. Among the species taken were *Melitaea didyma* Esp., *Mellicta athalia* Rott., *Plebejus argus* Linn. and *Lycaeides idas* Linn., several male *Meleageria daphnis* Schiff., *Plebicula dorylas* Schiff. and some worn *Maculinea arion* Linn. of the dark form *obscura* Christ. There were several *Parnassius apollo* Linn. in copula among the grasses and I took two pairs. The horny appendage which the females carry after copulation is formed during the act and appears to come from the male. After separation it seals over the vagina and possibly retains the semen. It certainly prevents further matings. These females laid quite happily in a plastic box in the hotel, smothering some Stonecrop (*Sedum* sp.) with their eggs. Among the Skippers present were *Spialia sertorius orbifer* Hübn. and *Carcharodus lavatherae* Esp. Coppers were represented by *Heodes alciphron* Rott. with females like the northern races, *Palaeochrysophanus hippothoe leonardi* Frhst. which in the male has very dark purple suffusion of the lower wings, and *H. virgaureae* Linn. I took one *Lycaena phlaeas* Linn., a male with pronounced tails and darkly suffused. Higher up the slope where there were outcrops of rock, Bretherton took the first example of the local Erebia, *E. melas schwardae* Frhst., which is black with white eye spots. The sun starts to get behind the mountains about 3 p.m. and butterflies disappeared so we walked back to the car and drove back through Zabljak and took a very rough dirt and stone road towards the village of Curovac. The commonest bird was the Hooded Crow which sat along the roadside in twos and threes. We took the left fork of the track and entered the forest where we parked the car and searched the clearings in the wood below the crag of Crvena Greda. Nearby is another lake, Zminje Jezero, the Lake of the Serpent, deep in the forest and we met some fishermen returning from it. A stream ran down from the lake through damp clearings but apart from *Mescacidalia aglaja* Linn. there was nothing here. The forest is quite sterile apart from the occasional wanderer and we decided to have a look at the flowery meadows



on the way back to Zabljak. These were being cut by scythe by a group of men and the only species present were *Aglais urticae* Linn. and a *Pyrgus* sp., *P. alveus* Hübn., which we found throughout the area. Though we did not know it then, this was to be the last full day of sunshine we were to enjoy and as a storm came up over the mountains we returned to the Hotel for our evening meal. This always proved amusing as the menus were Serbo-Croation and the phrase book could not cope so that we used a pin and hoped for the best, not always successfully. The local delicacy was a sort of cheese and potato cake with sour milk and although Bretherton did order it on several occasions we always seemed to get something else. The food was ample and generally well cooked but breakfast always produced a hard-boiled egg and dessert was always three stewed plums. Our room looked out onto the mountains and we watched the storm break. The power to the village was cut almost everytime there was a storm and often when there was not, so that setting was often difficult and we had supper more often by candle light with candles stuck into bottles. With this first storm the weather took up a pattern of very bright and promising dawns which developed into clouded mornings and by 4 p.m. we had a storm with torrential rain or hail.

On the Tuesday we decided to strike for the high ground in the hope of getting above the grazing and took the path leading to the highest peak, Bobotov Kuk. This led round the Black Lake and then up into the forest for about an hour's climbing along a rough track. The normal sequence of forest is reversed and above the *Abies* is a belt of Beech (*Fagus sylvatica* Linn.) interspersed with a dwarf Acer, *Acer visianii* Nym. Above this we came out into rock strewn upland meadows where the grass was grazed like any bowling green. The predominant flower was a beautiful yellow Flax, *Linum capitatum* Kit., which the sheep avoided. Among the rocks were flying plenty of male *E. melas* and I took one *Lasiommata petropolitana* Fab., several *Pieris mannii* Meyer, *P. napi* Linn. and one nice male *Maculinea alcon* Linn. Somehow we missed the path to Bobotov Kuk as the way was unmarked and the chaos of rocks made the route confusing. We found ourselves in a deep gorge leading round the foot of the peak called Meded. This was a jumble of rocks which eventually led us to a large amphitheatre-like area surrounded by the peaks of the massif, Bobotov Kuk, Obla Glava (the Bald Head) and Ledena Pecina (the Ice Cavern). Here we took odd specimens of *Erebia epiphron* Knoch. and one *E. medusa* Schiff. but the grazing was again so close that we did not expect to see much. We met a young shepherdess who was knitting with untreated wool while tending the sheep. There are both wolves and bears in the mountains and all the flocks have an attendant, usually only a child. She attached herself to us and shouted 'lepteri' each time she spotted a butterfly and finally seized Bretherton's net and scrambled up a cliff face to net an Erebia, breaking the net in the process. We eventually lost her after giving her some sweets but she was the only person I met on the trip who knew the names of all the peaks and she could also count to ten in English. On the slopes above the amphitheatre I took a male *Erebia gorge* Hübn. and some *Aricia allous* Geyer. A pair of eagles circled overhead and I saw one attacked by a Peregrine Falcon which made the eagle look clumsy. Suddenly thunder crashed above the peaks and we decided to make our way down, arriving at the car as all hell let loose with blinding rain and hail and the road was quickly awash.

As the next morning was heavily clouded we decided to try the Tara Gorge, an area which had been collected in by Mrs Mary Nicholl in 1901. A bone-shaking road leads across the plain for some seventeen kilometres to the top of the gorge which is the deepest in Europe and second only to the Grand Canyon. At one point near Curovac there is a sheer drop of 3,000ft. We took Mr and Mrs Taylor with us and stopped at the top of the Gorge where the road starts to fall towards the River Tara. Here we found some very flowery meadows which were ungrazed and these were rich in butterflies despite the overcast skies. *Erebia ligea*, *E. euryale* and *E. aethiops* Linn. were on the thistle heads with *F. niobe eris* Meig., *M. aglaja*, *M. didyma* and *Clossiana titania* Esp. There was an abundance of the dark form of the Marbled White (*Melanargia galathea procida* Hbst.) and several male Black-veined Whites (*Aporia crataegi* Linn.). *M. arion* and *M. alcon* were

present and a few male *Lysandra coridon* Rott., which were small and with very dark borders. Both *Maniola jurtina* Linn. and *Hyponephele lycaon* Khn. were common and I took some of the former for George Thomson. The males had pronounced dark spots on the underside of the lower wings. The slopes had belts of Fir and Beech edging the meadows and along the roadside I saw *Brintesia circe* Fab. and *Argynnis paphia* Linn. on the large Ground Elder clumps. We drove down the winding road towards Durdevica Tara where there is a huge bridge spanning the gorge carrying the road to Pleveja. The road divides, the other arm running down the gorge to Mojkovac. We followed a grass track leading down to the ruins of the old bridge destroyed in the War. On the clumps of Ground Elder (*Aegopodium podagraria* Linn.) were numbers of beetles, *Cetosia* sp,. *Trichius* sp. and *Trichodes* sp. and a few Longicorns and everywhere a large Syntomid moth, black and white with a yellow belt. Bretherton spotted a newly emerged Jersey Tiger (*Euplagia quadripunctaria* Poda) on a rock. In the puddles by the path were Yellow-bellied Toads (*Bombina variegata* Linn.). We met and photographed a Montenegran farmer wearing traditional hat and clothing but it started to rain so we made our way back to a small wooden tavern by the bridge to drink some of the excellent local beer. On the way back to Zabljak across the plain we explored the wayside meadows but found the same conditions as elsewhere. Grazing and scything had again produced an almost insect-sterile area.

July 13th is a national holiday in Montenegro and on that day there were horse races on the plain nearby and the village was thronged with people all day, coming in from the mountains and area around. They wandered about in groups and drank around the tables before the hotel and local taverns until the early hours of the morning. We decided to try the route to the left of the Black Lake and took a path leading up through the forest to the foot of the second highest peak in the group, Savin Kuk. This is a mountain having a steepish slope on the south side and a sheer drop on the north. Near the top at 7,215 ft there is a spring, Savina Voda, which is the highest known in the Karst region, and welcome in this land without mountain streams. As we reached the foot of the Kuk it again clouded over and a cold wind blew from the plain. We explored the foot of the slopes where we saw *E. melas*, *L. maera* and a few *Clossiana euphrosyne* Linn. Conditions were so poor that we returned to the lake where we saw a group of people roasting a whole sheep over a fire. In the village we had a look round the cemetry where the red star has surplanted the cross and were amazed at the elaborate memorials, carved in a black granite with photograph-like pictures of the dead engraved into the stone. It appeared that the majority of the young men of the village had been killed during the years of occupation. During the stay we found memorials dotted about all over the mountains, inscribed in the Cyrillic.

Friday produced a day of heavy cloud and drizzle. After dinner we drove out along the road to Curovac and took the right fork and in the woodland took a left fork which led us up along a winding road high into

the alps above. The road was terrible and we at last stopped by some beautiful meadows full of a large *Polygala*, *P. croatica*, which had pink and blue colour forms. The bottom of the slopes had small dells in which grew clumps of *Polygonum bistorta* Linn. and here we found *P. hippothoe* at rest and a *Coenonympha* sp. which looked half way between *C. tullia* Muller and *C. iphis* Schiff. Bretherton subsequently found it to be *C. tullia occupata* Rebel. As the weather again deteriorated we drove back down and along the road to Curovac to explore some large peat bogs by the road. Here we found a few more of the *C. tullia*. The road ends abruptly at the foot of a slope at the top of which the Gorge falls sheer to the river 3,000 ft below—without warning or fence. The mist swirled below to shround the river and sheep grazed nonchalantly at the edge of the precipice beside me. We drove back to Zabljak where we experienced another evening of storm and candlelight. The weather continued in the same vein all day on Saturday when it rained for about six hours. We did a little shopping in a Cooperative supermarket, the village store which was extremely utilitarian in its stock, there being no attempt to cater for tourists, a pleasant change.

Sunday gave us a clear sky and we decided to try the path again to Bobotov Kuk and managed to take the correct one just above the forest. Here *E. melas* was well out and I took two females. Bretherton captured a single *E. pronoe* Esp. and there were several *P. mannii* and *P. apollo* on the wing. We now took the path to the right which leads up to the high peaks through a belt of dwarf Pine, *Pinus montana*, most of which were prostrate. Large funnel-like depressions lay each side of the track, the bottoms of which were openings to potholes, covered with branches to keep animals from falling in.

The slopes were heavily grazed right up to the snows where we found the little wooden huts or Katuni which are used by the nomadic shepherds during the summer months as dwellings. They are little more than a stone foundation with uprights and a ridge against which are set wooden planks to form a tent-like home. We reached the foot of Obla Glava when a thunderstorm started and we hurried down towards the Lake just catching the edge of the storm. We went to bed by candle at 10 p.m.

We had decided that if Monday gave us fair weather we would try the road leading to the Stozina Pass. The morning was sunny with a cool wind and we drove out of the village along the metalled road to where it turned off back into the massif towards the peak of Stozina. This road was again quite terrible, passing through beautiful meadows which we now knew would support few butterflies and then winding like a snake up towards the pass. Just below Stozina we disturbed nine Vultures which were feeding on a carcase below the road accompanied by a flock of Hooded Crows. They rose above us and for the rest of the day they circled above us, rising and falling in thermals. On the left of the road the slopes fall to a glacial lake surrounded by ridges of bare limestone but on the right the steep slopes were thick with clumps of grass, so far ungrazed. We climbed up with

some difficulty and disturbed an Erebia which turned out to be *E. ottamana durmitorensis* Warren. We found it common over the whole slopes here and quite fresh in both sexes. It is a very variable insect, some being very similar to *E. cassioides* Hohenworth in size and colour but in general larger than that species. *E. epiphron* was also plentiful, the form being quite distinct, and worn specimens of *C. tullia*. Higher up the slope I took one or two worn specimens of *Parnassius mnemosyne* Linn., all females. The lower wings of this race are well marked with black on the inner margin. Other species flying were *A. allous*, *P. hippothoe*, *E. melas* and I took one *Boloria* sp., *B. graeca balcanica* Rebel and I saw several others. The steepness of the slopes and the slippery grass made collecting difficult. A surprise was to take two specimens of *Agrodiaetus damon* Schiff. sitting on a few flowers of Sanfoin *Onobrychis viciifolia* Scop. growing among the rocks. As I scrambled along among the rocks I heard a loud hissing at my feet and looked down to see a curled up specimen of the local Viper ('*Vipera microps*') threatening me. I was able to capture two species of lizard, one being a local species (*Lacerta mosorensis*) which subsequently laid five parchment covered eggs. These I brought back with me for Coleridge. We spent most of the day on these slopes and although the area seemed deserted, when we stopped for lunch we found ourselves with an audience of shepherd boys and girls, one of the girls wearing high-heeled shoes! A small group of horsemen with pack-horses came over the pass while we were there. In the mountains we saw no mules, only small horses. Our experience here indicated that if only more areas were left ungrazed, the butterfly population could be very rich. On the way back we stopped by another glacial lake, Valovito Jezero, where we took *Polyommatus icarus* Rott., *P. argus*, *L. idas* and a female *P. hippothoe*.

By now the state of the gear box and the weather indicated that we should return to the coast earlier than anticipated so we arranged reservations for three nights back at Budva and spent our last day, Tuesday, above the Tara Gorge. It was fitfully sunny and again there was plenty on the wing. We found several freshly emerged *Strymonidia spini* Schiff. and a few worn *Brenthis daphne* Schiff., and on a plant of *Gentiana cruciata* Linn. a spattering of eight eggs of *M. alcon*. A few Bath Whites (*Pontia daplidice* Linn.) and *Colias crocea* Geoff. were also moving across the slopes up the gorge. We had a good feed of wild strawberries growing by the roadside, a species with a very tall white flower. We returned early for a last look at the Black Lake and packed for our departure. At supper we dined with a German and his wife who were collecting Coleoptera in the area. They warned us that the road down the Tara Gorge was almost impassable as they had attempted it the day before and had had to return and try the road via Pleveja. However we thought it could not be worse than the Niksic road and set out in bright sunshine next morning past Durdevica Tara and into the Gorge. The road was impossible. Massive works were in progress almost along the whole of the first twenty five kilometres with tunnels being blasted or concreted, piles of rock and rubble on the road, gangs and

bulldozers working and, worst of all, great slurries of mud through which we had to keep going as to stop would have left us hopelessly bogged. Boulders crashed against the underside of the car but fortunately the rain kept off. We stopped on a reasonable stretch above the surging river and took a specimen of *Minois dryas* Scop., freshly emerged. Suddenly we came off the bad road onto a fine tarmacadam surface which took us down to the head of the gorge where we again made a brief stop. On the Ground Elder there were plenty of butterflies including *Limenitis reducta* Stdgr. and *Aphantopus hyperanthus* Linn. and the typical form of *Fabriciana adippe* Schiff. Of course the inevitable storm started and we were driven back to the car by a sharp shower. The road entered the Moraca Gorge with the river Moraca running down towards Lake Scutari. It took us one and a half hours winding driving to reach Titograd. The plain stretches away towards the lake and a railway line runs parallel with the road. We stopped for a drink by the Lake where the marshy pools are dotted with yellow water lilies and edged with clumps of Purple Loosetrife (*Lythrum salicaria* Linn.). White Egrets sat among the Willows and brilliant dragonfies were everywhere. I walked down to the water's edge and hundreds of frogs leaped into the pools at my approach. The storm still hung over Lovcen so we pressed on over the pass above Virpazar to about 3,000ft. Just short of the top the fates struck and the gear box jammed solid stopping the car in the middle of the road. After some time I managed to get a lift down to the coast at Petrovac and was deposited at an 'autoservis'. The proprietor explained that the nearest breakdown equipment was four hours up the coast at Dubrovnic but he let me use his 'phone to contact Hertz at Cilipi who eventually arranged to send a new vehicle. I then hired a taxi and returned to collect Bretherton and the luggage, through the clouds to the top of the pass. He had managed to get the car off the road and we left it to return to Petrovac to wait. At about 9.30 p.m. the new car and a young driver arrived and he insisted on going right back up the pass to the broken-down vehicle. After crashing its gear box around and making a noise like a tank he decided that it would drive and proceeded to lead us down the pass at break-neck speed. After thirty kilometres in the mist and dark we reached the outskirts of Budva where he abandoned his vehicle beside the road, signed us up for the new one which I had been driving and we left him. What eventually happened to him or the car we have never found out. On arrival at our hotel we found that our booking had not been made but we were eventually accommodated in separate rooms and were glad to get to bed after a trying but exciting day.

Although we now hoped for better weather we were to be disappointed. Thursday started with clear skies but as soon as we reached the slopes above Budva on the Cetinje road a thunderstorm broke above us and we sat for two hours in the rain before returning to the hotel. At 2 o'clock it cleared and we drove back up the same road for five kilometres. There were large numbers of *C. pamphilus* on the wing, the males being well marked with a black line on the forewing costa. *C. crocea* and *P.*

daplidice stragglers were on the wing with at least two fast flying *I. iolas* around the *Colutea* bushes. We gathered lots of pods with larvae and eggs but these later turned out to be *L. boeticus*. *P. icarus* was very common and as the sun weakened the whole area was invaded by *Vanessa cardui* Linn. which sat on the banks, road and open spots sunning themselves. Later we had a swim in the warm Adriatic beside the hotel and after supper walked up into the old town. Within the wall no cars are allowed and the narrow streets are as they were before the car was invented. The little shops cater for the tourist and were thronged with visitors. We climbed in the dark up to the top of the fort overlooking the harbour and had a wonderful view of the town behind us and around the bay, all brilliant with lights. We found a nice tavern with a gypsy violinist and sampled the strong beer. On our way back we noticed there were numbers of large bats hawking under the high street lights taking the moths that circled there.

Friday again produced heavy rain until nearly noon when we again tried the Cetijne road. We found rather a fine gorge just below the road at the 26km. milestone and here we added some new species, *Nordmannia ilicis* Esp., *Philotes baton schiffermulleri* Hemming, *M. didyma* (second brood) and we saw *Hipparchia alcyone syriaca* Stdgr., one of which Bretherton managed to net. They were sitting on the trunks of the oaks by the road and and only flew when disturbed. I saw one very large green lizard and another huge tortoise. Sweeping overhead was a small group of Alpine Swifts, white bellied and larger than our own Swift. We spent the evening again at the tavern where we joined up with our friends of Zabljak, the Taylors.

Saturday saw us ready packed and away at an early hour. We had decided to drive back round the Gulf of Kotor and not take the ferry. Despite threatening storms we started on the winding road which climbs up to emerge above Kotor at the head of the fiord. Here we stopped and took several *P. mannii* and some *Pyronia tithonus* Linn. There were also several *Pararge aegeria* Linn. which were of the same form found in Britain. The road down to Kotor is steep and full of bends but from then on we followed an easy route all along the edge of the Gulf with the deep water on one side and steep rocky slopes above. The roadside was dotted with Chaste Bushes (*Vitex agnus-casti* Franch) which look rather like *Buddleia davidii* Franch. and are nearly as attractive to butterflies. One had several specimens of *P. egea* and Whites which included *P. ergane*, *P. mannii* and *P. rapae*. We stopped to have our packed lunch at the village of Perast where a domed church stands on a small island in the middle of the Gulf. The promised storm still rumbled over the peaks and it began to rain. Further along the road we disturbed *L. reducta* on a wooded slope and I saw a black Skipper which was one of the *Gegenes* sp. but failed to net it. During the rainstorm we rested at the point where the ferry starts and as the rain abated we drove back towards Cilipi across the plain lying behind a coastal ridge. By a roadside stream I took *L. coridon* and one specimen of *Lysandra bellargus* Rott. and a female *M. trivia*. Here the slopes are dotted with tall pillar-like Cypress spiking out of the maquis scrub. The

hour of our departure was approaching and we made our last stop beside the airport where there was a large area of limestone pavement in the crevices of which there was quite a growth of grass and flowers. The only specimen of note here was our only *Hipparchia statilinus* Hfngl. which fell to Bretherton's net. We gave the remainder of our food and my somewhat worn mountain shoes to a woman sitting by the roadside and delivered our car to the Hertz agent. We were charged the cost of petrol used to deliver the new car to us and then boarded the plane which was twenty minutes late in arriving. Our return flight across Europe was above a continuous cloud cover and through a series of huge electrical storms which the pilot carefully skirted. We landed at Gatwick right on time and were relieved to be met and driven home after what had been an eventful and interesting two weeks. Our tally of butterfly species was 102 and one wonders how we might have fared had we had clear and sunny days instead of one of the worst fortnight's weather that I have experienced abroad.

P. W. Cribb (2270)

THE DECLINE (AND FALL?) OF THE LARGE BLUE BUTTERFLY

Outside books on butterflies, the Large Blue (*Maculinea arion* Linn.) has never been an especially familiar species. Its breeding sites have often been jealously guarded secrets of both collectors and conservationists; while its complex life-history and its relationship with ants have not made it a suitable subject for breeding and release efforts by the amateur enthusiast. The life-cycle of this species, even in a simple form, will illustrate the point.

The adult insect is found on the wing during late June or early July. The life-span of an individual specimen is not well known, but may not be longer than a week. During this short time mating takes place and the eggs are layed on the flowers of Wild Thyme (*Thymus* spp.). The young larvae feed on the flowers, but later leave the thyme, are picked up by ants of the genus *Myrmica*, and taken to their nests where over-wintering takes place. The larvae feed on the ants' brood during their stay in the nests and, in the summer, they move to the top of the nests where they pupate for a period of about three weeks, before the adult emerges and climbs out of the ants' nest into the outside world. Such a life-cycle is, clearly, not the key to an ubiquitous and abundant distribution, and it is interesting to speculate as to the history of this insect prior to the availability of records.

Its arrival in Great Britain may have been closely related to the recession of the glaciers which, at times, covered most of the country. During this period the food plant would have undoubtedly formed a fairly common component of the bare-ground flora colonizing in the wake of the receding ice-fields. It is, therefore, possible that this period formed a hey-day for the insect. A considerable reduction in the numbers could have

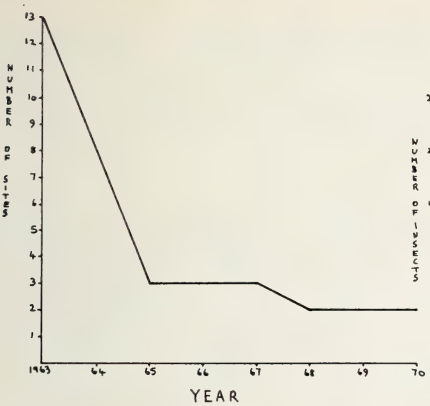


Fig. 1.

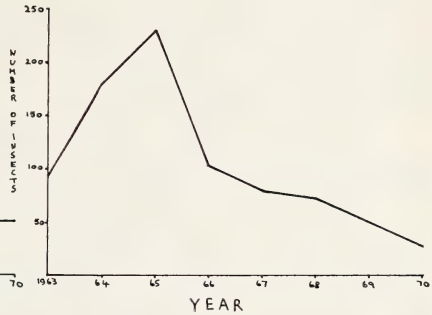


Fig. 2.

been expected to have taken place as the great forests developed, and the insect probably survived only in very limited localities until the clearance of the forests and the introduction of the rabbit.

In more recent times (since the year 1800) the Large Blue has been quite widely recorded. Records occuring in most of the southern counties, a list of which includes Bedfordshire, Berkshire, Buckinghamshire, Cornwall, Devon, Dorset, Gloucestershire, Hampshire, Herefordshire, Hertfordshire, Kent, Northamptonshire, Somerset and Wiltshire. By 1960, however, the list was down to Cornwall, Devon, Gloucestershire and Somerset. While for 1970 confirmed records are available only from Devon and Cornwall.

It is the sites on the northern coast of Devon and Cornwall with which I have been chiefly concerned, and here the breeding areas of the insect are found towards the mouths of coastal valleys. The sites are largely neglected by farmers as they are too steep for improvement, but they are used as rough grazing for sheep. Because of this the scrub which develops is periodically cleared by the traditional method; burning. However, the prospects for the continued survival of the Large Blue Butterfly, even in these restricted areas, can by no means be considered bright. During the years between 1963 and 1970 the breeding sites in the area have dropped in number from thirteen to two (*Fig.* 1), while the numbers of insects recorded, although reaching a peak of about 225 in 1965, have slumped to about 25 in 1970 (*Fig.* 2).

Why this general decline in the fortunes of the Large Blue Butterfly should have occured can by no means be considered known to science. This lacuna in our knowledge most obviously presents an enormous problem to those involved in planning the conservation of the insect. Because of this I would like to consider some of the possible causes of the decline. The list is quite lengthy and, although it is probable that some of the suggestions are more likely than others, it is impossible to rise above the

realms of speculation as the data required to support any of them is largely lacking, and since the damage has already taken place, largely unobtainable.

The list of possible reasons for the decline can, however, be divided into about four main sections.

The effects of weather

The adverse effects of the climate, which is frequently stated to have been deteriorating in recent years, can effect several stages of the life-cycle, and are thus hard to pin down. The problem being complicated by the enormous gap in our knowledge of the climatic requirements of the species. In spite of this, several sensitive areas of the life-history come readily to mind. The adults are known to fly only in sunny conditions. They seek the shelter of scrub when the weather is cloudy or wet. The damage caused by the former, although being less direct than the damage which can be caused by heavy rain penetrating the shelter of the scrub, must be considered serious when the short life-span and limited emergence period are taken into account, as it is not improbable that the periods of bad weather can exceed the life-span of the adult insect. Moreover, the high velocity of the winds in these coastal areas is often more than sufficient to carry the insects from the somewhat restricted breeding sites, should they take to the wing at the wrong time.

The difficulties facing the immature stages are less clearly defined than for the adults, excessive dampness may encourage fungal growths in both the larval and pupal stages. While the conditions necessary for the successful passage of the newly emerged adult from the ants nest to the outside world are unknown. Despite the gravity of these problems, there is little meterological data which can be related to the relative abundance of the Large Blue, and it must be remembered that the insect has survived the British climate since its arrival in the country. Thus, a decline, of the magnitude recorded in recent years, is, perhaps, unlikely to have been caused by climatic factors alone.

Factors effecting the foodplant

Wild Thyme can be found growing in a large number of different environments, from heath-land to mountain slopes. The common factor being that an early stage in the succession of the plant communities is maintained. This may be due to a variety of reasons, and the Thyme growing in the coastal valleys where the Large Blue is found in the West Country owes its existence to several factors. At least five separate areas of Thyme growth can be recognized (*Fig.* 3). These areas are:

(a) The flat area at the very mouth of the valley. Here there is 100% plant cover, but the vegetation is kept low by the pruning effect of the salt-laden sea winds.

(b) The area a little more inland. Here a somewhat taller community has developed, the sea wind being unable to keep the vegetation down to

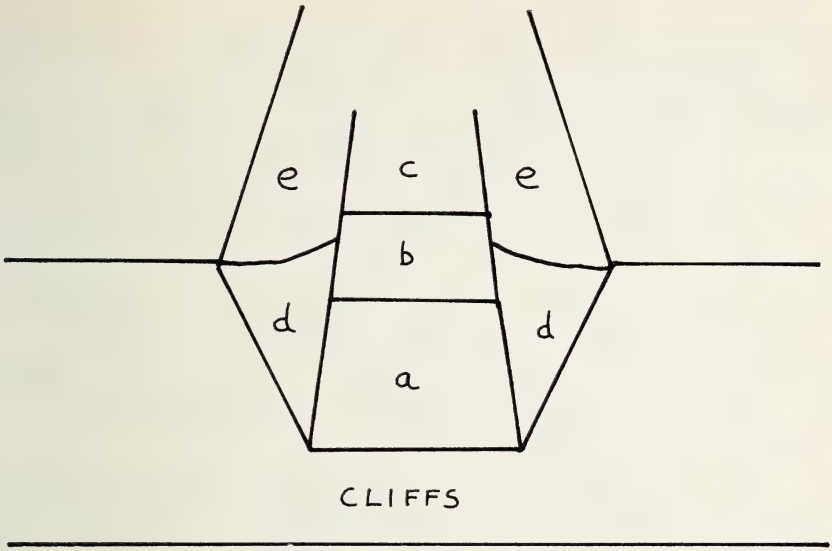


Fig. 3.

the height characteristic of area a. In this area the Thyme is found mainly on the mounds of fresh earth thrown up by the nest building of the ant *Lasuis flavus* (Fab.) (this relationship between these ants and the Thyme being far more noticeable in the old Gloucestershire sites).

(c) At this distance inland Thyme is found only at the edges of paths, as the mounds of the ants are swamped by more successful invasive vegetation. Only the trampling effect of the edges of the paths used by visitors to the area succeeds in keeping the environment open enough for the successful growth of the plant.

(d) On the steep coastal parts of the valley sides. In this area wind and water erosion, coupled with some salt spray pruning keep a very open plant community.

(e) Inland of this area on the valley sides the effects of exposure are lessened. Here the Thyme exists only where regular burning and grazing takes place.

Four separate points of danger can be recognized for these sites:

(i) **Weather.** Adverse weather may be detrimental to Thyme growth in two ways. Firstly, drought may destroy the entire plant. Secondly, a strong sea wind, at the wrong time, may destroy the Thyme flowers on which the young larvae of the Large Blue Butterfly feed.

(ii) **Ploughing and planting.** With the development of the crawler tractor, areas of the valley sides which had previously been unavailable for cultivation have been made accessible for ploughing, the natural vegetation (including Thyme) being replaced with plants of greater

economic value. This has taken place in seieval areas which were suitable for the Large Blue.

(iii) **Scrub encroachment.** This has been caused by the cessation of regular burning, which must take place in the more sheltered areas of the valleys if an area suitable for the growth of Thyme is to be maintained. The failure to undertake this operation regularly has been caused by the lowering of the importance of these areas as sheep grazing. This has resulted in the swamping of the Thyme, a situation which is not remedied by the reintroduction of a burning system as the high temperatures generated by the burning of very dense vegetation destroys any remaining Thyme, and too much of the gorse which is required by the adult insects as shelter. In addition to the encroachment caused by the lack of burning the traditional balance of the vegetation has been severely upset by myxomatosis which has destroyed one of the areas major grazing animals, the rabbit.

Direct effects of collecting

There is no evidence, at all (Spooner, 1963), to suggest that collecting has wiped out any flourishing colonies, although the possibility that very small, and dying colonies have been destroyed by these activities can not be entirely discounted.

Genetic problems

The possible genetic effect, which can not be tested experimentally at such a late stage in the decline of the insect, is due to the probable destruction of gene flow between separate colonies. It is often supposed that a colour cline exists in the Large Blue Butterfly (Ford, 1945). The West Country forms being brighter in colour than those found elsewhere. This would suggest small, but significant, gene flow between adjacent sites, and in Devon and Cornwall the Large Blue Butterfly probably occured in most of the coastal valleys. Thus, the insects may have been able to move between the sites with some frequency.

However, with the destruction of some of the sites due to agricultural, and other, reasons, and the predations of collectors (by the simple logic that if there are normally x insects in a population any reduction in the numbers caused by collectors will equally reduce the number available for the chance passage from site to site) the complete genetic basis of the species is destroyed. What were previously semi-isolated populations become isolated and the entire system breaks down. This suggestion is, to my mind, the most likely for three reasons:

(i) Several of the sites from which the Large Blue Butterfly has vanished still support Thyme, and ants of the correct species. Thus, they appear to be suitable for the Butterfly, but unfortunately it is not present.

(ii) The effect of collectors would not be noticed at first, and may therefore go unnoticed. Especially as any effect occuring at a later date would not necessarily take place at the site where collection occured.

(iii) At the two sites where the insect is still to be found, one supports

two colonies of the insect separated by a distance of a few yards. While the other, which is failing, also consisted of two nearby colonies until the middle of the sixties when one of them was destroyed. The survival of these two sites can easily be explained by virtue of the comparatively high gene flow which is possible between the two colonies.

If, and no one can be sure, this genetic problem is the cause of the decline, things are very black indeed for the Large Blue as a process of this kind, once started, is almost impossible to stop.

Conservation

Now that we have reviewed the decline of the Large Blue Butterfly, we must look at what is being done to prevent the fall. Obviously the decline in both the number of sites and the number of insects had made itself apparent over a number of years, but as no one body had data for a large number of sites the situation could not be measured accurately. However, during the sixties a survey in Devon and Cornwall provided the data given in *Fig.* 1, and *Fig.* 2, more recently a survey has been undertaken in Gloucestershire, but unfortunately the insects seems to already to have been lost from the County.

Active conservation measures have recently taken place in the West Country and fall into three main categories:

(1) **Protection of the sites**. Two of the last three sites known to contain the butterfly (although one of these seems to have lost the insect by now) are nature reserves administered by the local County Trust. In these management for the encouragment of Thyme, mainly by burning and clearing, can be done freely, when comprehensive management plans are adopted. The other site is under the control of a farmer who, although he will not give up ultimate control of the land, will allow burning and other forms of management in the area as he, as yet, can find no use for it himself. In spite of this it is probable that a use for the land may appear in the future, and thus the situation here is somewhat tenuous.

(2) **Protection of the insect.** All of the three sites are wardened during the flight period of the adult, but this is quite a recent undertaking, and to be of effect the somewhat costly task must be done regularly. Moreover, the legal status of the wardens is somewhat questionable, and, at best, they can only give protection to the insects that appear on the sites by their own efforts. With the increased recreational demands which are being made upon the area by holiday makers and walkers the sites are in danger of being disrupted by people whose very presence, rather than harmful activities, causes the trouble, while damage by wardens and *obna-fide* naturalists who wish to photograph the Large Blue is also possible.

(3) **Breeding and release.** Things are now so bad that the breeding and release of the insects has to be considered. This is difficult because of the life-cycle demands that ants as well as the butterflies have to be kept and there are not really enough of the British insects left to experiment with, especially as it has never been bred successfully in large numbers. However,

World Wide Butterflies are attempting the rearing with fertile females obtained from the Continent. If the attempt is successful there may *just* be time to try this with the British race, and it may work if the sites are kept in good condition.

None the less, unless significant breakthroughs are made in the very near future, I would predict that the Large Blue Butterfly of Britain will be extinct by 1980, at the latest. Then our *Bulletin* will be full of discussion as to the merits of the introduction of the Continental insects.

January 1971 Brian R. Benham (4393)

(This article originally appeared as a publication of the Conservation Group of the AES).

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SPOONER, G. M. (1963. *Entomologist*, **96**: 199.

BOOK REVIEWS

Emperor Moths of South and South-Central Africa by Elliott Pinhey, D.Sc. Pp. 150+xi with 43 plates, 15 in colour, and many line drawings. C. Struik (Pty) Ltd., Cape Town. 1972. £5·80, including postage, from E. W. Classey Ltd.

The moths covered by this book are, according to the publishers, described in a way that should appeal both to the layman and to the student. As far as I, an informed layman, am concerned I think that he succeeds and I have little doubt that the many students of the Saturniidae among our members will agree.

The book starts with a general description of the Saturniidae, their habits, how to rear them, types of caterpillar, structure, collection and preservation. The bulk of the book consists of keys to and descriptions of all the named and some unnamed species of emperor moth in the area covered. Details of the early forms and life histories are also given. Any user of this Society's *Silkmoth Rearer's Handbook* will find the additional information invaluable. The illustrations, particularly the many genitalia drawings in the text, are good and the plates figure the moths described and some of their larvae. The book ends with two pages of references, an interesting section on the derivation of the moths' scientific names, a glossary, a host plant index (which may help readers to find alternative foodplants) and a general index.

Criticisms of the book are not many. Some of the plates of the moths are strangely arranged with some specimens having half a wing cut off at the edge of the page. Many of the photographs are of worn or chipped specimens, although this may reflect the scarcity of material.

All in all I think that this book is to be recommended to all those interested in rearing silkmoths, as much additional information will be found here. P.A.B.

Wild Life Conservation and Dead Wood by Alan Stubbs, B.Sc. pp. 18. A supplement to the *Quarterly Journal of* The Devon Trust for Nature Conservation. 1972. 27 half tone illustrations. 20p.

This booklet was published by the Devon Trust for Nature Conservation and perhaps the best praise that I can give it is to say that I wish that it had been published by the AES instead. Mr. Stubbs is, I know, a keen conservationist but he has produced a restrained and balanced book, which recognises that those who manage woodlands for economic and amenity purposes have a claim to be heard as well as the conservationist who is primarily concerned with preserving the fauna and flora of our woods and forests. It is aimed primarily at foresters and those who are concerned with managing woodlands, and because it points out in a scientific but sane way the advantages of this type of management it may find more ready acceptance among them. It provides a simple introduction to the complex ecological process that is going on in our woods, giving us an idea of how the breakdown of dead wood and other forest litter is accomplished, to form the eventual nourishment of the growing plants and trees. For the entomologist it is interesting, giving him a broader view of the process at work and how it involves the insects in which he is interested, something that the ordinary text book will not give. There are eleven half tone illustrations showing some typical woodland situations, including a field meeting of the British Entomological and Natural History Society in Knole Park. There are also sixteen of the better known forest insects illustrated. It is extremely well printed and produced and its price is very modest for a work of this order. G. P.

The World of Butterflies by Michael Dickens and Eric Storey. Pp. 127. Osprey Publishing Ltd, Reading. 1972. 105 pages are coloured photogravure plates of set butterflies with textual notes on the species illustrated. £1·95.

The text of this introductory booklet to some of the World's most colourful butterflies is by Mr Dickens of the Butterfly Farm at Bilsington, Kent and the photography has been done most expertly by Mr Storey. The brief introductory text is fairly elementary and intended for the uninitiated but there are minor errors such as the mis-spelling of Fabricius and doubt as to the singular of chrysalids. The Preface makes a plea for the conservation of butterflies but the trade in exotic dead material is currently on the increase and is jeopardising the existence of these beautiful insects in some areas. Mr Dickens emphasises the importance of breeding and observation as opposed to collecting. The plates are of good quality but the information is rather in the form of 'cigarette card' data. I feel that this book ranks rather as a good little picture book than as an entomological reference book and will appeal to those with a fringe interest in natural history. P. W. C.

REARING THE APOLLO BUTTERFLY (*Parnassius apollo* Linnaeus)

In 1970 I obtained some eggs of two Spanish races of the Apollo, *P. a. hispanicus* Obth., and *P. a. marteni* Eisner. They were chalky white, 1.5 mm in diameter, flattened on top, and covered in white bumps.

They overwintered in my back garden in a small curtain netting cage exposed to all weathers. I brought them indoors in the middle of January 1971 and the first hatched on the 22nd. The larva made a small hole in the side of the egg through which it emerged very quickly, the remainder of the eggshell being ignored. It was 2 mm long, and black with pale warts and fine hairs all over. The large head was black and shiny, the body tapering down to the rear.

After hatching, the larvae wandered around rapidly for two days without eating anything at all. After this they started to nibble their foodplants which are Stonecrops and Orpines (*Sedum* spp.), and other succulents. I kept them in cages which consisted of flower pots of the foodplants covered over with fine curtain netting supported by wire hoops. The larvae thrived in sunshine or strong electric light, and good ventilation was absolutely essential.

The *P. a. hispanicus* hatched a month earlier than the *P. a. marteni*, but otherwise their appearance and habits seemed the same. All the larvae developed red warts, in contrast to many *P. a. geminus* Stitchel which I saw in Switzerland in 1969 which all had pale yellow warts. When fully grown they were plump with small heads and about 4.5 cm long. They loved basking in the sun on rocks. When touched, the larvae extruded orange osmateria but I observed no scent.

Skin changes were exceedingly rapid, taking about a second, In the cool temperatures and very little sunshine in the late spring of 1971, nearly all the larvae died when half grown, but some *P. a. marteni* managed to pupate late in July. They spun slight cocoons in earth crumbs. The plump pupae, which looked very like some moth pupae, were covered with a pale purplish bloom. When this was rubbed off, the casing was found to be brown and shiny.

After a month as pupae, the butterflies emerged in late August. They were rather small. The late emergence, small size, and larval deaths were due, I am sure, to the poor conditions, so unlike the hot sierras of Spain. However, I once reared some Apollos from the Alps in a good English summer with complete success.

A. P. Waters (2615)

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AES BULLETIN No. 300

EDITORIAL

Welcome to the 300th *Bulletin*. With the present quarterly publication hundreds only occur every twenty-five years, so I hope you will find this an enjoyable number.

Over the last few years there has been a failure to produce annual indices. We are pleased now to be in a position to remedy this and hope that you will receive the indices for 1969 and 1970 with this *Bulletin*. Those for 1971 and 1972 have been prepared and should be going to the printer in the near future.

I look forward to meeting members at the Exhibition and hope that they will come and tell me what they think about the *Bulletin*. Please try and bring an exhibit so that this year it really will be the Annual Exhibition of the Amateur Entomologists' Society and not 'The Entomological Dealers' Trade Fair'.

Paul Boswell (2853)

COLLECTING NOTES—AUGUST 1973

The smaller moths

The drawings in this issue are from the pen of a different artist, Mr J. S. Noyes of the Imperial College Research Station in Berkshire. His technique is quite different from that of Mr E. S. Bradford. Mr Noyes' drawings have a wingspan of between seven and eight inches: Mr Bradford's are only three inches across. This means that whereas Mr Bradford's drawings are reproduced in their original size, those of Mr Noyes have to be greatly reduced by the printer. There is less detail in Mr Noyes' figures, but he works faster and his output is higher. At present Mr Bradford is engaged on a heavy programme of entomological work and he can only maintain our supply of drawings at the expense of other tasks. We already have some 400 of Mr Noyes' illustrations, and, if we find they reproduce well, you can look forward to the regular publication of a number of them. So the use of his drawings in this issue is by way of an experiment. Mr Bradford and I have selected from them one species which is boldly marked and two which are obscurely marked, being very much alike except for their antennae. The original drawings show the differences very clearly and we hope the same will be true on the printed page.

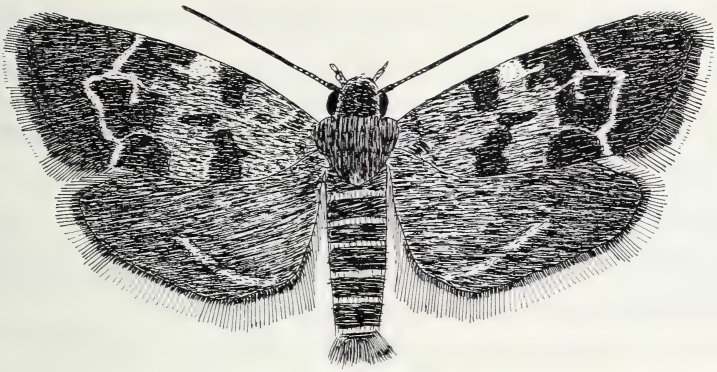
Mr Noyes' first drawing is of *Anthophila* (*Simaethis*) *fabriciana* Linn., one of the few microlepidoptera sufficiently well known to the general entomologist to have an English name in current usage—the Nettle-tap.

The forewings are dark brownish fuscous marbled with pale grey, and the costal spot and post-median fascia are yellowish white; the hindwings are paler brownish fuscous with yellowish white markings. There are conspicuous pale bands on the abdomen. The off-white, dark-spotted larva feeds in April and July in a silk web on the tenderer leaves of Stinging Nettles (*Urtica* spp.) and Pellitory-of-the-Wall (*Parietaria diffusa* Mert. and Koch). The adults fly abundantly round their foodplants in the July and late summer sunshine.

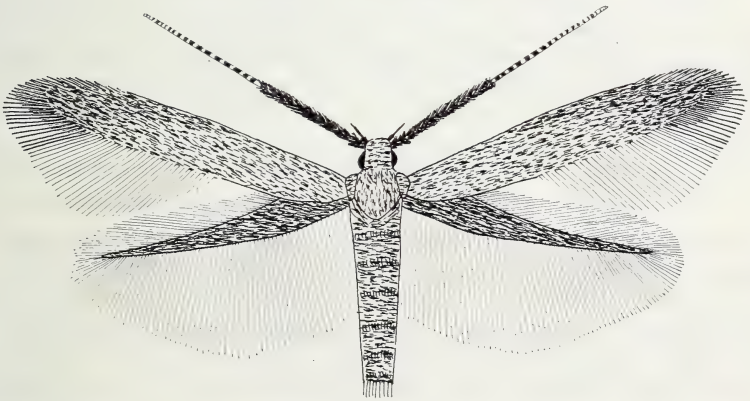
The other two moths are *Coleophora spissicornis* Haworth and *C. deauratella* Lienig and Zeller, which, together with *C. trifolii* Curtis (*frischella* sensu auct.) form the group with shining brassy forewings and antennae thickened at the base. When I am in an opulent mood, I refer to the ground colour of the forewings as golden rather than brassy and, to add to their beauty, they have brilliant purple or coppery reflections, especially towards the apex. All three have dark grey hindwings. Though so much alike, they are easily distinguished. Firstly, they come in three sizes. The largest is *trifolii* with a wingspan of 17–18 mm; in the middle is *deauratella* with a span of 12–13 mm; while the smallest is *spissicornis*, measuring only 11–12 mm. The difference in size between the last two sounds insignificant on paper but is readily apparent in the specimens, being proportionally about the equivalent to the Small and Large White Butterflies. But it is the antennae which give the clearest criteria for distinction. The tips of the antennae of *spissicornis* are white ringed with dark fuscous, while the other two have fuscous antennae with plain white tips. But there are also convenient differences between the antennae of the last two, for *deauratella* has the basal third thickened with dark coppery scales, whereas *trifolii* has only the basal quarter so thickened.

The life-histories also differ. *C. trifolii* has a larva which feeds on the seeds of the Common Melilot (*Melilotus officinalis* (Linn.) Pallas). After eating out one of the seeds, it appropriates the empty husk as a portable case which it then spins to the side of another seed. It eats out this seed and then progresses to a third; and so on. So, in searching for the cases, you should look for a small hole in the side of the seeds; having found that, you hunt for one seed apparently growing out of the side of another. If you find this, you have found the case. The text-books give August to October as the months in which to find the larvae. In my experience they eat only the green seeds up till the end of August and if you search later you will be too late.

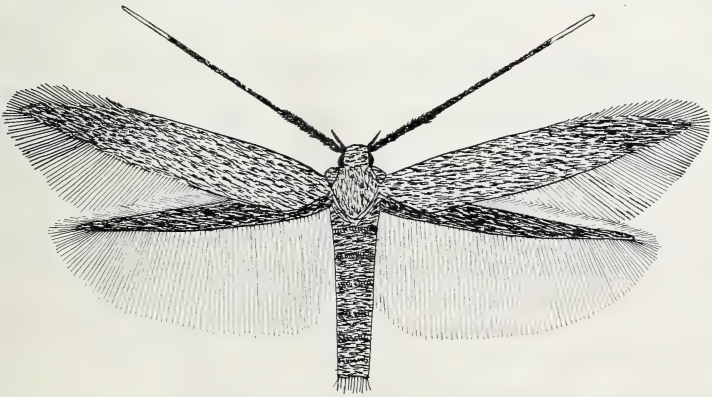
C. deauratella feeds on the seeds of Clovers (*Trifolium* spp.). The case is made inside a floret which has been eaten out, but the larva also uses a lot of silk in its construction. If you look at dead clover flowers, you may notice the pale brown, trivalve anal end of the case projecting a little way between the florets. It is hard, but not impossible, to find. I am very good at locating 'dead' cases late in the summer: I have only once found a live one from which I have reared the moth. Most of my series were taken



Anthophilus (*Simaethis*) *fabriciana* Linn.



Coleophora spissicornis Haworth



Coleophora deauratella Lienig and Zeller

All figures are reproduced at eight times natural size

as adults in June sitting in daylight on the flowers of Birdseye Speedwell (*Veronica chamaedrys* Linn.).

I have never yet found the larva of *C. spissicornis*. I can only say what the textbooks tell us, which is that it feeds in a cylindrical case on the flower-heads of Haresfoot Clover (*Trifolium arvense* Linn.) from September to October. The moth may be taken, not uncommonly, flying at dusk or assembling at light. Now I come to think of it, I have never even looked for the case. We all have our repertoire of the species we know and are all to ready to go on repeating the same programme, seldom aspiring to anything new. During the coming winter why not make plans to explore new territory in the areas where you are most ignorant.

A. M. Emmet (1379)

Coleoptera

Catopidius depressus (Murray) was added to the British List by Easton (1941) who beat a single female from birch at Boxhill, Surrey, during May 1940—a rather a typical habitat for this species, and the Anisotomidae in general. For many years *depressus* was regarded as a rarity, being recorded seven times up to 1964, and only once in abundance (Sculthorp 1951). It is now known that *depressus* occurs fairly commonly in burrows of the rabbit. It may prove to be quite widespread, but because of its habits, not encountered in the normal course of collecting.

Allen (1946) captured two males in the leaf-litter just inside the entrance of a burrow. Welch (1964a) collected 890 specimens of *depressus* from ten pit-fall traps baited with dead roach placed in the entrances to rabbit burrows from mid-March to early May 1963. Appleton (1969) has also taken *depressus* in profusion using similar traps, but only a single specimen from leaf-litter just inside the burrow. It would seem that the bait in the trap attracts the beetles out from the deeper parts of the burrow. An excellent account of collecting by this method is given by Welch (1964b), it should be noted that apart from *depressus*, 292 other Anisotomidae comprising thirteen species, and other beetles representing seventeen families are recorded by Welch (1964a & b).

The genus *Catopidius* Jeannel contains only one species—*depressus* and forms the link between *Catops* Payk. and *Choleva* Latr. *Depressus* is most closely related to the '*nigritus*-group' of genus *Catops*, and was originally placed next to *Catops fuscus* Panz. by Murray (1856). It may be distinguished from *fuscus* by the shape of the pronotum (widest at the posterior angles and narrowed gradually towards the anterior border), and by the aedeagus, figured and described by Kevan (1946).

Up to the time of writing *depressus* has been recorded from the following counties:—

Berkshire—Windsor Forest and Silwood Park.
Hampshire—Fareham and Lyndhurst.
Isle of Wight—Headon Hill.

Kent—Gravesend and Footscray.
Northamptonshire—Guilsborough.
Oxfordshire—Horspath Common.
Surrey—Boxhill and Galton.

Doubtless it will be found in many other counties in the future.

J. Cooter (3290)

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INTRODUCTION TO CRANEFLIES—PART V

Tipulinae continued

Genus Dolichopeza. The single species has a drab blackish brown colour, and is the only large British Cranefly with white tarsi and no discal cell.

White footed Ghost. *Dolichopeza albipes* Stroem. It is found around the banks of shaded streams and ditches in June (sometimes earlier), especially hiding in dark crannies. When this sombre coloured insect is flying over shaded dark peat and soil with its legs splayed, all one can see is the white bands near the tips of its legs, giving it a ghostly appearance. The larvae live in moss.

Genus Prionocera. This genus contains three species of drab grey Craneflies with a dark line along the dorsal surface of the abdomen (as in *Tipula luna*). They are distinct in the combination of lack of whorls of hairs and presence of a saw-tooth lower margin on the antennae.

Common Saw-tooth *Prionocera turcia* Fabricius. It is a local species occurring on bogs and round the margins of acid ponds; from May to September as two broods in the south. The ninth tergite in the male bears long pointed projections at each hind corner; these projections are shorter and blunt in the two rare species. Females are difficult to separate.

Hairy Saw-tooth *Prionocera pubescens* Loew. A very rare species which has longish hairs on the praescutum. Bristol and N.W. Yorkshire, June.

Norfolk Saw-tooth *Prionocera subserricornis* Zetterstedt. Known only by a single male taken at Catfield, Norfolk in August.

Genus Ctenophora. Shining black or black and yellow species which in the male have conspicuous feathery lobes on the antennae; the absence of whorls of hairs on the antennae in the female is a character only shared by *Prionocera* and *Dolichopeza*. (Note that the subgenus *Rhipidia* of *Limonia* has feathery antennae in the male; these are much smaller species with *Limonia* wing venation).

All the species are local or rare and breed in dead wood. They resemble ichneumons or large wasps in flight; from May to July. They are perhaps most easily obtained by rearing from larvae taken in the spring. Areas with ancient forest, such as the New Forest, the Chilterns and North Wales, are the most favourable.

The British species may be keyed out as follows:—

(1)	Black stigma clearly defined as a spot	2
	Stigma not a distinct spot, other wing markings present	5
(2)	Abdomen clearly yellow and black banded, 6 parallel yellow bands on hind edges of segments	*flaveolata*
	Abdomen orange, reddish or black; segments uniformly coloured or with a longitudinal dorsal stripe	3
(3)	Male 9th tergite as in figure. Female ovipositor short, about the same length as the fourth abdominal segment; Abdomen slightly shining.	*pectinicornis*
	Male 9th tergite otherwise, as in figures. Female ovipositor elongate, much longer than fourth abdominal segment, abdomen highly glossy, smooth and slender. In female, the first two segments of the abdomen are red and the rest largely black; males variable.	4
(4)	Coxae at least brown tipped, trochanters yellow, antennae black, brown or orange.	*atrata*
	Coxae and trochanters black, antennae black.	*nigricornis*
(5)	Wings yellowish with a brown smudge near the wing tip.	*ornata*
	Pattern of wing markings as in *Nephrotoma quadrifaria* (illustrated), but stronger	*bimaculata*

Bar-winged Feather *Ctenophora bimaculata* Linnaeus. The smallest species, with a wing length of only 10–15 mm. It is perhaps the most widespread species and breeds in a variety of dead wood including birch and willows.

Wasp-banded Feather *Ctenophora flaveolata* Fabricius. Scarce in ancient forests.

Smudge-winged Feather *Ctenophora ornata* Meigen. Very rare, most recent records apply to the New Forest and the Chilterns where it breeds in dead ancient beech trees.

Yellow Feather *Ctenophora pectiniicornis* Linnaeus. Very local, but one of the more frequently recorded species. The male is predominantly yellowish. It has been bred from beech and almost certainly occurs in dead oak wood.

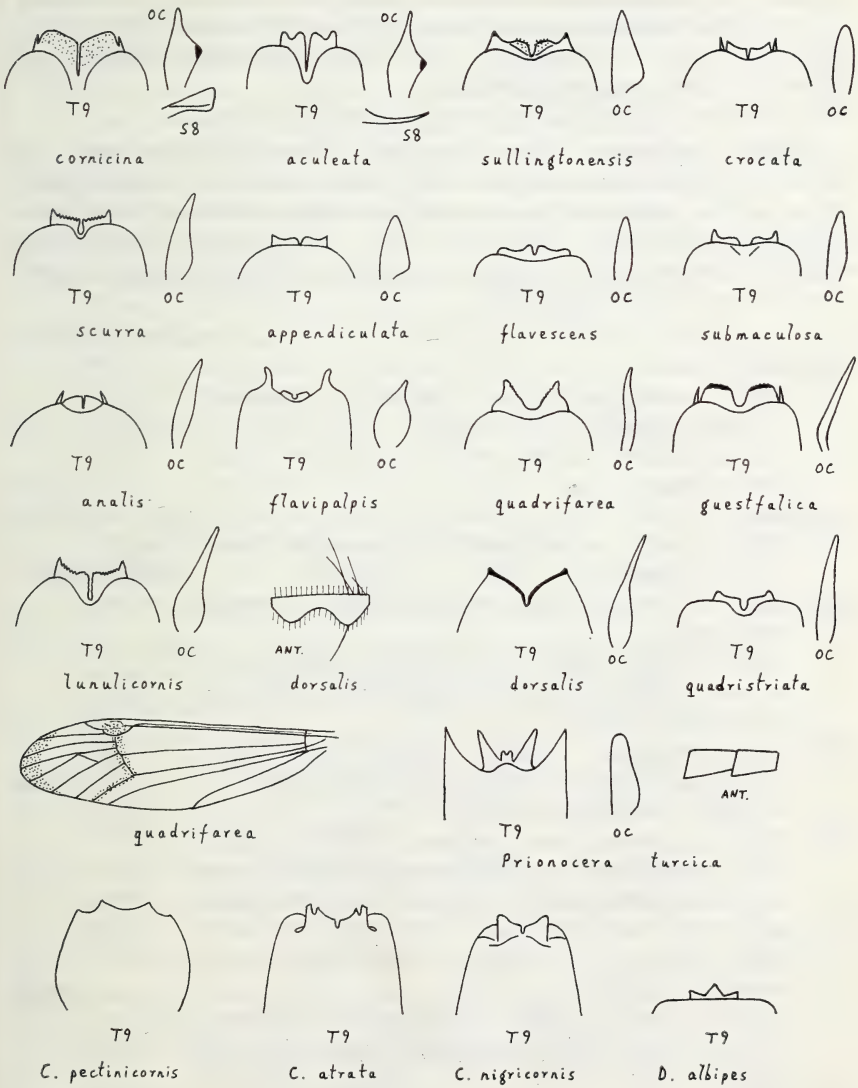

Fig. Genera *Nephrotoma*, *Prionocera*, *Ctenophora* and *Dolichopeza*, illustrating the male 9th tergite and outer clasper (posterior to right) of all *Nephrotoma* species, plus the posterior projection of the 8th sternite of *cornicina* and *aculeata*, the wing of *quadrifaria* showing the shaded band below the stigma and an antenna segment of a male *dorsalis* (*quadristriata* similar) showing the serrate lower surface, characteristic of the central segments. *Prionocera turcica* with the male ninth tergite, outer clasper and central antennal segments showing serrate appearance in side view and absence of whorls of hairs. *Ctenophora* and *Dolichopeza* on bottom row showing shape of male 9th tergite.

Variable Feather *Ctenophora atrata* Linnaeus. The males are very variable in colouration and have conspicuously club shaped genitalia. It is widespread but very local. Specimens with extensively orange antennae are referred to as var. *ruficornis* Meigen.
False Variable Feather *Ctenophora nigricornis*. Very scarce.

Genus Nephrotoma (Tiger Craneflies). A very distinctive genus of yellow and black Craneflies, most of them with three distinct black stripes on the praescutum, a character otherwise only found in the subfamily Cylindrotominae (including False Tigers) which will be considered in the next part. Though superficially rather similar, habitat and time of year assist identification.

A new key is provided which should simplify the identification of the commoner species:—

(1) Dorsal surface of thorax with stripes almost or completely fused. Scarce species. 2
Dorsal surface of thorax with 3 distinct well separated stripes. 3

(2) Sides of thorax black. Usually in heathy woods. *crocata*
Sides of thorax mainly yellow. Very rare on inland dunes in Sussex. *sullingtonensis*

(3) Sides of thorax yellow, with yellowish or orange markings. 4
Sides of thorax yellow with black markings or spots, at least on the lower part of the thorax. Includes commonest species. 6

(4) Large, markedly elongate species, wing length 15–20 mm. Likes dry sandy heaths and woods. *scurra*
Smaller, less elongate species. 5

(5) Wing tip conspicuously darkened. (Male genitalia lack a ventral apical projection on sternite 8. Female ovipositor clubbed at tip (of cerci) and lower (sternal) valves well developed. This species can have black markings on the side of the thorax and is repeated after 12.) *analis*
Wing tip not, or only inconspicuously darkened. (Male genitalia with a short narrow projection with a swollen tip at the ventral apex. Female ovipositor pointed with lower (sternal) valves reduced.) *cornicina*

(6) No black stigma on wing (or at the most very pale brown). Grass and dune species. 7
Black stigma on wing (or distinctly dark brownish). Includes woodland species. 9

(7) Robust yellow species with the dorsal surface of the abdomen a dusky yellow and with a broad dark stripe. Abdomen only slightly flattened laterally. *appendiculata*

Slender primrose yellow species with narrow dorsal stripe on abdomen. Abdomen of male markedly flattened laterally. 8

(8) Inland species of grass and scrub. Black patch on back of head as broad as long. Side of abdomen only with black spots. *flavescens*

Coastal sand dune species. Black patch on back of head narrower and side of abdomen with faint stripe rather than spots. *submaculosa*

(9) Common species of woods and hedgerows. Check through the following three species before proceeding. 10

Without characters of above three species. Uncommon species, or confined to Scotland, or restricted to coastal sand dunes (*analis* is repeated here). 11

(10) A dark shade across the wing below the stigma (see figure) *quadrifaria*

Postnotum with well developed black hairs. *guestfalica*

Abdomen with conspicuous yellow and black banded pattern (i.e. dorsal stripe not continuous) *flavipalpis*

(11) Side stripes of dorsal surface of thorax at their anterior end, either extend almost to lateral edge at junction with side of thorax or with a separate black spot in this position. Scotland only. *aculeata*

Side stripes of dorsal surface of thorax, at their anterior end, stop well short of the lateral edge and with no separate black spot. 12

(12) Male antennae with 19 segments which are strongly serrate (saw-toothed), female with 15 simple segments. *dorsalis*

Antennae with 13 segments as usual. 13

(13) Dune species found on west coast. Genitalia predominantly yellow in male and at most only a narrow black ring before the genitalia (when viewed from the side) in the female. *quadristriata*

Not a dune species. Genitalia of male predominantly black (viewed from the side) and in the female the yellow genitalia are preceeded by a well-developed black ring. 14

(14) A narrow black line on the back of the head. Rare. *lunulicornis*

A triangular mark on the back of the head. Uncommon. *analis*

Heath Banded Tiger *N. crocata* Linnaeus. A local species usually found on sandy paths in heathland woods. This striking cranefly looks wasp-like, with its sharply defined jet black and deep yellow bands. It is recorded in May, June and August.

Sussex Tiger *N. sullingtonensis* Edwards. Only known from inland dunes in Sussex in May and June.

Heath Tiger *N. scurra* Meigen. This species can occur even on dry open sandy heaths, though it is also found in dry woods and hedgerows. It is usually one of the later species to appear, being most frequent in July and August.

Dark-tipped Tiger. *N. analis* Schummel. A scarce species of woods in June and July. The markings on the sides of the thorax can be black or orange.

Mottled Tiger *N. cornicina* Linnaeus. A frequent but easily overlooked woodland and hedgerow species which occurs in July, August and September. The yellow sides of the thorax have a mottled appearance with orange markings.

Meadow Tiger *N. appendiculata* Pierre. This is the most frequent species to be found on open grassland in May and June though it is sometimes found as late as August. It can also be common along hedgerows but is only rarely found in woods.

Primrose Tiger *N. flavescens* Linnaeus. A slender built, clean primrose yellow species taken mainly in late June and July on dry chalk grassland, and similar situations on other soils, is likely to be this species. It can occur on coastal dunes but is usually replaced by the following species.

Common Dune Tiger *N. submaculosa* Edwards. Local on coastal sand dunes: only regularly occurs inland in the north where river bank situations are preferred. This species looks very similar to *flavescens* and great care should be taken with any inland records since these usually prove erronous. It is recorded from April until August, but is normally at its peak in June.

Bar-winged Tiger *N. quadrifaria* Meigen. This is a very common species of hedgerows and woods, and unmistakeable because of shaded bar across the wing. It is particularly frequent in June and July.

Black-haired Tiger *N. guestfalica* Westhoff. Found in woods especially by water but is one of the less frequent species. This is one of the small Tigers with a wing length of 11–14 mm. It is recorded from June until August.

Wood Banded Tiger *N. flavipalpis* Mg. This is a distinctive species of mid-summer which is found commonly in woods and hedgerows and has a tendency to fly over puddles of water. The banded appearance of the abdomen is best developed in the female.

Scottish Tiger *N. aculeata* Loew. So far this species is only recorded from the north eastern part of the Central Highlands of Scotland where it is on the wing in August and September.

Serrate Tiger *N. dorsalis* Fabricus. This is and the following species are the only ones with serrate (saw-toothed) antennae. It is very scarce in damp woods and is probably more easily found in northern districts. It is out from May until August.

Western Dune Tiger *N. quadristriata* Schummel. Known only from coastal sand dunes in Wales and North Devon where it is exceedingly local in dune slack areas (damp depressions within or behind the dunes) in July and August.

Scarce Tiger *N. lunulicornis* Schummel. A scarce woodland species which is poorly known, but appears to be a mainly western species. Records apply to June, July and October.

Guide to common species of Tipulinae

Entirely orange species	*lunata* and *cava* (*Lunatipula*)
Grey species	*luna* and male *fulvipennis* (*Acutipula*); *subnodicornis* (*Savtshenkia*); *lateralis* (*Yamatotipula*); *turcica* (*Prionocera*).
Abdomen orange with black dorsal stripe	*unca* (*Beringotipula*); *scripta* (*Vestiplex*), *vernalis* (*Lunatipula*); *luteipennis* and *melanoceros* (*Platipula*).
Brownish species	*oleracea* and *paludosa* (*Tipula*); female *fulvipennis* (*Acutipula*); *marmorata*, *rufina*, *staegeri*, *signata*, *alpium* (*Savtshenkia*).
Femora at least half black	*variipennis* (*Pterelashisus*); *subnodicornis* (*Savtshenkia*).
Woods and hedgerows	*fascipennis* and *lunata* (*Lunatipula*); *scripta* (*Vestiplex*); *varipennis* (*Pterelashisus*); *flavolineata* (*Dendrotipula*); *pabulina* (*Oreomyza*); *marmorata* (*Savtshenkia*); *flavipalpis*, *quadrifarea* (*Nephrotoma*).
Wet woods or wooded streamlines	*maxima*, *vittata*, *fulvipennis* (*Acutipula*); *oleracea* (*Tipula*); *variicornis* (*Schummelia*); *luteipennis* (*Platytipula*); *pagana*, *staegeri*, *sigmata* (*Savtshenkia*); *albipes* (*Dolichopeza*).
Open marshes and meadows	*luna* (*Acutipula*); *oleracea* and *paludosa* (*Tipula*); *vernalis* (*Lunatipula*); *flavescens*, *appendiculata* (*Nephrotoma*).
Bogs and moorland	*subnopicornis* (*Savtshenkia*); *melanoceros* (*Platytipula*); *turcica* (*Prionocera*).
Open Streamsides	*Lateralis* (*Yamatotipual*).
Heathland woods	*cava* (*Lunatipula*); *marmorata* (*Savtshenkia*); *scurra* (*Nephrotoma*).
Mountains	*alpium* (*Savtshenkia*); *montana* (*Vestiplex*).

(to be continued)

Alan E. Stubbs

A PRELIMINARY SURVEY OF THE FOOD AND FEEDING HABITS OF ADULT BUTTERFLIES (Continued)

British Butterflies and their food preferences

Danaus plexippus Linn.

Unfortunately I have no personal records of the Monarch, but it appears to be confined to flower nectar only. In America it favours species of *Asclepias*, *Solidago*, *Aster*, *Cirsium* and *Trifolium pratense* Linn. In Britain it appears to have been first recorded on *Succisa pratensis* Moench, but its favourite flowers are said to be *Veronica* spp. and *Aster* spp. It has also been recorded visiting *Centranthus ruber* (Linn.) DC., *Buddleia davidii* Franch. and species of *Dahlia*, *Escallonia* and *Plumbago*.

Pararge aegeria egerides Stgr.

The Speckled Wood is frequently reported as seldom to be seen feeding in the adult state. This is not borne out by personal observations. It is addicted to sap and fruit juices as well as flower nectar. The blossoms of *Rubus fruticosus* Linn. agg. appear to be its favourite source of nectar, but I have also seen it on *Ligustrum vulgare* Linn., *Cardamine pratensis* Linn., *Crataegus monogyna* Jacq., *Thelycrania sanguinea* (Linn.) Fourr., *Senecio jacobaea* Linn., *Prunus spinosa* Linn., *Symphoricarpus rivularis* Suksd., *Bidens tripartita* Linn., *Pulicaria dysenterica* (Linn.) Bernh. and *Taraxacum* sp. The butterfly is a frequent visitor to the sap of 'Cossus' trees and has been observed feeding from the over ripe fruits of *R. fruticosus* and *Viburnum lantana* Linn. It has been recorded by others on *Eupatorium cannabinum* Linn. and *Centaurea nigra* Linn., as well as two nectarless plants *Sambucus nigra* Linn. and *Clematis vitalba* Linn., in which case it must possess a proboscis sharp to lacerate the tissue of the flower to imbibe the sweet sap.

The typical subspecies, *P. a. aegeria* Linn., I have observed quite often in S.W. France but I have only seen it feeding from a 'Cossus' tree, it was not seen to visit flowers.

Lasiommata megera Linn.

From my own observations the Wall feeds entirely on flower nectar, mostly from plants of the family Compositae such as *Senecio jacobaea*, *Cirsium arvense* (Linn.) Scop., *Centaurea nigra*, *Achillea millefolium* Linn., *Pulicaria dysenterica*, *Bellis perennis* Linn. and *Hieracium* spp. Outside this family I have seen the butterfly on *Buddleia davidii*, *Anchusa sempervirens* Linn., *Origanum vulgare* Linn., *Centranthus ruber* and *Succisa pratensis* Moench.

Erebia epiphron Knoch

I have no first-hand experience of the Mountain Ringlet. According to Newman (1871) it frequents heather moors "but not a single specimen was seen to settle on it."

Erebia aethiops Esp.

I have not been able to make observations on the Scotch Argus. The only plant listed by Knuth (1906) is *Knautia arvensis* (Linn.) Coult. Newman says that it is usually found on heather but remarks that it was seen to visit *Origanum vulgare* in County Durham (on limestone). It has also been recorded elsewhere on *Centaurea nigra*, *Erica tetralix* Linn. and *Carduus* spp.

Melanargia galathea Linn.

The Marbled White feeds only on flower nectar and, other than its great favourite *Knautia arvensis*, is mainly addicted to the Compositae, Its principle food source is undoubtedly *Centaurea scabiosa* Linn., which has been present in every colony I have personally visited. I have also seen it visit *Origanum vulgare*, *Trifolium pratense*, *Trifolium repens* Linn., *Achillea millefolium*, *Galium* sp., *Thymus serpyllum* Linn. and *Cirsium arvense*. Knuth, referring to the butterfly in Europe, lists four species of *Trifolium*, three of *Centaurea*, *Cirsium*, *Carduus*, as well as *Eupatorium cannibinum* and *Chrysanthemum leucanthemum* Linn.

Hipparchia semele Linn.

The Grayling is another species that is often stated to be indifferent to flowers. It probably prefers sap, particularly that of pine trees but my own observations show that among flowers it visits *Echium vulgare* Linn., *Trifolium pratense*, *Buddleia davidii*, *Origanum vulgare*, *Chamaenerion angustifolium* (Linn.) Scop., *Rubus fruticosus* and *Erica cinerea* Linn. Others have recorded it on *Anagallis tenella* Linn., *Cirsium arvense*, *Lotus corniculatus* Linn., *Anacamptis pyramidalis* (Linn.) Rich. and *Dipsacus fullonum* Linn., as well as at the over-ripe fruits of *R. fruiticosus*. I have not seen it visit fruit myself, and would not have considered it to be a fruit feeder, however it may do so.

Pyronia tithonus Linn.

The Gatekeeper's food is undoubtedly solely flower nectar, mainly from *Rubus fruticosus* and *Cirsium arvense*. It is however partial to *Pulicaria dysenterica* as well as *Arctium minus* Bernh., *Buddleia davidii*, *Origanum vulgare*, *Thymus serpyllum*, *Convolvulus arvensis* Linn. and *Succisa pratensis*.

Maniola jurtina Linn.

The ubiquitous Meadow Brown feeds exclusively from flower nectar and visits most of the common flowering plants such as *Rubus*, *Cirsium*, *Ligustrum*, *Pulicaria*, *Trifolium*, *Senecio*, *Origanum*, *Succisa*, *Knautia*, *Buddleia*, etc. I have also seen it at *Scabiosa columbaria* Linn., *Carlina vulgaris* Linn., *Dipsacus fullonum*, *Echium vulgare*, *Ranunculus* sp. and *Centranthus ruber*. No doubt there are many others but Bramble and Thistles are the most visited.

Coenonympha pamphilus Linn.

The Small Heath is another species confined to flowers, but due to its short proboscis it is obliged to visit flowers with shallow nectaries. I have observed it at *Achillea millefolium*, *Rubus fruticosus*, *Scabiosa columbaria*, *Pulicaria dysenterica*, *Chrysanthemum leucanthemum*, *Ranunculus* spp., *Anthyllis vulneraria* Linn., *Medicago lupulina* Linn. and *Senecio jacobaea*. I once saw it feeding gregariously on *Stellaria holostea* Linn. when more than a dozen individuals were imbibing from a clump of the plant. It is interesting to note that its near relative, *C. arcania* Linn., although recently observed closely in France, was not seen to feed at any time.

Coenonympha tullia Muller

I have not had the good fortune to see the large Heath in the field and have to rely on the observations of others. Huggins (1953) records it on species of *Hieracium*, *Erica*, *Trifolium* and *Potentilla erecta* (Linn.) Rausch. and Long (1957) mentions *Erica tetralix*.

Aphantopus hyperantus Linn.

The Ringlet is another flower lover and *Rubus fruticosus* is its favourite. I have also seen it visiting *Arctium minus*, *Origanum vulgare*, *Ligustrum vulgare*, *Anthyllis vulneraria* and *Helianthum chamaecistus* Mill., which is said to be nectarless. If this is true it must possess a proboscis sharp enough to pierce the flower for sap. The Ringlet is the only butterfly I have ever seen feeding from the very shallow nectaries of *Daucus carota* Linn., other than a brief visit from *Limenitis camilla* Linn., when I have no proof that the butterfly was feeding.

Clossiana selene Schiff.

Ajuga repens Linn. and *Endymion nonscriptus* (Linn.) Garcke are the two favourite sources of nectar of the Small Pearl-bordered Fritillary, at any rate in the south of England: however in the Lake District, where it flies somewhat later, I have seen it on *Erica tetralix* and *Thymus serpyllum*. Knuth mentions *Crepis* sp. in Europe.

Clossiana euphrosyne Linn.

The Pearl-bordered Fritillary appears to be more catholic in its tastes with regard to flower nectar. I have seen it on *Endymion nonscriptum*, *Ajuga reptans*, *Sorbus aria* (Linn.) Crantz, *Taraxacum* sp., *Hieracium* sp., *Viola* sp. and *Lotus corniculatus*. Salts evidently have an attraction for this species as I have seen it at wet mud and wet sawdust. It is also recorded at a dead rabbit.

Issoria lathonia Linn.

This is another species on which I have been unable to make personal observations, but from the records of others it appears that the Queen of Spain Fritillary is confined to flower nectar. Knuth mentions *Knautia arvensis*, *Scabiosa columbaria*, *Centaurea scabiosa*, *Convulvulus arvensis*, *Hieracium* sp. It has also been recorded on *Nepeta cataria* Linn., and Newman gives *Taraxum* spp. and 'thistles'. It was taken on dog excrement in the south of France by Mr. P. Taylor in 1969.

Mesoacidalia aglaja Linn.

The Dark Green Fritillary seems to be mainly attracted to thistles, particularly *Cirsium acaulon* (Linn.) Scop., but I have also seen it as a frequent visitor to *Centaurea nigra*. It has also been recorded on *Buddleia davidii*.

Fabriciana adippe Schiff.

The High Brown Fritillary is particularly fond of tall thistles, such as *Cirsium vulgare* (Savi) Ten., but I have also recorded it on *Centaurea scabiosa*, *Rubus fruticosus* and *Betonica officinalis* (Linn.) Trevis. Wood (1883) records it on *Jasminum officinale* Linn.

Argynnis paphia Linn.

The Silver-washed Fritillary is essentially a flower visitor, attracted mainly to *Rubus fruticosus*, but also fond of tall thistles, such as *Cirsium vulgare*. I have also seen it on *Buddleia davidii*, *Arctium minus*, *Senecio jacobaea*, *Epilobium angustifolium* and *Ligustrum vulgare*. Wood records it on *Jasminum officinale* and Knaggs (1869) on *Centaurea nigra*.

Mellicta athalia Rott.

My observations on the Heath Fritillary are confined to France where I have seen it on *Rubus fruticosus* and *Erica cinerea*. Knuth records it, also in Europe, on *Helianthemum chamaecistus* "vainly trying to suck", for this is a nectarless flower. In Cornwall it is recorded by Clark (1906) on *Veronica chamaedrys* Linn. and Mr P. W. Cribb, in correspondence, also mentions it visiting *Veronica* sp. as well as *Ajuga reptans*. He goes on to say that in Europe it is attracted to moist patches as well as sheep droppings and cow pats.

Melitaea cinxia Linn.

I have no personal experience of the Glanville Fritillary, but Knuth records it on *Echium vulgare* and Knaggs on *Rhinanthus minor* Linn., to which Newman adds *Anthyllis vulneraria*. According to Mr P. W. Cribb, *Hieracium* spp. and allied yellow Compositae seem to be the only flowers visited, but like *Mellicta athalia* it is fond of visiting water, sheep droppings and cow pats in Europe.

Euphydryas aurinia Rott.

I have not met with the Marsh Fritillary in the field and am therefore indebted to Mr P. W. Cribb for these observations. He has recorded it on *Ajuga reptans* and *Hieracium* spp. and makes the point that in some of its localities there are very few flowers and little feeding seems to take place. It was not observed in the wild to frequent damp patches of ground, but its habitat is often damp which would obviate this. It has, however, been seen to drink water in captivity.

Vanessa atalanta Linn.

The Red Admiral is well known as a visitor to both wild and cultivated flowers, but its varied diet also includes fruit juices, carrion, fermenting sap and an attraction to freshly laid tar. Personal observations of flowers visited include *Aster* spp. (most species), *Hedera helix* Linn., *Arctium minus*, *Ligustrum* spp., *Buddleia davidii*, *Cirsium* spp., *Echium vulgare* and many cultivated species of the Compositae. In Jersey I have seen it on *Jasminum officinale*. It is very fond of rotten and fermenting fruits, particularly apples and pears, and a 'Cossus' tree will attract it from some distance to imbibe the fermenting sap. I have not seen it at carrion myself, but it is recorded elsewhere as visiting a dead rat. It has also been seen settling on freshly tarred roads, but the reason for this is as yet unexplained.

Vanessa cardui Linn.

Unlike its near relative *V. atalanta*, the Painted Lady is only attracted to flowers. *Buddleia davidii* and *Aster* spp. are perhaps its two favourites, but it will visit many wild and cultivated flowers. I have seen it on *Hieracium* sp., *Ligustrum* sp., *Trifolium pratense*, *Senecio jacobaea*, *Hedera helix*, *Centaurea nigra*, *Sambucus nigra* (nectarless) and *Calluna vulgaris* (Linn.) Hull. The unusually early arrival of immigrants in 1952 resulted in a list of spring flowers visited. These were *Tussilago farfara* Linn., *Erica carnea* Linn., *Ranunculus ficaria* Linn., *Erica mediterranea* Linn., *Primula vulgaris* Huds., *Cheiranthus cheiri* Linn. and cultivated species of *Primula*, *Aubrieta*, *Anemone* and *Viburnum tinus* Linn.

Aglais urticae Linn.

Other than one or two records of odd behaviour, such as attraction to fresh cement and dry 'honeydew', the Small Tortoiseshell is essentially a flower lover. It visits most wild and garden flowers suitable for its long proboscis. Its prime favourites are *Buddleia davidii*, *Aster* spp., and *Sedum spectabile* Bor. Other plants it has been seen to visit are *Rubus fruticosus*, *Hieracium* spp., *Cirsium* spp., *Senecio jacobaea*, *Salix caprea* Linn., *Tussilago farfara*, *Betonica officinalis*, *Origanum vulgare*, *Centranthus ruber*, *Calluna vulgaris* (Linn.) Hull., *Chamaenerion angustifolium*, *Thymus serpyllum*, *Erica cinerea*, *Trifolium pratense*, *Centaurea nigra*, *Echium vulgare*, *Primula* spp., *Taraxacum* spp. and *Aubretia* spp.

Nymphalis polychloros Linn.

The Large Tortoiseshell is generally thought to feed exclusively on tree sap, and indeed the only time I have met with it (in S.W. France) it was so doing from a 'Cossus' infected Oak. Beaufoy (1947) however records it as visiting *Prunus spinosa* and *Buddleia davidii*, while Temple (1945) gives *Petasites hybridus* (Linn.) Gaertn.

Inachis io Linn.

The Peacock is mainly a flower lover, but it is also fond of tree sap, but not from 'Cossus' trees. I have also seen it at wet mud and the droppings of a fox. After hibernation it visits *Salix caprea* and *Tussilago farfara* mainly, but I have also seen it at *Primula* spp., *Prunus spinosa*, *Cardamine pratensis* and *Dactylorchis fuchsii* (Druce) Vermeul. In July the new brood visits *Chamaenerion angustifolium*, *Stachys officinalis*, *Eupatorium cannabinum*, *Cirsium* spp., *Arctium minus*, *Ligustrum* spp., *Pulicaria dysenterica*, *Succisa pratensis*, *Senecio jacobaea*, *Origanum vulgare*, *Dipsacus fullonum*, *Achillea millefolium*, *Buddleia davidii*, *Aster* spp. and the cultivated varieties of *Phlox* and *Dianthus*.

Nymphalis antiopa Linn.

I have no personal experience of the Camberwell Beauty but it would appear to be mainly a sap feeder. There are records of it at both birch and maple sap. It has also been observed at the juice of apple peelings and at wet mud. Knuth mentions it visiting *Tussilago farfara* in Europe and Knaggs refers to *Lonicera* (?*periclymenum* Linn.) and *Hedera helix*.

Polygonia c-album Linn.

The Comma favours a very varied diet and although best known on *Buddleia davidii* and *Aster* spp. it is also fond of *Rubus fruticosus* (especially the red-stemmed variety), *Ligustrum* spp., *Salix caprea*, *Prunus spinosa*, *Centaurea nigra* and has been recorded elsewhere on the white variety of *Syringa*. Other than flowers I have seen it feeding from sap flowing from a 'Cossus' infested Silver Birch, from wet soil with rabbit droppings, from over-ripe blackberries and rotten apples, as well as sucking up perspiration from the entomologist's forearm. The closely related American species, *P. faunus* Edwards, has been recorded as feeding in numbers on carrion.

Apatura iris Linn.

I have no personal records of the feeding habits of the Purple Emperor although I have seen it on the wing on several occasions. I therefore refer to Heslop *et al* (1964) whose monograph on this species is unequalled. Running sap from wounded trees and aphis secretion (honeydew) are possibly its principal diet and, although the habit appears to have almost died out in England (possibly due to the insect's vulnerability when feeding to the increasing numbers of predaceous birds) attraction to carrion is

still strong abroad. There are records of the insect visiting flowers, but this probably only occurs when sap and honeydew are not readily available due to unsuitable weather conditions and other factors. Plants mentioned are *Aster* spp., *Centaurea* spp. and *Buddleia davidii*.

Limenitis camilla Linn.

Other than young males at wet mud, the only food I have seen the White Admiral take is nectar from *Rubus fruticosus*. One visit seen to *Daucus carota* was probably of no value as a record as it was too far away to see if the insect was feeding: in any case the flowers are unsuitable for a long-tongued butterfly. It has been recorded elsewhere on *Ligustrum* spp. of which its near relative *L. reducta* Stdgr is very fond.

Hamearis lucina Linn.

The Duke of Burgundy Fritillary is rarely seen to feed in the adult state. I have seen it on *Helianthemum chamaecistus*, which is nectarless, and *Sinapis arvensis* Linn. Others have recorded it on *Crataegus monogyna*, *Ranunculus* spp., *Polygala vulgaris* Linn. and *Ajuga reptans*.

(*To be continued*) B. R. Stallwood (1547)

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THE REPORT OF THE COUNCIL OF THE AMATEUR ENTOMOLOGISTS' SOCIETY FOR THE YEAR 1972

During 1972, the Council met six times, five times under the chairmanship of the President, Mr G. Prior, and once under that of Mr R. Hilliard. This year has seen a continued expansion of membership and for the first time in its history, the Society had more than 1,000 paid-up members.

Bulletin

Four *Bulletins* were published, three of these edited by Dr P. Boswell and one jointly by him and Mr J. Bocock, the former Editor. There were delays in publication due to difficulties with the printers and other matters and for this and cost reasons the Council decided to change printers. It is hoped that the new printers will ensure prompt delivery in the future.

Material of a high quality continues to be supplied by members, resulting in a publication that is now highly regarded both inside and outside the Society.

Publications

The leaflet *Killing, Setting and Storing Lepidoptera* was revised and published, also a new Membership List. A new leaflet on the dissection and study of the genitalia of Lepidoptera is with the printers. The Council records its thanks to Mr L. Christie for his continuing assistance as our Publications Agent.

Exhibition

This was again held at the Holland Park School and the attendance continued to be high and the number of exhibits increased. The most gratifying thing was the increase in the number of junior members exhibiting, all of whom reached a very high standard. The Council also put into operation its policy of regulating the number of trade exhibitors.

Finance

This is reported in detail by the Honorary Treasurer.

The Council records its thanks to the members of Council who have retired—Messrs. R. H. Allen, J. Bocock and R. J. Cooter—also to Mr M. Hough who has had to relinquish the office of Exhibition Secretary.

G. Prior
President and Honorary General Secretary

HONORARY TREASURER'S REPORT FOR THE YEAR 1972
AMATEUR ENTOMOLOGISTS' SOCIETY

Firstly may I introduce myself to members of the AES. It has been a pleasure to take over this job from Mr Glyn Henwood at a time of progress and expansion for the Society.

Looking at the Income and Expenditure Account you will see that subscription income rose to £1062, reflecting a net gain to the Society of 115 new members. Regrettably, the increase in subscriptions was completely absorbed by very substantial increases in producing the *Bulletin* and in running costs (stationery, postage, etc.), which together totalled £1069, slightly more than subscription income alone. The subsidy to the Conservation Group was raised to £22 and the cost of producing the Membership List (published every four years) was, at £142, effectively met by a fortunate increase in members' donations. The excess of income over expenditure can therefore be attributable solely to surpluses arising from activities such as the Exhibition, AES badges, Wants and Exchange Lists, all of which vary very considerably from year to year.

Income and Expenditure Account: Year ended 31st December, 1972

1971 £	Expenditure	1972 £	1971 £	Income	1972 £
592	Bulletins	719	921	Subscriptions ..	1062
—	Membership List ..	142	89	Donations	125
25	Stationery	56	27	Advertising.. ..	70
134	Postage and Distribution ..	232	11	AES Badges (net) ..	13
11	Room Hire.. ..	34	109	Annual Exhibition (net)	62
7	Depreciation (Duplicator) ..	7	—	Wants and Exchange List ..	14
16	Insurances and Sundries	21	27	Bank Deposit Interest ..	30
5	Conservation Group	22			
394	Excess Income ..	143			
1184		1376	1184		1376

Balance Sheet at 31st December, 1972

1971 £		1972 £	1971 £		1972 £
926	General Fund ..	1320	69	Fixed Assets ..	62
394	Excess Income ..	143	1320	Building Society Deposit	1386
1527	Publications Fund..	1767	650	Current Assets ..	1329
160	Publications Surplus	997	51	Sundry Debtors ..	103
80	Building Society Interest	66	1224	Cash at Bank ..	2127
49	1973 Subs. in advance	352			
3	1973 Donations in advance	42	3314		5007
175	Sundry Creditors ..	320			
3314		5007			

N. H. Cooke, Hon. Treasurer

Accounts shown are subject to audit

In view of the need for membership income to keep pace with inflation, the Council decided to increase subscriptions as from September 1st, 1972 to £1·50 (Juniors 80p). Although a detailed explanation of this decision was given in the November 1972 *Bulletin*, I should add here that this is the first increase since 1966, it is not substantial, and, in my view, should not have to be repeated for a similar length of time (or longer) provided the Society continues to gain new membership as it has done

recently. I am pleased to report that there has to date been no significant fall in 1973 subscriptions.

With regard to the Balance Sheet, the General Fund balance of £1463 is an indication of the fundamental strength of our finances. The Publications Fund balance of £2830 includes a surplus for the year of £997, only £358 of which is attributable to a surplus on publication sales. The remaining £639 arises from a revaluation of stocks at December 31st, 1972. The valuation of publications has always been a contentious point, but I feel (together with a majority of Council) that the previous method of excessive depreciation of stocks did not reflect their true worth in the Accounts (especially for insurance purposes) and bore no relation to any future income arising from sales. A determined effort has therefore been made to revalue stocks at their net realistic value only, and I hope this basis will be used for future valuations. Although this change will reduce future surpluses attributable to the Publications Fund, it will give members a more accurate picture of the position.

To conclude, I hope that the Society's current progress will not be restricted by the kind of financial weakness it has suffered from in the past. At present that is not the case and the Society has entered 1973 with very liquid resources at its disposal with which to finance larger *Bulletins* as well as new publications, and provide a generally improved service to its members.

Nicholas Cooke
Honorary Treasurer

THE ANNUAL EXHIBITION 1973

The Exhibition will be held on the 29th September at the Holland Park School. No special theme has been set this year as it is felt that this may have inhibited some members from exhibiting last year. The Council would like members to concentrate exhibits on the study of the living insect but set insects are also acceptable and if possible all exhibits should have some purpose in mind. The name of the exhibitor should be clearly indicated in each case and, where appropriate, notes should be attached giving information and background to the display. Junior members' exhibits will again be judged and suitable prizes awarded.

Every member should have something worth showing to his fellow members and it could be as little as one insect. Drawings, photographs, equipment as well as insects, dead or alive, add to the interest of the day and no member should come empty handed. Members may bring their own slides for showing in the projection room and should be prepared to talk about them. It is hoped that some practical demonstrations can be given during the afternoon.

Dealers in entomological equipment, literature and livestock will be present during the day but members who wish to dispose of any surplus

material must use the facilities provided by the Wants and Exchanges table. You may bring surplus material for sale by the Society's representative and the proceeds will go to the Society's funds or you may dispose of the material yourself, making some donation to the funds for the use of the table space.

Remember that this is YOUR Exhibition and its success depends on your active participation not only in attending but also in adding to the exhibits.

A final warning—last year some members failed to book table space until the last minute and could not be given as much space as they would have liked. Please send in your requirements as soon as possible so that you are not disappointed in the staging of your exhibit. If you do have to leave it to the last minute, please telephone me at 01 894 9001 so that your needs can be met.

Let us make this year's Exhibition the best yet.

P. W. Cribb (2270)

THE 1972 ANNUAL EXHIBITION

Drawing on the experience gained from our first three years at Holland Park School, the current Exhibition was planned to provide a sensible balance between members' exhibits and the dealers offering entomological material. Both contribute significantly to the success of the day and the result was gratifying with a splendid response from members and friends and a significant decrease in the display of irrelevant articles. The introduction of a special theme for the year, in this case 'Garden Insects', proved a useful incentive for individual efforts. However it is intended as an addition to normal exhibits and not as a replacement.

The standard of refreshments and the efficient service was a credit to Mrs. Hilliard, and the hard-working band of helpers, and added much to the appeal of the occasion. Also, the spacious surroundings enabled visitors to enjoy the exhibits with more ease and comfort than is usually the case. The suggestion that the canteen should be moved to the further end of the Hall is not very practical. Easy access to the kitchens is essential for supplies, hot water and washing up, as well as the siting of the power points.

Among the many workers who contributed largely to the success of the event were Martin Hough, who undertook most of the preliminary arrangements and Peter Cribb and George Prior, who managed the final arrangements. Stephen Cribb once again held the Enquiries Table. Special attractions were the demonstration of genitalia dissection by Richard Dickson, the art of setting Diptera by Alan Stubbs and the supervision of the showing of members' colour slides by Peter Cribb. We were pleased to welcome the St Ivo Natural History Society once

again. Henry Berman contrived to transfer a large band of students and literally a miniature zoo, by coach from Hunstanton.

The junior members provided excellent exhibits and the Committee decided to award three prizes instead of the one intended. The three finally selected were Andrew Creber, Ian McIlraith and K. A. Moseley, and details are mentioned in the general list.

It is our usual custom to briefly note the exhibits, but the actual listing of them is becoming increasingly difficult in the comparatively short time available. The exercise would be eased if members will prepare a slip showing their name and AES number, together with a precise description of their exhibit. A further suggestion made in the February, 1973 *Bulletin* for a better coverage together with photographs of the more interesting exhibits, is being considered by the Council. Probably this would require a separate report by another member of the Society.

Exhibits this year included:—

AES Conservation Group—Two exhibits dealing with the damage caused by domestic insects and methods of encouraging useful insects in the garden.

Appleton, D. (3631)—Beetles found in the Isle of Wight, this year.

Batchelor, C. and Milton, J.—British butterflies and moths.

Bayliss, R.—A comprehensive collection of British Lepidoptera.

Bee Research Association—Picture library covering various aspects of bee-keeping and Bumble Bee distribution maps.

Benham, B. R. (4393) and Muggleton, J. (3253)—Studies on the ecology of Ladybirds (Coccinellidae).

Biological Records Centre, Monks Wood—Progress of national recording schemes.

Blackman, T. (4303)—Large model of Bush Cricket (*Metrioptera roeselii* (Hagenbach)).

Cattermole, P. A. (3652)—Some butterflies and moths taken during a visit to N.W. Scotland in July and August, 1972.

Chandler, P. J.—Flies (Diptera), dependent on decaying trees.

Cordell, P. A. (3656)—Larvae of some common moths from Kent and East Surrey to illustrate variation. Method of preserving caterpillars. Local species and forms of moths from S. Kent.

Creber A. (4893)—Map and chart showing distribution of various lepidoptera in Saltash (Plymouth area).

Cribb, P. W. (2270)—Examples of butterflies bred in a suburban back garden. Butterflies taken on a recent trip to Montenegro (Jugoslavia). Larvae of *Apatura iris* Fab. (Purple Emperor Butterfly) being bred for release.

Dickson, R. (3674)—Photographs and records of Browndown Fen (near Gosport), a habitat for a number of rare species of insects. Now to be used as a dump.

Edwards, J. S.—Butterflies from Overseas, including Singapore, Hong-Kong, Ceylon and Bernese Alps.

Else, G. R. (3881)—Aculeate Hymenoptera (social insects with ovipositor modified as a sting, bees, wasps, ants, etc.) from Hampshire.

Gardiner, B. O. C. (225)—Exotic crickets, locusts, and beetles. Particulars of breeding methods and equipment required.

Goodden, R. C. (2614) and Mrs. R.—Life history and method of breeding Large Blue Butterfly (*Maculinea arion* Linn.) in captivity.

Hammond, C. O.—Abdominal patterns of the queens of six species of British social wasps. Also reference series of adults.

Heath, J. (3882) and Mrs. C.—Collection of living Praying Mantids (Saltatoria).

Hilliard, R. D. (99)—Examples of moths occurring reasonably commonly in a London suburban garden, adjacent to a golf course.

Hodges, P. (4797)—Illustrated life history of Cabbage Moth (*Mamestra brassicae* Linn.).

Leeke, R. (4971)—Large map showing dominant plant species of an area of wasteland. Also summary and examples of insect population.

Loveday, J. M. (4191)—Paintings of European butterflies.

Mardle, K. W. (4668)—Method of mounting insects on styrene squares.

McCormick, R. F. (3375) and Penney, C. (3880)—A survey of the British Lepidoptera seen this year.

McIlraith, I. A. (4621)—Life history of the Stag Beetle (*Lucanus cervus* Linn.), fully illustrated.

McLean, I. (3848)—Butterflies taken in France and Switzerland from 1966 to 1971.

Moseley, K. A. (4773)—Detailed notes and examples of social bees and wasps.

Palmer, H. (4183)—Design in the display of butterflies.

Payne, R. M. (2982)—Common flies (Diptera) occurring in gardens.

Perceval, M. J. (3798)—Interesting Rhopalocera noted in France during 1972.

Platts, J. (4300)—Heavy-bodied moths (Noctuidae) from Kent.

Roche, J. (3096)—Microlepidoptera recorded from Kent and other areas in 1972.

Sadler, E. A. (2966)—Local British Lepidoptera. Insects from the Isle of Elba and a comprehensive collection of British shells.

Selden, P. (4115) and Henderson, M. (4709)—Beetles recorded from the Forest of Dean.

Shearer, V. (2827)—Larvae of the Scarce Swallowtail Butterfly (*Iphiclides podalirius* Linn.).

Smart, L. A. (3548)—Local series of the Common Blue (*Polyommatus icarus* Rott.) and Green-Veined White Butterflies (*Pieris napi* Linn.).

St. Ivo Natural History Society—A representative collection of creatures of many orders being bred and studied by this vigorous school society.

Stubbs, A.—Details of the British Cranefly Recording Scheme. Insects dependent on rotting wood. (Display to mark the publication of the first Advisary Pamphlet by the Joint Committee for the Conservation of British Insects.)

Tuck, K. (4937)—Various species of Stick Insects.

Tyler, D. B. (3865)—Aberrations of British butterflies and moths. Examples of hawkmoths (Sphingidae) and useful types of larval breeding cages.

Uffen, R. W. J. (1660)—Life cycle of the Gracilarid (*Caloptilia syringella* Fab.), a leaf miner pest on privet and lilac. Also the extensive fauna living on urban privet hedges.

Waters, A. P. (2615)—Butterflies recorded from France and Switzerland during 1972.

Williams, R. J. (4531)—Complete collection of Lepidoptera listed from the Orpington area of Kent.

Wilson, D. J. (4600)—An outstanding aberration of the Adonis Blue Butterfly (*Lysandra bellargus* Rott.).

Zoological Gardens—The London Zoological Gardens showed some of the smaller creatures currently on view at Regent's Park.

R. D. Hilliard (99)

"UNPRONOUNCEABLE AWFUL NAMES"

At last we have the long-awaited second edition of the *Kloet and Hincks Check List of Lepidoptera.* Two members of the AES quite independently have said that they find some of its technical terms and conventions hard to follow and others no doubt have the same difficulty. The following notes are intended to help such persons.

Sphinx ligustri Linnaeus, 1758
Hyloicus pinastri (Linnaeus, 1758)

Why is the author's name in brackets in the second instance and not in the first? When Linnaeus named the Privet Hawk, he placed it in the genus Sphinx where, marvellous to relate, it has stayed ever since. In the same year he also named the Pine Hawk, placing it in the same genus *Sphinx*, but it was subsequently transferred to Hübner's genus *Hyloicus*, established in 1819. Brackets are used when a species has been transferred to a genus different from that in which it was originally described, as in this instance. The distinction is not a very important one and need only be observed when you are writing in a strictly scientific context.

Pheosia tremula (Clerck, 1759)
dictaea (Linnaeus, 1767)

Here we have a straightforward synonym. Both the authors gave a name to the Swallow Prominent, but as Clerck's name was the first to be published, his is the name we must use. This rule is called the Law of Priority.

Cerura vinula (Linnaeus, 1758)
erminea sensu Stephens, 1828

'Sensu' means 'in the opinion of'. Here it is indicated that Stephens misidentified *vinula* as *erminea* (which is not a British species), i.e. when he wrote about the Puss Moth he got his determination wrong and 'in his opinion' it was *erminea*. So *erminea* is not strictly a synonym of *vinula*. The purpose in recording Stephens' misidentification is to help entomologists who may study his work and would otherwise be confused.

Apamea charactea (Hübner, 1800–03)
hepatica sensu auct.

'Auct.' is the abbreviation for 'auctorum' and means 'of the authors'. Here it is indicated that a number of authors misidentified the Clouded Brindle and called it by a name that belongs to another moth.

Lacanobia w-latinum (Hufnagel, 1766)
genistae (Borkhausen, 1792) nec (Villers, 1789)

'Nec' means 'but not'. In this instance Borkhausen named the Light Brocade '*genistae*', unaware that three years previously Villers had used the name for a different insect. This use of the same name for two or more distinct species is called homonymy. So we understand here that *genistae* Borkhausen is a synonym for *w-latinum*, but *genistae* Villers is not.

Oegoconia quadripuncta (Haworth, 1828)
deauratella (Herrich-Schäffer, 1854) partim
Oegoconia deauratella (Herrich-Schäffer, 1854)

'Partim' means 'in part'. A few years ago the Gelechiid 'species' *quadripuncta*, which had the junior synonym *deauratella*, was discovered to consist of two very similar species. The name *deauratella* was available for the 'new' species. But when Herrich-Schäffer gave the name in 1854 he had a mixed series of specimens and he was applying it to the 'old' and 'new' species alike. So part of his concept of *deauratella* still belongs to *quadripuncta*.

Sorhagenia rhamniella (Zeller, 1839)
Sorhagenia lophyrella (Douglas, 1846)
rhamniella sensu auct., partim
tulli Riedl, 1962
Sorhagenia janiszewskae Riedl, 1962
rhamniella sensu auct., partim
Coleophora therinella Tengström, 1848
peribenanderi (Toll, 1952)
benanderi Toll, 1942, nec Kanerva, 1941
therinella sensu Pierce and Metcalfe, 1935, et auct.

Now, using the information given above, try your hand at working

out the interesting story told by the synonymy of the species of micro-lepidoptera given above.

My thanks are due to Dr J. D. Bradley, one of the authors of the revised 'Kloet and Hincks Check List', for reading through these notes and making some helpful suggestions. However, he protests that the quotation I have adopted as my title does not reflect the tone of what follows (always wanting to change names, you see); he should first have asked if I were interpreting 'awful' in its slang or religious sense. But to be more serious, the new check list is a scholarly document of great value to entomologists and our sincere gratitude is due to its authors.

A. M. Emmet (1379)

PIEMONTE AND LIGURIA

This year (1972), as a change from the unpredictable northern summer conditions (it was subsequently the hottest summer in Finland this century!) we decided to go south. The trip from Finland to Italy being difficult to accomplish by road and sea in less than two and a half days, a sojourn of 'reasonable' duration was planned. For me this was no problem, as Finnish schools close down on May 31st for the long summer holiday. My wife, with exemplary cunning, simply arranged to have a baby on the 26th of June, thereby depriving her firm of her services for just about the whole collecting season and getting a bumper parcel of free nappies from the Republic of Finland. When the offspring (a male, in mint condition) chose to arrive in Switzerland as early as June 6th, I merely erected our tent and in between bouts of collecting and the odd shower of snow, recalled to mind other breeding experiments that had not come off quite as planned.

Realising that the newly-arrived would require something more than a canvas roof and a handful of ant larvae, we established him safely in a special home and sped south to melons and two-litre bottles of red wine.

The map is a crude depiction of the areas in which we stayed, while the table gives visual estimates of the numbers of butterflies encountered.

Torino, ensconced in a sea of browned wheat fields and long columns of lime trees, appalled us so much that we came out at a run and we didn't stop until we arrived at a large deciduous wood in which the *Apatura ilia* Schiff. were flying down to fidget about piles of refuse at the roadside. The main drawback of this collecting spot was that it was also frequented by a young lady, who sat on an orange-box by the roadside and conducted nefarious business with passing gentlemen.

West towards Pinerolo the mountains begin and you soon have all the peaks and twisting bends that you could wish for. Further up, at Sestriere, rising to 3000 metres, snow-capped peaks shimmered in the sun, and slightly lower down flowers of every imaginable colour jostled for space as the breeze dug into them. Here many special alpine species were

bursting into bloom for, in the last ten days of June, it was still exhilarating spring at those altitudes. Strewing over the beds of flowers were dozens of Lackey Moth larvae (*Malacosoma neustria* Linn.), while trefoils hid Burnet Moth larvae, and the odd Tiger Moth caterpillar beat a furry retreat as your feet scuffed through the ankle-deep herbage. From the top you gazed west into France, but a few kilometres distant, and when you

looked around you in a full circle you took in the bow-shaped cables of ski-lifts and then hundreds of Larches forming the tree layer. Above the tree line, like a last thin fringe of hair around a monk's head, brownish-green slopes showed where the *Erebia* larvae still munched in the last strongholds of grasses. Above these was a wrinkled dome of snow.

There was no place, however, so romantic as the winding valley beyond Exilles and Oulx. At 700 metres there was no longer the invigorating alpine scene. The emphasis was upon rock, hard and glittering under a sadistic sun, and Apollos scudded in their literal scores up and down cliffs studded with scabious and other plants with tiny blooms and cringing little leaves. It was so hot and dry you wondered the red-flowering *Sempervivum* and yellow-flowering *Sedum* were not dessicated out of existence. Here, too, the Black-veined White (*Aporia crataegi* Linn.) chased anything white, Scarabaeid beetles homed in to the flowers of a solitary sweet-chestnut, and the males of the black and white burnet, *Zygaena ephialtes* Linn., buzzed about in search of mates. One of my wife's innumerable fine captures was a male *Cerambyx cerdo* Linn. taken at the chestnut blooms. Figured in every 'Common Insect Guide' from Nordkapp to Palermo, this is a fine long-horn beetle of length 30 to 50 mm.

On the floor of the valley among lush meadows *Heodes alciphron* Rott. ssp. *gordius* Sulz. raced about and gleamed purple whenever the sun struck its ruddy upperside, and there were females too that had no such embellishment. And in a copse meadow higher up and away from the glare of sun-beaten rock, fritillaries dashed hither and thither, whilst, perhaps the most exciting of all, the weird orange larvae of the Southern Festoon (*Zerynthia polyxena* Schiff.) clung to the thin stems of *Aristolochia rotunda* Linn. and brought to mind the Papilios of even warmer lands.

My wife presented me with a male Dark Green Fritillary (*Mesoacidalia aglaja* Linn.) in which the forewing ground colour was almost entirely obscured by a black suffusion, truly a fine aberration.

Everywhere the Ascalaphid ant-lions danced in the air or came to rest on flower heads so that their yellow-marked wings and long, clubbed antennae could be seen. The black and parchment coloured pupae of *Melitaea phoebe* Schiff. and *M. didyma* Esp. hung from the stone walls separating the meadows from the roadsides, and crickets sang from the entrances to their burrows. Only the lure of the Mediterranean would have forced me out of this enchanting area: and this it did on June 30th.

Taking the most direct southerly route involved driving part of the way through France and there, in the Roia (Roja) valley between sheer peaks, the first olive groves made their appearance and the sight of male *Gonepteryx cleopatra* Linn. strengthened the impression that we had passed out of our area. At Imperia, on the coast just south of the Alpi Maritimi, finding a camping site was merely a process of elimination, as there seemed to be dozens of them. At last we chose one and from June 30th to July 6th we slept under poplars, where aphids competed with

caterpillars to pour their waste upon our tent and the evening voice of the quaint little Mediterranean tree frog (*Hyla arborea meridionalisl* Linn.) beat insistently from just over the wall. The humidity was high and one kept up a permanent sweat, in contrast to conditions in the Sestriere area where the sun tended to 'set' early behind the peaks and plunge the camp site into cold shadow.

In the hills (for mountains had ceased to exist) the accent was once again upon aridity, provided you stayed near the coast. But if you ventured inland you faced a tangle of vegetation and an inclination that made collecting a hazardous occupation. After netting a series of *Nordmannia ilicis* Esp. from this perpendicular jungle, we kept to the coastal region and faced the merciless heat. Dust and scrub, bare rock and olive groves, an orchard of fig trees in a dip of the land, a cane copse, undersized bushes with thorns—these were the order of the day on the first slopes north of the blue Mediterranean. If a touch of Africa were required, this was obtained as the odd locust glided bird-like across the scrub to hide away in some bush or stout herb, from which, if you could fight your way through the thorns, it could be extracted after a diligent search. Flight seems to be the priority only so long as the insect is sitting high enough up to be able to shoot off in a long glide (for it cannot flap); otherwise, though well camouflaged, it is no match for the insect-attuned eyes of you or me. Hornets were huge; and enormous wasp-like insects (*Scolia flavifrons*) with yellow spots on their otherwise black abdomens occasionally zoomed in to see what one was about. Inevitably, wherever there was a patch of wet mud near a stream, 'Skippers' and 'Blues' dipped their proboscides into moisture. Large dark blue humble-bees (*Xylocopa* sp.) were busy among the scabious blooms.

On a privet bush (*Ligustrum vulgare* Linn.) beside the bed of a river which had almost dried up, a privet hawkmoth larva (*Sphinx ligustri* Linn.), already four centimetres long, was discovered on July 5th. A wingless bush-cricket called *Ephippiger*, green and floppy-legged, pushed his horsey face around a leaf and was captured instantly. When roused from his box he would utter a testy 'tizi' (his Burgundian name), and incidentally by performing a jig on my microphone ruined a brilliant recording of one of the less boisterous voices of the Mediterranean. As a punishment I took him home and fed him Finnish grass.

Liguria, as you wind north, seems to end abruptly at a little place called Ponte di Nava (950 metres), where an inordinately large number of priests mingled with an alpine vegetation very similar to that seen around Sestriere. From then on, towards Torino, *Z. ephialtes* was cut down in dozens by speeding cars.

We returned to Sestriere on July 6th and certain changes were noted in the butterfly populations, as shown in the table. A new discovery was the small Argentera valley, at 1800 metres, where the valley floor was of almost Lappish appearance, being carpeted with flowers and including

such important foodplants as the *Astragalus* species, around which *Albulina orbitulus* de Prun. wove blue patterns. Ascending one day (July 8th) to 2376 metres, we enjoyed the experience of passing up through the various zones by means of a circuitous cart track ten kilometres in length. *Oeneis glacialis* Moll. basked on the track at 2200 metres, while at the summit, like a crowning glory, *Erebia pandrose* Bork. gambolled across the sparse grass and the dry stones—and, watching it there, impressed by the ragged peaks gathered all around, you might have been forgiven for proclaiming the grass, the stones and the butterflies Norwegian. It was a fine titbit of arctic-alpine entomology and a just climax to a gruelling climb in the heat of the day.

We passed back to Switzerland the way we had come—via the Valle d'Aosta—and there, at rather less cost, are neat snippets of arid Mediterranean-type vegetation supporting such romantic creatures as the Large Tortoiseshell butterfly (*Nymphalis polychloros* Linn.) and the Green lizard (*Lacerta viridis* Linn.)

One left with regret, in spite of the howling wind that sprung up on July 10th, but, with bottles of olives and capers, three live tree frogs and twelve litres of red wine, all of which safely crossed the frontiers, one could do worse than close one's eyes in the evening as a tree frog pipes up in the vivarium and wish one were back there, for both are great places for the entomologist.

5.9.1972 Leigh Plester (2968)

Table

Localities visited, heights and dates (figures in brackets are the number of different species seen on each occasion).

July	19th	Aosta 500 m. (3)
	20th	Torino 250 m. (1)
	21st	Torino 250 m. (4)
	21st	Perosa Argentina 600 m. (15)
	22nd	Sestriere 2000 m. (3)
	22nd	Exilles 700 m. (10)
	23rd	Exilles 700 m. (25)
	23rd	Sestriere 2000 m. (3)
	24th	Sestriere 1800 m. (17)
	24th	Exilles 700 m. (15)
	25th	Sestriere 1800 m. (25)
	25th	Bardonecchia 1200 m. (18)
	26th	Torino 250 m. (5)
	26th	Pragelato 1500 m. (18)
	27th	Exilles 700 m. (13)
	28th	Exilles 700 m. (30)
	29th	Pragelato 1500 m. (1)
	29th	Saluzzo 350 m. (1)
	30th	Tende 800 m. (6)
	30th	Piene Basse 300 m. (9)
	30th	Imperia 200 m. (3)
Aug.	1st	Imperia sea level (18)
	2nd	Albenga 200 m. (10)
	3rd	Marina di Andora 100 m. (16)
	4th	Imperia sea level (8)
	5th	Marina di Andora 100 m. (25)
	7th	Sestriere 1800 m. (24)
	7th	Exilles 700 m. (26)
	8th	Valle Argentera 2300 m. (36)
	9th	Valle Argentera 1800 m. (28)
	10th	Perosa Argentina 600 m. (5)
	11th	Aosta 500 m. (4)

The following pages show visual estimates of the numbers of each species seen at different altitudes.

	Heights above sea level (metres)					
Species	0–250 (9 sites)	300–500 (4 sites)	600–800 (9 sites)	1200–1500 (3 sites)	1800–2300 (7 sites)	No. of sites at which seen
Papilio machaon Linn.	11	—	2	—	7	9
Iphiclides podalirius Linn.	2	—	6	2	4	5
Parnassius apollo Linn.	—	—	291	4	16	8
Pieris brassicae Linn.	2	—	1	—	—	2
P. rapae Linn.	— } +15	2	4	4	3	8
P. napi Linn.	5	—	4	5	31	10
Pontia daplidice Linn.	3	1	—	—	—	4
Aporia crataegi Linn.	—	—	336	30	19	13
Euchloe ausonia Hübn.	—	—	—	—	2	2
Anthocaris cardamines Linn.	—	—	4	—	23	6
Colias phicomone Esp.	—	—	—	1	42	3
C. crocea Geoff.	25	—	—	1	—	4
C. hyale Linn. / *C. australis* Ver.	3 }	—	4	8	5	6
Gonepteryx rhamni Linn.	—	—	1	4	2	4
G. cleopatra Linn.	15	5	—	—	—	3
Leptidea sinapis Linn.	22	—	—	—	20	3
Apatura ilia Schiff.	8	—	—	—	—	2
Limenitis reducta Staud.	—	—	1	1	—	2
Nymphalis antiopa Linn.	—	—	1	—	—	1
N. polychloros Linn.	—	3	1	—	—	3
Inachis io Linn.	—	—	2	1	—	3
Vanessa atalanta Linn.	3	—	1	—	—	2
Aglais urticae Linn.	—	—	6	3	26	5
Polygonia c-album Linn.	1	—	1	—	—	2
Mesoacidalia aglaja Linn.	—	—	56 } +50	—	—	7
Fabriciana adippe Linn.	1	—	33	—	—	6
F. niobe Linn.	—	—	30	—	2	3
Issoria lathonia Linn.	—	—	3	—	—	1
Brenthis daphne Schiff.	—	—	30	—	—	2
B. ino Rott.	—	—	4	—	2	3
Clossiana euphrosyne Linn.	—	—	3	7	45	6
C. titania Hübn.	—	—	62	4	20	9
Melitaea cinxia Linn.	—	—	3	4	9	4
M. phoebe Schiff.	—	—	17	4	4	7
M. didyma Esp.	31	—	6	—	2	8
M. diamina Lang.	—	—	—	—	8	3
Mellicta athalia Rott.	1	—	64	8	17	11
Euphydryas cynthia Schiff.	—	—	—	—	2	2
E. aurinia Rott.	—	—	—	—	22	3
Melanargia galathea Linn.	99	1	106	1	—	10
Hipparchia semele Linn.	2	—	1	—	—	2
Satyrus ferula Fab.	—	—	17	—	—	2
Oenis glacialis Moll.	—	—	—	—	2	1
Brintesia circe Fab.	24	1	—	—	—	4
Erebia euryale Esp.	—	—	—	—	73	5

E. epiphron Knoch	—	—	—	—	10	1
E. medusa Schiff.	—	—	18	10	—	4
E. alberganus de Prun.	—	—	75	10	62	10
E. cassioides Hohen.	—	—	—	—	2	2
E. meolans de Prun.	—	—	—	—	28	3
E. pandrose Bkh.	—	—	—	—	30	1
Maniola jurtina Linn.	74	21	3	—	—	9
Aphantopus hyperanthus Linn.	1	—	3	—	—	3
Pyronia cecilia Vall.	5	—	—	—	—	2
Coenonympha pamphilus Linn.	8	—	20	5	6	14
C. arcania Linn.	61	20	135	10	10	14
C. gardetta de Prun.	—	—	—	—	56	4
Pararge aegeria Linn.	4	—	—	—	—	2
Lasiommata megera Linn.	22	—	2	—	—	4
L. maera Linn.	—	—	46	—	10	8
L. petropolitana Fab.	—	—	—	—	8	3
Hamearis lucina Linn.	2	—	11	—	—	3
Nordmannia acaciae Fab.	—	—	1	—	—	1
N. ilicis Esp.	20	—	—	—	—	1
N. esculi Hübn.	1	—	—	—	—	1
Strymonidia pruni Schiff.	1	—	—	—	—	1
Callophrys rubi Linn.	—	1	1	4	19	9
Lycaena phlaeas Linn.	5	—	—	—	—	2
Heodes virgaureae Linn.	—	—	6	—	—	2
H. tityrus Poda	—	—	—	—	2	1
H. alciphron Rott.	—	—	12	—	1	5
Palaeochrysophanus hippothoe Linn.	—	—	1	—	—	1
Cupido minimus Fuess.	—	1	—	—	162	7
Celastrina argiolus Linn.	1	1	—	—	—	2
Glaucopsyche alexis Poda	—	1	2	2	7	6
G. melanops Boisduval	—	2	—	—	—	1
Maculinea arion Linn.	6	—	—	—	—	2
M. arion obscura Christ	—	—	—	—	28	5
Philotes baton Bergst.	3	—	—	—	1	3
Plebejus argus Linn. / *Lycaeides idas* Linn.	51	—	6	1	5	7
Eumedonia eumedon Esp.	—	—	2	—	3	2
Aricia agestis Schiff.	—	—	1	—	1	2
Albulina orbitulus de Prun.	—	—	—	—	20	1
Cyaniris semiargus Rott.	3	—	21	7	44	13
Plebicula escheri Hübn.	2	—	—	—	—	1
P. dorylas Schiff.	14	—	9	10	—	5
P. amanda Schneider	4	—	—	—	—	1
Lysandra coridon Poda	25	—	—	—	—	2
L. bellargus Rott.	1	—	—	—	2	2
Polyommatus icarus Rott.	5	—	9	11	20	9
P. eros Ochs.	—	—	—	—	15	1
Pyrgus malvae Linn.	—	—	1	—	7	3
P. alveus Hübn.	—	—	—	—	2	1

Species	0–250 (9 sites)	300–500 (4 sites)	600–800 (9 sites)	1200–1500 (3 sites)	1800–2300 (7 sites)	No. of sites at which seen
P. fritillarius Poda	—	—	23	—	26	8
Spialia sertorius Hoffm.	—	—	—	—	9	1
Carcharodus alceae Esp.	2	—	2	—	—	3
C. lavatherae Esp.	—	—	3	—	—	3
Erynnis tages Linn.	—	—	3	15	14	6
Thymelicus lineola Ochs.	63	—	13	—	—	8
Ochlodes venatus Brem. and Grey	2	1	5	—	—	4

Notes on the table:

The Editor's assistance in converting the results into the above form is gratefully acknowledged.

The occurrence of true alpine species (e.g. *Erebia* spp., *A. orbitulus*, *L. petropolitana*, etc.) at higher elevations is well illustrated. For the remainder it would be unwise to infer too much, but in many cases species records appear at adjacent levels. The time factor is, of course, very important in relation to altitude. *C. euphrosyne* furnishes a good illustration of this, as my results depict a temporal distribution rather than a stratification in relation to increasing altitude. The difference between the distributions of *C. arcania* (an "all level" species) and its alpine ('high level') relative, *C. gardetta*, shows up well. Two apparent enigmas are easily solved: *L. sinapis* was still at the first brood stage at 1800–2300 metres, while the second brood was already on the wing at the lower elevations along the hotter Ligurian coast; *P. baton* was in a similar position.

C. hyale and *C. australis* have been summed, as have *P. argus* and *L. idas*, owing to the difficulty of determining the species on the wing. *Erebia cassioides* and *Nordmannia esculi* were discovered in areas beyond those mentioned in Higgins and Riley (1970). *M. arion* type and *M. arion obscura* have been recorded separately as they were easily distinguished in the specimens examined.

REFERENCE

Higgins, L. G. and Riley, N. D. (1970). *A Field Guide to the Butterflies of Britain and Europe*. Collins, London.

THE INSECT TRADE

The arguments for and against dealing in insects continue to rage, both in this and other journals and to my mind it is particularly unfortunate that no facts as to the scale of the whole operation and what effects, if any, the sale of insects might have, for better or worse, on their survival are available.

There is, I believe, an emotive feeling that a colourful butterfly is (a) rare, and (b) forms the majority of the trade in insects. This is just not so, butterflies form a fraction of one per cent of the total usuage of insects and the total trade in dead insects is also miniscule compared with that of live insects.

In Victorian days students would be asked to bring along some roaches for dissection "easily obtainable on request from the local baker". For present day purposes such animals are utterly unsuitable. Insects required for research must be bred under controlled conditions and given only known foods. Consequently if research in entomology (other than taxonomy) is to be carried on at all then unless the insects are bred on the premises, as they indeed often are, they must be purchased from reliable and reputable dealers. The sheer numbers of insects often required, perhaps thousands per day, coupled with the fact that they are required regularly throughout the year, make with only occasional exceptions, any question of wild collection of specimens for sale a completely uneconomic proposition and all such specimens have to be, and are, bred. A practice of course which does no harm at all to any wild population.

During the past five years I have personally been responsible for breeding more insects than have been captured in the wild by all collectors for their collections ever since Thos Mouffet sat his little daughter on a Tuffet while he dashed off after another new species for his *Theatrum Insectorum*. About 1588 I believe. I also estimate that the present daily production of bred insects is equal to, or perhaps exceeds, all dead specimens at present in all the museums of the world. Which makes the few insects that are actually caught wild for sale statistically insignificant.

Which does not of course mean they can be ignored completely. It is still true that someone could go and collect all of a rare species for sale and so cause its extinction. But would it be an economic proposition? Would any trader do it in todays climate of conservation opinion? I think the answer is a firm "No". The goose that laid the golden egg would be killed and antipathy aroused. Far better to go and take a fertile female and breed *ad infinitum* even if you had to release them only a few at the time onto the market to keep the price up! Also to go and try to collect rare species is a gamble. Great expense could be incurred, particularly for a remote area, and very little return might in fact accrue. One cannot be certain of getting any at all. There are far easier ways of making money.

The South American *Morpho* butterflies serve to illustrate a point here. At one time they were indeed collected, but the sprawling suburbs

of Rio, airports, motorways, and wasteful tropical agricultural methods eventually resulted in it being too expensive and uncertain to collect them wild and consequently large numbers of them are now bred and as a result the wild population remains subject only to the attacks of suburbs, motorways, insecticides, etc. It is rather unfortunate that the Joint Committee for the Conservation of British Insects have condemned the use of insects for the manufacture of 'jewellery', since it has been the very demand of this market that has caused the switch from caught to bred specimens and of course once the bred are available other demands are also met from this source. Insect 'jewellery' also has a history going back some five millenia and who knows but that the resultant 'sacred' nature of the insects in the past has not been the means of saving them?

There appears to be no evidence that the extinction of any species has ever been caused by collecting. I know it has been stated that it was dealers who extinguished the British Large Copper, but I have already refuted this elsewhere. Let us face facts, it was the activities of the XX Valeria Victrix and II Augusta Legions, followed in turn by Bishop Morton, Sir Cornelius Vermuyden, Telford and Rennie, working in conjunction with successive Dukes of Bedford and for the immense financial gain of all concerned. Their activities reduced the Fenland area from some two and a half thousand square miles to random pockets (still being eroded away) amounting to only a few square miles total. Can any species be expected to withstand such devastation of its habitat? Would it not have been better if advance warning had been given and some traders moved in and caught all the specimens before the pre-drainage burning of the vegetation? Perhaps not in Victorian days; but surely today it would pay some trader to continuously rear a threatened species year after year, and recoup his expenses by the sale of some of them.

A very good example of the good done by traders exists in Taiwan where some butterflies are actively farmed. Foodplants are planted, scrub vegetation cleared off and as a result prices of the species concerned have fallen and what were once quite rare butterflies are now comparatively common in selected areas. Another point that must not be overlooked in the trade and sale of insects is that while many exotic butterflies may seem rare to us on account of their beauty (or price), in their natural habitat they may well be pests to be destroyed on sight and indeed I know that millions of pounds are in fact spent trying to keep under control some of the species commonly sold by dealers. Work is about to start on the Itaipu Dam in Brazil. This will result in the destruction of several thousand billion insects and will doubtless produce a climatic change effecting a similar number with unknown results. Is there not something to be said for having the area cleared by collectors and traders so that at least we know what is being destroyed? I am willing to hazard a guess that at least 10% of the species concerned are as yet undescribed. Nearer home the Newmarket bypass is dangerously close to one of our famous National

Nature Reserves, Chippenham Fen. It has already been stated at a public enquiry that this road could endanger certain water supplies by blocking natural drainage systems. There is, therefore a chance it could effect the Fen. As it is it ploughs through and destroys part of the Devils Dyke, also well known for its relict chalk fauna and flora and I also suspect a number of colonies of moths, outliers from the Chippenham populations are also to be destroyed. There is no doubt that this minor civil engineering work is going to do more towards insect destruction than the activities of any collector or trader of dead insects.

Whether anyone should collect by buying dead insects is another matter and possibly one that is entirely between the collector and his bank manager; but to what extent does it actually go on? Is not most of the trader's trade either in livestock (mostly foreign), apparatus, supplying research and teaching purposes, and, which does not concern the average naturalist, decorative—a section of the trade which will take place anyway. I think many of the present day entomologists have originally had their interest aroused by buying, or having bought by a kind uncle, some specimens or livestock. There is nothing new in this. Victorian gentlemen not only bought and exchanged extensively; those who could afford it employed regular collectors. Even with modern transport facilities it is still not possible to collect everything oneself and much of the knowledge of tropical species has been due to the energies of traders organising supplies and their customers working out the taxonomy and life history. Exchange of specimens, in Victorian days between North and South, fen and downland, wood and heathland is today between countries and continents and to my knowledge very widespread. From my study of current traders' catalogues I would say most of them (the parts dealing in dead insects that is) are angled towards the specialist collector and the museum. No amount of activity by the collector can obtain for him all the subspecies of a particular group without the aid of the worldwide contacts of the trader. I say he serves a very useful purpose and quite frankly the average amateur entomologist forms a very small part of his trade indeed and almost certainly spends more on books, apparatus, photography and getting out into the field than he does on dead insects.

Brian O. C. Gardiner (225)

SOME OBSERVATIONS ON THE EGG-LAYING HABITS OF THE SILVER WASHED FRITILLARY

I was interested in the article by Mr Mori (1972) on the egg-laying habits of several species of butterfly, in particular *Argynnis paphia* Linn. (Silver Washed Fritillary). A few years ago, while collecting in the Plym Forest, Devonshire, I noticed females of this species depositing eggs in crevices in the rocks along a section of disused railway cutting. The rock

surface was liberally cut out in the form of ledges and crevices: in some of these the surface of the rock was liberally covered in mosses and lichens. An occasional female would walk about inside these crevices and lay an egg here and there on the upperside of the rock on the moss surface.

Keeping track of egg depositing females and at the same time searching for the eggs became an almost impossible task, so eventually I just searched at random, crevices along the cutting and was fortunate to find about sixty ova: although this required several days searching: and twisting ones neck sideways and upwards to detect the small yellow eggs. I carried a pair of forceps and carefully removed a small patch of moss with the egg attached.

The female appears to choose dry crevices, as I found nothing wherever dampness prevailed or when water seeped downwards from above. The butterflies only laid in periods of sunshine despite spending several minutes in deep shade. Possibly eggs deposited in this manner may only represent a percentage from a female's allotment: the remainder being layed on tree trunks as is usually stated. The strange thing was that I could not find any violets (*Viola* spp.) in the vicinity: usually these plants are present, being the larval pabulum but in fact, very little in the way of low growing vegetation was around, the stone ballast from the railway track still covering most of the ground.

Since discovering the wild ova, I have obtained eggs in captivity from females. Egg laying cages have been described before so I shall not give details of my own, I think however that several things are essential for the female to oviposit successfully. Firstly violets should be present to stimulate egg laying, and flowers for the butterfly to feed on, e.g. Buddleia, which flowers in July and August. The top of the cage should be covered to provide a shady laying area and, on sunny days, the whole cage sprayed with water regularly. The eggs will nearly always be laid in the shaded area on the netting near the top of the cage. I had three females together in my cage and received about 250 eggs in very little time, I then released the butterflies in the original locality.

One word of warning, on summer evenings, unless you live in an earwig free neighbourhood, do not keep your cage outdoors overnight; I lost fifty ova in one night to three of these creatures that made entry into the cage. Either remove the netting and box the females for the night, or bring the whole outfit indoors until morning.

J. Platts (4300)

REFERENCE

MORI, Y. (1972). *Bull. amat. Ent. Soc.*, **31**: 115.

UPSIDE-DOWN PUPAE

Mr J. Bocock (1970) in his article on breeding and rearing the Giant Atlas Moth (*Attacus atlas* Linn.), refers to the fact that this species '. . . not infrequently manages to pupate head downwards, and unless

turned will fail to emerge from the cocoon.' During the course of rearing many hundreds of saturniid pupae contained in the pendent style of cocoon I have come across only three which were inverted. The first of these was a male *Hyalophora gloveri* Strecker (Glover's Silkmoth), procured in cocoon from a dealer early in 1966; the second was a *Philosamia cynthia* Drury f. *ricini* Bois. (Eri Silkmoth) reared from the egg in late '67; the third, and most recent, a female *Rothschildia orizaba* Westwood (Orizaba Silkmoth), again raised from the egg in 1972. This last species, still in pupa, is the more unusual in that the spinning larva seems to have averted almost certain suicide (human intervention disregarded) by elaborating the cocoon to accord with its eventual topsy-turvy posture, i.e. with the exit fibres at the distal extremity, even though the previously-spun suspension tape is in the usual proximal position!

It is noteworthy, perhaps, that two of the three pupae were slightly deformed, the *gloveri* being noticeably, but not considerably, flattened dorso-ventrally, whilst the *orizaba* pupa has a rather pointed head end. Whether these features were caused by the effects of gravity on the still-soft pupae or whether they are linked directly to some physiological disturbance which prompted the larvae to pupate upside-down in the first instance, I do not know; suffice it that after being re-orientated the *gloveri* and *ricini* pupae produced moths which appeared normal enough, and there seems little reason to suppose that the *orizaba* will be any different.

The phenomenon of pupal inversion is obviously widespread amongst the 'silkmoths', though not especially frequent in any one kind, since it only occurs perhaps once or twice in a couple of hundred spinnings. I suspect that it may be just one more unhappy accident which can befall the insect during metamorphosis, unaccountable to any genetic influence, but it would be interesting to know if the pupal progeny of re-orientated parents are also gymnastically inclined!

D. J. Moon (3850)

REFERENCE

Bocock, J. (1970). *Bull. amat. Ent. Soc.*, **29**: 76.

JUNIOR NEWS

As I had only one letter since I wrote the last 'Junior News', this month's article is going to be a short one, I am afraid.

First of all, the Annual Exhibition is on September 29th, and I hope that as many as possible will make an attempt to come and exhibit. As in previous years, tables will be set aside for Juniors' exhibits and if you wish to compete for the Society's prize you must put your exhibit on these tables. A form will be given to you to fill in your name, address and age.

The exhibit will be assessed on its originality and quality, and the age of the exhibitor will be taken into account. Only those members who are still Juniors at the time of the Exhibition and are paid up ones will be acceptable.

By the time this reaches you, you will have had time to read and act upon the May Junior News and I hope that I shall receive some results which I can print during the next winter.

The one letter that I have had is from Graham Busby of Helston, Cornwall, who when walking on a Nature Trail from Pottesco to Cadgwith came across a 'collar' of ova of the Common Lackey (*Malacosoma neustria* Linn.). From this find he is now breeding about a hundred and ten larvae, and he has observed how when they change their skins (ecdysis), they retreat to their web. He hopes to release a lot of moths later on. I hope that this will be in the area where he found them. If he releases them near his neighbours' apple trees (providing they have apple trees) they won't like him very much. Lackey moths can be a nuisance in orchards. The larva is very striking and easily seen and identified, and the moth fairly variable.

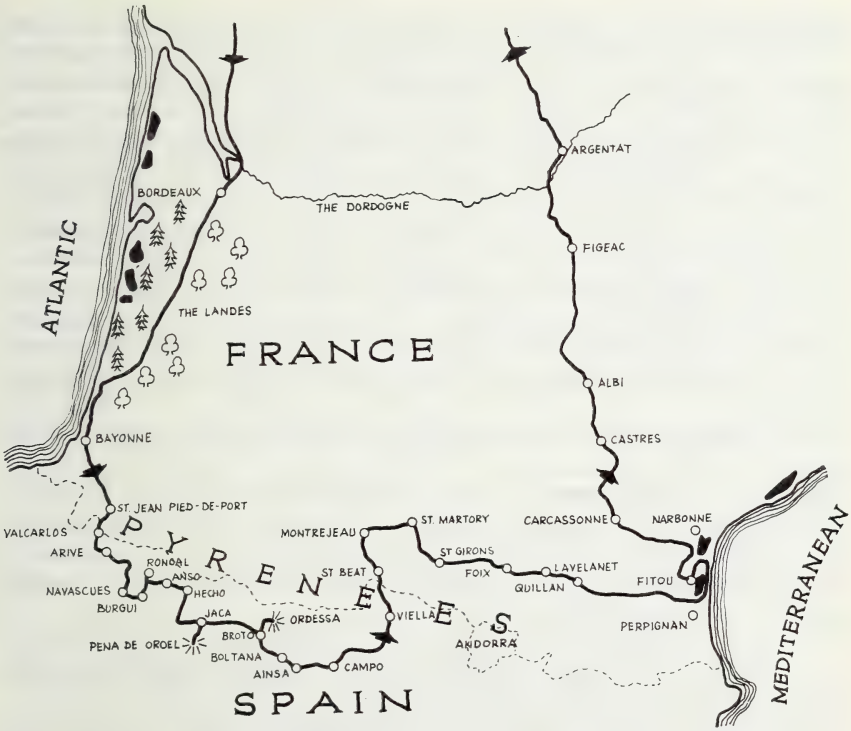
D. Ollevant (1514)

COLLECTING IN FRANCE AND NORTH SPAIN

My friend, Mr G. Thomson, and I set out from Solihull on our long planned trip to the Pyrenees on the evening of 26th May, 1972 and stayed at a friend's flat in Littlehampton before crossing the Channel to France early the next day. Our means of transport was a Volkswagen minibus converted for sleeping, which we had stocked up with enough food to last us for our ten days of travelling.

After a very rough and unpleasant six hour voyage from Newhaven to Dieppe, we motored through Rouen, Alencon and Le Mans. Our first night in France was spent in a field near the side of the road outside La Fleche. The weather was cold and miserable and I had not seen a butterfly since leaving Solihull. We both hoped for better weather as we travelled south. The next day was still cold so we set off for the Pyrenees passing through the beautiful town of Saumur on the Loire, Parthenay, Noirt and Saintes. We stopped for a brew-up outside Saintes and as I walked through the lush grass and Ox-eye Daisies I saw my first butterfly settled on a daisy, a Marsh Fritillary (*Euphydryas aurinia* Rott.) and I managed to get a good photograph.

The weather was now at last improving as we crossed the Gironde over the very high bridge at Bordeaux. I was looking forward to the Landes Forest about which I had heard so much. We stopped for lunch alongside a track in the middle of the Forest and I caught specimens of the Holly Blue (*Celastrina argiolus* Linn.), Glanville Fritillary (*Melitaea cinxia* Linn.), Green-underside Blue (*Glaucophsyche alexis* Poda) and



Speckled Wood (*Pararge aegeria aegeria* Linn.). After a detour to the sand dunes alongside the cold grey Atlantic, we pressed on to St. Jean Pied de Port to spend the night in the foothills of the Pyrenees.

The Spanish customs were very suspicious of us at Valcarlos frontier post but after examining our vehicle and contents they allowed us to move on to the Spanish Pyrenees and the Province of Navarre. The road, winding and steep, made driving rather tiring so we stopped to take some photographs and have a cup of coffee. Several of the large Cardinal (*Pandoriana pandora* Schiff.) were racing at great speed along the roadside but I didn't stand a chance of obtaining a specimen. The short grass by the roadside was the home of several Grizzled Skippers (*Pyrgus malvae* Linn.) and were remarkably difficult to see amongst the stone debris from the cliffs above the road. The scenery in this area really is magnificent and near Arive we decided to stop and have a short walk. As we walked up a small stoney path alongside a stream the sun was now very hot and Fritillaries were darting and gliding in all directions. I collected specimens of Glanville Fritillary (*Melitaea cinxia* Linn.), Pearl-bordered Fritillary (*Clossiana euphrosyne* Linn.), Small Pearl-bordered Fritillary (*Clossiana selene* Schiff.), and Heath Fritillary (*Mellicta athalia celadussa* Fruhstorfer). Trees gave some very welcome shade further up the stream where several

Speckled Wood (*P. a. aegeria* Linn.) and Green Hairstreak (*Callophrys rubi* Linn.) were skilfully darting from leaf to leaf and further up, the stream became just a trickle of water over muddy ground and was swarming with Skippers and Blues. The countryside was becoming very hot and dry as we passed through Navascues and butterflies were not very plentiful but at Ustes I caught the very beautiful Spanish Fritillary (*Euphydryas desfontainii baetica* Rambur). Near Burgui there is a tremendous panoramic view over the Navarre countryside with snow-covered mountain peaks in the distance. I was taking a photograph of this superb view when the first Scarce Swallowtail (*Iphiclides podalirius* Linn.) flew past and after a short walk into the scrub and rock landscape, Mr Thomson spotted a Duke of Burgundy Fritillary (*Hamearis lucina* Linn.) which was netted whilst he sprinted at high speed—I don't recommend this over such rough terrain.

The temperature seemed to be getting higher and higher as we motored up the Esca Valley so we cooled off in the icy waters of the Rio Esca which cascaded through narrow gorges with tremendous fury. At Roncal photography was a must as the old main street and narrow alleys off were ideal subjects. As I rested against an old stone wall, I watched Scarce Swallowtails gliding up and down the road stopping only for a second and then off again and impossible to catch.

After being lost on an isolated track to an ancient hamlet called Fago, we decided to camp beside the Rio Aragon near Hecho where the river is quite red in colour and very swift flowing through wooded hillsides. Early next morning I examined the grassy banks alongside the road to find the Common Blue (*Polyommatus icarus* Rott.) Adonis Blue (*Lysandra bellargus* Rott.), a form with black spots on the upper hindwings, Grizzled Skipper, a very dark form and Pearl-bordered Fritillary.

The visit to Jaca seemed like a return to civilization after the desolate and deserted countryside we had been travelling through. At Pena de Oroel amongst the rich herbal growth, there were a great number of butterflies on the wing including Berger's Clouded Yellow (*Colias australis* Verity), Morocco Orange Tip (*Anthocharis belia euphenoides* Staudinger), Wood White (*Leptidea sinapis* Linn.), Green Hairstreak, all in great abundance and with Scarce Swallowtails and Green-underside Blues being extremely common.

Our destination for the evening was the National Park of Ordesa, an area of great natural beauty, but while we were there, we saw no butterflies. The weather was cold and damp with heavy mist. The following day the weather had improved and Mr Thomson and I went for a good hard walk up the valley to a waterfall with snow at its base. After photographing some alpine flowers, we set off through Broto along the Rio Ara. Scarce Swallowtails and Adonis Blues (*Lysandra bellargus* Rott.) were very common along the hedgerows here but the Swallowtails were as usual exceedingly good at avoiding the net. However, I managed to capture a

fine specimen and we moved on past Boltana and Ainsa through some very awe-inspiring scenery to Campo, along the beautiful gorges carved out by the Rio Esera where vultures were seen high above the rock faces. After passing through the long Viella tunnel, our vehicle broke down due to an electrical fault. After some amateur repairs to the wiring, we camped the night just beyond Viella. The weather had deteriorated badly and had become most unpleasantly cold and wet, so that night we decided to press on across the border into France, and to the Mediterranean.

We drove hard the next day through St. Gaudens, St. Girons, Foix, Quillan at last reaching the Mediterranean near Perpignan. What a disappointment. After an hour or so, we eventually found somewhere to have a quiet swim in the sea. The coast line here has been ruined by holiday bungalow, hotel and large scale road developments and all we were interested in was leaving and finding an unspoilt spot to stay the night before it became dark. This we found only about one mile inland near Fitou.

Next morning I was up early and recorded the following butterflies in the rocky hillside by the road: Western Marbled White (*Melanargia occitanica* Esp.), Spanish Gatekeeper (*Pyronia bathsebe pardilloi* Sagarra), Provence Chalk-hill Blue (*Lysandra hispana* H. S.), Small Heath (*Coenonympha pamphilus pamphilus* f. *lyllus* Esp.), the common Mediterranean form and the familiar Meadow Brown (*Maniola jurtina* Linn.) looking out of place in this barren rocky landscape.

Our journey was now northwards to Carcassonne, stopping en route at a meadow beside a stream near Lagrasse to collect Black-veined White (*Aporia crataegi* Linn.) Cleopatra (*Gonepteryx cleopatra* Linn.), Short-tailed Blue (*Everes argiades* Pallas), more Provence Chalk-hill Blues and Swallowtails (*Papilio machaon* Linn.) all of which were very plentiful.

At Carcassonne, I saw my first Camberwell Beauty (*Nymphalis antiopa* Linn.) flying up and down a high stone wall but never coming into reach and busy chasing a Red Admiral (*Vanessa atalanta* Linn.).

Secondary roads were the priority as we were not very partial to the major trunk roads with heavy traffic and large towns to pass through. Our route was via Castres, Albi, Cordes, Figeac, Bretenou and to the Dordogne. I had always wanted to see the Dordogne, so we detoured along the river as far as Argentat, stopping for lunch in the woods. The second sighting of a Camberwell Beauty was in these woods on the banks of the Dordogne, but I was not lucky enough to catch it. I walked into the woods here and was rewarded with the following butterflies; an as yet unidentified *Erebia*, beautifully dark black-brown in colour with a sheen on the underside, Speckled Wood (*P. a. aegeria* Linn.), and in a meadow alongside a stream Knapweed Fritillary (*Melitaea phoebe* Schiff.), Meadow Fritillary (*Mellicta parthenoides* Keferstein), Marsh Fritillary (*Euphydras aurinia* Rott.), Brimstone (*Gonepteryx rhamni* Linn.), Black-veined White, Sooty Copper (*Heodes tityrus* Poda) and Peacock (*Inachis io* Linn.).

As we progressed northwards the weather again became colder and wetter and by the time we reached Rouen the rain was torrential. On our return to Newhaven, however, it became warm and sunny again and was a pleasant welcome home after a most enjoyable trip.

R. Bellingham (4653)

BREEDING ROTHSCHILDIA AUROTA CRAMER

On July 5th, 1972 I received thirteen larvae of *Rothschildia aurota* Cramer from a dealer. They were first instar, thicker in front and tapering somewhat to the rear. The larvae were of form *speculifer* Walker and had come from SE Brazil. The body was golden yellow with black bands, the head also was black.

On July 6th one larva shed its first skin, the colour staying virtually the same. The others entered the second instar between July 7th and 11th. On July 13th a larva changed its second skin. The third instar larva was quite different, being apple green with orange tubercles. The underside of the larva was now covered with small white hairs. At this stage I removed the larvae to a much larger plastic box. On July 21st two larvae changed their third skins. There was little difference between the third and fourth instar larvae. Up till now Privet had been readily devoured and now feeding became necessary every day.

By July 25th I had lost two larvae, both failing to shed their skins. At this stage one larva measured 9 cm long by 1·5 cm wide. By July 27th most larvae had entered their final instar and were growing well. On August 3rd, at 9.00 pm, the first larva started spinning its cocoon, wrapping silk around privet leaves. By morning the cocoon was finished and measured 9 cm by 3 cm. Some larvae were slow in pupating, the last cocoon being formed as late as August 22nd. The largest cocoon measured 10 cm by 4 cm and the smallest 4·5 cm by 2 cm. I placed the eleven cocoons in a cage on peat and sprayed them once or twice a week.

On September 23rd a perfect male with a 15 cm wingspan awaited me in the morning. It was very beautiful seen for the first time, but I killed it for my collection. On September 29th a female, also with a 15 cm wingspan, emerged. It was very similar in markings and colouring to the male, but the abdomen was shorter and fatter. I kept her for breeding purposes. Between October 1st and 20th four more females and two males emerged. I killed a pair for my collection. The five females I kept for breeding purposes laid eggs, but all were infertile. The two cocoons which had failed to produce moths were opened and the pupae inside found to be dead.

So I had failed to breed the moths, but they were the most beautiful and one of the largest species that I have reared.

P. D. Brock (4792j)

MR DAVID TYLER'S LARVAE CAGE: A LABOUR SAVING MEANS OF KEEPING PLATYCLEIS (ORTH.) EGGS MOIST

This last year I have been studying the song behaviour of the bush crickets of the genus *Platycleis* (Tettigoniidae, Orthoptera). The two species in which I am particularly interested are *P. affinis* Fieb. and *P. intermedia* (Serv.). Studies on the living adults are confined to the months of July and August. It would be most desirable therefore, to obtain a laboratory culture in which the adults were available for a greater part of the year. Eventually, it may be possible to obtain a stock throughout the year by phasing the appearance of the adults.

In order to procure eggs, adults were captured in southern France last summer. These were placed in large wooden stock cages and presented with various oviposition sites. These included cotton wool, cellulose wadding, polyurethane foam, polystyrene, concentric columns of blotting paper, sphagnum peat, top soil and sand. Hartley and Warne (1972) describe how they removed eggs of bush crickets from the stock cages, washed and incubated them on damp cotton wool in specimen tubes or Petri dishes. This method is clearly an excellent one for keeping the eggs moist and thus potentially viable. It is, though, a laborious and time-consuming procedure. My own experience revealed that *P. affinis* and *P. intermedia* preferred firm damp sand as an egg laying medium. The combination of sterility of the sand and its porosity meant that the substrate was mould free and generally rather moist.

The sand was contained in a large, shallow, glass jar and so, once the eggs had been laid, there was no need to spend time or to disturb them by transferring them to a damp medium for incubation. However, the eggs that were deposited just under the surface of the sand tended to become dry and thus it was necessary to keep the top layer moist. This could be achieved by covering the top of the jar with a small polythene sheet held in place by an elastic band or, alternatively, by adding water to the exposed surface by spraying or pouring the water down a glass rod. (Water could not be poured directly onto the sand for this resulted in the eggs being flushed to the surface). Air inside the polythene covering tended to become stagnant and thus it was spraying that proved to be the most suitable alternative. The remaining disadvantage was that vigilance had to be kept over the eggs in order that they should not dry out.

It was at this point when I was considering means of eliminating the labour of spraying the eggs that I read the article on Mr Tyler's design for a larvae cage (Tyler, 1973). Clearly, this cage is a most admirable one for culturing *Platycleis*. As a stock cage, the cane props allow purchase for the adults which climb freely during their normal activity. Extensive oviposition sites are available at their feet. For food, a shallow dish of wheat, maize and other seeds, as well as cereals, can be introduced. Dead adults can be removed and the remaining sand and egg mixture can be

left and kept damp simply by ensuring that the basement bowl contains water. Capillary action of the water will supply moisture to the eggs.

At present, the only disadvantage that I can see with this cage, when used for culturing bush cricket eggs, is that it is a large piece of apparatus and thus cannot easily be placed in a fridge or incubator. Such treatment is often necessary with these insects for many of them undergo diapause (Dumortier, 1967; Hartley and Warne, 1972). The problem of size can be overcome to some degree, especially in cases where a fridge or incubator may not be available, by simulating the ground temperatures of the natural habitat by placing the cages in the appropriate cupboards, sheds, garages, etc. These temperatures can be determined through consultation of the literature contained in the library of the Department of Climatology, Meterological Office, Bracknell, Berkshire. In the case of *P. affinis* and *P. intermedia* the temperatures for southern France are found in Garnier (1966).

Although this discussion has been limited to the use of Mr. Tyler's cage for culturing two species of bush crickets, there is no reason why it should not be used for rearing other insects that deposit their eggs in the ground; for instance, the scorpion flies, *Panorpa communis* Linn. and *P. germanica* Linn. The great advantage of this cage is that, once it has been constructed and stocked, little maintenance is required. The mesh dome allows air to pass through and thus prevents stagnation. Also, the absence of glass or plastic sides and open pools of water means that fatalities are reduced. Moreover, the damp substrate ensures that the ambient air is moist and so is suitable for rearing most insects.

I shall report on the effectiveness of this cage for culturing *Platycleis* in the *Bulletin* next year.

Michael J. Samways (4927)

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BREEDING THE CLOUDED YELLOW BUTTERFLY (COLIAS CROCEA GEOFF.)

While in Montenegro in July 1972 I took a large specimen of the Clouded Yellow of the female form *helice* Hbn. I placed it in a plastic box along with some sprays of Bladder Senna (*Colutea arborescens* Linn.) which I had collected as they had some larvae of the Long-tailed Blue (*Lampides boeticus* Linn.) feeding in the pods. During the journey home by air I carried the box in my satchel and on arriving home placed it

in the window of my room. The next day I found that the butterfly had laid quite a large number of eggs on the leaves of the *Colutea* and I removed the sprays and placed them in a jar of water. The eggs quickly turned orange and hatched within a week. The small larvae fed on the leaves and transferred to new shoots of the same plant when the original ones had started to yellow. The larvae are pale yellow when small but after moulting become green. They feed on the upperside of the leaf and rest down the mid-rib. When they were half-grown I introduced a pot of Lucerne and the larvae were brought to maturity on this. There were some losses from a spider when the larvae were small but I eventually had sixteen pupae, the majority having pupated on the stems of the Lucerne. Within a fortnight they began to emerge and produced 8 males and 8 females, 4 of which were typical and 4 of the form *helice*. Two of the latter had the white slightly shaded with yellow and had traces of homeotic aberration, one having a patch of orange in the left lower wing and the other a blotch of white in the black area of the forewing. I obtained one pairing between a typical male and female but the weather was so poor that I only obtained three eggs and now in December have one pupa from these.

The genetics of the form *helice* are of particular interest and it is unfortunate that the season was not long enough to obtain further generations. According to Ford (1953) the factor controlling the form is linked to the X (sex defining) chromosome and in the male, which has paired X chromosomes, the results of the factor are masked even when it is carried by both of the pair. In the female, which has an XY pairing of chromosomes, the *helice* factor is dominant and if present will always be apparent. Ford states that the degree of whiteness may vary and considers that this may be due to the action of other controls. My original female's genetic status may thus be deduced from her progeny with some hope of accuracy. If we call the typical form of the X chromosome X_1 and that of the *helice* form X_2 and the female chromosome Y, then my *helice* female was X_2Y. She must have paired with a male which had X_1X_2 chromosomes. Had he been X_1X_1 then the progeny would have all been typical as the X_2 factor is masked in the male but always apparent in the female.

Thus

X_1X_1 paired with X_2Y	but	X_1X_2 paired with X_2Y
results in		results in
X_1X_2 or X_1Y or X_1X_2 or X_1Y		X_1X_2 or X_1Y or X_2X_2 or X_2Y
(Which would all look typical.)		

The second case would give fifty/fifty males and females and of the latter, half should in theory be of the form *helice*. This was the result in the case of my female. Had the male with which she paired been homozygous (X_2X_2) then all the females would have been of the form *helice* as all would bear the controlling factor. The next stage of the exercise would have been to pair several of the males with *helice* females keeping them all separate. In those cases where all the female progeny produced by this

pairing were of the form *helice* it could be assumed that the male was homozygous and I would have obtained a pure *helice* stock as no X_1 factor would have been present. The next stage would have been to assess the strength of the homozygous form and its chances of becoming a viable wild race. When observing the butterfly in the wild there seems to be an advantage in the pale form colouring as it is far less obvious when settled and if the homozygous form was healthy it would seem that in isolation a race with white females could arise. However in the case of *C. crocea* the range is very large and there must be a continual mixing of the genetic material. There are however other *Colias* species which show the same dimorphism in the female and in some of these the butterfly tends to be much more local. This would seem to indicate that the pale form is either not at an advantage or that in its pure form it has some biological weakness.

Ford refers to a similar sort of dimorphism in the Silver-washed Butterfly, *Argynnis paphia* Linn., in which the female occurs in a very dark form, *valezina* Esp. In North Italy in the valley of the River Toce we found that this was the only form that the female took and we did not observe one of the typical form of female. This would indicate that all the males carried the factor and that for some reason the dark form of the female was at an advantage and the gene concerned in no way weakened the butterfly.

1.12.1972 P. W. Cribb (2270)

REFERENCE

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BOOK REVIEWS

What Butterfly is that? by C. G. C. Dickson, Purnell & Sons. R.1.95 (£1).

This book measures only 5″ x 5½″, and is one of a series of pocket books published by Purnell and Sons concerning the natural history of southern Africa.

Mr Dickson is well known for his numerous publications on butterflies and this little book, like his previous works, is of very high quality. The text consists of short descriptive notes on ten families of butterflies. Details are given of food plants, distribution and all stages of the life cycles of 76 common species of butterfly to be found widespread in southern Africa. Of particular note are the eighteen exquisite colour plates reproduced from photographs taken by Mr H. N. Wykeham. All of the 76 species dealt with in the text are illustrated, often both male and female. The quality of these plates is really superb for such a small book.

This publication is ideal for young people and the information it contains forms a sound basis for those amateurs who are just entering into the study of the several hundred butterflies which occur in southern Africa. It should also encourage others to take up the study of this likeable group of insects. L. McLeod (3534)

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THE AMATEUR ENTOMOLOGIST'S SOCIETY

ANNUAL EXHIBITION, 1973

SATURDAY, 29th SEPTEMBER

12-30 p.m. to 4-30 p.m.

HOLLAND PARK SCHOOL, AIRLIE GARDENS, CAMPDEN HILL, KENSINGTON, W.8

ADMISSION FREE

EXHIBITS. The Hall will be open from 11-30 a.m. for receipt of exhibits. Please label clearly including name and membership number, if applicable. If you require a large space, please notify Meetings Secretary – P. W. Cribb, 355 Hounslow Road, Hanworth, Feltham, Middlesex. Tel. 01 – 894 9001.

DEMONSTRATIONS. Members will demonstrate setting of insects and slides will be shown during the afternoon.

GROUPS. Members of Groups who have been corresponding will be able to meet for discussion.

SURPLUS TABLE. This will be available for the sale of Members' surplus material. There is no charge.

ENTOMOLOGICAL TRADERS will be in attendance.

Light Refreshments will be available from 12-30 to 4-0 p.m.

To get there : Notting Hill Gate Station (Underground) or Kensington High St. Underground or Buses 27, 28, 31, 46 and 52 run along Kensington Church St.

CARS MAY BE PARKED IN PERMITTED AREAS OF THE SCHOOL GROUNDS

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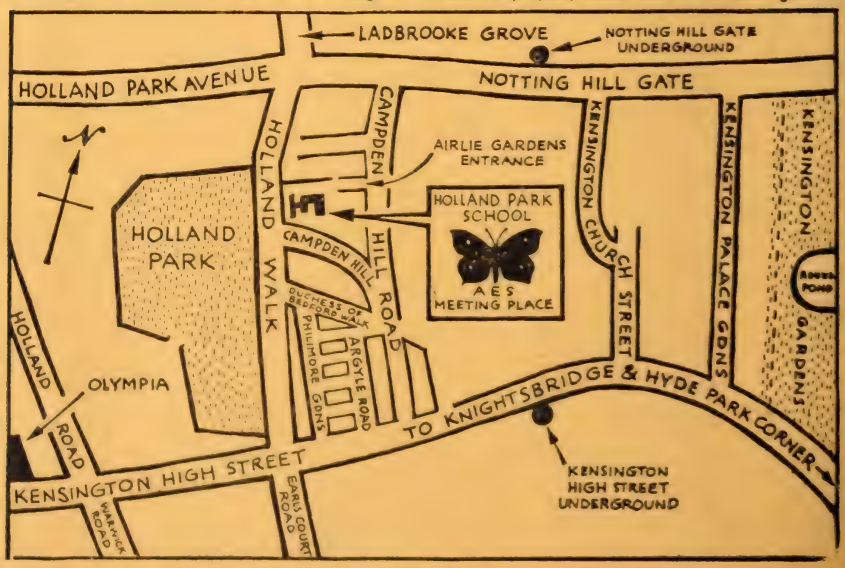

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Edited by: P. W. CRIBB

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AES BULLETIN No. 301

EDITORIAL

For personal reasons Dr. Paul Boswell has relinquished the position of Bulletin Editor and I act in a temporary capacity until a new Editor is appointed. I would like to thank Paul for help in producing this issue as much of the material came first to him. Members may wonder at the many changes in the officers of the Society over the last few years but all are voluntary workers and even a short period of service makes considerable demands on one's private leisure. Often business or other problems make it necessary to serve for only a short spell but the Council (and I hope the members) are grateful for the work that is done by such persons.

This number of the Bulletin has as its theme the breeding of insects of various orders and I commend to you Mr. Sheppard's (4431) idea of breeding a desired species and returning the surplus to the original habitat. If you are a collector first, then you will agree that the best specimens can only be secured by breeding and a series bred from one female is more acceptable to the conservationist than a similar number taken with the net. Breeding techniques are acquired very much by hard experience but others can help a lot by sending in their experiences for publication in the Bulletin. If you have any pet methods which are successful and have not yet been published, please put pen to paper.

P. W. Cribb (2270)

SO YOU WANT TO STUDY BEETLES
PART VII—CARABIDAE (GROUND BEETLES)

The larvae of this group of beetles are predatory, being extremely active and carnivorous. They feed at night often on the larvae of other species of beetle; some are predatory on the larvae of Lepidoptera, a few on snails, whilst some will eat young Woodlice. I must admit that I have not been very successful in rearing Carabid larvae. A few which were fully grown when found were reared without difficulty, but when smaller larvae were discovered, these mostly died, probably because I was unable to find sufficient of the right kind of living material to feed them on. Details of the life histories, such as the normal food, rarely seem to be known and a great deal needs to be learnt about these insects. Nevertheless I am convinced that in principle the methods I have used are at least adequate if somewhat imperfect and the main difficulty lies in providing the correct food for the larvae to prey on.

Finding larvae and providing an artificial habitat. The larvae of the Carabidae are found in much the same sort of places in which the imagines occur, under stones or logs, in moss, under dung where probably they are feeding on coprophagous larvae. They are easily recognised, being active with large jaws and a body reminiscent of a Staphilinid beetle, only grey or brown in colour. To me they are quite obviously larvae and beetle larvae. They can be collected in glass tubes similar to those used for adult beetles and at times can survive for quite long periods therein. At times, especially in hot weather, they can die quite quickly however. The introduction of a small quantity of damp sphagnum moss into the tube, or a little grass, will usually ensure their survival in transit home and until a more suitable enclosure can be prepared.

One of the difficulties in rearing is that the larvae usually readily eat each other and each one must be housed in a separate receptacle. They can be housed in jam jars but the best container is a flower pot (earthenware). I have found that a pot between 6 inches and 12 inches diameter is best. This is half filled with fine damp earth and stood in a deep saucer filled with water. The saucer must be topped up with water each day. A two inch square placed on top of the earth will provide the larva with shelter whilst allowing it to be viewed when required. The piece of glass can be covered with a stone or piece of plywood when viewing is not required or the whole container may be kept in the dark when not being observed. I have carried out observations of such a habitat using a red "dark room" light in a darkened room, without apparently disturbing the inhabitant. A piece of plastic sheet provides an adequate closure of the pot. Plastic flower pots are not very suitable as the contents become too wet and this leads to heavy condensation on the plastic covering and to conditions conducive to fungal growths which attack the larva.

Feeding. The larvae are difficult for although they eat other larvae and small insects, they have often formed preferences by eating particular types of prey before being caught and under these circumstances I found that unless one can discover these preferences, the larvae just refuse to eat other food and lie down and die. However the provision of a variety of small insects (Colembola, woodlice, etc. and assorted larvae) will often get the inmate feeding. Care must be taken to remove dead insects and partially consumed prey as these can form centres for fungal infestation. Occasionally I have persuaded recalcitrant larvae to take a little cooked liver but it is of course preferable to feed the normal live food and when using meat to tempt larvae to eat, great care must be taken not to leave pieces in the receptacle more than 24 hours as it goes bad very quickly.

Unfortunately, although a great many larvae seem to be known, comparatively little knowledge has accumulated regarding their feeding habits and methods of foraging.

During any attempts to rear Carabid larvae careful notes should be made

as to where the larva was taken and in particular notes should be made of any small insects or other possible source of food nearby; any remains of devoured insects should be collected, cross referenced and kept as it is often possible for an expert to identify the creature from its remains. In this way a knowledge of the larvae's true food pattern could be built up. Cast larval skins should be kept, labelled and kept for reference. Pupation usually takes place in a cell in the earth and information regarding pupae of this group is also scarce.

This brings me to an end of the present series of articles on Beetles. I hope that they have proved both interesting and helpful. If they have encouraged any members to take up the study of beetle life histories, then they will have achieved their purpose. There is still a great deal to be learnt and it is knowledge that can readily be sought by the amateur. All that is required is patience and careful recording. Do we know, for example, for any species of beetle—how often mating is necessary; how many eggs are laid; where they are laid; how long before they hatch; the degree of fertility; the number of larval instars there are? The questions are a myriad, the answers all too few.

In conclusion, a last question. The *Meloe* spp (Oil Beetles) lay their eggs widely in the grass or soil; on hatching the young larvae drift to flower heads, attach themselves to bees and are carried to the nest where they feed on honey. Is the cycle necessary? Can one transfer them straight to the honeycomb, using a camel-hair brush? Is the presence of the bee a necessity? I don't know. Do you? To make a collection of any order of insects has its uses and is often necessary but the study of the life histories can be far more rewarding and leads to the discovery of new things—I commend it to you.

B. J. MacNulty (4528)

COLLECTING NOTES—AUGUST 1973

The smaller moths

REARING LARVAE ON GROWING FOODPLANTS

For the rearing of the larvae of the Microlepidoptera at least I consider that the suggestions we have had on this topic to be still too complicated. All that is needed is one flowerpot, three sticks of from 9 to 18 inches in length, depending on the height of the plant, half a discarded lady's stocking (I mean, of course, half a nylon stocking discarded by a lady: you should keep her for the next pair) and a long and short piece of string. The string may be unnecessary.

Plant your plant in the pot. Stick the sticks in a triangle round the edges. Place on the earth some moss, rotten wood or hollow stems or any other material the future occupants may need for pupation. Cut off part of the stocking foot and calf to suit the length of your sticks. Roll the stocking

over the upper part of the pot and over the sticks. Roll the stocking over the pot from the base and upwards as this is easier. Fasten the stocking round the rim of the pot with the longer piece of string, though this is generally unnecessary since the elasticity of the nylon makes a larva proof union. Insert the larvae through the top end of the stocking and then tie it with the short piece of string, or if you prefer, put a half knot in the stocking itself. Sink the pot up to the rim in a bed in an out of the way part of the garden and, unless there are big and numerous larvae on a small plant, your livestock will need no further attention.

I have never bothered to sterilise the earth which in any case is normally the sod in which the foodplant was growing in the wild. The thrips, etc., and my larvae seem to co-habit quite amicably. I am writing this in the first day of Spring (March 21st) and I have already had out this year over 70 moths of about 25 species, and I doubt if I have lost any through predators.

Last winter I had between 30 and 40 flowerpots sunk in the garden. Think what it would have been like if I had had that number of washing-up bowls half full of cement! Or fish buckets!

I am most grateful to Mr E. S. Bradford for his clear drawing of a flowerpot used in the method advocated. To show the pot and its appurtenances he has had to represent it as standing on the soil; remember to sink it to prevent desiccation.

A. M. Emmet (1379)

Editor's note : Col. Emmet's notes and Mr. E. S. Bradford's drawings of the Microlepidoptera will be continued in the next volume of the Bulletin.

JUNIOR NEWS

In a letter Robin Kames of Hampton, near Evesham, tells me that he caught a female *Celerio galii* Rott. (Bedstraw Hawk) which came to an M.V. trap on the night of 13–14th June, this year.

The moth was put into a breeding cage with the flowers of Buddleia and Lady's Bedstraw. Two hundred ova were laid in two batches on the Bedstraw, but I haven't heard yet from him whether they were fertile or not.

Robin also bred from bought ova of *Papilio machaon brittanicus* L. (Common Swallowtail); the larvae being fed on Fennel. He lost two, but ten completed the life cycle. He then hand paired two which emerged nearly at the same time, and from that female he obtained sixty-six fertile ova. By the 21st July he had fifty-three larvae left.

The Editor has had a contribution for the "Bulletin" which he has passed on to me. It is an article on an attempt to breed *Maniola jurtina* L. (The Meadow Brown).

There is nothing (or nearly nothing) to stop me writing a shortened version in this "News", so here it is.

First of all C. Gardiner took eleven specimens of the Meadow Brown on the 24th August, 1972, eight being females. The males had been on the wing longer than the females and all males died the next day.

He then added four more pairs, and by the 29th August a hundred and five ova had been laid. Of these, only one had been laid on the potted grass, Annual Poa (*Poa annua* L.) provided in the cage. The rest being scattered around the cage on various objects. Most of the ova were laid during the evenings under artificial light.

The cage was at never less than 70°F and all the larvae had hatched in fourteen days. By 13th October they had not visibly grown, being about one mm. long, so presuming that they were hibernating, the cage was placed out of doors.

There the account ends at the moment, perhaps we can have the final instalment for a later "Junior News".

One thing you must be sure about when you do a study on an insect is to make sure that you have the identity correct. I have received an account of how to breed *Vanessa atalanta* L. (Red Admiral) which is a little puzzling until you suddenly realise that it is, in fact, *Nymphalis io* L. (Peacock). Facts also must be checked—guesses are no good at all—and original observations are much more valuable than copying out bits from text-books (they might be wrong!).

By the time this reaches you it will be Winter. Don't forget to keep a look out on tree trunks and fences for the moths that emerge in the winter. Don't forget too, that there are two species of Winter Moth, a copy of "South" will tell you the difference.

More letters, please.

D. Ollevant (1514)

COLLECTING NOTES—COLEOPTERA

For the subject of this quarters Collecting Notes, I have chosen the genus *Lycoperdina* Latr. There are two British representatives, both exclusively associated with Puff Ball fungi.

L. bovistae (Fab.)—a rather local beetle, restricted to the more southern English counties.

L. succincta (Linn.)—a very rare species, only recorded from a few localities, but may turn up in your area.

I have found *bovistae* on two occasions, both times in the larval stage. Firstly in Houghton Forest, West Sussex, April 21st 1971, in *Lycoperdon pyriforme* (the Stump Puff Ball), secondly in Botley Wood, Hampshire, February 10th 1973, in *L. perlatum* (the Common Puff Ball). Infested fungi can be detected by the presence of a small hole or holes in the leathery skin, presumably made by the adult beetle entering to lay eggs. To confirm their presence, the fungus should be pulled apart carefully and examined. The larvae are easy to rear, fungi containing them should be placed in a well ventilated tin and kept in a cool place. The larvae I collected in Sussex pupated in May and emerged during June.

J. Cooter (3290)

THANKS, LINNAEUS!

In the year 1735, a book was published in Holland written by a young Swedish biologist, Charles Linné or to give him his Latin title—Carolus Linnaeus. The book was written in Latin and its title "Systema Naturae" indicates what it was about. It was an attempt to classify the world of living things in an orderly manner.

It was so great an advance on anything of the kind that had appeared before that people thought it to be the result of a life-time's study. At that date the author was in fact only twenty-eight years old. He continued with his work of classification throughout his life and published numerous other works. The Systema Naturae was revised again and again and ran to ten editions. His system has now been in use for about 200 years and thanks to it we have an International Language of Science which enables the whole world to call the same living thing by the same name. Although Linnaeus' first interest was Botany, his method was applied to Zoology, the binomial system by which each item is identified by a *specific* name which identifies it to a type and a *generic* name, defining its closest relationship with other species. He also devised the system of classifying according to Order, Class, etc. Without his work the progress of natural science might have been held back for many years.

C. P. J. Samson (4601)

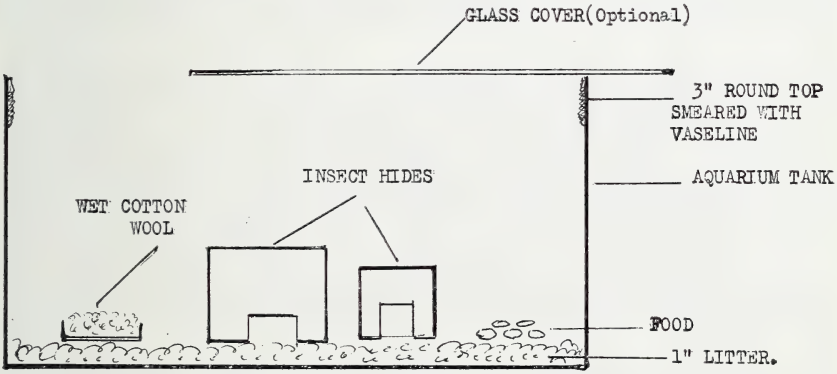
COCKROACH CULTURE

The following describes a method for the culture of cockroaches that I have found to be successful and economical in time.

The most suitable container is an 18″ x 10″ x 10″ aquarium tank—a larger one for a strong culture. About an inch of litter is placed on the floor. I use wood shavings or vermiculite, but I have seen silver sand, or a mixture of peat and silver sand, used instead. The litter is important for many species as the nymphs burrow into it. On top of the litter is put one or more insect hides, a pad of moist cotton wool in a dish, and the food.

Insect hides are made from inverted cardboard boxes, each with a piece cut from one side.

A larger one can be placed over a smaller one; the insects will rest between the two boxes.



AQUARIUM TANK FOR COCKROACH CULTURE

For food I use the pellets (diet 41B) as sold for feeding laboratory mice as a basis, but this may need modification. Generally they will take a wide range of dried foods, provided that they are not rich in protein. The pad of moist cotton wool is kept moist by means of a glug bottle.

A 3″ ring of Vaseline is smeared all round the top to prevent escapes. The insects (except *Gromphadorhina spp.*) are generally unable to climb up clean glass. However, the glass becomes dirty after a time and they can climb up this.

A sheet of glass can be put over the tank, leaving a gap at one end. When the colony becomes strong the glass can be removed entirely. The aim is to keep the humidity relatively low but allow the insects access to wet cotton wool. In this way infestation by mites can be avoided—otherwise the humidity generated by the evaporation of water from the mass of insects encourages their development. I lost a very strong culture of the Madeira Cockroach in this way. The mites covered everything, including the insects (which they do not attack directly). To cure this I transferred some of the insects to a fresh tank set up as above. 2 weeks later they were

moved to a second tank. The combination of a drier atmosphere and 2 changes of container overcame the trouble. This is the only serious "disease" that I have had so far.

The cockroaches do better when crowded, and there is some evidence (for the American Cockroach) that the presence of frass, as in an old culture, hastens development.

A culture set up as described may last for 3 years or more, the surplus insects being removed when it becomes overcrowded (usually indicated by the insects being found outside of the hide during the day). If a colony is started with only a few individuals, some species may take 2 or more years before they become really numerous.

The following are two of the species that I have kept under the conditions described; no doubt many more will respond to the same treatment. There are others, such as the Wool-eating Cockroach, which are reputed to be difficult and need special conditions, but are interesting to the specialist.

The Madeira Cockroach (*Leucophea maderae*) is an insect which is approximately the same size as the American Cockroach. It exhibits false ovoviviparity. The ootheca (egg case) is formed in the usual way and protrudes from the abdomen of the female (this can occasionally be seen), it is then rotated through 90° before being withdrawn into the brood pouch on the underside of the abdomen. The rotation enables the egg case to fit into the flattened body. Here the eggs are protected from dessication (the coverings of the ootheca are thin) and from parasitism. The nymphs hatch directly from the brood pouch. The method of reproduction of *Blaberus spp.* is similar.

The adults can fly—I have witnessed this occasionally, but the flight is weak, and they do not seem able to gain height, which is just as well, as they are kept in an open aquarium tank! This species likes fruit. A very strong culture in a 2 ft. tank ate 2 whole apples (cut in half) in 24 hours! However, fruit does not appear to be essential. This species has been recorded as a pest, so perhaps some care is needed in handling it.

Blaberus craniifer is a large species, about 2½″ long and over 1″ wide (over wings). The common name, "Giant Death's Head Cockroach", is due to the markings on the pronotum which have a fanciful resemblance to a skull (a little far-fetched, I think!). The nymphs are most attractive, with light and dark brown markings, flattened, but appear almost round when viewed from above at certain stages. When disturbed they either feign death or burrow into the litter. The life cycle takes about a year. The natural habitat of this Mexican species is under rotten logs. *B. discoidalis*, which is also in culture in this country, is similar, but smaller.

Cockroaches are a specialist interest, without the bright colours associated with other groups, and with unpleasant associations in the minds of some people. However, the very large tropical species repay study, as relatively little is known of their biology as compared with the American

Cockroach. It is to be hoped that the number of species of these undemanding insects that are available will increase. This can only benefit the study of entomology.

I would like to thank B. Gardiner Esq., Dept. of Zoology, Cambridge University, for his advice on the culture of cockroaches.

P. S. Clark (4488)

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REARING ANTHERAEA YAMAMAI Guérin-Meneville FROM EUROPEAN OVA

In August 1968, while staying with some friends in S. Austria near a town called Mureck, I found a female silkmoth beneath an electric light on the wall of their farmhouse.

Being unable to identify the moth, I confined it to a box to obtain ova, which I did. As they did not hatch out within the following three weeks I assumed them to be infertile, or that they would overwinter as ova.

But they did hatch out the following year in mid-April. I supplied them with a variety of leaves on which to feed (Hawthorn, Hornbeam, Rose, Plum etc.), and found most of them preferred Hawthorn. I reared them on this until their 3rd instar. (This is when I obtained a copy of the Silkmoth Rearer's Handbook and was able to identify them as *A. yamamai*). Then I gave them a mixture of Oak and Hawthorn, and found they relished one as much as the other.

They fed up and pupated in June, spinning white, whole cocoons, the outer layer of which varied from pale green to yellow.

The adults started emerging in August and as no information on pairing was present in the Silkmoth Rearer's Handbook I confined three adults (2 males, 1 female) to a 36 cm x 22 cm x 22 cm high box, the top of which was covered with netting.

The moths started to fly as soon as the light faded, and two of them paired some ten minutes later, staying as such for only 15 minutes. This I found was the rule, and only occasionally did a pair stay together until morning.

Ova of the above pairings were kept and reared the following year. In subsequent summers I was able to observe *A. yamamai* in the wild and collect fresh ova, and make the following observations.

(1) The adults occurred and came to light during August; most of the ones coming to light being males. The moths also occurred in large numbers and could be found in S. Steiermark and S. Burgenland in S. Austria and Slovenia in N. Yugoslavia.

(2) Adults occurred in many colour-forms, the most common being a greyish-yellow the rarest being a canary-yellow.

(3) The larvae can be fed on Hawthorn, Hornbeam, Beech and Sweet-chestnut, but prefer Oak to all of these.

The moth is spreading northwards in Europe, according to the Vienna Natural History Museum, and has become firmly established since it's initial introduction in the 1860's. It is a native of Japan.

A. R. Pittaway (4802)

A STAINING TECHNIQUE FOR WING VENATION STUDIES

For some time now I have been looking for a method of preparing the wings of micro-lepidoptera in a way that would demonstrate clearly the pattern of wing venation. When dealing with the larger moths and butterflies it is often quite sufficient to remove the scales by rubbing the wings between one's fingers but clearly this is liable to damage the smaller and much more delicate micros. In Mr G. Thomson's article in the May 1965 edition of the Bulletin (Bull. amat. Ent. Soc. 24: 56–57) a method is described whereby wings are first bleached and then used like a photographic negative to produce a print on photographic paper. To do the same for the smaller moths would inevitably require the use of an enlarger.

The most successful technique I have tried so far has evolved from a series of experiments in which certain stains were found to colour the veins much more strongly than the wing membrane, thus producing a preparation in which the detailed structure of the wing is very clearly seen.

The materials necessary for carrying out the work can be obtained from any of the firms selling microscopical equipment and reagents.

MATERIALS.	Lignin Pink powdered stain.	Several small dishes
	Isopropyl alcohol	eg. solid watch glasses
	Gurr's Neutral Mountant.	Small bottles to hold the
	Conc. Hydrochloric acid.*	stain and the bleach.
	Household Bleach.	Slides and coverslips.

It is important that the mountant be miscible with the alcohol. If another mountant is used it may be necessary to use a different alcohol.

THE STAIN. 10 drops of conc. HC1 are added to 10 mls. of alcohol. A minute quantity of the powdered stain (as much as will cover the tip of a penknife blade), is dissolved in a little water and then added to the acidified alcohol; the ingredients are then thoroughly mixed together.

THE BLEACH. This should be diluted to half its strength with water.

PROCEDURE. Small quantities of the diluted bleach, the stain, and the alcohol should each be poured into small glass dishes. Ideally, there should be three dishes for the alcohol to avoid any mixing of the solutions during the operation.

***Editor's note :** Care must be taken with dangerous chemicals.

I find that wings are most easily removed from set specimens since it is then possible to get close to the base with very fine forceps.

1. Transfer wings to alcohol—1 minute.
2. Transfer to bleach—usually less than 5 minutes. If left for too long the wings tend to soften.
3. Rinse in alcohol—30 seconds.
4. Stain—at least 2 hours. Hind wings take longer than forewings and do not stain so deeply.
5. Wash in alcohol to remove excess stain.
6. Mount in Neutral Mountant on a microscope slide and cover with a coverslip.

The main drawback in this method is the length of time required for staining. I have tried using different stains but have found that in some cases, for example with aceto-carmine, aniline blue, and nigrosin, the scales became so densely coloured that the veins were totally obscured. With safrinin "O", or eosin, there was practically no staining effect. Aqueous eosin is precipitated from solution by acid.

Glacial acetic acid gave fairly good results when used with lignin pink but there was a tendency for the scales to stain more heavily. Acid seems to be an essential ingredient of the staining solution, since I was unable to get any results when it was omitted. Doubling the quantity of acid did not reduce the staining time.

The stain described above can also be used for genitalia preparations, and for this, satisfactory results are often obtained with a staining time of five minutes.

B. Morrison (3761)

BEETLES IN YORKSHIRE

On a recent visit (on the 4th March 1973) to the site of a coleoptera survey being carried out by a colleague and ourselves, the area under investigation was the north facing hillside sward near the scarp of the Yorkshire Wolds. Under the turf high on the hillside we discovered many larvae (about twenty to the square foot). Some were taken for further observation. By using the "Coleopterist's Handbook"—our most useful asset—we identified them as belonging to the family *Dascillidae*, of which only two species occur. On reaching the adult stage, we were able to identify them as *Dascillus cervinus* L. A week later than the above visit there was no trace of the larvae to be found at the site although those in captivity had not yet undergone metamorphosis. Digging deeper and breaking the turf failed to reveal signs, yet there was no evidence of pupae, imagines or parasites. We would welcome any opinions as to what had occurred. Other species found were *Agriotes obscurus* L., *Serica brunnea* L. and *Feronia madida* Fab.

R. D. Cawkwell (5076) D. G. Sanders (4898)

AN UNUSUAL HABITAT

This article is about one and a half years of moth trapping in an area where one would hardly expect much at all, but to my surprise and delight the area has proved quite productive.

The area in question is the highly urbanised East end of London. Although there are not many factories around the area in which I lived (Newham) there is certainly not much open land. The majority of Newham consists of terraced houses and skyscraper blocks (Remember Ronan Point?). There is however, a piece of land some 400 yds. x 200 yds. which used to be the council rubbish dump (hence its local name of "The Dumps"). This area I know very well and it is now covered with many species of low plants. There are also many bushes, most of which are Elder (does anything feed on this?), but there are one or two sallows, poplars and hawthorns. It is this area which, I believe harbours most of the insect population that appeared in my trap.

"The Dumps" is about ¼ mile from my house, in the garden of which is situated my trap (125 watt MV pearl bulb). The 30′ x 15′ garden has a 40′ high wall at the bottom and 6′ high walls either side, so how the moths see the light is a mystery.

The list below includes all species taken in the trap which was running between July 1971 and August 25th 1972. They are listed in accordance with the latest edition of South's British Moths.

Mimas tiliae Linn.	c	*Ceramica pisi* Linn.	5
Smerinthus ocellata Linn.	4	*Discestra trifolii* Hufn.	c
Laothoe populi Linn.	c	*Hadena bicolorata* Hufn.	4
Deilephilia elpenor Linn.	c	*H. bicruris* Hufn.	5
Harpyia bifida Brahm.	1	*Orthosia gothica* Linn.	1
Cerura vinula Linn.	c	*O. stabilis* Schiff.	6
Phalera bucephala Linn.	1	*O. incerta* Hufn.	9
Tethea ocularis Linn.	10	*O. gracilis* Schiff.	4
Cilix glaucata Scop.	1	*Leucania pallens* Linn.	c
Orgyia antiqua Linn.	few	*L. impura* Hübn.	c
Euproctis chrysorrhoea Linn.	3	*L. lythargyria* Esp.	c
E. similis Fuess.	few	*L. conigera* Schiff.	c
Leucoma salicis Linn.	2	*Cucullia umbratica* Linn.	1
Agrotis segetum Schiff.	c	*C. asteris* Schiff.	4
A. puta Hübn.	c	*Xylocampa areola* Esp.	1
A. exclamationis Linn.	c	*Allophyes oxyacanthae* Linn.	1
A. ipsilon Hufn.	1	*Anchoscelis litura* Linn.	c
Spaelotis ravida Schiff.	2	*Cirrhia icteritia* Hufn.	1
Diarsia rubi View.	few	*C. ocellaris* Borkh.	2
Ochropleura plecta Linn.	2	*Cryphia perla* Schiff.	c
Amathes c-nigrum Linn.	c	*Apatele aceris* Linn.	c
A. xanthographa Schiff.	c	*A. megacephala* Schiff.	6
Axylia putris Linn.	c	*A. psi* Linn.	c
Euschesis janthina Schiff.	2	*A. rumicis* Linn.	c
E. comes Hübn.	c	*Amhipyra tragopognis* Clerck	c
E. interjecta Hübn.	3	*Mormo maura* Linn.	1
Noctua pronuba Linn.	c	*Dyptergia scabriuscula* Linn.	1
Lampra fimbriata Schreb.	9	*Apamea lithoxylae* Schiff.	c
Mamestra brassicae Linn.	c	*A. monoglypha* Hufn.	c
Melenchra persicariae Linn.	c	*A. sordens* Hufn.	c
Diataraxia oleraceae Linn.	c	*A. secalis* Linn.	c

Procus literosa Haw.	c
P. furuncula Schiff.	c
Eremobia ocholeuca Schiff.	1
Luperina testacea Schiff.	c
Phlogophora meticulosa Linn.	c
Thalpophila matura Hufn.	c
Caradrina morpheus Hufn.	c
C. alsines Brahm.	5
C. ambigua Schiff.	c
C. clavipalpis Scop.	c
Gortyna micacea Esp.	f
G. flavago Schiff.	f
Pyrrhia umbra Hufn.	12
Cosmia trapezina Linn.	4
Rhizedra lutosa Hufn.	1
Arenstola pygmina Haw.	1
Catocola nupta Linn.	3
Euclidimer mi Clerck	1
Polychrisia moneta Fab.	6
Plusia gamma Linn.	c
Unca triplasia Linn.	10
Scoliopteryx libatrix Linn.	3
Nola cucullatella Linn.	1
Spilosoma lubricipeda Linn.	c
S. lutea Hufn.	c
Cycnia mendica Clerck	c
Phragmatobia fulignosa Linn.	8
Arctia caja Linn.	c
Callimorpha jacobaeae Linn.	4
Hemithea aestivaria Hübn.	3
Calothysanis amata Linn.	f
Sterrha vulpinaria H.-S.	3
S. interjectaria Boisd.	5
S. aversata Linn.	c
Xanthorhoe fluctuata Linn.	c
X. ferrugata Clerck	3
Euphyia bilineata Linn.	3
Pelurga comitata Linn.	2
Lygris mellinata Fab.	1
Dysstroma truncata Hufn.	2
Epirrhoe alternata Mull.	6
Eupithecia linariata Schiff.	8
E. pulchellata Steph.	1
E. centaureata Schiff.	c
E. absinthiata Clerck	c
E. assimilata Doubl.	f
E. vulgata Haw.	f
E. icterata de Vill.	f
E. succenturiata Linn.	c
E. indigata Hübn.	c
Chloroclystis rectangulator Linn.	f
Gymnoscelis pumilata Hübn.	1
Operophtera brumata Linn.	f
Abraxas grossulariata Linn.	c
Campaea margritata Linn.	1
Gonodontis bidentata Clerck	c
Crocallis elinguaria Linn.	c
Ourapteryx sambucaria Linn.	c
Opsthograptis luteolata Linn.	c
Lycia hirtaria Clerck	c
Biston betularia Linn.	17
Menophra abruptaria Thunb.	13
Cleora rhomboidaria Schiff.	c
Itame wauaria Linn.	2
Chisma clathrata Linn.	1
Zeuzera pyrina Linn.	1
Hepialus humuli Linn.	f
H. lupulina Linn.	f

c—common f—few

I use the term "few" for old approx. records and it can be taken to mean between 5–20.

The *S. ravida* that were taken were a male (31/8/1971) and a female (21/8/1972). The female laid approx. 350 eggs which (all but a few) changed from a pale straw colour to a shiny grey, however they did not hatch.

Among the *C. perla* were 3 bright orange specimens (ab. *ochracea?*), a very dark grey specimen and several darker than normal forms (Melanics?)

Of the 17 *B. betularia*, 16 where ab. *carbonaria* and one was a type. Other melanics where *C. rectangula* (all), *M. abruptaria* (50%), *A. monoglypha* (3 only) and *C. rhomboidaria* (one only). Several of the other species contained darker than normal forms.

Well if this article has a moral, it is that the collector would perhaps be doing the entomological world a greater service by trying out areas that are not "known" collecting areas.

I am now at 10 Elms Farm Road, Elm Park, Hornchurch, Essex, and would appreciate hearing from anyone who knows/lives in the area, or indeed from any fellow collectors.

W. Coster (4697)

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REARING THE LESSER SWALLOW PROMINENT PHEOSIA GNOMA FAB.

According to Newman and Leeds, it is a moth very difficult to rear in captivity—I agree. The larvae are scarce in the Doncaster region and of the odd ones I have managed to beat in 25 years collecting, never once did I succeed in rearing them. In the early 1950's a Wakefield entomologist published a solution in a local journal, saying that unless his method is followed you are doomed to disappointment. In 1956 I managed to beat a couple of larvae, and put it to the test. They can be reared indoors until they are nearly full fed and then must be sleeved out on growing Birch.

As a preliminary, you need a pot about 5″ diameter—the modern plastic ones are admirable, as they are very light, and fill it with a nice friable mixture of sandy soil and powdered peat, which must be damp. The open end of the sleeve is then tied round the pot, which may require a little support from a higher branch; the larvae readily pupate in this, and after a lapse of time, can be retrieved and the cocoons placed in your pupa box.

Both my specimens emerged in 1957, and are the only ones I have ever bred.

L. G. F. Waddington (169)

FURTHER NOTES ON THE YEAR 1972

On reading Mr Cribb's notes on the 1972 season I immediately took out my notebook to compare our "years". Most of the notes did not look too good but here are some of the best.

May 11 Orange Tip, *Anthocharis cardamines* L., males on the wing.

May 17 Peacock, *Inachis io* L., *Pieris brassicae* L., *P. rapae* L., *P. napi* L. and Cinnabar Moth, *C. jacobaeae* L. all seem to be fairly common.

June 1 Went to Holme (just outside Scunthorpe) with Mr Johnson (4074) and observed female Brimstone, *Gonepteryx rhamni* L., flying around a Buckthorn Bush (Rhamnus sp.). On searching we found one egg which proved to be infertile. Other Lepidoptera seen were *Aglais urticae* L., *I. io.* the Wall Butterfly, *Lasiommata megera* L., the Mother Shipton moth, *Euclidimera mi* Cl. Also taken various larvae of Geometridae and the Vapourer Moth, *Orgyia antiqua* L. Found larvae of the Orange Tip.

June 15 Orange Tip larvae already in 4th instar. Pupae of *P. brassicae* (overwintered) still not hatched.

June 17 Larvae of Garden Tiger, *Arctia caja* L., on waste ground in Scunthorpe.

July 1 Saw imago of Wood Tiger, *Parasemia plantaginis* L. on visit to Turbury Nature Reserve, Epworth, Lincs.

July 7 Normanby Hall M.V. meeting. Fair number of moths including Plain and Beautiful Gold Y (*Plusia iota* L. and *P. pulchrina* Haw.), *Biston betularia* L. (Melanic) *Eumichtis adusta* Esp., and the Peach Blossom, *Thyatira batis* L.

July 26 Caught an immaculate *Habrosyne derasa* L. at light in garden.

Aug. 7 Caught fresh Scalloped Oak, *Crocallis elinguaria* L. in garden.

Aug. 13 Caught ancient Gothic moth, *Phalena typica* L. on Buddleia, quite inebriated.

Generally it was a poor year for migrant insects in Lincolnshire. I did not see one Painted Lady, *Vanessa cardui* L., or Red Admiral, *V. atalanta* L. There were few Small Coppers, *Lycaena phlaeas* L., and no Common Blues, *Polyommatus icarus* Rott. One dreams of times when summer came in the summer.

R. K. Moore (4508)

OBTAINING BUTTERFLY EGGS IN CAPTIVITY

Many moths will lay their eggs on the sides of cages or boxes. Whole families, such as the Saturniidae, do not feed as adults. Butterflies however, are more troublesome. All feed as adults. Furthermore they will rarely lay on anything except their foodplant.

Butterflies may be fed on either natural or artificial flowers. Should natural flowers be used the lower leaves must be stripped off and the stems placed in a jar of water, the neck being stuffed with cotton wool or a "Kleenex" tissue. It is best to renew the flowers every two days. The kind of flower to use depends on the species of butterfly, some preferring one sort, others another. This is something that can only be learnt by observing which flowers the butterflies normally visit in the field. There are however certain useful standbys on which most butterfiies will feed, such as Valerian, Buddleia, Mint, Lantana, Lucerne and Lobelia. If butterflies are being bred regularly it is an excellent plan to have various flowers in pots. The last two mentioned above grow both well and quickly when sown from seed.

Artificial flowers have many advantages. They do not take up so much room in the cage, nor do they make a mess by dropping petals. The food used in them consists of a 10% solution of clear honey in water, but equally good results are obtainable by using sugar in most cases. The bulk supply of food is best kept in a polythene "squeeze bottle" and can be stored for several days in a refrigerator, the flowers being topped up daily and cleaned out two or three times a week.

These artificial flowers are not those usually associated with the word and sold in the place of real flowers for decoration. They consist of a glass tube, $\frac{1}{2}''$ x $1\frac{1}{2}''$, which holds the honey solution, the lip of the tube being surrounded by a painted corolla made of thin cardboard and glued to the

glass with "Araldite". This corolla is $1\frac{1}{2}''$ in diameter and must be painted white with blue or yellow rays. Six such flowers should be mounted on a piece of plywood which in turn is supported by a strong wire so that the flowers are positioned two thirds up the height of the cage of butterflies.

There are a number of variations on these flowers. For durability and ease of cleaning the glass tubes may be mounted directly into holes drilled in a sheet of perspex, the corolla then being painted direct onto the perspex around each tube.

Butterflies vary considerably in their ability to feed on artificial flowers. Even different individuals of the same species show variation. As examples no trouble has been experienced with *Pieris rapae*, *Inachis io* or *Danaus plexippus*, but while some broods of *Pieris brassicae* will come and feed happily, others will not. Neither will *Papilio machaon*. When it is noticed that they are not coming to feed then they must be hand-fed. To do this, pick the butterfly up, between finger and thumb, with the wings folded over the back. Place it on the flower so that its feet are able to get a grip, then, using a spreading needle, gently uncoil the proboscis and insert it into the tube of honey. In the majority of cases the butterfly will commence to feed and may then be released when it will continue to do so.

Contrary to popular belief many butterflies are comparatively long-lived. Besides those, such as members of the genera *Aglais* and *Gonepteryx*, which hibernate and therefore live for nearly a year, it should be possible to keep many species alive in captivity for several weeks. If they die within a week this is a sure sign that they are not getting enough food or are being kept too hot and dry.

Having attended to the feeding, the next consideration is pairing. In the case of the wild caught females this problem will not at first arise, as the chances are very high that she has already mated. Nevertheless there should be males in the same cage for, with a few exceptions (*Parnassius* being physically incapable of pairing twice), most butterflies will mate several times during their active egg-laying life. It has in fact been shown that maximum egg production is only attained in *P. brassicae* when several pairings take place. I have also noticed that *Papilio* tend to mate only once but *Danaus* seem to mate every few days.

In order to obtain successful mating and oviposition it is essential that they should be warm enough and I think that many failures may be explained by their having been kept too cold. Whatever butterflies may do in the field they do not always react to quite the same conditions in captivity, and I find that below 20°C most species are rather inactive. Between 25 and 30°C is a good optimum temperature for both mating and oviposition. This must be regarded as a daytime temperature and it is best to allow a considerable drop at night. Keeping up this temperature continuously will only shorten their lives and, except in the case of tropical species, will do more harm than would a touch of frost.

Wild caught butterflies are often already fertile. Bred ones however,

must be mated or they will commence to lay infertile eggs. It is often stated that sunlight is essential, but this is not entirely true. *P. brassicae* and *I. io* have both been bred for several generations entirely by artificial illumination. Both these species as well as others frequently pair on dull, overcast days. Pairing is, however, so much more likely to occur in sunlight that advantage should be taken of it whenever possible. Not all species like the direct blast of the sun, however, and a knowledge of the natural habitat is useful in this respect. Some wood-loving butterflies which normally fly half in shade prefer to have their cages partially shaded as well, the genus *Pararge* for instance.

There is also an optimum age for pairing which in *P. brassicae* is 2–3 days, but this age will depend both on the species and the temperature at which the emergent adults have been kept. At times pairing takes place within hours of emergence, especially of the female. Hibernating butterflies though will not pair until the following spring and these are discussed below. Generally speaking any butterfly over a day old is ready to pair. Over this and the readiness to do so falls off.

There are two aspects to mating butterflies. Firstly, when there are a number of both sexes available and, secondly, when only one pair is available. In the first instance there is often little trouble and they will pair up almost at once. In the second case, and this is one which arises whenever genetical studies are being undertaken, it may often occur that no pairing takes place. Like many animals butterflies may at times show a distinct preference in their choice of partners and reject an otherwise apparently suitable mate. One method of encouraging pairing is to keep the butterflies away from all daylight for a couple of days and then, ensuring that the temperature is high enough, bring them out suddenly into bright sunlight. If this fails then it may be worth making an attempt at hand pairing. I must point out, however, that I have never had great success at this myself. It is a method developed for hybrid *Papilios* and with these fairly good results have been obtained. It might also work with other large butterflies. With small species there is considerable risk of injury during manipulation. Nevertheless, especially with a rare species, or an important genetic combination, it is at least worth giving a try. The male and female are picked up, one in each hand, using finger and thumb as already described for feeding. The male should be so held that very gentle pressure can be exerted on the abdomen, this causing the claspers to open. The tips of the two abdomens are now carefully juxtapositioned so that the female tip lies between the claspers. They should now be held still for a few minutes. With luck the male will grip the female and pairing will take place, the pair then being carefully returned to their cage.

Once the butterfly is fed and mated she is ready to lay eggs. This will be done over a period of days or weeks. At first only a few eggs will be laid, the number gradually rising and then tapering off. After about a week an opportunity should be allowed for a second pairing, it being best in fact to

leave the male or males in the same cage as the females all the time.

With a few exceptions the correct foodplant must be provided. A few species, mainly Satyridae, will scatter their eggs on the floor of the cage. Even these though are best provided with a pot of grass. There is no doubt that a growing foodplant is best and, when a planned breeding programme is being undertaken, this can be catered for in advance. Usually however one never knows what butterflies may be coming to hand. Even in such cases it is often possible to find and dig up wild foodplants and transfer them to a pot.

The alternative to a potted plant is of course cut stems placed in a jar of water. The great disadvantage of these is that the leaves seldom stay fresh until the eggs hatch. Plants show great variations in keeping times in water. Cabbage and Willow wilt very quickly, Privet, Nettles and Carrot keep well. Once the eggs have been laid it is therefore best to remove them to small plastic boxes in which the newly hatched larvae may also be reared. It is also best not to allow too great an age scatter of eggs to accumulate on the foodplants. Apart from the fact that some newly hatched butterfly larvae are cannibals, small larvae hatching in a large cage are easily lost.

For Satyrids which may lay over the floor of the cage, a good plan is to line it with paper and gather up the eggs daily on this. Most grass-feeding species I have reared go well on young wheat. This should be sown thickly in shallow earthenware pans and when kept warm comes up in only a few weeks, ready for use. Most grass feeders also lay readily on this young growth.

There are a number of butterflies that present both difficulties and a challenge when it comes to obtaining their eggs. These are the Lycaenidae and the hibernating species.

In their early stages the Lycaenid caterpillar tends to feed internally in flowerbuds, on which the eggs are laid. It is therefore almost essential to have growing food for these. Furthermore, if there is more than one egg per flowerbud only one larvae will survive. the first to hatch eating any later rivals. Failing growing food, the only thing to do is to remove the eggs and put them in plastic boxes. Keep a very close eye on them and as soon as hatched transfer to freshly picked flowerbuds.

The other difficult group is the hibernators. With these, patience is required. Normally such butterflies emerge in the autumn, feed for a varying period and then hibernate until spring. Some of them however may have one or more summer generations and it is therefore only the last generation that presents any difficulty. One method of dealing with these is to keep them fed and allow them to hibernate normally. If they are kept warm however it will be found that a percentage of them will eventually cease to have the hibernating desire and commence to pair. This occurs with *I. io* and *Vanessa atalanta*, but it may be two months before they start to lay eggs.

There remains the important question of where to keep the butterflies and what to keep them in. All kinds of cages may be used. They should all be light and airy. Small cages of a few cubic feet are in many instances satisfactory, but the larger the butterfly then the larger the cages should be. My own are of 25 cubic foot capacity, wood-framed, the sides mainly of glass except for half of the front which is of muslin and allows entrance. The top also is of muslin. In such cages I have kept many species. Where to keep the cages is more important. One thing to be born in mind is that butterflies pair much better when the light is coming at them from all directions. A greenhouse is therefore the best place. Care must then be taken, firstly that they do not get too hot during the day, which involves keeping a close check on the ventilation, and, secondly, that they can be kept warm enough during periods of inclement weather to ensure satisfactory mating and oviposition. If an already heated greenhouse is available well and good, but a far cheaper method is to install a low wattage tubular heater inside the butterfly cage, controlled if possible by a thermostat. Most of us however do not have a greenhouse available and have to make do with a garden shed, corner of the garage, or perhaps a spare room in the house. There is little doubt that butterflies do not do so well in such situations. Whenever possible, therefore, remove the entire cage outside into the sunlight.

At times, in spite of having given apparently ideal conditions, the butterflies refuse to mate. In such cases the cause is almost certainly in the butterflies themselves although the exact reason is hard to define. Inbreeding may be one cause, for it is said that this may "weaken" a stock, although this does not by any means always happen. It may well be that close relatives, such as brother and sister, have an inbuilt inhibitory mechanism to prevent them pairing. I have had certain *Pieris* butterflies refuse to pair and these same insects have later paired readily with an unrelated stock. At other times, although normal pairing has taken place, only infertile, or poorly fertile eggs are laid. This may also be due to inbreeding, or, in the case of certain genetic strains, a lethal factor. It is also known that if the larvae of the moth *Arctia caja* be reared at too high a temperature, infertile eggs result in the next generation. A similar mechanism may well occur in some of the butterflies. These factors account for the occasional failure; it is only if there is consistent failure that it is necessary to re-examine our breeding conditions.

Brian O. C. Gardiner (225)

A CORRECTION

Referring to my article in the February 1973 Bulletin on my trip to Greece, I find that on closer examination the butterfly referred to as *Cyaniris helena* Stdgr. is in fact *Agrodiaetus admetus* Esp.

G. Smith (4950)

NOTES ON LEPIDOPTERA BREEDING CAGES

During the Winter I take stock of my entomological apparatus and think about replacing it. With Spring being not so far off, I thought of breeding cages and here are my views on them.

I rear Lepidoptera to familiarise myself with larvae so that I can identify them when I meet them again, occasionally to photograph them and, in the case of "micros", to obtain cabinet specimens. This is probably the easiest way of obtaining "micros" and certainly an interesting one. It would serve no purpose to describe the many types of cage possible (many varieties are dealt with in various AES publications, although the materials used are often much out of date). A cage must necessarily keep its occupants in, preferably be cheap, be easy to clean and robust, and allow for observation and experiment.

Most commercially available cages fall short of these demands. They are usually some type of box or cylinder. The cylinder type is one of the cheaper and better varieties, but I do not use it. After a few years the cellulose acetate cylinder darkens and becomes brittle. Moisture condenses on the sides when any reasonable amount of foodplant is placed in them and the foodplant is difficult to remove or replace. Larvae which pupate underground are easily accommodated but those which spin up on the sides of the cage are not. Cylinder cages are easy to make, but tins for the bases are hard to come by.

Of the box type of cage I use Worldwide Butterflies' "Economy Cage" which is essentially an eight inch cube of cardboard and netting. It is fairly cheap and not as flimsy as it sounds. The top does not fit very well, but a little bending of the cardboard sides leaves gaps no larger than the netting mesh. It obviously cannot be used out of doors, but I have liberally varnished some of mine for use in a damp garage and they have stood up to it very well. I use this cage because it is cheap, very light in weight, the netting is easy to see through and it is easily stacked. Although small it can be crammed with foodplant without any fear of water condensation. When rearing "macro" larvae indoors I use this cage extensively. It is also useful as an emergence cage since moths can climb the netting or cardboard sides and hang from the top. I have kept ten fully grown larvae of the Indian Moon Moth (*Actias selene* Hübn.) in one of these cages without any difficulties due to overcrowding. It would be easy to make these cages, but I do not think they would work out much cheaper than if they are bought. Larger cages made from net covered wood frames and a hardboard base would be useful and cheaper than commercial cages of the same size.

The cage I use most often is simply a plastic box. These are cheap, transparent, very easily cleaned and can be written on with a wax pencil. A box two inches in diameter is ideal for a single, small larvae. I rear all my Totricids right through to imagines in these boxes, clearing out the frass and adding a fresh leaf occasionally. When used indoors condensation is

not much trouble and can be overcome by opening the box for a few hours. When dealing with large numbers of "micro" larvae from various habitats it is essential to keep each separate or records become very confused and small plastic boxes here become essential. Larger boxes are useful when large caterpillars or several small ones of the same species are being reared. Clear sandwich boxes with a transparent, airtight, push-on lid, measuring 5″ x 3″ x 2″ and 7″ x 4½″ x 2″ are the best to use.

I also use plastic boxes for newly hatched larvae but great care must be taken to avoid condensation on the one hand and drying of the foodplant on the other. If I have a reasonably large batch of ova (twenty or more) I usually rear half of the newly hatched larvae in a sleeve out of doors and half indoors. The likelihood of losing them all is reduced and the comparison of growth rates is interesting. The larvae reared outside should mature naturally so the imagines can be released in a suitable locality to mix with the wild population.

Most of my breeding is done indoors where the temperature is fairly even, hence the caterpillars are not in anything like their normal environment and, while I record details of hatching, etc., they cannot be considered to apply to the wild population.

My few outdoor cages are all sleeves used when a growing foodplant is available or for hibernating larvae; sleeves are very useful but I am apt to forget about them. I have used muslin and nylon netting for sleeves and I prefer a netting sleeve as there is no need to undo it to look at the inmates and the mesh lets the frass through. Muslin has the advantage of imprisoning small caterpillars but it shrinks fearfully in the rain. Fine mesh nets are rather expensive, but nylon netting and muslin are both cheap.

My choice of cage is influenced by the foodplant as well as by the larval size. Flower-feeding caterpillars do not do well in plastic boxes as most flowers quickly rot and cannot be removed without serious interference: sleeving a growing plant is best. Some twigs do not keep well in water, particularly birch and oak, while oak in a plastic box keeps little better than a flower. Hazel is often a good substitute for oak.

My range of cages is very limited but I find it suitable for most caterpillars as well as many other insects. I do not believe in spending a lot of time in making cages, as it is better spent on observation.

B. Coles (3533)

BUTTERFLIES ON FRESH TAR

Mr Stallwood's mention of butterflies being attracted to fresh tar in his interesting article in the May Issue of the Bulletin reminds me that I once captured three male specimens of *Apatura iris* L. which were flying along and settling on a freshly tarred road which ran through a Wiltshire wood.

D. W. H. Ffennell (4020)

A CAGE FOR REARING CATERPILLARS

Aside from providing decent board and lodging for caterpillars, an indoor larval cage which is to be produced in reasonable quantity should be simple to construct, cheap, and able to withstand a certain amount of rough handling during the hectic days of summer. Also, I personally find that the water container for foodplant is a nuisance when placed inside the cage. The following design thus allows for the siting of the water container (jar, bottle, or plastic box) underneath the cage floor with, it must be admitted, loss of a certain amount of breeding space.

The construction of the cage is as shown in the diagram. Side walls, for lack of money, I have made chiefly from discarded pieces of plywood (we live next door to a carpenter's workshop), but the odd pieces of hardboard that have come my way have proved far more satisfactory. The rough side of the hardboard forms the inside walls and "lid" and gives the larvae excellent purchase. Plywood may be covered with netting or rough cardboard if desired, but this adds to the work.

The two open sides I generally cover with butter-muslin to simulate the semi-gloom of the great forests, but mosquito-netting or curtain material makes for easier observation.

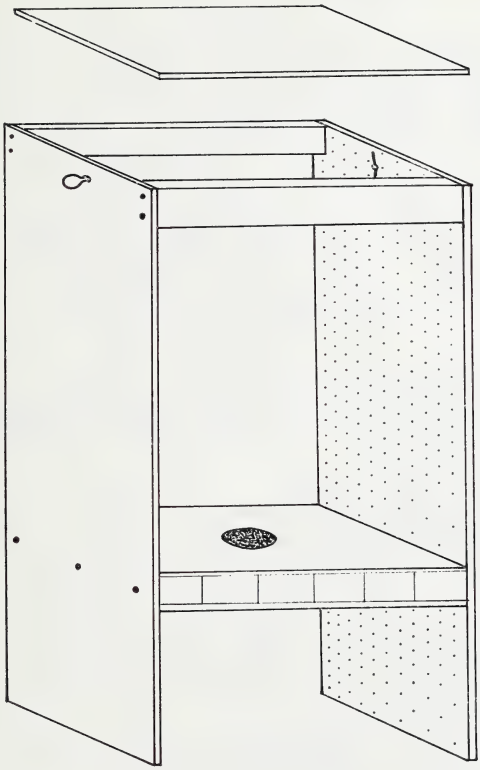
The top may be secured by means of an elastic band fitted over the wire loops (a strong arrangement), or a hinge can be made from wide masking-tape or similar material.

When fitting the second side, incidentally, secure it with one nail, then stand the cage upright and adjust until it does not rock. Then nail firmly into place.

The floor I have in some cases provided with a single large hole (cut to specific sizes with circular saws fitted to a power drill), in others with several smaller holes. The main problem here is that you must decide in advance what size water container you will be using with a particular cage, and drill the holes accordingly. The bottom of the cage clears the top of the water container by 5–10 mm., and so long as you work within the circumference of the latter, there is considerable lee-way as regards size, number and arrangement of holes. The holes are drilled before assembly.

I do not myself fit a second floor beneath the water container since I can then lift the whole cage, complete with food-plant, when required to replenish the water. With the slight clearance given and the protection of the two sides it is not possible to accidentally knock the water container over with the cage in position. When lifting the cage, the thickness of the wooden floor (constructed of combination-board or equivalent) prevents the stems of the foodplant from slipping very far sideways.

Small holes when not in use are plugged with cotton wool. For one big cage with four large holes I simply nailed a piece of plywood to one surface of each of the discs cut out, and these can now be used as a sort of bung for holes not in use.



The height of the cage depends mainly on the use to which it will generally be put. Long, thin stems such as those of grasses require a long, slim cage (wide enough to put your arm into, however); low-growing plants such as violets (Viola spp.) and Bird's-foot trefoil (Lotus sp.) fit nicely into a cage of "dumpy" stature. If only a few cages are to be constructed, it is obviously better to make these fairly tall, as they can then be used for all types of foodplants.

I have successfully used such a cage on occasion for egg-laying female moths, after covering the wooden sides and top with paper lightly glued in place to facilitate removal of the eggs. With the opening at the top, however, raising the lid will more often than not result in your nimble butterfly sallying forth into the great world, and personally I am sick of chasing butterflies up window-panes.

17.5.1973 Leigh Plester (2968)

BUTTERFLIES IN JAPAN

I would refer to the article by Mr Harrington in the *Bulletin* on his visit to Japan (Harrington, 1972). As I am familiar with the butterflies and moths of Japan I would like to add my comments to his observations and suggest some corrections in regard to the species described.

Graphium doson albidum is a southern species and in Japan occurs only in the south west. Kyoto is central and I have not heard that this species has been captured in this city. There are two species of *Graphium* in Japan, the other being *G. sarpedon* L. which is very common and a familiar butterfly in this area. It is found even in the cities as Kyoto because the food plant grows in the streets, on school playing fields or in the gardens of shrines and temples. I think the species described by Mr Harrington was *G. sarpedon*.

Ypthima motschulskyi Brem. et Grey is a western species and not common or very rare because it is very localised in Japan. The Asagiri heights are 800–1200 metres above sea level and this is higher than the normal altitude for this insect.

Of the species of the genus *Limenitis*, we have *L. populi* Linn. which is very rare on the mainland of Japan. There are also *Limenitis* (*Ladoga*) *camilla* Linn. and *L. glorifica*. The latter is less common than *L. camilla*. *Neptis hylas* Linn. is a very southern species and not recorded on the mainlands. It is found in the southern islands (Amami and Ryukyu). There are six species of *Neptis* in Japan and *N. hylas* and *N. aceris* are difficult to distinguish apart but their distribution is different and it would seem that this *Neptis* would be *N. aceris*.

Among the *Colias* there are two, *C. palaeno* L. an alpine species, and *C. erate* Esp. which is found throughout Japan.

Zizina otis otis F. is not a Japanese species. There are two similar genera *Zizina* and *Zizeeria* in Japan. *Zizina* are a southern group while *Zizeeria* which was separated from *Zizina* in 1941 is very common in Japan. The two genera are difficult to separate.

Udapses species are not recorded from the Japanese mainlands, being found only on the islands at the southern tip. I was puzzled as to what species these could be but believe that they were *Daimio tethys* Men. as the Kanto form of the butterfly has a similar colour and pattern to *Udapses*.

In regard to the Moths, we have two *Actias* in Japan. One is *Actias artemis artemis* Bremer and Grey and the second is *A. selene gnoma* Butler. *A. artemis* is distributed throughout Japan but is not common and subspecies are recorded in Korea, and Amur. *A. selene* is found in Hokkaido and on the mainland but is very rare and quite difficult to distinguish from *A. artemis*.

I hope that Mr Harrington will find these notes useful and that other members will show an interest in the Lepidoptera of Japan.

31.5.1972 Yukiharu Mori (4657)

(Editor: Authors have been omitted in those cases where it has not been possible to ascertain them).

REARING THE FOX MOTH (MACROTHYLACIA RUBI LINN.)

The larvae of the Fox Moth are very handsome, in the first stages they are a rich dark brown, almost black, with golden rings around the body. They grow to a fine size and when fully grown are a velvet black, covered in short chestnut and long glossy brown hairs.

All the literature I have seen on this species indicates that a high proportion of the larvae die during their winter hibernation, the cause of this being a white fungus or mould which attacks them as they lie torpid during the winter months. Since, according to P. B. M. Allan (1943) "judging by his (the Fox Moth) frequency he has no difficulty in braving the winter when at large, yet to bring him through frost and snow, let alone rain and fog (in captivity), is, ordinarily, quite a feat". When I came across a number of these larvae in early August on a hillside near Ystradfellte, a village in Breconshire, South Wales, I returned to my home in Hertfordshire wondering whether I had any chance in overwintering them.

Initially I placed the larvae in a cylindrical breeding cage and fed them on Sallow (*Salix caprea* Linn.) and Bramble (*Rubus fruticosus* Linn.) which were freshly cut in the evening and placed in a food jar in the cage, taking the usual precaution of packing the mouth of the food jar with moss to stop the larvae crawling into the water and drowning.

About mid-September I took a large flowerpot and filled it with soil to about three inches from the top. I cut a turf of fairly long grass, placed it in the top of the pot and trimmed it to size. Grass at this time of the year is beginning to die off and the larvae get right down amongst the base of the stems to keep dry and warm when hibernating.

I buried a small glass food jar in the turf, flush with the surface, into which I placed a spray of Bramble as foodplant since Sallow at this time of the year is rather tough. Taking two withies from a hazel bush, I pushed these down the sides of the flowerpot and bent them over, pushing them into the opposite sides of the pot forming two cross over hoops. I then covered this structure with muslin secured around the base with string.

Before I put the larvae onto the turf, two to a pot since they like a lot of room, I checked the turf to make sure it was free of spiders and earwigs, etc. I renewed the food supply daily since the weather at the end of September varies and the *rubi* larvae feed intermittently if it turns warm. I also considered it important to remove daily any frass on the surface of the grass as this would quickly encourage mould.

I continued to renew the food supply and to remove the frass until the weather turned cold and the larvae crept down into the grass to hibernate by making a hollow in the turf into which they curled in the form of tight balls. Once the larvae had become dormant I covered them with loose, dry grass as I felt it important to keep them fairly well protected from the worst of the weather.

The flowerpots were kept in a sheltered place against the side of a shed facing south and I erected a board over them to take the worst of the heavy rainfall, but positioned it in such a way as to allow some moisture onto the muslin.

At the beginning of March, as the weather became warmer, the larvae crawled up to sun themselves (success!) and a few days later spun their cocoons of grass mixed with their own hair. After a month I brought them indoors and placed them on moist peat in an emerging cage. It was more than satisfying in mid-May to find the moths starting to emerge.

I am not certain as to why I obtained complete success with my larvae, a contributing factor could be that the conditions in which I kept them were as natural as possible, although, R. L. E. Ford (1963) suggests that *rubi* suffer high losses in the wild during the larval state due to mould. I would like to feel that my success with these larvae was due to removal of frass each day from the breeding cage, thus discouraging any mould growth. However, it could be that mould is an unavoidable natural condition and that I was lucky.

If, as Ford suggests, the losses are high in the wild state, one would expect the Fox Moth to be uncommon, but it is not. Does this then indicate that *rubi* is so numerous as a larvae that even after heavy losses it is still widespread? This would suggest a situation, although on a smaller scale, not unlike that of *Pieris brassicae* Linn. (Large White Butterfly) which is attacked by the parasitic Ichneumon Fly (*Apanteles glomeratus*) but never-the-less is still common.

Philip Jenner (4647)

DWARF ORANGE TIPS

In recent Bulletins there have been references by K. A. Mosely and S. H. G. Humfrey to the occurrence of dwarf imagines of *Anthocharis cardamines* L. I have one taken at Horam in Sussex of which the wing span is 35 mm. I also have a specimen of the Small White, *Pieris rapae* L., measuring only 32 mm.

A. J. May (4347)

Editor's Note. In my experience such dwarf specimens are due to inadequate food supply either due to the ovum being laid on an isolated plant, too small to support the insect properly, or to plant dessication. This is particularly true in the case of the Orange Tip as the egg is so often laid on the flowers of an isolated *Cardamine pratense* L. plant. When more than one egg is laid the larvae are cannibals and reduce the competition for food but even then the larvae may be undernourished. It is well known that many butterflies producing a second brood in hot climates, subject to arid conditions, are often only half the size in the second brood and this seems to be due solely to the dessication of the food plant. It is quite easy to produce these dwarfs in captivity by under-feeding.

REARING THE PINE HAWK

During a most unfruitful trunk-searching session on July 20th last I suddenly caught sight of a large grey object perched about twenty feet up on a Scots Pine trunk (*Pinus sylvestris*).

After a rather hair-raising climb during which I was supported mainly by dead and rotting branches, I succeeded in boxing my desire in the largest pillbox I had with me.

Upon my return to terra firma I discovered it was a magnificent specimen of Pine Hawkmoth (*Hyloicus pinastri* Linn.).

On my return home I placed her in a shoe-box together with a sprig of Scots Pine, and in about six hours she had deposited twenty-five yellowy-green eggs on the needles. These I snipped off, together with a small piece of needle and placed on blotting paper in a small plastic box.

As I had already reared this species before (and in this I am indebted to G. V. Day (29) for much useful information concerning it) I was wise to a few of its idiosyncrasies, and thus when the eggs eventually hatched I transferred the minute green-grey larvae to a fresh sprig of pine.

For a week or so they were kept in a small plastic lunchbox, but when they had grown large enough I put them in a large cylindrical cage where, even though the foodplant was not in water (which I had been advised rendered them liable to a condition from which they rarely recovered), eleven of them I found lifeless at the bottom of the cage. Fearing an epidemic I gathered up the remaining larvae and put them in a meticulously clean cage, where they enjoyed Five-Star comfort with all "mod. cons".

The larvae had, by the beginning of October changed from green to a rather oily brown, as though they had fallen in a vat of castor oil. As they were getting quite large now, I filled the base of the cage with peat, and by the fifteenth of October a few of the larvae had disappeared into the soil. The remainder swiftly followed, bar two which, due to a parasitical cause began to shrink, and in a few days they were both limp and lifeless.

At the end of November, I decided to store the pupae in an airtight box, and after excavating about five cms. I found the first pupae which had made itself a flimsy cell. All the others had also pupated at around this level even though there was ten cms. of peat available.

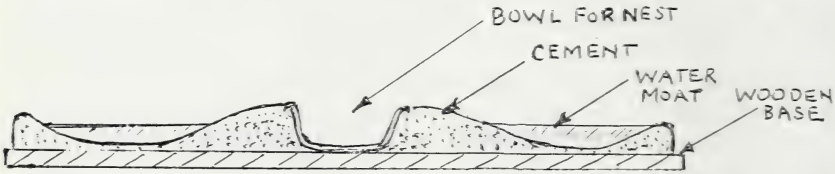
The pupae were carefully laid in a plastic box on cellulose wadding (a material which has served me well for this purpose, as it has no tendency to stick to the pupa as cotton wool does). During the winter months I inspected the pupae about once a month, and gave them a light mist spray of luke warm water.

In May they were taken out of the box and laid on moist peat in a spacious cage where the first moth (a male) emerged on May 30th and eight more between then and July 12th. Two of these I kept and the rest were released where I had found the original female so that they might reinforce the wild breeding stock of the area.

Clive Sheppard (4431)

KEEPING THOSE ANTS AT BAY (AND ALIVE)

I refer to I. Scott's troubles with keeping his ants. I offer the following observations which he may find helpful. Insects flourish best in captivity when given as much space as possible so the Formicarium should be as big as is convenient. Ants can roam over any surface, even when upside down, within their foraging area. The ants' nests at the London Zoo are given about three feet in each direction but this may be too large for the average amateur. A moat of water is still the best way to confine the ants but the base of the "island" should slope gently towards the water and not end abruptly in a "cliff" over which the ants are sure to fall. They need water and can get what they want from the water's edge of the sloping shore. Water will have to be added daily in hot weather to compensate for evaporation and a wide wall brush should be passed over the surface to remove debris and film which forms on the surface and enables ants to cross over. Outdoor cages should be protected from birds and it is sufficient to form a frame of timber which is then covered with nylon netting of the type used to cover fruit bushes.



Section of Formicary

The making of the cage can be as follows. A plastic washing-up bowl is placed on an old table top or similar flat board of the dimensions suggested above, in the centre of the board with the bowl mouth upwards. A mound of cement sand mixture is built up round the bowl to its lip and then dished away and down to be raised again at the periphery of the table so that a moat is formed around the central island (see sketch). The ant's nest is set in the bowl with soil and litter from the original site of the nest if possible. It is a heavy contraption so should be made in situ.

Do not use DDT to prevent roaming as the ants will bring it back into the nest with fatal results. Suitable food for the ants to collect can be placed in spots around the island.

T. P. Payne (4688)

THE GLOW WORM—A GENERATOR OF COLD LIGHT

When one switches on an electric bulb, a certain amount of light is obtained but at the same time much energy is wasted in heat. About 15% of the energy is producing light and this is a great waste of resources. The

ideal would be to produce "cold light" where all the electrical energy was used to produce light. Nature has solved this problem in the Glow Worm. If a specimen is touched you will observe that the source of the light glow is cold. The Glow Worm is a member of the Genus *Lampyris* which is comprised of several species of Beetle (Coleoptera) and the glow is confined to the female of the insect in the case of the British *Lampyris noctiluna* L. and she is also wingless. Some foreign species are winged in both sexes and may both bear a "lamp".

The larvae of the Glow Worm are carnivorous, living in the soil, litter or in crevices of woodlands, hedgerows, etc. Their main food is snails which they anaesthetise by injection and drink when the contents of the shell have deliquesced.

The Bioluminescence is a natural phenomenon which occurs not only in insects but also in other living organisms such as Myriapods, certain fishes, etc. The Glow Worm produces light as a result of respiration. Oxygen is conveyed to the organs by means of spiracles and tracheae. The exoskeletal structure of the posterior abdominal segments is modified. It consists of a number of cells nourished by a dense network of tracheae—ensuring a plentiful supply of oxygen. Among the cell structure are corpuscles that generate the light—the photogenic cells, impregnated with *luciferin*, a fatty substance. When oxygen reaches the photogenic cells via the spiracles, it combines with the luciferin. The chemical reaction is accelerated by another organic substance, *luciferase*, which acts as a catalyst. The oxidated luciferase then becomes *oxy-luciferin*.

Oxy-luciferin is luminescent, but this is not the end of the process. In a car headlamp, the light is amplified by a reflector behind the bulb. In principle the same is to be found in the Glow Worm. Behind the layer of cells that generate the light there is another reflector layer consisting of cells impregnated with *urea* and *xanthein*. This layer acts as a mirror, both reflecting and amplifying the light from the photogenic cells.

The process of bioluminescence is a slow transformation by oxidation of chemical energy into luminous energy. The resultant light is "cold"—none of the energy is used in producing heat and we have a 100 per cent use of energy for light production. Man lags behind in this field as the most advanced artificial lighting achieved by low-pressure fluorescence yields a 60 per cent light production. However some people take advantage of the natural perfect light. In Central America and in the West Indies they catch giant Glow Worms which emit a splendid light and keep them in cages—an economical and remarkable means of illumination.

C. P. J. Samson (4601)

Editor: The other British Lampyrid is *Phosphaenus hemipterus* Goeze, a rare beetle which the late H. J. Cribb used to find among the gravestones of a Sussex Churchyard. Both sexes are luminescent.

A PRELIMINARY SURVEY OF THE FOOD AND FEEDING HABITS OF ADULT BUTTERFLIES (Concluded)

LYCAENIDAE

Lampides boeticus L.

My only encounter with the Long-tailed Blue was in France, when a specimen was seen sitting on a cigarette packet. They appear to have a liking for artificial objects. South (1921) refers to two individuals taken in different parts of Britain in 1899 both sitting on a window. P. W. Cribb tells me, in correspondence, that it visits moist patches and sheep-droppings, particularly in Spain, in areas where there are no flowers. He has also seen it settled on Leguminosae spp., but more likely ovipositing than feeding.

Kerner (1895) mentions it feeding from *Colutea arborescens* L. in Europe.

Cupido minimus Fuessl. Proboscis: 5–5½ mm

I have observed the Small Blue feeding from the flowers of its larval foodplant *Anthyllis vulneraria* L. in the spring, and examples of the summer brood on *Lotus corniculatus* L. It is no doubt attracted to other members of the Leguminosae, and has certainly been observed to visit wet mud.

Everes argiades Pall.

My only experience of the Short-tailed Blue was in France, where I found two worn females ovipositing on *Medicago lupulina* L., but unfortunately they were not seen to feed. No doubt the small species of Leguminosae also supply the nectar they need.

Plebejus argus L. Proboscis: 7–9 mm

My records for the Silver-studded Blue show only *Erica cinerea* L. but I should be surprised if it did not visit *E. tetralix* L. and *Calluna vulgaris* (L.) Hull as well.

Like many species of "Blues" it is fond of water and has been recorded, in Europe particularly, drinking in numbers from wet patches by streams.

Aricia agestis Schiff.

The Brown Argus is a flower visitor and I have observed it on *Thymus serpyllum* L., *Pulicaria dysenterica*, (L.) Bernh., *Trifolium repens* L., *Scabiosa columbaria* L., *Origanum vulgare* L., and in France, on *Lychnis flos-cuculi* L.

Polyommatus icarus Rott. Proboscis: Male 7–8 mm
Female 8–10 mm

Except for visits to wet mud, the Common Blue is a nectar seeker and has been observed to visit the following plants: *Thymus serpyllum* L., *Lotus corniculatus* L., *Veronica chamaedrys* L., *Cirsium arvense* (L.) Scop., *Origanum vulgare* L., *Scabiosa columbaria* L., *Pulicaria dysenterica*, *Centaurea nigra* L., *Carlina vulgaris* L., *Anacamptis pyramidalis* (L.) Rich., *Trifolium repens* L., *Anthyllis vulneraria* L., *Senecio jacobaea* L., and in France, *Scabiosa columbaria* L.,

Lysandra coridon Poda Proboscis: 9–11 mm

The Chalkhill Blue is another flower lover and has been seen to visit *Scabiosa columbaria* L., *Knautia arvensis* (L.) Coult., *Origanum vulgare* L., *Thymus serpyllum* L., *Carlina vulgaris* L., *Cirsium arvense* (L.) Scop., and *Prunella vulgaris* L. Males will congregate in large numbers on cowpats and damp spots.

Lysandra bellargus Rott.

I have not seen the Adonis Blue since commencing this study, but P. W. Cribb tells me that its favourite flowers are *Origanum vulgare* L., and *Thymus serpyllum* L., particularly the former. He has also seen it visiting *Senecio jacobaea* L. and in hot weather drinking from cow-pats and damp patches on pathways.

Cyaniris semiargus Rott. Proboscis: 7–8 mm

From observations made in France, the Mazarine Blue was seen to visit *Lotus corniculatus* L., but no doubt has many other sources of nectar. It is a regular damp patch visitor.

Maculinea arion L. Proboscis: 8 mm

I have not met the Large Blue but Knuth (1906) records it feeding from *Vicia cracca* L., while Wood (1883) gives *Ajuga reptans* L. and *Thymus serpyllum* L. (its larval foodplant).

Newman (1871) also gives *Thymus serpyllum* L. and *Ajuga reptans* L., and adds "dwarf thistles". He states also that the butterfly was never seen on *Rubus fruticosus* L. agg.

Celastrina argiolus L.

The Holly Blue has quite different habits from the other Blues, flying high and consequently visiting quite different plants. It mainly feeds on flower nectar and those visited being: *Ligustrum vulgare* L., *Hedera helix* L., *Buddleia davidii* Franch., *Rubus fruticosus*, *Sambucus nigra* L. (nectarless), *Viburnum tinus* L., *Thelycrania sanguinea* (L.) Fourr., *Mentha aquatica* L., and *Pentaglottis sempervirens* (L.) Tausch.

Knuth (1906) lists several species of *Salix* and *Hieracium* in Europe and other continental records include *Grevillea* spp., *Lavandula* spp., and *Cistus* spp.

Other British records are for *Ilex aquifolium* L., *Laurus* spp., and *Ribes nigrum* L.

It can be seen from the above that the butterfly favours flowering shrubs rather than low plants, in keeping with its higher flight. In addition to flower nectar I have seen it drinking at wet mud, attracted to the unopened buds of dogwood (possibly for honeydew q.v.) and it has been reported elsewhere at bird droppings and at running water. P. W. Cribb has observed it persistently visiting aphid infested shoots of *Pyracanthus* sp.

Lycaena phlaeas L.

The Small Copper is a well known flower lover, particularly the Compositae and I have observed it on the following members of that

family: *Chrysanthemum leucanthemum* L., *Bellis perennis* L., *Senecio jacobaea* L., *Hieracium* spp., *Taraxacum* spp., *Pulicaria dysenterica* (L.) Bernh., *Anthemis* sp., *Aster* spp., and *Achillea millifolium* L.

Other flowers visited include *Crataegus monogyna* Jacq., *Ranunculus* spp., *Stellaria holostea* L., *Calluna vulgaris* (L.) Hull, *Erica cinerea* L., *Buddleia davidii* Franch., *Trifolium pratense* L., *Centranthus ruber* (L.) DC., *Scabiosa columbaria* L., and the cultivated strawberry (*Fragaria* spp.).

It has also been recorded feeding from the froth of the "Cuckoo spit" insect. (Hemiptera, Cercopidae), while I have personally seen it at wet sawdust.

Lycaena dispar Haw.

I have no experience of the Large Copper, but it is said to be fond of flowers. Ford (1945) gives *Lythrum salicaria* L., and *Thalictrum flavum* L., for the subspecies *batavus*. Oberth., while Jenkins (1859) writing of the extinct British subspecies *L. dispar dispar* mentions its attraction to *Eupatorium cannibinum* L.

Callophrys rubi L. Proboscis: 8 mm

The Green Hairstreak feeds on nectar and I have observed it on *Lotus corniculatus* L., *Ligustrum vulgare* L., *Fragaria vesca* L., and in France, *Daucus carota* L.

It has also been recorded by others on *Endymion nonscriptus*, *Sambucus nigra* L. (nectarless), *Syringa* sp., *Crataegus monogyna* Jacq., *Genista tinctoria* L. and *Genista anglica* L.

Thecla betulae L.

I have not met with the Brown Hairstreak but it appears to feed mainly from flower nectar. Haines (1945) gives *Eupatorium cannibinum* L., and *Rubus fruticosus*, and Dunk (1956) *Succisa pratensis* Moench., and *Cirsium* sp. It has, however, been recorded as feeding from a rotten apple, which seems unusual for a member of the Lycaenidae.

Quercusia quercus L.

The Purple Hairstreak is generally considered to be addicted to honeydew, which I have confirmed myself, but I have also seen it feeding from the flowers of *Rubus fruticosus*. Knuth (1906) however, mentions *Eupatorium cannabinum* L., in Europe, and Knaggs (1869) lists *Tilia* sp.

Strymonidia W-album Knoch.

The White Letter Hairstreak feeds mainly from flowers although it is also addicted to honeydew. My only personal record for the species is on *Rubus fruitcosus* L. agg., but there are numerous other records in the literature which include *Senecio jacobaea* L., *Ligustrum* sp., *Origanum vulgare* L., *Cirsium* spp., *Centrantus ruber* (L.) DC., *Heracleum sphondylium* L. and *Heracleum mantegazzianum* Som. & Lev.

Strymonidia pruni L.

I have seen the Black Hairstreak on the blossoms of *Sambucus nigra*

(nectarless) and drinking from wet mud, but it is recorded elsewhere feeding from *Rubus fruticosus*, *Ligustrum vulgare* L., *Centranthus ruber*, and *Ranunculus* spp. and Hogweed, *Heracleum* spp.

PAPILIONIDAE

Papilio machaon britannicus Seitz. Proboscis: 18–20 mm

The only observation I have of the Swallowtail feeding in Britain is that on a bred specimen that was released. It went immediately to *Betonica officinalis* L. and then to *Chamaenerion augustifolium* (L.) Scop. and spent some five minutes at these flowers before flying off. I was thus able to watch the fluttering movements, as it fed, which are peculiar to this family.

Dunk (1956) records the following plants visited in Norfolk: *Lychnis flos-cuculi* L., *Trifolium pratense* L., *Endymion non-scriptus*, *Silene dioica* (L.) Clairv., *Iris pseudacorus* L.

Papilio machaon bigenerata Vty.

The continental subspecies has been recorded at the following according to Knuth (1906): *Centranthus ruber*, *Knautia arvensis*, *Lythrum salicaria* L., *Anthericum ramosum* L. and *Syringa officinalis* L. It has also been recorded on *Buddleia davidii* and *Lavandula* sp.

PIERIDAE

Aporia crataegi L.

The Black-veined White appears to feed from nectar only. In France I have seen it on *Trifolium pratense* L., *Lychnis flos-cuculi* L., *Centaurea scabiosa* L. and *Cirsium arvense*. Knuth (1906) adds *Echium vulgare* L. and *Rubus fruticosus* L. agg. Before it became extinct in Britain, Newman (1871) recorded it on *Chrysanthemum leucanthemum* L.

P. Taylor records males massed on wet mud in the Hautes Alpes in groups up to 30 per sq. ft.

Pieris brassicae L. Proboscis: 16 mm

The Large White is another flower visitor with a well-known liking for *Buddleia davidii* Franch. and *Lavandula* sp. Among the many other plants it visits are *Ajuga reptans* L., *Endymion non-scriptus*, *Senecio jacobaea* L., *Pulicaria dysenterica*, *Dipsacus fullonum* L., *Gentianella amarella* (L.) Börner, *Knautia arvensis*, *Hieracium* spp., *Vicia sepium* L., *Taraxacum* spp., *Lythrum salicaria* L., *Centrantus ruber*, *Syringa officinale* L., *Lychnis flos-cuculi* L., *Scabiosa columbaria* L., *Onobrychis viciifolia* Scop., as well as many cultivated flowers.

Pieris rapae L. Proboscis: 13–18 mm

Other than drinking from wet mud puddles in hot weather the Small White is also addicted to flower nectar. *Buddleia davidii* is one of its main attractants, but it too frequents many wild and garden plants, some of which are: *Lavandula* sp., *Senecio jacobaea* L., *Chamaenerion augustifolium*, *Endymion non-scriptus*, *Pentaglottis sempervirens*, *Stellaria holostea*

L., *Epilobium hirsutum* L., *Pulicaria dysenterica, Helianthemum chamaecistus* Mill. (nectarless), *Tussilago farfara* L., *Convolvulus arvensis* L., *Trifolium pratense* L., *Crataegus monogyna, Taraxacum* sp., *Bellis perennis* L., *Onobrychis viciifolia* Scop., *Lychnis flos-cuculi* L., *Lotus corniculatus* L. and *Sinapis arvensis* L.

Pieris napi L. Proboscis: 10–12 mm

Although I have seen the Green-veined White at wet mud puddles and wet sawdust, it is otherwise confined to flowers. Like the other *Pieris* spp., it has a wide range of preferences of both wild and garden flowers some of which follow: *Pentaglottis sempervirens, Ajuga reptans* L., *Aster* spp., *Senecio jacobaea* L., *Stellaria holostea* L., *Endymion non-scriptus*, (and cultivated varieties), *Epilobium hirsutum* L., *Vicia cracca* L., *Pulicaria dysenterica, Buddleia davidii, Myosotis arvensis* (L.) Hill, *Sinapis arvensis* L., *Clematis vitalba* L. (nectarless), *Convolvulus arvensis* L., *Lychnis flos-cuculi* L., and *Ranunculus* spp.

Pontia daplidice L.

I have no personal records for the Bath White except that of a friend who saw one on *Buddleia davidii* during the 1945 "invasion".

Knuth (1906) gives *Anchusa officinalis* L., and a species of *Centaurea*.

Anthocharis cardamines L. Proboscis: 12 mm

The Orange Tip appears to be solely confined to flowers: *Ajuga reptans* L., *Rubus fruticosus, Sinapis arvensis* L., *Veronica beccabunga* L., *Endymion non-scriptus, Stellaria holostea* L., *Taraxacum* sp., *Vicia cracca* L. and *Iberis* sp.

Colias hyale L. Proboscis: 12–13 mm

The Pale Clouded Yellow is a flower visitor but the only times I have seen it feeding was at *Echium vulgare* L. and *Trifolium pratense* L. No doubt it has many other preferences but the butterfly is not frequent enough to make many observations. Tutt (1895) gives "yellow trefoils" and *Hieracium* spp. in the Alps.

Colias crocea Geoff.

The Clouded Yellow is also addicted to flower nectar and I have seen it on *Trifolium pratense* L., *Centaurea nigra* L., *Senecio jacobaea* L., *Taraxacum* spp., *Hieracium* spp. etc. It has been recorded elsewhere on *Picris echioides* L.

It is interesting to note that, according to my observations, *croceus* avoids *Buddleia*. During the "Clouded Yellow Year" of 1947 I did not have one visitor to my tree although the species was frequent nearby on *Taraxacum, Hieracium* and *Pulicaria*.

Colias australis Vty.

My sole observation of the feeding habits of the New Clouded Yellow was on *Echium vulgare* L., but no doubt it is a flower lover.

Gonepteryx rhamni L. Proboscis: 16–17 mm

The Brimstone is only to be found at flowers and as it is sexually dimorphic it was not difficult to record the preferences shown by each sex. I found males visiting: *Crataegus monogyna*, *Silene dioica* (L.) Clairv., *Taraxacum* spp., *Pulicaria dysenterica*, *Viola* spp., *Primula vulgaris* Huds., *Gaillardia* sp., *Pelargonium* sp., *Lythrum salicaria* L., *Dianthus* sp., and in France *Calystegia sepium* (L.) R.B., Females: *Ajuga reptans* L., *Vicia cracca* L., *Centaurea nigra* L., *Lamium purpureum L.*, *Lamium album* L., *Symphytum officinale* L., and *Phlox* spp.

Both Sexes: *Endymion non-scriptus*, *Betonica officinale*, *Buddleia davidii*, *Helianthus* spp. and *Primula* spp.

Leptidea sinapis L. Proboscis: 10 mm

Other than one record from France when it was seen at wine-tainted mud, the Wood White appears to be a flower visitor. I have observed it at *Ajuga reptans* L., *Stellaria holostea* L., and *Epilobium hirsutum* L. Knuth (1906) gives *Ranunculus acris* L., *R. bulbosus* L., *R. repens* L., and *Melampyrum pratense* L. I have seen it in France, myself, on *Lychnis flos-cuculi* L.

HESPERIIDAE

Erynnis tages L.

Mcleod (1947) referring to the Dingy Skipper says "It shows no marked preference for any flower". Quite likely this is true, but I have not observed the species sufficiently to confirm this. I have seen it, however, on *Pentaglottis sempervirens*, *Ajuga reptans* L., *Lotus corniculatus* L., *Ranunculus* sp., *Vicia sepium* L.

Chalmers-Hunt (1961) records it feeding from a "sugared" tree and at the flowers of *Viburnum lantana* L.

Pyrgus malvae L.

I have observed the Grizzled Skipper at flowers and at wet mud. The plants visited were: *Ajuga reptans* L., *Lotus corniculatus* L., *Endymion non-scriptus* and *Ranunculus* spp.

Carterocephalus palaemon Pall.

I have not met with the Chequered Skipper, but Knuth (1906) gives *Rubus fruticosus*, and South (1921) *Glechoma hederacea* (L.) and *Ajuga reptans* L.

Adopaea lineola Ochs.

The Essex Skipper is a flower lover, and I have seen it on *Cirsium arvense*, *Prunella vulgaris* L., *Trifolium repens* L., *T. pratense* L., *Pulicaria dysenterica*, and in France, on *Erica cinera* L. Knuth (1906) gives *Daucus carota* L. in Europe.

Adopaea flava Brunnich (*sylvestris* Poda) Proboscis: c. 14–15 mm

The Small Skipper visits wet mud and I have seen in drink human perspiration from the back of the hand, but otherwise it is devoted to flower nectar. Plants I have observed it visit are: *Buddleia davidii*, *Cirsium*

arvense. *Centaurea nigra* L., *Origanum vulgare* L., *Betonica officinalis* L., *Centaurium erythraea* Rafn (nectarless). *Chamaenerion augustifolium*, *Vicia cracca* L., *Carlina vulgaris* L., *Echium vulgare* L., *Convolvulus arvensis* L., and *Vicia sepium*.

Thymelicus acteon Rott.

I have not met with the Lulworth Skipper, but Knaggs (1869) gives "Yellow Thistle".

Hesperia comma L. Proboscis: 15–16 mm

I have only one personal record for the Silver-spotted Skipper, and that was at *Cirsium acaulon* which is confirmed by Tutt (1896). "Dwarf thistles" and South (1921) who gives "Low-growing thistles". Symes (1957) mentions *Carlina vulgaris* L., and that the males were fond of settling on rabbit droppings.

Ochlodes venata Brem. & Grey. Proboscis: c. 16 mm

The Large Skipper is a great nectar seeker and I have observed it at the following plants: *Rubus fruticosus*, *Centaurea nigra* L., *Ajuga reptans* L., *Taraxacum* sp., *Solanum dulcamara* L., *Pentaglottis sempervirens*, *Anthyllis vulneraria* L., *Echium vulgare* L., *Medicago sativa* L., *Knautia arvensis* (L.) Coult., *Geranium robertianum* L., *Lotus corniculatus* L., *Onobrychis viciifolia* Scop., *Linaria vulgaris* Mill., *Symphytum officinale* L., *Vicia cracca* L., *Ligustrum vulgare* L., and *Gymnadenia conopsea* (L.) R.Br. After visiting the last named plant, the Fragrant Orchid, the butterfly was seen to be carrying the pollinia on its head.

B. R. Stallwood (1547)

This completes the original observations of B. R. Stallwood on the feeding habits of adult British Butterflies. For the first time members have a very comprehensive study of the subject and this should form a basis for further observations and new discoveries. Editor.

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CUCKOO BEES (PSITHYRUS spp.)

It may seem strange to find a text book article in this *Bulletin* as it is most likely that most insect orders and sections of those orders have been covered a long while ago. The genus *Psithyrus* perhaps is one that has not. Cuckoo Bees form a small part of the almost 'forgotten' order of Hymenoptera. This large order which has more than six thousand species in Great Britain has always merited more study than it has ever received. (This is one good reason why I have switched some of my attention to this order from the really over-studied and over-collected order of Lepidoptera.)

In Britain there are six species of cuckoo bee, all being generally distributed, with the exception of *Psithyrus bohemicus* (Seidl) which is a northern species only. The other five are *Psithyrus campestris* (Panzer), *Psithyrus barbutellus* (Kirby), *Psithyrus vestalis* (Geoff. in Fourcroy), *Psithyrus sylvestris* Lepeletier and *Psithyrus rupestris* (Fab.).

At first sight cuckoo bees look just like bumble bees (*Bombus* spp.), and it has been suggested that they are degenerate forms of the latter that have taken to a life of 'crime'. There is no worker caste, as in bumble bees and wasps, in the genus *Psithyrus;* the cuckoo bees have found means of doing without them. Identification is tedious as coat colours are nothing to go by. They have darker wings than bumble bees and the coat is very sparse; the shiny black plates of the abdomen can usually be seen quite well. The underside of the abdomen also shows such plates, and small bumps or callosities on the last segment. These callosities leave no doubt to each individual species and are therefore a boon in the field of identification of female specimens. A quick method of separating a cuckoo bee from a bumble bee is to look for pollen baskets on the hind legs of the female as the latter has them and the former does not.

Now, what of the earlier mentioned life of crime. One cannot help but notice the 'juggernaut' or tank like appearance of the female cuckoo

bee, as though she were built for war. Indeed, she is built for war. The female wakes from hibernation in a similar way to the bumble bee queen (having spent the winter buried under the soil), but later. She feeds herself and then begins to look for a *Bombus* nest. The deep toned buzz she makes is sufficient to tell her from a bumble bee immediately. On finding a *Bombus* nest she will wait for the queen or workers to leave, and then she hides inside. After several days of hiding and stealing honey she comes out and challenges the nest's legitimate residents. Her powerful structure and longer sting usually enable her to win, killing many workers in the process. Sometimes the female cuckoo bee loses the battle and is ejected from the nest by sheer weight of numbers but not without heavy losses to the nest occupants. Assuming the cuckoo bee does win she assumes the queenright, and the *Bombus* workers now look after her brood, which will hatch into males and females only. When all the original workers have died off leaving no one to look after the nest it is deserted and the gardens are full of male and female *Psithyrus* bees feeding, so to speak, hand to mouth from the flowers. After mating the males die, leaving the females to destroy another bumble bee nest the following year.

Each cuckoo bee has a certain host species of bumble bee, which it resembles closely. These are:—

P. vestalis—Bombus terrestris (Linn.)
P. campestris—B. agrorum (Fab.)
P. bohemicus—B. lucorum (Linn.)
P. rupestris—B. lapidarius (Linn.)
P. barbutellus—B. hortorum (Linn.)
P. sylvestris—B. pratorum (Linn.)

Cuckoo bees can stray from their regular host species to another one, and I have even seen females trying to enter bee-hives (without success, needless to say!).

Only the very 'basics' have been given, every aspect of the cuckoo bee and its life would fill a book and there are new things to be found out about these insects all the time.

K. A. Moseley (4733j)

BOOK REVIEWS

Klucze do oznaczania owadow Polski. (Keys for the Identification of Polish Insects). Volume 19, parts 8, 13, 14, and 23. Published by the Polish Entomological Society, obtainable by exchange through—Library of the Polish Entomological Society, Wroclaw, ul Cybulskiego 30, Poland or by purchase through "Ars Polona", Warszawa, Krakowslie Przedmiescie 7, Poland.

The Polish Entomological Society is to be congratulated on producing such a fine series of reference works. The entire Entomological fauna of Poland is to be covered in twenty-nine volumes, and volume nineteen, devoted to the Coleoptera, has been divided into one hundred parts, some of which are again sub-divided into more convenient sized booklets.

There must be very few members of the Society able to read Polish, so this will to some extent limit the use of these excellent works. Below is given not so much a review, but an indication of their use to the British Coleopterist only interested in indigenous species. Their use to anyone interested in European beetles will in most cases be much greater.

The format is very similar to our own Royal Entomological Society's "Handbooks", although more detail is given. Each contains introductory chapters on the biology and morphology of the Family in question; doubtless a translation of these chapters would be most rewarding. These are followed by a checklist of the species known to occur in Poland, grouped into sub-genera and genera, synonymy and varieties are also given. The checklist is useful to the British worker. However I would recommend the accepted British nomenclature be used by us amateurs at least for the time being. A description of each species is given and the characters of each sub-family and genus are also listed. The works are very well illustrated with numerous clear line drawings. These by themselves are of much assistance to the British worker, especially if used in conjunction with an English text. Thus a greater degree of accuracy may be achieved when determining critical species, especially when no reference material is available.

I can recommend these four books, but the prospective purchaser should note that some of the Families covered have been revised fairly recently by British workers.

Zeszyt 8 Gyrinidae, by Edward Tranda 1969. Pages 19, figures 54.

Eleven of the twelve British species are covered by this part. However in view of the excellent works by the late Professor F. Balfour-Browne (1950 and 1953) the Polish work is rendered almost of no use to us. The figures are much clearer, being line drawings, than those in Balfour-Browne's books. As would be expected in a work dealing only with one family, there are more drawings of diagnostic value, (e.g. outline of the pronotum of six of the British species, and figures showing microsculpture).

Zeszyt 13 Catopidae, by Waclaw Szymczakowski 1961. Pages 69, figures 176.

This part includes all the British species except the easily recognisable *Catopidius depressus* (Murray) and *Bathyscia wollastoni* Jan. For the British Coleopterist without the excellent papers published in the Entomologist's Monthly Magazine in the nineteen-forties covering all the British species, this book should prove extremely useful. It is well illustrated with figures of the aedeagi of males and sexual sclerites of the females of many species. It has been used already to correct one previously undetected error, (see C. Johnson 1966).

Zeszyt 14 Colonidae, by Waclaw Szymczakowski 1969. Pages 28, figures 78.

Twenty-one species of this Family are known to occur in Poland, this includes the nine British species. The Family was revised in the forties by

the late D. K. Kevan and obviously I would recommend this in preference to the Polish work. However copies are rather scarce nowadays so I would suggest this book be purchased as a very good alternative. It is possible to determine all the British species especially if used in conjunction with a Polish-English dictionary. Also well illustrated, the figures being self explanatory and have great diagnostic value.

Zeszyt 23 Scaphidiidae, by Ivan Löbl 1970. Pages 16, figures 28.

This Family is poorly represented in the British Isles and has never produced many problems of identification. Two species *Scaphium immaculatum* (Olivier) and *Scaphidium quadrimaculatum* Olivier are instantly recognisable and the two *Scaphosoma* are easily separated with the aid of a hand lens. Nonetheless this work is most interesting and should not be passed over. The aedeagi of all eight and the antennae of seven of the Polish *Scaphosoma* are figured, this includes both the British species. I would suggest that anyone with this book should dissect all their British male *Scaphosoma* and make a careful examination of their antennae.

J.C.

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BOOKS RECEIVED

British Butterflies by George Hyde. Published in paperback by Jarrold Colour Publications, Norwich—July 1973 in two books at 20p each. (61 pp. 50 plates in colour, 30 plates in black and white).

These two books illustrate all the British Butterflies, mainly in colour.

They are taken from living subjects in natural surroundings and although most are considerably enlarged, the wingspan is given in millimetres, together with the English and scientific names. A few of the early stages are shown but these are almost all in black and white. The text is clear and informative but deals rather sketchily with habits and early stages. These reasonably priced volumes with their attractive colour make a useful addition to the "Jarrold Nature Series" books and are likely to appeal to the general reader who is interested in Natural History or to the younger entomologist.

A.W.

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355 Hounslow Road, Hanworth, Feltham, Middlesex. 1973.

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