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Cover photograph: A caddisfly, *Limnephilus affinis Curtis* (Trichoptera: Limnephilidae), from Hyde Park, London, 2003. Photo: Peter Barnard.

**NOTE:** The Editor invites submission of photographs for black and white reproduction on the front covers of the journal. The subject matter is open, with an emphasis on aesthetic value rather than scientific novelty. Submissions can be in the form of colour or black and white prints or colour transparencies.

# THE 2002 PRESIDENTIAL ADDRESS – PART 2
# A HISTORY OF FISHING FLIES

PETER C. BARNARD

*Department of Entomology, The Natural History Museum, Cromwell Road, London SW7 5BD*

During a lifetime's interest in freshwater insects I have always been fascinated by those species that are imitated by the artificial flies of anglers, even though I have never been flyfishing myself. Recently I became interested in the history of these fishing flies and, having begun to investigate how much we know of early artificial flies, I wondered just how good these imitations really need to be. It soon became clear that this question has exercised fishermen for a long time, and the debate continues today!

Ancient Egyptian tomb paintings include several pictures of people fishing with rod and line, though it is not clear what bait they may be using. One such picture has a fly hovering over the water next to the fisherman, but its presence seems to be accidental. The first written record of flyfishing seems to be by the Roman author Claudius Aelianus (known as Aelian) in his work *On The Nature of Animals*, ca. 200 AD, where he describes speckled fish (which must be native trout) in Macedonian streams feeding on flies that hover above the river, said to be the colour of a wasp and humming like a bee! These sound most like hoverflies, but later authors have speculated on whether they could have been some kind of mayflies. But the local Greek fishermen were said to have made artificial flies by tying red wool round a hook and attaching two red feathers, and these are described as irresistible to the trout.

Although we have to assume that flyfishing continued in some form in several European countries there is the usual gap in the written word until the Middle Ages. But in 1496 a book called *The Treatyse of Fysshynge wyth an Angle* (i.e. with a hook) was published in St Albans, of which an original manuscript exists (McDonald, 1957). The first page of the printed book shows a remarkably modern-looking fisherman (Fig. 1) but sadly there are very few illustrations, one notable exception being a drawing of many different sizes of hooks which, in the days before tackle-shops appeared, had to be hand-made. But most important from our point of view is that the *Treatyse* contains the descriptions of twelve patterns of artificial flies, including details of how to tie them using different colours of wool, feathers and silk thread. Unfortunately the flies are not illustrated and it is difficult to follow the tying instructions, though several modern fishermen have made intelligent reconstructions. All are what would be considered as simple patterns nowadays, and some of their names such as "Stone Fly" and "Dun Fly" are similar to those of modern forms, but from an entomological viewpoint it is frustrating that we cannot be sure which natural flies they were imitating. The book was so popular that it was reprinted many times over the next century, and was later combined with other books on hawking and hunting.

No new fishing books were published for over a century, from 1496 to the end of the sixteenth century. Then in 1620 appeared *The Secrets of Angling* by William Lawson containing just one picture of a fly, unfortunately such a crude illustration that we cannot tell whether it is an artificial or a natural, but at least it is the first published illustration of a fishing fly. Perhaps we should not be too hard on Lawson, because many books at that time contained very crude figures which do not necessarily reflect the quality of the original drawings. A good example is the first

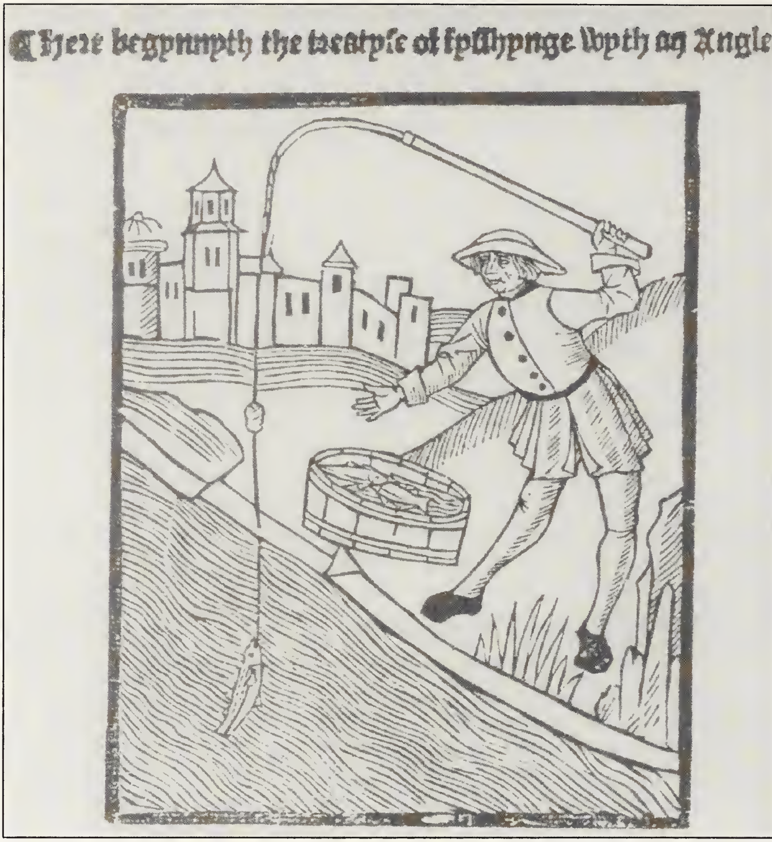


Fig. 1. First page of *The Treatyse of Fysshynge wyth an Angle* (1496).

book on entomology published in Britain, Thomas Moffet's *Theatrum Insectorum* (1634). It contains very crude woodcuts of insects, not at all easy to recognise to species level, yet the original manuscript of Moffet's book, which still exists in the British Library, contains the original artist's watercolour paintings. These demonstrate that the standard of observation and quality of painting were actually very high, and were not done justice by the woodcuts, which were no doubt made as cheaply as possible to keep printing costs low.

A little later in the seventeenth century appeared *The Art of Angling* by Thomas Barker (1651) containing descriptions of fishing flies, but again with no pictures. This book was based largely on the *Treatyse* of 1496, with just a few new fly patterns, still of a very simple kind. Over the next few decades a handful of other fishing books were published, again with simple fly types, and with little original content. But in 1653 came a milestone, a book that everyone has heard of, Izaak Walton's *The Compleat Angler*. This became one of the most reprinted books of all time, yet its popularity is hard to explain. Walton seemed to know little about fishing, especially about flyfishing, yet he had a best-seller on his hands. He quotes unlikely tales from

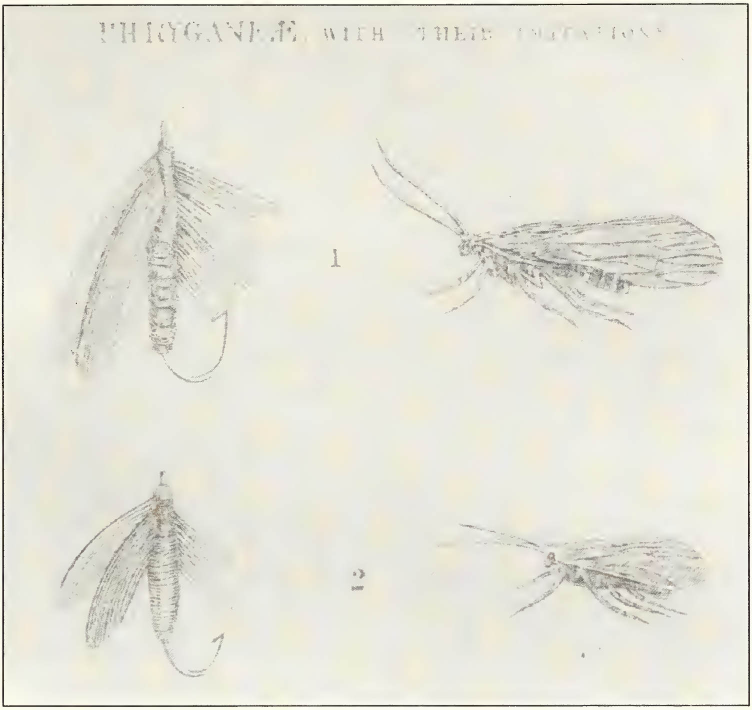


Fig. 2. Plate from *Salmonia* by Humphrey Davy (1828).

various sources without questioning their truth. But the book remains a very entertaining read even today and is still in print, having gone through over 400 editions and reprints. The artificial flies described by Walton are something of a disappointment, as he quotes the same names as the 1496 *Treatyse*, written 150 years before! However, he also describes many natural insects, including several kinds of caddisfly larvae which are easily recognisable. But, rather tantalisingly, he does not link these larvae with the adults (in fact he believed that caddisfly larvae gave rise to mayflies!), and so there is still no link between natural and artificial flies. In the fifth edition of *The Compleat Angler* (1676), a second section was added by Charles Cotton on fishing for trout or grayling, which included more about flyfishing. The two authors seemed an unlikely pair in many ways: Izaak Walton was a pillar of the church, from an upper-class family, whereas Cotton was fond of the high life and was the author of some rather bawdy poems (though they seem rather tame today). But the two became lifelong friends and continued to fish together. Cotton was a less entertaining author, but a far better fisherman than Walton.

We continue to be frustrated by the lack of illustrations in angling books until in 1662 *The Experienc'd Angler* by Robert Venables appeared. Venables was a colonel in the Roundhead army during the Civil War but in his later life he had the leisure time to write a book about fishing, and on the title page are a couple of tied flies, crude but recognisable as such. Up until this time anglers had to tie their own flies and, with the lack of published patterns, they presumably tried to match whatever flies they saw on their local river. But by 1681, in the back pages of a book called *The Angler's Vade-Mecum* by James Chetham, we find the advertisement of a fishing tackle maker in London, specifically mentioning artificial flies for sale, and by the middle of the eighteenth century such adverts were common. Also by 1700, books were beginning to contain more pictures of artificial flies, together with the natural flies, both adults and larvae, although the naturals and artificials were never linked together. Probably the most important book on fishing in the eighteenth century was *The Art of Angling* by Richard Bowlker (1774). This pocket-sized work contains descriptions of thirty artificial flies, all well illustrated, and was quickly followed by *A Concise Treatise on the Art of Angling* by Thomas Best (1787), which again had good illustrations of artificials, but again there was the frustration of not knowing which real flies they were imitating. As well as general angling books we begin to see specialised flyfishing works, such as the *The Flyfisher's Guide* by George Bainbridge (1816). This had the promising subtitle "Illustrated by colour plates representing upwards of 40 of the most useful flies, accurately copied from nature": it certainly had good plates of artificials, plus plates of natural flies, but again they were not linked to each other.

Most of us think of Sir Humphrey Davy as the famous physicist and inventor (of the miners' safety lamp, for example) and as President of the Royal Society. But he was also a keen fisherman, although he wrote nothing on the subject until the last year of his life and dictated a book called *Salmonia* on his deathbed in 1828. At first sight it looks like the answer to our entomological frustration, because it illustrates artificials and naturals side by side (Fig. 2), but sadly Davy failed to name any of the flies, just describing their appearance, and saying "I have not, however, the knowledge, or if I had, have not the time, to go through the lists of these interesting little animals". So even by around 1830 there was still no link between well-established patterns of artificial flies and the natural insects, which by this time were also becoming well-known and described in detail. Then, at last, the breakthrough came. In 1836 appeared Alfred Ronalds' *Fly-fisher's Entomology* the first book to combine entomology and fishing, at least in the title. Ronalds illustrated 47 natural flies, and combined them with their artificials on the same plate (Fig. 3). He named the artificials, and also named the natural insects on which they were based: he not only described how to fish with the artificials, but also described the life-histories of the naturals. This was the first bridge between the two disciplines of angling and entomology, and a measure of success is that this book, first published in 1836, went through twelve editions, with the last one as late as 1921, basically unchanged and with the same colour plates. It is worth noting that Ronalds' insect collection, on which he based these plates, still exists in the Hope Department, Oxford.

Ronalds' book had a considerable effect on other angling authors. Two different directions of flyfishing began at this time: the attempt to match natural insects as closely as possible, and another school which took fly-tying to an art in its own right. So in 1847 we have a book called *A Handbook of Angling* by Edward Fitzgibbon, published under the pseudonym of "Ephemera" which contains what today would be called fancy flies. Many of these large, complex, brightly coloured flies were used for salmon, some even for sea-fishing.

In an unpublished journal written in 1843 (but not published until 1995), A.J. Lane illustrates a fearsome multiple-hooked pike "fly", but of course pike, and indeed sea-fish, do not normally eat natural flies. Lane even suggests that one of the most successful pike flies is an imitation of a sand-martin! It may be preferable to call these creations artificial lures, rather than flies, as it is probably the bright colours

Fig. 3. Plate from *Fly-fisher's Entomology* by Alfred Ronalds (1836).

and the way the fly is fished that attract the fish, rather than a resemblance to any real fly. Returning to the school of good imitations of natural flies, in a book called *The Scientific Angler* by David Foster (1882) we find plates (Fig. 4) which follow the tradition of Ronalds (1836). All the flies are named and we also see larvae, including the hairy caterpillar of a moth. These, called Palmers, had been known as far back as Izaak Walton's time, yet it is not clear which caterpillar they imitate (possibly some that drop into the water accidentally) but they seem successful as fishing flies.

At the end of the nineteenth century we come to one of the great names in flyfishing literature, Frederic Halford. He wrote several books, but the most significant to the entomologist is *Dry Fly Entomology*, published in 1897. He benefited from the excellent entomological work that had been published in the late nineteenth century, e.g. R. McLachlan on Trichoptera and the Rev. A.E. Eaton on Ephemeroptera. Halford's book included 100 best patterns of tied flies, each with a highly complex set of instructions for tying them. Precise materials and colours were specified, for example the fly called Tup's Indispensable uses fur that for the right colour and consistency must be taken from the scrotal sac of a ram! The natural flies were much better illustrated than in previous angling books, showing complete life-

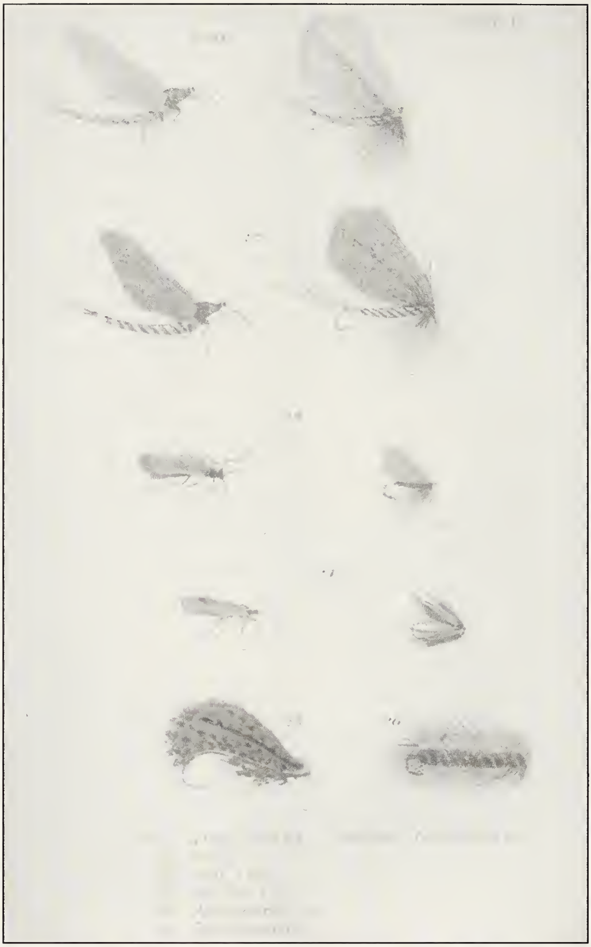

Fig. 4. Plate from *The Scientific Angler* by David Foster (1882).

cycles, though only in black and white figures (Fig. 5). After Halford's book there grew up enormously heated discussions about the merits of dry-fly fishing (i.e. using floating flies), wet-flies, and nymph-fishing. Halford reckoned that you could not imitate nymphs because you could not copy their movement, but he met his match in the shape of another well-known author, George Skues, who disagreed with almost everything Halford said. This is not the place to go into such arguments about different fishing methods, but clearly much depended on what the fish could actually see. Could they see colours, could they see fine details on a fly, did they see rising nymphs directly or reflected in the surface film? One man, Francis Ward, decided to test some theories, and built himself an observation pond from which he could see just above and just below the water surface. He decided that "even the most gaudy fly, seen against the surface of the water, merely appears a grey iridescent silhouette, and for this reason I do not think that the colour of the fly matters if the size be right


Fig. 5. Plate from *Dry Fly Entomology*, by Frederic Halford (1897).

for the condition of the water and the fly be fished so as to suggest life" (Ward, 1911). This led to more controversy, with the formidable Skues joining battle again, and in some ways this argument still rages today.

Getting back on our entomological track, another important book appeared in 1921, Martin Mosely's *Dry-fly Fisherman's Entomology*. Mosely was a well-known fisherman, who also worked at The Natural History Museum for many years on the taxonomy of Trichoptera, and his collection is still there. He felt that Halford's monochrome illustrations of natural flies were unsatisfactory, so he produced this book with colour plates as a pocket-sized supplement to Halford. The illustrations are rather small though of good quality. But for much of the first half of the twentieth century anglers were presented with a truly dreadful succession of books on freshwater insects, starting with *The Natural Trout Fly and its Imitation* by Leonard West (1912). West proudly proclaims at the bottom of his plates, "drawn by Leonard West from nature", but one has to doubt his powers of observation as all the wings are figured upside down, though this does not prevent the book from fetching high prices on the second-hand market! Similar books include Charles Wauton's *Troutfisher's Entomology* (1930) in which the illustrations are so poor as to be unrecognisable, and another pocket book *The Fly-Fisher's Flies* by Roger Woolley (1933), in which it is claimed that "anglers will find they are able to tell almost at a glance what natural fly is on the water": in fact the line-drawings are unbelievably crude and quite useless.

Thankfully things improved again after the Second World War, with the introduction of the famous New Naturalist series of books, of which one of the earliest was *An Angler's Entomology* by J.R Harris, published in 1952. Harris was a good angler and a good entomologist, and this was one of the first freshwater insect books to rely on colour photos, all taken from living or freshly killed specimens, though it has to be said that some plates were less successful. However, the text was the best to date, setting new standards for succeeding publications, and also had distribution maps. Slightly later, *Lake Flies and Their Imitation* by C.F. Walker (1960) went back to using paintings rather than photos, and harked back to the Ronalds' tradition of putting naturals and artificials on the same page. In recent years we have seen excellent identification guides to freshwater insects with top-quality photos or paintings. The variety of artificial flies now available commercially is staggering, with a recent dictionary of trout flies listing over 400 named patterns. The demand for more realistic imitations has led to some incredibly accurate copies of both adults and larvae of freshwater insects.

Whether the accuracy of the artificial, or its presentation to the fish, is more important, is the subject of constant discussion amongst flyfishermen. But I suggest that accurate fly-tying is the result of careful observation by the angler, and such an observant angler, who understands freshwater life, is sure to be more successful. Moreover, anglers have a vital role in monitoring population levels of some freshwater insects whose apparent declines are giving rise to great concern, especially on southern chalk-streams. Training courses are currently being developed for these fishermen to enable them to monitor some of the critical species on their rivers, and to build up a nation-wide database of their abundance, which will feed into existing recording schemes.

So I hope this brief travel through the history of flyfishing shows the links between the sport of fishing, the study of freshwater insects, and ultimately the conservation of some of those species of interest to the fishermen and of importance in freshwater ecosystems.

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## SHORT COMMUNICATION

**The 'pondweed' leafhopper *Macrosteles* (= *Erotettix*) *cyane* (Boheman) (Cicadellidae) rediscovered in Surrey.**—Kirby (1992, *A Review of the Scarce and Threatened Hemiptera of Great Britain, JNCC*) notes that *M. cyane* was known from only four localities in the U.K.; Epping Forest in Essex, Dallington Forest in Sussex, and Holmwood and Fifield (sic?) in Surrey, and lists it as RDBK. On 10.x.2002, I found it in numbers on a pond at Newdigate Brickpits, Surrey (TQ2042). Adults and nymphs were abundant on a large raft of *Potamogeton natans* L. growing in a large pond dug into clay. The pool was *ca.* 60 m × 15 m in area with a maximum depth of 1.5 m. The eastern half of the pond surface was covered in *P. natans*, whilst the western half was open and unvegetated. The *M. cyane* were most numerous furthest away from the shore on the densest rafts of pondweed, which were only accessible in chest waders. Here they were accompanied by *Mesovelia furcata* Mulsant & Rey (Hem: Mesoveliidae), *Gerris argentatus* Schummel (Hem: Gerridae), *Donacia versicolorea* (Brahm) (Col: Chrysomelidae) and various Diptera (dolichopodids and ephydrids). The Notable *Aquarius* (= *Gerris*) *paludum* (Fabricius) was abundant on the open water areas. The most curious occupant of one raft was a crab spider *Xysticus cristatus* (Clerck) (Thomisidae), which was over 5 m from the shore but moving around and stalking Diptera with little concern for its somewhat precarious existence. *Pirata praticus* (Clerck) (Lycosidae) were also present but were more accustomed to living above water, and were accomplished film walkers.

Previous records suggest the bug is associated with small water bodies. This is not the case at Newdigate, but the pond was somewhat sheltered by clay banks and trees and not heavily affected by wave action. The hoppers were accomplished at landing and taking off from the surface film when driven from the pondweed leaves, and were tricky to capture. Both nymphs and adult males were a very distinctive blue colour, but this was in the form of a powdery bloom, which was rapidly lost on captive specimens, and in the setting process. This powdery coating may help waterproof the bugs. The surface beneath this bloom is a very dark blue colour. Adults were much more numerous than nymphs (*ca.* 10:1).

Newdigate is only a couple of kilometres south of Holmwood, so it is possible that the species has had a continuous presence in the area.—J. S. DENTON, 2 Sandown Close, Alton, Hants GU34 2TG.

# INVERTEBRATE CONSERVATION IN THE UK – THE ROLE OF INVERTEBRATE LINK (JCCBI) AND THE BRITISH ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY

O. D. Cheesman[1] and J. W. Phillips[2]

[1]*CABI Bioscience, Bakeham Lane, Egham, Surrey, TW20 9TY,* [2]*"Maytime", St Peter's Road, Northney, Hayling Island, Hampshire, PO11 0RT*

This paper reviews the involvement of the British Entomological & Natural History Society (BENHS) with Invertebrate Link (JCCBI), and their current contribution to invertebrate conservation in the UK.

## Review of the Role of Invertebrate Link (JCCBI)

First formed in 1967 as the Joint Committee for the Conservation of British Insects, the name was later changed to reflect coverage of non-insect groups, becoming the Joint Committee for the Conservation of British Invertebrates. More recently, the name has been changed again to Invertebrate Link (JCCBI) the shortened form InvLink is used here. The new name reflects the Committee's key role as a 'link' body, analogous to Wildlife & Countryside Link (a broad forum of UK voluntary environmental organisations, see *http://www.wcl.org.uk/home.shtml*) or Plantlife Link (a forum of UK botanical societies and conservation organisations, convened by Plantlife). Membership of InvLink, and the right to send no more than two representatives to meetings, is open to any UK or country-level body with an interest in the conservation of British invertebrates (see Annex 1 for the current InvLink membership), although the Committee largely confines its attention to terrestrial and freshwater faunas. The full Committee meets twice yearly, but its work is advanced in interim periods by a sub-committee, the Executive (see Annex 2 for current membership). Working Groups may also be formed to pursue particular issues (like that recently established to help co-ordinate invertebrate input to the forthcoming review of UK Biodiversity Action Plan Priority Species – see the InvLink notice published elsewhere in this volume). Over the years, the Committee has produced a number of well-regarded documents, in the form of codes of practice and policy statements, examples of which are summarised in Table 1. It has also organised a series of conferences, the latest of which is planned for 3 April 2004 (details available through Buglife, see website address below). InvLink provides a unique forum for the exchange of information and views amongst a wide range of bodies involved in invertebrate conservation in the UK. This role has been enhanced recently by the abolition of observer status for the country conservation agencies and other statutory bodies, which now enjoy full membership status on the Committee. In order to effectively discharge its roles and responsibilities, InvLink relies on committed individuals who can speak on behalf of those organisations represented on the Committee.

Perhaps the most significant InvLink initiative in recent years has been its pivotal role in the establishment of Buglife – the Invertebrate Conservation Trust (BICT), which now exists as an independent entity (see *http://www.buglife.org.uk*). Hence, there are now two bodies with a specific remit to further the conservation of all invertebrates in the UK. Whilst a range of societies, agencies and other institutions (many of them members of InvLink) are contributing to this goal, these two bodies are the only ones dedicated specifically to this task. Unlike InvLink, BICT has the

Table 1. Examples of tangible outputs from Invertebrate Link (JCCBI)

**Lists of rare and endangered British insects**
Amongst the first attempts to formally recognise those species in need of particular conservation attention.

JCCBI 1973a. British Macrolepidoptera: rare and endangered species and forms. *Entomologist's Monthly Magazine* **108** [1972]: 179–180.

JCCBI 1973b. British Odonata and Orthoptera: rare and endangered species. *Entomologist's Monthly Magazine* **109**: 50.

JCCBI 1973c. Rare and endangered species – general list. *Entomologist's Monthly Magazine* **109**: 250–251.

**Code for insect collecting**
A widely cited guide to good practice in insect collecting. First published in 1969; revised and re-issued in 1987; recently revised and re-issued as:

Invertebrate Link (JCCBI) (2002). A Code of Conduct for Collecting Insects and Other Invertebrates. *British Journal of Entomology and Natural History* **15**: 1–6.

**Code for insect re-introductions**
A widely cited guide to good practice in the re-establishment of insect populations.

JCCBI 1986. Insect re-establishment – a code of conservation practice. *Antenna* **10**: 13–18

**Guidelines for invertebrate site surveys**
Brooks, S.J. 1993. Joint Committee for the Conservation of British Invertebrates: Guidelines for invertebrate site surveys. *British Wildlife* **4**: 283–286. Also available as AES Leaflet 38 – *Site survey guidelines*.

**Conference proceedings**
Brooks, S.J., ed. (1997). *Unity of purpose for invertebrate conservation: maintaining the biodiversity of British invertebrates*. Proc. 1st JCCBI Conference, Peterborough, 24 February, 1996, 48pp.

Brooks, S.J. & Stubbs, A.E., eds. 1998. *How to give invertebrates a higher profile in conservation*. Proc. 2nd JCCBI Conference, Peterborough, 27 September 1997, 74 pp.

**Others** (unpublished JCCBI)
Lott, D. & Stubbs, A.E. 1999. *Guidelines to local BAP groups on the selection of priority habitats for invertebrates*. (Unpublished, JCCBI.)

Willing, M.J. 2000. *JCCBI Green Paper: Towards establishing a national invertebrate conservation co-ordinating body – The Invertebrate Conservation Trust*. (Unpublished, JCCBI.)

facilities to manage specific, funded projects. Hence, BICT is better placed than InvLink to implement specific initiatives involving conservation action 'on the ground'. BICT also has a full-time staff, and is therefore relatively well-placed to provide a rapid response to particular incidents or circumstances when there is no opportunity for the wider invertebrate interest and conservation community to do so through InvLink. Furthermore, whilst BICT will hopefully develop a strong public identity, there is not such an immediate need for InvLink to do so. This will put BICT in a better position than InvLink to take the lead on public advocacy ('campaigning') for invertebrate conservation, leaving the Committee to concentrate on issues relating to strategy, policy, and the promotion of appropriate principles and best practice.

InvLink provides a unique mechanism for the direct exchange of information between members of the UK invertebrate interest and conservation community and for the development of collective views. This includes policy-level advocacy ('lobbying'), at least in those instances when a considered, unified view from across the invertebrate interest and conservation community would carry more weight than individual submissions. However, there may also be occasions (e.g. when insufficient time is available to agree a common position) when individual submissions from organisations represented on InvLink would be more appropriate as part of a lobbying process. There may also be occasions when not all of the organisations represented on the Committee feel able to 'sign up to' a particular set of views expressed by InvLink. This can be accommodated by the omission of the names of such organisations from any presentation of those views. However, the Committee strives as far as possible to develop views based on a broad consensus.

In summary, InvLink exists to advance the conservation of invertebrates in the UK by facilitating exchange of information between relevant organisations and statutory bodies, and by providing a context for co-operative ventures in relation to the development of strategy, policy, principles and best practice. Its main roles and responsibilities are those directly relating to:

- Provision of a forum for the free flow of information between organisations and statutory bodies involved in invertebrate conservation in the UK, with an emphasis on terrestrial and freshwater faunas, and on *in situ* conservation measures.
- Stimulation of debate, discussion and ideas towards the enhanced conservation of invertebrates in the UK, particularly through collaborative working amongst those bodies represented on the Committee.
- Production of specific guidance to the wider invertebrate interest and conservation community (specialists, academics, conservation practitioners, etc.) and policy makers, through the development and dissemination of codes of best practice, statements of principles, etc.

## Review of the role of the BENHS

The membership of the BENHS includes a significant proportion of the leading field entomologists in the UK. As befits its position in the entomological world, the Society is committed to broad conservation aims. However, in the current climate, it could be argued that it should become more involved in practical conservation initiatives. The major obstruction to this has always been the lack of any full-time paid employees, the functioning of the Society being totally dependent upon volunteer labour and the dedicated efforts of its Officers and Council.

The Society has, from inception, supported and been represented on the Joint Committee for the Conservation of British Insects, now Invertebrate Link (JCCBI). Many of the Society's members contribute to conservation in various different ways, in addition to being members of the Society, for example by supporting other allied organisations such as the RSPB, Amateur Entomological Society, Royal Entomological Society, Butterfly Conservation, Dipterists Forum, Bees, Wasps and Ants Recording Society and Wildlife Trusts. The amassing of species records and their submission to National Recording Schemes is a major element in monitoring our indigenous fauna, and a number of BENHS members contribute in this way. Published species records, like those appearing in articles and exhibition reports in the Society's journal, are also valuable for assessing and monitoring species distribution patterns. A review of UK Biodiversity Action Plan Priority Species is due to be completed in 2005 (see the InvLink notice published elsewhere in this volume), and it is hoped that significantly more BENHS members will be able to undertake survey work on species selected from the new lists, as and when they are published. The Society's strength has always lain in the in-depth expertise of its membership, which is second to none and covers all Orders of invertebrates, coupled with its world-renowned publications and journal. These, together with organised field and indoor meetings and retention of reference collections, make an invaluable contribution to entomology in general and conservation in particular.

In 1994, the Society's Conservation Working Group (CWG) was founded, primarily based upon the enthusiasm of Stephen Miles (President 1999), with the aim of undertaking specific activities that could bring to bear the expertise of members on matters relating to the conservation of the UK's invertebrate fauna. It is fair to say that the response to this initiative from the general membership was somewhat disappointing, and is probably reflected by the position that the Society currently holds in relation to practical conservation measures. However, the members who expressed an interest in this branch of the Society's activities have, with the limited available resources, attempted to enhance the profile of the Society in various ways (e.g. see Phillips & Dobson, 1998).

From 1994–1999 Invertebrate Identification Days were held for the Hampshire and Herefordshire Wildlife Trusts and for the RSPB in Suffolk, and it is hoped that similar initiatives will continue over the coming years. During the last four years, the Society has been involved in Butterfly Conservation's Action for Threatened Moths Project (Parsons *et al.*, 2000; Phillips, 2000), and has assisted them in the assessment of the status of some Biodiversity Action Plan Priority Species, namely: the Barred Tooth-Striped *Trichopteryx polycommata* (D. & S.), the Square-spotted Clay *Xestia rhomboidea* (Esper), (e.g. Young, 2001); and the Brighton Wainscot *Oria musculosa* (Hübn.).

Another major undertaking has been becoming Lead Partner for the Heathland Flies Project; this involves a five-year programme of survey work to assess the ecology and relationships between the Mottled Bee-fly *Thyridanthrax fenestratus* (Fallén); the Heath Bee-fly *Bombylius minor* L., and the hoverfly *Chrysotoxum octomaculatum* Curtis, together with the sphecid wasp host *Ammohpila pubescens* Curtis. This work is co-ordinated by Stephen Miles. A working plan of research into the life history of these species has been going on between 1990–2003, involving up to 25 BENHS members (and some non-members), from the home counties to as far north as the Isle of Man. It is hoped that, by disseminating the results and their heathland management implications, the Society will influence those tasked with the management of vulnerable heathland areas to take into account the conservation of these and similar dependent species.

In conclusion, it should not be forgotten that the Society (in line with its charitable status) manages two funds; namely The Maitland Emmet BENHS Research Fund and The Professor Hering Memorial Research Fund, which enable grants to be made to research projects of a conservation nature on an annual basis.

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## Annex 1: Organisations currently represented on Invertebrate Link (JCCBI)

Action for Invertebrates
Amateur Entomologists' Society
Ancient Tree Forum
Balfour-Browne Club
Biological Records Centre
British Arachnological Society
British Dragonfly Society
British Entomological & Natural History Society
British Myriapod & Isopod Group
Buglife – The Invertebrate Conservation Trust
Butterfly Conservation
CABI Bioscience
Conchological Society of Great Britain & Ireland
Countryside Council for Wales
Department for Environment, Food & Rural Affairs (Defra)
Dipterists' Forum
English Nature
Environment Agency
Forestry Commission (Forest Research)
Joint Nature Conservation Committee
National Trust for England, Wales & Northern Ireland
Natural History Museum
Royal Entomological Society
Royal Museum of Scotland
Royal Society for the Protection of Birds (RSPB)
Scottish Natural Heritage
The Wildlife Trusts

## Annex 2: Current membership of the Invertebrate Link (JCCBI) Executive

Mike Morris [President, Invertebrate Link (JCCBI)]
Oliver Cheesman [Chairman, Invertebrate Link (JCCBI)]
Nigel Bourn [Convenor, Invertebrate Link (JCCBI)]
David Lonsdale
Alan Stubbs
John Phillips

# NOTES ON THE DISTRIBUTION AND HABITATS OF SOME SPECIES OF BRITISH HEMIPTERA

M. D. EYRE[1,2], J. C. WOODWARD[2] AND M. L. LUFF[2]

[1]*Entomological Monitoring Services (EMS), 13 Manor Grove, Benton, Newcastle upon Tyne NE7 7XQ,* [2]*Centre for Life Sciences Modelling, School of Biology, The University, Newcastle upon Tyne NE1 7RU. mickeyre@blueyonder.co.uk*

ABSTRACT

Recent invertebrate survey work has generated a considerable number of Hemiptera records which has increased knowledge of both species distribution and habitat preferences. Records of nationally rare and scarce species are given, together with information on range expansion and habitats for several more common species. Most records were generated in northern England and Scotland, with some from West Yorkshire and the London area. The quality of the available information concerning Hemiptera species distribution is discussed.

## INTRODUCTION

With an increase in the amount of invertebrate survey work being carried out for national conservation bodies and as a part of the land development process in the UK, records of a considerable number of Hemiptera species have been generated in the past decade. Our work has been concentrated in northern England but we have information from a number of Scottish areas and from north London. It rapidly became apparent that the habitat and distribution information in the recent literature of the review by Kirby (1992) or in the RECORDER package (Ball, 1997) were, in a number of cases, inaccurate or absent, even for common species.

Information is given below for a number of species for which there are new distribution data or for species recorded from habitats not previously identified. These data have been generated during surveys for a number of invertebrate groups using a mixture of pitfall trapping, suction and sweep sampling. However, it should be understood that there was no attempt to record rare or scarce species. Site national grid references, vice-county numbers and date of sampling are given in the Appendix. Where sites cover a number of 1 km grid squares the numbers in the text are referable to those in the Appendix.

## NOTEWORTHY RECORDS

### HOMOPTERA

#### Cercopidae

*Cercopis vulnerata* Illiger

This obvious species is common in the south of England with its northern limit given in RECORDER as being about the River Tees. It occurred on dunes just to the south of Teesmouth at Coatham but was also recorded from chalk waste heaps at Prudhoe (sites 2 & 3) and from near the confluence of the Rivers North and South Tyne, both in Northumberland.

#### Cicadellidae

*Agallia brachyptera* (Boheman)

A northern and eastern nationally scarce species (Kirby, 1992), most previous records were from mainly dry sites with a number from disturbed ground. These conditions prevailed where the species was found on a number of post-industrial sites such as the chalk heaps at Prudhoe (sites 1, 2 & 3) and on riverine sediments at Dilstonhaugh and near the confluence of the Rivers North and South Tyne, all in Northumberland. It was present on old sand workings at Crawcrook and Stargate in County Durham and there are also records from dune sites along the north-east England coast at Coatham, Druridge Bay and Alnmouth and from more dense, wet grassland at Allerton Bywater in West Yorkshire (Eyre *et al.*, 2003). A further record from Ryton in Tyne & Wear from short dense dry grassland was from pitfall trapping, as were all the other records. The relative under-recording of this species may be a reflection of its ground-dwelling habits.

*Ebarrius cognatus* (Fieber)
A nationally scarce species of northern England and Scotland recorded from very sparsely vegetated riverbanks (Kirby, 1992). It was recorded from an area of cobbles and pebble sediment with sparse ruderal vegetation by the River Feshie in Speyside.

*Eupteryx florida* Ribaut
Apparently a species found in southern England and Wales but given as absent from the north in RECORDER, it was found on damp grassland with rank vegetation at Ryton.

*Evacanthus acuminatus* (Fabricius)
Recorded being from as far north as Yorkshire in RECORDER, there are new records from the chalk heaps at Prudhoe (site 3) and by the River Tweed at St Cuthbert's, both in Northumberland. In addition, it occurred on riverine sediments by the River Tweed next to its confluence with Ettrick Water and at Mertoun, which may constitute new Scottish records.

*Graphocraerus ventralis* (Fallén)
A species of well-drained sites given as absent from the extreme north of England in RECORDER. We found it on North Gare Sands dune sites to the north of Teesmouth, Co. Durham and on set-aside arable land at Throckley, Northumberland.

*Macropsis infuscata* (J. Sahlberg)
This species was found on riverine shingle at Beltingham by the River South Tyne in Northumberland. Previous records appear to be from only the southern counties (RECORDER).

*Macrosteles fieberi* (Edwards)
The Scottish records given for this nationally scarce species in Kirby (1992) are for eastern and northern counties. We recorded it from a dry grass bank near Craigash, just to the north of Glasgow.

*Macrosteles scutellata* (Boheman)
Another species apparently not recorded north of Yorkshire (RECORDER), it was found on the old sand workings at Stargate and on riverine sediment at Beltingham.

*Macrosteles sordipennis* (Stål)
A nationally scarce species of saltmarsh sites (Kirby, 1992), apparently with only one Scottish record, from Dumfriesshire, and with an inland record from Co. Durham. We have it from a saltmarsh on Greatham Creek (site 2) in Co. Durham

but the more interesting records were from riverine sediments by the River Carron in north-west Scotland. It was found near Strathcarron, only about 1 km from the coast, and also further up Glen Carron, about 15 km from the coast.

*Mocuellus metrius* (Flor)
The RECORDER package states that this species occurs in long vegetation in marshes but is not found north of Yorkshire. However, we have found it near the confluence of the North and South Tynes and at Aviemore, Tulchan Lodge and Fochabers by the River Spey in northern Scotland. These sites were well-vegetated riverine sediments, as were sites by the Ale Water, a tributary of the River Tweed, and at Auldgirth by the River Nith where it was also recorded.

*Mocydia crocea* (Herrich-Schaeffer)
Another species apparently rare or absent further north than southern England and Wales (RECORDER). It was found near the confluence of the two Tynes and on the riverbank at Close House (site 1) and on the old sand workings at Crawcrook and Stargate and the set-aside at Throckley. There are also records from dune sites at Coatham and North Gare Sands and from damp grassland on Prestwick Carr (site 2).

*Mocydiopsis parvicauda* Ribaut
This species was recorded from an old colliery site at Allerton Bywater, West Yorkshire, even though RECORDER maintains that it is not found north of East Anglia.

*Paluda adumbrata* (C. Sahlberg)
A species of well-drained sites, such as chalk grassland (Hawes & Stewart, 1997), it is generally found in southern England and is said to be rarer or absent elsewhere (RECORDER). There are, however, records from the dunes at Coatham and from the chalk heaps at Prudhoe (site 2) and it was also found on the old sand workings at Crawcrook and on old pasture at Cockle Park in Northumberland.

*Psammotettix frigidus* (Boheman)
Kirby (1992) gives only Scottish records for this nationally scarce species, from open grassy sites, and RECORDER also states that it is only found in Scotland, even though Horsfield (1993) recorded it from Pen-y-Ghent, Yorkshire. We have found it in Scotland on the grassy sides of streams draining moorland on the Langholm–Newcastleton SSSI (sites 1, 2 & 3) in the Borders and from riverine shingle by the River Feshie in Speyside and at Incheril in north-west Scotland. It occurred all over the chalk heaps at Prudhoe (sites 1, 2 & 3) and on colliery spoil sites at Marley Hill (sites 1 & 2) and Weetslade in north-east England and at Allerton Bywater (Eyre *et al*., 2003). There are also records from dune sites at Coatham and Druridge Bay, from the sand site at Stargate as well as from old pasture at Cockle Park.

*Psammotettix putoni* (Then)
A common species of coastal sites, it was found on riverine shingle at Achnashellach and Coulags in the River Carron catchment in north-west Scotland. It has also been recorded from colliery spoil at Weetslade in Northumberland and from a similar site at Sharlston, West Yorkshire.

**Cixiidae**

*Cixius cambricus* China
A nationally scarce species with only one record for England given by Kirby (1992), with a number from Scotland. It was recorded from riverine sediments by the

River Tweed at Horsburgh Ford and near the confluence with the Ettrick Water. There is also a record from open woodland in the Coquet valley in Northumberland at Grasslees Wood. Kirby (1992) postulated that because it is ground-dwelling, it is likely to be under recorded and these three records were all from pitfall trapping.

**Delphacidae**

*Asiraca clavicornis* (Fabricius)
This nationally scarce species appears to be relatively common in south-east England with a distribution centred on London and the Thames valley (Stewart, 1999a). There are a considerable number of recent records (Allen, 1999; Jones & Hodge, 1999; Badmin, 2001, 2002; Denton, 2001). A number of the records by Jones & Hodge (1999) were from railway embankments and it was recorded from the sidings at Cricklewood (sites 1 & 2) in 2001.

*Calligypona reyi* (Fieber)
A rare British species with a Red Data Book (Insufficiently known) conservation designation. Kirby (1992) gives only four confirmed records; old ones (pre-1960) from Norfolk, Suffolk and Dorset and in 1971 and 1973 from the Isle of Wight. It is a species found amongst *Juncus* and *Scirpus* on coastal marshes (RECORDER) and there are a number of more recent records from southern English sites (Kirby *et al.*, 2001). There were abundant *Juncus* tussocks on the wet sand of the old extraction area at Crawcrook, Co. Durham from where this species was found in 1996. This record not only greatly expands the range of *C. reyi* but it also appears to be the first inland record.

*Dicranotropis divergens* Kirchbaum
There are records for this nationally scarce moorland species from Westmorland and Northumberland and three Welsh counties in Kirby (1992) even though RECORDER asserts that it is found only in Scotland. Cherrill & Sanderson (1994) recorded it from sites in Redesdale (sites 1 & 2) near the Scottish border and we have it from the Scottish side on the Langholm–Newcastleton Hills SSSI (site 4). There is another Scottish record from riverine sediments by the River Dulnain in Speyside.

*Eurysa lineata* (Perris)
Apparently a southern English species and absent from the north (RECORDER), we found it on dunes of the North Gare Sands at Teesmouth.

*Stenocranus minutus* (Fabricius)
Another common species in the south which is rarer or absent in the north (RECORDER). It was recorded from the Prudhoe chalk heaps (sites 2 & 3), from the dunes at Coatham, the riverbank at Close House (site 2) and the sand workings at Crawcrook.

## HETEROPTERA

**Coreidae**

*Bathysolen nubilis* (Fallén)
There are a number of recent records for this nationally scarce species with Denton (1998) and Kirby *et al.* (2001) identifying it as spreading in southern England. Nau (1998) found it on an old railway track in Bedfordshire and it was recorded from old railway sidings at Cricklewood, north London (sites 1 & 2) in 2001 and 2002. These were sandy sites with sparse, ruderal vegetation.

## Lygaeidae

*Drymus pilicornis* (Mulsant)

Kirby (1992) states that this nationally scarce species does not occur north of Derbyshire and is usually recorded from calcareous grasslands. However, we found it on colliery spoil at Marley Hill, Co. Durham (site 1) and also on the railway sidings at Cricklewood (site 2) in 2001. Part of these sidings include an area of demolished buildings and there are areas of weathering concrete and masonry providing calcareous habitats.

*Drymus pilipes* Fieber

Another nationally scarce ground-bug species apparently found no further north than Derbyshire (Kirby, 1992) and found on chalky or sandy sites. It was taken on dune sites either side of Teesmouth at Coatham and on Seaton Sands.

## Miridae

*Capsus wagneri* Remane

There were relatively few recent records for this nationally scarce wetland species in Kirby (1992) but it became obvious that it had been under recorded. Kirby *et al.* (2001) states that there are recent, post-1980, records from Huntingdonshire, Somerset, Middlesex, Northumberland, Sussex, Norfolk, Northamptonshire, Lincolnshire and Dumfriesshire. It was abundant on Prestwick Carr (sites 1 & 2), an area of relict lowland wetland to the north of Newcastle upon Tyne, being found in pitfall traps, yellow pan traps and sweep samples.

*Orthotylus fuscescens* (Kirschbaum)

A nationally scarce species found on Scots pine in Scotland (Kirby, 1992), it was recorded from pitfall traps on riverine sediment at the confluence of the River Calder with the River Spey near Newtonmore.

*Trigonotylus psammaecolor* Reuter

Said to occur on sand dunes north to Cumberland and Fifeshire (Kirby, 1992), although RECORDER only gives the southern half of Britain, this nationally scarce mirid was found on the inland sand workings at Crawcrook, Co. Durham.

## Pentatomidae

*Sciocoris cursitans* (Fabricius)

A nationally scarce species of open, dry sites with records only from southern England (Kirby, 1992), there are recent records from dunes in Cornwall (Alexander & Grove, 1991) and chalk grassland in Surrey (Kirby, 1994; Denton, 1997). It was found on the dry, sandy areas of Cricklewood sidings (site 2) in 2002.

## Rhopalidae

*Stictopleurus punctatonervosus* (Goeze)

A bug species rated as extinct by Kirby (1992) with records from Surrey and Sussex but none later than 1870. It is a species of dry, open habitats and it has been found recently on this type of site. Bowdrey (1999) found it at three dry and sparsely vegetated sites in Essex in 1997 and 1998, one from a post-industrial site (Stewart, 1999b). It was also recorded from Bexley in Kent in 1998 and at West Acton and Chelsea in Middlesex in 1999 and 2000 by Jones (2000). These sites included derelict land and an old railway embankment (Stewart, 2001) and it was also recorded from East Sussex in 2001 by P. J. Hodge (Stewart, 2002). In was found on Cricklewood sidings (site 2) in 2002 on an area of open sandy habitat with sparse vegetation. This species appears to be spreading and a possible conduit is likely to be the areas of appropriate habitat adjoining railway lines.

**Saldidae**

*Halosalda lateralis* (Fallén)

Apparently absent from the northern English counties (RECORDER), this saltmarsh species was found by Greatham Creek, Co. Durham (site 1).

**Scutelleridae**

*Eurygaster maura* (Linnaeus)

RECORDER reports that this grass feeding nationally scarce bug is confined to the calcareous grasslands of the North Downs but Kirby (1992) stated that there were records from dunes and other dry grassland sites. It occurs on dunes in Kent and chalk grassland in Surrey (Denton, 2001; Badmin, 2002) and it was found on the railway sidings at Cricklewood (site 2) in 2001.

## Discussion

The records presented above indicate that the knowledge of the distribution of even common Hemiptera species is not especially comprehensive and that far more information on species distribution and habitats is required. The situation is not helped by the generally inaccurate information given in the RECORDER package (Ball, 1997), with an inability to restate the information given in the review of Kirby (1992). Similar deficiencies have been observed with the Coleoptera (Eyre, 1998) and this is a problem given that this package is so widely available and provides the only rapidly accessible information on Hemiptera species.

The generation of so much new distribution data is a result of a more standardised approach to invertebrate survey work. The use of pitfall traps (Luff, 1996) and suction samplers (Stewart & Wright, 1995) has led to the identification of a number of beetle (e.g. Eyre *et al.*, 2001a; Eyre & Luff, 2003) and Auchenorrhyncha assemblages (Eyre *et al.*, 2001b). During these surveys a considerable number of rare and scarce beetle species were recorded (Eyre *et al.*, 1998, 2000), including a number from urban and post-industrial sites (Eyre *et al.*, 2002). A considerable number of the records of the rarer Hemiptera species in this paper were found on sites such as colliery spoil, railway sidings, old sand extraction areas and chalk dumps. These man-made habitats have been neglected in the past and are proving to be valuable invertebrate refugia. Jones (2001) found a number of rare and scarce species on railway embankment sites on the London Underground, with ruderal vegetation. Species of calcareous grasslands and sandy heaths were found on the sidings at Cricklewood and it may be that habitat next to the railway system will prove to have a high invertebrate conservation value.

## Acknowledgements

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**Appendix** The grid reference, vice-county number and year(s) sampled of the sites mentioned in the text.

| Site | Grid reference | Vice-county | Year |
|---|---|---|---|
| Cricklewood 1 | TQ2287 | 21 | 2001, 2002 |
| Cricklewood 2 | TQ2386 | 21 | 2001, 2002 |
| Sharlston | SE3820 | 63 | 1999 |
| Allerton Bywater | SE4227 | 63 | 1998 |
| Coatham | NZ5725 | 62 | 1995 |
| Crawcrook | NZ1263 | 66 | 1996 |
| Ryton | NZ1465 | 66 | 2002 |
| Stargate | NZ1663 | 66 | 1996 |
| Marley Hill 1 | NZ1956 | 66 | 1995 |
| Marley Hill 2 | NZ1957 | 66 | 1995 |
| Greatham Creek 1 | NZ5025 | 66 | 1995 |
| Greatham Creek 2 | NZ5125 | 66 | 1996 |
| North Gare Sands | NZ5327 | 66 | 1996 |
| Seaton Sands | NZ5328 | 66 | 1996 |
| Beltingham | NY7864 | 67 | 1996 |
| Redesdale 1 | NY8294 | 67 | 1990 |
| Redesdale 2 | NY8394 | 67 | 1990 |
| North/South Tyne confluence | NY9165 | 67 | 1995 |
| Grasslees Wood | NY9597 | 67 | 1996 |
| Dilstonhaugh | NY9764 | 67 | 1995 |
| Prudhoe 1 | NZ0963 | 67 | 1994 |
| Prudhoe 2 | NZ0964 | 67 | 1994 |
| Prudhoe 3 | NZ1064 | 67 | 1994 |
| Close House 1 | NZ1265 | 67 | 1995 |
| Close House 2 | NZ1365 | 67 | 1995 |
| Throckley | NZ1567 | 67 | 1996 |
| Prestwick Carr 1 | NZ1873 | 67 | 2002 |
| Prestwick Carr 2 | NZ1973 | 67 | 2002 |
| Cockle Park | NZ2091 | 67 | 1996 |
| Weetslade | NZ2572 | 67 | 1996 |
| Druridge Bay | NZ2894 | 67 | 1996 |
| Alnmouth | NU2409 | 67 | 1996 |

Appendix (*Continued*)

| Site | Grid reference | Vice-county | Year |
|---|---|---|---|
| St Cuthbert's | NT8642 | 68 | 1996 |
| Langholm–Newcastleton SSSI 1 | NY3896 | 80 | 1995 |
| Langholm–Newcastleton SSSI 2 | NY4086 | 80 | 1995 |
| Langholm–Newcastleton SSSI 3 | NY4191 | 80 | 1995 |
| Langholm–Newcastleton SSSI 4 | NY4291 | 80 | 1995 |
| Horsburgh Ford | NT3039 | 78 | 1996 |
| Ale Water | NT4620 | 80 | 1997 |
| River Tweed/Ettrick Water confluence | NT4932 | 81 | 1996 |
| Mertoun | NT6231 | 81 | 1996 |
| Auldgarth | NX9186 | 73 | 1997 |
| Craigash | NS5676 | 86 | 2000 |
| Strathcarron | NG9443 | 105 | 1996 |
| Coulags | NG9744 | 105 | 1997 |
| Achnashellach | NH0148 | 105 | 1997 |
| Incheril | NH0361 | 105 | 1997 |
| Glen Carron | NH0852 | 105 | 1996 |
| River Feshie | NH8401 | 96 | 1997 |
| River Dulnain | NH8620 | 95 | 1997 |
| Aviemore | NH8911 | 95 | 1996 |
| Tulcan Lodge | NJ1335 | 95 | 1996 |
| Fochabers | NJ3358 | 95 | 1996 |
| near Newtonmore | NN7097 | 96 | 1996 |

## SHORT COMMUNICATIONS

**The horsefly *Atylotus rusticus* (L.) in the Central Weald.**—On 4 August 2003 a male of this horsefly was taken in the walled garden at Groombridge Place (TQ533376). At about mid-day, clumps of blue *Eryngium* flowers attracted lots of hoverflies and aculeates, plus this single horsefly. Whilst Groombridge is in Sussex, the location is just inside Kent.

*Atylotus rusticus* is a very rare species, since c. 1850 only known from the Lewes and Pevensey Levels in East Sussex, from which there are fairly recent records (Stubbs & Drake, 2001; *British Soldierflies and their allies*, BENHS). Groombridge is distant from acknowledged good quality grazing levels, suggesting that hidden away there are some worthwhile parts of the upper River Medway flood plain and its tributaries.

Hopefully dipterists and coleopterists will be encouraged to investigate the further potential for aquatic and semi-aquatic species in this area.—A. STUBBS, 181 Broadway, Peterborough, Cambridgeshire PE1 4DS.

***Lasius brunneus* (Latr.) (Hymenoptera: Formicidae): house ant, hero and coward.**— R. A. Jones (2003) recounts his surprise at being sent workers of *Lasius brunneus* (Latreille), so typically of a timid and retiring nature, which had been infesting a biscuit tin within a house, speculating that the ants may have been nesting within old timbers there.

In fact a number of accounts exist of similar behaviour by the species in this country, among the earliest published being those of Kane and Tyler (1958). In one of their cases, the ants were invading a canteen and seemed to originate from a wild population in an adjacent wooded area. In another case concerning a domestic infestation, although workers were present outside on nearby garden trees, alates swarmed from behind skirting boards inside the building, suggesting a nest there.

Two similar cases were reported to me, with voucher specimens, in the 1990s from Hertfordshire, where the species is quite common across the southern half of the county. In one, workers numbering in dozens daily had been seen in the wood-lined cloakroom and kitchen of a timber house in Berkhamsted. The occupant, local naturalist Enid Evans, stated that the ants ignored any food fragments and seemed quite aimless in their wanderings. There was no visible evidence of occurrence or entry from outside. She could not say whether any decay or damp occurred within the structural timbers of her house which may have provided a nest site, but it is likely this was the case. The ants' food source remained a mystery.

In the second case, again reported by a naturalist occupant (Colin Everett) in a 19th Century house at Garston, it seemed more likely that the ants were opportunistic entrants originating from wild populations which had been observed among trees within 50 metres of the house. There was no evidence suggestive of internal nesting. Workers were first seen on the outside walls and then at various places within the house. Despite control measures having been taken, ants were still being seen around food cupboards several years later.

If this domesticated side to the character of *L. brunneus* is seen as somewhat counter to its normally well-deserved reputation for extreme timidity (rapidly fleeing upon the slightest disturbance), a recent observation (Attewell, 2003) was, to me at least, much more surprising. If anything, it showed that it can sometimes be quite courageous, or at the very least, indifferent to danger. During an attempt in 2002 to photograph workers of *L. brunneus* tending aphids on the undersides of Dogwood leaves in a hedgerow near Radlett, Herts., the inevitable movements resulting from handling the leaves caused the ants to be disturbed. Instead of immediately quitting the scene in fear of their lives as I would have expected, however, these ants either remained calmly with their aphid charges, or else walked nonchalantly onto my hands with mandibles just slightly ajar, almost as if more from curiosity than anything else!—P. J. ATTEWELL, 69 Thornbury Gardens, Boreham Wood, Herts., WD6 1RD.

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Attewell, P.J. 2003. Ants, 2000–2002 (Recorder's Report). *Transactions of Hertfordshire Natural History Society* **35**: 20–24.

Jones, R.A. 2003. *Lasius brunneus* (Latr.) (Hymenoptera: Formicidae) found indoors. *British Journal of Entomology & Natural History* **16**: 219.

Kane, J. & Tyler, P.S. 1958. Domestic infestations by *Lasius brunneus* (Latr.) (Hym., Formicidae). *Entomologist's Monthly Magazine* **94**: 286.

# THE DIGITAL PHOTOGRAPHY OF SET INSECT SPECIMENS

M. J. TAYLOR

*Entomology Section, Liverpool Museum, National Museums & Galleries on Merseyside, Willam Brown St, Liverpool, L3 8EN*

## ABSTRACT

The development of methods for photographing insect specimens using film cameras has already been published (Taylor, 2001).This paper describes methods for use with a Nikon 995 digital camera. A large range of specimen sizes can be photographed within a very compact design. Subjects can be photographed down to a field size of 16 mm by 12 mm. The digital equipment shares the same desirable characteristics as the film version, namely the availability of repeatable and consistent illumination to the specimen including controlled directionality of lighting. True representation of metallic and irridescent colours, pollination patterns, surface sculpture and texture is assured.The portable version of the equipment is light and simply made, breaking down into conveniently transportable modules.The potential for increased accessibility of visual taxonomic data vested in specimens held in museum and personal collections via Web Sites and CDs is discussed.

## INTRODUCTION

The availability of new models of digital cameras with very close focusing capabilities during 2001 presented an opportunity to develop the equipment designed previously for film cameras for use with these new cameras. The main potential advantage was the elimination of the need to digitise 35 mm slide originals with the associated extra costs and timescales involved, prior to being able to make use of e-mail transfer, construction of reference Web Sites and the production of CDs.

## DEVELOPMENT OF THE PORTABLE EQUIPMENT

The development of the portable equipment was based upon the simple 45° angled ramp used to develop the original articulated mirror design using natural north light as the experimental light source (Taylor, 2001; Fig. 1).

The original ramp design was impractical for film photography due to its size and weight and the long extension tube lengths required to achieve large magnification images of small insect specimens.The long extension tube lengths resulted in very small equivalent apertures leading to excessively long exposure times which often resulted in reciprocity failure in the film emulsion.

The very close focus capability of the new digital cameras coupled with practical aperture options with high depth of field, and non reliance on film technology removed these obstacles.

Initial experiments with the Nikon 995 camera on the original film experimental outdoor ramp quickly confirmed the potential. A very compact design was developed, weighing 2.5 kg, tailored to this camera. The two element design is based firstly upon a 45° angled ramp with a fixed triple mirror positioned at the lower end. It incorporates a simple insect specimen stage which straddles the fixed mirrors and slides towards and away from the camera to achieve the desired combination of image size and focus. An additional removable piece of 4 mm mirror glass, 25 mm wide by 120 mm long, angled at 45°, is placed across the ramp between the fixed mirrors and the camera front when close focus distances are used which require the

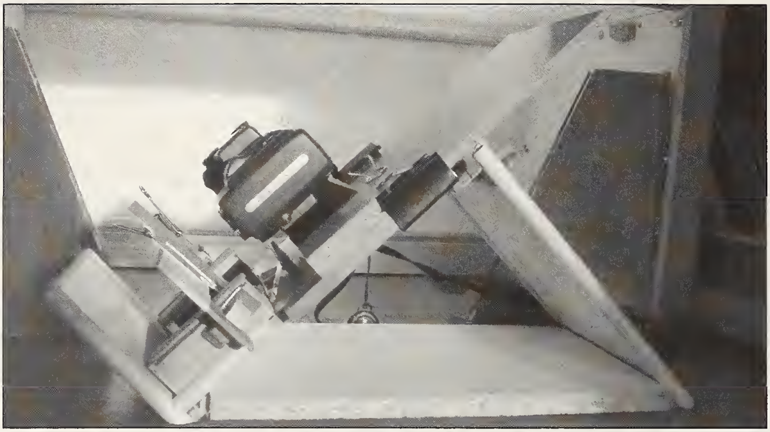

Fig. 1. Portable camera mount and specimen stage.

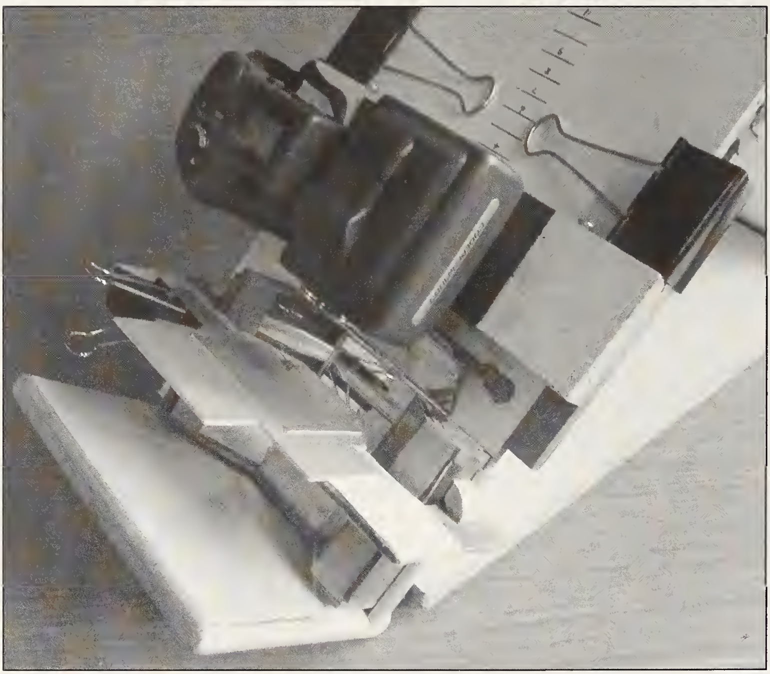

Fig. 2. Close up view of specimen, mirrors and camera.

insect stage to be positioned part way along the fixed mirrors. The specimen stage is held in position by friction by careful fitting during construction. The camera mounting platform, which is made from a simple saddle, straddling the upper part of the ramp also slides up and down the ramp and is clamped in position using large 'bulldog' clips. The ramp assembly is hinged so it can be folded for ease of transport.

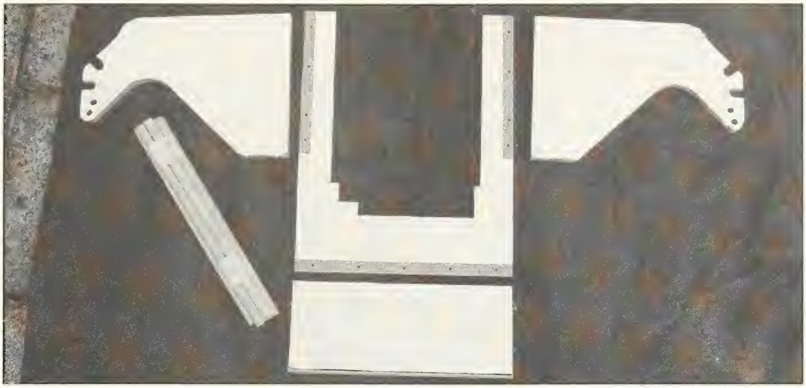

Fig. 3. Screen assembly components.

Fig. 4. Portable equipment in use in Chios, Greece.

Figure 1 shows the hinged ramp with the insect stage and camera in the operating position. Figure 2 shows a close up view of the specimen, mirrors and camera.

The second element of the design is the light diffusing cover. The diffuser is simply made from 15 mm white plastic covered chipboard, cut out using a jigsaw. Holes are drilled in the upper part of the side pieces to locate two 9 mm wooden dowels which provide stability and a fairlead function to separate the two layers of tracing paper forming the removable screens. These two removable screens are located at the top of the assembly in slots provided for the purpose. For overseas use the screen assembly is simply screwed together on arrival and disassembled for transport back home. The screen material used was tracing paper, the screens measuring 260 mm wide with the lower one 320 mm long and the upper one 380 mm long. Both are taped to 15 mm dowels at each end. Figure 3 shows the parts required for the diffuser as prepared for transport overseas. In the case of the prototype, the plastic covering on the Contiboard pieces had been locally removed where they fitted together as the diffuser was to be kept in Chios for use in future years and was to be permanently assembled by screwing and glueing together. Figure 4 shows the complete set of equipment in operation in Chios, Greece.

## Development of the Laboratory Equipment

The laboratory version was developed for use in the UK so that the operation could be undertaken independently of weather conditions. The virtually permanent blue skies of the Aegean made the use of the portable version entirely practical in Chios during the survey season from March to November.

The design comprises three elements, the first element is the open fronted work chamber incorporating a light source with a diffuser screen at the top.

The prototype was constructed by converting a small chest of drawers, this was based on a piece of furniture originally measuring 930 mm high, 770 mm wide and 420 mm deep. Such items are regularly available in salerooms for from £20 to £50.

The base of this unit was cut off leaving the upper 580 mm for conversion. In the case of the prototype all the drawers and front lateral struts were removed. A hinged plywood platform was positioned inside the carcase at the top to mount the three 20 W strip lights and a piece of plywood was also attached at the front to screen direct light from the operator and to position the light switch. It was also used to mount a strip of mirror glass internally to reflect light back downwards onto the working area. Figure 5 shows the layout of the strip lights. Alternatively the ‘light box’ upper section could be made by inverting one of the original drawers and placing it inside the top of the carcase retaining it by means of repositioned drawer bearers. Slots were provided in the sides and the back of the work chamber

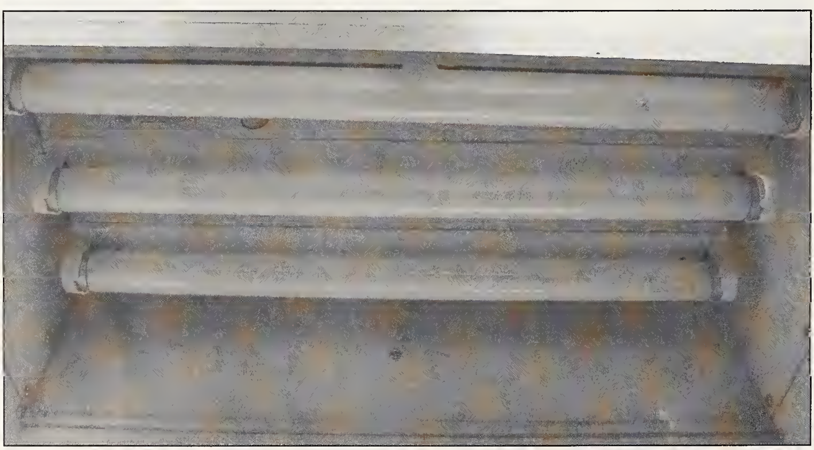

Fig. 5. Strip light layout.

Fig. 6. Camera mount and specimen stage.

immediately below the strip lights to hold the light diffuser made from Clear Cracked Ice plastic sheet made by Glaziette Ltd (tel. 0120 479 1185).

A double layer of tracing paper was fixed to the upper surface of this screen to diffuse the light. A piece of black card measuring 90 mm wide by 150 mm long was fixed to the lower surface of the screen to shade the camera monitor screen from direct illumination.

All internal surfaces of the strip light platform and the walls of the work chamber were lined with aluminium kitchen foil and covered with Milk White Cracked Ice textured plastic sheets with the smooth surface against the foil as a light diffusing and reflecting surface. The completed work chamber internal space measures 680 mm wide, 330 mm high and 380 mm in deep.

The second element of the design is the camera mount and specimen stage, it is based on a 45° angled ramp supported by prop and base panels all glued and screwed together. The basic ramp assembly is made from pieces of oak from a plank 170 mm wide and 20 mm thick with a slot 6 mm wide and 7 mm deep running along one edge. The ramp is 400 mm long, the prop 190 mm long and the base 230 mm long, the base being fixed to the bottom ends of the ramp and prop by 20 mm × 20 mm triangular section pieces. The insect stage carriage is positioned at the bottom of the ramp, this is the same item which was developed as the Flash Gun/Stage Carriage for the film version (Taylor, 2001, Fig. 6). In this application only the insect staging facility is utilised. A piece of 4 mm mirror glass 140 mm wide by 255 mm long is fixed to the upper surface of the ramp from the top of the stage carriage to its upper end. The camera saddle, incorporating a knurled screw for engaging the camera tripod thread, is placed at the upper end of the ramp. The saddle is fitted with a metal plate which engages the groove running along the left hand side of the ramp, the saddle is locked into position by a metal dowel fitted through the right hand saddle side engaging one of a number of pre-drilled holes put into the right hand side of the ramp. Figure 6 shows the complete assembly with specimen stage and camera in position.

The third element of the design is the pair of side mirrors which are positioned inside the work chamber against the side walls on each side of the camera ramp.

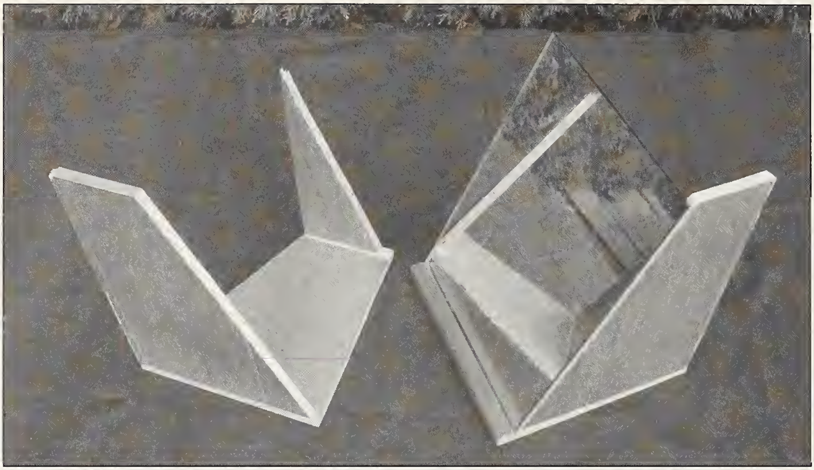

Fig. 7. Construction details of side mirror assemblies.

Fig. 8. Laboratory equipment in operation.

These mirrors are positioned to reflect light from the light screen to the lower parts of the specimen. In the prototype system the 4 mm mirror glass pieces originally measured 280 mm high by 200 mm wide. In developing the prototype system, experimentation to optimise the positioning of the mirrors necessitated the trimming of the inner edge to a length of 210 mm due to its intersection with the work chamber side walls. In the optimum position the angle between the bottom edge of the mirrors and the side walls was set at 25°, with the plane of the mirror angled back at 70° to the horizontal. Figure 7 shows construction details of the side mirror assemblies and figure 8 shows the laboratory equipment in operation.

## Operation of the Developed Equipment

The portable equipment was used in the summer of 2001 in Chios mainly to photograph the more interesting material as it was removed from the setting boards (see Figure 4). All photography was carried out in the morning between 900 h and 1100 h, almost entirely in sunny clear blue sky conditions with the screens facing direct sunlight. Under these conditions the double layer tracing paper screen reduced the UV levels to such an extent that there was no discernible colour cast when viewing the resultant images on either the 15″ Laptop TFT (thin-film transistor) screen or on inkjet prints. On one or two days when there was a light overcast sky, equally successful results were obtained without the use of the screens.

All specimens, for both portable and laboratory processing, were staged using photographic grey card as the background in the manner described for the use of film cameras, Taylor (2001).

The Nikon 995 digital camera was used in the manual mode. After a little practice the judgement of best focus distance and zoom position was easily achieved, helped by the flexibility offered by the camera optics. When photographing small specimens e.g. one with a span of 12 mm and body length of 9 mm, a focal distance of 0.02 m was selected manually then the specimen was moved towards and away from the camera in the manner described for the type of equipment being used whilst viewing the image on the camera monitor screen. When the optimum position was achieved to give crisp focus, and the zoom control adjusted to fill the frame with the image, the aperture was adjusted manually by stopping down to the minimum achievable aperture under the prevailing light conditions. At very close focus distances the full zoom range of the lens could not be used as there were out of focus zones at the short and long lens focal lengths. This was not a problem as there is a screen display which indicates the achievement or otherwise of correct focus as the zoom control is operated. When photographing very fine details on large insects at minimum focus distances it was sometimes difficult to ensure that focus had been achieved on the exact area required, in these cases a number of exposures were taken with small adjustments to subject to camera distances. The resulting images were then viewed and only the required ones then retained, there being no cost penalty due to wasted film and time.

When photographing larger specimens at longer specimen to camera distances it is best to use the largest working distances and longer focal length optical zoom settings as light levels are somewhat higher and in consequence more stopping down of the aperture is available, also specimen position adjustment is easier to carry out.

When using the laboratory equipment it was not possible to achieve an absolutely neutral colour balance by selecting combinations of light tube colour spectrum and screen materials. However the consistency inherent in the system made colour adjustment simple and routine once the initial digital images had been taken. I prefer to keep my camera 'white balance' at the default settings as the camera is frequently being used for general outdoor purposes, and adjust set specimen image colours using Photoshop colour balance adjustments. In the prototype system I used two standard 20 W tubes and a single north light 20 W tube. I then apply a standard correction of −44 Blue and −20 Red to achieve neutral colour cast. This correction was very easily established due to all specimens having been photographed against a photographic grey card background.

Fig. 9(a). Laboratory photograph of *Volucella bombylans* L. Specimen M0036, I.O.Man.

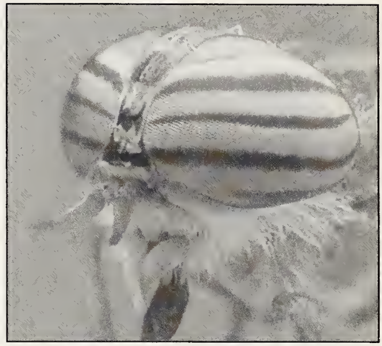

Fig. 9(b). In field photo of anaesthetised *Tabanus* near *obsolescens* Pand. female, Chios, Greece.

## Availability, Selection and Preparation of Set Insect Specimens

The new digital cameras offer huge potential for increased accessibility of visual taxonomic data currently vested in specimens widely distributed in museums and private collections. Reference images freely available via Web Sites and CDs would be of major benefit to students and specialists alike and would encourage wider interest by members of the general public in the subject matter covered.

The vast majority of material in museums is totally inadequate for photographic purposes. Also the use of the small percentage of suitable specimens which are held in museum collections is sometimes withheld for reasons of museum copyright protection. In my survey work on invertebrate biodiversity on Chios I have been building up a reference collection of pristine specimens for photographic purposes, currently particularly strong in some families of Diptera, Coleoptera, Hymenoptera, Lepidoptera and a few other Orders. Digital images from this material are to be made freely available to all for non commercial purposes. Examples of a whole insect and a close up study are shown in Figure 9. Even though I spend a lot of time in the field and on specimen preparation it also takes luck to make progress in obtaining good material. The simplicity, ease and cheapness of producing high quality digital images hopefully will encourage other workers to help build up stocks of suitable specimens and result in increasing numbers of freely available images.

Specialist workers could assist the process by specifying the different general and detailed images most helpful for the study and understanding of their subject matter. This could then ensure the most effective preparation and use of any pristine specimens which become available. The recognition of the location and availability of suitable existing specimens would enable selective collecting activity to be concentrated on securing the most critical missing material.

## Computer Manipulation of Digital Images of Set Insect Specimens

One of the most effective uses of high quality digital images concerns the viewing of critical visual characteristics whilst working through identification keys. To take an example of a small robberfly, a specimen of a small species of *Saropogon* measuring 20 mm in span and 12 mm in body length was photographed using the closest focus distance and largest zoom magnification. This resulted in the body length seen on the Laptop 15″ TFT screen measuring 160 mm, this representing the full uncropped frame at a magnification of thirteen times lifesize. The zoom tool can then be used to magnify the image by a further factor of two or three times for critical detail scrutiny. This is all done under restful viewing conditions and convenient adjacency of reference keys, diagrams and textbooks. Images of any particularly interesting features thus revealed can then be saved with a few clicks of a 'mouse', and subsequently sent for assessment to a specialist via an e-mail attachment.

## Reference

Taylor, M. J. 2001. The development of a practical technique for achieving realistic photographic images of set insect specimens. *British Journal of Entomology and Natural History*, **14**: 195–206.

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## SHORT COMMUNICATION

**Status of *Paysandisia archon* (Burmeister) (Lepidoptera: Castniidae) in southern Europe.**—It was interesting to read that this South American species, recently introduced to Europe was noted in southern England during 2002 (see *Br. J. Ent. Nat. Hist*, **16**: 2003). This insect was introduced into Europe, it is thought in about 1995, by a palm importer at Anglès near Girona in the province of Cataluña, Spain. It is the practice of such importers to bring in mature palms; demand cannot at present be met by growing from seed alone. The preferred foodplants of *P. archon*, *Trithrinax campestris*, the Blue Needle Palm and *Butia yatay*, the Yatay palm, are particularly slow growing in any event. Now, several years later, the insect is well established around Girona and also on the French Mediterranean coast between Toulon and Hyères in the département of the Var (83). It is thought also to have gained a foothold in Italy, though there is no confirmation of this at present. The insect is not just attacking its preferred foodplant, but any palms. Even mature specimens can be killed by infestations. Palms of course have been planted extensively around the Mediterranean coast so it is not short of potential hosts. Spain, too, has an indigenous palm, *Chamaerops humilis*, the Mediterranean Fan Palm, which is attacked.

It was said that the specimen found in southern England was a migrant, but this is unlikely. This insect does not seem to have moved, up to now that is, very far from its point of introduction. Although it has killed every Chusan Palm, *Trachycarpus fortunei*, within a 2 km radius of Girona. The Chusan Palm and many hardy palms are planted and survive quite severe winters well inland, but there have been no other sightings so far other than in the two localities mentioned.

Incidentally, interest in *P. archon* has led to the discovery of another introduction here in southern France, the pyralid *Pseudarenipses insularum* Speidel & Schmitz. The Banana Moth, *Opogona sacchari* Bojer (Tineidae) is also well known by growers. The latter is well established in greenhouses at Sieuras in the département of the Ariège (09) not far from my home.—T. Hollingworth, 6, impasse Frédéric Chopin, F-31700 Blagnac.

# BOOK REVIEW

**Butterflies of the Bristol region** by R. Barnett, R. Higgins, T. Moulin & C. Wiltshire. Bristol Regional Environmental Records Centre, 2003. 205pp. Hardcover £24.95. ISBN 0-9545235-0-4.

In the introduction to this book Ray Barnett raises a point that many might ask every time a new book appears on British Butterflies—it is whether yet another book in a crowded market is really necessary. Many such books rehash much of the same information, but in this case Barnett and his co-authors have put together an excellent and original volume which serves a real and valuable purpose. It is a worthy addition to the long line of books covering the Lepidoptera of counties and regions that have been produced in the last 20 years or so.

This book is the second in a series on the Wildlife of the Bristol Region (the first covering the flora was published in 2000). The Bristol Region is defined as the area formerly known as the county of Avon, which today comprises the city of Bristol and a section each of South Gloucestershire and North Somerset.

Our islands have the most thoroughly recorded fauna of any comparable region on earth and its true value can be seen in a volume like this where the authors wear an admirable conservation ethic on their collective sleeve. Their aim is to summarise the current status of the butterflies of the region and to set this in the context of old records dating back around 200 years to show how butterfly populations have changed. In this way it is intended that the losses of butterflies from the region in the past, and the parlous state of many today, can highlight conservation needs and also show the great potential of this area for butterflies. Recent records are based primarily on the work of the Avon Butterfly Project, coordinated by the Bristol Regional Environmental Records Centre (BRERC) based at Bristol Museum during the 1990s and incorporating data from the Common Butterfly Survey of the 1980s.

There are chapters on the different kinds of habitats to be found in the region, case studies of some of the region's best sites, a chapter on conservation, a section on the rich history of butterfly recording in the region and finally the species by species accounts, accompanied by distribution maps. The book is clearly written and fascinating to read. Sadly it concludes on a regular basis that one species after another has suffered grievously from habitat change. It is extraordinary to read of species like the Chalkhill and Adonis blues once abounding on the 'Downs' area in Bristol, not far from the city centre. Today this large expanse of recreational grassland is far removed from any vision of a butterfly habitat. There are many historical gems of this kind scattered throughout the text and when one reads them it becomes clear just how rich in Lepidoptera this region must have been.

If really effective conservation work relies on sound knowledge of an area, both present and past, to highlight a species' habitat needs and to pinpoint danger signs, then books like this have a crucial role to play. It is written, say the authors, primarily to appeal to residents of the area, but I would suggest that visitors to the region, or indeed any naturalist with an interest in the fortunes of our butterflies, will find much in it that is fascinating.

RUPERT BARRINGTON

# THE PREDATION OF SLUGS BY THE NEW ZEALAND FLATWORM, *ARTHURDENDYUS TRIANGULATUS* (DENDY) (TERRICOLA: GEOPLANIDAE)

Peter H. Gibson and Derek J. Cosens

*Institute for Cell, Animal and Population Biology, University of Edinburgh, Ashworth Laboratories, West Mains Road, Edinburgh EH9 3JT, UK.*
*E-mail address: peter.gibson@ed.ac.uk*

## Abstract

The presence of *Arthurdendyus triangulatus* (Dendy) on the soil surface under rubber matting in an area of waste-land in Edinburgh was regularly monitored over four years. During February and March 2001 three chance observations were made of specimens of the flatworm attacking the slug *Arion fasciatus* (Nilsson). In a field study in four Edinburgh allotments from February to April 1993 using artificial soil surface shelters dead earthworms were found but no dead slugs. In laboratory container experiments during the same period, specimens of the slug were eaten but not in preference to earthworms. These studies suggest that slugs may contribute to the diet of *A. triangulatus* in the field when earthworms are scarce and this could reduce the vulnerability of earthworms.

## Introduction

The New Zealand flatworm *Arthurdendyus triangulatus* (Dendy) (Terricola: Geoplanidae), until recently known as *Artioposthia triangulata* (Dendy) (Jones & Gerard, 1999), is a predator of earthworms and is commonly found in urban areas of Scotland following its introduction some forty years ago (reviewed by Cannon *et al.*, 1999). The species is of interest because of its potential effect on agriculture, especially organic farming, due to a possible reduction in soil fertility following a decline in earthworm numbers. In the present study the observation that *A. triangulatus* feeds upon slugs in addition to earthworms is investigated.

## Materials and methods

### *Waste-land study*

Observations on the fauna under a piece of discarded black rubber matting were made at fortnightly intervals over four years from March 1998. The matting was 1 $m^2$ in area and 10 mm thick, and lay on bare soil in a piece of waste-land at Craighouse in Edinburgh, Scotland (Ordnance Survey grid reference NT 273608). The waste-land had previously been a car park constructed from granite hard-core, which had over the years accumulated soil to a depth of 40 mm.

### *Allotment study*

The numbers of *A. triangulatus*, earthworms and slugs were monitored between February and April 1993 in four similar allotments in Edinburgh: Lady Road (NT 275714), Mortonhall Road (NT 257711), Midmar Drive (NT 251706) and West Mains Road (NT 263710). These allotments have been intensively studied over a number of years (Gibson & Cosens, 2000a & b). Experimental shelters were used, each made from a 40 × 35 cm plastic bag filled with 10 kg of soil and placed inside a

Table 1. Four laboratory studies on the feeding of *Arthurdendyus triangulatus* when presented with *Dendrodrilus rubidus*, *Arion fasciatus* and fresh minced beef for up to 31 days

| Treatment (*n*) | Mean weight of flatworm (g) | | Mean weight of "prey" (g) | Survival (days) |
|---|---|---|---|---|
| | Start | Finish | | |
| 1. Earthworm trial (9) | 0.91 ± 0.23 | 1.06 ± 0.21 | 0.22 ± 0.02 | 4.22 ± 0.70 |
| 2. Slug trial* (2) | 0.90 ± 0.17 | 1.11 ± 0.25 | 0.59 ± 0.09 | 2.50 ± 1.06 |
| Slug trial* (6) | 0.74 ± 0.14 | 0.64 ± 0.12 | 0.84 ± 0.10 | 31 |
| 3. Minced beef trial (9) | 0.71 ± 0.10 | 0.60 ± 0.11 | 1.44 ± 0.38 | 31 |
| 4. Earthworm and slug trial** (18) | 0.77 ± 0.08 | 0.86 ± 0.09 | 0.24 ± 0.02 | 4.33 ± 0.56 |

*Nine specimens of *A. triangulatus* were used at the start of this study but one died.
**18 specimens of the slug were not eaten in 31 days.

second identical bag, which was then stapled closed. A total of 104 shelters were placed on the ground in close contact with the soil after clearing away grass and other vegetation, and each had a soil contact area of 0.14 m$^2$. The shelters were placed equidistant from each other in staggered rows in each of eight fallow 200 m$^2$ plots, two in each allotment. The shelters within the rows and the rows themselves were 4 m apart. Because of the time required, the shelters were laid over 7 days starting on 16 February and ending on 22 February 1993. The numbers of *A. triangulatus*, live and clearly dead earthworms (they showed no movement), and slugs under the shelters were recorded every two to five days over 45 days. Observations began after each shelter had lain in position for 20 days, and therefore started on 8 March through to 14 March. Consequently observations were terminated from 22 April through to 28 April 1993.

### *Laboratory study*

Specimens of *A. triangulatus*, the earthworm *Dendrodrilus rubidus* (Savigny) and slug *Arion fasciatus* (Nilsson), were collected in February 1993 from under wooden planks, plastic sheeting and paving stones lying on bare soil within the four allotments. The study was carried out over 31 days using screw-topped one litre glass containers which were one-quarter filled with damp soil from one of the allotments and which had first been sieved using a 5 mm mesh to remove stones. A specimen of *D. rubidus* was added to the first container, a specimen of *A. fasciatus* to the second, minced beef (which was replaced weekly) to the third, and a specimen each of *A. fasciatus* and *D. rubidus* to the fourth. All the specimens were weighed before being put into the containers. Single specimens of *A. triangulatus*, which had been starved for three weeks, were weighed and one was placed in each container. The study was carried out at 10 °C in the dark and the containers examined daily to determine whether any specimens had been eaten. At the end of the study the specimens of the flatworm and the earthworms were reweighed. The first three treatments were replicated nine times and the fourth 18 times.

## Results

### *Waste-land study*

Specimens of *A. triangulatus* were first found under the rubber matting in 2000 and subsequently they were found regularly. Earthworms and slugs were also commonly found. On 25 February 2001, two specimens of *A. triangulatus*, each weighing 0.8 g, were found under the matting each in the process of eating a slug, *Arion fasciatus*. The head end of both slugs had been partially digested (5% of the body) and the remains of the slugs weighed 0.3 g and 0.4 g. On 7 March another *A. triangulatus*, weighing 0.8 g, was found eating a slug of the same species. The head had been eaten (5% of the body) and the remains of the body weighed 0.7 g. All three slugs had produced copious mucus.

### *Allotment study*

The mean numbers of specimens per shelter ($n = 104$) found over 45 days were: 21.1 (sum = 2190, SD = 21.9) live earthworms, 0.8 (sum = 70, SD = 2.1) mostly whole but clearly dead earthworms, 30.5 (sum = 3170, SD = 24.0) live slugs, and 5.6 (sum = 583, SD = 6.0) *A. triangulatus*. There was a variety of species of earthworm and slugs. Spearman rank correlation showed that there was a significant positive correlation ($n = 99$, $P < 0.01$) between the numbers of *A. triangulatus* and dead earthworms ($r = 0.408$) and between the numbers of *A. triangulatus* and slugs ($r = 0.287$). There was no significant correlation between *A. triangulatus* and live earthworms. The calculations were made using the mean numbers of specimens per shelter per plot per sample date.

### *Laboratory study*

In the first of the four treatments (Table 1) the specimens of *A. triangulatus* ate all nine individuals of *D. rubidus* within about four days (mean = 4.2 days, SD = 0.70, $n = 9$) and gained a mean of 16.5% in weight. In the second treatment, one of the nine specimens of the flatworm died. Out of the eight *A. fasciatus*, two were eaten on day 1 and day 4 (mean = 2.5 days, SD = 1.06, $n = 2$) and the specimens of *A. triangulatus* gained a mean of 23.3% in weight. The six remaining slugs were not eaten. In the third treatment, the flatworms did not eat any of the fresh minced beef over the 31 days and they lost a mean of 18.3% in weight. In the fourth trial, where 18 pairs of slugs and earthworms were each kept in the same containers with *A. triangulatus*, all the earthworms were eaten. This took about four days (mean = 4.3 days, SD = 0.56, $n = 18$) and the flatworms gained a mean of 11.7% in weight. None of the slugs was eaten.

## Discussion

These chance observations of *A. triangulatus* apparently attacking the slug *A. fasciatus* raise the question of whether the flatworms were simply exploring the possibility of slugs as a source of food and whether the flatworms were scavenging dead or injured slugs. No such attacks or scavenging have been reported (Cannon *et al*., 1999) and no dead or attacked slugs were found during the allotment study carried out at the same time of year. However, *A. triangulatus* was found to attack and eat apparently healthy slugs presented to them in the laboratory. Feeding on the slugs resulted in a gain in weight thus showing that the slugs were of nutritional benefit to the flatworms and were unlikely to be attacked for some other reason. The percentage increase in weight of *A. triangulatus* was, perhaps surprisingly, greater than that gained from feeding on earthworms. This, again, suggests that slugs are an acceptable source of food. The flatworms did not eat the minced beef presented to them and therefore appeared to be actively seeking the slugs and not simply driven by extreme starvation to scavenge. This suggestion is in keeping with the observation that the flatworms were never seen to eat carrion in the field.

Although *A. triangulatus* ate slugs out of choice they clearly preferred earthworms when these were available as demonstrated in the laboratory choice experiment. This raises the question as to why the flatworm should attack slugs under the rubber matting in the waste-land. The answer would appear to be, as in the laboratory experiment, that it did not have a choice. At the time of the field observations the number of earthworms under the rubber matting would have been small. The reason for this is that the soil layer was so thin (40 mm), and those earthworms that were eaten would have to be replaced by others from outside the car park some three metres away from the matting since they could not have come up through the granite hard-core. *Arthurdendyus triangulatus* may, therefore, have been forced to eat slugs as an alternative to earthworms. This scenario should be compared with the conditions in the allotment. Here the numbers of earthworms for the same time of year was relatively high since the soil depth was not limited in the same way. In the allotment there were many earthworms since large numbers of dead ones were found (the reason for their deaths was not obvious). The correlation between number of dead earthworms (as a measure of the total numbers of earthworms) and *A. triangulatus* in the allotment suggests that earthworms were sufficiently numerous to maintain the flatworm. The lowest grass temperatures recorded over this period (minimum monthly mean over the year was $-0.10\,^{\circ}$C in March, recorded at The Royal Botanic Gardens in Edinburgh) will have driven many earthworms deeper into the soil in the allotment (Gibson *et al.*, in press) but they would still have been available to *A. triangulatus*. However, under the matting the earthworms had no such escape from falling temperatures (minimum monthly mean over the year was $-3.81\,^{\circ}$C in February) due to the hard-core preventing their downward movement. That is, they became "sitting prey" to *A. triangulatus* and may have been rapidly removed.

The present findings indicate that under conditions where earthworms are likely to be scarce or absent, slugs are also eaten. This may not significantly alter the predation pressure on earthworms but it could reduce their vulnerability where their numbers have been seriously depleted.

## Acknowledgements

The authors wish to thank Derek Barker for his assistance and Maureen Cameron for indispensable help.

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# GREEN DESERTS? THE INVERTEBRATE FAUNA OF MOWN GRASS PLAYING FIELDS

RICHARD A. JONES

*135 Friern Road, East Dulwich, London SE22 0AZ*
*bugmanjones@hotmail.com*

## ABSTRACT

A suction sampler was used to collect invertebrates from short mown grass playing fields and utility lawns in London's Battersea Park. Thirty-five species were found, but of these only 21 occurred more than once, and seven very common species dominated the fauna. These comprised: four beetles *Bembidion lampros* (Herbst), *Kissister minimus* Aubé, *Tachyporus pusillus* Grav., *Megasternum obscurum* Marsh., the black pavement ant *Lasius niger* L., an unidentified springtail and an unidentified lyniphiid spider. Samples collected from similar areas of grass where the mowing regime had been relaxed for even short periods had increased species numbers.

## INTRODUCTION

Despite the presence of many unusual and interesting insects in a few unmanaged parts of Battersea Park (Jones, 1999, 2001), the large areas of utility grass lawns, playing fields and sports grounds are bemoaned for being mundane, uninteresting and ecologically sterile. Various suggestions have been put forward as to how to improve the biodiversity of the short grass areas, without compromising their use by the general public for sports, games, walking, picnicking and the like. Key among these suggestions has been the idea to leave some areas of grass to grow long, and to manage them with a regime of hayfield or wildflower meadow management. Such areas might include around trees and shrubs bounding the edges of the park or the verges of some of the many tarmac paths passing through the park.

In the spirit of local experiment, managers at the Park agreed to look at these possibilities and commissioned this survey to examine the results. The first stage of the survey was to record species already existing in the short turf—the 'baseline' fauna before changes in management are implemented.

## METHODS

Eleven sample sites in London's Battersea Park (VC17, 'Surrey') were visited on 18 June and 1 October 2002 (Fig.1). Areas 1–9 were all short mown grass around the southern and western edges of the Park. All 9 sites were part of the more or less continuous lawn-like mown grass that makes up most of Battersea Park. They were all regularly cut by tractor-drawn or 'ride-on' mowers using multiple cylinder-bladed cutting arrangements to a sward height of about 3 cm.

In addition, and by way of comparison, two further sample sites were selected. Area 10 was a rough and slightly uneven area of grass next to the gardening paddock and compost heaps. It was sometimes cut short, but was sometimes missed in the cutting regime. In May 2002 the grass was about 15 cm high and there were several clumps of *Urtica dioica* L. (Stinging Nettle), *Cirsium vulgare* L. (Spear Thistle) and *Senecio jacobaea* L. (Ragwort) nearby. In October 2002 it had been recently mown to about 5 cm high. Area 11 was an area of grass near Albert Bridge. It had previously been cut short, but had been allowed to grow long (about 25–30 cm) during building

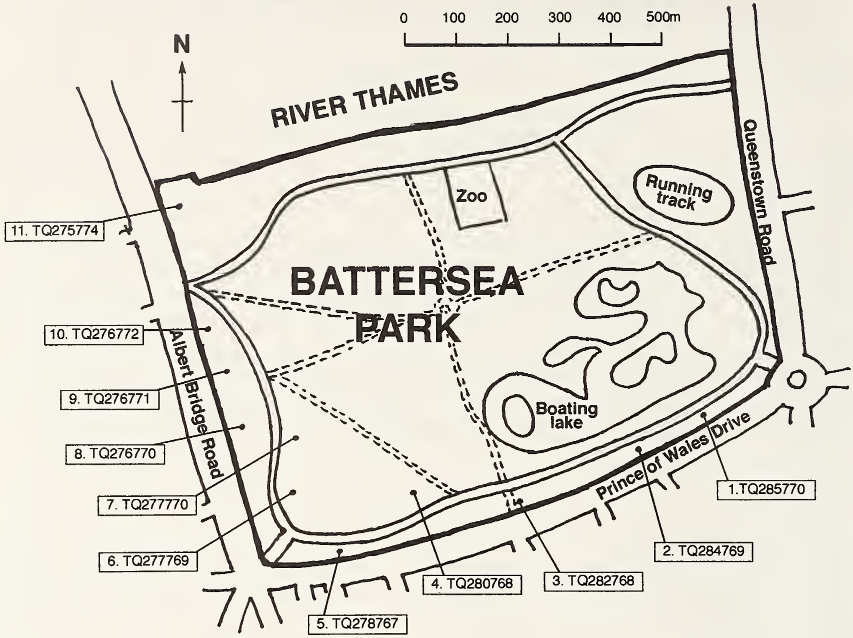


Figure 1. Sketch map of Battersea Park, showing the locations of the 11 sample sites and their grid references.

work in the Park because it was inside the contractors' security fence. It too had clumps of stinging nettle, spear thistle and ragwort in the area.

It was realized well in advance of the site visits that standard use of a sweep net would be inappropriate because the plant layer at most of the sample areas was only a few centimetres high and impossible to sweep. Similarly pit-fall trapping in well-trodden public areas is fraught with the difficulties of people or animals interfering with the pit-fall pots. Therefore a 'suction sampler' was used in all sample areas.

A suction sampler is an adapted domestic garden 'blowervac'. There are many makes and models on the market and for this study a McCulloch BVM 240 machine was used (purchased from the B&Q DIY supermarket chain for £99.99). To collect invertebrates, a muslin bag is firmly fitted over the air intake spout with a large jubilee clip. Using the suction mode, the spout is then pushed into the plant layer and the vacuum is enough to lift invertebrates and trap them, by the pressure of the rushing air, in the bag. The machine is then turned off and the contents of the bag emptied out onto a large plastic sheet for examination.

Earlier ad-hoc experiments on my garden lawn showed that a collection time of about one minute, lifting the spout up and pressing it down into the grass about once a second, generated a good sample through which to search. The opening of the suction tube of the sampler was oval, $12 \times 14$ cm, giving an aperture of approximately 132 $cm^2$. Sixty sucks at the ground (one per second for one minute) gave a total area of about 0.8 $m^2$ per sample. The sixty sucks were usually walked in a rough circle about 3 m in diameter. This approximately uniform sample method was used on all occasions, with two suction samples being taken from each site.

## Survey results

A total of 57 invertebrate species were recorded. By far the majority (40 species) were beetles. Most are very common throughout the London area, occurring in parks, gardens and woods, but three unusual species were found all represented by single specimens.

*Atomaria scutellaris* Motschulsky, a minute scavenger beetle, (Coleoptera: Cryptophagidae), short grass area 5, 18.vi.2002. A recent immigrant to Britain and first noted from the Isles of Scilly in 1968, this beetle is now known from a variety of habitats including saltmarsh, grasslands and woods, and it appears to be expanding its range in southern England (Johnson, 1993).

*Ponera coarctata* (Latreille), a small ant, (Hymenoptera: Formicidae), long grass area 11, 18.vi.2002. This diminutive and secretive ant makes only small colonies beneath stones, mosses and leaf litter. It is nationally scarce and more or less restricted to the southern counties of England where most of its sites are coastal (Barrett, 1979; Falk, 1991). This was one of the ants found in my garden lawn when the first tests of the suction sampler were carried out.

*Myrmecina graminicola* (Latreille) a small ant (Hymenoptera: Formicidae), area 11, 18.vi.2002. This dark and slow-moving ant is always found in low numbers, often in the nests of the yellow meadow ant *Lasius flavus* (F.) beneath stones. It is rather local and apparently restricted to the southern counties of England and Wales where many of its sites are coastal (Barrett, 1979). This was also one of the ants found in my garden lawn when the first tests of the suction sampler were carried out.

Of the 57 species recorded during this survey, only 35 were found in the short mown areas 1 to 9 (22 additional species were found in the longer grass areas 10 and 11). Of these 35 short-grass species, 14 were found only once, mostly as single specimens suggesting that although living in the turf, they were not a significant part of the fauna and may be strays from neighbouring habitats. Seven species were found in 50% or more of the sample areas. Table 1 ranks the 57 species according to the number of sample areas in which each occurred.

## Discussion

Insect diversity very often reflects the diversity of the plants at a site, the diversity of plant architecture and the diversity of the surface of the substrate. The lawns and playing fields of Battersea Park are flat, uniformly cut short and almost completely dominated by rough grasses. The regime of rotary mowing constantly enriches the soil with mulched grass cuttings, fertilizing it and encouraging a limited number of grass species which become dominant, edging out other less competitive plants.

This management regime is deliberately chosen to achieve as tough and uniform a grass growth as possible for the utility nature of the Park. This is in complete contrast to other ‘semi-natural’ short turfs such as those grazed by sheep or rabbits. In such cases the turf height may be similar to that of a cut lawn, but constant transfer of nutrients by grazing animals, released in dung or urine elsewhere, produces a patchy nutrient-poor soil environment that discourages dominant species and leads to a plant diversity of many dozens of species per square metre. Invertebrate diversity on such sites is likewise very high.

Table 1. Ranking of the 57 invertebrate species found in grassland areas in London's Battersea Park. Seven species dominate the short mown playing fields, in that they were found in over half of the sample areas. A further 14 recurring species were found in two or more short grass sites and 14 species only in one site, usually as single specimens. Another 22 species were found only in the long-grass areas sampled for comparison

| Species | Family (Coleoptera unless stated otherwise) | No. of short grass areas recorded ($n=9$) | No. of long grass areas recorded ($n=2$) |
|---|---|---|---|
| **Dominant species** | | | |
| *Lasius niger* L. | Hymenoptera: Formicidae | 9 | 2 |
| Unident. springtail sp. 1 | Collembola | 8 | 2 |
| *Bembidion lampros* (Herbst) | Carabidae | 7 | 0 |
| *Kissister minimus* Aubé | Histeridae | 7 | 2 |
| *Tachyporus pusillus* Grav. | Staphylinidae | 6 | 1 |
| Unidentified money spider | Aranaea: Lyniphiidae | 6 | 2 |
| *Megasternum obscurum* Marsh. | Hydrophilidae | 5 | 2 |
| **Other recurring species** | | | |
| *Sitona punctiocollis* (Steph.) | Curculionidae | 4 | 1 |
| *Forficula auricularia* Lin. | Dermaptera: Forficulidae | 4 | 1 |
| *Chasmodon apterus* Esenb. | Hymenoptera: Braconidae | 4 | 0 |
| *Amara aenea* Deg. | Carabidae | 3 | 0 |
| *Harpalus affinis* Schr. | Carabidae | 3 | 0 |
| *Amischa analis* (Grav.) | Staphylinidae | 3 | 0 |
| *Amischa forcipata* (M. & R.) | Staphylinidae | 3 | 0 |
| *Mocyta fungi* (Grav.) | Staphylinidae | 3 | 1 |
| *Philonthus nitidicollis* Lac. | Staphylinidae | 3 | 0 |
| *Tachyporus hypnorum* (F.) | Staphylinidae | 3 | 1 |
| Unidentified bark louse | Pscoptera | 3 | 0 |
| *Stenus ossium* Steph. | Staphylinidae | 2 | 0 |
| *Aridius bifasciatus* Reit. | Lathridiidae | 2 | 1 |
| *Lasius flavus* (Fab.) | Hymenoptera: Formicidae | 2 | 0 |
| **One short-grass site only** | | | |
| *Trichapion simile* (Kirby) | Apionidae | 1 | 0 |
| *Orthoperus* species | Corylophidae | 1 | 1 |
| *Atomaria scutellaris* Mots. | Cryptophagidae | 1 | 0 |
| *Tychius picirostris* (Fab.) | Curculionidae | 1 | 0 |
| *Sitona hispidulus* (Fab.) | Curculionidae | 1 | 0 |
| *Enicmus transversalis* (Ol.) | Lathridiidae | 1 | 0 |
| *Mocyta clientula (Er.)* | Staphylinidae | 1 | 0 |
| *Nehemitropia sordida* (Marsh.) | Staphylinidae | 1 | 0 |
| *Oligota pumilio* Kies. | Staphylinidae | 1 | 0 |
| *Philonthus tenuicornis* M. & R. | Staphylinidae | 1 | 0 |
| *Quedius boops* Grav. | Staphylinidae | 1 | 0 |
| *Stenus nanus* Steph. | Staphylinidae | 1 | 0 |
| Unidentified shore fly | Diptera: Ephydridae | 1 | 0 |
| Unidentified springtail sp. 2 | Collembola | 1 | 0 |

(*Continued*)

Table 1. (*Continued*)

| Species | Family (Coleoptera unless stated otherwise) | No. of short grass areas recorded ($n=9$) | No. of long grass areas recorded ($n=2$) |
|---|---|---|---|
| **Only in long grass areas** | | | |
| *Notiophilus rufipes* Curt | Carabidae | 0 | 1 |
| *Pterostichus madidus* (Lin.) | Carabidae | 0 | 1 |
| *Longitarsus luridus* Scop. | Chrysomelidae | 0 | 1 |
| *Barypeithes pellucidus* (Boh.) | Curculionidae | 0 | 1 |
| *Gabrius nigritulus* Grav. | Staphylinidae | 0 | 1 |
| *Oxypoda adumbrata* Gyl. | Staphylinidae | 0 | 1 |
| *Rugilus orbiculatus* (Payk.) | Staphylinidae | 0 | 1 |
| *Stenus cicindeloides* (Sch.) | Staphylinidae | 0 | 1 |
| *Stenus fulvicornis* Steph. | Staphylinidae | 0 | 2 |
| *Stenus picipes* Steph. | Staphylinidae | 0 | 1 |
| *Stenus rogeri* Kraatz | Staphylinidae | 0 | 2 |
| *Tachyporus chrysomelinus* (Lin.) | Staphylinidae | 0 | 2 |
| *Tachyporus pallidulus* Sharp | Staphylinidae | 0 | 1 |
| *Anthocoris nemorum* (Lin.) | Hemiptera: Anthocoridae | 0 | 1 |
| *Orius niger* (Wolff.) | Hemiptera: Anthocoridae | 0 | 1 |
| Unidentified flower bug | Hemiptera: Anthocoridae | 0 | 1 |
| *Myrmecina graminicola* (Latr.) | Hymenoptera: Formicidae | 0 | 1 |
| *Ponera coartctata* (Latr.) | Hymenoptera: Formicidae | 0 | 1 |
| Unidentified springtail sp. 3 | Collembola | 0 | 1 |
| *Philoscia muscorum* (Scop.) | Isopoda: Philoscidae | 0 | 1 |
| *Porcellio scaber* (Latr.) | Isopoda: Porcellionidae | 0 | 1 |

It was very much expected that a survey of the invertebrate fauna of the close-mown areas in Battersea Park would produce few species. Species numbers recorded from areas 1 to 9 were 12, 13, 15, 8, 15, 10, 7, 13 and 11, respectively. The average number of invertebrate species recorded from the nine short-grass sites was just 11.6, confirming that this habitat type has extremely low species richness.

Site 10 was slightly different from the nine short-grass sites in that, although it was mown during 2002, it was occasionally missed by the mowing machinery and this had allowed a small variety of rough herbs to grow in the area. This additional diversity in plant species and plant architecture probably accounts for the fact that 22 invertebrate species were recorded from the grass hereabouts. This demonstrates that with even a small relaxation of the mowing regime, invertebrate richness increases.

Site 11 was also different from the nine short-grass sites. It was exactly like them a year ago, but as part of the extensive building and hard-landscaping works going on in Battersea Park, it had not been mown during 2002. Consequently, the grass grew long and various rough herbs had started to establish. At this site, 21 invertebrate species were found, demonstrating that after only a few months without mowing the invertebrate species richness of the site increased.

## Future invertebrate monitoring

With the agreement of Battersea Park's managers, it is intended to alter the mowing regime of some of the presently short-mown areas 1–9. Major works in the Park are part of a 'restoration' plan, to bring the Park to resemble its former glory when created 150 years ago. At that time the southern and western boundaries of the park were edged with shrubberies, where the adjacent grass was not so manicured as today. After 150 years, there are no longer any shrubs growing in these areas and the edges of the Park are dominated by large plane and other ornamental trees surrounded by mown lawn right up to the boles. Part of the restoration is expected to return these areas to shrub and to relax the mowing regime around them. Other small areas of the Park may also be allowed to grow long.

The invertebrates making use of these areas, as the grass grows longer, will be monitored during 2003 and beyond, to measure how biodiversity is increasing there.

## Acknowledgements

This survey was commissioned by Robert Wells of the Battersea Park Restoration Project under the auspices of the London Borough of Wandsworth. Many of the small rove beetles (family Staphylinidae) were kindly identified by Alex Williams. Jim Brock of The Horniman Museum, Forest Hill, also offered help and advice identifying some specimens.

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***Sisyra terminalis* Curtis (Neuroptera: Sisyridae) at Richmond Park, Surrey, in 1994.**—The report of the 14 January 2003 BENHS Indoor Meeting (*Br. J. Ent. Nat. Hist.* **16**: 196) mentions that Dr P.C. Barnard showed a specimen of the sponge fly *Sisyra terminalis* from Richmond, Surrey, found in summer 2002. The report suggests that this may have been the first London record for over 100 years, but in fact there is at least one other fairly recent record, also from the Richmond area. I recorded *S. terminalis* at the BENHS field meeting in Richmond Park (TQ1971, v.c. 17) on 6 August 1994. The specimen was caught at MV and passed to Colin Plant, to whom I am grateful for the determination.—Martin C. Harvey, Hampshire and Isle of Wight Wildlife Trust, Woodside House, Woodside Road, Eastleigh, SO50 4ET.

# FIRST RECORD OF *PTEROMALUS LEUCANTHEMI* JANZON (HYMENOPTERA: PTEROMALIDAE) IN BRITAIN, WITH NOTES ON IDENTIFICATION AND BIOLOGY

A. POLASZEK[1*], D. APLIN[2], V. K. BROWN[3] AND A. C. GANGE[2]

[1]*Department of Entomology, The Natural History Museum, London SW7 5BD, & Department of Biological Sciences, Imperial College of Science, Technology & Medicine, Ascot, Berks SL5 7PY, UK. ap@nhm.ac.uk.* [2]*School of Biological Sciences, Royal Holloway College, University of London, Egham, Surrey TW20 0EX.* [3]*Department of Agriculture, University of Reading, Earley Gate, PO Box 237, Reading, Berks RG6 6AR. *Corresponding author*

## ABSTRACT

The first record of *Pteromalus leucanthemi* Janzon from Britain (Surrey) is presented. Specimens were reared from galls of the tephritid fly *Tephritis neesii* (Meigen). Notes on the biology and identification of *P. leucanthemi*, and detailed comparisons with *P. albipennis* Walker, are provided.

## INTRODUCTION

The chalcidoid genus *Pteromalus* currently contains approximately 350 species in Europe of which 60 are known to occur in the UK (Noyes, 2001). The northwest European species were treated in detail by Graham (1969) under the genera *Pteromalus* and *Habrocytus* (Graham, 1969). *Habrocytus* has since been synonymised with *Pteromalus* (Bouček & Graham, 1978). *Pteromalus* species have a wide range of biologies, and include gregarious endoparasitoids of Lepidoptera pupae, endoparasitoids of solitary and social aculeate Hymenoptera pupae, and endoparasitoids of Coleoptera. *Pteromalus* species have also been reared as hyperparasitoids, often facultative, in the cocoons of Ichneumonidae and Braconidae, or from the pupae of other chalcidoids. Egg-predation in spider egg-sacs has also been recorded (Noyes, 2001). While the genus as a whole exhibits very broad host relations, individual species are mostly highly specialised, with respect both to overall biology and actual host range.

Graham (1969) divided this large genus (as *Habrocytus*) into a number of species-groups. His *albipennis*-group consists entirely (where the biology is known) of primary endoparasitoids of Tephritidae (Diptera) in galls on a wide variety of Asteraceae. This paper records the recent discovery in Britain of one member of this tephritid-specific group, *Pteromalus leucanthemi* Janzon.

A study was initiated in early spring 2001 to demonstrate how the colonisation of plant roots by arbuscular mycorrhizal fungi can alter insect parasitoid performance, through effects on the host plant and host insect (in this case leaf-mining larvae and flower-feeding species). The work involved detailed field observations of potted plants of *Leucanthemum vulgare* Lam. (Oxeye Daisy), within a wild flower meadow community rich in this species. Plants with reduced levels of mycorrhiza (controls) were compared with those to which different combinations of mycorrhizal species innoculum had been added.

On 20 June 2001, the second author (DA) reared four individuals (3♀ 1♂) of a chalcidoid from the flowerhead of an experimental control plant (reduced mycorrhiza) of *L. vulgare* infested with larvae of the tephritid, *Tephritis neesii* (Meigen), in the grounds of CABI Bioscience at Egham (SU996697). The flowerhead was collected on the 3 June 2001 and placed into a paper bag with a clear plastic front. The adult pteromalids emerging were later identified by the first author (AP) as *Pteromalus leucanthemi* Janzon.

## IDENTIFICATION OF *PTEROMALUS LEUCANTHEMI* (Plate 1, A–F; Figs 1–10)

Identification of *P. leucanthemi* was undertaken initially using Graham's (1969) key, in which female specimens keyed out approximately to *P. albipennis* Walker. However, Janzon's description (1980) of *P. leucanthemi*, based on material reared from the same host on the same host plant (*T. neesii* on *L. vulgare*), also agreed well with the newly-collected specimens. In the original description of *P. leucanthemi*, Janzon did not compare it with *P. albipennis*, but with *P. cardui* (Erdös) and *P. musaeus* (Walker). Both *P. albipennis* and *P. leucanthemi* differ from *P. cardui* in having the median area of the propodeum less transverse (see Graham, 1980:497, fig. 373). *Pteromalus musaeus* has the setae on the underside of the costal cell in a complete row (incomplete in *P. albipennis* and *P. leucanthemi*). Morphological differences between *P. albipennis* and *P. leucanthemi* appear to be very few. Based on Graham's figure of the female *P. albipennis* clypeus (Graham, 1980: 501, fig. 394), it is less deeply incised in that species than in *P. leucanthemi* (Plate 1, C), although this character is not visible in the lectotype of *P. albipennis*. There are some additional differences in propodeal structure between the females of the two species, *P. albipennis* (female lectotype) having more extensive reticulation in the median area. Janzon (1986) carried out an extensive morphometric study of the *albipennis*-group, measuring 24 pairs of length ratios for 10 putative species. His results show considerable overlap between the two species here considered, in all ratios measured. The three most promising character ratios presented by Janzon are post ocellar length/ocellar–ocular length, scutellar breadth/length, and eye height/scape length. Of these, the first two ratios are identical in the two species, based on the material examined, and the last character is not visible in the lectotype of *P. albipennis*. Further comparative morphological studies were therefore carried out using the material available in the collections of the Natural History Museum, London. Specimens identified as *P. albipennis* were partially dissected and slide mounted. Fore wings, female and male antennae and male genitalia were compared with those of *P. leucanthemi* (figs 1–10). Several differences were noted as discussed below, but the interpretation of these differences must be subject to the usual caveats of reliability concerning identification of this difficult group of species, and the possibility of much greater variation encountered in larger samples. Thus it is with some reservation that the new material is here identified as *P. leucanthemi* and newly recorded from Britain.

Differences noted between *P. leucanthemi* and *P. albipennis*: female antenna (figs 1,2) relatively more slender in *P. leucanthemi* (fig. 2), scape as long as funicle segments F1–F4. Scape shorter than F1–F4 in *P. albipennis* (fig. 1). Male antennae (figs 3,4) also relatively more slender in *P. leucanthemi* (fig. 4). F6 quadrate in *P. albipennis* (fig. 3), longer than wide in *P. leucanthemi* (fig. 4). Flagellar segments with contrasting light and dark areas in *P. leucanthemi* (fig. 4), of more uniform colour in *P. albipennis* (fig. 3). Fore wings (female, figs 5,6) with postmarginal vein very slightly longer in *P. leucanthemi*; angle between stigmal and postmarginal veins slightly more acute in *P. leucanthemi* (fig. 6). Male genitalia very similar (figs 7,8); digiti each with five teeth in *P. albipennis* (fig. 9) and four in *P. leucanthemi* (fig. 10), the inter-volsellar region apparently convex in *P. albipennis* (arrowed fig. 7, detail fig. 9) and planar in *P. leucanthemi* (arrowed fig. 8, detail fig. 10). This last difference could be an artifact of slide-mounting.

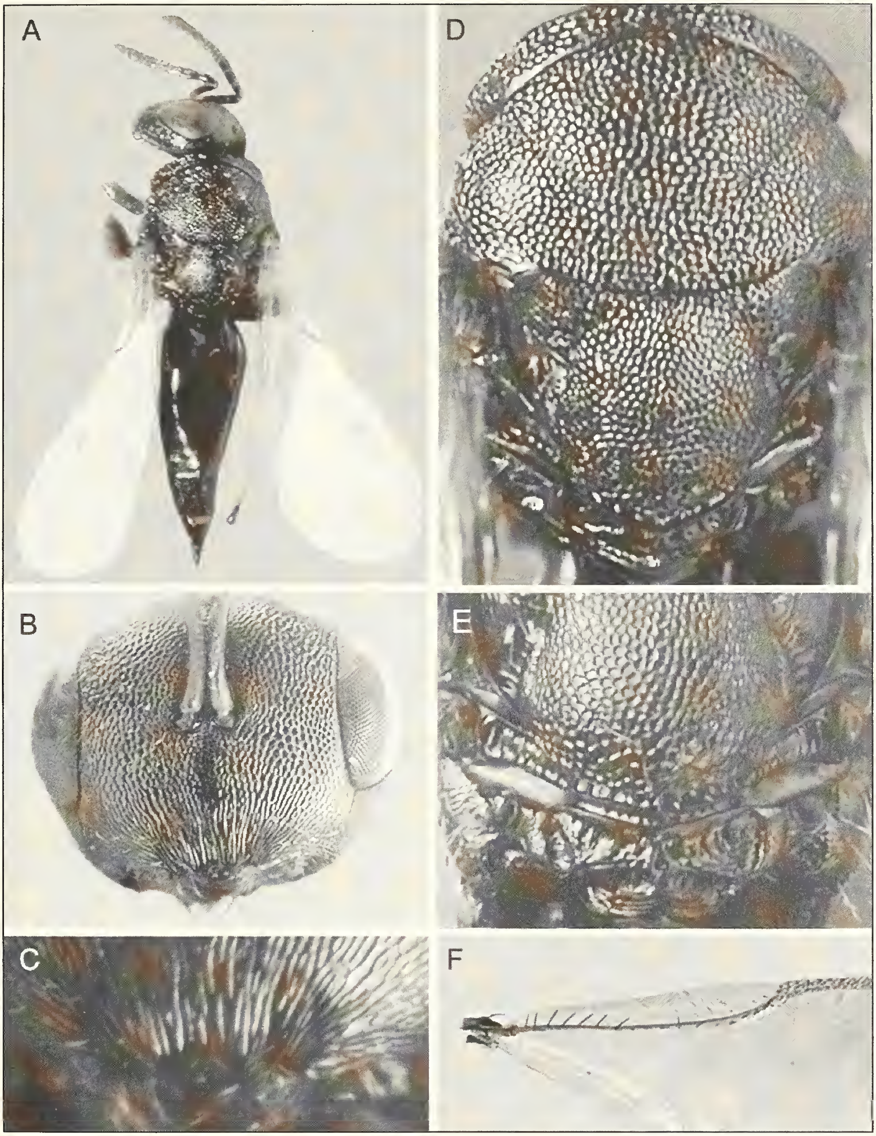
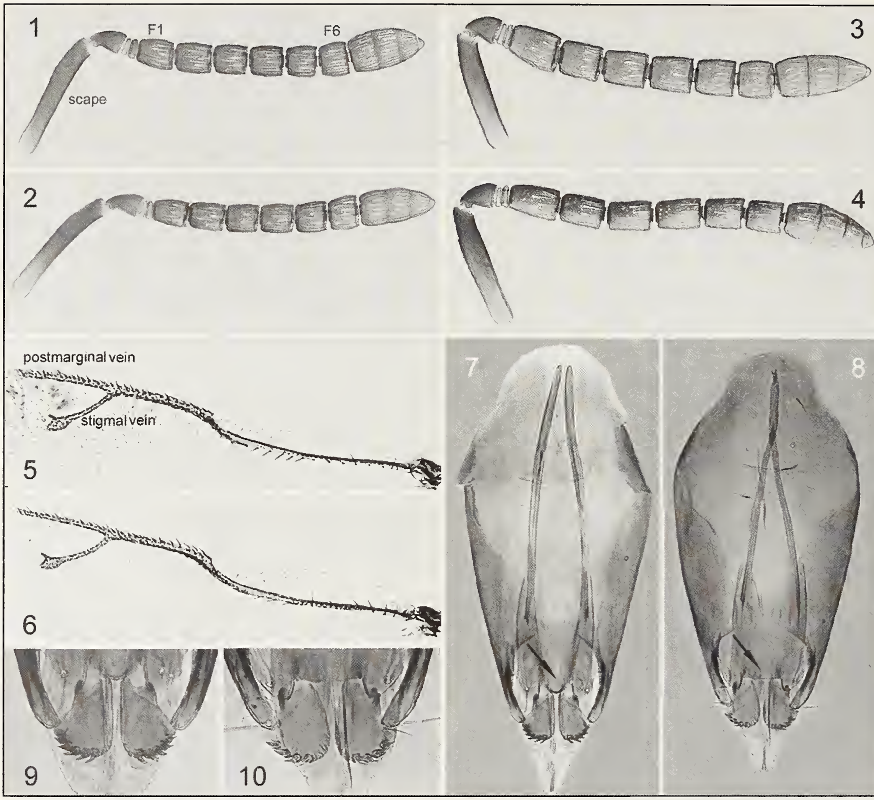



Plate 1. A–F *Pteromalus leucanthemi* female: A: habitus; B: face; C: clypeus; D: mesosoma; E: distal mesosoma; F: base of fore wing.




Figs 1–10: 1. *Pteromalus albipennis* female antenna; 2. *P. leucanthemi* female antenna; 3. *P. albipennis* male antenna; 4. *P. leucanthemi* male antenna; 5. *P. albipennis* female fore wing; 6. *P. leucanthemi* female fore wing; 7. *P. albipennis* male genitalia; 8. *P. leucanthemi* male genitalia; 9. *P. albipennis* male genitalia, detail; 10. *P. leucanthemi* male genitalia, detail.

Material examined: *Pteromalus albipennis* Lectotype ♀: [UK] Isle of Wight. BM Type: HYM 5.3376. 2♀ 3♂ UK: [Surrey?, Kew?] "bred from head of *Centaurea nigra*" (G.C. Varley) [various collection dates, 1932–35].

*Pteromalus leucanthemi* Janzon: 3♀ 1♂ UK: England, Surrey, Egham. *ex Tephritis neesii* in flowerheads of *Leucanthemum vulgare* (D. Aplin). col. 3.vi.2001 em. 20.vi.2001.

All specimens deposited in the Natural History Museum, London.

## Biology of *Pteromalus leucanthemi*

This appears to be the only record of this species since its description by Janzon (1980). As with other species of the *Pteromalus albipennis* species-group, it is a primary parasitoid of tephritid larvae in flowerheads of Asteraceae (Compositae), in this case, *L. vulgare*. It would appear that in this species group, the adult female lays an egg in the fully-grown host larva. The parasitoid wasp pupates in, and emerges as an adult, from the puparium of the host (Janzon, 1984).

## Acknowledgements

The authors acknowledge NERC for the award of research grant NER/B/S/2000/00158 and Royal Holloway College and the University of Reading for facilities. The support of the Keeper and staff of the Entomology Department, the Natural History Museum, is gratefully acknowledged. The first author acknowledges with thanks essential corrections by Dick Askew to a previous draft, and additional useful comments by Mark Shaw and Roger Burks.

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# BOOK REVIEW

**Butterflies in Slovenia**. By David Withrington. LeWit (privately published), Soft cover, 39 pp, plus back cover map. Peterborough, 2003

This is a super booklet, and attractively produced with a scatter of colour photos of habitats and butterflies. It is a personal review of experiences from 14 visits to Slovenia, during which 138 species were recorded. Notes are given for each species, together with information on selected localities arranged under ecological regions. The author's love and passion for Slovenia shines through, and is reflected in his choice of publishing privately. As a Slovenia fan myself, and one who has delighted in seeing the butterflies there, I feel some other BENHS members should also enjoy this booklet. David is generously offering to send it free to those who provide him with a self-addressed A5 envelope bearing a second class 34p stamp for return in UK: his address is 21 Lawn Avenue, Peterborough PE1 3RA.

Alan Stubbs

# REVIEW

**Photographic atlas and identification key to the robber flies of Germany**. CD-ROM, by Fritz Geller-Grim (Ampyx-Verlag, Germany, 2003). €25.00. ISBN 3-932795-18-0. E-mail: stark@ampyx-verlag.de.

To me this is brilliant. The CD-ROM is very easy to use, and I say that as someone who gets flummoxed by anything that isn't 'nit-proof'. Even if robberflies are not your favourite insects, read on since this seems a model for others to follow using modern technology.

The opening page offers English or German text (click on flag). Options include a key to the 82 species known from north-west Europe (Belgium, Netherlands, Denmark, Norway, Sweden, Germany and UK). Key couplets are accompanied by close-up colour photos of characters, often with arrows to features, and in the case of *Dioctria*, strong red highlight over the arrangement of pleural shimmer-stripes, and on antennal segments where comparative length is important. In some cases pictures of genitalia dissections are offered, as with *Machimus cowini* Hobby. In total there are 1,900 photos, including whole insects. Robberflies have some awkward complexes but I really felt confident with this kit.

The arrangement has been well thought through. The checklist allows selection of a species, genus, or a species complex (as within *Machimus*) or subfamily. After such selection, a side list allows direct call-up of related taxa. The introduction makes clear that it is a key work, so there is nothing about the biology, except under 'Notes' the 'research' option gives some habitat diagrams showing the niche of various species for May, June and July. 'Notes' also told me that the known world fauna comprises 6,854 valid species in 528 genera, though many more remain to be described, especially in the tropics; world maps show the numbers for species and genera in the main regions. Under literature, the main European and country key works are given.

Among the 'Notes' options, there is one on photography. A Nikon Coolpix 900 gave a resolution of 3.3 million pixels, and photos were taken down a microscope eye-piece without an adaptor. Thus it was practical to visit museums to take photos, though independence by taking a cool light source with two fibre-optic arms was felt desirable, supplemented by extra light if necessary. The CD-ROM uses lower resolution pictures, but they are very good for the purpose.

The author is one of the leading authorities on robberflies in Europe and he acknowledges collaboration with many other dipterists, including Dr Malcolm Smart and Mike Taylor in England and Dr Martin Speight in Dublin. It is daunting to reflect on how many hours went into this venture (and duplicating text in two languages), but there would not be many volunteers with the time and skill to draw 1900 detailed sketches. Photos are quicker once the procedure is running smoothly, and the results much more preferable. Half the battle in preparing a key work is to decide techniques and format. I very much hope that others will be inspired by this format since there is an urgent need for more easy-to-use key works with colour illustrations.

ALAN STUBBS

# *ELYMANA KOZHEVNIKOVI* ZACHVATKIN (HEMIPTERA: CICADELLIDAE) IN BRITAIN: IDENTIFICATION, DISTRIBUTION AND HABITAT

M. D. EYRE[1,2], J. C. WOODWARD[2] AND M. L. LUFF[2]

[1]*Entomological Monitoring Services (EMS), 13 Manor Grove, Benton, Newcastle upon Tyne NE7 7XQ,* [2]*Centre for Life Sciences Modelling, School of Biology, The University, Newcastle upon Tyne NE1 7RU*
*Email: M.D.Eyre@ncl.ac.uk*

## ABSTRACT

The cicadellid leafhopper species *Elymana kozhevnikovi* Zachvatkin is brought forward as a new British species. It was recorded in 1995 and 1996 from sites in the Scottish borders and from Northumberland in northern England and this paper provides information on the identification of the species, its known distribution and its habitat in Britain.

## INTRODUCTION

*Elymana kozhevnikovi* Zachvatkin was announced as a British species in a newsletter of the Auchenorrhyncha recording scheme (Stewart, 1996), when specimens caught by M. D. Eyre in southern Scotland in 1995 were identified by J. C. Woodward and checked by the national recorder A. J. A. Stewart. These records have been mentioned in work on species (Kirby *et al.*, 2001) and assemblage distribution (Eyre *et al.*, 2001) but no information on identification, exact distribution and habitat in Britain has been published. This paper covers these points and brings forward further records.

## IDENTIFICATION

The species closely resembles *Elymana sulphurella* (Zetterstedt) (Le Quesne, 1969), with the only reliable diagnostic separation character on part of the male genitalia. Figure 1 shows the male pygofer lobes of *E. sulphurella* and *E. kozhevnikovi* (adapted from Ossiannilsson, 1983). The dorsal (inner) side of *E. kozhevnikovi* pygofer lobes have a comb of stout denticles, whilst there is only a thin row of denticles on the lobes of *E. sulphurella*. Specimens are in the collections of J. C. Woodward and of the Entomology Department of Liverpool Museum at the National Museums and Galleries on Merseyside.

## DISTRIBUTION AND HABITAT

This is, in Scandinavia, a species of woods, scrubland, damp meadows and sandy areas recorded in Sweden but not Denmark or Norway by Ossiannilsson (1983). It was first found in Britain in the Scottish borders on the Langholm–Newcastleton Hills SSSI, in vice-county 72 (National grid reference, NY394866), in August 1995 and again in August 1996 (NY394866 and NY392865) using pitfall traps and a suction sampler (Stewart & Wright, 1995). It occurred on the grassy sides of two streams cutting through peat moorland. These sites were on mineral soil, unlike the surrounding peat, on well-drained pronounced slopes. These conditions provided a soil for fine grass species, usually mixed with bracken, within large areas of heather

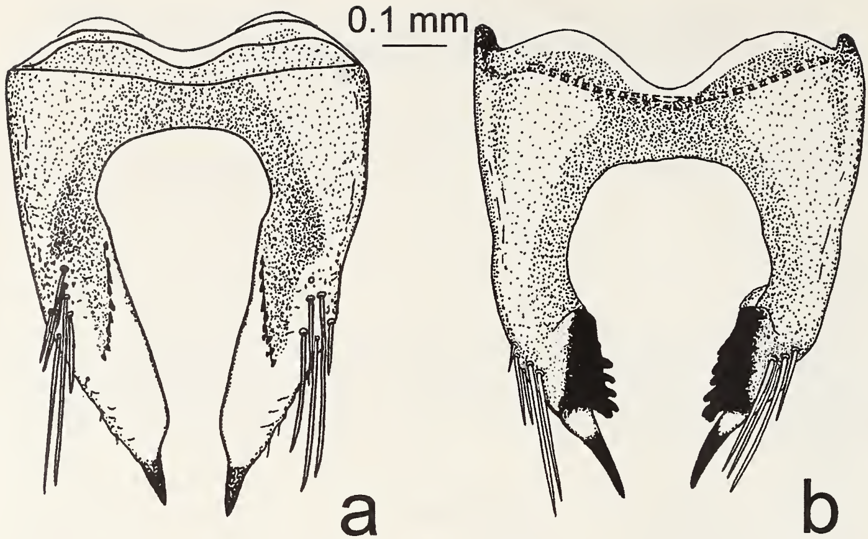


Figure 1. Male pygofers of (a) *Elymana sulphurella* and (b) *Elymana kozhevnikovi* showing the comb of stout denticles on the dorsal (inner) side of the lobes of *E. kozhevnikovi* (adapted from Ossiannilsson, 1983).

and coarse moorland grasses. Other Auchenorrhyncha species present on the same sites were *Adarrus ocellaris* (Fallén), *Aphrodes albifrons* (Linnaeus), *A. bifasciatus* Linnaeus), *A. makarovi* Zachvatkin, *Cicadella viridis* (Linnaeus), *Conomelus anceps* (Germar), *Deltocephalus pulicaris* (Fallén), *Dicranotropis hamata* (Boheman), *Diplocolenus abdominalis* (Fabricius), *Jassargus distinguendus* (Flor), *J. sursumflexus* (Then), *Javesella discolor* (Boheman), *Macustus grisescens* (Zetterstedt), *Muellerianella fairmairei* (Perris), *Philaenus spumarius* (Linnaeus), *Psammotettix nodosus* (Ribaut), *Streptanus aemulans* (Kirschbaum) and *S. sordidus* (Zetterstedt) (nomenclature follows that of Le Quesne & Payne, 1981).

*Elymana kozhevnikovi* was also captured, again by M. D. Eyre, in August 1996 from two patchy woodland sites in the valley of the River Coquet, draining the Cheviot Hills, providing the first English records. The site at Linbriggs (NT892066) (VC 68) was very steep with soil between scree. The ground vegetation was mainly grasses and was partially shaded by scattered ash trees. The steep bank led to grass moorland and the other Auchenorrhyncha species found there were *Aphrodes flavostriatus* (Donovan), *A. bifasciatus*, *A. makarovi*, *D. abdominalis*, *J. distinguendus*, *Neophilaenus lineatus* (Linnaeus), *P. spumarius*, *Streptanus marginatus* (Kirschbaum) *S. aemulans*, *S. sordidus* and *Thamnotettix confinis* (Zetterstedt). Grasslees Wood (NY953974) (VC 67) was on a less steep bank but with mineral soil below peat moorland. Shade was provided by oak and ash trees and there was some bracken. The other leaf- and planthopper species present were *A. ocellaris*, *A. albifrons*, *A. bifasciatus*, *A. makarovi*, *Arocephalus punctum* (Flor), *Arthaldeus pascuellus* (Fallén), *C. viridis*, *C. anceps*, *Conosanus obsoletus* (Kirschbaum), *Delphacodes venosus* (Germar), *Dikraneura variata* Hardy, *J. distinguendus*, *M. grisescens*, *M. fairmairei*, *N. lineatus*, *P. spumarius*, *S. aemulans* and *S. sordidus*.

*Elymana kozhevnikovi* appears to be a species occurring in the marginal land between moorland and more intensive agriculture. It did not occur on any of the upland land cover types in the Scottish borders and we do not have it from any sites in the managed landscape of lowland north-east England. All sites had thin mineral soils, were well-drained, had a degree of shade and were grazed to some extent by either sheep or deer. These habitat preferences generally tally with those given by Ossiannilsson (1983), except that we do not have it from damp meadows.

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## BOOK REVIEWS

**Butterflies of Cyprus**. By Christodoulos Makris. (Nicosia: Bank of Cyprus Cultural Foundation, 2003). 329pp. Hardbound £29.50. ISBN 9963-42-815-0. Softbound £25.80. ISBN 9963-42-817-7.

Finding illustrations of the island's butterfly fauna is a problem which has faced visitors to Cyprus for many years. For one thing, Cyprus has its own endemics, which are rarely mentioned in the popular European field guides, let alone illustrated. Lying at the southeast corner of Europe, Cyprus also has a few Asian and African species such as *Cigaritis acamas* (Klug) (Levantine Leopard) and *Ypthima asterope* (Klug) (African Ringlet), which are also hard to find as illustrations.

At long last, all these problems are solved by a sumptuous new book by Christodoulos Makris. Produced as one of a series of works on the flora and fauna of Cyprus, it has been subsidised by the Bank of Cyprus to enable lavish illustrations of all of the island's butterflies. Its 329 pages describe all 53 species in immense detail, with typically 10 photographs of living examples of ova, larva, pupa and adults of both sexes, showing different colour forms and seasonal variations. The captions give a further insight, by identifying the flora in the picture, which is particularly helpful for visitors who may be seeing the host plants and nectar sources for the first time. A separate section shows an equally comprehensive array of well-labelled set specimens, allowing confident identification and separation of similar species. The text to the main section is well written, yet concise, with all the detail one expects clearly laid out for reference, including phenology and distribution. The distribution maps are the most comprehensive and up to date ever to have been published for Cyprus. They include all previously published records, 12 years of local study by the author and his contemporaries, the amassed records of visiting lepidopterists and expatriate residents living both in the south and the north of the island. They have been contributed by Eddie John, and provide a special interest to all those visiting BENHS/AES members who have been sending their records to him. In conjunction with the habitat descriptions, they provide an easy check on what is there to be found—and where to search for new records too!

Some of the author's painstaking field work has been written up in scientific journals, and is nicely condensed here within the species descriptions. Typical is the detail of the breeding of *Libythea celtis* (Laicharting) (the Nettle-tree Butterfly) in Cyprus, formerly considered an occasional migrant. His treatment of the three migrants that have been found only once, and of *Colias erate* (Esper), which remains unsettled, is nicely presented, informative and unprejudiced.

Several features of the book are imaginative and pleasing; each family starts with a block of photographs at life size, showing (for example) all 15 lycaenids on one page. Some close-ups of wing scale patterns add a rare beauty, as does the high quality of the life-cycle and early stages photography. The sections on Enemies and Defence show superb pictures of predators in action, chemical defences deployed and camouflage at work. What is special here, is that the examples are all of Cyprus species, the ant, for example, feeding on the secretions of a larva of *Zizeeria karsandra* (Moore) (the African Grass Blue). The preliminary sections on the geology, morphology and vegetation of Cyprus are authoritative and clearly illustrated. The closing section, a discussion on the species of Cyprus, is thought provoking, and includes an excellent tabulation of phenology and altitudinal distribution; another clear guide for planning what to find, and where.

This volume will clearly remain the definitive work on the butterflies of Cyprus for many years to come. It is a must for any lepidopterist with more than a passing interest in the Mediterranean islands. Like the *Millennium Atlas*, it is too large to fit into your back pocket, but that is hardly a failing! The Greek language version has been available in Cyprus for some months (with a different ISBN), and this English edition is likely to outsell it.

ROB PARKER

## The Common Plants Survey 2004

Plantlife International is conducting a survey of common UK plants from 1st March–30th September 2004. These include such familiar species as Traveller's Joy, Red Dead Nettle, Common Poppy, Thrift, Yellow Flag and Marsh Marigold. The aim is to measure changes in abundance and distribution of 56 key species in relation to changes in suburban spread, road development and other land use patterns through repeat surveys. Next year a Common Plants Report is planned which will give a more accurate picture of how our wild plant populations are thriving. The information will be used to direct policies designed to protect wildlife. If you wish to participate in monitoring a 1 $km^2$ near you please contact Joanna Thurman for a recording sheet and full colour identification guide on 01722 342739 or email *joanna.thurman@plantlife.org.uk*.

# UK BAP Priority Species Review 2005: the role of Invertebrate Link (JCCBI)

The UK Biodiversity Action Plan (BAP) is a key part of the nature conservation effort towards ensuring that the UK fulfils its obligations under the Convention on Biological Diversity (1992). Under the BAP, target driven Species Action Plans (SAPs) and Habitat Action Plans (HAPs) are prepared and implemented for those species and habitats identified as being in greatest need of increased conservation effort. The current BAP list encompasses 391 species, 44% of which are invertebrates.

The list of BAP Priority Species is to be reviewed in 2005, providing an opportunity to remove some species, and to add others that are in need of urgent conservation action. It seems unlikely that the total number of Priority Species will change substantially, but this will be an opportunity to propose changes to the current list. The formal mechanisms and detailed timetable for the review are yet to be announced by the Department for the Environment, Food and Rural Affairs.

In order to ensure that the conservation needs of terrestrial and freshwater invertebrates are represented in the review process, Invertebrate Link (JCCBI) has established a Working Group to help co-ordinate the gathering of relevant information.

The Invertebrate Link (JCCBI) UK BAP Priority Species Review Working Group has undertaken to:

- *Identify 'co-ordinators' for groups of invertebrate taxa.*
  Co-ordinators will be asked to liaise with relevant experts, interest groups and recording schemes, to review the conservation status of British species amongst their target taxa, and propose changes to the current list of BAP Priority Species where appropriate.
- *Assist co-ordinators in the review process.*
  For example, through the Joint Nature Conservation Committee (JNCC), raw lists of British species for each group of invertebrate taxa will be produced, showing their current conservation designations (where this information is readily available), providing a template against which co-ordinators can work.
- *Collate a set of recommendations on invertebrate Priority Species.*
  These will be fed into the BAP review process, on behalf of the invertebrate conservation community.

## Criteria for selecting Priority Species

The general criteria for selection are unlikely to differ from those used for the original Biodiversity Action Plan lists published in 1995. These were based on international conservation status, rarity and rates of decline. However, the available data for many invertebrate taxa are not sufficient to establish whether, for example, a species has declined by more than 25% in the last 25 years. For this reason, the Working Group is keen to encourage a pragmatic approach to the selection of invertebrate Priority Species, drawing on the knowledge of relevant experts to make judgements within the bounds of the selection criteria and available data. The Working Group will issue more detailed guidance to co-ordinators as the formal mechanisms for the review process become clearer.

### Indicative timetable

*Early 2004*: Co-ordinators identified and raw species lists (where available) provided by JNCC.

*During 2004*: Co-ordinators liaise with relevant experts, interest groups and recording schemes to review Priority Species for their groups of invertebrate taxa.

*Late 2004*: Recommendations on invertebrate Priority Species collated.

*Early 2005*: Information fed into the formal review process.

This is a substantial undertaking, and it is intended that the relevant information should be gathered (as far as possible) through existing networks of experts, interest groups and recording schemes. If you wish to participate, you are encouraged to contact colleagues, societies and recording schemes to ensure that they are alert to the Priority Species review, and to make contact with designated co-ordinators in due course.

Those who wish to know more about the Working Group, or the review process (as it relates to invertebrates) should contact: Oliver Cheesman (CABI Bioscience) *o.cheesman@cabi.org* Tel.: 01491 829071.

Information on the UK Biodiversity Action Plan, including the review process in general, is available on the BAP website: *http://www.ukbap.org.uk/*

Invertebrate Link (JCCBI) is a forum for voluntary and professional organisations involved with the conservation and study of invertebrates in the UK. The group's objective is to 'advance the conservation of invertebrates in the UK by facilitating exchange of information between relevant organisations and statutory bodies, and by providing a context for co-operative ventures in relation to the development of strategy, policy, principles and best practice'. The membership currently comprises representatives of:

Action for Invertebrates
Amateur Entomologists' Society
Ancient Tree Forum
Balfour-Browne Club
Bees, Wasps and Ants Recording Society
Biological Records Centre
British Arachnological Society
British Dragonfly Society
British Entomological & Natural History Society
British Myriapod & Isopod Group
Buglife – The Invertebrate Conservation Trust
Butterfly Conservation
CABI Bioscience
Conchological Society of Great Britain & Ireland
Countryside Council for Wales
Department for Environment, Food & Rural Affairs (Defra)
Dipterists' Forum
English Nature
Environment Agency
Forestry Commission (Forest Research)
Joint Nature Conservation Committee
National Trust for England, Wales & Northern Ireland
Natural History Museum
Royal Entomological Society
Royal Museum of Scotland
Royal Society for the Protection of Birds (RSPB)
Scottish Natural Heritage
The Wildlife Trusts

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## ARTICLES



## SHORT COMMUNICATIONS



## PROCEEDINGS & TRANSACTIONS / SOCIETY NEWS



## REVIEWS



## ANNOUNCEMENTS