The Bulletin

of the Amateur Entomologists' Society

Volume 71 • Number 500 February 2012

ISSN 0266-836X Editors: Dr P. Wilkins & Paul Sokoloff

The Amateur Entomologists' Society

Founded in 1935

The AES • P.O. Box 8774 • London • SW7 5ZG

www.amentsoc.org

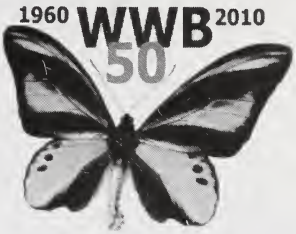
Email: contact@amentsoc.org • bug-club@amentsoc.org

Officers of the Society

President: Peter Hodge
Secretary: Dafydd Lewis (secretary@amentsoc.org)
Treasurer: Peter May (treasurer@amentsoc.org)
Registrar: Dafydd Lewis (registrar@amentsoc.org)
Bulletin Editor: Phil Wilkins/Paul Sokoloff (bulletin-submission@amentsoc.org)
General Editor: Jacqueline Ruffle
Advertising Secretary: Peter Hodge (advertising@amentsoc.org)
Exhibition Secretary: Wayne Jarvis (exhibition@amentsoc.org)
Youth Secretary: Kieren Pitts
Conservation Secretary: David Lonsdale
Webmaster: Kieren Pitts
ICN Editor: David Lonsdale (icn@amentsoc.org)
Wants & Exchange: Peter May (newsletter-editor@amentsoc.org)

THE AES WORKS TO PROMOTE AND DISSEMINATE ENTOMOLOGICAL KNOWLEDGE AND TO ENCOURAGE AN INTEREST IN ENTOMOLOGY AMONG THE YOUNGER GENERATION.

Worldwide Butterflies



Goodden GemLight runs all night on 8AA batteries!

A revolutionary light, ideal for foreign travel and field study. Never has there been such a small and lightweight moth light. Powered by tiny rechargeable batteries Designed for the Moonlander, it works also on a sheet, is better than actinic, and might be adapted to suit other traps. Auto photoswitch for convenience.

For full details and prices **www.wwb.co.uk**

NEW Moonlander Moth trap

Now re-designed, even lighter and with superb new supports and new carrying bag. Moths favour Moonlander reticulated foam moth shelers over traditional egg boxes.

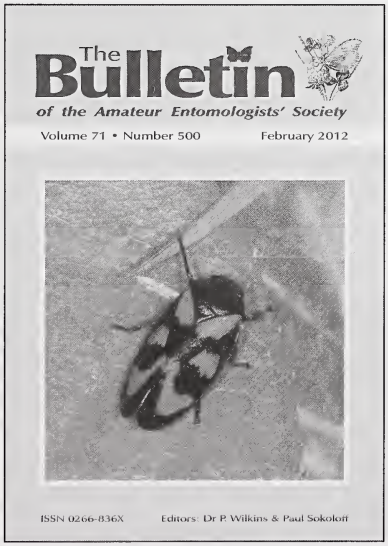
Works as sheet and trap combined.

Both trap and light are total innovations by Robert Goodden.
Tried and tested in Europe and the tropics. In good conditions the results are spectacular.

Worldwide Butterflies website offers **Livestock and Equipment for breeding and study. Specimens for specialist collectors: watch the site for spectacular aberrations.** See exactly what is currently available as the season changes. **Look ahead** for species coming in their season. **Sale Offers** of equipment, books, livestock and specimens - an ever evolving range..

www.wwb.co.uk Add it to your **Favorites - check it regularly**.

Bulletin Cover


The Bulletin
of the Amateur Entomologists' Society
Volume 71 • Number 500 February 2012
ISSN 0266-836X Editors: Dr P. Wilkins & Paul Sokoloff

The photograph on this month's cover is the Red and Black Froghopper, *Cecropia vulnerata*.

This very distinctive species belongs to the Homoptera, (Auchenorrhyncha, family Cercopidae) and is related to the cicadas. The larval stages of froghoppers are most commonly associated with "cuckoo-spit" on the stems of plants, but those of *C. vulnerata* are rarely seen as they live, often communally, on underground roots, protected by solidified froth .

The adults are quite common, and can be seen in suitable localities from April right through to July. Like all of the froghoppers, it has a well-developed jumping mechanism to escape danger. Jumping movements are poorly understood. This froghopper can jump within one millisecond of a stimulus, which is too fast to be explained by muscle power alone, and suggests an additional "elastic" tension is present within the hind legs. Microscopic examination supports this view as an elastic energy storing molecule, called resilin can be found in small structures on the metathorax. One interesting issue is how the froghopper synchronises its two legs for such a rapid jump. One can imagine the consequences of the legs firing out of sequence!

The Bulletin
of the Amateur Entomologists' Society

Volume 71 • Number 500 February 2012

Editorial

As the entomological year stirs, the editor reflects on the inadvisability of making predictions about the weather and its consequences. We remember our very own "Michael Fish moment" last year when an editorial was written during the prolonged spring drought – at least in the southern parts of the country – but by the time the *Bulletin* was published there was torrential rain. Nevertheless, the absence of early rain, the warm spring and other factors did seem to influence our native insects, with moth trap operators noticing the early arrival of many species, some many weeks before their normal emergence time.

In the February and June editorials of the *Bulletin* we drew attention to the debate on the government's proposals on the future of woodlands in this country, and reported on the setting up of an Independent Panel on Forestry. This Panel invited public comment and over 42,000 responses were received. The Panel issued its first report in December 2011 and the initial conclusion that it is important to retain a public forest estate is a welcome one, as is its stated desire to increase woodland cover and access to woodland, and its recognition of the need to restore damaged ancient woods. Despite this the report fails to make a commitment to review the strength of woodland protection. This is critical as it becomes increasingly clear that existing levels of protection cannot be guaranteed into the future. We have such a low level of woodland cover with so many pressures on land; we cannot afford to be complacent about its protection. You can access the report through the DEFRA website on: http://www.defra.gov.uk/forestrypanel/reports/

In recent editorials both of the editors have appealed to members for contributions to the pages of the *Bulletin* and I am very grateful to those members have responded to this appeal. We want to fill six issues a year with material that is readable and of interest to members, so please keep the contributions coming!

Paul Sokoloff

Society Matters

AES NEWSLETTER

Members are reminded that in order to receive the electronic AES Newsletter they should sign up for it on the website www.amentsoc.org/newsletter/signup. Members wishing to receive advice on internet or email access or wishing to receive a paper copy of the Newsletter should contact the Hon. Secretary.

NOTICE OF AES ANNUAL MEMBERS' DAY

This year's Members' Day will take place on 28th April at the Manchester Museum, University of Manchester, Oxford Road, Manchester M13 9PL, commencing at 12:00 midday. The detailed agenda will be available closer to the time through the Newsletter, the website www.amentsoc.org and from the Hon. Secretary, PO Box 8774, London SW7 5ZG. The Manchester Museum houses the third largest collection of insects in the United Kingdom.

AGM 2012

The Members' Day will begin with the Society's Annual General Meeting, which usually takes up to 30 minutes. The Agenda and Annual Report to Members will be made available on the Society's website immediately following the Council meeting on 2nd March as well as in paper form at the event, and the Annual Report to Members will be published in the *Bulletin* after the meeting. If you wish to receive the Annual Report in advance and do not have internet access or email and are unable to attend the AGM you should contact the Hon. Secretary at the address above. A separate summary version of the Annual Report is submitted to the Charity Commission each year, along with the Hon. Treasurer's annual return, and these can be viewed on the Commission's website.

The following members will retire from the AES Council by rotation at the AGM: Peter Hodge; John Howells; Wayne Jarvis; Dr David Lonsdale; Dr Kieren Pitts. Of these, Peter Hodge, Wayne Jarvis, David Lonsdale and Kieren Pitts have expressed their willingness to remain on Council if duly nominated and elected. Mr Ralph Hobbs was co-opted to Council in December and will therefore also stand for election at the AGM.

Our President, Mr Peter Hodge, has agreed to accept Council's nomination to remain as AES President for the further period April 2011 – April 2012. Additional nominations for Council membership and positions are invited in advance of the AGM or on the day. Members

wishing to find out what Council membership involves should contact the Hon. Secretary or any Council member.

THE HAMMOND AWARD

Members are reminded that articles published in the AES Bulletin are considered for this award, which was initiated in March 1982 in memory of Cyril O. Hammond (of Colyer and Hammond fame). The Award is given for the best contribution to the *AES Bulletin* on the theme of British Insects, in any one year. The winner will receive a Certificate and £100, presented at the AGM.

DATA PROTECTION ACT

All members should please note that any personal information supplied to the Society is treated in accord with the requirements of current data protection legislation and will be used only for the purposes of administering the Society. We will not divulge personal information to any third party unless legally obliged to do so. The possibility of publishing a membership list is being considered but there are no plans to issue such a list during the 2012 membership year.

A study of gregariousness – larvae of the Buff-tip *Phalera bucephala* (L.) (Lep.: Notodontidae), and similarities with Thaumetopoeidae

by Martin Probert (14071)

55 Higher Compton Road, Hartley, Plymouth PL3 5JA.

Abstract

Observations of groups of larvae of *Phalera bucephala*, from first to final instar, were made in each of three successive years, and details recorded of the feeding-and-resting cycle and its changing nature, of the effect of leaf size on behaviour, of the strength of the instinct to remain together, of the splitting-up and reconnection of sub-groups of larvae, of the massed migration of larvae from one part of a tree to another, of similarities with behaviour of processionary caterpillars in the family Thaumetopoeidae, of a redundant behaviour in the later instars, and of the gradual breaking-up of the original company.

Keywords: Lepidoptera, Notodontidae, *Phalera bucephala*, larvae, gregarious, processionary, Thaumetopoeidae.

Introduction

Concerning the larva of *Phalera bucephala*, Richard South tells us that 'It feeds in companies . . . until nearly full grown' (*Moths of the British Isles*, 1961).

The Rev J. G. Wood gives more detail: 'The eggs . . . are laid in batches, sometimes as many as sixty in number . . . and when hatched, the little caterpillars belonging to each brood remain together, and feed upon the upper surface of the leaf. After their first change of skin, they break up into six or seven small companies, and each company remains together until the change into the pupal state is at hand. As they become larger they make their way to the topmost branches . . .' (*Insects at Home*, 1883).

These details accord with my own observations, but there is much of interest to add.

In 2009 I encountered a group of 70 first-instar larvae feeding on a five-metre high specimen of a non-native species of Hazel called Filbert (*Corylus maxima*) in my garden. I observed these feral larvae several times a day until they pupated. Surprisingly not one was lost to either wasp or bird, although a few succumbed to disease. The following year, 2010, I introduced further first-instar larvae to the same tree, and again

observed them daily for two months until they left the tree to pupate. I retained a few pupae, kept them over winter, obtained some moths, then eggs, and in 2011 the resultant first-instar larvae were bred indoors on Rose (*Rosa*) and Grey Willow (*Salix cinerea*), plants of which the leaf size is considerably smaller than that of the Filbert. One group of first-instar larvae were introduced to a leaf on the same Filbert as in earlier years, but these rapidly diminished in number. There were just five remaining on the leaf when I had the (mis)fortune one morning to see a wasp reduce their numbers to nil in a matter of seconds. When the larvae indoors had reached the third instar, the majority were moved outside to the Filbert and successfully completed their development there. Except for the experiments made indoors on Rose and Willow, the bulk of the following observations are of larvae ranging freely over the Filbert.

The larvae are hairy: 'downy' is how W. F. Kirby describes them (*British Butterflies, Moths and Beetles*, 1887). The usual precautions were taken (minimal handling, not rubbing the eyes, washing the hands) and no irritant effects were experienced.

Jim Porter mentions that the larvae 'are very easy to rear in confinement' (*Colour Identification Guide to Caterpillars of the British Isles*, 2010), to which I would add that the later instars, when kept in captivity, exhibit atypical behaviour. To express a full range of behaviour, the larvae require more than food: they require space.

First-instar larvae

The first-instar larvae of *P. bucephala* station themselves side by side on the upper surface of a leaf, nibbling away at the upper layer (Figure 1), consuming the upper epidermis and the central (green and nutritious) mesophyll, and leaving the (translucent) lower epidermis. The lower epidermis, as seen from above, is divided by a neat arc from the untouched part of the leaf. The feeding position shown in the photograph, and the cycle of activity to be described in this section, is unique to the first instar. After about five minutes, the larvae retire in ones and twos and groups to the edge of the leaf, slink over the edge, and gather together on the lower surface. Here, sheltered from rain and sun and overhead predators, and with their frass falling freely to the ground, they rest for perhaps 20 minutes. Then, the time of rest over, the group becomes active once more. Each larva hurries back to the edge, reappears on the upper surface, and gallops for position at the previously nibbled arc. As soon as it arrives, feeding recommences as the larva continues to gnaw away at the upper layer. The whole group are soon lined up again neatly side by side. Late comers may find themselves confronted by a

wall of tails, so are forced to wander back and forth, seeking an opening. Having found a gap among the line of tails, they work their way in until their body is in line with those of the adjacent larvae. The fresh bout of nibbling will continue for five minutes. The entire cycle of upper-surface feeding and lower-surface resting will repeat, over and over and over again, for several days.

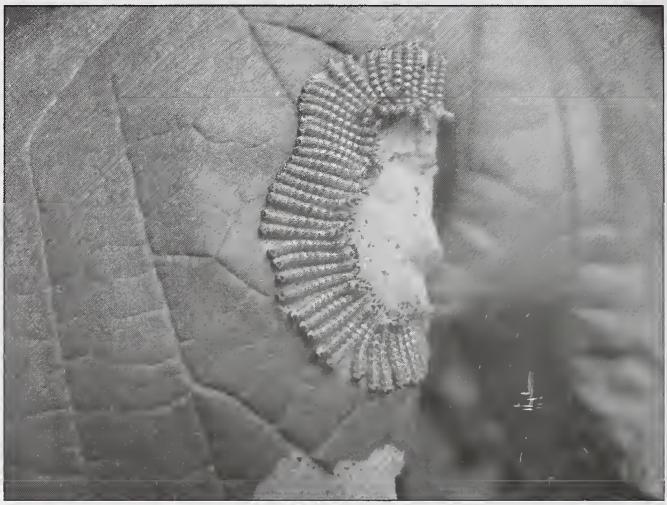


Figure 1. First instar larvae feeding from upper surface. Photo: Martin Probert

Presumably, from the point of view of nourishment, it would make little difference to the larvae if, rather than consume the upper epidermis and mesophyll, they fed off the lower epidermis and mesophyll. But, in moving onto the upper surface as they do, the larvae place themselves in a position which they otherwise tend to avoid. What advantage is gained by this behaviour? One possibility is that upper-surface feeding leaves the lower surface in a pristine condition, offering the larvae, when resting upside-down beneath the leaf, a secure foothold and a firm anchorage for silk life-lines. Lower-surface feeding, by removing the lower epidermis and central mesophyll, would leave the larvae hanging upside-down beneath a chewed underside of upper epidermis. Such a surface, sullied perhaps with loose particles of mesophyll, might be a risky place for gregarious larvae to gather.

Attacking a fresh leaf

When first starting to feed upon a leaf, the larvae, from their preferred position on the lower surface, will advance to the edge of the leaf, bend

their heads around onto the upper surface, and begin nibbling the upper layer (Figure 2). With time, as the nibbled arc retreats from the leaf edge, the larvae will be forced to move more and more onto the upper surface.

This initial position can be observed more than once when a large group feeds upon a plant with small leaves. A small leaf size necessitates a move to a fresh leaf when the upper layer of the first leaf is consumed.

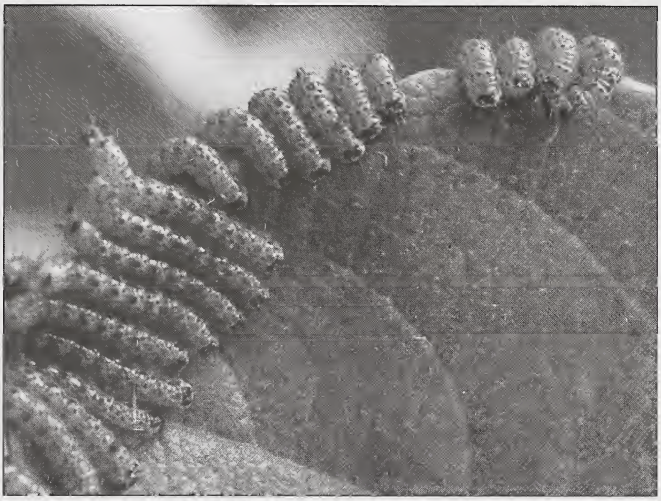


Figure 2 First instar larvae attacking a fresh leaf. Photo: Martin Probert

The effect of leaf size

On a large leaf, such as Filbert, the arc at which the larvae line up grows longer with each bout of feeding. But on a smaller leaf, such as Grey Willow, the opposite may occur. As the nibbled area spreads over a small leaf, the arc at which the larvae line up will initially grow longer, but eventually will grow shorter. As a consequence, fewer and fewer larvae are able to feed simultaneously. An interesting situation results. The group splits into two, with off-set feeding times. One group feeds while the other rests. When the feeding group starts to break up, the other group starts to wake up, and the two groups change places, those from the first group struggling to back out against the advancing larvae of the second group, while those of the second struggle to find an opening through the retreating members of the first. Both groups remain on the upper surface, exchanging places, and the surface becomes sprinkled with minute pellets of frass.

It may be that the number of larvae I introduced to the leaf of Grey Willow exceeded the number of eggs that would be placed on such a leaf in the wild. (If the number introduced was indeed excessive, then

the way the larvae adapted themselves to the novel situation is noteworthy.) I have twice discovered first-instar Buff-tip larvae on Grey Willow, but, regrettably, made no record of the number. It might be interesting to accumulate records of the number of first-instar larvae discovered on leaves of different size.

Timing the feeding cycle

It is difficult to fix a precise moment at which to time the duration of the feeding-and-resting cycle. During the feeding phase, when the larvae are on the upper surface, they are easy to see, so a point in this phase was chosen for timing the cycle. The point chosen was that at which, after having fed, roughly half the larvae had left the line.

The most striking observation was that of a group on a Rose leaf. The times at which half the larvae had departed were recorded as 15:11, 15:40, 16:08, 16:36 and 17:04. The durations of each cycle were thus 29 mins, 28 mins, 28 mins and 28 mins. A similar constancy was recorded during other observations: 27, 34, 27, 20, 28, 23, 20 (a different group on Rose); 28, 23, 23 (a group on Grey Willow); 36, 34, 28 (a different group on Grey Willow). All these observations were of larvae kept under cover. Outdoors, the group of 70 on Filbert took roughly an hour to complete each cycle. The differences in the average lengths of these cycles may depend upon factors such as the age of the first-instar larvae, the digestibility of the leaf, and temperature.

Given a particular group of larvae under observation, it is possible with reasonable accuracy to predict the time of the next feeding phase. I made good use of this fact many times while observing various groups of larvae, taking advantage of the known duration of the resting phase to pursue other activities, while being on hand to witness the next bout of feeding.

Larvae of the second and later instars

When first-instar larvae are about a week old, and 5mm long, the first moult occurs. The second-instar larvae remain gregarious, but now consume the entire thickness of the leaf. As there is no longer any necessity to move onto the upper surface in order to feed, the larvae remain for preference on the lower surface, their heads at the edge of the leaf, their bodies more or less side by side, and chew away (Figure 3). Some may rest, stepping back from the edge to do so, while others continue to eat. When a leaf is so reduced that there is little space for all the larvae, half the larva move onto the upper surface. When this happens, the heads of both parties (the upper-surface group and the lower-surface group) are often seen nibbling away at the same section of

edge. As the leaf is reduced still further, and nothing but a skeleton of veins remains, a search for fresh nourishment will begin.

Figure 3 Second instar larvae feeding from edge. Photo: Martin Probert

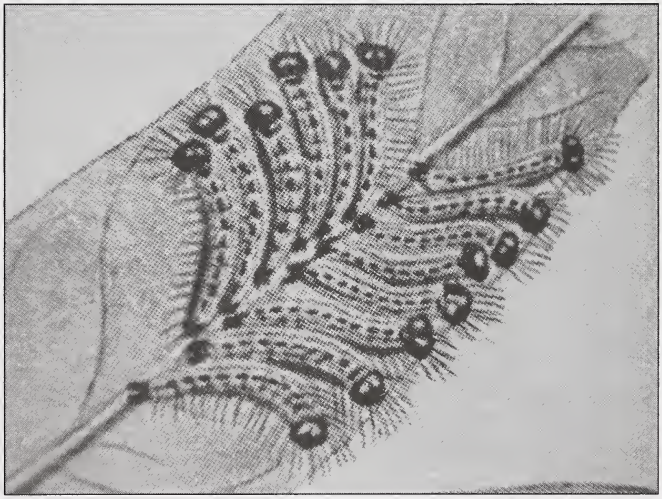


Figure 4 Which instar? Illustration from 'South'

Interpretation of an illustration in 'South'

Plate 40 in Richard South's *Moths of the British Isles* shows the larvae of *P. bucephala* distributed on each side of the midrib of a leaf blade, half

on the left, half on the right, each larval tail touching the midrib, the bodies parallel to the lateral veins, and with the heads near to, or at, the edge of the leaf. The overall layout of the larval bodies resembles a feather (Figure 4).

From the observations in the preceding sections, we are in a position to identify the instar depicted in South's illustration. The larvae are not first-instar larvae engaged in feeding, for such larva will always be working away from an edge of the leaf (Figure 1), even when the tail end of the body is on the lower surface (Figure 2). Nor are they first-instar larvae at rest on the lower surface, for, with no food available on the lower surface, the bodies of the larvae are invariably orientated at random. The illustration is of the second (or later) instar. Six of the larvae are feeding, their heads at the edge of the leaf (compare with those feeding in our Figure 3), while the remaining eight, having backed away from the edge, are resting. (And yet, inexplicably, none of the leaf has been consumed!)

As a further reason for these larvae being other than first instar, we note the large heads and comparatively small bodies which are typical of larvae which have recently moulted.

Figure 5 Moult from 4th to 5th instar. Photo: Martin Probert

South's illustration appears again on page 80 in *The Observer's Book of Larger Moths* where the text informs us that 'the larvae . . . eat the lower side only of one leaf'. This is at variance with my observations: the first instar of *P. bucephala* only ever fed from the upper layer, while the later

instars consumed the entire thickness of the leaf. The companion volume, *The Observer's Book of Caterpillars,* states that 'when [the larvae] are not feeding they cluster together on a twig where they resemble a dead leaf'. This too is something I have not observed. Throughout the three years of the study the larvae have always rested gregariously beneath a leaf. However, when a leaf has been reduced to a near skeleton of midrib and lateral veins, the larvae remain bunched about the veins till the last vestige of edible membrane has gone, and it is perhaps this moment which is alluded to. The larvae may be found in such a configuration either eating, resting, or (*see* Figure 5) moulting.

Strength of instinct

The motivation to remain together – what I will call the 'gregariousness instinct' – is very strong. The larvae move along contiguous joined structures, travelling from leaf to petiole (leaf stalk) to stem, but are extremely reluctant to pass between parts of the plant in incidental contact. To test this observation, I conducted the following experiment.

I cut off a 10cm length of thin stem. The fragment bore several skeletonised leaves and, on one of them, a colony of third-instar larvae. There was no edible membrane on the fragment. This fragment was carefully lodged among the leaves of a quite different stem from the same tree.

The larvae were very active, wandering along the fragment of stem, and up and down the petioles and midribs of the skeletonised leaves. Several of these midribs lay in contact with the surface of fresh leaves of the new stem. But, for three hours, although the larvae never ceased to explore, and constantly brushed against the new leaves, they never once moved *en masse* from the old stem to the new. Their wanderings remained along the contiguous joined structures of the old stem. A couple of times one individual strayed onto an adjacent fresh leaf, but soon returned to the company of the others.

Eventually, from a position on a skeletonised leaf where several larvae were gathered, and from where it was impossible for those at the edge to retreat because of the presence of those behind, a pair moved onto a fresh leaf. The foremost, with the other in contact behind, moved along the midrib to the tip of the new leaf. Slowly, one by one, others followed.

The numbers on this fresh leaf steadily increased. And yet, two hours later, half of the original colony was still on the original fragment. Any one of these could have reached over and fed from an adjacent fresh leaf without leaving the old stem, but none did so. The instinct to remain together was clearly stronger than the urge to feed in isolation.

Although this experiment was with captive larvae, I have observed, with groups of larvae living freely on the Filbert tree, this same reluctance to stray onto any part of the tree in incidental contact.

It should be added that a single larva in isolation, such as one moved to a fresh plant, or an individual late in the final instar, is not motivated by the same instinct as one that has just left a group of its fellows, and so may well behave differently. Isolated larvae may move to a part of the plant in incidental contact.

A benefit, and possible disadvantage, of gregarious behaviour

E. B. Ford, in *Moths*, states that the larva of the Buff-tip 'apparently produces a rank, disagreeable smell detectable to some people, though not to myself.' Ford also suggests that an unpleasant odour 'will be accentuated if the larvae live together in close company'. Such an odour, arising from a company of larvae, may deter one or more of those insectivorous vertebrates capable of climbing, among them some species of mice, shrews, squirrels, lizards, and snakes. Neither odour, nor the covering of hairs, was any protection to first-instar larvae against predation by wasps. Perhaps, in the latter case, the odour acted as an attractant.

Sub-groups, reconnection, and migration

From time to time a few larvae, engaged in feeding on a leaf, will wander off down the petiole to the branch. Here they potter up and

Figure 6 Procession of three larvae. Photo: Martin Probert

down, slowly, hesitatingly, singly, or in pairs or trios (Figure 6) head to tail, meeting other larvae engaged upon a similar activity, moving a short distance along the branch, then returning to where they started. Where two or more larvae are involved, those following may advance with the head touching the tail of the larva in front, or alternatively may lag behind by some 5cm. In either case, the larvae that follow proceed with confidence, following the path taken by those in front without hesitation.

As time goes on, and the larvae lengthen and grow fatter, and fewer fit comfortably on the same leaf, a group will break up into two or more sub-groups. But, although sub-groups will be found feeding on separate leaves of the same or associated branches, the sub-groups will invariably come together again before moving off in a group to seek fresh food elsewhere. The larvae, after the move, may need to be sought for, having migrated to a quite different branch in another, usually higher, part of the tree. This splitting apart of a group, and the subsequent reconnection of the resultant sub-groups, is a frequent occurrence. The numbers of larvae in groups before and after migration, recorded on several occasions during the observations, were invariably identical: none had taken a wrong turning.

As an example of this reconnection of sub-groups before migration, one morning at 8am there were, on a leaf, eight larvae of the fourth instar of which one was noticeably smaller, and, on a leaf of an associated branch, five larvae of which one again was noticeably smaller. At 6pm the larvae were discovered (by standing on a ladder and searching the upper branches) about 150cm higher up the tree. Eight were on a single leaf, three on the next leaf but one, and two on the next leaf, a total of thirteen larvae, of which two were noticeably smaller, the same totals as at 8am. Each of the two morning sub-groups had descended 50cm till they had come to a common fork, had then descended an additional 50cm, ignoring two forks on the way, changed direction at the third fork, and had then ascended 250cm to reach the evening position. The ascent negotiated six forks, and at each fork each larva had taken the same branch.

Patience (*considerable* patience!) will reveal the process of migration from one part of the tree to another. The larvae, after a period of assembly on a branch, will set off purposefully downwards till the branch meets a more substantial branch or the trunk, then climb upwards at a good pace three or four or five abreast (Figure 7), and terminate on one or more leaves at the end of a fresh branch. The sight of scores of purposefully migrating Buff-tips is impressive.

Figure 7 Massed migration to a higher branch. Photo: Martin Probert

The processionary behaviour of *P. bucephala*

I have not seen, in accounts of the habits of *P. bucephala,* any mention of their movements in single file (Figure 6), nor of their massed migrations (Figure 7). Both events are easily missed, and not likely to be witnessed except through lengthy observation. And yet these events may justify us in claiming that Britain has always had, among the native lepidopteran larvae, a processionary species.

The formation in single file of small groups of *P. bucephala* resembles the lines in single file of the Pine Processionary *Thaumetopoea pityocampa* (which I once encountered on an alpine plateau in the Canton of Ticino, Switzerland). The gregarious purposefulness of the massed migration of large numbers of the Buff-tip is also reminiscent of that of *T. pityocampa.* The width of the columns of large numbers of Buff-tips on the move, up to five abreast, reminds me of a description of the Oak Processionary *T. processionea,* which is said to move in a 'broader' procession than *T. pityocampa* (Chinery 1986).

In his discussion of the Pine Processionary, Fabre mentions that the species is not only encountered in the well-known lines of several hundred

individuals, but also in mini-processions, sometimes 'only two in a row', and such rows of two or three is exactly what we see in the Buff-tip.

The Pine and Oak Processionary, and the Buff-tip, belong to the superfamily Noctuoidea, but, whereas the Buff-tip is placed in the family Notodontidae, the processionaries are today separated from them in the family Thaumetopoeidae. I suspect that, purely on the basis of the similarity of the movements of their larvae, the Buff-tip and the Processionaries may at some stage have been more intimately related on the evolutionary scale than is implied by their present placement in separate families.

The ability of Buff-tip larvae to retrace their steps

A single larva will leave a group and wander off down the petiole, along a branch, proceeding slowly, pausing all the way, turn a fork and proceed along another branch, wander possibly onto a leaf, and then return. One afternoon, studying a group of fourth-instar larvae gathered beneath a leaf, I observed how they were being abandoned and rejoined by lone larvae on a continuous basis. No matter how many forks were negotiated on the outward journey, each larva, in returning, took the correct path at every branching of the way. None failed to return. This same activity occurs well into the fifth and final instar.

It is possible that the means by which the Buff-tip retraces its steps, and the means by which small lines of Buff-tips follow one another along branches, is the same as that described by Fabre in relation to the Pine Processionary. Each larva of the latter species, as it advances, lays a thread of silk. The thread, says Fabre, 'is so tiny that the eye, though armed with a magnifying-glass, suspects it rather than sees it'. But, in the case of the Pine Processionary, each caterpillar adds to the thread of silk so that, when many caterpillars have passed, and many threads have been added, the trail is easy to see. But whether there are many threads, or just a single thread, it is sufficient for the Pine Processionary to find its way back to where it started.

I was reading Fabre's description about a month after the 2011 Buff-tip larvae had gone down into the soil. The month had been wet, the rain falling in torrents on many occasions, and it seemed unlikely that any trace of silken threads, if that was how the larvae were retracing their steps, would remain. But, using a x10 magnifier to search those places where the larvae had once been, I discovered, here and there at the tips of shoots, pale threads several centimetres long running parallel to the axis of the shoot. So it would seem possible that the larvae are using the same technique as the Pine Processionary to retrace the path. It would

be instructive, when the Buff-tips are active, to examine a branch immediately after the passage of a larva.

I have observed that, as a Buff-tip larva wanders off by itself along a branch, it continuously dips its head towards the surface of the bark. It's not much of a movement, and the movement is easily overlooked. Closer observation also revealed that, from time to time, the head jerks upward. It is possible that, in making these movements, the larva was either laying out a line of silk, or feeling for the presence of such a line.

A redundant behaviour?

The same jerking movement of the head, described in the previous paragraph, can be seen when larvae are resting together beneath a leaf. In observing this movement we are perhaps witnessing the moment when a larva, anticipating the possibility of a sudden gust of wind, anchors its silk life-line to the lower surface. We shall assume (pending further observation) that this interpretation is correct. This anchoring of a life-line, invaluable to a lightweight first-instar larva, is also carried out by middleweight fourth-instar larvae. When disturbed, lightweight larvae will hang from a thread and climb back up, but middleweight larvae drop to the ground. I suspect that middleweight larvae don't readily abandon the leaf, for that would be against the 'gregariousness instinct'. Presumably the life-lines of these middleweight larvae snap, or the larvae are too heavy to make the ascent. So this apparent anchoring of a life-line by middleweight larvae would appear to be what I have called a 'redundant behaviour': while there had been an evolutionary advantage to developing this safety mechanism for the benefit of the first instar, there had been no significant evolutionary advantage to losing the behaviour by the time of the fourth instar, and so the fourth instar attaches its line, but gains nothing by doing so.

The breaking-up of the original group

As the Rev J. G. Wood observed, '[the original company of larvae] break up into six or seven small companies'. The breaking-up does not, however, occur immediately 'after their first change of skin', but may be observed to take place gradually over several instars. Could the break-up result from some deliberate factor? If so, that factor would be in conflict with the 'gregariousness instinct'. A tendency to occasionally lose the way would seem to provide a simpler mechanism for the partial breaking-up of the original company. Such a tendency may have survival value, enabling the larvae to distribute themselves throughout a tree while remaining in small groups.

Figure 8 Mature larva (late 5th instar) feeding alone. Photo: Martin Probert

In about two months the impressively large larvae (up to 60mm long) will be in the last days of the fifth and final instar. If on a tree out of doors, they will be feeding on the upper branches (Figure 8), and their eating activity will be clearly visible (given a suitable vantage point) as leaves disappear rapidly one by one. Given the size and appetite of each individual, it is hardly surprising that the larvae no longer attempt to keep together.

Eventually, as the time for pupation draws near, individuals will be found at ground level, looking for a suitable pupation site, and disappearing beneath the topsoil.

References

Carter D. J. 1979. *The Observer's Book of Caterpillars*. London: Frederick Warne.

Chinery M. 1986. *Guide to the Insects of Britain and Western Europe*. London: Collins.

Fabre J. H. 1912. *The Life of the Caterpillar*. Tr. De Mattos A T. London: Hodder and Stoughton.

Ford E. B. 1955. *Moths*. London: Collins.

Ford R. L. E. 1974. *The Observer's Book of Larger Moths*. London: Frederick Warne.

Kirby W. F. 1887. *British Butterflies, Moths and Beetles*. London: Swan Sonnenschein, Lowrey & Co.

Porter J. 2010. *Colour Identification Guide to Caterpillars of the British Isles*. Stenstrup, Denmark: Apollo Books.

South R. 1961. *Moths of the British Isles*. Series I. London: Frederick Warne.

Wood Rev J. G. 1883. *Insects at Home*. London: Longmans, Green & Co.

The unusual hindwing of the Seraphim moth

by Peter Holland (6700)

33 Chiltern Crescent, Wallingford, OX10 0PG.

As every entomologist knows, most insects have two pairs of wings: a pair of forewings on the mesothoracic segment (also called the T2 segment) and a pair of hindwings on the metathoracic (T3). In some insects one pair has been greatly modified in evolution, for example in Diptera the T3 wings have been modified into balancing organs called halteres and in Coleoptera the T2 wings are modified into wing-cases (elytra). Fleas or Siphonaptera have lost wings altogether, while in some geometrid moths the females have greatly reduced wings and are flightless, such as in the Winter Moth *Operophtera brumata* and Mottled Umber *Erannis defoliaria*. But no living insect has three pairs of wings with the bizarre and controversial exception being the Membracidae treehoppers which have a 'helmet' on T1 that develops from wing-like outgrowths; (Prud'homme *et al.* 2011). If insects do not have three pairs of wings, then why are there two species of British moth with names suggestive of six wings? These are the Seraphim *Lobophora halterata* and the Small Seraphim *Pterapherapteryx sexalata*.

The common names of these two moths refer to a type of angel encountered in Judaism and Christianity. According to Isaiah (Chapter 6, verse 2), a Seraph has six wings: *'with two he covered his face, with two he covered his feet, and with two he flew'*. The singular was Seraph and the plural Seraphim, so there seems to have been a mistake made in naming the moths. In moths the plural has become the singular, so you can have one Seraphim moth but not one Seraphim angel. The origin of this "mistake" is unclear, but the name Seraphim was first used by Moses Harris (1775), with Haworth (1803) following his lead in providing the English name Small Seraphim. The genus and species names of the Small Seraphim are also indicative of six wings: *Pterapherapteryx* meaning 'wing-bearing-wing', *sexalata* indicating 'six-wings'. The specific name of the Seraphim, *halterata*, makes references to the halteres of Diptera (Emmet 1991), and reflects the fact that at first glance a (male) Seraphim moth seems to have four full-sized wings in addition to two small wing-like structures – a thoroughly confusing state of affairs. In fact, there are *not* six true wings, only the usual four, but the hindwings are strangely modified and appear to have an extra tiny pair of wings connected to them.

On the night of 24 April 2011, a male Seraphim came to a light trap I was running in my back garden in Oxfordshire. It was the first I had

Specimen of the Seraphim *Lobophora halterata* showing the unusual hindwing modification.

recorded. When the moth obligingly moved its forewings, I could clearly see the hindwing modification. This is not a simple split in the wing, as you would see in plume moths (family Pterophoridae) or the tails of the Swallow-tailed moth *Ourapteryx sambucaria*, but rather there is a flange or lobe of wing tissue, at the trailing edge, that sits right on top of the upper surface of the hindwing. Most of the identification guides do not show this well. It cannot be seen in the illustration in Waring, Townsend and Lewington (2003) since this shows a moth in its resting position, although these authors give a good description of the strange wing. It is visible in the photographs of set specimens in Skinner (2009) and the drawings in South (1961), but neither author makes particular mention of it. By far the best illustration I could find is a drawing in an old book by Newman (1869). If one looks very closely at the real thing, it is possible to work out that the trailing edge of the hindwing is deeply lobed, and then concertinaed back on top of the rest of the wing, rather like a piece of origami paper that has been folded over and then back again.

Why should the Seraphim have this unusual modification? As noted above, the name *L. halterata* suggests a parallel with the halteres of Diptera. These are also rod like in appearance, albeit modified from the

whole hindwing not just part of it. Dipteran halteres are used in sensory perception – the fly vibrates them up and down, out of phase with the beating wings. If the position of the fly alters, then the angle between halteres and wings changes because the rapidly vibrating halteres continue to beat in their original plane due to inertia. A battery of sensory receptors pick up the change, and so the fly detects the most subtle shifts in its position. But to be fair, the lobed wing tissue of the Seraphim moth does not look very much like a haltere. It does not have a narrow stem and bulbous end, and it does not have the space to vibrate freely since it sits on top of the main wing blade. A role in sensory perception during moth flight seems very unlikely. A better clue to function comes from the fact that the modification is only seen in males. That the unusual wing structure is seen in one sex and not the other suggests that the function is related to reproduction in some way. One possibility is that it houses specialised glandular tissue, used for secreting pheromones. As is well known, the females of many moth species release chemicals to attract males, with some of these acting over large distances. Less widely known is the fact that males of many moths also release volatile chemicals from specialised organs on their abdomen, thorax, legs or wings, and in some cases these have been shown to affect the behaviour of females during mating or the behaviour of competing males (Birch et al. 1990). I can find no report of this having being examined in the Seraphim or Small Seraphim, or in a closely related moth such as the Early Tooth-striped *Trichopteryx carpinata*, but it is surely a feasible and testable hypothesis.

References

Birch, M.C., Poppy, G.M., Baker, T.C. 1990. *Scents and eversible scent structures of male moths.* Ann. Rev. Entomology **35**, 25-54.

Emmet, A.M. 1991. *The Scientific Names of the British Lepidoptera: their History and Meaning*. Harley Books.

Harris, M. 1775. *The English Lepidoptera.* J.Robson, London.

Haworth, A.H. 1803. *Lepidoptera Britannica* J.Murray, London.

Newman, E. 1869. *An Illustrated Natural History of British Moths.* Hardwicke and Bogue, London.

Prud'homme, B., Minervino, C., Hocine, M., Cande, J.D., Aouane, A., Dufour, H.D., Kassner, V.A. and Gompel, N. 2011. *Body plan innovation in treehoppers through the evolution of an extra wing-like appendage.* Nature **473**, 83-86.

Skinner, B. 2009. *Colour Identification Guide to Moths of the British Isles.* 3rd edition. Apollo Books.

South, R. 1961. *The Moths of the British Isles.* New edition. Warne and Co., London.

Waring, P., Townsend, M., Lewington, R. 2003. *Field Guide to the Moths of Great Britain and Ireland.* British Wildlife Publishing.

Help wanted – an historic entomologist Mr W. A. COPE

by Mark Youles

5 Ravenward Drive, Toyse Lane, Burwell, Cambs. CB25 0AD.

Email:irisscientist@gmail.com

I am an amateur entomologist who has been studying the Apaturinae for a number of years. The reason for this correspondence is in direct relation to my research, as for some time now I have been desperately attempting to locate an original reference source, which despite numerous queries somehow appears to have escaped all those who have attempted to find it. Consequently I am appealing to *Bulletin* readers in the hope that someone can help me locate the source of this most elusive reference.

The seed to the source of the reference required was reported by George. E. Hyde in 1954 in the *Bulletin's* sister publication *The Entomologist's Record and Journal of Variation* (**66**: 98-100). Within Hyde's article entitled "A Further Note on *Apatura iris* Linn", Hyde is quoted as saying "*Mr. W.A. Cope, one of our best authorities on this species*". Research on "W.A. Cope" has not been easy, but the earliest reference to him that I have managed to find was in the 1895 volume of *The Entomologist's Record and Journal of Variation* (**7**: 157) and was in relation to a capture of *Xanthia ocellaris*. Throughout the many pages of *The Entomologist's Record* which I have searched, W.A. Cope's name pops up numerous times, even as late as Vol.89 (1977). From the various records found "W.A. Cope" was obviously a close friend of the renowned naturalist and artist F.W. Frohawk, see *The Entomologist* (1901, **34**: 2 & 168) and there are numerous mentions to his specimen collections in *The Entomologist's Record* Vol.76 (1964). References show that he was also mentioned within the Victoria County History (V.C.H) of 1908 as well as in Vol.96 (1956) of de Worms' "London Natural History Society" publication. In 1895 he lived in Bromley, Kent.

In spite of all the entries relating to "W.A. Cope" however, I unfortunately appear to be unable to locate any actual articles which have been published by the elusive "W.A. Cope" and certainly am unable to find any reference to his putative work or studies in relation to *Apatua iris*, which would enable Hyde to refer to him as being "one of our best authorities on this species". I would very much like to hear from anyone who has information relating to any of the published work by "Mr. W.A. Cope", but more importantly, if anybody can please provide any information relating to his supposed work or studies in relation to *Apatua iris*?

I thank you very much in advance for any help that you may be able to provide in relation to this request.

Some insects seen in Dorset, 2011

by Hilary Bateman (14912)

73 Woodbury Avenue, Bournemouth BH8 0HH.

I am fortunate to live in Dorset, not far from Bournemouth and just a short walk from the river Stour. On 15th July this year, in our garden that backs onto a small strip of woodland, a Migrant Hawker Dragonfly (*Aeshna mixta*) zoomed around for several minutes. It landed on the Californian lilac and I was able to photograph it (see picture). We don't have a pond, nor do either of our neighbours. It visited our garden a number of times that day quartering the air as if looking for prey. This species breeds in standing water, and is often found well away from water, usually along hedgerows and woodland edges. On 3rd August, a Variable Damselfly (*Coenagrion pulchellum*) flew backwards and

forwards over the flowers. Unlike the previous species, this damselfly is not often found away from its preferred habiat of ditches, ponds and canals. We were lucky to find a large ichneumon (*Rhyssa persuasoria*) in our conservatory which I captured and released. This is one of the largest ichneumon wasps' in the UK, and is a truly impressive insect.

An insect which I was not readily able to identify was a very large hoverfly that looked like a hornet. On consulting my insect guide it appeared to be *Volucella zonaria*, although it is possible it could have been the closely related species, *Volucella inanis*. The larva of this alarming, although harmless, species has been found in wasps nests.

The latter part of summer and into autumn we have seen a large number of Red Admiral *(Vanessa atalanta)* and Speckled Wood*(Pararge aegeria)* visiting the bramble rose and sedums in our garden. When walking our dog down the lane that leads to the river I have noticed a huge number of ivy bushes covered with flowers. On 28th October, I was astonished to see one bush in particular, sited in full sunlight, absolutely covered in wasps. They were literally all over it. The extent of the ivy must have been 7ft high and 4-5 foot across. I thought wasps died off in autumn. Were these indulging in one last feast before expiring?

Although we do not run a moth trap, the two other interesting sightings were a Common Emerald moth (*Hemithea aestivaria*) in our kitchen on 27th July, and a snout moth (most likely *Hypena proboscidalis*), also in our kitchen on the same day.

A primary solitary egg parasitoid (Hymenoptera: Proctotrupoidea, Scelionidae) of The Vapourer, *Orgyia antiqua* L. (Lepidoptera: Lymantriidae)

by Hewett A. Ellis (9940)

16, Southlands, North Shields, Tyne and Wear, NE30 2QS.

Introduction

Primary parasitoids attack and kill their host. An egg parasitoid is defined as a parasitoid species that oviposits in the host egg and completes its development therein, having killed the host (Shaw,1990). Certain species of Hymenoptera families Mymaridae (Fairy-flies), Trichogrammatidae and Scelionidae, are true egg parasitoids (Shaw & Askew,1976; Shaw & Fitton,1989). In a previous paper (Ellis,2009) I gave an account of a primary gregarious egg parasitoid belonging to the Trichogrammatidae which parasitised the eggs of the Small Skipper *Thymelicus sylvestris* (Poda) concealed in grass sheaths. The purpose of the present paper is to document parasitisation of a batch of the Vapourer *Orgyia antiqua* L. eggs by a primary solitary parasitoid belonging to the Scelionidae. In addition, observations on the behaviour of the parasitoid are reported.

Eggs of the Vapourer

The Vapourer moth emerges from its pupa in August and September. The female has vestigial wings and is incapable of flight, remaining on the surface of the cocoon until found by an attracted day-flying male. Shortly after mating, the eggs are deposited on the outside of the cocoon in a large batch of several hundred. Here they remain overwinter and hatch in the following spring. Such a cocoon, more or less covered by a batch of several hundred eggs, was collected on the 16th March 2009 from a Broom shrub growing in a garden in Beach Road, Tynemouth (Northumberland VC 67; Grid Reference NZ 361 701). Externally the sub-globose eggs appeared normal, each about 0.9mm in diameter and greyish-white with a single narrow brown ring just below a minutely pitted upper surface (Figure 1.). The twigs with attached cocoon and eggs were kept in a transparent plastic container and checked daily for any emerging larvae.

The egg parasitoid

Externally the eggs remained unchanged but the expected larvae of the Vapourer did not emerge. Instead, on the 2nd May 2009, 8 tiny adult scelionid parasitoids emerged, each through a circular exit hole measuring about 0.4mm in diameter, made in the side of an egg. In the

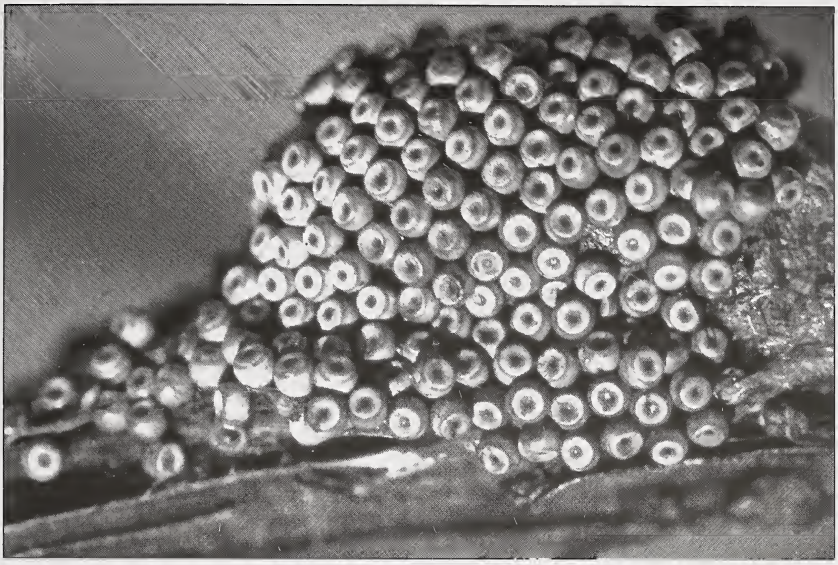


Figure 1. Batch of parasitised eggs of the Vapourer, *Orgyia antiqua* on female cocoon. Externally the eggs appear normal. Photographed 18th May 2009, Hewett Ellis.

following days further parasitoids emerged, always one per egg and always at the side between the base attached to the cocoon and the narrow brown ring.

Initially males predominated, their number peaking on the 6th May. Female numbers peaked later on the 11th May, by which time male numbers emerging daily had diminished. The last parasitoid to emerge was a female on the 26th May 2009. Between the 2nd and 26th May a total of 190 parasitoids emerged, the greatest number on any one day was 30 on the 11th May and by the 14th May 94.7% of the 190 emerging had done so. The cumulative frequency of parasitoids emerging daily is shown in Figure 2. The date of emergence and the sex of individual parasitoids were determined in 188 of the 190 and the data are shown in Figure 3.

Some additional parasitoids died whilst attempting to emerge and remained stuck, partially protruding from their exit holes. In 11 of these the antennae were visible permitting sexing (see below), there being five male and six female parasitoids. Overall, of the 199 parasitoids whose sex was determined 121 were male and 78 female, a male: female ratio of 1:1.55.

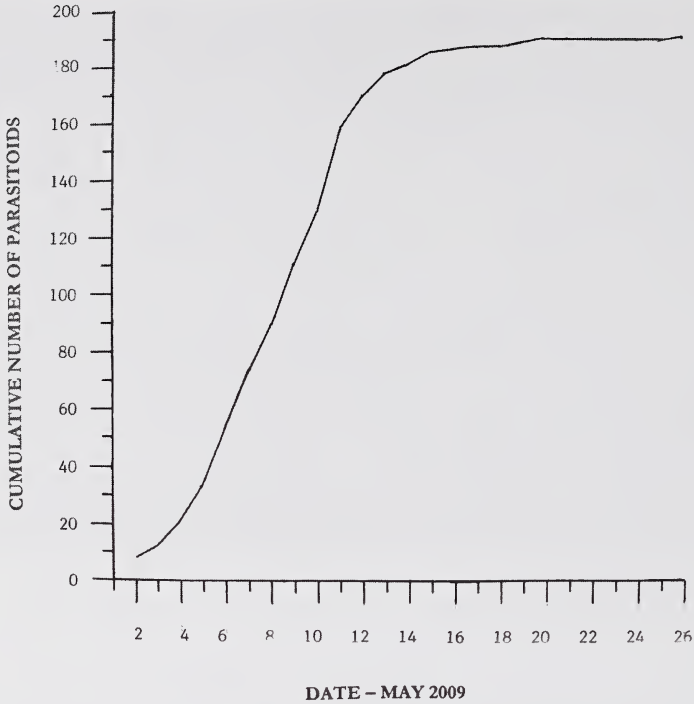


Figure 2. Graph showing the daily cumulative number of scelionid parasitoids emerging between 2nd and 26th May 2009; based on 190 insects in which the precise date of emergence was known.

No further parasitoids emerged after the 26th May 2009. The cocoon and eggs were retained for two years in case some of the parasitoids were to undergo a prolonged diapause before emerging. This did not occur and at the final examination made in August 2011 the eggs were counted and then dissected. To avoid errors of omission or duplication, the number of eggs was determined under the dissecting microscope by marking each egg counted with a fine felt-tip pen. This revealed 288 eggs on the cocoon. The eggs were then dissected from the cocoon, so that the whole surface of each could be examined. This revealed additional dead, partially emerged parasitoids stuck in exit holes previously not visible on account of their position low down near the bases of closely packed eggs. Any intact eggs were cut open and in all but seven, which by now appeared collapsed and empty, there was a dead adult parasitoid. Overall 281 of the 288 eggs had been parasitised (97.6%), and of these 190 (67.6%) had emerged successfully.

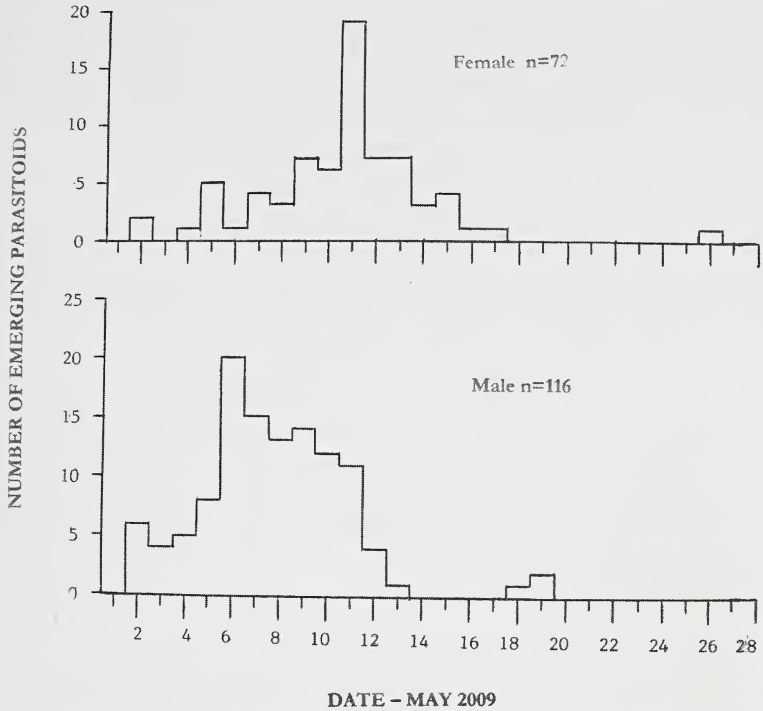


Figure 3. Graph showing the daily cumulative number of scelionid parasitoids emerging between 2nd and 26th May 2009; based on 190 insects in which the precise date of emergence was known.

Observed behaviour of parasitoids

During the period of emergence male parasitoids were observed walking over the surface of the eggs in a characteristic manner. Two males sat astride adjacent eggs from which females were beginning to emerge and remained still and rigid with fixed head, thorax and legs. At intervals the gaster was dorsi-flexed once or twice and the wings quickly fluttered, whilst the legs remained rigid. The males then became increasingly excited and walked round in circles repeatedly dorsi-flexing the gaster and flapping their wings as the females emerged further and their legs appeared. Mating pairs were observed on several occasions both in early morning (8.30-9.30 am) and mid-afternoon (3.30 pm.). Pairing occurred on the egg batch surface, with male and female facing in the same direction and with the male on top grasping the female's thorax and gaster with its legs and with much inter-touching of male and female antennae. One pair was noted to remain coupled for twenty minutes, proving that sibling mating occurred.

Description of parasitoid

Naked-eye examination revealed a tiny black hymenopteran and it was necessary to resort to microscopy to appreciate the morphology and make measurements of the body and wing sizes. Measurements were made at x40 magnification using a calibrated eyepiece graticule.

The head, thorax and gaster are black, mostly smooth and shiny but with a minutely pitted sculptured mesonotum. The total length (head + thorax + gaster) averages 0.9mm. The legs are pale tan coloured and there are four tarsal segments. The body is not flattened, the frons is smooth and nautili are present. The geniculate antennae are pale brown and inserted close together, low down on the face. The male antennae (0.74 mm long) comprise 12 segments (scape, pedicel and 10 flagellar segments), whereas the female has only 10 segments and the distal 5 are broadened to form a clavus. This anatomical difference was found to provide a ready means of determining the sex of individual insects. The forewings, each measuring 1.1mm in length and 0.44mm in width at the broadest point, show a reduced venation with a submarginal vein and a distinct stigmal vein measuring 0.19mm in length and a post-marginal vein of similar length.

Identity of parasitoid

I recognised the hymenopteran parasitoid as some species of chalcid and reference to Gauld & Bolton (1988) and Masner (1995) indicated it belonged to the Scelionidae, sub-family Telenominae. This was subsequently confirmed by Dr Mark Shaw, to whom I referred four male and four female specimens.

Discussion

The Scelionidae is a difficult family of parasitoids from a taxonomic viewpoint. The British Check List includes 102 species in 14 genera but Gauld & Bolton (1988) suggest that this is an underestimate since some genera probably contain additional similar species. In practice the British Scelionidae are poorly known and identification is often difficult, there being no modern keys to the majority of British species (Barnard, 1999). The texts of Gauld & Bolton (1988) and keys of Masner (1995) proved useful, the latter providing keys to the proctotrupoid subfamilies such as the Telenominae.

Members of the genus *Telenomus* are associated with lepidopteran eggs and many are host specific. In the case of the Vapourer the species is *Telenomus dalmanni* (Ratzeburg) and I believe it is highly probable that the present batch of eggs was attacked by this species. It should be noted

that although *T. dalmanni* is generally regarded as being host specific for the Vapourer there is one report of *T. dalmanni* parasitising the eggs of *Colotois pennaria* L. the Feathered Thorn moth during an outbreak of the moth which occurred in 1971-72 in eastern Austria (Jahn & Holzschuh, 1974).

The present scelionid parasitoid behaved as a primary and solitary true egg parasitoid. This is fairly typical for scelionid wasps, the majority being solitary parasitoids which attack clumps of eggs (Gauld & Bolton, 1988). Often such species have a preponderance of females (Waage,1982), but in the present case emerging males outnumbered females. However, this may not have been truly representative overall, since the normally later emerging females may have accounted for the greater proportion of those insects which died within intact eggs.

In many instances of egg parasitisation the presence of the parasitoid in the developing egg is indicated by a darkening which occurs prior to eclosion, since the egg shell (chorion) is more or less transparent, as in the case of the Small Skipper butterfly attached by a *Trichogramma* parasitoid (Ellis,2009). However the chorion of the Vapourer egg is thickened and opaque like porcelain and the presence of a parasitoid goes unsuspected until the adult emerges.

Female scelionids may oviposit into the host egg at any stage in its development but as the egg's chorion is thick and hard it would probably be an advantage for the parasitoid to attack newly-laid eggs when they are most vulnerable. Since *T. dalmanni* is probably univoltine and host specific and I observed mating of the parasitoids shortly after their emergence in the spring, then the adult female parasitoid must survive for several months before ovipositing in the host egg in late summer or autumn. Such long-term survival of females is known to occur in a related species of *Telenomus* (*T. gracilis*) (Gauld & Bolton,1988). The whereabouts of the female *T. dalmanni* during these months is uncertain, as is the means by which they reach the target host eggs. Once the parasitoid reaches a batch of Vapourer eggs, then presumably it recognises their suitability for ovipositing by their physical characteristics and the presence on them of chemical substances (kairomones) derived from the female moth (Strand & Vinson, 1982; Jervis & Kidd, 1996; DeLury *et al*, 1999). I do not know if any one large batch of eggs which is heavily parasitized, as in the present case, has been attacked by one or several parasitoids.

Mating between sibling parasitoids, as observed in the present study, is well recognised among both gregarious species and solitary species that attack gregarious hosts (Godfray, 1994). Characteristically, males emerge

first. When there are relatively few available females there may be competition between males but when host eggs are abundant (more than 50) and plenty of females are available then, as in the present case, there is little or no conflict (Waage,1982).

The distribution and frequency of the parasitoid throughout Britain is uncertain and this is possibly the first time it has been described in Northumberland. Indeed, the frequency of the Vapourer itself is poorly documented in the county. Dunn & Parrack (1986) reviewed the history and status of the moth in North-east England and noted that it had been recorded widely in Co.Durham (VC 66) and Northumberland (VCs 67 & 68) but in only 16 tetrads (2km x 2km grid squares). The current Northumberland Moth Database includes 38 sites in VCs 67 & 68 with 116 records of adults, 17 of larvae and only three of eggs. From these data it would appear that the Vapourer is widely distributed but not particularly common in Northumberland but it has almost certainly been under recorded. I have noted adult moths and more frequently larvae feeding on wild rose, blackthorn and heather at several sites but the present batch of eggs are the only ones I have encountered in the wild in Northumberland.

The low frequency of egg batches is probably relevant when considering the high rate of parasitisation found in the present eggs. When there are few and widely scattered batches of host eggs available to attack, it would be expected that the parasitisation rate within any single batch would be high. In contrast, when large numbers of egg batches are available, as in an outbreak of pest proportions, then the parasitisation rate might be lower. Although the Vapourer may be abundant from time to time, particularly in forests (Gillander,1908), as far as I am aware in Britain the moth is rarely so numerous as to be regarded as a serious pest. The situation is different in some mid-European forests, where outbreaks of the Vapourer moth infestations occur at intervals of 50 to 60 years. Wellenstein & Fabritius (1973) studied such an outbreak near Bad Wurzbach, Baden-Wurttemberg in 1971 and found that the scelionid parasitoid *T. dalmanni* was the most important egg parasitoid. In another outbreak in a pine forest which occurred in 1971 at Memmingen, Bavaria, in which there were vast numbers of egg batches, Skatulla (1974) found that overall 25.5% of eggs were parasitised by *T. dalmanni.*

Whilst parasitisation by *T. dalmanni* must have some adverse effect on the population dynamics of the Vapourer (Francardi & Roversi, 2002), whether in heavily infested or scarcely populated areas, there are other additional parasitoids which play a similar role by attacking the insect in

other stages of its life cycle. For example, the ichneumonid *Phobocampa crassiuscula* (Gravenhorst) attacks the moth larva (Wellenstein & Fabritius,1973) as does the braconid *Aleiodes alternator* Nees (Ellis,1999), and the moth pupa is attacked by the ichneumonid *Coccygomimus turionellae* (L.). In addition, the moth larvae may succumb to infection with a virus and its pupae may be killed by fungi (Skatulla, 1974).

Acknowledgement

I wish to thank Dr Mark R. Shaw for his help with the identification of the parasitoid and for drawing my attention to the German literature.

References

Barnard,P.C. 1999. *Identifying British Insects and Arachnids: An annotated bibliography of key works.* Cambridge University Press, Cambridge.

DeLury,N.C., Gries,R., Gries,G. Judd,G.J.R. and Khaskin,G. 1999. Moth-scale derived kairomones used by egg-larval parasitoid *Ascogaster quadridentata* to locate eggs of its host *Cydia pomonella. Journal of Chemical Ecology* **25(11)**: 2419-2431.

Dunn,T.C. and Parrack,J.D. 1986. *The Moths and Butterflies of Northumberland and Durham*, Part One: Macrolepidoptera. The Vasculum Supplement No.2. Northern Naturalists Union, Houghton-le-Spring.

Ellis,H.A. 1999. The parasitoid *Aleiodes alternator* Nees (Braconidae:Rogadinae) and the pseudohyperparasitoid *Gelis areator* Panzer (Ichneumonidae:Cryptinae) associated with the larva of the Vapourer moth *Orgyia antiqua* L. (Lepidoptera:Lymantriidae). *Bull. amat.Ent.Soc.* **58(423)**: 43-46.

Ellis,H.A. 2009. A primary gregarious egg parasitoid (HYMENOPTERA:Chalcidoidea, Trichogrammatidae) of the Small Skipper (Thymelicus sylvestris). *Bull. amat.Ent.Soc.* **68(482)**: 23-30.

Francardi,V. and Roversi,P.F. 2002. Role of *Telenomus dalmanni* (Ratzeburg) in controlling Vapourer moth in cherry tree stands (Hymenoptera Scelionidae, Lepidoptera Lymantriidae).*Proceedings for Biocontrol of Insect Pests.*6th International Symposium, 15-18 Sept.,Perugia.

Gillanders A.T. 1908. *Forest Entomology.* William Blackwood & Sons, London.

Gauld,I. and Bolton,B. 1988. *The Hymenoptera.* British Museum (Natural History), Oxford University Press, Oxford.

Godfray,H.C.J. 1994. *Parasitoids. Behavioural and Evolutionary Ecology.* Princeton University Press, Princeton, New Jersey.

Jahn,E. and Holzschuh,C. 1974. Beobachtungen zum Auftreten von *Colotois* (*Himera*) *pennaria* L. im Wiener-Wald in den Jahren 1971-1973. *Anzeiger für Schädlingskunde Pflanzen-und Umwelschutz vereinigt mit Schädlingsbekämfung,* **47(2)**: 20-24.

Jervis,M. and Kidd,N.1996. *Insect Natural Enemies.* Practical approaches to their study and evaluation. Chapman & Hall, London.

Masner,L. 1995. The proctotrupoid families. In: *The Hymenoptera of Costa Rica*, eds. P.E.Hanson & I.D.Gauld, Oxford University Press, Oxford.

Shaw,M.R. 1990. Parasitoids of European butterflies and their study. In: *Butterflies of Europe*, ed. O.Kudrna, Vol.2: Introduction to Lepidopterology. Aula-Verlag, Weisbaden.

Shaw,M.R. and Askew,R.R. 1976. Parasites. In: *The Moths and Butterflies of Great Britain and Ireland*, Volume 1. ed. J.Heath, Harley Books, Essex.

Shaw,M.R. and Fitton,M.G. 1989. Survey of parasitoids of British Butterflies. *Entomologist's Rec.J.Var* **101**: 69-71.

Skatulla,U. 1974. Zur Massenvermehrung des Schlehenspinners, *Orgyia antiqua* (L.) 1971/72 in Bayern. *Anzeiger für Schädlingskunde Pflanzen-und Umweltschutz vereinigt mit Schädlingsbekämfung* **47**(6): 89-93.

Strand,M.R. and Vinson,S.B. 1982. Source and characterization of an egg recognition kairomone of *Telenomus heliothidis* a parasitoid of *Heliothis viriscens. Physiological Entomology* **7**: 83-90.

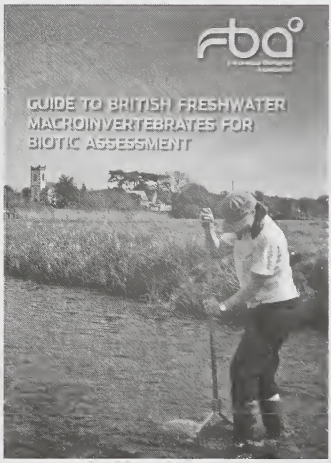
Waage,J.K. 1982. Sib-mating and sex ratio strategies in scelionid wasps. *Ecological Entomology* **7**: 103-112.

Wellenstein,G. and Fabritius,K. 1973. Beobachtungen am Schlehenspinner (*Orgyia antiqua* L.), und seinen Parisiten. *Anzeiger für Schädlingskunde Pflanzen-und Umweltschutz vereinigt mit Schädlingsbekämfung* **46**(2): 24-30.

Book Review

Guide to the British freshwater macroinvertebrates for biotic assessment

Compiled by Simon Pawley with contributions from Michael Dobson and Melanie Fletcher. 80 pages, numerous line illustrations. 246 x 171mm., limp cover. Published by The Freshwater Biological Association, Ambleside, October 2011. ISBN 978-0-900386-79-4. Price £25.00



The Freshwater Biological Association has over the years published many useful and practical guides to aquatic animals and habitats, and this latest publication deals with the larger freshwater invertebrates, although the term "larger" in this context includes any invertebrate with a body length greater than 0.25mm!

The coverage includes flatworms, annelids, molluscs, larger crustaceans, arachnids and all aquatic orders of insects. The text makes use of appropriate methods for different groups, including dichotomous keys, pictorial guides and

tables, along with copious line drawing illustrations and general tips on identification, which should allow rapid and confident identification of the major groups of British freshwater invertebrates. Illustrations are designed to show both the appearance of whole animals and, where appropriate, key identification features. For each group, a brief indication of typical habitat is given to further help with identification. An extensive list of keys and guides for further identification is also provided.

Overall, this is an excellent publication, but readers should be careful to ensure it meets their needs before buying the guide. The title itself is a little off-putting, but nevertheless accurate. Most biotic assessments are carried out on flowing water such as rivers and streams, and the guide does not set out to cover groups found in environments such as lakes and ponds. Despite this, numerous still-water families are included as many may stray into flowing water. Coverage is restricted to the benthic fauna (i.e. animals living on the water bed) rather than the pelagic (occurring only in the water column), and keys go to family level only, so you will not be able to get a species identification from this guide. However, for those interested in undertaking biological surveys and needing a helpful introduction to the identification of freshwater invertebrates, this fits the bill very well.

Talking of butterflies, moths and L. Hugh Newman

By Paul Waring (4220)

paul_waring@btinternet.com

I was given a copy of L. Hugh Newman's *Talking of butterflies, moths and other fascinating insects* (Littlebury & Co., Worcester, 1946) as a present for Christmas 2011 by a long-time friend of my wife's, Ruth Riggs. She confided she had discovered it on sale for a small amount in a local second-hand book shop. Over Christmas I found much in it that would interest any moth or butterfly enthusiast. For example I was able to read about the "remarkable moth year of 1943". In Chapter 5 Newman describes how "the greatest migration of Striped Hawks (*Hyles livornica*) ever recorded took place round about the end of May and during early June". And that is still true. In 1943 an estimated 540 individuals were reported. This compares with 60 in 1992, 80 in 1996, 68 in 2002, 142 in 2003, 59 in 2004 and 383 in 2006. Newman describes how the majority of the Striped Hawks in 1943 were seen in south-western England and how he stationed observers around clumps of Azaleas and Rhododendrons at dusk and managed to see an individual for himself which came for nectar when it was almost too dark to see. In 1946 Newman had no mercury vapour light trap to set up – these traps were not launched commercially until 1950. My own memories of watching Striped Hawks nectaring, and of other unusual finds with torch and net, as well as light-trap, came flooding back as I read Newman's excited accounts of his own adventures. Another comparison between the 1940s and today which hit me is a photograph opposite page 17 which shows Newman sitting in a fur suit out in a snowy forest in Finland with his lap-top! Only it is a little lap-top type-writer with a piece of paper sticking out, rather than a battery-powered hard-drive. In early December 2011 I was sitting in Mabira Forest, Uganda, with a lap-top and dongle linking to a cell-phone network, such that I was able to record and identify moths by using the Internet while the moths were coming to my light-traps! But in 1943 Newman describes how he had records of moths coming to him by phone and wire, as well as letters, during World War II, from friends in the armed forces stationed in North Africa and the Middle East, where they were able to report on accumulating numbers of moths which are migrants to Europe. "*Talking of...*" was Newman's first book featuring moths. I can also recommend "*British Moths and their Haunts*" which I have enjoyed for many years, and Newman wrote a number of others. Older readers will remember Newman as a broadcaster on BBC radio where he was a resident member of the team

who presented "Nature Parliament" on Children's Hour in the 1950s. He frequently referred to his Butterfly Farm in Kent, which he inherited from his father. If you would like to know more about L. Hugh Newman (1909-1993) himself, there is a brief biography and selected bibliography on Wikipedia and his obituary from *The Independent* is also on-line. There is also an excellent short news-reel, in colour, filmed by British Pathe in the summer of 1955, which you can Google on the Web. This footage shows Newman tending his sleeves of caterpillars outdoors and setting emperor moths indoors. There is even a recording of his appearance with Roy Plomley on the popular radio show Desert Island Discs (Monday, 17th September 1962) which may soon be available over the Web.

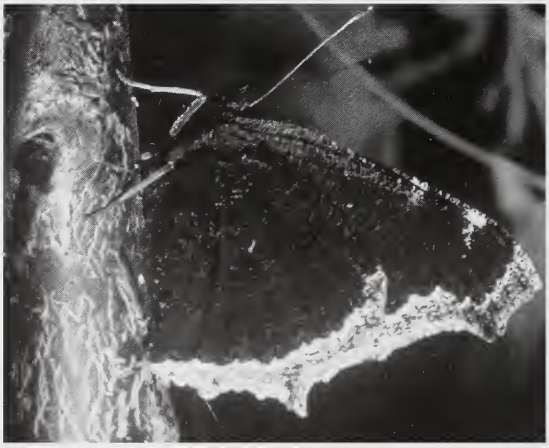
Meanwhile, although the winter-time in which I am writing is often thought of as a quiet time for moths, moth news continues to flood in to me via personal contact with lepidopterist friends, at entomological meetings, by electronic means, or the many national and local publications I receive. The county moth group web-sites and Yahoo discussion groups report catches in light-traps throughout the British Isles right up to the last night! The newsletters from the county moth recorders and moth groups now mostly come to me in electronic format, and currently I have a crop of them reviewing 2011. Splendidly printed annual reports come to me from a few counties such as Hampshire, illustrated with colour photographs. These are proper books with a sense of permanence, but they are expensive and time-consuming to produce and are becoming luxury items today. They are also more expensive to store than electronic formats and searching them for information often takes longer. But I do worry about being able to read and extract the information from all my CDs, DVDs and digital mini-videotapes on which my moth data is stored or backed up, once a few more decades have elapsed. But Newman's book I can simply take off the shelf and read half a century after it was written, without the use of any intervening technology.

The Mourning Cloak at Chamonix

by John Woolmer

Fig Tree Cottage, Roecliffe Road, Cropston LE7 7HQ.

The Robertsons used to enjoy their holidays at Chamonix. Hubert and Susannah were in their fifties and were always accompanied by their only son Thomas who, in his early twenties, still lived at home.



They eventually bought a chalet on the edge of the town which they visited to ski both in the depths of winter and in the early spring; but their favourite time was in late May when the spring flowers were at their finest. Hubert was particularly fond of the bright blue gentians which lit up the fields just below the snow line.

Thomas was an excellent skier and used to go for long expeditions, usually with a group of friends. Some of these would come back to the chalet at night, and there would be games of bridge, backgammon and Go. Hubert was a keen bridge player, but he and Tom formed an unlucky partnership. One April evening, they were doing better than usual against a pair of near experts whom Tom had met at university.

All went well, until Tom picked up a hand rich in Aces and Kings. He and his father bid confidently to a Grand Slam. When Tom saw his father's hand as he placed it down as dummy, he sighed; their curse had struck. They held 36 of the 40 high card points, lacking only the King and Jack of Clubs. But their hands had identical distributions; each held precisely 5 spades, 4 hearts and 2 each of clubs and diamonds. Tom had the Ace and 2 of clubs; his father the Queen and the 3. There was no play, not even a finesse in clubs, for the Grand Slam.

His father was very angry and, totally unjustly, blamed Tom for over-bidding. Their partnership disintegrated and they lost quite a lot of money. Tom went out to a nearby chalet and found his new girl friend Fiona. She comforted him in the way that women do best. Tom returned in the early hours, exhausted and dishevelled but rather happier. He

decided to go for a long ski trip in the morning and get the events of the evening out of his system.

The next morning Tom got up early and went skiing off piste. He hardly spoke to his parents. As he travelled across country, well off the marked tracks, the sun was shining very brightly. As he skied, he tried to calculate the odds against last night's fiasco at the card table.

He came up with a probability of around 1 in 100 million – considerably less than winning the national lottery or being struck by an avalanche on a particular day. He thought his father might be in a more forgiving mood if presented with these statistics!

He was aiming to ski down to a little Col called Le Chapeau which had a nice cafe just beneath it. He could get some hot chocolate there and ski down the path and pick up a bus on the roadside to take him back to Chamonix. He knew that the ground was quite dangerous; he was a long way off an established piste. He felt reckless, he was still angry about the quarrel during the previous night's game of bridge.

He never heard the avalanche; he just felt a terrible thud as a displaced rock struck him and he fell, soon to be covered with snow. They found his body about a week later. His parents realised, immediately, what had happened. They knew the area around the cafe below Le Chapeau; it was a place that they often went in the summer. It was a fine place for flowers and butterflies – they had found both Large Blues and Apollos flying in the vicinity. When they heard the avalanche, they spent the afternoon in apprehensive fear; by the evening, when Tom had failed to return, they knew what must have happened.

It was the late summer, before the Robertsons could bear to return to their chalet in Chamonix. On the first day, they visited Tom's grave. Fiona, who had just told them that she was four months pregnant as a result of Tom's final night, came with them. They found a Camberwell Beauty sunning itself on Tom's new marble headstone.

Susannah remarked that she found butterflies a great comfort – a sign of the Resurrection. Fiona retorted, somewhat sardonically, that the Camberwell Beauty was also called the Mourning Cloak in America on account of its dark funereal underside. She added that in Germany it was called *Traumantel* which also means a funeral cloak. Its French name, *Le Morio*, seemed to have no obvious meaning.

Fiona, and this was a great sorrow to the grandparents of her prospective offspring, was a staunch unbeliever. She regarded all religion as dangerous and any talk of the future life as a meaningless sop invented to try and staunch the grief of bereavement.

Each time the sorrowful parents visited the grave, they were met by a Camberwell Beauty. It always greeted them by rising off the tomb, flying around the cemetery, visiting a buddleia for some nectar and returning to the headstone which had been well warmed by the afternoon sun.

It was several years before they could bear to return to Chamonix in April – the anniversary of Tom's untimely death. They had largely lost touch with Fiona and Thomas junior. Fiona had married another of Tom's friends. Their grandson was now aged four and they doted on him on the rare occasions that were allowed to meet him.

One spring, they plucked up courage and drove to Chamonix. It was a beautifully warm spring and there were avalanche warnings. They visited the graveside and were disappointed that the Mourning Cloak wasn't present. They had been told that the Camberwell Beauties were easier to see in the spring after hibernation. They decided that they must visit the fateful avalanche site at Le Chapeau.

They parked their car at the bottom of the woods and climbed up the steep track to the cafe. They enjoyed a hot chocolate, laced with whipped cream, and a patisserie. The proprietor told them to be careful; there had been an avalanche warning and he was packing up for the day.

Then they continued up the track to the little promontory called Le Chapeau. This was where the avalanche had struck down their only son some five years earlier. It all looked very peaceful; the snow was beginning to melt and the spring flowers were appearing.

Suddenly they both looked up towards the wood. A pair of dark butterflies emerged from some trees, chasing each other in the mad wild courtship flight that so many butterflies enjoy. The pair circled them – they recognised them instantly as Camberwell Beauties pursuing their springtime mating ritual. Hubert and Susannah smiled at each other.

The butterflies flew up a narrow path which had trees on both sides. Instinctively, Hubert and Susannah followed them. Briefly one of them settled on the stony path. The butterflies gavotted on ahead, and then turned and then flew back, again circling the grieving parents and then they continued up the path as if beckoning their watchers to follow. This process continued for about twenty minutes. Hubert and Susanna were getting quite breathless in their pursuit. Then quite suddenly, the

butterflies settled low down on the new leaf of a sallow bush. They touched antennae and started to walk round each other. This ritual lasted a few more minutes.

Then they were up in the sky again; circling around each other in an ever more frenetic dance. Eventually, they landed back on the same leaf. After a lot of fluttering of wings, they were joined in that mystical union so beloved of the Prayer Book which was still one of Hubert and Susanna's greatest comforts.

'I wish I had a camera,' remarked Hubert, 'or even a butterfly net. I've always fancied rearing some caterpillars'.

They continued to watch their butterflies. The union lasted over half an hour. Then the butterflies separated and flew off in different directions. They watched the female, the larger one, circling some sallow bushes. Hubert said that she was probably looking for somewhere to begin to lay her clutch of about five hundred eggs.

Hubert and Susanna decided to go back to the cafe for some lunch. They hadn't realised how late it was or how far they had wandered from Le Chapeau. Then they heard a terrible deep rumble. Instinctively, they moved into the shelter of the trees. The rumbling went on for about twenty minutes. The main sound was below them in the direction from which they had come. When they tried to get back down the track towards Le Chapeau it was blocked by the newly displaced mounds of snow.

Fortunately as they had a map, they were able to continue on the path along which the butterflies had led them. It then took them across the mountain to a ski station below the Mur du Glace, below Mont Blanc. They were able to get some lunch there and to exchange news about the avalanche. Apparently, the little cafe had been buried, but fortunately there had been no customers present and the owners had somehow survived. Le Chapeau had once again borne the brunt of the slide.

Hubert and Susannah walked down the long path to Chamonix in silence. Each was wrapped up in their own thoughts. Each was thinking, but too ashamed to tell the other, that they rather wished the Camberwell Beauties hadn't deflected them and they had died together near the spot where their beloved Tom had perished. Both reflected aloud that it was probably the sighting of courting butterflies which had saved them from the avalanche. Inwardly, they each, felt a little ungrateful to Providence which had spared them but not their only son.

When they got home, they sought out Fiona and told her what had happened. She was deeply moved. She remarked, 'I am sorry, I have

rather neglected you. I still haven't quite got over Tom's death. I am reminded of him every day when I see his young son. He looks so like him. But he will need his grandparents and I will make sure that you see more of him. Perhaps one day, you will take him to Chamonix and show him the Mourning Cloaks'.

That conversation proved quite a turning point. Relationships were healed and wounds bound over. Tom was often allowed to stay with his grandparents. When he was eight, they all went on a holiday to Chamonix. Fiona and her husband, Ed, were good bridge players. They persuaded Hubert to take up the game once more. He became a quieter, better, player and he never criticised his wife in the way that he criticised Tom on that fateful night.

One summer's day, they took Tom junior to the graveside. A Camberwell Beauty was flying around the graveyard, just like the one from a previous generation all those years earlier. Hubert and Susanna remarked on their belief that the butterfly was a sign of the Resurrection. They told Tom about the first Easter Day and the transformation in the disciples. They explained about the Empty Tomb and mentioned the folded grave clothes – 'just like an empty chrysalis', Hubert added.

Tom junior smiled, with the knowing disdain of a young man in his eighth year, and said, 'Mother says that any such beliefs, in a future life, are based on a serious misconception!'

That night Hubert and Susanna went to bed quite late. They reflected on the day. Suddenly Susanna burst into uncontrollable laughter. Eventually Hubert asked, slightly irritably,

'What's so funny?'

Susanna looked up and smiled sweetly.

'It was what our grandson said about evidence for the resurrection being based on a serious misconception. Think! If a serious misconception had taken place on our Thomas's last earthly night, little Tom wouldn't be around to cheer us up in our old age!'

They both slept well that night. For the first time, they were both feeling glad that the second avalanche had missed them. Strangely they both dreamt about mating Mourning Cloaks! Rather, unusually, they talked about their dreams. Very diffidently, Hubert mentioned his feelings about the second avalanche. Susanna smiled knowingly and nodded in agreement. They travelled home feeling that the wounds of the past were almost healed and their faith in the Resurrection was somewhat strengthened. Sadly, Fiona and little Tom remained equally sceptical.

AES Publications

Amateur Entomologists' Society

NEW PRICES AS FROM 2nd OCTOBER 2011

Dipterists Handbook (Second Edition) edited by Peter Chandler (with contributions by 42 other authors)
This Handbook provides a work of reference for everyone interested in the study of flies, both beginners and experienced dipterists.

As in the first edition great emphasis has been placed on the habitats and biological associations of flies. Among the authors are specialists in each field of study so it has again been possible to bring together a summary of the latest knowledge of all aspects of the biology of Diptera at the species level.

There are additional subjects not covered in the first edition including Forensic entomology and an explanation of the classification of Diptera and a bibliography of key works for the identification of both adults and larvae. Some specific habitat associations are covered in greater detail to reflect increased ecological knowledge of flies and the greater significance now being placed on some habitats in the conservation of Diptera. 525 pages with 32 colour plates and 45 text figures. **£ 46.66**
Members price **£ 38.66**

British Butterflies throughout the year by Peter May
This new book from the AES describes the adults of different species of British butterflies, according to the time of year they appear on the wing. Nearly all the 60 British species are illustrated. Focussing on encouraging an interest in entomology among the young, and the young at heart, there is a helpful calendar of flight times and a useful checklist to help you keep track of your observations. **£ 5.42**
Members price **£ 4.42**

Preparing and maintaining a collection of Butterflies and Moths
by P. May and M. White. A practical manual detailing the various methods used to prepare specimens for a collection, from killing methods, setting the specimens and repairing damaged ones, to storage and preservation, including pest prevention and cure. 21 pages. 4 figures and 5 plates. (2006)
£ 5.42
Members price **£ 4.42**

The Hymenopterist's Handbook by Dr. C. Betts *et. al.*
2nd edition dealing with the history of their families, classification and structures; natural history; studying, collecting, breeding, attracting and preserving Hymenoptera. Appendices include keys to the families. 214 pages with numerous tables, keys and figures (1986) **£ 11.23**
Members price **£ 8.48**

Revised Flight Tables for the Hymenoptera
Revised flight tables for the Hymenoptera giving, wherever possible, times, location, flower visits and some indication of distribution and abundance. 24 pages (1988) **£ 3.17**
Members price **£ 2.92**

A Coleopterist's Handbook
Edited by J.Cooter & M.V.L.Barclay The *Coleopterist's Handbook*, is now available as a fully revised and expanded fourth edition. Nomenclature has been brought inline with current use, collecting/curatorial methods reflect best practice and plant/beetle and beetle/plant lists are included together. Recent additions to the British fauna, modern and traditional techniques are included. All advice and comment given in the book is based upon collective years of practical experience of both curatorial methods and field craft; beetle family chapters have each been written by an internationally recognised authority. 496 pages including 32 colour plates. **£ 50.90**
Members price **£ 39.90**

Host plants of British Beetles: A List of Recorded Associations
A list of a wide range of plants, in alphabetical order, together with the beetle species that have been recorded as being associated with them. 24 pages (1992) **£ 3.17**
Members price **£ 2.92**

A Silkmoth Rearer's Handbook by B.O.C. Gardiner
SPECIAL OFFER PRICE **£ 8.61**
No further discounted price available

Rearing and Studying Stick and Leaf-Insects by P. D. Brock
Specifically intended for beginners, although it is also suitable for experienced Phasmid enthusiasts, it is one of the few guides to rearing that features the majority of the culture stocks available, 22 species in detail. The informative text is complimented by 8 colour plates, 14 black and white plates and 29 figures. (New edition, 2003) **£ 8.73**
Members price **£ 7.73**

The Study of Stoneflies, Mayflies and Caddisflies by T.T. Macan
A comprehensive guide to collecting and studying the biology and ecology of these aquatic insects. 44 pages, 10 figures and bibliography (1982) **£ 3.92**
Members price **£ 3.42**

Breeding the British Butterflies by P.W. Cribb
A practical handbook covering all aspects of butterfly breeding, including general techniques, equipment and hints on how to breed each of the British species. 60 pages, 6 figures, 5 plates, Revised (2001) **£ 6.42**
Members price **£ 4.92**

Practical Hints for the Field Lepidopterist by J.W. Tutt
Written at the turn of the century, this book has been reprinted because of its scarcity and value to students of Lepidoptera. It gives a complete month by month guide to which species and stages of macros and micros to look for and how to find them. Also contains a biological account of the early stages and how to keep, rear, photograph and describe them. 422 pages. Hardback. (Reprinted 1994). **£ 23.15**
Members price **£ 18.15**

An index to the modern names for use with J.W. Tutt's Practical Hints for the Field Lepidopterist by B.O.C. Gardiner
A valuable cross-reference guide between the scientific and English names used in the early 1900s and the present time.
£ 4.42
Members price **£3.92**

A Guide to Moth traps and their use by R. Fry and P. Waring
The first sections deal with the measurement and properties of light leading into the types of lamp available and the electrical circuits needed to operate them. The next sections give details of the construction of the most popular traps used in the UK. The last half deals with the practical use of traps in the field including where and when to trap, limitations of traps and their relative performance. 68 pages, 21 figures, 15 plates (1996)
£ 7.42
Members price **£ 5.92**

The Amazing World of Stick and Leaf Insects by Paul D. Brock
A superb, comprehensive guide, for all those intrigued by these groups of insects. Topics covered include structure, fascinating facts, life history and development, defence behaviour, enemies, collecting, breeding (including trouble shooting), preserving, taxonomic studies, important collections in Museums etc. around the world and elaborate stories, beliefs and poems. Also outlines the major known species around the world on a regional basis. A section on Fossils is included. Includes a comprehensive glossary of the technical terms used in the description and classification of stick and leaf-insects. Hardback A5, 184 pages, 46 figures, 26 black and white plates and 40 pages of colour plates (containing 83 photographs and 4 drawings/paintings of insects and their habitats). (1999)**£ 16.26**
Members price **£ 13.76**

Rearing Parasitic Hymenoptera by M. Shaw
This booklet provides information on the parasitic Hymenoptera to enable successful studies to be made of this little understood group of the British insect fauna. Details are given on the general biology of parasitic wasps, rearing principles, efficient rearing practices and detailed methods of dealing with adult wasps. 52 pages, 4 colour plates (New edition – 2001) **£ 6.42**
Members price **£ 4.92**

Larval Foodplants of the British Butterflies by Peter May
A comprehensive compilation of the known larval foodplants of our native and immigrant butterflies. Also including "How to Encourage Butterflies to Live in Your Garden" by the late Peter Cribb 62 pages. (2003) **£ 7.92**
Members price **£ 6.17**

The larger water beetles of the British Isles by Peter Sutton
For those who love the spectacular larger water beetles of the British Isles, this is the publication that you have been waiting for! It is the only modern publication with colour illustrations of all of our aquatic coleopteran megafauna and it provides the most up-to-date distribution maps revealing their current distributions. Jam-packed with fascinating details of their life-histories, this book covers 11 species including the 6 native 'Great Diving Beetles' and the 'Silver Water Beetles'. It is also copiously illustrated with text figures and has much additional information including details of observed climate-induced range changes and the conservation measures required to ensure their continued survival. **£ 10.73**
Members price **£ 8.23**

Glossary for the Young Lepidopterist **£ 2.08**
6 pages, 2 figures. (1951) *Members price* **£ 2.08**

A Label List of European Butterflies **£ 2.92**
20 pages. (Revised 1981) *Members price* **£ 2.67**

Some British Moths Reviewed
Aid to the identification of some of the more difficult species. Reprinted from the *Amateur Entomologist* Vol. 5 (1941) and a *Guide to the Critical Species of Lepidoptera*, reprinted from *Entomologists' Gazette* 1969-72. 64 pages, 6 black and white plates, numerous figures (1985) **£ 4.17**
Members price **£ 3.67**

Butterflies of Cyprus 1998 (Records of a years sightings) by Eddie John
Observations of the 44 species of butterfly found on the island in 1998 including notes on each species and distribution maps. 46 pages (2000) **£ 4.92**
Members price **£ 3.92**

Collecting Het.Bugs (Hemiptera: Heteroptera) **£ 1.83**
12 pages (including 2 plates). (1946) *Members price* **£ 1.83**

Collecting Clearwings
12 pages (including 2 plates), 4 figures. (1946) **£ 1.83**
Members price **£ 1.83**

Collecting Lacewings
9 pages, 8 figures, 5 plates. (2nd edition 1976) **£ 2.42**
Members price **£ 2.42**

An Amateur's Guide to the Study of the Genitalia of Lepidoptera
16 pages, 15 figures. (1973) **£ 2.42** *Members price* **£ 2.17**

Rearing the Hymenoptera Parasitica **£ 2.42**
16 pages, 1 plate, 10 figures. (1974) *Members price* **£ 2.17**

Rearing Crickets in the Classroom
12 pages, 2 plates. (1986) (Reprinted 1993) **£ 2.08**
Members price **£ 1.83**

Guidelines for Entomological Site Surveys
Published on behalf of the JCCBI. 7 pages (2000) (Reprinted 2003) **£ 3.08**
Members price **£ 2.83**

The Journal of the Entomological Exchange and Correspondence Club 1935-1936
An AES Jubilee Publication. Fascinating reprint of the very first volume of the AES journal. 100 pages. **£ 3.42**
Members price **£ 2.92**

All the above publications sent post free to U.K. addresses. Outside U.K. please add 10% to order value for postage by surface mail. For postage by air-mail outside Europe please add 30% to order value. Please allow 28 days delivery.

Please make all cheques/postal orders payable to 'AES Publications' and send to:
AES Publications, 1 Tower Hill, Brentwood, Essex CM14 4TA.
Telephone 01277 224610 • Fax: 01277 262815 • E-mail: aespublications@btconnect.com

A new book by Sonia Copeland Bloom

This is the third book in the *Tales and Truths* Series published by the AES, and is about Eddie the Earthworm and his friend Ellie, who turn a problem into a solution and save the day when an important worm gathering threatens to be a disaster!

These books consist of an engaging story about a minibeast supplemented by factual sections, including how to look after them as pets.

HOW TO ORDER

To order please send a cheque for the correct amount to:
Tales and Truths, PO Box 8774, London SW7 5ZG
Or visit the AES online shop:
http://shop.amentsoc.org

Members' price £3.50 post free
(Non-members' price £5.50)

AES Membership Rates 2012

Membership of the Society runs from 1st January to 31st December each year. New members will receive all publications published during the year of enrolment subject to availability, except for those joining on or after 1st October.

Any member joining on or after 1st October will be deemed to have joined for the following year unless he or she specifically requests membership for the current year. If such a request is made, the publications already published that year will be sent with the enrolment confirmation letter and the remaining ones will be sent when they are published. A further membership subscription will be necessary for the following year.

If you have any queries about membership please contact us via the website, www.amentsoc.org or PO Box 8774, London SW7 5ZG

Individual Adult Membership

Membership sub-category	UK	Overseas
Bulletin only	£20.00	£25.00
Entomologist's Record only	£25.00	£30.00
Bug Club Magazine only	£20.00	£25.00

Individual Bug Club / Junior Membership

Membership sub-category	UK	Overseas
Junior under-18 (*Bug Club Magazine* only)	£12.00	£17.00
Junior aged 13-17 (*Bullerin* only)	£12.00	£17.00

Family or Combined Membership

Membership sub-category	UK	Overseas
Bulletin & Entomologist's Record	£40.00	£45.00
Bulletin & Bug Club Magazine	£28.00	£33.00
Entomologist's Record & Bug Club Magazine	£35.00	£40.00
Bulletin, Entomologist's Record & Bug Club Magazine	£48.00	£53.00

Associate / Institutional Membership

Membership sub-category	UK	Overseas
Bulletin only	£20.00	£25.00
Entomologist's Record only	£50.00	£55.00
Bug Club Magazine only	£20.00	£25.00
Bulletin & Entomologist's Record	£65.00	£70.00
Bulletin & Bug Club Magazine	£28.00	£33.00
Entomologist's Record & Bug Club Magazine	£65.00	£70.00
Bulletin, Entomologist's Record & Bug Club Magazine	£75.00	£80.00

The Amateur Entomologists' Society
PO Box 8774, London SW7 5ZG
www.amentsoc.org

The
Bulletin
of the Amateur Entomologists' Society

Volume 71 • Number 500 February 2012

CONTENTS

Printed by Cravitz Printing Co. Ltd., 1 Tower Hill, Brentwood, Essex CM14 4TA.