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Cover photograph: Nymphs of the parent bug, *Elasmucha grisea* (L.) (Hemiptera: Acanthosomidae), living communally on a birch leaf. Photo: Richard A. Jones.

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.

A CODE OF CONDUCT FOR COLLECTING INSECTS AND OTHER INVERTEBRATES

INVERTEBRATE LINK
(Joint Committee for the Conservation of British Invertebrates)

Introduction

Field entomologists in the UK have long supported the code for collecting that was published over thirty years ago by the (now renamed) Joint Committee for the Conservation of British Insects. The code, which was partially revised in 1987, has now been thoroughly updated. It thus takes account of developments in conservation and is applicable to all terrestrial and freshwater invertebrates; not just insects. The code, of necessity, defines certain activities that should be avoided or restricted but it equally emphasises the need to collect invertebrates in order to gain valuable information, much of which can aid conservation. The code is reproduced in full below and will also be separately published. Additionally a 'pocket' summary of the code will be published free of charge by the Forestry Commission

The Code

This Committee believes that the study of invertebrates and the formation of reference collections, complete with their inherent recorded data, are important sources of information which make a vital contribution to the conservation of the invertebrate fauna and to conservation in general. To this end, accurate identification of species is essential and often requires the examination of dead specimens.

Available evidence indicates that invertebrate populations are not generally harmed by the collection of specimens. Collecting may, however, have some potential to harm populations that are very localised or that have been seriously affected by the loss and fragmentation of habitats, caused by ever-increasing changes in land use. Such changes include the decline of traditional farmland management, urban expansion and road development.

In view of these considerations, the Committee believes that collecting should always be limited to the minimum necessary for the purpose intended, as well as by full compliance with legal requirements relating to particular sites and species. This principle is enshrined within the following code of conduct, together with guidance on the safeguarding of collections and associated data.

The Committee acknowledges the restraint that is already exercised by most people who study invertebrates in the field. Furthermore it believes that, by subscribing to this code, they can show themselves to be a concerned and responsible body of committed naturalists who wish to maximise the value of their data for conservation.

1.0 Collecting—General

1.1 No more specimens than are strictly required for a specific purpose should be captured or killed. Remember that even an apparently common species may be locally vulnerable.

1.2 Individuals of readily identified species, particularly butterflies, should not be killed, nor removed from the wild, unless required as voucher specimens or for scientific or educational study. If they are not needed for

such purposes, they should be examined while alive and then released near the place of capture.

1.3 If the accumulation of scientific data is not a specific aim, consideration should be given to photography as an alternative to collecting, especially for macrolepidoptera.

1.4 Species that do not occur in abundance should not be taken year after year from the same locality.

1.5 Specimens for exchange or disposal to other entomologists should be taken sparingly, and preferably not at all.

1.6 Invertebrates should not be collected from the wild for sale or other commercial purposes, including the manufacture of jewellery, or for purely ornamental display.

1.7 If specimens are sold from captive-bred stock or from old collections, they should be accompanied by data, including details of provenance.

1.8 When obtaining early stages by collecting leaf-mines, galls, seed heads etc., never take all that can be found. Leave as many as possible to allow the population to survive.

1.9 Do as little damage to the habitat as possible.

1.10 Adequate records, as indicated in article 5.1, should always be kept.

1.11 Collections should be properly housed, so as to prevent deterioration or damage by pests.

1.12 The future value of every collection should be safeguarded. The owner's will should provide for the appointment of a scientific executor, who can offer the collection to a learned society or a museum.

2.0 Collecting—Rare, Local and Endangered Species

2.1 It is illegal to collect certain listed invertebrate species or forms except under licence from the relevant authority[1]. Other taxa listed as being of 'Conservation Concern' should not be collected except with the utmost restraint[2]. A pair of specimens of any such taxon should be considered sufficient for a personal collection. Species in greatest danger should not be collected at all for this purpose.

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[1] In Great Britain, these taxa are protected under Section 9 (1) of the Wildlife & Countryside Act (1981) and are listed within Schedule 5 of the Act. The licensing authority at the time of writing is DEFRA; applications can be made via the national conservation agencies (e.g. English Nature). The authority for Northern Ireland is the Environment & Heritage Service of DoE(NI).

[2] Such taxa are listed in CITES schedules, Biodiversity Action Plans, Red Data Books and reviews of nationally or locally notable species, as updated on the websites of UK government conservation agencies: e.g. www.english-nature.org.uk and www.citesuk.gov.uk

The taking of larger or annually repeated samples may, however, be justifiable for *bona fide* scientific study, if it can be reasonably expected to have no damaging effects on the population.

2.2 The collection of rare or local species from sites where they are already known to occur does not generally provide useful data and should be avoided, except for the purpose of survey or other scientific study.

2.3 Newly discovered localities for rare species should be reported to the appropriate conservation organisations, records centres and organisers of recording schemes (*see* 5.2).

3.0 Collecting—Trapping

3.1 The catch in a trap should be released after being examined, except for any specimens that must be killed for voucher purposes or for an ecological or other scientific study. The release should be made in the same locality, but away from the immediate trap site. The catch should preferably be kept in cool shady conditions and then released at dusk. If this is not possible, it should be released in long grass, or other cover; not on lawns or other exposed surfaces.

Anaesthetics are harmful and should not be used.

3.2 Live trapping, for instance in traps filled with egg-tray material, is always to be preferred to the killing of the catch.

3.3 Unwanted invertebrates should not be fed to fish, birds or other animals.

3.4 If a trap used for scientific purposes is found to be catching rare or local species unnecessarily, it should be re-sited.

3.5 Traps and lights should be sited with care so as not to annoy or confuse other people or to waste police time.

4.0 Collecting—Permissions and Conditions

4.1 Always seek permission from the landowner or occupier before collecting on private land. Obtain appropriate permit(s) for access and/or collecting on any site controlled by a conservation body, such as a county wildlife trust, local authority, the national conservation agency, Forest Enterprise or National Trust. (Collecting on a Site of Special Scientific Interest requires permission both from the owner and from the local office of the appropriate national conservation agency.[3])

4.2 Always comply with any conditions laid down by the granting of access and the permission to collect.

4.3 Always report your findings to the person who gave you permission, at least by commenting orally on the ecological requirements of a few species of interest. Findings from a nature reserve or other important site should be sent to the appropriate authority in the form of a list of the species recorded, annotated with habitat data.

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[3] In Great Britain these agencies are: English Nature, Scottish Natural Heritage and Countryside Council for Wales.

5.0 Recording—General

5.1 Full and relevant data should be kept together with all specimens retained; i.e. as attached data labels in the case of dry mounted collections. These data may be repeated and amplified in databases, notebooks and other media.

5.2 Species lists, together with any other data, should always be lodged with the relevant county and national recording schemes[4]. If possible, the data should be entered on a database compatible with the National Biodiversity Network.

6.0 Collecting—Protecting the Environment

6.1 Protect habitats and remember the interests of other naturalists. Avoid harm to nesting vertebrates and to vegetation, particularly rare or fragile plants.

6.2 When 'beating' trees or shrubs for invertebrates, do not thrash leaves or twigs so as to cause damage; a sharp jarring of branches is normally sufficient and more effective.

Searching for larvae, rather than indiscriminate beating, should be considered as more environmentally friendly and giving more insight into the lifestyles of the species concerned.

6.3 When coleopterists (or others) work dead wood or bark, they should leave a substantial proportion untouched in the locality. Where practicable, detached bark and worked material should be replaced.

6.4 Overturned stones and logs should be gently replaced in their original positions unless very deeply embedded.

6.5 Damage to aquatic habitats from over-vigorous use of water nets or kick sampling should be avoided. Water-weed and moss which have been worked for invertebrates should be replaced, together with the unwanted animals. Plant material that has been left by site managers in litter heaps should be replaced and not scattered about.

6.6 'Sugar' should never be applied to tree trunks or other surfaces where it could harm lichens or other epiphytes or where it would be unsightly. 'Wine ropes' should be used in preference to sugar patches.

6.7 Uprooting plants or digging up turf without permission from the landowner is generally illegal in the UK and should not be done. Certain plant species, which are listed as fully protected by law, should not be picked or collected in any way without an appropriate licence.

For invertebrates in short turf, damage to the habitat can be avoided and the efficiency of sampling improved by the use of a 'suction sampler'.

6.8 Litter from vertebrate nests or roosts should be collected only in compliance with the laws applying to the species concerned.

6.9 Follow the Country Code and comply with all bylaws that apply to the site concerned.

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[4] Relevant schemes and databases may be listed on invertebrate conservation websites.

7.0 Rearing and Breeding

7.1 If obtaining breeding stock of scarce species, try to do so from captive colonies that have already been successfully established, rather than from wild-caught sources.

7.2 No more larvae or other livestock should be collected from the wild than can be adequately fed and maintained in captivity.

7.3 Bred or reared invertebrates that are surplus to requirements should not, without consultation as defined in Article 7.4, be released into the wild, except back into their parental population. Large numbers should not be released even into a parental population if it is small and localised.

Surplus invertebrates that, according to Article 7.4, are not suitable for release should if possible be offered to others with a relevant interest.

The above guidance, which is based on genetic and ecological considerations, refers to native taxa. It is illegal in the UK to release any non-native invertebrate into the wild, except under special licence from the relevant government agency[5].

7.4 The establishment of a new population or the attempted reinforcement of an existing one should not be undertaken except within a well-prepared, ecologically sound programme; this must be sanctioned by the appropriate conservation agencies, notified to the relevant recording schemes and local organisations and agreed with the owner or occupier of the site(s) concerned. Also consult "Insect Re-establishment—a code of Conservation Practice" issued by the Committee.

The guidelines in 7.3 and 7.4 include precautionary measures to avoid the adverse effects of releasing potentially deleterious genes into recipient populations.

8.0 Health and Safety, Insurance etc.

8.1 All collectors and surveyors should look after their own safety and that of anyone else who may be affected by what they are doing. Formal risk assessments may be required by site owners or commissioners of surveys.

8.2 If any activity might cause suspicion or confusion (e.g. the use of light traps in certain localities), the relevant authorities, such as the police or coastguard, should be notified beforehand.

All those involved in fieldwork, especially organised events, should be aware or made aware of their liabilities for personal injury or damage to property. Appropriate insurance cover should be obtained if necessary.

First published 1969; second edition, May 1987.

This edition was drafted with the help of contributions and advice from K.N. Alexander, N.A.D. Bourn, O.D. Cheesman, P.J. Hodge, R.A. Jones, R.S. Key, D. Lonsdale, M.G. Morris, J. Muggleton, M. Parsons, J.W. Phillips, A.J. Pickles, A.E. Stubbs and M. Willing.

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[5] At the time of writing, the relevant UK agencies are DEFRA (for England and Wales) and its counterparts in Scotland and Northern Ireland.

A summary of this code is published free of charge by the Forestry Commission Research Agency, Alice Holt Lodge, Wrecclesham, Farnham, Surrey GU10 4LH (Tel. 01420 22255)

INVERTEBRATE LINK
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Organisations represented on Invertebrate Link

Action for Invertebrates
Amateur Entomologists' Society
Balfour-Browne Club
Bee Improvement and Bee Breeders' Association
Bees, Wasp, and Ants Recording Society
Biological Records Centre
British Arachnological Society
British Dragonfly Society
British Entomological and Natural History Society
British Myriapod and Isopoda Group
Buglife – The Invertebrate Conservation Trust
Butterfly Conservation
CABI Bioscience
Conchological Society of Great Britain & Ireland
Countryside Council for Wales
DEFRA
Dipterists' Forum
English Nature
Environment Agency
Forestry Commission (Forest Research)
Joint Nature Conservation Committee
National Trust for England, Wales and Northern Ireland
Natural History Museum
Royal Entomological Society
Royal Museum of Scotland
RSPB
Scottish Natural Heritage
The Wildlife Trusts

A Code of Conduct for Collecting Insects and Other Invertebrates

The British Entomological and Natural History Society, Butterfly Conservation and Buglife — The Invertebrate Conservation Trust congratulate Invertebrate Link (formerly the JCCBI) on producing the new edition of *A Code of Conduct for Collecting Insects and Other Invertebrates*, which is published in this issue of the *British Journal of Entomology and Natural History*. We warmly welcome and endorse the new Code and expect that all members of our respective societies will abide by its provisions and will encourage others to do likewise.

Collecting insects and other invertebrates is a legitimate activity for biological recording, scientific research, personal study and other purposes, with the exception of the relatively small number of protected species (in Britain these are listed on Schedule 5 of the Wildlife and Countryside Act, 1981, see www.jncc.gov.uk). By complying with the new Code, entomologists will be able to pursue their interests in invertebrates, knowing that they will not harm populations of those species that they collect. It would be wise to remember that in a few other European countries the privilege of collecting insects (and other invertebrates) has been partly or largely withdrawn, through highly restrictive legislation. More enlightened attitudes currently prevail in Britain, where collecting invertebrates is acknowledged as an essential part of accurately recording species for conservation and other purposes. However, should entomologists be perceived as abusing this position, then there is the real possibility of extensive restrictions on collecting being introduced in Britain. All naturalists have a duty to act responsibly and to adhere to the new code, thereby ensuring that their activities will increase our knowledge of invertebrates and continue to benefit conservation.

Invertebrate Link (formerly the JCCBI) is an umbrella organisation whose membership consists of NGOs and statutory organisations concerned with the conservation of Britain's invertebrates. All have contributed to and endorse the new Code. Current members are: Action for Invertebrates; Amateur Entomologists' Society; Balfour-Browne Club; Bee Improvement and Bee Breeders' Association; Bees, Wasps, and Ants Recording Society; Biological Records Centre; British Arachnological Society; British Dragonfly Society; British Entomological and Natural History Society; British Myriapod and Isopod Group; Butterfly Conservation; CABI Bioscience; Conchological Society of Great Britain & Ireland; Countryside Council for Wales; Dipterists' Forum; English Nature; Environment Agency; Forestry Commission (Forest Research); Buglife - The Invertebrate Conservation Trust; Joint Nature Conservation Committee; Department for Environment, Food and Rural Affairs; National Trust; Natural History Museum; Royal Entomological Society; Royal Museum of Scotland; Royal Society for the Protection of Birds; Scottish Natural Heritage; The Wildlife Trusts.

ANNOUNCEMENTS

Land & Water Bugs of the British Isles by T.R.E. Southwood & D. Leston — available again!

After many years out of print "Southwood & Leston" has been reissued in electronic format by Pisces Conservation. Land & Water Bugs of the British Isles is available on CD-ROM. The plates, figures and text are reproduced from the original, and are now fully cross-referenced and searchable. The book is in Adobe Acrobat pdf format (with free Reader software supplied), which allows text and plates to be printed.

Cost: CD (Windows) [but Acrobat PDF files can also be read on Apple Macintosh] £18 (includes VAT) plus £2 postage.

Available from: Pisces Conservation, IRC House, The Square, Pennington, Lymington, Hants, SO41 8GN. Tel. 01590 676622 Fax 01590 675599. Email: pisces@irchouse.demon.co.uk

[It is possible to telephone and order with a credit card]

National Moth Night 2002

This year the National Moth Night is being held on the night of 15th June 2002. It is organised by Atropos and Insectline. The aims of the event are as follows: to encourage widespread moth recording and to gather useful data; to stimulate wider interest in moths and raise their profile amongst the public; to raise funds for moth conservation projects. Further details can be found on www.atroposuk.co.uk or www.insectline.co.uk

Neil Horton Lepidoptera Collection moves to Cardiff

The Lepidoptera collection built up by Dr G.A.Neil Horton, living near Usk, Monmoushire has been transferred in 2001 to the National Museums & Galleries of Wales, Cardiff. Many of the specimens were collected in Monmouthshire, south Wales and were the subject of the book Monmouthshire Lepidoptera (1994). The collection includes the first specimens collected of The Silurian (*Eriopygodes imbecilla*. Fab) a species still only known from the Abergavenny arca. All specimens will be databased as they incorporated into the main British collection. For access to and information on the collection contact Mike Wilson, Department of Biodiversity & Systematic Biology, National Museums & Galleries of Wales, Cardiff, CF10 3NP

Editorial Correction

Hawkins, R. D.; Southern Bush Cricket: BJENH Volume 14, Issuc 4, page 213. Apologies to David Elemcnt for mis-spelling his name in the Acknowledgements.

SOME WETLAND DIPTERA OF A DISUSED BRICK-PIT

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Abstract. Diptera records were collated for several years of collecting at a disused brick-pit containing many temporary pools and a lake. The fauna included many uncommon species and a few coastal species whose presence is attributed to salinity from the clay. The numbers of Ephydridae and Dolichopodidae from areas with different hydrological characteristics are highest in areas of shallow pools and seasonal inundation and lowest at the shore of the lake. Species that are normally abundant in surrounding wetlands are scarce in the pit, suggesting that the low nutrient status of the water makes this site unusual in the nutrient-rich arable countryside of the Fens.

Introduction

It is becoming well established that shallow water, gently sloping margins and seasonally dry ponds are of great value to pond invertebrates; many water beetles, in particular, show a strong preference for temporary pools (Eyre *et al.* 1986, 1992; Bratton, 1990; Collinson *et al.* 1995). Little appears to have been published about the flies associated with this habitat, yet these insects may be particularly abundant around ponds and in wetlands (e.g. Blades & Marshall, 1994). Most of what has been published concerns aquatic families of flies, especially chironomids and ceratopogonids, but other wetland families contribute much to the species richness of the dipterous fauna of water margins (Batzer, *et al.*, 1999; Drake, in press).

This paper gives the results of casual investigations of the flies associated with water margins at a disused brick-pit. Although the work was not undertaken or structured with the intention of formal publication, it contributes towards our understanding of the richness of this fauna. Greater details are given for shore-flies (Ephydridae) whose habitats are poorly documented in the European literature but which are likely to show some clear associations with different features of wetlands.

Site description and methods

Dogsthorpe Star Pit is a disused brick-pit on the outskirts of Peterborough, Cambridgeshire (TF2002–2102). Two outstanding features of the site are the presence of seasonally flooded areas and small pools that dry out in summer, and a slight brackish influence, despite being about 20 miles from the nearest coastline. It was notified by English Nature as a Site of Special Scientific Interest (SSSI) in 1993 for its outstanding assemblage of invertebrates, principally water beetles. The site is now owned by the Wildlife Trust. Digging Oxford Clay for the brick industry from about 1899 until the 1950s left a long pit with an almost flat floor sloping gently downwards from west to east. Two new roads reduced its size to the present 36 ha. The pit would naturally fill with water had it not been pumped by its previous owners in expectation of its after-use as a landfill site. When the SSSI was notified the pit became worthless so regular pumping stopped in 1993, resulting in the deeper east end becoming a lake of about 10 ha from which drowned hawthorns still arise here

and there. The lake obliterated a large number of the shallow pools which first drew the attention of entomologists to the site, including the cruciform pool that gave Star Pit its name. The rise in water level appeared to have slowed down in the late 1990s, helped in part by irregular pumping by the wildlife trust, so that, by 1999, the level fluctuated about 40 cm between high winter and low summer levels. Three of the four sides of the lake abut the pit's walls so that the shores here are steep-sided, leading directly to deep water fringed with dense reeds, rushes or wave-washed mud. The fourth, western shore has a very shallow gradient and merges with the drier part of the pit's floor. With the onset of autumn rain, an extensive area of perhaps 2 ha next to this shallow shore becomes a swamp with varied vegetation types interspersed with large expanses of open, shallow pools mostly up to about 20 cm deep and of widely varying extent. Later in the winter, the rising lake also inundates the swamp. By midsummer, the water dwindles to a few wet patches and occasional pools, and the shallow shoreline at the west end of the lake becomes a broad, sparsely vegetated, muddy margin. 1999 was one of the wettest years in the duration of this study but nevertheless nearly all the pools had dried out by late July; after heavy rain, most had refilled by late August and remained wet until the end of the year. A similar pattern of inundation and retreat has continued for several years, although the recent two wet winters of 2000 and 2001 have resulted in a higher water level throughout the system. Unauthorised motorbike scrambling appeared to be an important factor in maintaining water in some of the pools in the driest part of the year, as this activity deepened and 'puddled' the ruts, whereas the bare clay of undisturbed pools dried and cracked.

A patchwork of wetland plant communities has formed. Most pools and inundated areas which remain wet for much of the time are dominated by usually sparse *Juncus articulatus* and *Agrostis stolonifera* (occasionally dense but always very short) over almost bare clay, fringed with occasional or sometimes dense *J. inflexus*. In spring, *Ranunculus aquatilis*, *R. sceleratus* and *Chara* occupy the pools, followed in summer by an invasion of ruderal plants on the bare, often cracked clay. Stands of *Typha angustifolia*, *T. latifolia*, *Phragmites australis*, *Scirpus lacustris*, *S. tabernaemontani* and small patches of *Baldellia ranunculoides* and *Scirpus maritimus* make up the remaining wetland vegetation types. A few drainage ditches retain water throughout the year but, as most of them are choked and shaded by *Phragmites*, they support a species-poor aquatic flora.

The dry areas of the floor support a mix of vegetation types of which *Calamagrostis epigejos* over moss is the most prevalent. This also partly floods in winter. The steep sides of the pit are mostly either almost bare clay with sparse ruderal vegetation, hawthorn scrub or rank grassland on the new road embankments.

Measurements of conductivity made by John Bratton in 1989 suggested that there was a clear brackish influence, with readings between 2920μS cm^{71} after heavy rain in May and 5460μS cm^{71} after a dry spell in June that year; for comparison, local tap water has a conductivity well below 1000μS cm^{71} and June value here represented approximately 6–8% sea water (value obtained by extrapolation of figure in Thomas *et al*, 1934). The chloride concentration measured by the National Rivers Authority in December 1992 was 90 mg l^{-1}, which represents almost insignificant salinity (less than 0.5% seawater), although still higher expected. It is likely, however, that sea salt is the cause of the brackishness, and not other ions such as leachate from the adjacent landfill site. The source remains unconfirmed but is most likely to be from weathering of the clay or possibly brackish water from the ancient aquifer in the limestone below the clay (Horton, 1989).

Star Pit is moderately isolated from other similar water bodies. Nearby wetlands where some of the species discussed here could have originated are sand and gravel pits within 1.5–2.5 km, other brickpits, both used and disused, at least 6 km away, and drainage ditches within the surrounding arable countryside.

Surveys in 1992–3 by several entomologists including myself, John Bratton, Roger Key, Peter Kirby and Alan Stubbs resulted in the first records of Diptera for the site. I later collected adult Diptera using a sweep net and, in May and June 1996, larvae using a pond net, kitchen sieve and direct observation. The intention was to collect as many species in the target groups as possible, so sampling was not standardised. Visits in 1999 were made at approximately monthly intervals from May to October each lasting about 3–4 hours. In 1993, 1996 and 1997 a broad spectrum of families was collected; in 1999 the only families to be collected thoroughly were Dolichopodidae, Sciomyzidae and Ephydridae, although other groups were also taken.

In 1999, the pit was divided into areas with contrasting characteristics but the seasonally changing water landscape made it difficult to stick to these – a swamp in May became discrete pools by June and damp mud by July, so sampling the flies associated with water margins had to be opportunistic. Samples were allocated to one of five areas:

1 Seasonal pools with short vegetation. Much of this area flooded as a swamp continuous with the rising lake from autumn to early spring, passing through a stage of discrete shallow pools in spring before almost completely drying out in midsummer. This cycle maintained a mosaic of heterogeneous but mainly short vegetation. Sampling included the edge of a long ditch with permanent water, although the difficulty of sweep-netting the reed-choked edge meant that it contributed few species to the collection.
2 Seasonal pools with tall emergent plants. These pools were fed by rainfall and perhaps inflow from surrounding land, including a weak seepage from a road embankment which never dried out completely; ochre and filamentous algae here suggested that it may have been connected to the adjacent landfill site or road drains. Most water lay under *Phragmites*, *Typha* spp, *Scirpus* spp or *Juncus inflexus*, often with a mossy understorey; most open pools here were kept bare by motorbikes scrambling. The elevation was higher than the swamp area so the lake did not flood these pools in 1998 or 1999.
3 Lake shore. Only one small but dipterologically productive stretch on an otherwise uninviting shore was sampled where a carpet of *Eleocharis acicularis*, sparse *Juncus articulatus* and occasional *Alisma plantago-aquatica* was inundated in winter and uncovered through much of the summer; mud was exposed when the lake was at its lowest in July and August.
4 Drawdown zone of the west shore of the lake. This was flooded for much of the year, but became swampy, patchy reedbed with small areas of *Eleocharis acicularis* and *Juncus articulatus*, and a broad muddy wave-washed margin up to about 20 m wide at the lake's lowest level.
5 Permanently water-filled ditch at the far west end. Only a small stretch could be swept because most of the ditch was choked by dense reeds.

Family accounts

The list of Diptera for Star Pit now stands at 255 species. These include 24 Empididae and Hybotidae, 35 Dolichopodidae, 36 Syrphidae, 13 Sciomyzidae, 14

Tephritidae and 44 Ephydridae. There are 17 nationally scarce species and one nationally rare species (RDB3), *Myopites inulaedyssentericae* Blot (national statuses from the biological recording package Recorder, as at December 1999). The wetland species among these are mentioned below; the remaining species are nearly all associated with the ruderal aspect of the site and were recorded in the early 1990s.

Dixidae. No attempt was made to collect these systematically. The coastal species *Dixella attica* (Pandazis) (RDB3) was found in 1993 and 1999, suggesting that it is resident.

Ceratopogonidae. The family was not systematically collected but one species, *Bezzia* (*Pygobezzia*) *atrata* Macfie, deserves mention; specimens were obtained on 1.vi.1996, and 29.v. and 25.iv.1999. The male genitalia agree completely with the drawings by Macfie (1944) and Clastrier (1962) of *B. atrata*, which Remm (1974) synonymised with *strobli* Kieffer but the taxonomy of the genus is sufficiently muddled to be unsure of the correct application. This species, whatever its name, is clearly an addition to the British fauna.

Stratiomyidae. Few species were found but they included *Stratiomys singularior* (Harris) which, although not invariably found at the coast, does have a strong association with brackish sites. In 1996, larvae were frequent at one moss-dominated *Typha* bed, which appears to be fed by the weak seepage, but they could not be found again in 1999. *Oxycera morrisii* Curtis was reared from larvae collected from moss-dominated pools, and those of *Oxycera trilineata* (L.) and *Oplodontha viridula* (Fab.) were also occasionally found. Adults of *Vanoyia tenuicornis* (Macquart) and *Nemotelus nigrinus* Fallén occurred rarely.

Empididae. *Hilara curtisi* Collin and *H. cornicula* Loew were collected sufficiently frequently during their short flight period to be sure that they breed on the site. *Hilara subpollinosa* Collin is a local species known to occur in ditch systems on grazing marshes, and its regular occurrence at Star Pit suggests that it breeds in this wetland too. *Dolichocephala irrorata* (Fallén) and *D. oblongoguttata* (Dale) were frequently found on bare wet mud, often but not always in the shade of tall monocotyledons.

Dolichopodidae. Most of the species recorded over the years were found again in 1999; the only species not re-recorded were *Dolichopus griseipennis* Stannius, *Chrysotus collini* Parent, *Schoenophilus versutus* (Haliday) and *Sciapus wiedemanni* (Fallén) (Table 1). The apparent absence of the last species is likely to be due to its grassland habitat not being searched. A total of 35 species is rather low for a well worked wetland site although it is similar to values obtained by a season's collecting with water traps in several semi-natural wetlands in Belgium (Pollet, 1992). Of the seven most abundant species, three are generally regarded as local in Britain. *Campsicnemus picticornis* and *Micromorphus albipes* were the most frequently caught species, occurring throughout the wet parts of the site, with captures each month from May to September in 1999, and *Syntormon pumilum* was collected frequently each month from May to August 1999. Four common species made up the remaining species frequently caught here: *Dolichopus nubilus*, *Rhaphium caliginosum*, *Syntormon pallipes* and *Sympycnus desoutteri*. It is noteworthy that common wetland species such as *Dolichopus ungulatus* (L.) and *Campsicnemus loripes* (Haliday) were absent

Table 1. Dolichopodidae and Ephydridae recorded in July 1997 and during 1999 at Star Pit. The values are the number of sampling sites where the species was recorded; the last column (Abundance) gives the product of the total number of locations6visits when the species was recorded (an approximate indication of frequency over the whole site). The column labels are the year, day and month. †confused with *graecula*.

	97 11 Jul	99 2 May	99 29 May	99 25 Jun	99 27 Jul	99 22 Aug	99 22–5 Sep	99 26 Oct	Abundance
Achalcus cinereus (Haliday in Walker)	1	–	–	–	–	–	–	–	1
Argyra argyria (Meig.)	–	1	–	–	–	–	–	–	1
Campsicnemus curvipes (Fallén)	–	–	1	3	1	–	3	2	10
Campsicnemus picticornis (Zett.)	–	–	2	4	3	3	2	–	15
Campsicnemus scambus (Fallén)	–	–	–	–	–	–	–	1	2
Chrysotus palustris Verrall	–	–	1	1	–	–	–	–	2
Chrysotus suavis Loew	–	–	2	–	–	–	–	–	2
Dolichopus campestris Meig.	–	–	–	1	–	–	–	–	1
Dolichopus festivus Haliday	–	–	–	–	1	–	–	–	1
Dolichopus lateliimbatus Macquart	–	–	–	–	–	–	1	–	1
Dolichopus nubilus Meig.	1	–	1	2	–	1	–	–	6
Dolichopus plumipes (Scop.)	–	–	1	1	–	–	–	–	2
Dolichopus signifer Haliday	–	–	1	–	–	–	–	–	1
Hydrophorus bipunctatus (Lehmann)	–	–	–	–	–	–	–	1	1
Hydrophorus litoreus (Fallén)	–	–	–	1	–	–	–	1	2
Hydrophorus praecox (Lehmann)	–	–	–	–	1	–	1	–	3
Liancalus virens (Scop.)	–	–	–	–	–	1	–	–	1
Medetera saxatilis Collin	–	–	1	–	–	–	–	–	1
Medetera truncorum Meig.	1	–	–	–	–	–	–	–	1
Micromorphus albipes (Zett.)	1	1	2	3	–	2	2	–	12
Poecilobothrus nobilitatus (L.)	–	–	–	1	–	–	–	–	1
Rhaphium caliginosum Meig.	1	1	–	2	–	–	1	–	5
Rhaphium laticorne (Fallén)	–	1	1	1	–	–	–	–	3
Scellus notatus (Fab.)	–	–	1	–	–	–	–	–	1

continued

Table 1. continued

	97 11 Jul	99 2 May	99 29 May	99 25 Jun	99 27 Jul	99 22 Aug	99 22–5 Sep	99 26 Oct	Abundance
Sympycnus desontteri Parent	–	2	1	1	1	2	3	–	10
Syntormon denticulatum (Zett.)	1	–	1	1	–	1	–	–	4
Syntormon pallipes (Fab.)	–	2	1	–	1	2	4	2	16
Syntormon pumilum (Meig.)	1	–	2	4	1	1	–	–	9
Tenchophorus spinigerellus (Zett.)	1	–	–	1	–	–	–	–	2
Thrypticus bellus Loew	–	–	1	–	–	–	–	–	1
Thrypticus nigricauda Wood	–	–	–	1	–	–	–	–	1
total dolichopodids	7	7	16	16	7	8	8	5	31*
Axysta cesta (Haliday)	–	1	1	1	–	1	2	–	6
Coenia curvicauda (Meig.)	–	1	–	–	–	–	–	–	1
Coenia palustris (Fallén)	–	–	1	–	–	–	2	–	3
Discocerina obscurella (Fallén)	–	–	–	2	–	–	–	–	2
Ditrichophora plumosa (Fallén)	–	1	–	–	–	–	–	–	1
Ephydra riparia Fallén	–	–	–	–	–	–	2	1	3
Hyadina guttata (Fallén)	–	–	1	–	–	–	–	–	1
Hyadina humeralis Becker	1	–	–	1	–	1	–	–	3
Hyadina rufipes (Meig.)	–	–	–	–	–	–	1	–	1
Hydrellia albilabris (Meig.)	–	–	–	–	–	1	1	–	2
Hydrellia argyrogenis Becker	–	1	–	–	1	–	4	–	6
Hydrellia cardamines Haliday	–	–	2	2	1	2	2	–	9
Hydrellia cochleariae Haliday	–	–	–	1	1	–	–	–	2
Hydrellia fascitibia (von Roser)	–	–	–	–	–	2	–	2	4
Hydrellia griseola (Fallén)	–	1	2	3	–	1	6	3	18
Hydrellia maculiventris Becker	–	–	–	–	–	–	1	–	1
Hydrellia maura Meig.	–	1	2	2	3	3	4	2	18
Hydrellia nigricans (Stenhammar)	–	2	2	4	1	3	3	–	15
Hydrellia obscura (Meig.)	–	–	1	1	–	1	–	–	3

Hydrellia porphyrops Haliday	–	–	–	–	–	1	1	–	2
Notiphila cinerea Fallén	1	–	2	3	3	3	2	–	14
Notiphila dorsata Stenhammar	1	–	–	1	1	–	–	–	3
Notiphila graecula Becker	1	–	2	3	2	3	3	–	14
Notiphila nigricornis Stenhammar	1	–	–	1	–	–	–	–	2
Notiphila nubila Dahl†	1	–	–	1	–	–	–	–	2
Notiphila riparia Meig.	1	–	–	–	1	1	–	–	3
Notiphila venusta Loew	1	–	–	1	–	–	–	–	2
Paracoenia fumosa (Stenhammar)	–	–	–	–	–	–	1	–	1
Parydra aquila (Fallén)	1	–	–	–	–	1	2	1	5
Parydra coarctata (Fallén)	–	1	2	2	2	3	5	1	17
Parydra fossarum (Haliday)	–	3	2	3	3	3	6	2	23
Parydra pusilla (Meig.)	–	–	–	–	–	1	–	–	1
Pelina nitens Loew	1	–	–	–	–	–	–	–	1
Pelina similis Papp	–	–	–	1	–	–	–	–	1
Psilopa nigritella Stenhammar	–	–	1	2	1	1	–	–	5
Scatella lutosa (Haliday)	–	–	–	1	–	–	–	–	1
Scatella paludum (Meig.)	–	1	2	1	1	2	1	–	8
Scatella silacea Loew	–	–	–	–	–	–	1	–	1
Scatella stagnalis (Fallén)	1	–	1	2	1	–	3	–	8
Scatella tenuicosta Collin	1	2	–	3	1	3	4	1	17
Scatophila ?noctula (Meig.)	–	1	–	–	–	–	–	–	1
Setacera aurata (Stenhammar)	–	–	–	–	–	–	1	–	1
Setacera micans (Haliday)	–	–	–	–	–	–	–	1	1
Setacera trina Collin	–	–	–	–	–	–	–	1	1
total ephydrids	12	12	15	23	15	20	23	10	44

**Chrysotus collini* Parent, *Dolichopus griseipennis* Stannius, *Schoenophilus versutus* (Haliday) and *Sciapus wiedemanni* (Fallén) were recorded in earlier years.

and other normally ubiquitous species such as *Poecilobothrus nobilitatus* and *Dolichopus plumipes* were infrequent.

There was one coastal species, *Dolichopus signifer*, which is almost entirely restricted to coastal sites (Fonseca, 1978; Falk & Crossley, in prep.). Males were collected in June 1993 and late May 1999, suggesting that there is a resident population. Other species often recorded in coastal habitats, though not confined to these, are *Schoenophilus versutus* and *Dolichopus nubilus* (Emeis, 1964). Local species that were occasionally collected were *Dolichopus campestris*, *Rhaphium laticorne*, *Scellus notatus*, *Thrypticus nigricauda* and *Chrysotus suavis*, the last not being necessarily associated with wetlands.

Syrphidae. I did not collect the group assiduously but Alan Stubbs recorded many in 1993. Some less common wetland species included *Platycheirus fulviventris* (Macquart), *Neoascia interrupta* (Meig.) and *Anasimyia contracta* Claussen & Torp, the last two having been first found in 1993 as well as more recently, and thus suggesting resident populations. *Parhelophilus versicolor* (Fab.) was recorded in 1993.

Sciomyzidae. The group as a whole is poorly represented, with only 13 species being recorded. The most frequently found wetland species in 1999 were *Colobaea punctata* (Lundbeck) and *Pherbellia nana* (Fallén) which, although regarded as nationally scarce, were widespread and locally numerous each month from 29.v.–25.ix.1999. The frequent occurrence of *P. nana* at Star Pit concurs with Falk's (1991) suggestion that it may prefer pools and ditches that dry out in summer and have sparse emergent *Phragmites*. Other than the terrestrial *Pherbellia cinerella* (Fallén), the remaining sciomyzids were infrequently recorded. *Colobaea bifasciella* (Fallén) is the only nationally scarce one among these, collected on 2.v.1999. A shortage of aquatic snails may be a reason for the limited fauna since, of the ten species recorded, only *Lymnaea peregra* (Müller) and *L. truncatula* (Müller) were frequent in the seasonal pools. *Pherbellia nana* attacks hygrophilous snails, so may not be confined to these aquatic species (Knutson, 1970).

Sepsidae. Four species of *Themira*, including *T. superba* (Haliday), were recorded. Their larvae develop in dung-enriched muddy water margins (Pont, 1979), and there was certainly plenty of bird dung on the lake shore, resulting mainly from roosting black-headed gulls attracted to the adjacent landfill site. *Themira* species were infrequent away from this nutrient-rich shore.

Anthomyzidae. This family was not systematically collected. Two conspicuous uncommon members are *Typhamyza bifasciata* (Wood) (11.vii.1997) and *Anagnota bicolor* (Meig.) (2.v.1999). *Typha angustifolia* is regarded as the host plant of *T. bifasciata* and although the plant occurs here it is hardly abundant. There is no *Carex paniculata* which Falk & Ismay (in prep.) suggested is a possible host plant of *A. bicolor*, whereas cigar galls formed by the chloropid *Lipara lucens* Meig. on *Phragmites* are a common sight here, and these are a more probable larval site of *A. bicolor*. *Anthomyza collini* Andersson and *A. gracilis* Fallén were the common species, as expected at a site with plenty of reed.

Ephydridae. Considerable effort was taken recording this family, especially in 1999. Some species were the commonest flies on the water margins, along with Sphaeroceridae which were not investigated. All 44 species recorded over the years

were found in 1999 (Table 1). This represents about a quarter of the British shore-fly fauna (Chandler, 1998), and about one-third of the freshwater species (of those found, only species of *Hyadina* may not be closely tied to freshwater habitats, although the literature is ambiguous, e.g. Dahl, 1959 and Clausen, 1983). Although nearly all species were recorded at least once in the area of the most extensive and varied shallow pools, nine were infrequent or absent here. The scarcity of information on the distribution of most ephydrids makes it difficult to assess their rarity status but those at Star Pit that I regard as uncommon nationally are *Axysta cesta*, *Hydrellia fascitibia*, *H. porphyrops*, *Notiphila venusta*, *Parydra pusilla*, *Scatella silacea* and *Scatophila noctula*.

The genera *Hydrellia* and *Notiphila* were well represented. Most species of *Notiphila* were restricted to the midsummer months, and only the ubiquitous *N. cinerea* and *N. graecula* occurred into late September. The normally common *N. riparia* was scarce. As might be expected of species whose larvae are fully aquatic, the adults were nearly always found very close to the more permanent water such as within the reedbeds along the lake shore and ditches. Few *Notiphila* were found by the seasonal pools, and they never reached the abundance found in the dense beds of emergent vegetation in ditches and river margins of the surrounding countryside. *Notiphila umbila* is probably fairly widespread, although not common, in southern Britain (Drake, 2001) and was confused with *graecula* during the study so it is not possible to give precise information on its habitat or flight period at Star Pit. Dates of vouchers kept are 5.vi.1993, 11.vii.1997 and 25.vi.1999; *graecula* was also present on the same dates in 1993 and 1997.

Britain's commonest species of *Hydrellia*, *maura* and *griseola*, were found throughout the sampling period from 2.v. to 26.x, although *nigricans* and *cardamines* were also frequently recorded for much of the year and at a variety of pools; *cardamines* was sometimes the most abundant *Hydrellia*. *H. argyrogenis* also had a long flight period but was found only in low numbers. Although relatively few specimens of some other species were found, the dates suggest that *H. cochleariae* and *H. obscura* fly in early summer and *H. fascitibia*, *H. maculiventris* and *H. porphyrops* fly later. The infrequent collection of some *Hydrellia* is probably a consequence of their flying low when disturbed, which enables them to evade sweep netting. For instance, when *H. argyrogenis* was disturbed it flew only just above the water to the nearest piece of floating vegetation and clearly avoided the mud margin. The low occurrence of the common *H. albilabris* is probably related to the scarcity of floating duckweed (*Lemna*) in which the larvae feed, although the fly has been found in abundance at a pool devoid of *Lemna* on another nearby site (Castor Hanglands NNR). At the lake shore (area 3), *H. cardamines* and *H. nigricans* were numerous (*Juncus articulatus*, which was frequent at this site, is a host plant of *nigricans* (Mathis & Zatwarnicki, 1995)), and it was the only site where a few specimens of *H. maculiventris* were found.

Only a few, mainly common species of *Parydra* were recognised and, as is typical of the genus, they were most numerous on bare mud. *P. aquila* was found on several occasions only at the muddy receding shore of the lake and at a nearby mud patch. Its confined distribution may have been related to the high organic content of this mud where bird droppings were abundant. *P. pusilla* was found only once, which was surprising in view of its frequency at another nearby disused brickpit (Drake, 1999). Another genus whose distribution and abundance may be constrained by the organic content of the mud is *Scatella*, of which no species was numerous. The only locally abundant species was *S. palustrum* on the receding muddy lake shore with bird droppings. *S. lutosa* is usually found on coastal sites.

Two species were most frequently found in early summer. *Psilopa nigritella* was locally frequent for a short period in June. *Axysta cesta*, while most frequent in spring and early summer, continued to be found until 25 September, and is clearly not a 'spring' species as suggested by Dahl (1959). It was almost restricted to the lake shore and nearby flooded areas, and was most frequent, although never numerous, in the *Eleocharis acicularis* lawn on the lake shore.

Larger species of ephydrids, including all three British *Setacera*, *Ephydra riparia* and *Paracoenia fumosa*, were found only late in the year. As usual with *Ephydra* and *Setacera*, they were found on the surface of pools with a broad (c. 1 m) expanse of open water uninterrupted by vegetation, and this probably limited their occurrence to recently flooded, sparsely vegetated ground.

Species that were rarely recorded included three species of *Hyadina*, two *Pelina*, both *Coenia*, *Ditrichophora plumosa* and the normally frequent *Discocerina obscurella*.

The opportunity is taken to illustrate the genitalia of male *Hydrellia nigricans* (Fig. 1), which was one of several species not figured by Collin (1966), and which was inadvertently omitted from Chandler (1998) and not included as British in Mathis & Zatwarnicki (1995). It is a common and widespread species in southern Britain.

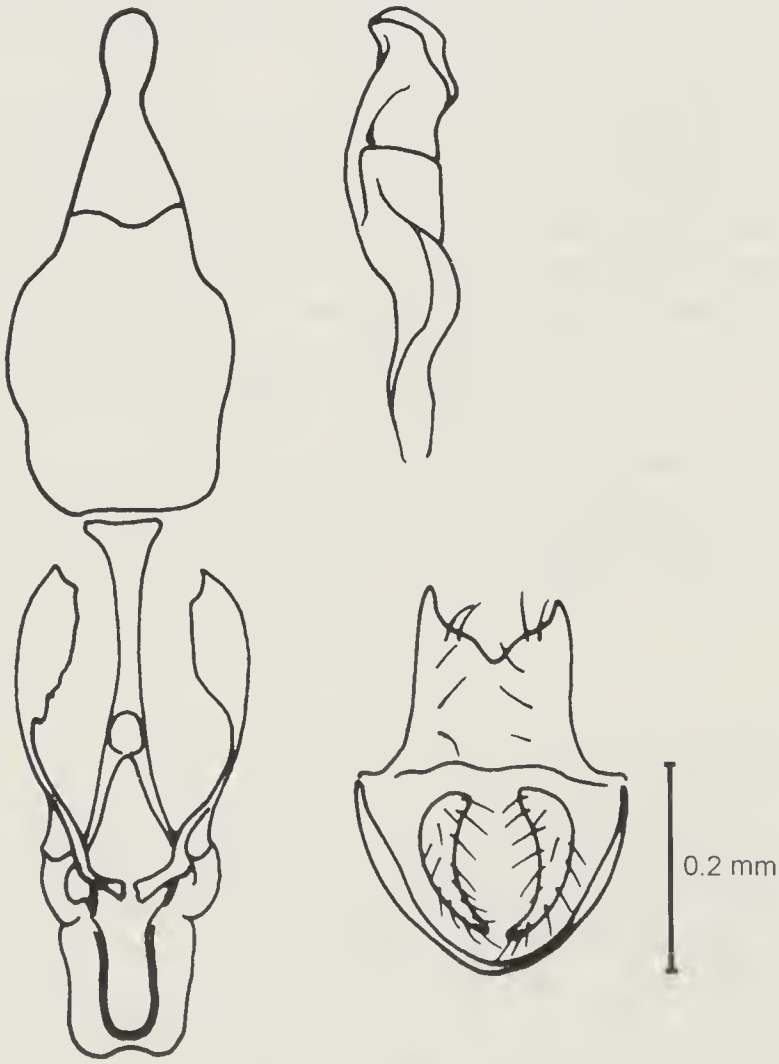

Figure 1. Genitalia of male *Hydrellia nigricans*. Left: internal appendages and aedeagus (uppermost). Right above: aedeagus in lateral view. Right below: epandrium. Scale line represents 0.2 mm.

Diastatidae. *Diastata adusta* Meig. was a widespread and numerous species on the site from 2.v. to 26.x.1999. It is frequently encountered in wetlands (Chandler, 1986).

Habitat associations for samples collected in 1999

The number of species of dolichopodids, ephydrids and sciomyzids using each of the five characterised types of wetland show that most were recorded in the better-worked area of seasonal pools and inundation, but no area could be considered devoid of interest for at least one of the families (Table 2). Several samples from around the lake shore at unproductive points have been omitted since the effort spent here was low. The species richness of dolichopodids and ephydrids was considerably higher in the more sparsely vegetated seasonal pools (first column of Table 2) compared with that in the seasonal pools with taller vegetation and the productive stretch of lake shore (all three areas having been sampled with similar intensity).

Species were ordered by eye into groups that may reflect preferences for different habitat types. The following suggestions are made for the more frequently occurring species, but must be taken cautiously and should not be assumed to be universally true. Inclusion in a group was based on a species distribution and its abundance, so that even though a species may have been found over the whole site, it was allocated to one habitat group if it was particularly abundant there. Some species fall into more than one category.

showing no affinities: *Sympycnus desoutteri*, *Syntormon pallipes*, *Scatella tenuicosta*, *Hydrellia argyrogenis*, *H. griseola*, *H. maura*, *H. nigricans*, *Notiphila cinerea*, *N. graecula*, *Parydra coarctata*, *P. fossarum*.

favoured by seasonal pools with open, sparse vegetation: *Campsicnemus curvipes*, *C.picticornis*, *C. scambus*, *Dolichopus umbilus*, *Hydrophorus praecox*, *Micromorphus albipes*, *Rhaphium caliginosum*, *Syntormon pumilum*, *Pherbellia nana*, *Colobaea punctata*, *Ephydra riparia*, *Psilopa nigritella*, *Scatella stagnalis*.

favoured by densely vegetated seasonal pools: *Campsicnemus curvipes*, *C. picticornis*, *Micromorphus albipes*, *Rhaphium caliginosum*, *Syntormon pumilum*, *Pherbellia nana*, *Colobaea punctata*.

dependent upon proximity to nearly permanent water: *Syntormon denticulatum*, *Rhaphium laticorne*, *Axysta cesta*, *Hydrellia cardamines*, *Notiphila dorsata*, *N. riparia*.

Table 2. Number of species of Dolichopodidae, Ephydridae and Sciomyzidae recorded in different wetland types (described in the methods) in 1999.

	seasonal pools with short vegetation	seasonal pools with tall vegetation	permanent (but productive) lake shore	drawdown zone of lake	ditch with permanent water
Dolichopodidae	24	14	11	6	1
Ephydridae	33	21	20	20	10
Sciomyzidae	6	6	3	3	0
Number of samples taken	8	7	7	4	1

dependent upon nutrient-enriched mud: *Scatella paludum*, *S. tenuicosta*, *Parydra aquila*.

Discussion

Star Pit SSSI was notified primarily for its assemblage of water beetles. This review of the Diptera shows that they too are an important component of the wetland fauna. The species composition differed conspicuously from rich fenland sites, for example the complete absence of *Hercostomus* and infrequent occurrence of *Dolichopus* which is usually speciose in British fenlands, and which together made up a far larger proportion of the total species recorded in a Flemish wetland on clay (Pollet & Decleer, 1989). The far-from-lush vegetation and stunted growth of *Phragmites*, *Scirpus lacustris* and *Typha* pointed to a low nutrient status of the water in the pools. Apart from one tiny seepage and perhaps slow feed from ground-water into the permanent ditch, there is no obvious input of water other than rainfall. The lake, in contrast, is likely to be in the process of becoming nutrient-enriched as a result of the large population of roosting gulls that feed on the adjacent landfill site. The low nutrient status of the pools is reflected in the absence or scarcity of a number of flies that are commonly found in lowland wetlands, pond margins and ditches, for example *Dolichopus ungulatus*, *D. plumipes*, *Notiphila riparia*, *Scatella stagnalis* and *S. tenuicosta*. Flies such as *Scatella paludum* and *Parydra aquila* that are usually associated with organically enriched habitats were present only on or near the lake shore where bird droppings were frequent. Those associated with accumulations of leaf litter, such as *Coenia palustris* and *Discocerina obscurella*, were also disadvantaged by the low amounts of organic matter (Foote, 1990; Foote & Eastin, 1974). Star Pit is thus an unusual water body in an arable countryside setting where high inputs of fertiliser and naturally eutrophic aquatic conditions are the norm.

The dipterous fauna of Star Pit appeared to differ from that of Orton Pit SSSI, another nearby brick-pit but with clear differences in the physical structure, hydrology and vegetation. Here the rare fenland species *Ochthera mantica* (Fab.) and *Thrypticus cuneatus* (Becker) were recorded, and *Parydra pusilla*, found only once at Star Pit, was rather more numerous (Drake, 1999).

The brackish element seen in the water beetle fauna of Star Pit was not so marked among the flies. Species in this group were *Dixella attica*, *Dolichopus signifer*, *Stratiomys singularior* and possibly *Schoenophilus versutus*, *Dolichopus nubilus*, *Ephydra riparia* and *Scatella lutosa*, although the last five are known from entirely freshwater inland sites. It is noteworthy that the slow filling-up of the pit has not eliminated this interesting component of the fauna.

The more detailed study in 1999 has shown that shallow seasonally inundated pools can be a valuable habitat for some groups of wetland Diptera. By comparison with the lake shore and reed-choked ditches, the richest sites were the seasonal pools and swamp, especially those where annual inundation and retreat kept the vegetation sparse and prevented tall monocotyledons from establishing large stands. The composition of the dolichopodids shows a strong similarity with the group of mainly ground-dwelling species favouring unshaded humid conditions recorded by Pollet & Grootaert (1987). It is almost certain that the extensive water margin and wet shores presented by numerous pools is the breeding site for many of these dolichopodids and other flies found most often in the short vegetation that characterises the seasonal pools. Four nationally scarce or local species that were particularly frequent at Star Pit, *Pherbellia nana*, *Colobaea punctata*, *Campsicnemus picticornis* and *Micromorphus albipes*, are thought to be outstanding beneficiaries of the seasonal nature of the pools.

An aspect of these pools that contributes to their importance for wetland Diptera is the exposure of bare sediment, which is nearly always clay at Star Pit; Scheiring & Foote (1973) found that the mud-shore habitat supported more species of ephydrids than any other of nine freshwater habitats that they studied. This is in part due to the unshaded, nutrient-washed substrate supporting the micro-organisms—diatoms, bacteria and blue-green algae—that form the food of many shore flies, which in turn are probably among the prey of dolichopodid larvae (Thier & Foote, 1980; Zack, 1983). The instability and temporary nature of this habitat, coupled with its rapid regenerative ability, are essential features that make this habitat more attractive to some Diptera compared with the permanent, even if fluctuating shoreline of the lake (Dahl, 1959; Thier & Foote, 1980). The lake shore at Star Pit, apart from, tiny sheltered stretch vegetated with short *Eleocharis*, was steep-sided and was either dominated by reed standing in the water or was nearly bare and wave-washed, thus making it uninhabitable for most dipteran larvae adapted to water margins. Even the broad muddy western shore exposed by summer drawdown supported relatively few species. Steinly (1986) also concluded that wave-washed shores were poor habitat for ephydrids compared to sheltered shorelines with shallow water.

Seasonal pools are probably not the habitat of some species since complete drying-out probably leads to their local extinction. Many ephydrids, for instance, were noticeably scarce in the pronounced drying-out in July 1999 and could be found only close to water, even if only tiny pools such as wheel ruts, and the total number of species recorded was noticeably lower than in the preceding and following months (Table 1). Species of *Parydra* became conspicuously infrequent away from the vicinity of the lake after July, and the additional bare mud where they are so often found did not compensate for possible death of the semi-aquatic larvae. Fewer species of dolichopodids were found than were expected in a wetland, and this may reflect excessive drying-up of their larval sites, especially as it seems that some larger species (although not small ones) are probably univoltine (Meuffels *et al.*, 1989) and thus lack the opportunity to invade pools during their wet phase.

These results were based on unstructured sampling and are no more than indications of the high value of seasonal wetlands to these flies. The association of ephydrids with variations on the wetland theme failed to show as much as had been hoped. It is clear that detailed sampling, perhaps using emergence traps to pinpoint the larval breeding sites, is needed to confirm the suspicion that seasonal wetlands and fluctuating water levels are of particular importance to Diptera.

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SHORT COMMUNICATIONS

***Cecidostiba fungosa* (Geoffroy) (Hymenoptera: Pteromalidae). A new association with the agamic generation of *Andricus quercuscalicis* (Burgsdorf) (Hymenoptera: Cynipidae) in Britain.**—The "knopper" galls of *Andricus quercuscalicis* (Burgsdorf) are common on the continent and in Britain but were not recorded in this country until first found by Claridge (1962). Several studies have followed the changes in parasitoid guilds associated with this species in Britain and across mainland Europe. Hails *et al.* (1990) found very low frequencies of parasitism in British galls and the detailed studies of Schönrogge *et al.* (1995) still found differences between the British and mainland European guilds. One of the species frequently associated with *A. quercuscalicis* on the continent but not in Britain was *Cecidostiba fungosa* (Geoffrey) (=*hilaris* (Walker)). (In 1961 R. R. Askew described *C. adana* from French galls of *A. quercuscalicis* but he is now of the opinion that *adana* is a junior synonym of *fungosa*. (R. R. Askew, *pers. comm.*).)

On 10.xi.98 the author collected "knopper" galls from Kent, Shorne, TQ6770 and these were overwintered in an outside building. One female *C. fungosa* emerged on 15.iv.1999 and another female on 17.iv.1999. Another collection of galls from Kent, High Halstow, TQ7776 on 19.x.1998 produced five males and three females in iv.1999. *C. fungosa* is a frequent parasitoid associated with the oak apple galls of *Biorhiza pallida* (Olivier) but the above are the first British records of an association with *A. quercuscalicis*.

Schönrogge *et al.* (1995) showed that *C. fungosa* does not attack the larvae of *A. quercuscalicis* but rather is a parasitoid of the inquiline cynipids *Synergus gallaepomiformis* (Boyer de Fonscolombe) and *S. umbraculus* (Olivier) found in knopper galls. Neither the presence of the inquilines nor that of *C. fungosa* is generally fatal to *A. quercuscalicis*. Both of the inquiline species are frequent in other oak galls in Britain but are rather scarce from *A. quercuscalicis*. It is noteworthy that from the Shorne collection of galls one male *S. gallaepomiformis* emerged 2.vi.1999.

I would like to thank R. R. Askew for confirming the identity of *C. fungosa* and for help with the nomenclature.—MALCOLM JENNINGS, 206 Lower Higham Road, Gravesend, Kent DA12 2NN.

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***Eustalomyia histrio* (Zett.) new to Scotland with notes on *Eustalomyia festiva* (Zett.) (Dipt.: Anthomyiidae) in Scotland.**—Members of the genus *Eustalomyia* are large and strikingly marked black and white anthomyiid flies that have been rarely recorded in Scotland. According to Hennig (1976) members of the genus are brood parasites in the nest of Hymenoptera.

Two ♂♂ *Eustalomyia histrio* were taken from the trunk of a large beech tree on 14.vii.1996 in Maggie Bowies Glen (NT 3860, VC83) near Crichton south of Edinburgh. Maggie Bowies Glen is a narrow gorge occupied by woodland consisting mostly of beech, oak and alder, including much fallen and dead wood. According to the Scottish Insects Record Index (SIRI) at the National Museums of Scotland (NMS) this is the first Scottish record of *E. histrio*.

There are only two published records of *Eustalomyia festiva* in Scotland. The first Scottish record was by Nelson (1984) in August 1980 from Methven Wood, an old deciduous wood in Perthshire. More recently Bland (1999) bred two ♂< *E. festiva* from puparia found in the galleries of the wasp *Ectemnius ruficornis* (Zett.) (Sphecidae) in a rotten birch stump at Threepwood Moss, Roxburghshire.

Further records of *E. festiva* from Scotland are from specimens taken by other collectors (named below) and identified by me or from my own collecting. A , *E. festiva* was bred by G. E. Rotheray from a puparium taken on 13.iv.1997 in decaying sapwood from a birch log at Craigellachie (NH8812), a Highland birchwood on Speyside, Inverness-shire. Further records of *E. festiva* include a second record from Methven Wood (NO0526), where I. MacGowan took a ♂ on 16.vi.1997. There are also a number of records from southern Scotland at localities in the Lothians and the Clyde valley woodlands (Lanarkshire). These are of a ♀ taken on a fallen elm tree in Crichton Glen (NT 3860) on 13.vii.1993 by G. E. Rotheray; two ♂♂ taken on a freshly fallen oak log in the Hermitage of Braid (NT2570) on 5.vii.1994 and a ♂ taken on a birch log in Cleghorn Glen (NS8845) on 19.vii.1997.

These new records of *E. festiva* extend the known range in Scotland from the Borders and lowland Perthshire to other parts of southern Scotland and to Strathspey in the Highlands.

I am grateful to G. E. Rotheray and I. MacGowan for their specimens of *E. festiva* and to Andy Whittington for access to SIRI at the NMS.—David Horsfield, 131 Comiston Road, Edinburgh, EH10 6AQ.

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SOME SIGNIFICANT NEW RECORDS OF ANTS (HYMENOPTERA: FORMICIDAE) FROM THE SALISBURY AREA, SOUTH WILTSHIRE, ENGLAND, WITH A KEY TO THE BRITISH SPECIES OF *LASIUS*

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Abstract. This paper discusses records of 26 ant species found in the Salisbury area between 1992 and 1999. Nine species are believed to represent additions to the Wiltshire county list. A further two species had only been recorded on one previous occasion. Records from adjacent areas of South Hampshire are included. Observations of the behaviour of some of the scarcer species are described. All 11 British species of *Lasius* were recorded and an identification key is provided for this genus.

Introduction

The published ant fauna of Wiltshire is relatively poor. Collingwood & Barrett (1964) listed 18 species as occurring in South Wiltshire and 13 in North Wiltshire, giving a combined total of 19. In comparison, the neighbouring Watsonian vice-counties of South Hampshire and Dorset have the richest faunas in mainland Britain, with 31 and 32 species, respectively, being listed in the same publication. This difference is in part due to the more restricted range of habitats in Wiltshire. In particular, Wiltshire has no coastline and lacks extensive areas of heathland, both of which make a major contribution to the diversity of aculeate faunas in Britain. However, the limited fauna probably also reflects the lack of attention from collectors, most being drawn to the richer localities to the south. This effect may be self-perpetuating.

This paper describes records obtained by the first author between 1992 and July 1999. Most come from within a 10 mile (16 km) radius of Salisbury. They include a number of scarce species, which shows that the ant fauna of Wiltshire is more interesting than previous work suggests. Records from adjacent areas of South Hampshire are also included.

A number of recent taxonomic revisions affect the British ant fauna, the most important being the major revision of *Lasius* by Seifert (1992). A key for the identification of *Lasius* of all three castes is therefore included, prepared by the second author.

Methods and description of main sites

All specimens were collected by hand. Trapping could yield additional results, particularly on open downland, which is difficult to search in the absence of features such as stones and pieces of fallen wood.

Six-figure grid references are provided for the main sites. Seven- or eight-figure references are used occasionally to clarify the exact location of a site. All records come from the 100 km grid square "SU" unless otherwise stated.

The month and year are given for the main records. The day is also given for the most important records and for many observations of sexuals, where the additional detail is informative.

The first sites visited were around Porton, about five miles north-east of Salisbury. Targett's Corner (185 370) was the most productive site in the village, but there were also significant records elsewhere, particularly northwards along the Tidworth Road.

The most important sites in this survey are on the Ministry of Defence (MoD) Ranges at Porton. These cover about 7000 acres (11 square miles) and are surrounded by farmland. They include the largest continuous tract of undisturbed chalk grassland in Britain (Anonymous, 1990). The records described here all come from two conservation areas, "Happy Valley" (around 235 385) in Wiltshire, and the Isle of Wight Woods (around 250 372) in Hampshire. Both include areas of open chalk grassland, scattered trees, and woodland, primarily of beech or conifers. The "antscape" on Roche Court Down (250 360) and a small ancient oak wood on Thorny Down (203 342) were only very briefly inspected. The Portway Roman road, which runs just outside the north-west boundary of the ranges, was also visited.

The Devenish Reserve (129 351), a small Wiltshire Wildlife Trust reserve in the Woodford Valley, north of Salisbury, also yielded significant records. It consists of small areas of beech woodland and chalk downland on the side of the valley. Between this site and Salisbury is Phillips' Lane (132 329) where high banks line the road up towards the hill-fort at Old Sarum.

The other main chalk site visited was Clarendon Palace, east of Salisbury (181 301). The banks beside the chalk track, approaching the palace from the direction of Salisbury, had an interesting fauna. The fauna of the woodland around the palace itself, which is partly on clay, was less diverse. Grovely Wood, north-west of Wilton, again mainly on recent clay which overlies the chalk, had a poorer fauna.

Sites on the older rock types west of Salisbury were hardly explored, but several sites on younger strata with acid soils, to the east and south of Salisbury, were visited. Hound Wood (226 301) and Bentley Wood (252 291) near Farley, and Common Plantation, Alderbury (199 279) contain mixed and conifer woodland. South of Redlynch, at the northern edge of the New Forest, are Langley Wood (224 205) an ancient oak wood, and mixed and conifer woodland at Tinney's Firs (203 198), Loosehanger Copse (210 187) and north-west of Nomansland (242 178). No significant areas of heathland were present at any of these sites, and this habitat may now be entirely restricted to Hampshire.

Results

Subfamily Ponerinae

(1) *Hypoponera punctatissima* (Roger)

At about 19:30 hours on 7.vii.1995, an alate female was captured on a piece of clear plastic sheet lying on the ground in a garden in a modern housing estate at Fugglestone Red, Salisbury (about 118 320). On further searching, a second was found dead in a spider's web on an adjacent fence, but none were found in the surrounding area and the species was not seen again. The weather was warm (about 20–25°C) and humid, with hazy sunshine.

This species is of uncertain status in Britain, and although often included in the list of native species, it is doubtful if it can survive in the absence of man, most records

coming from hothouses and organic waste heaps warmed by fermentation. The origin of these two specimens is uncertain, although alate females of this species are reported to be able to disperse over considerable distances (Donisthorpe, 1927; Collingwood, 1979).

Subfamily Dolichoderinae

(2) *Tapinoma melanocephalum* (Fab.)

This is a distinctive "tramp" species, spread throughout the tropics by man. In July 1998, at least 20 live workers and a number of dead adults were found inside the top of a mangosteen fruit from south-east Asia, purchased in a Salisbury supermarket. Brood (mainly larvae) were also present, but no queen. Two weeks later, some brood, without adults, presumed to be of this species, were found in similar circumstances.

Subfamily Myrmicinae

(3) *Myrmica lobicornis* Nylander

This species was found at several sites in Wiltshire and adjacent areas of South Hampshire. These are the first published records for Wiltshire. This species tends to be rather sparsely distributed. It is one of the more easily overlooked *Myrmica* species as typically only one or a few foraging workers are found. In this area survey, it was most often found at woodland edges.

It was first found in June 1993 on the MoD ranges at Porton. Workers were seen just inside woodland west of Tower Hill (238 382). It was subsequently found on a number of occasions at the same site and westwards along the edge of this wood, the most recent record being in July 1996. On 31.v.1994 a worker was found in a puddle on the track through Happy Valley, and on 5.vi.1994 a dealate female was found dead on the same track nearby (230 386). In July 1993 a worker was found across the Hampshire border in Isle of Wight Woods (252 372), foraging on top of a small *Lasius flavus* mound.

In August 1993, one or two workers were found along the Portway Roman road (229 393) and again a year later, including one worker climbing on a bramble leaf amongst the grass. In May 1997 a worker was found on the track to Clarendon Palace (179 300) fighting a headless worker of *M. sabuleti* or *M. scabrinodis*. In May 1998 two workers were seen (177 299).

Although there is a small area of suitable habitat at the Wiltshire Wildlife Trust's Devenish reserve near Little Durnford, it has not yet been found there.

(4) *M. rubra* (L.)

This species was much less common than the similar *M. ruginodis*, below, but was found at a few well-vegetated sites.

In August 1993 and May 1994 workers were found on a bridge in marshland near Gomeldon (182 359). A male and two workers were taken by the roadside at Newton Toney on 21.viii.1994 (215 402). Workers were found at Dinton in May 1995 (019 319) and at the Devenish Reserve, Little Durnford, in September 1995. In June 1996 and May 1998, workers were found near Clarendon Palace (174 299), feeding on the extra-floral nectaries of common vetch (*Vicia sativa*).

(5) *M. ruginodis* Nylander

This species is very widespread and was present at most of the sites visited, occurring in woodland, lush grassland and scrub. It is usually absent from open downland, where it is replaced by *M. sabuleti* or *M. scabrinodis*.

It was found on the Porton Ranges (both Happy Valley and Isle of Wight Woods), Porton village, Targett's Corner, along the Portway, at Phillips' Lane, Devenish Reserve, Clarendon Palace, Hound Wood, Bentley Wood, Common Plantation, Grovely Wood, and Langley Wood.

Females of the form *microgyna* were found at two sites. On 29.viii.1994 a dealate female and worker of this form were taken near South Tidworth in Hampshire (236 470). On 13.viii.1995 a dealate female *microgyna* was seen wandering on a tree stump at Common Plantation, and later a nest was found nearby containing alate females (199 279).

Specimens found in May and June 1993, feeding on the extra-floral nectaries of common vetch beside the Porton–Amesbury road (180 375), were initially thought to be *M. rubra*, but proved to be short-spined examples of *M. ruginodis*.

(6) *M. sabuleti* Meinert

This species is the dominant *Myrmica* species on most warm chalk downland sites and is usually abundant. It can also occur in gardens and other areas with short turf. Sites in the Salisbury area include the Porton Ranges, Porton village, Newton Toney, the Portway, Devenish Reserve, Phillips' Lane, the track to Clarendon Palace and Grovely Wood.

This species is known to tend aphids on the roots and herbage of the short turf it lives in, but on two occasions it was seen on the Porton Ranges with herds in unexpected situations. In June 1993 it was seen with aphids concealed on and under the bark of a juniper bush in Isle of Wight Woods. It may have also been tending a few on the foliage, but most of these were guarded by *Formica fusca*. In June 1998, it was found with aphids on a small sprig two or three feet up a spruce trunk, on the edge of woodland west of Tower Hill.

This species is the main host of the large blue butterfly, *Maculinea arion*, throughout Europe (Thomas, 1992, p. 156; Thomas, 1994; Wardlaw *et al*, 1998).

It is also the host for two workerless parasite ant species, *Myrmica hirsuta* and *M. (Sifolinia) karavajevi*, which were not found during this survey, but could be present. *M. hirsuta* males and females are very similar to *M. sabuleti* sexuals. *M. karavajevi*, which can also occur in *M. scabrinodis* colonies, is more distinctive, being rather smaller than its hosts.

(7) *M. scabrinodis* Nylander

This is another common species, but more localised than *M. sabuleti* on the MoD ranges at Porton and other chalk downland sites, where it was mainly restricted to the more exposed or sparsely vegetated areas, or in clearings in woodland. For example, on the Porton Ranges it occurs just outside woodland on Tower Hill (237 382), in a clearing in Happy Valley (236 386), and in the Isle of Wight Woods (252 372). It also occurs at Newton Toney (215 402), along the Portway (229 393), near the entrances to the Devenish Reserve and by the road outside, at Lake cum Wilsford (131 387), and Grovely Wood (055 344).

(8, 9) *Stenamma debile* (Foerster) and *S. westwoodii* (Westwood)

These species have only recently been separated, but most British and European *Stenamma* records are believed to refer to *debile*. The male caste is most easily distinguished, males of *debile* and *westwoodii* having three and five mandibular teeth respectively (Dubois, 1998). Examination of males taken in Porton village has shown that both species are present. The numerous worker records from that and other sites have not been separated.

The workers are small, slow-moving and inconspicuous, but may be found in leaf litter or on the soil surface, particularly in humid conditions. Thus they were more often found on the surface in early summer when the soil was still damp. It has been reported that they are most active in the early morning (Collingwood, 1979) which may be the case, but they can certainly be found at other times. They are most easily seen on bare soil around the base of banks, often beside roads, although traffic can hinder a search. Healthy, injured or dead workers are sometimes found on the edge of the tarmac. Stenamma is quite often present at *Lasius fuliginosus* sites. *Stenamma* will forage under black plastic sheeting placed in suitable areas, but we have never encountered it under fallen logs (in contrast to *Myrmecina graminicola*) so although it is difficult to find, observations suggest that it is not a truly cryptic genus and may somewhat resemble *M. ruginodis* in behaviour, as a general scavenger and predator on small insects. Prey items seen include flies, aphids, small mites and beetles and other unidentified insect fragments. They will take freshly killed springtails, when presented, but are more wary of ant brood. They will also accept biscuit particles and sweet materials. The female castes will sometimes curl into a ball on disturbance, like *M. graminicola*, below, which is much better known for this behaviour.

There is one very old Wiltshire record, from Dinton, west of Salisbury, in 1854 (Donisthorpe, 1927). This could belong to either species.

Stenamma was first found by this author near Targett's Corner in Porton village (185 370) on 15.viii.1992, when a worker was seen right beside the road. It curled into a ball when captured. Next day, another was seen fighting a *Myrmica ruginodis* worker. It escaped unhurt on disturbance. Workers (some dead) were found on about ten occasions up to June 1994. On 18.ix.1993, two workers were seen fighting, but they separated when disturbed. The site was then visited less frequently and the genus was not seen there again until 1999, when it was found twice in May, with a final record in early July. A dealate female was found late in the evening on 16.ix.1992 and a male on 3.x.1993, at the edge of the road. Two more dealate females were found during very warm weather on 29.iv.1994. The first was captured in the late afternoon, again on the edge of the road, the second a little later in about the same place, curling up when handled.

Alates were more frequently found in a garden nearby (188 371), appearing between early September and early October. A dead male of *S. westwoodii* found indoors in mid-November may have been dead some time. One live male was also found indoors. Alates were regularly found trapped in spiders' webs and occasionally in water. A male taken on 4.ix.1994 is *S. westwoodii*, but another found on 28.ix is *debile*.

Stenamma is present but elusive in woodland in Happy Valley on the Porton Ranges. Single workers were found on only four occasions. It was first found on 8.v.1994 on bare soil a few inches from a stump inhabited by *L. nylanderi* (c 239 387). It curled up when caught. Another worker was found on a track about 400 yards away (235 386) on the 31st of the same month. In May 1997 a number of small (about one foot square) pieces of black plastic sheet were laid in potentially suitable postions to attract this genus. On 19.x.1997, a worker was found curled up under one of the sheets laid within a few feet of the second record. Another was found under the same sheet on 28.vi.1998 (along with a 6-inch-long slow-worm!). None were ever seen under nearby sheets or others elsewhere, including several around the site of the first record.

The best site for observing these ants is on the track to Clarendon Palace (c 178 300). Workers were often relatively easily seen due to the very infrequent vehicle traffic. The first record was on 28.v.1995, when a number were found on bare soil by the track. One was carrying a small fly. Later, a loose trail typically consisting

of 8 or 9 workers was found, leading to a dead bee partially buried on the track. On 2.vi.1996, numerous foragers were visible—probably about 20 over about 100 yards. One tried to sting a small (1cm) green catepillar, but it escaped. The author then killed it, and later at least six workers were present on it. Another worker was chased briefly by a rove beetle, *Pella lunueralis*, the ant running and then rolling away, before uncurling and running off. The entrance to a nest was noticed in bare soil on a north-west facing bank, on the south side of the track. There was no pile of excavated soil outside the small hole. Up to a dozen foragers were visible by the track. These removed dead springtails and also fragments of biscuits that were placed nearby. On 16.vi.1996 there was plenty of activity. Twice, workers were seen apparently fighting. Again, what appeared to be a loose trail led to food hidden under debris at the edge of the track. The workers again carried off dead springtails, but were wary of *Lasius flavus* larvae, especially when undamaged. A 4mm long, black weevil was attacked by one worker but escaped due to its hard armour. On visits in early August and early September, the species was not found, presumably due to dry weather, but one forager was seen near the nest on 13.x.1996. On 5.v.1997 a dealate female was found. The last visit to the site was on 25.v.1998, when at least 20 workers were seen, including one or two trails. The clearest involved a group of at least eight workers, and was still present approximately two hours later.

Stenamma was also found at Phillips' Lane (132 329) west of Old Sarum hill-fort on 30.v.1995. At least a dozen workers were seen along the roadside banks. Foragers were seen several times in May and June of 1996, including about 10 on 23.vi.1996. The most recent record was on 4.v.1997, when a dead worker was retrieved from a *M. ruginodis* forager. It looked to have been dead for some time, and was probably not killed by the *Myrmica*.

The Devenish Reserve (1285 350) is about 1¼ miles (2km) north of Phillips' Lane. On 23.vi.1996 several single workers were found in a very small area (not more than two square yards) of leaf litter near to the southern entrance to the reserve, near the path and about six feet from the first *L. nylanderi* colony (see later). A single forager was seen in exactly the same place in early May 1997 and two virtually together in mid-May 1998, but none were found on a final visit in June 1999. It was not seen elsewhere on the reserve.

On 5.v.1996, in the late afternoon, a single worker was found at Langley Wood (around 224 2045) slowly crossing an area where the leaf litter had been cleared about 15 minutes earlier. It disappeared into the fine vegetable debris on top of the soil, which had to be removed and checked very carefully before the ant could be captured. This site is a mature oak wood, and is the only *Stenamma* site in this study not on chalk, being underlain by London Clay.

(10) *Myrmecina graminicola* (Latreille)

The records described here are thought to be the first published for Wiltshire.

Myrmecina was found at a number of sites, in sheltered positions on grassland, in gardens, or open woodland, on chalk. This ant is slow-moving, inconspicuous and cryptic, and the workers are rarely seen in the open, normally being found under stones, moss, fallen wood or other debris. They are sometimes found in the nests of other ants. The female castes curl up when threatened, and climbing alates will often drop to the ground, which is an effective escape mechanism. The males are wasp-like, with dark wings. They are more robust and active than most male ants, but will sometimes "play dead" if disturbed, although they do not curl up like the more sluggish female castes. A captive male was seen to drink water and fruit juice unaided on 8.viii.1993.

The first record was from the MoD Ranges at Porton on 24.v.1992, when a single worker was taken on the Wiltshire–Hampshire border (241 388) under a log 1–2 ft from a *Lasius flavus* mound. On 16.viii.1992 another worker was found under a small stone on a rather barren slope in the Isle of Wight Woods (254 3725) in Hampshire. Subsequently, isolated foragers or small groups of workers were found on these ranges on numerous occasions. More rarely, colonies were also discovered.

This species was most easily found in open, scrubby woodland in Happy Valley (around 239 387). The ground in this area is very densely covered with flints of various sizes and both foragers and colonies were found under these. This species can tolerate some shade, but if this woodland is allowed to fully regenerate, the population in this area would be expected to decline considerably (although the shading could benefit *L. nylanderi*). Foragers were surprisingly rarely seen under the black plastic sheets laid in Happy Valley for *Stenamma* in May 1997. They were only seen under two sheets, both within yards of the location of the first *Stenamma* record, where single workers were found several times in 1999, between the end of March and late June. The final record on the Porton Ranges was also from this area, when about six workers were found under a stone on 2.vii.1999.

Elsewhere on the Porton Ranges, workers and nests of this species were more frequently found under pieces of fallen wood. In the Isle of Wight Woods (Hampshire) colonies were found at 248 369 and 255 3745. Workers were most frequently encountered around 256 370. It was not found on the open downland areas, such as in Happy Valley (233 386), Tower Hill (around 235 383 and eastwards) the Breck (around 250 380) or south of Isle of Wight Woods (around 250 367). Some of these areas are less sheltered or more sparsely vegetated than the known sites, but this lack of records may also reflect a lack of logs or stones to search under.

The colonies found were not excavated, but were estimated to contain very approximately 100 workers, and only single queens were seen. The brood cycle appears to be similar to other British Myrmicinae. A colony found under a log on 2.v.1993 had many well grown larvae and probably also some eggs. Of a total of seven nests found in the period 23.vii to 11.viii (between 1993–1995) all had worker pupae (except for one in a well shaded site which had mature larvae) with alate pupae in at least one. Some also had small to medium-sized larvae. On 15.viii.1993 about 20 adult males were present in a nest under a stone. On 23.vii.1995 a group of 6–10 workers, but no brood, were seen under a stone with a white woodlouse (*Platyarthrus hoffmannseggi*) although Donisthorpe (1927) reported that no myrmecophiles were known to occur with this ant. On 19.vii.1998 a dealate female was found in tunnels under a stone, but again no brood were seen.

From observations of captive colonies it appears that pale "callow" workers may not occur in this species, the pupae being fully pigmented before the adult emerges. This is unusual.

This species is known to enter the nests of other ants (Donisthorpe, 1927; Collingwood, 1979) and it has been suggested that they prey on the brood (Brian, 1977). Although this predation may occur, most of the numerous records of foragers from this site were not inside ant colonies, although (unsurprisingly) there were often foragers or tunnels of other species in the vicinity. Single workers were seen near nests of *Myrmica* species, *L. flavus* and *L. alienus*, but the only record in this survey from actually inside an alien colony was in a *M. sabuleti* nest, in September 1993. The *Myrmecina* worker was just inside or right beside the *Myrmica* colony, situated in a log, and entered a chamber in the log soon after the disturbance.

Alates were found outside a nest only twice at this site. A male on 14.viii.1993 in the Isle of Wight Woods (256 374) was seen climbing on grass on a bank and then flew off. An alate female was seen on the wall of a building (209 372) five days later.

Myrmecina also occurs in Porton village. In contrast to the records from the MoD Ranges, nearly all records were of sexuals. The only records of workers were of two specimens found dead in a garden near the Tidworth Road (188 371) on 9.v.1994 and 21.v.1994 and a live one seen on the tarmac of the drive on 3.vii.1999.

On 31.viii.1992 a dealate female was found in the same garden. Between 1992 and 1994 alates and dealate females were found at this site and nearby at Targett's Corner (185 370) and Southbourne Way and Malvern Way (187 369) many times from the end of July (30.vii.1994) until the middle of October (11.x.1994) but most frequently from approximately mid-August to mid-September. Dealate females were also seen in the spring and early summer (for example 27.iv.1994, 29.iv.1994, 7.v.1994, 10.vi.1994 and 13.vi.1994) presumably searching for food or a new nest site, like queens of other myrmicine species.

Single alates were seen on walls and concrete surfaces, including both horizontal and vertical faces. Small groups of alates were seen on several occasions. Late in the afternoon of 6.viii.1993, a group of five alate females, each 1–2 inches apart, were on top of a low wall in Southbourne Way. All were crouching still and difficult to spot, and the dark wings of both sexes may act as camouflage. About 20 yards away, in Malvern Way, there was a similar-sized group, which included a mating pair. Several isolated alate females were also seen. The mating pair was captured and later mated again in a container for 15–30 minutes. About half an hour later, the female started to shed her wings, although she did not complete this until about an hour later. Next day, at about 18:00, an alate female was seen in the same place in Southbourne Way, and three more half an hour later. On 8.viii.1993 one alate female was present there, and a male in Malvern Way. On 13.viii.1993, two single alate females were on a different area of wall in Southbourne Way, where they were catching the evening sunshine. Early in the afternoon on 19.ix.1993, despite breezy weather, becoming dull, a larger group was found in a garden on the Tidworth Road. About six males and a similar number of alate females were congregated on the edges of some steps, most on the top surface, some on the vertical faces. They were in loose groups, the females virtually immobile most of the time, the males slightly more active and more dispersed. One mating pair was seen. By mid-afternoon, fewer were present, especially the males, and by early evening the weather had deteriorated and none were seen again.

These alates had presumably just been released from the nest for the nuptial flight, but were never seen guarded by workers. This contrasts with most British species, but is consistent with the observations of Crawley, noted in Donisthorpe (1927). As they were slow-moving and rarely observed to fly off, and were sometimes seen in the same place over a period of several days, the females probably wait for males to fly to them, perhaps attracted by a pheromone, with mating occurring on the ground. They must either hide nearby or be accepted back into the nest overnight or in poor weather. However, alates were sometimes found trapped in spiders' webs or water, which shows that many, if not all, fly at some stage, and an alate female was seen at least 10ft in the air on 26.viii.1994. Either the alates may fly away from the nest and congregate at mating sites, or disperse by flight after mating.

Myrmecina was also found on one or more occasions at four other sites.

On 21.viii.1994, two males and a dealate female were found on a wall in Newton Toney (c215 402). Later on the same day an injured worker was taken, found stuck in soil at the edge of the track along the Portway (c229 392).

It was also recorded from the Devenish Reserve (c1285 350). On 30.v.1995, up to 15 workers and a probable dealate female were seen on open soil on the path immediately outside the northern entrance to the reserve (129 352). Several went into a small hole, presumably the nest entrance. On 25.vi.1995, one worker was seen in the same place. As noted earlier, it is unusual to see workers of this species in the open on the soil surface. On 17.ix.1995, an alate female was glimpsed immediately outside a *Myrmica scabrinodis* nest on the bank beside the road, when NCB disturbed the nest. On 30.vi.1996, a worker was found under a large log amongst lush grass on the slope of the valley side, with or near some *L. flavus*.

This species was also found a few times along the track towards Clarendon Palace, most from a short distance nearer to the Palace than most of the *Stenamma* records (about 178 300). On 2.vi.1996 two dealate females were found a few yards apart in the open on an exposed chalk face at the base of a steep bank by the track. In mid-afternoon on 8.ix.1996, two males were seen, one resting on the track, the other, flying, landed on the author's arm. On 13.x.1996, alates of both sexes were present. One dead dealate female, one dead and one injured male were taken. About 10 males were seen along the track, on the chalk. Most were in semi-shade or on the sunny side of the track. Several flew, especially when handled. One alate female flew in and landed, and the alates may be attracted to congregate on pale surfaces like *Myrmica ruginodis*. Males of one or two *Myrmica* species were also flying. Two dealate females were found separately by the track on 5.v.1997. On 25.v.1998, two dealate females were within a foot of each other, where alates were seen in October 1996, and a worker was seen near where the species was first recorded, with another worker, dead, a few feet away.

(11) *Leptothorax acervorum* (Fab.)

This species is present at many open woodland sites. It is widespread on the MoD Ranges near Porton, including Tower Hill, Happy Valley, and the Isle of Wight Woods, and is present nearby, along the Portway. It also occurs near Gomeldon village (184 360), on Devenish Reserve (on the roadside bank), at Lake cum Wilsford (131 387), Clarendon Palace, Common Plantation, Bentley Wood, and near Fovant (002 297).

Observations of this species attacking *Formicoxenus nitidulus* males and a *L. nylanderi* worker are noted under those species.

(12) *L. nylanderi* (Foerster)

This scarce species was found at two sites. The only previous record for Wiltshire comes from Whiteparish in 1960 (Collingwood, 1961). Surprisingly, there are very few reliable records of this species from the New Forest, the only recent one being from just north of Brockenhurst in July 1999 (Simon Hoy, personal communication).

On 29.viii.1993 a worker was noticed on or just under the remains of a birch log on the ground in a clearing in scrubby woodland in Happy Valley on the MoD Ranges at Porton (c239 388). A colony was then found in an old but hard tree stump a foot or so away. One or two dealate females, alate females and at least two males were seen. A subsequent search of other tree stumps in similar, fairly sunny, situations in nearby clearings was unsuccessful.

On 30.iv.1994, several workers and a dealate female were found foraging on an old stump in a more shaded position in open beech woodland some distance away (c240 386). During the remainder of 1994 a careful search was conducted and it soon became clear that this species usually favours shaded positions. The workers tend to avoid prolonged exposure to intense sunlight and high temperatures, which is

atypical of British ants, and in contrast to the other British *Leptothorax* species. Over 100 colonies were eventually located in the scrubby woodland where the first nest was found, several within ten yards of it. Most were in old but hard tree stumps, the others in smaller fragments of wood. On stumps in sunnier positions, *L. nylanderi* was invariably on the shaded side or, in the case of hollow stumps, on the inside surfaces, often shaded by low herbage. In some cases, *L. acervorum* was nesting on the same stump, usually occupying the sunny side. The only interaction seen was an *acervorum* worker attacking a *nylanderi*, even though *nylanderi* is said to be the more aggressive species, despite its smaller size (Collingwood, 1979).

From mid-June onwards, numerous colonies were found in a mature beech wood immediately to the west (around 238 388). Most nests were in cracks and beetle holes in fallen branches lying amongst dense leaf litter. Small branches, only an inch or so in diameter and often lacking bark, seemed to be preferred over larger logs or smaller twigs. Some also occurred in stumps or in dead wood at the base of beech trunks. There was little or no living vegetation near these nests. This is of particular interest because the deep shade of beech woodland is a poor habitat for ants in Britain, and the only other species present in the shadier areas were small numbers of *M. ruginodis* and occasional *F. fusca* foragers.

The approximate range of this species is defined by the four grid references 235 385, 237 389, 242 391 and 240 385. It is clear that these two habitats and peripheral areas support several hundred colonies, or more—a substantial population for this scarce species. Interestingly, it appears to be extremely rare in an area of very similar beech woodland in the Isle of Wight Woods (Hampshire) with only one record—on 6.v.1996 a single worker was seen amongst leaf litter near two large beech trees (c 256 370). A possible reason for its rarity is that the Hampshire site is not sheltered from the prevailing south-westerly breeze. It is tempting to speculate that a slight increase in average temperatures ("global warming") could allow the species to increase at this site.

As disturbance of the nests was avoided, alates have only been observed twice, at the end of August. The first occasion was when the species was originally found, the second on 28.viii.1994, when a male was seen being carried to a new nest site. It was carried in the manner typical of *Leptothorax*. Dealate females were observed more frequently, mainly in spring and early summer (late April to July). These are presumably nest-founding females, foraging for food. However, as most were seen in the vicinity of workers, and on 12.vi.1994, one was seen apparently carrying food into an established colony, it is possible that some may be acting temporarily as "workers" associated with a mature colony. On another occasion, two females were seen fighting on a tree-root.

Two colonies have also been found at the Devenish Reserve (1285 350), just over 7 miles (11.5 km) to the west-south-west of the main Porton site at Happy Valley. Both were in sheltered beech woodland at the edge of the valley floor. On 30.iv.1995, the first colony was found near the southern entrance, in an abandoned pole, in the hedge at the reserve boundary by the road. On 25.vi.1995, a second was found in a very old tree stump 100 yards or so to the north-east. Both colonies were still present on 1.vi.1999.

(13) *Formicoxenus nitidulus* (Nylander)

This species was also recorded from just two sites, the first records from Wiltshire. It was not found at the other *Formica rufa* sites noted, but may well be present.

It was first found at Hound Wood, near Farley (c226 301) on 2.vii.1993. A single male was found at the edge of a large *F. rufa* heap. On 30.vii.1993 at least four were

seen on the same or a nearby heap, mostly on top of a stump in the nest. They were very active, and two were seen to "greet" each other.

On 21.ix.1995 it was found at Common Plantation, near Alderbury (c 199 279). About a dozen males and a worker were found on a large *F. rufa* nest, often climbing or resting on the tips of pine needles. At least 20 males were present on a different heap a hundred yards or so away, and once or twice these were seen chasing and grasping each other. The species was subsequently found at that site on a number of occasions up to July 1999. Most records were from May, September and October, but they were recorded in every month between late April and early December with the exception of June.

Workers were seen in late April, May, July, August, September, October and, in 1995, in early December. Usually only one or a few were visible. On one occasion, two workers were seen "tandem running". A worker was once seen to carry another across a *Formica* heap in the same manner as *Leptothorax* species. The workers from a colony fragment captured from an abandoned mound (see below) behaved similarly. A worker was once seen to be picked up two or three times by a *Formica rufa* worker, but it was released unhurt—usually they are overlooked or ignored, or occasionally threatened.

Males were found in May (once only, in 1997), August, September, October and, in 1995, early November. The males, once present, are usually more numerous and conspicuous on the mound surface than are the female castes. On 15.x.1995, dozens of males were present on one heap, with several females (alate and dealate) under clusters of males. On 15.ix.1996, literally hundreds of males were visible on the surface of the same well-populated mound, along with two alate females. The females were just beyond the edge of the mound, one on a bramble leaf, and some males were seen six inches from the heap. Males were also active on other heaps, but in far smaller numbers. 18.v.1997 was the only occasion when males were seen in the spring (albeit on a different heap) with 20+ active. These had presumably overwintered. On 7.ix.1997 they were again quite abundant on many different heaps, and two males were attacked by *L. acervorum* workers, which in one case even attempted to sting, but both *Formicoxenus* seemed to escape unhurt when disturbed. The males actively patrol the mound surface, sometimes apparently favouring certain areas, such as the top or pieces of wood in the nest. They have been seen to pursue and attempt to mate with not only alate females, but dealate females, workers and sometimes even each other, at least briefly! Sometimes two or three, perhaps more, will climb on to a single "victim" which is probably grasped by the neck or thorax. The males will also "greet" each other with their antennae, like workers.

Alate females were seen in August, September and October. They were sometimes found near the edge of the heaps or on the ground or low vegetation nearby, but were never seen to fly. They are reported to adopt a "calling posture" and attract the more numerous males with pheromones (Buschinger, 1976) but such behaviour was not seen by NCB. The dealate females were seen in late April, May, August, September and October, wandering on the heaps, sometimes near the edge, but not on nearby vegetation. They were presumably searching for nest sites or food. Most British myrmicine species, including the closely related *Leptothorax*, behave similarly.

It has been reported that *F. nitidulus* is able to emigrate in the columns of host workers when the latter change nest sites (André, 1881) and more recently it has been confirmed that they can follow odour trails laid by the *Formica* (Elgert & Rosengren, 1977). Observations at this site suggest, however, that their ability to do this may be, at best, rather limited, and it may only be possible over short distances. On 16.viii.1998, at least 20 workers and about a dozen females (about half of them alate)

were seen on a recently abandoned *Formica* nest, especially on the top. There were also two workers about three feet along a fallen tree trunk which lay beside the nest. None were visible a week later, but the following week several workers and at least one dealate female were seen. On 13.ix.1998, again none were visible on the surface of the heap, but the nest material was deposited beside what was thought to be the new nest of the *F. rufa* colony, about 100 yards away. About 20 *Formicoxenus* workers and a similar number of females were seen on the material afterwards. In addition, two small groups of workers with brood were found under the bark of a stump deeper inside the abandoned heap, and these were captured, along with two single dealate females and several single workers, from the remaining nest material, to give a group of two dealate females, 21 workers and a few eggs and small larvae. These were released a week later, along with another three workers and a dealate female found at the old nest site. Early the following May, two workers were seen at the new site, but the *Formica* were again moving, this time to a site 10–15 yards away. At the end of the month, none were seen at either this latest or the newly abandoned heaps, and none were found in the process of again moving the nest material to the latest site, but in early July a worker was seen at the remains of the recently abandoned nest. None were found at the original site in 1999 and it would be interesting to know if the *Formicoxenus* would have survived the winter at the abandoned site.

These observations do not provide any evidence for the other mystery of *Formicoxenus* biology—their food source. They have been reported to receive regurgitated food from the *Formica* workers (Stäger, 1925, confirmed by Buschinger, A., personal communication, in Holldobler & Wilson, 1990, p. 465) but Stumper (1950) concluded that this must be uncommon, as most *Formicoxenus* workers keep strictly to themselves. Certainly, this behaviour has not been observed by the current authors, so presumably occurs only within the *Formica* mound. The small colony kept by the first author for one week, without *F. rufa*, ignored some freshly killed springtails offered, and probably also some small *Myrmica ruginodis* larvae, but took some milk chocolate.

Subfamily Formicinae

(14) *Lasius flavus* (Fab.)

This species is essentially universal on chalk downland and other areas of well drained, close-cropped grassland, including gardens. It is present on the MoD Ranges at Porton, the Devenish Reserve and most of the sites discussed in this paper, although it is much less abundant in woodland, especially on some acidic or clay soils, such as those underlying the *Formica rufa* sites in this area.

The population on the MoD Ranges at Porton has been estimated at 35 billion ants, nesting in three million soil mounds, and the "antscape" on Roche Court Down is regarded as a habitat of national importance (Anonymous, 1990). However, the statement that many of the individual mounds are 80–100 years old is unlikely to be correct, although the soil mounds of extinct colonies will be continually recycled.

On 5.vii.1998 on the Porton Ranges, a queen with distended gaster and clusters of eggs nearby, was seen near the surface when a mound was opened. This is noteworthy because the nest queens are rarely seen, normally remaining hidden deep within the nest. On 4.x.1998, worker pupae were still present in some nests, and, more notably, eggs were seen in at least one. On 28.iii.1999, clusters of small black aphid eggs were seen in a nest, also at Porton. Following the disturbance, they were carried into the nest by the workers. Medium-sized queen larvae were already present. These observations suggest that larvae are overwintered, which is probably

atypical of British formicines. Finally, on 9.v.1999 the myrmecophilous beetle *Claviger testaceus* was found in another colony, also at Porton.

(15) *L. alienus* (Foerster)

Literature records could refer to this species or to *L. psammophilus*, below.

This species occurs in several areas of the MoD Ranges at Porton, often on or close to vehicle tracks, and in other areas where the vegetation is too sparse to support competitors such as *L. flavus* or *Myrmica* species. It is present along the ridge west of Tower Hill, along the track through Happy Valley, and in the Isle of Wight Woods. It should be present on other, similar, sites. On 4.vii.1993, workers were found climbing a pine tree (around 232 384). Such behaviour is unusual for this species in Britain.

It was also found along the Clarendon Way in May 1995. It is probably present at the Devenish Reserve—in June 1996 a worker, believed to be of this species, was seen on a log on the valley side, but it was not captured, so the record could not be confirmed.

(16) *L. psammophilus* Seifert

This species has recently been split off from *L. alienus* (Seifert, 1992). It is believed to favour acid heathland, so the single record, from the Porton Ranges, was unexpected. Any literature records of *L. alienus* from heathland in South Wiltshire would presumably refer to this species.

On 14.viii.1993 workers and flying alates were taken from dry, sparse chalk grassland in the Isle of Wight Woods, Hampshire (c255 374). The site was an area of grassland warm enough to support a population of the silver-spotted skipper butterfly (*Hesperia comma*) which requires high temperatures (Thomas, 1992).

(17) *L. brunneus* (Latreille)

This was the most important record from this study and the first from Wiltshire. This is a "Notable A" species (Falk, 1991). Most British records of this scarce and unobtrusive species are from the Greater London area and the upper Severn Valley. The nearest established localities are in the north-east corner of Hampshire. It has not been recorded from the New Forest, even though habitat that would appear to be suitable is present there.

This species is arboreal, usually living in dead wood and obtaining food from aphid herds, including species which live on or under bark. It has been found on a wide range of trees, but ancient oaks are favoured (Donisthorpe, 1927). The classic British locality is Windsor Great Park in Berkshire. It is much less aggressive than potential competitors such as *L. niger* and *L. platythorax*.

It was found only in Happy Valley on the MoD Ranges at Porton. On 2.vii.1994, some very small *Lasius* workers were noticed amongst *Leptothorax nylanderi* workers at the base of an old, double-trunked, beech tree (c236 386). It was still present at the beginning of July 1999, although the workers were still mostly rather small, suggesting that the colony is still not a strong one. No other colonies have been found, even on the oak trees that are present near the railway line and along the Portway beyond. It is even just conceivable that the colony was founded by a female brought by train from nearer London!

The nest is not discernible from the ground, but is at least 20 ft up, as workers have been seen (with difficulty!) climbing one trunk up to about that height. Workers are mostly seen when descending to the base of the tree and ascending carrying food in their crops. The source of this food is unknown. On 27.v.1996, several were seen

carrying medium-sized worker larvae up the trunk. In 1999, at least two foragers were seen about three feet away from the base of the tree, on a fallen branch. Another was seen foraging in the leaf litter about eight feet from the tree. They will take sweet liquids put down as bait. Freshly killed larvae and pupae of other ants are also taken, but less readily, unless mixed with sweet foods. When baited, up to about 90 workers have been visible at once, on the food and climbing the trunk. The workers are active and "nervous" in behaviour, reminiscent of *Tapinoma erraticum*. They will harrass and drive off, with a reasonable degree of success, other insects and foragers of ant species such as *L. nylanderi*, *M. ruginodis*, *L. niger/platythorax* and *F. fusca*, which attempt to take this food. The workers have been seen in spring and early summer, from early May to the first half of August. In 1998, the only record was of a few workers, believed to be *L. brunneus*, glimpsed at least seven feet up the trunk, presumably deterred from coming lower by the presence of *L. niger/platythorax* at the base of the tree. The author killed these on several occasions, which successfully deterred them from visiting the tree. *L. brunneus* has not been visible later than August, even in the absence of such competition, so by then they are presumably relying on food sources in the crown of the tree.

In total, seven species of ants have been recorded from this beech tree. Although rather fewer than the 40+ which have been found on large canopy trees in tropical rain-forest, this is a very respectable total in a temperate region!

(18) *L. niger* (L.)

The "common black ant" is widespread and often abundant in most urban and suburban areas in southern England, including this area of Wiltshire. Records from rural or semi-natural habitats included the MoD Ranges at Porton, Newton Toney, the Portway, Devenish Reserve, Phillips' Lane, Grovely Wood (055 344), the Clarendon Way, Common Plantation and Bentley Wood.

On 2.viii.1992, a nest queen with distended gaster was found in a colony under a flint at a site north-west of Porton village. This is unusual, as noted already for *L. flavus*.

In the late afternoon on 5.viii.1994, some small Phorid flies were seen harassing *L. niger* workers (that were themselves attacking *L. flavus*) in a garden in Porton. One fly was captured.

(19) *L. platythorax* Seifert

This species has only recently been separated from *L. niger* (Seifert, 1992) so there are no previously published records from Wiltshire. It closely resembles *L. niger*, but the workers are usually larger and nests occur in wood or damp areas. It was found on several occasions on the MoD Ranges at Porton. Workers probably of this species have been seen around the base of the tree inhabited by *L. brunneus* and it definitely occurs on another large beech approximately 50 yards away. Other proven colonies occur in tree stumps in other areas of Happy Valley (230 3855 and 2385 388).

(20) *L. fuliginosus* (Latreille)

Colonies of this species tend to be widely scattered but long-lived. The carton nests are deeply buried and, unusually for a British ant, are often shaded by thick vegetation, so the exact nest site can be difficult to locate, even though columns of the large, shining black workers can be very conspicuous. The species is also unusual for the long season over which alates have been found, from May to October (Collingwood, 1979).

It occurred at several sites near Porton. The first record was in July 1992, from Targett's Corner in Porton village (185 370) where it was still present in July 1999. On 13.vi.1993, an injured dealate female was seen there, being dragged by workers. On 30.vii.1994, a male was found dead nearby in Porton village. *L. fuliginosus* was found along the Portway on 7.viii.1993, when a partially dealate female was seen with workers (probably at 2295 393). These were seen again, probably nesting at the base of a pine, on 21.viii.1994. An alate female was also seen. On that date, another colony was found amongst beech trees at 2315 395. A dealate female was found injured on the track through woodland in Happy Valley on the Porton Ranges on 3.vii.1994 (238 386). No colony was found on the MoD Ranges, but it could well be present somewhere on site, perhaps in the cultivated areas around the perimeter.

It also occurs near Clarendon Palace. On 28.v.1995 trails were present on the track at 178 300 and a nest was found at the base of a large, old oak around 189 3035. Males were seen outside the latter colony. A male was seen by the track at the first site on 16.vi.1996. On 5.v.1997 an alate female and at least four males were seen on the oak, and on 25.v.1998 at least two alate females and many males were going up and down the tree.

(21) *L. umbratus* (Nylander)

L. umbratus and the following three related species are more strictly subterranean than *L. flavus*, which they superficially resemble. Although they sometimes construct soil mounds over their nests, the brood are rarely, if ever, found in the upper levels of the nest. It is also uncommon to find all three castes together, which is unfortunate, as such complete series greatly assist identification in this taxonomically difficult group. The four British species can be divided into two pairs. *L. umbratus* and *L. meridionalis* both have erect hairs on the scapes and tibiae. *L. mixtus* and *L. sabularum* do not. Significant variation can occur, so some identifications between species within each pair are tentative.

The records for *L. umbratus* listed below are believed to be the first for Wiltshire. Although recorded from several sites (mostly in gardens or by roads) all are based on sexuals, particularly females.

Dealate females and alates of both sexes were taken in Porton village on 14, 21, 22.viii.1993 and 24.ix.1993, including a dealate female killed by *L. niger*. A dealate female was found dead near buildings on the MoD site at Porton on 19.ix.1997.

Two alate females were captured, and others seen, in the nearby village of Allington (c 205 3915) on 21.viii.1994. On the same day, another was found along the Portway (c 228 392) and males were retrieved from spiders' webs.

Dealate females were twice found dead on pavements in Salisbury (around 151 295 on 20.ix.1997 and at 140 316 on 30.viii.1998).

(22) *L. meridionalis* (Bondroit)

Another new record for Wiltshire, this species was unexpected, being mainly known from East Anglia, Surrey and South Wales where it has usually been found on acidic or sandy soils, including dunes and heathland (Collingwood, 1979).

Most of the records reported here are again based on females.

In Porton village, a dealate female was taken, and others seen, on 14.viii.1993. An alate was found on 10.x.1993. On 14.ix.1995, three dealate females were being killed by *L. niger* workers near MoD buildings. Others were seen alive in the vicinity. A specimen of a dealate female (1993) and a worker (1995) also from this site, unfortunately lack clear collection details.

On 2.ix.1996 an alate female was found on the pavement along the Wilton Road, Salisbury (137 304). A dealate female was seen nearby.

(23) *L. mixtus* (Nylander)

Most of the records are from the MoD Ranges at Porton, usually workers taken under logs on grassland and in open woodland.

Workers were taken twice in the Isle of Wight Woods in Hampshire (approximately 256 370) on 23.v.1993, with further records on 17.vii.1993 and 14.viii.1993.

It was also recorded from areas of the site in Wiltshire. On 4.vii.1993 two workers were found on Tower Hill at about 238 382. There were several records from Happy Valley. On 31.v.1994, workers from two colonies were found. On 24.vii.1994, three workers were captured from under a very old birch log in leaf litter at the edge of a clearing in the beech wood (c238 387) where there was very little vegetation present to support root aphids. On 1.x.1995, all three castes were taken from an irregular soil mound, about six inches high, in a clearing beside the main track through Happy Valley (c237 3855). Some workers were visible outside and alates of both sexes were visible at the entrances. This was a rare opportunity to capture all castes of a *L. umbratus* group species together.

On several occasions, dealate females were found alone under objects in circumstances which suggest that they can overwinter alone before trying to gain entry to the nest of a host species of *Lasius* to initiate a new colony. On 3.v.1993 one was found under a large log in partial shade, in Happy Valley. Only *L. flavus* occurred nearby. On 4.ix.1993 another was found in the same area in similar circumstances. The next day, one was taken from a chamber under a flint in quite deep shade, beside a large pine by a track in Isle of Wight Woods (c 249 373). Another had been seen earlier in the day beneath a log, with a few *L. flavus* workers quite nearby. Yet another, seen on 4.x.1998 near Tower Hill, alone in a cell under a piece of wood, was also most likely to be of this species, or *L. sabularum*.

This species was also found at the Devenish Reserve, on 6.x.1996, when two workers were taken amid some excavations under a new fence post laid down on slightly shaded grassland.

An alate female was taken on a path in Salisbury (139 312) on 19.ix.1998.

(24) *L. sabularum* (Bondroit)

This is a recently re-described species, very similar to *L. mixtus* (Seifert,1992) and thus the first records published for Wiltshire.

The first record was on 3.v.1993, when two workers were found under a log in Happy Valley. Other records from that area were 29.v.1994 (four workers under a stone) and 4.x.1998, when several workers were seen with root aphids, again beneath a stone (c 240 388). On 20.vi.1999, two large workers were found under a section of tree trunk on grassland (235 385).

On 5.viii.1994, a dealate female was found dead near buildings (209 372).

On 6.vi.1993, about ten workers were found under a log in the Isle of Wight Woods (c247 373, Hampshire). *L. flavus* occurred under logs to either side. In April 1997, four workers were collected by Porton Conservation Group members from under an object, during archaeological excavations at New Lodge, again in the Isle of Wight Woods (around 243 372).

There were two records from Porton village. On 4.ix.1994, an injured male and a dealate female were found separately beside roads. On 1.x.1994 an alate female was found in a garden, in a spider's web.

It also occurred at the Devenish Reserve, when three workers were found under a log on 10.v.1998.

There was one record from Salisbury. On 26, 27.vii.1998, all three castes were present inside a porch (140 316). On the second evening, many workers, hundreds of males and about twenty alate females were seen.

(25) *Formica fusca* L.

This species is widespread but local, occurring in heathland areas and open woodland on acid soils, and in open woodland or along woodland edges on chalk. It does not normally nest on open chalk downland.

It is widespread on the Porton Ranges, including Happy Valley (Wiltshire) and Isle of Wight Woods (Hampshire). At least two males and some pupae were seen in a nest on the Porton Ranges at the late date of 4.x.1998. Other records from chalk sites include the Portway (228 392), Newton Toney (215 402), and near Shipton Bellinger (240 458, in Hampshire), all in August 1994. It is present on the bank beside the road at the Devenish Reserve. A colony was found between Bemerton and the Wilton Road, Salisbury (115 315) in June 1996.

It should occur at all of the sites listed for *Formica rufa*, below, and has been definitely recorded at Hound Wood (July 1993), Common Plantation (May 1995, still present in 1998), Loosehanger Copse and Tinney's Firs (July 1996). Other sites on (presumably) acid soils are Bentley Wood (May 1992, 252 291), Grovely Wood (055 344 and 070 335, July 1995) and between Dinton and Teffont Magna (ST 996 3145, May 1995).

(–) *Formica cunicularia* Latreille

This species was not found in Wiltshire during this study, but may still occur, as it was found twice on heathland in neighbouring areas of Hampshire. A worker was seen at Hale in August 1995, on the heath beyond the *Formica rufa* colonies (see below). In July 1996 one worker was found at the edge of the road near Hope Cottage (225 1685) immediately adjacent to the county boundary.

The previous Wiltshire records are from Redlynch and Hamptworth in the south of the county, and West Kingston in the west, in 1960 (Collingwood, 1961).

(26) *F. rufa* L.

This species is present at a few woodland sites on acid soils to the east and south-east of Salisbury. It was first found at Hound Wood, near Farley (226 301) in June 1992, but was not seen on a visit to Bentley Wood, further to the east. The ants at Hound Wood are reputedly introduced. In May 1995 it was found at Common Plantation (196 280 to 2005 279) nearer to Alderbury. It was also found at three sites further to the south in Wiltshire, at the northern edge of the New Forest—near Nomansland (242 178) in May 1996, Tinney's Firs (203 198) and Loosehanger Copse (210 187 and 2125 188) in July 1996. In August 1995 it was found at Hale in Hampshire (around 190 180). Although there is concern at the decline of "wood ants" in many areas of Britain, they were still present when these sites were last visited—Hound Wood in October 1998, Loosehanger Copse and Hale in May 1999 and Common Plantation in July 1999.

At Common Plantation, sexuals were seen during May in 1995, 1997, 1998 (inside one nest) and 1999. Two worker pupae were still present at Hound Wood at the late date of 18.x.1998.

There is an old record from Franchise Wood in 1965 (Collingwood, 1966).

Summary

Records of 26 species are reported. Of these, *T. melanocephalum* is certainly introduced and *Hypoponera punctatissima* has uncertain status. Of the 24 definitely native species, 9 are believed to be the first published records from Wiltshire. Three of the *Lasius* species (*L. platythorax*, *L. psammophilus* and *L. sabularum*) have only recently been separated as species (Seifert, 1992).

Myrmica lobicornis, *Stenamma debile* (or *S. westwoodii*, as the species have only recently been distinguished), *Myrmecina graminicola*, *Formicoxenus nitidulus*, *Lasius brunneus* and *L. meridionalis* are also noted for the first time.

This increases the total list of ant species recorded from Wiltshire from 19 to 28.

In addition, both *Stenamma westwoodii* and *Leptothorax nylanderi* have only been recorded on one previous occasion.

Five predominantly heathland species, *Tapinoma erraticum/ambiguum*, *Myrmica sulcinodis*, *Tetramorium caespitum*, *Formica cunicularia* and *F. sanguinea*, formerly recorded from South Wiltshire (Collingwood, 1961, Collingwood & Barrett, 1964) were not found. The heathland areas in the extreme south of the county were not well searched, but the decline in this habitat may have led to them becoming extinct. The "wood ant" *Formica rufa*, was found on acid soils, with the inquiline *Formicoxenus nitidulus* also recorded from two sites.

The MoD Ranges at Porton proved to have a rich fauna, with 20 species present. This list includes *L. brunneus*, a Notable A species, and several other scarce species. Only *Myrmica rubra*, *Formicoxenus nitidulus* and *Formica rufa* were not found there. It is particularly noteworthy that all 11 of the currently recognised *Lasius* species found in mainland Britain have been found at that one site.

The Devenish Reserve, a small Wiltshire Wildlife Trust Reserve north of Little Durnford, also yielded some significant records. 12 species were recorded, including *Stenamma debile/westwoodii*, *Myrmecina graminicola* and *Leptothorax nylanderi*.

Discussion

The results clearly show that the ant fauna of Wiltshire is under-recorded and deserves more attention than it has received in the past.

Most of the area covered by this survey can be divided into two general areas, one underlain by Cretaceous chalk, the other by Tertiary sands and clays. There is also a small area with earlier Cretaceous strata (Geological Survey, Sheets 298, 314 and 315).

The bedrock over most of the Salisbury area is Upper Chalk, which is soft and contains flints. The soil cover varies in depth but the pH is usually alkaline, except in small areas that are particularly well drained or overlain by acidic deposits. Typical chalk downland is well drained and nutrient poor, and is well known for its rich flora, most notably a range of orchid species (Anonymous, 1990). The habitat is also notable for supporting a diverse butterfly fauna (Thomas, 1992). Where the turf is adequately grazed, high population densities of ants are present, particularly *Myrmica sabuleti* and *Lasius flavus*. Open, mixed woodland on warm chalk sites can have a rich ant fauna, including scarce species such as *Myrmecina graminicola* and *Stenamma* and also *Lasius umbratus* group species. Climax beech woodland casts a deep shade and is usually poor for ants in the British Isles, but *Leptothorax nylanderi* is present in this habitat at Porton, and the only *Lasius brunneus* colony found was also nesting in a beech tree, albeit in a warm position.

It is noteworthy that the best chalk woodland surveyed has a more interesting fauna than the woodland areas of the New Forest, where there are few or no recent reports of *Stenamma*, *Leptothorax nylanderi* and *Lasius fuliginosus*, and no records at

all for *Myrmecina* and *Lasius brunneus*, despite the attention of numerous collectors over at least a century.

Although *Leptothorax nylanderi* is numerous in one area of the Porton Ranges, only a single worker was found in another area of potentially suitable habitat nearby, and just two colonies were located at the Devenish Reserve. If careful monitoring showed a clear increase in these populations or an expansion of its range, this could be an indication of climatic change. An increase in temperatures might also benefit *Lasius brunneus*.

Acidic soils mainly occur where Tertiary strata outcrop to the south-east of Salisbury (Alderbury eastwards) and again in the north of the New Forest, south and east of Whiteparish. These consist of sands and clays. In the Dinton area, west of Salisbury, earlier strata, including the Middle and Lower Chalk, Upper Greensand and Gault Clay, are exposed. Acid soils can give rise to heathland, but no extensive tracts are present in the study area. The main areas in the north of the New Forest are in Hampshire, and even these have a poorer fauna than around Beaulieu and Brockenhurst, further to the south. Much of the heathland on the Wiltshire side of the border, around Landford (where *Tapinoma erraticum/ambiguum*, *Myrmica sulcinodis*, *Tetramorium caespitum*, *Formica cunicularia* and *F. sanguinea* were recorded in the past) seems to have deteriorated, with grass replacing heather, so it was not studied. The populations of the more interesting species will presumably have declined, and some may now be extinct in Wiltshire.

Acid soils are still important for the presence of *Formica rufa*, which is not found on chalk, for reasons that are not fully understood. It is present at several sites south of Salisbury, as well as in the north of the New Forest. The "wood ants" are of interest to conservationists because of their role in woodland ecology and as hosts to a number of myrmecophilous species. There is concern that they may be declining nationally.

Acknowledgement

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A Key to the *Lasius* species found in mainland Britain (after Seifert, 1992)

Workers

1 Colour shining black; head large, broadly cordate, occiput emarginate ..... *fuliginosus*
– Colour otherwise—greyish or brownish black, slightly bicoloured or yellow 2
2 Colour yellow or brownish yellow; maximum eye length one sixth of head width 3
– Colour greyish to brownish black, alitrunk sometimes paler than gaster; eye length more than one fifth of head width 7
3 Antennal scapes and front tibiae with numerous suberect hairs standing out clearly from general pubescence 4
– Antennal scapes and front tibiae with pubescence only or at most an occasional hair 5
4 Scapes and all tibiae flattened with a thin front edge; petiole scale subrectangular; funiculus segments clearly longer than broad ..... *meridionalis*
– Scapes and tibiae rounded elliptical; petiole scale with curving sides; funiculus segments cup-shaped ..... *umbratus*
5 Body hairs long, especially on promesonotum; scapes, tibiae and underside of head with pubescence only ..... *flavus*
– Body hairs very short; underside of head with some long hairs 6
6 Hind tibiae with 2 or 3 suberect hairs; dorsal body hairs up to 0.06–0.08 mm long ..... *sabularum*
– Hind tibiae with pubescence only; dorsal body hairs very short, less than 0.05 mm ..... *mixtus*
7 Scapes and all tibiae with abundant standing hairs 8
– Scapes and tibiae without standing hairs, or 2 or 3 at most 9
8 Clypeus with close pubescence; dorsal body hairs of even length. Colonies in earth nests or under stones in open environments, towns and gardens ..... *niger*
– Clypeus with sparse pubescence; long hairs on promesonotum standing out

from the rest. Woodland species nesting in tree stumps or marshy places ..... *platythorax*

9 Head and alitrunk paler than gaster; head nearly as broad as long; frontal triangle and furrow clearly indicated ..... *brunneus*

– Head always as dark as gaster; frontal furrow indistinct or obscured by pubescence 10

10 Hind tibiae with 2 or 3 suberect hairs and some short hairs on the declivitous face of the propodeum ..... *psammophilus*

– All tibiae without suberect hairs; declivitous face of propodeum without short hairs ..... *alienus*

Queens

1 Colour shining black; head broadly cordate and clearly wider than alitrunk; scutum overhangs the pronotum ..... *fuliginosus*

– Colour yellowish brown to dull black; pronotum not obscured by scutum in dorsal view 2

2 Front tibiae and antennal scapes with numerous standing hairs 3

– Front tibiae and scapes bare with an occasional standing hair only 6

3 Head distinctly narrower than alitrunk; eyes bare 4

– Head at least as broad as alitrunk; eyes with short hairs 5

4 Alitrunk flattened dorsally; ventral head hairs long (0.19–0.22mm); clypeus with sparse pubescence ..... *platythorax*

– Alitrunk with rounded dorsum; ventral head hairs short (0.15-0.17); clypeus with close pubescence ..... *niger*

5 Scapes and tibiae flattened with thin front edge; petiole scale subrectangular; body colour dark; funiculus segments clearly elongate; general pubescence thin ..... *meridionalis*

– Scapes and tibiae rounded elliptical; petiole scale with broadly rounded sides; colour yellowish brown to dark brown; funiculus segments cup-shaped; pubescence thick ..... *umbratus*

6 Head at least as broad as alitrunk 7

– Head narrower than alitrunk 8

7 Dorsal body hairs extremely short, less than 0.06mm; scapes and tibiae always without standing hairs ..... *mixtus*

– Dorsal body hairs up to 0.08mm; hind tibiae with occasional suberect hairs ..... *sabularum*

8 Underside of body yellowish; eyes with microscopic hairs ..... *flavus*

– Body colour evenly dark; eyes bare or with one or two hairs at most 9

9 Head marginally narrower than alitrunk; frontal triangle and furrow clearly indicated; body hairs short, pubescence sparse and decumbent ..... *brunneus*

– Head distinctly narrower than alitrunk; frontal triangle and furrow obscured by pubescence; hairs on dorsum long 10

10 Scapes and tibiae without suberect hairs ..... *alienus*

– Scapes and hind tibiae with occasional hairs ..... *psammophilus*

Males

1 Whole body shining black; head cordate ..... *fuliginosus*

– Body colour various shades of greyish brown to black; occipital border straight 2

2 Head distinctly narrower than alitrunk 3

– Head at least as wide as alitrunk 8
3 Mandibles with apical and one pre-apical tooth ..... *flavus*
– Mandibles with apical tooth only, masticatory border smoothly rounded into pre-apical cleft 4
4 Scapes and tibiae with suberect hairs 5
– Scapes and front tibiae without hairs 6
5 Body size larger, alitrunk length 1.7–1.9 mm ..... *niger*
– Body size smaller, alitrunk length 1.55–1.65 mm ..... *platythorax*
6 Frontal triangle and furrow distinct ..... *brunneus*
– Frontal triangle and furrow obscured by pubescence 7
7 All tibiae without suberect hairs ..... *alienus*
– Hind tibiae with 2 or 3 hairs on extensor surface ..... *psammophilus*
8 Scapes and tibiae with outstanding hairs 9
– Scapes and tibiae hairless 10
9 Body colour dull black; head features obscured by pubescence ..... *umbratus*
– Body colour moderately shining black; frontal triangle and furrow distinct ..... *meridionalis*
10 Mandibles with 5 or more distinct teeth ..... *sabularum*
– Mandibular dentition weak and indistinct ..... *mixtus*

BOOK REVIEW

Insects on Palms. F. W. Howard, D. Moore, R. M. Giblin-Davis, R. G. Abad. CABI Publishing, Wallingford, Oxon, UK. 2001. 400 pages 16 colour plates. £65

The authors have arranged the book in 8 sections, each of which focuses on aspects of the insects' behaviour rather than dealing with each species in turn. Section 1 is an introduction to the Class Insecta and the plant family Palmae; 2 deals with defoliators of palms; 3 with sap feeders on palms; 4 with insects of palm flowers and fruits; 5 with palm borers; 6 with population regulation of palm pests; 7 with the principles of insect pest control on palms and 8 with field techniques for studying palm insects. For me this system makes the book much more readable. As a non-entomologist, whose interest in insects stems from their role as vectors of plant diseases, I found the first chapter particularly informative, although the palm family was dealt with in much more detail than the insects. Throughout the book the authors make use of boxes of text to provide extra information. I am not sure if this is part of the publishing house style but I found it does allow the authors to give plenty of side detail on the uses of palms, their diseases and methods of sampling for insects on palms for example. This does mean that readers do not have to treat the book as a work of reference but can dip in and out for pleasure. The book is well illustrated with both colour and monochrome photographs, line drawings and tables. Colour reproduction is generally good but the black and white photographs are variable with some appearing to lack contrast; some of the reproductions of older line-drawings are rather poor. I felt that some of the monochrome plates would have benefited from colour, especially those detailing Lepidoptera or species of palm, but that might have pushed the price too high. Although not intended as an identification manual or complete list of every insect found on palms, this is a very practical book for any who have an interest in palms and the insects associated with them. Mites are given honorary insect status but you would not get that from the title!

PHIL JONES

THE 2000 PRESIDENTIAL ADDRESS—PART 2 SOME ASPECTS OF THE STUDY OF THE COLEOPTERA OF KENT

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I have always had an interest in natural history and some of my earliest memories are of collecting woodlice at the age of two (and even then recognising that there were more than one species), and of breeding the magpie moth through to a second generation before my fourth birthday. Interests continued to fluctuate between one branch of wildlife and another (and still do to a certain extent), but after I had finished my National Service I resolved to try and concentrate my interests toward the study of Coleoptera. My uncle was then secretary of the local horticultural society and a certain Dr A. M. Massee was listed on the programme to talk about insects and garden pests. I went along to this meeting and managed to get myself introduced to Dr Massee as someone who was interested in beetles. He suggested that I come and visit him at his home so that he could show me how to go about a study of these insects properly. I can still remember that visit; I was directed up to his study where he was sat in front of his microscope and surrounded by several open storeboxes containing some of his largest and most colourful beetles. He showed me how to set beetles with some examples of *Gnorimus nobilis* (L.) that he just happened to have handy, he identified a few specimens that I had taken along, and invited me to join him on a trip to Deal the following weekend. This was a start to a fine friendship between us that lasted for the rest of his life.

Dr Massee kept a card index of the Hemiptera–Heteroptera of Kent of which he later published a full account (Massee, 1963), and in the mid-1950s he suggested that I do the same for the Coleoptera. This I agreed to do, not realising at the time that there were some eight times as many beetles as bugs, and that a great number more entomologists have looked at and still look at beetles than there are that look at the plant bugs.

Mainly because of its position and its geology, Kent is a very rich county from the natural history point of view. It is situated at the very south-east corner of the British Isles with some two-thirds of its borders influenced by maritime conditions. To the north it is bordered by the tidal Thames, looking across to Essex, to the east by the North Sea and the Strait of Dover, and to the south by the English Channel. France, which can be seen from many points along the coast on a fine day, is a mere 37 kilometres away.

During the Miocene period the centre of what is now Kent (and Surrey and Sussex) was pushed up as a large ripple caused by the formation of the Alps. Since that time this central area has been slowly weathered down and washed away along the rivers, a process that continues today as seen with the recent floods and resultant muddy waters being washed down the rivers to the sea. The main river systems now are the Darent, the Medway, the Stour and the Rother. This latter now reaches the sea at Rye in East Sussex although formerly it used to flow out in the Greatstone area of Kent. This weathering away of the soils has revealed the underlying rocks, which now leave an interesting pattern of soil types and conditions.

The most prominent feature of the county is the chalk scarp which runs roughly east to west. To the south of the chalk is found the calcareous Gault Clay, then comes the Lower Greensand consisting of slightly acid Folkestone Sands, and the

Hythe Beds which are a mixture of acid and calcareous rocks and form the Ragstone Ridge. Below this is found the Weald Clay, a flat area of rather neutral clayey soil, and in the extreme south of the county, in what is the central area of the Weald proper, are found the rather acid, hard rocks of the Tunbridge Wells Sands. To return to the north of the county, we find that overlying the chalk are the superficial deposits known as clay-with-flints. The London Clay is one of the major deposits in the north with the famous fossil-rich cliffs on Sheppey eroding quite dramatically, and it is this London Clay which acts as a source for the muddy salt-marshes in the Medway, Swale and parts of the Thames shore. Other sandy Eocene deposits are also found in the north of the county, particularly in the Whitstable–Canterbury area and in the area around Dartford and south-east London. The chalk crops out again to form the Isle of Thanet, and finally there are extensive recent deposits of alluvium which form the Romney Marsh, at whose southern end at Dungeness is found the greatest expanse of shingle in Europe.

I hope that the geologists among you will not cringe at this crude and simple overview of the geology of the county, but this is really just to try and illustrate the complexity of habitats that are found in the county. If we start in the north of the county we have the hard chalk cliffs at the eastern end of Thanet, the eroding London Clay cliffs on Sheppey with continual land slips, and the salt-marshes and grazing marshes by the Swale and Medway and along the Thames through to London. Starting from the true maritime environment of the North Sea, the Thames and surrounding land become less maritime as one travels west.

The acid sands south of Whitstable and around Canterbury support some fine woodlands often collectively known as the Blean, whilst in the west are the acid heathlands of Dartford Heath and Blackheath. The chalk supports some excellent downland with its rich flora supporting insects, while the chalk cliffs on the coast provide a unique habitat within the country. The Gault Clay with its many ponds and streams supports some fine woodlands, but it is also much-prized land for farming. The Folkestone Sands are poorer farming areas and support some nice woodland and heathland, but are also extensively quarried for their sand, providing further rich habitats for beetles. Likewise, the Ragstone of the Hythe Beds has been extensively quarried, these quarries again providing rich beetle habitats. The Weald Clay is extensively farmed and at first sight looks as though it might be less interesting, but the whole area is pitted with ponds and small lakes and is riddled with small streams. All these provide rich pickings for the coleopterist. The High Weald with its acid sandy rocks provides yet further habitats with extensive woodlands, often cut into by streams causing steep gills, sometimes with small waterfalls.

The extensive Romney Marsh is an area typically of sheep-grazing meadows bounded by an extensive network of marsh dykes, which are very rich with invertebrates. Then along the south coast is found the extensive shingle beach reaching from the Sussex border through to Dungeness. This is a unique area within the British Isles and needless to say is also home to many interesting and rare species of beetle.

As already mentioned, the county is dissected by various rivers. The Rother now only forms part of the boundary between Kent and Sussex and no longer has its entrance to the sea in Kent, but along its former course, particularly in the Fairfield area of the Romney Marsh, there are still relict populations of many coastal plants and invertebrates. The Darent enters the Thames in the area of the Dartford Marshes although these are now but a relic of the area as it used to be, mainly through the construction of the Thames barrier and subsequent work on the seawalls, plus other

developments in the area. However, upstream where it cuts through the chalk around Shoreham, there is still a very rich area for all forms of wildlife. Likewise, the Medway gap through the chalk is again of great interest and the Medway valley north of Maidstone I consider to be one of the richest areas in the county, but perhaps I am biased, as that is the area in which I live. The Medway estuary, together with the Swale (a waterway on the south side of Sheppey), provide the bulk of the extensive salt marshes to be found in the county. Finally the Stour cuts through the chalk in the Wye–Chilham area and through the extensive marshes around Stodmarsh, and reaches the sea at Sandwich where it continues to deposit sand at the mouth. These sands, which run from Deal through Sandwich Bay to the estuary, have long been popular with coleopterists, and the 'Deal Sandhills' are probably the best known beetle locality in the county. The gravel along each of these river valleys has been exploited over the years and there are now many gravel pits, usually flooded, to provide yet further habitats.

Although this all sounds ideal, the picture at the present day is not so good. We have the Channel Tunnel and the vast area of railway sidings and other associated developments around Folkestone. A new rail link is being cut right across the whole county and the motorways are being widened. Over the past few years, spokesmen from every local authority in the county have proclaimed that their patch must not lose out on all this new 'prosperity'. So everywhere you go in the county, new warehouses, office blocks and housing are being built. Most of the land that remains is heavily farmed, either sown ley fields with cow-pats that contain no insects, or very large arable fields with no weeds and hence no insects.

In the nineteenth and early twentieth century with the population centred on London, localities in Kent were very popular with coleopterists and other entomologists. A horse cab could easily reach Darenth, for Darenth Wood, or Birch Wood (now completely eaten up by Swanley) for an evening or a day's collecting. With the advent of trains even more distant localities could be reached such as Whitstable, Deal or Folkestone. I should perhaps warn fellow entomologists that if they are ever looking at old collections they will probably not find the locality labels up to the standard that we expect these days. These old locality labels will probably reflect their station of arrival. 'Whitstable' can be anywhere in that area, but generally means somewhere in the Blean Woods. 'Folkestone' probably means Folkestone Warren or the chalk hills behind the town. 'Deal' can mean the Deal Sandhills, or any place from St Margaret's Bay through to Pegwell Bay and inland to Ham Fen and other sites within a day's walk of Deal.

This popularity of the county with coleopterists has its good and bad sides. We now have a very rich history of what has been found in the past, but on the down side it means that in researching past records there has never been a dull year. There have always been active coleopterists in or visiting the county and publishing what they find. So in contrast to many counties which have only ever had one or two active coleopterists, the entomological literature abounds with records from Kent. This means that if you ever pick up an old copy of any entomological journal such as the *Entomologist's Monthly Magazine*, or a modern one such as *The Coleopterist*, you can be sure that there will be some Kent records to abstract. Perhaps we can quickly look at some of the more prominent of these entomologists.

In 1908 W. W. Fowler published an annotated list of the Coleoptera of the county in the *Victoria History of Kent*. Fowler will need no introduction, as he is the author of the five-volume *British Coleoptera* (1887–1891) which is the base-line for all work on British beetles. Although he did visit Kent a few times, most of the records for his Kent list were based on those of G. C. Champion, J. J. Walker and W. West.

Champion (1851–1927) was an active coleopterist who regularly collected in the county. He was an editor of the *Entomologist's Monthly Magazine* in which he published some 426 articles, apart from publishing elsewhere such as in the *Annals and Magazine of Natural History* of which he was also an editor. In 1870 on a visit to Sheppey he met J. J. Walker and together that day they discovered *Baris scolopacea* (Germar) new to Britain. They remained friends and collecting partners, and indeed some fifteen years later Champion was to marry a sister of Walker.

Whilst in the Royal Navy, Walker (1851–1939) was stationed at times in Chatham and at Sheerness. Whilst at Chatham he regularly collected in the Cobham Park area, or would catch a train to Snodland and then work his way along the Medway valley back to Chatham. Whilst at Sheerness on the Isle of Sheppey, he collected widely over the island and was particularly fond of the old bone factory at Queenborough, and of evening walks along the north coast from Sheerness along to the 'Royal Oak'. He published widely and mention should perhaps be made of his paper on Coleoptera and Hemiptera of the Deal Sandhills in 1900 and his List of Coleoptera of the Isle of Sheppey in 1932. Walker was connected with the *Entomologist's Monthly Magazine* in some form or other from 1904 until his death and that journal contains many of his beetle records from the county.

W. West lived at Finsbury Park from around 1919 (before that period living in the Lewisham area) and was a former Honorary Curator of this Society. He collected mainly in the London area and north-west Kent and died in 1924.

Other collectors who have lived in the county include K. C. Side (died 1979) and A. M. Massee (1899–1967). Ken Side was a schoolmaster who lived in Dartford and then in Cuxton, collected widely in the county and published several short notes as well as a list of beetles from Farningham Wood (Side, 1961 and 1964). Dr Massee, a former President of the Society, lived at East Malling in the centre of the county, was a very active entomologist and published numerous notes on the Coleoptera. I have already mentioned his help toward myself, but this help and generosity was extended to anyone else who showed a genuine interest in beetles, or plant bugs. Many present-day entomologists owe quite a debt to Dr Massee from the experiences that he shared with his field craft and techniques in finding elusive species of beetle, and of their subsequent preparation.

Among the many visitors to the county mention must be made of H. Donisthorpe and T. Hudson Beare who published many notes of their finds during the first part of the twentieth century.

It is probably wrong to pick out present-day coleopterists who either live in or visit the county, but I must make mention of one. This is Mr A. A. Allen, formerly of Blackheath and now living in Charlton, who I consider to be one of the foremost amateur entomologists that this country has ever known. Some years ago he mentioned to me that he had just passed the one thousand mark for publications of entomological papers and short notes, and he is still going strong. A great number of these publications refer to Coleoptera in Kent, including lists of beetles from his garden at Blackheath (one of the largest lists of beetles from any one locality in the country) and a list of the Coleoptera recorded from Knole Park, Sevenoaks.

With a number of excellent coleopterists living in the county at the present, and with Kent still being very popular for visiting entomologists, the number of published references grows by the week, and I find it quite difficult to keep completely up-to-date.

In a county so potentially rich for beetles, and with an active history of past and present coleopterists recording in the county, then perhaps I should try and mention some of the beetles known from the county and something of what is known of their

present status. With something over 2900 species of beetles recorded from Kent, time will only allow for a small random selection of species to be mentioned. I should perhaps mention that there are also 448 species of Hemiptera–Heteroptera recorded from the county, an order of insects the study of which is quite compatible with that of the Coleoptera.

Cicindela campestris L., the green tiger beetle, is typically found on sandy heaths and in open sandy woodlands. The present (1971 onwards) recorded distribution (Fig. 1) must be well on the way to what is the true present distribution within the county, although records suggest that it is now far less common than formerly. However, *Cicindela maritima* Latreille and Dejean, which was recorded only from the Sandwich–Pegwell Bay area in the *Victoria County History*, is still present there and not likely to be found anywhere else in Kent. A specimen of *Cicindela sylvatica* L. in the Sunderland museum collection, labelled Sandwich Bay, is I feel a specimen that has become mislabelled in the past, as there is no other record from the county.

Omophron limbatum (Fab.) was first recorded from Rye in the neighbouring county of East Sussex in 1969. In April 1972, together with R. D. Pope and K. C. Side, I visited Rye Harbour to have a look at *Omophron* but, on the instructions of the warden, not to take specimens; in the seeing we were successful. Later in the day we moved on to the Dungeness area and, whilst walking around one of the flooded sandpits near Lydd, Ken Side mentioned that the damp sand area at the edge of the water looked very similar to the habitat where we had found *Omophron* earlier in the day. So I scooped up a handful of sand as we walked along and, to our amazement, two specimens of *Omophron limbatum* walked out. On searching, we found *Omophron* plentiful and also added *Heterocerus hispidulus* Kiesenwetter and *Dyschirius obscurus* (Gyllenhal), all three species new to the county, during the day. The Dungeness area has continued to yield new species, both for the county and the country, with *Bembidion coeruleum* Serville, new to Britain, during this last year (Telfer, 2001).

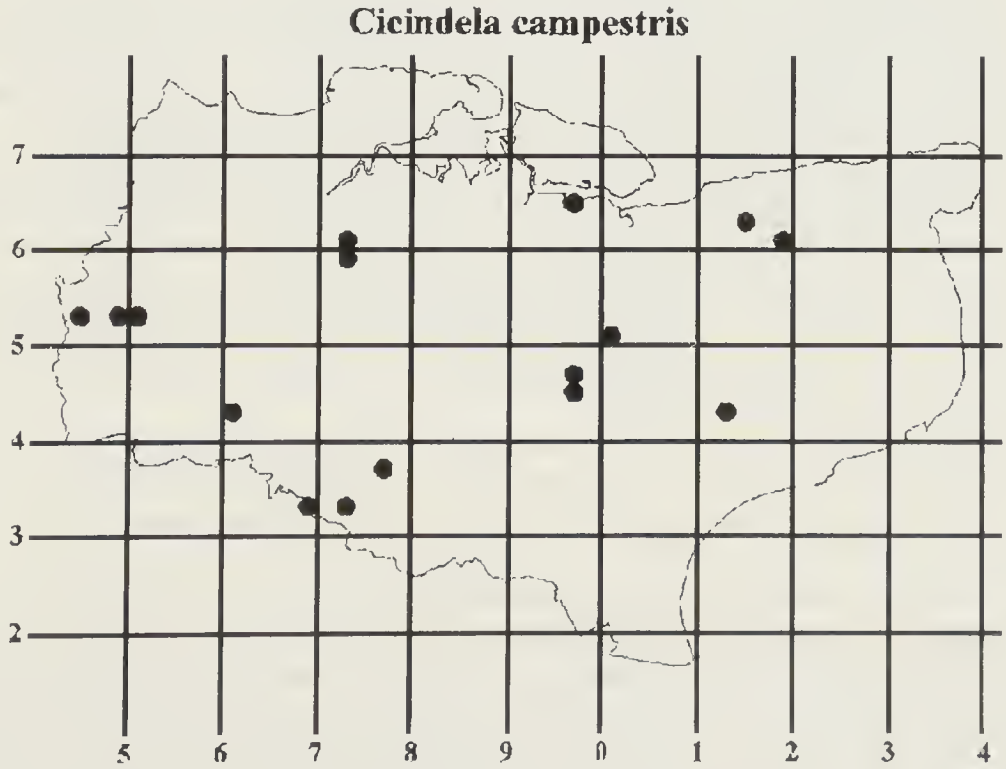

Fig. 1

Carabus granulatus L. is just recorded from a few marshy areas in the county, usually during the winter, hibernating under bark.

Leistus rufomarginatus (Duftschmid) was discovered new to Britain by Crowson (Crowson, 1942) near Sevenoaks in April 1942 and has spread throughout England and Wales since then. Although now widely scattered in the county, it certainly cannot be called common.

Broscus cephalotes (L.) is a rather scarce beetle within the county, occurring in the only suitable coastal sand dunes we have, in the Deal–Sandwich Bay area and at Greatstone near Dungeness.

Laemostenus terricola (Herbst) is another rarely recorded species. Fowler in the *Victoria County History* (1908) stated that this species was 'generally distributed and as a rule common'. However, the only 20th century record that I could trace was of it being found in an apple store at Aylesford in 1944 (Massee, 1945), until I found it in abundance in the same parish in 1965. It was found by placing pitfall traps baited with fish into rabbit burrows, the idea coming from that excellent little paper by Colin Welch, 'A simple method of collecting insects from rabbit burrows' (Welch, 1964). Each time I have tried this technique since then, it has always produced *L. terricola*, and it is also the only way I have taken *Catopidius depressus* (Murray) and *Aleochara cuniculorum* Kraatz.

Panagaeus bipustulatus (Fab.) is a rather local species of open, dry sandy or chalky soils and, in my experience, usually taken singly. This was certainly the case of one taken in my garden a few days after moving in, and with not a sign since. Elsewhere in the county it is almost restricted to a few coastal localities.

Demetrias imperialis (Germar) is a delightful little insect that is a particular favourite of mine as it was probably the first beetle of any note that I took. Formerly confined to the Fens of Norfolk and adjoining counties, it was first recorded in Kent by Walker in 1898. Since then it has slowly spread through the coastal marshes and up the river estuaries (Fig. 2). It is most often found in old stems of great reedmace, *Typha latifolia* L.

In a complete opposite to the last species, *Brachinus crepitans* (L.) has been steadily decreasing in range over much the same period of time. Formerly much more widespread, the bombardier beetle is now restricted to a few coastal areas in the county, and even there is found only at the very top of the shore line.

The distribution and status of the water beetles of the county were summarised by Carr and Philp in 1988. Mention might be made of *Hygrobia hermanni* (Fab.), the screech beetle, a fairly frequent species in ponds and stagnant ditches throughout most of the county (Fig. 3). One of the specialities of the county is the great silver diving beetle, *Hydrophilus piceus* (L.), which is regularly found in marsh dykes in the north and south of the county, but occasionally turning up inland, usually then at light traps or street lights (Fig. 4).

The Staphylinidae present some problems in recording distribution in that only the serious coleopterists will look at and are able to identify these, and so there are fewer records. *Tachyporus hypnorum* (Fab.) is one of the commoner species and the resultant distribution map (Fig. 5) shows the progress so far for a species that is probably found throughout the county. Another species, *Tachyporus chrysomelinus* (L.), equally as common, presents further problems as it was recently split into two species (Booth, 1988). All old records have had to be put aside and fresh records kept for both *T. chrysomelinus* and the split, *T. dispar* (L.), and always having to check that the recorder for any record sent in for this species is aware of this split.

The lesser stag beetle *Dorcus parallelipipedus* (L.) is a frequent species found in and around old stumps and is a beetle that does get reported by general naturalists at

Demetrias imperialis

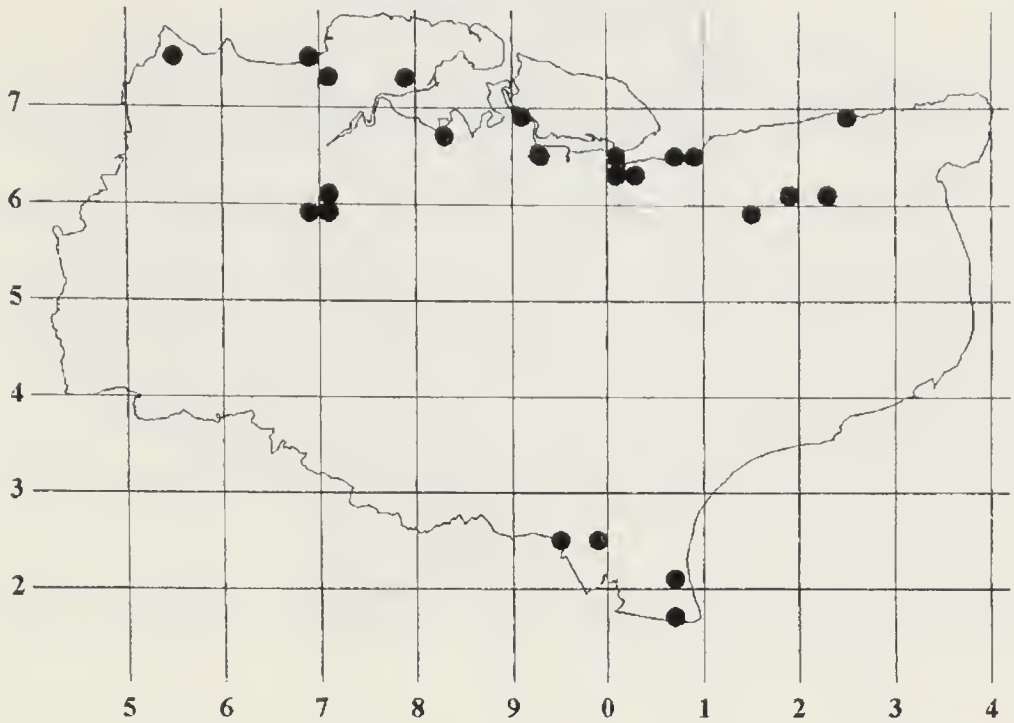

Fig. 2

Hygrobia hermanni

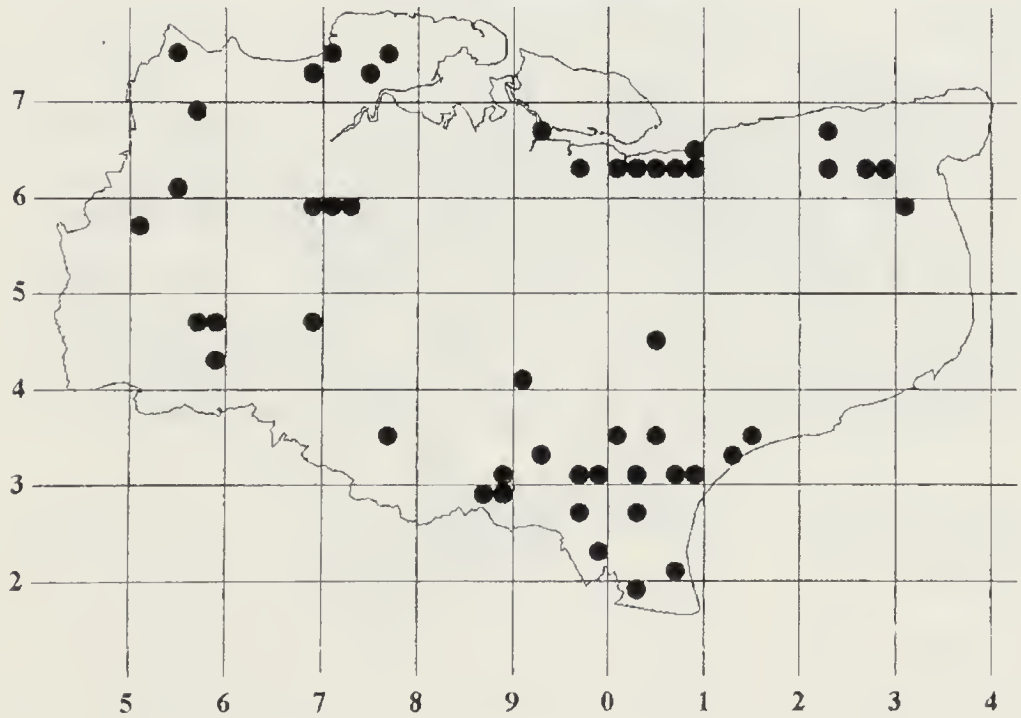

Fig. 3

times. Here always one has to check that it has not been mis-identified for a female stag beetle *Lucanus cervus* (L.), and vice versa. The Notable stag beetle is one of the insects that is heavily protected by the law and receives a lot of publicity and attention from the conservation bodies. However, in Kent, the stag beetle is quite frequent in gardens, parks and hedgerows in the north of the county between

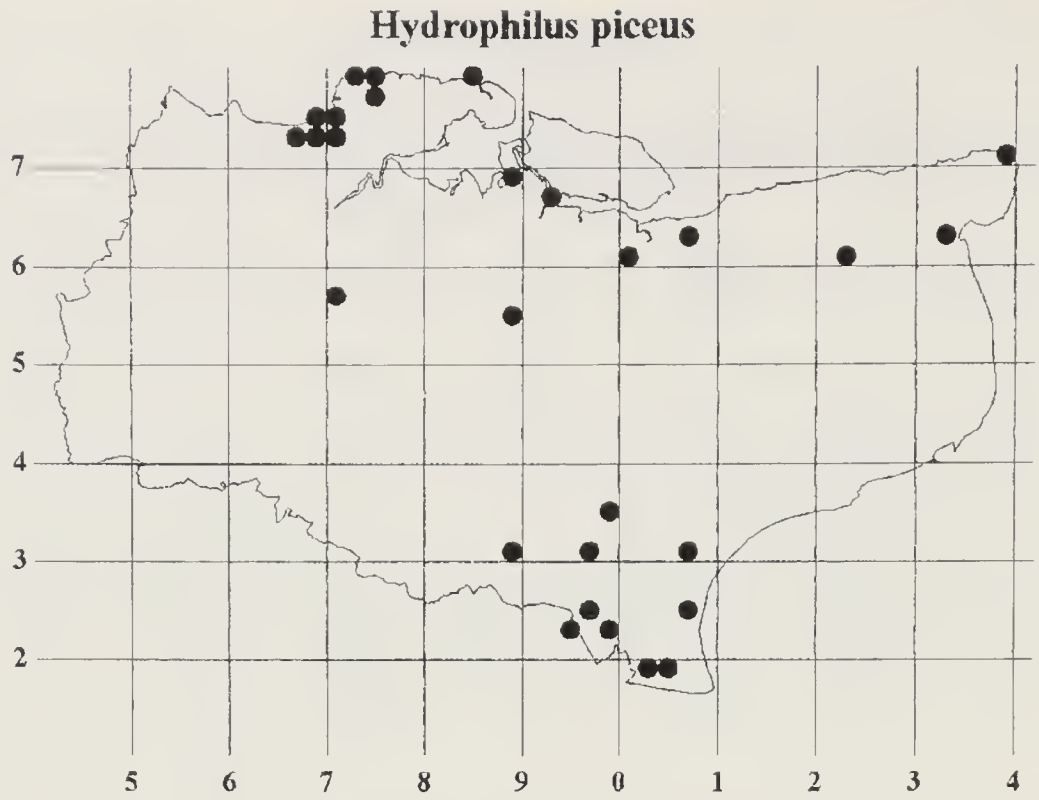

Fig. 4

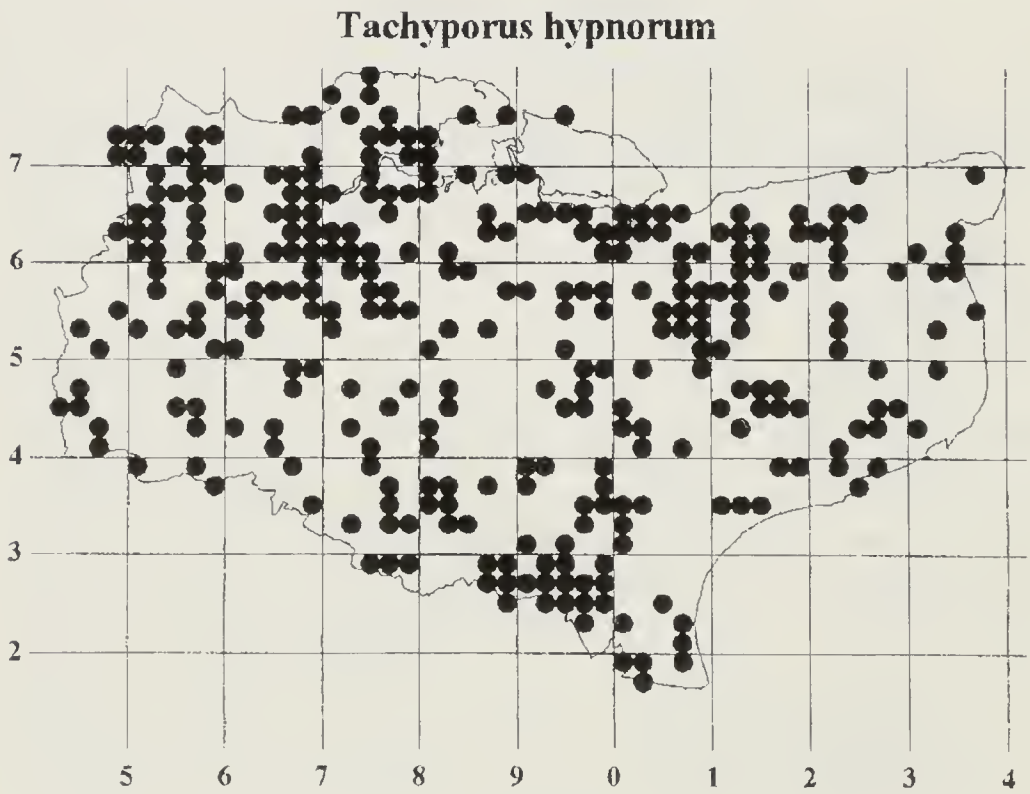

Fig. 5

London and Canterbury (Fig. 6). The spectacular *Typhaeus typhoeus* (L) appears to be restricted to the more sandy, heathy areas in the county where rabbits are present. It digs long tunnels in the sandy soil into which it carries rabbit droppings, but in recent weeks, because of the high water table, it has been found quite close to the surface in very short tunnels. *Serica brunnea* (L.), a small brown chafer, is another

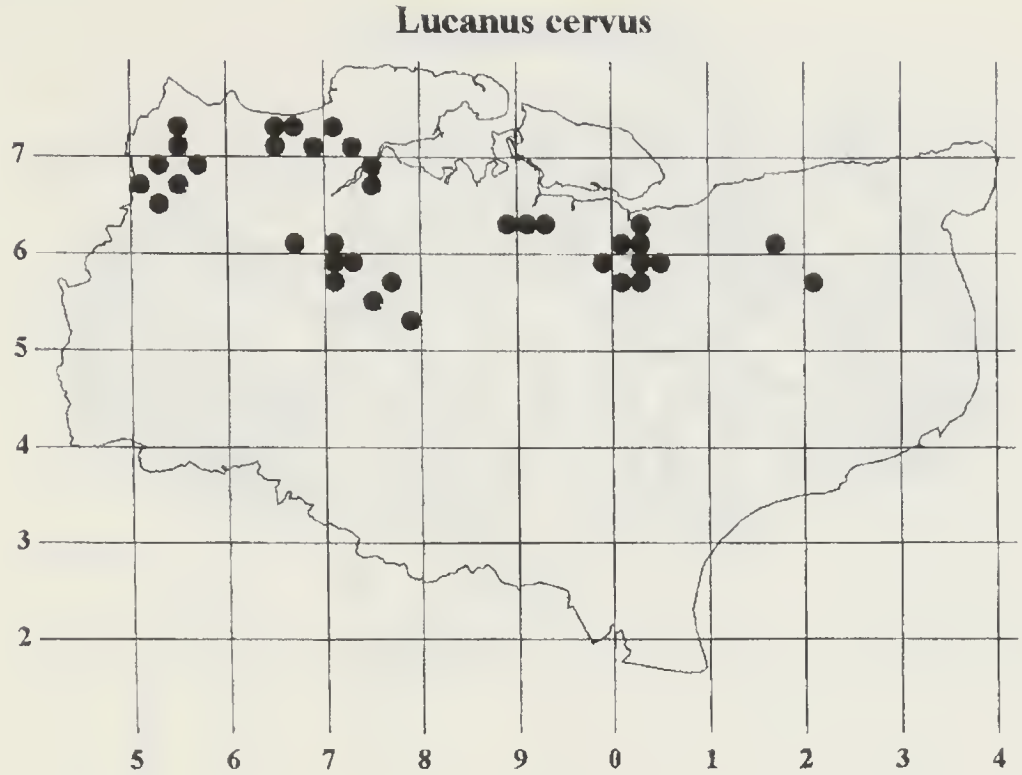

Fig. 6

rather local species of sandy areas, but is attracted to light and so is often reported by members of the public when attracted to lighted windows, or by lepidopterists because it is attracted to their m.v. lamps.

A common beetle, and one of the most obvious, is the soldier beetle *Rhagonycha fulva* (Scopoli), still regularly known as 'blood-sucker' by the general public. I would have expected this species to be found throughout the county and the present distribution map (Fig. 7) shows the recording progress so far.

Another species that sits out prominently on flower heads is *Malachius bipustulatus* (L.), but whether this will be as widespread as the previous species has still to be worked out. However, other members of this genus appear to have a much more restricted and interesting distribution, such as *Malachius vulneratus* Abeille, which appears to be confined to the salt marshes along the Thames and in the Medway estuary.

The delightful little *Anthocomus rufus* (Herbst) is another species such as the already mentioned *Demetrias imperialis* (Germar), that was formerly restricted to the Fens but over the last fifty years or so has been spreading around the coastal marshes and along the river valleys.

Endyomychus coccineus (L.) is a spectacular-looking beetle with a thinly scattered distribution in woodland areas. It is associated with fungus-infected trunks and logs and is always pleasing to find. Much rarer is *Diaperis boleti* (L.), first discovered in the county in 1988 and with a few subsequent records. From records elsewhere in the country this species has probably extended its range in recent years. My own observations are that it is associated with the bracket fungus *Piptoporus betulinus* (Bull.) Karst. on birch.

Lagria hirta (L.) has a widespread but rather localised distribution within Kent. However, the slightly larger but similar-looking *Lagria atripes* Mulsant and Guillebeau now appears to be lost to the county. Recorded as new to Britain in 1948 (Allen, 1948) from the Blean Woods, *L. atripes* was common in the Orlestone

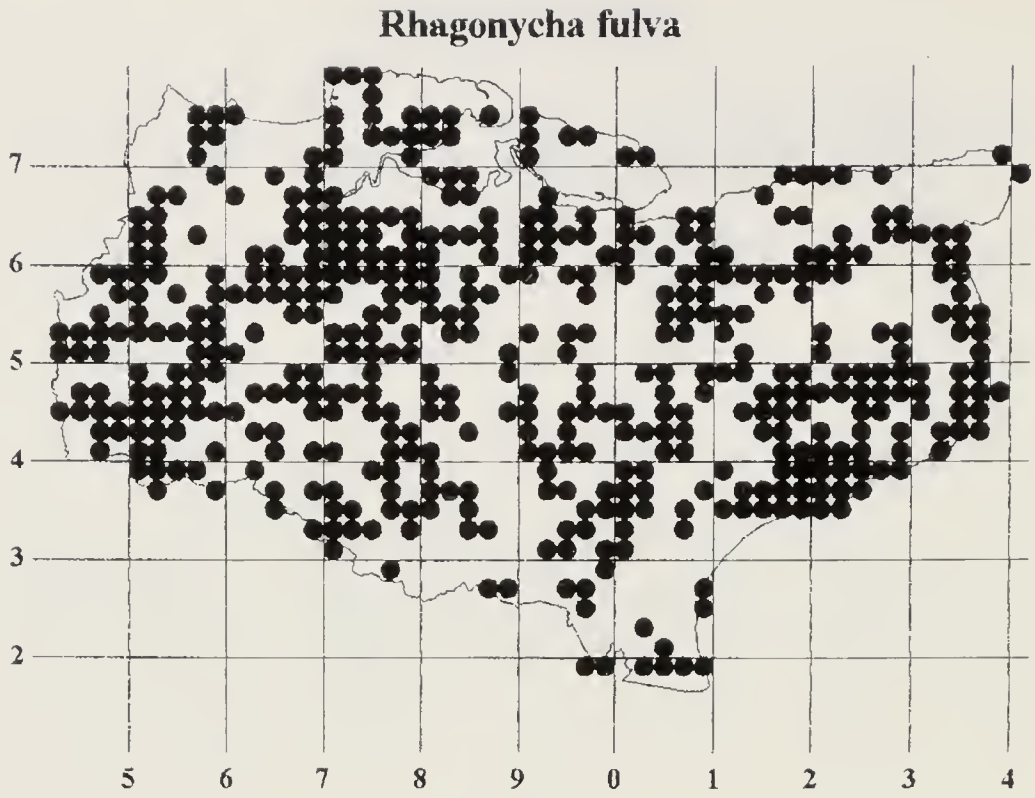

Fig. 7

Forest area from the late 1950s to the early 1960s, where it was last seen in 1963. It is difficult to find a reason why this beetle should have come and gone like that.

Another very localised tenebrionid beetle is *Cteniopus sulphureus* (L.) which is confined to the coast between Dungeness and Sandwich. Even here its distribution is rather patchy, but where it does occur it is usually in abundance.

The two cardinal beetles are both found in woodlands scattered throughout the county. *Pyrochroa serraticornis* (Scopoli) (Fig. 8) is much the more frequent of the two, while *P. coccinea* (L.) is a much more local insect.

I will make mention of *Osphya bipunctata* (Fab.), a Monks Wood speciality that has been recorded from the Chattenden Woods area in the past. I have searched for hours on many occasions to try and refind this species in the county, but so far without any success. This is often the way in that one has good fortune in finding one species, but no luck with another of similar standing. One local species that I have searched for and found on numerous occasions is *Oncomera femorata* (Fab.). This is a strange beetle that on first sight looks like a cross between a cantharid and a cerambycid. It occurs in chalky areas and is best searched for during the winter months when it can be found under large flat pieces of wood lying on the ground, either among ivy, *Hedera helix* L., or with that plant nearby.

Meloe proscarabaeus L. is the only oil beetle to have been found in the county over the past fifty years, yet in the past some nine species of Meloidae have been recorded. Donisthorpe (1903) records taking 25 specimens of *Meloe cicatricosus* Leach in two weeks in the Margate area in April 1903, and this is only one of many similar records, particularly from that area, around that time. It is difficult to understand why we have lost these beetles, where, in spite of the vast amount of building and other development, there are still sites with good colonies of solitary bees (their presumed hosts).

The longhorn beetles always attract attention and have been responsible for a number of people to take a closer interest in this group of insects. I would not say

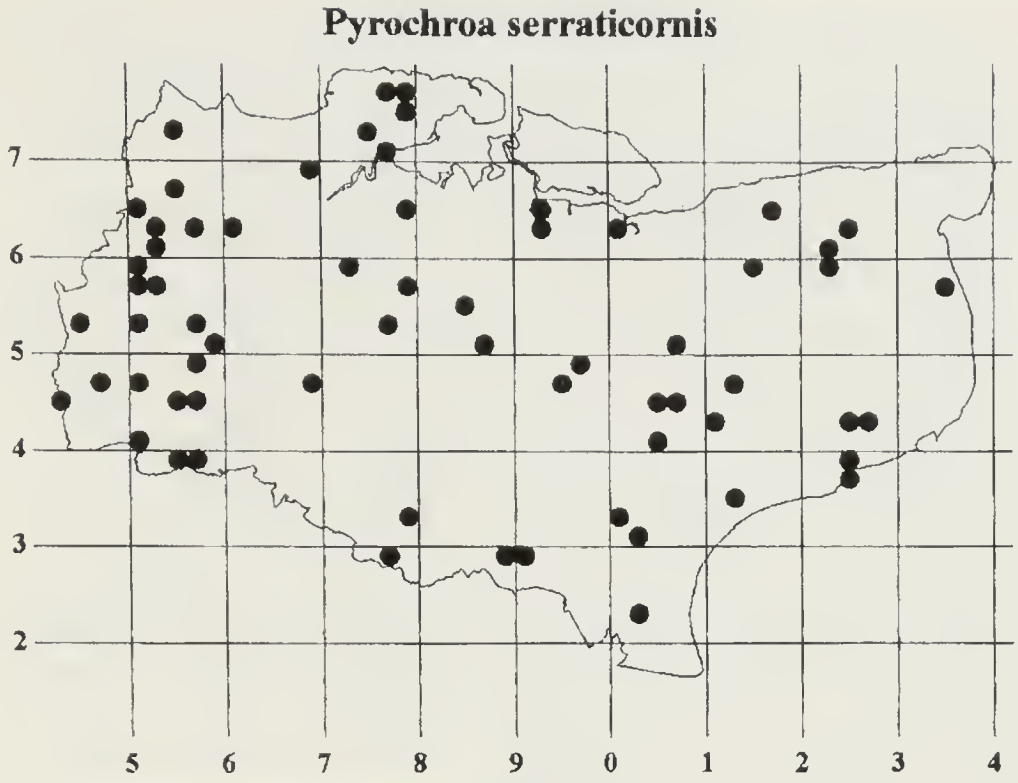

Fig. 8

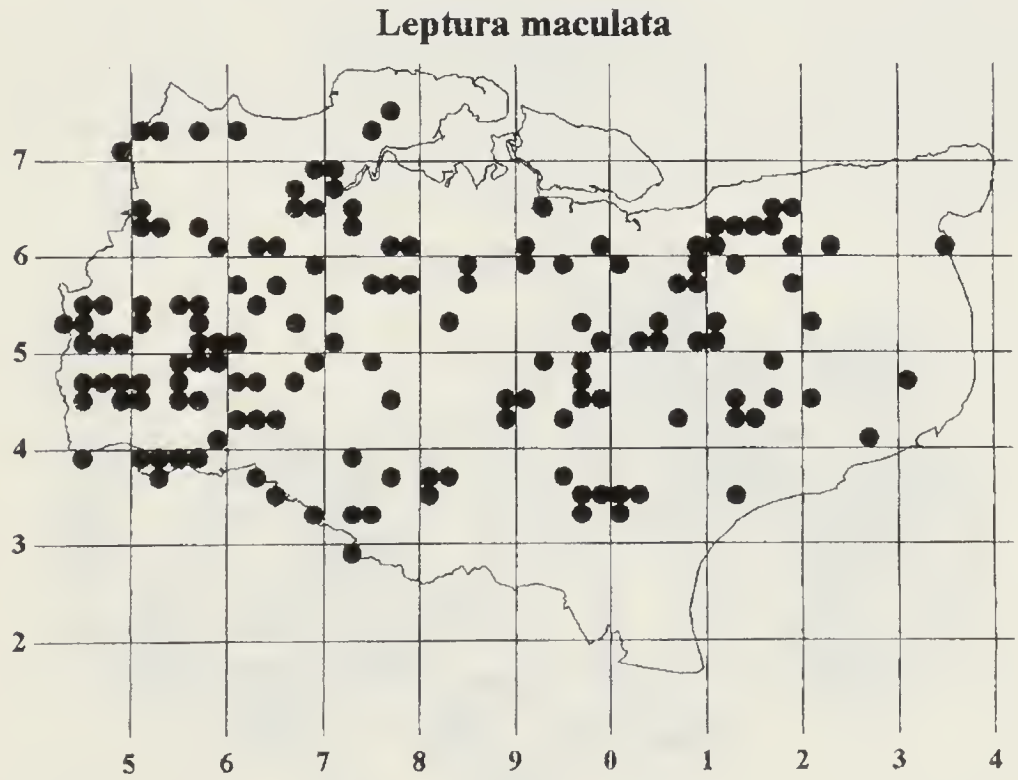

Fig. 9

that Kent was rich in this family of beetles, and although some 52 species have been recorded in the county there are only recent records for half of these. One of the most frequent is *Leptura maculata* Poda which has been quite widely recorded (Fig. 9).

Macroplea mutica (Fab.) is a rather scarce aquatic member of the Chrysomelidae which I have had the pleasure of finding on several occasions. On all but one of these

occasions I was specifically looking for this beetle by pulling out fennel pondweed *Potamogeton pectinatus* L. from suitable dykes and waiting for the beetle to crawl out. The other occasion I was walking around the edge of a flooded gravel pit in the Medway valley and on looking into the water at a submerged clump of fennel pondweed I observed several *M. mutica* crawling over the plant.

The ladybirds, always popular with the general public, have received a lot of attention from the scientific point of view in recent years. One of the major publications has been that by Roger Hawkins on the *Ladybirds of Surrey* (Hawkins, 2000). His excellent distribution maps show what can be done when a determined effort is made with one group. This publication was of particular interest to me as Surrey is one of the neighbouring counties to Kent, and his near-complete coverage of the seven-spot ladybird *Coccinella septempunctata* L. illustrates that I still have quite a lot of work to do to obtain the same coverage for Kent (Fig. 10).

The scarce seven-spot ladybird *Coccinella magnifica* Restenbacher looks very similar to its common cousin but has a much more restricted range (Fig. 11) and is found associated with the wood ant *Formica rufa* L. Another species associated with the same ant is the chrysomelid *Clytra quadripunctata* (L.) and this has a similar restricted distribution (Fig. 12), When we compare the recorded distribution of the wood ant (Fig. 13) with these last two species I think that it shows the association of these species with the wood ant, but also shows likely areas where further records of these two species of beetle might be obtained.

The bloody-nosed beetle *Timarcha tenebricosa* (Fab.) is a species that as a boy I used to see quite frequently, and old records show that it was a common and widely distributed species. The larvae feed upon one of the most common and widely distributed plants in the county, cleavers *Galium aparine* L., and also the almost as frequent hedge bedstraw *Galium mollugo* L., yet the beetle has now become very scarce, and as the distribution map (Fig. 14) will show, is almost restricted to the coast between Folkestone and Sandwich.

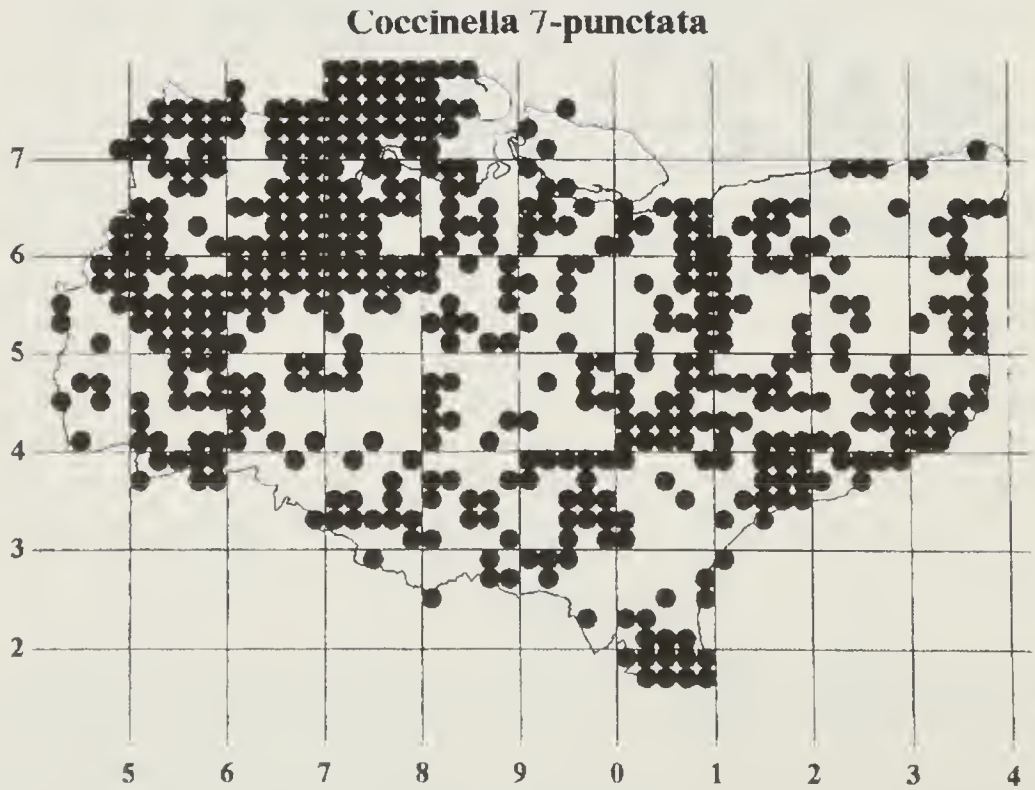

Fig. 10

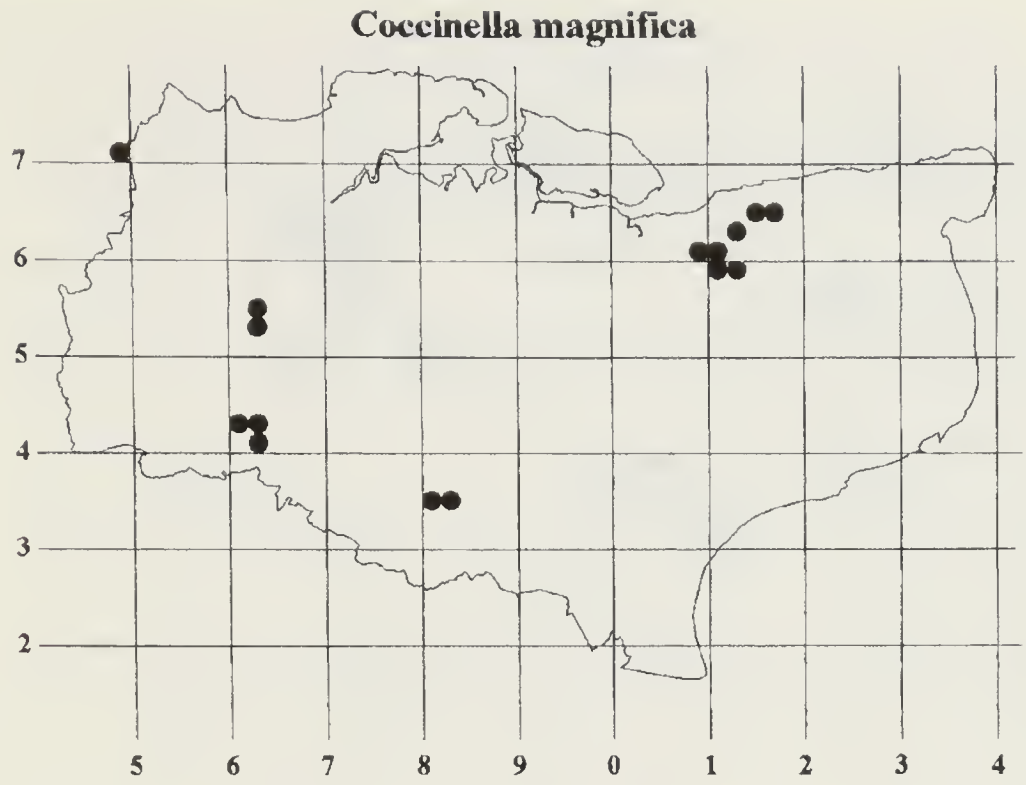

Fig. 11

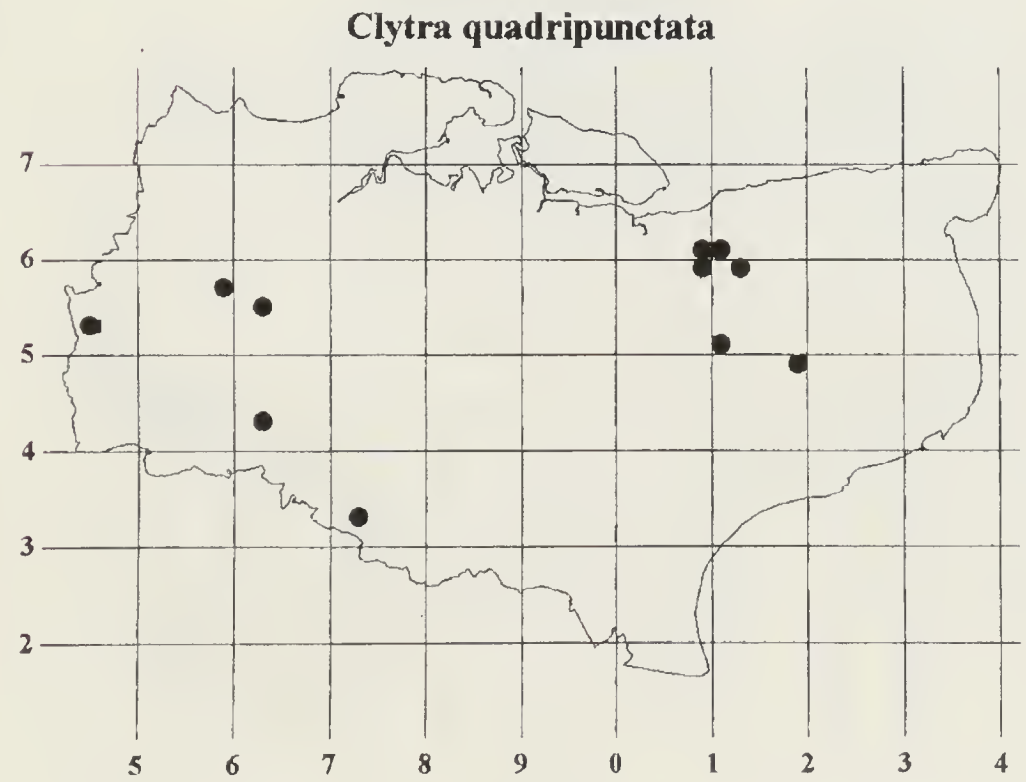

Fig. 12

Gastrophysa viridula (DeGeer), a common beetle in some parts of the country, is one of the rarest in Kent. It was recorded once by J. J. Walker along the Medway valley in the 1890s and not seen again until found by Kevin Chuter along the Beult valley (to the south of Maidstone) in 1992 and subsequent dates (Chuter, 2000). *Prasocuris*

Formica rufa

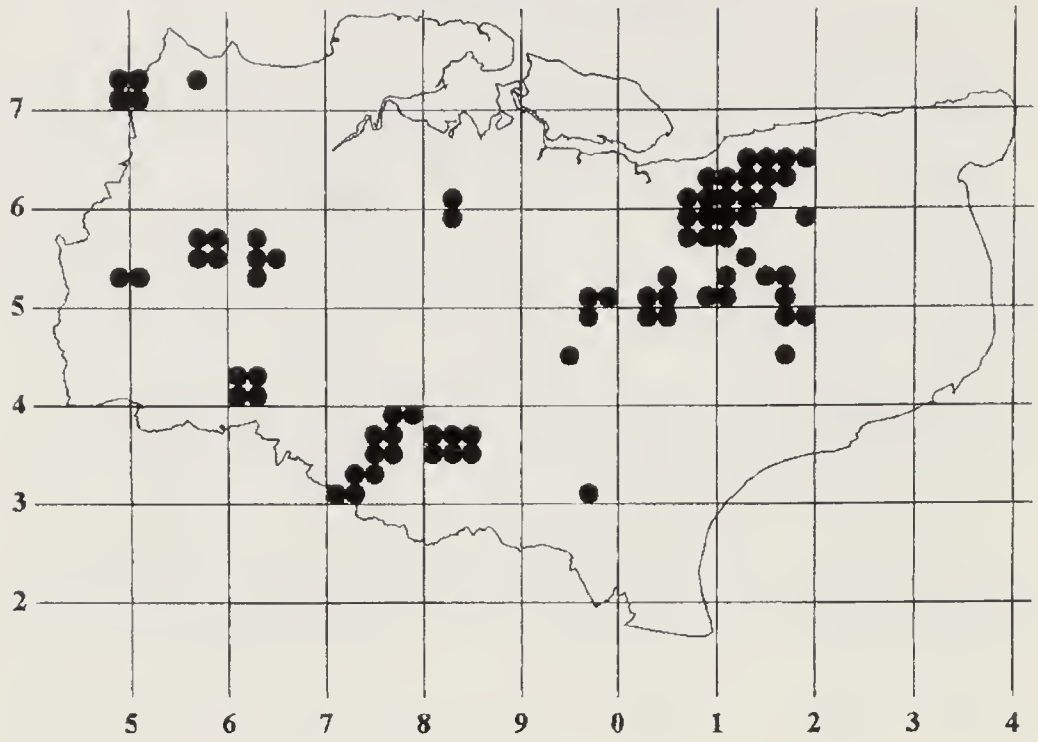

Fig. 13

Timarcha tenebricosa

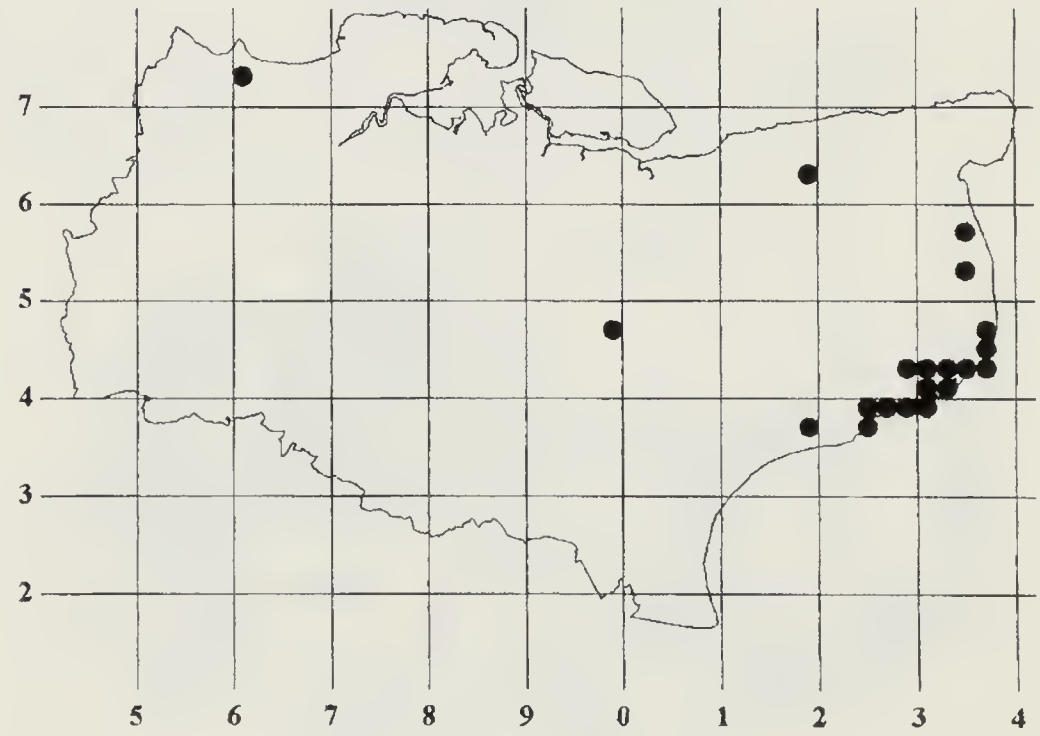

Fig. 14

phellandrii (L.) is another attractive chrysomelid beetle that is quite frequent in marshy areas where various species of water-dropwort *Oenanthe* sp. occur (Fig. 15).

Platyrhinus resinosus (Scop.) is one of the exciting anthribid beetles, which are always pleasing to find. There are a few scattered records spread throughout the county, but I feel that it is perhaps more frequent than these few records suggest. On

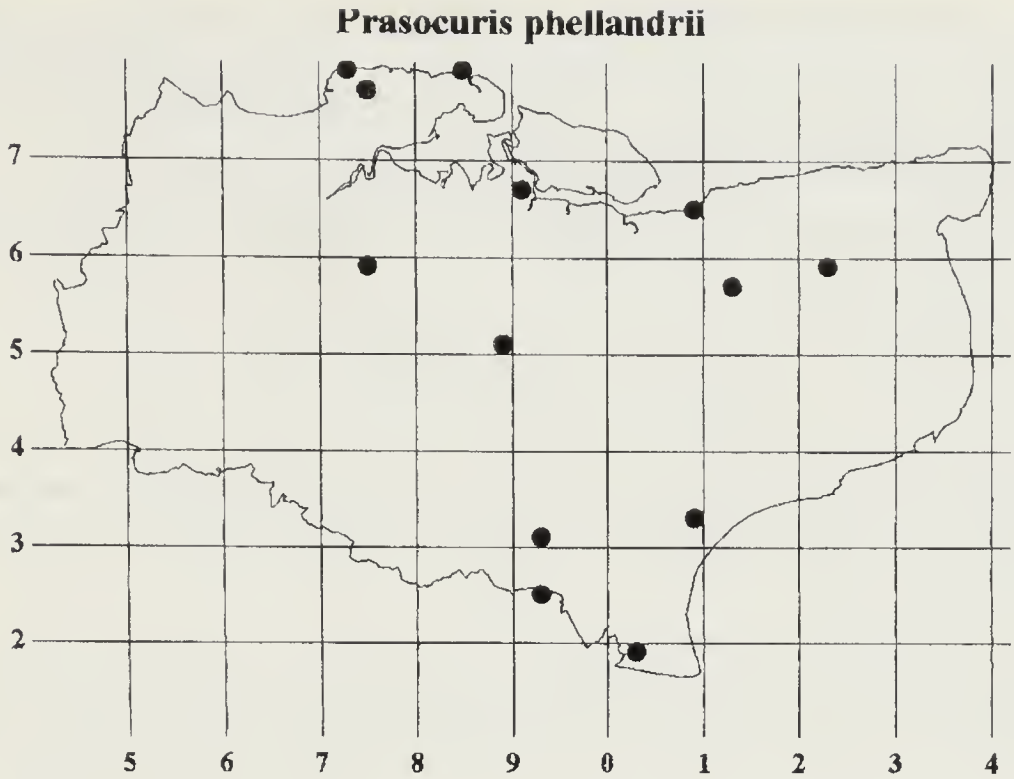

Fig. 15

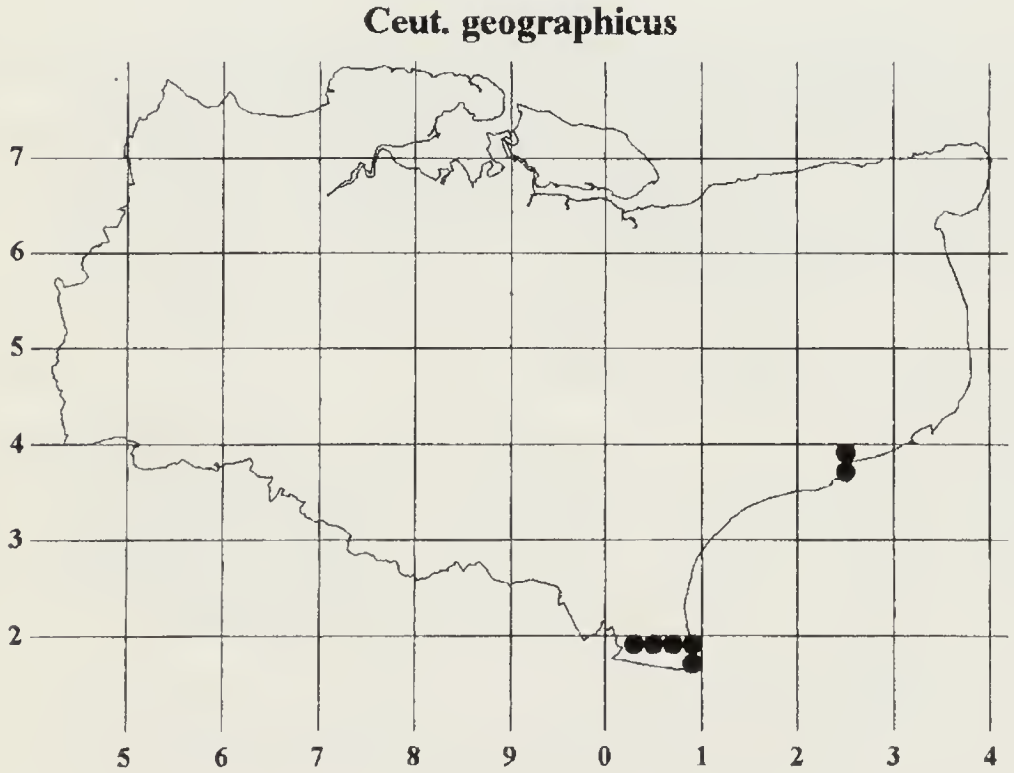

Fig. 16

one occasion I can remember that on approaching a fallen ash (*Fraxinus excelsior* L.) trunk heavily infested with the fungus *Daldinia concentrica* (Bolt.) Ces. and de Not., I spotted something small drop off. On careful inspection where this object had fallen I found a fine specimen of this beetle. I then looked at several other infected trunks and found numerous further specimens, each time the beetles would drop to the

ground as I approached, and their cryptic coloration would make them very difficult to find among the dead bits of vegetation and twigs. I could not be sure if it was my movements or the vibration from my approach that caused them to drop, but it was a very effective method of concealment.

Pseudoprotapion astragali (Paykull) is a weevil that I must mention as it was another one of the species that Dr Massee showed me on that first visit to him all those years ago. Ever since, I have shaken every plant of its host plant, wild liquorice *Astragalus glycyphyllos* L., that I have ever found, and I have done a reasonable amount of botanising in the county, but I have only ever found it once. It was quite abundant on this one occasion, and although it has been recorded on a few other occasions, it remains, for some non-apparent reason, a very rare insect in the county.

The last beetle I will mention is another beautiful weevil that is well named, *Ceutorhynchus geographicus* (Goeze), after its map-like markings on the elytra. This is another scarce insect, being found on its host plant, viper's-bugloss *Echium vulgare* L., in a few localities in the south of the county, mainly about Dungeness and Folkestone (Fig. 16).

I trust that you have all found this brief look at some of the aspects of the study of the beetles in Kent of interest. Finally I must thank all those people who have supplied records to me over the years and trust will continue to do so, and that it may eventually be possible to produce a full account of all the beetles to be found in Kent.

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SHORT COMMUNICATION

Forthampton Oaks, Gloucestershire: a site of major importance for saproxylic invertebrates—I first brought Forthampton Oaks—near Tewkesbury (SO83)—to the notice of readers nearly ten years ago when I discovered *Trinodes hirtus* (Fab.) on one of the ancient oak pollards (Alexander, 1992). This was an addition to the county beetle list at that time. The site was ear-marked for further recording but the opportunity to carry out a more extended investigation did not arise for some time.

Contact was established with the tenant farmer early in 1999 and a visit by members of the Gloucestershire Invertebrate Group followed on 14 August. The finds from that one visit were outstanding (see below) and a follow-up visit was made on 22 April the following year.

Amongst the more significant finds are:

Coleoptera:

Ampedus cardinalis (Schiödte): single elytron suspected as belonging to this species, 1999; live adults and larvae in red-rotten oaks, 2000; a new county record—albeit with a second locality discovered in 2000;

Procraerus tibialis (Boisduval & Lacordaire): elytra frequent in debris in hollow oaks, 1999; live adult in oak, 2000, coll. John Harper—a fairly widespread species in the north of the county, although rare nationally;

Globicornis rufitarsis (Panzer): one dead adult amongst debris in old oak, 2000—last recorded in the county over 100 years ago;

Trinodes hirtus (Fab.): larvae numerous under webby bark on ancient oak pollard, 20.x.1991, adult reared; larvae on most of the trees sampled, 1999 & 2000—one of only two localities known in the county;

Opilo mollis (L.): fragments in debris in hollow oaks, 1999; live adults beneath dead bark on oak trunks, 2000—one of only two sites in the county where it has been seen in recent years;

Prionychus melanarius (Germar): elytron under loose oak bark, 1999—one of about four areas where it is known in the county.

Pseudoscorpiones:

Dendrochernes cyrneus (L. Koch): under trunk bark on ancient oak, 1999—one of four known areas in the county for this species.

All of the above currently have British Red Data Book or Nationally Scarce status. The species combination reads more like a combination of Windsor Great Park and Sherwood Forest than an obscure backwater along the Severn Vale. However, this general area is proving to be truly remarkable for saproxylics—the equally amazing Bredon Hill (Whitehead, 1996) and Croome Park (Lott *et al.*, 1999) are still very new to entomology.

The site comprises some 30 to 40 ancient oaks within an area of commercially farmed land—partly under rye-grass ley and partly sweet corn. About one-third of

the oaks are already dead and others are in severe decline—a consequence of modern intensive farming. While the owner is interested in finding more sympathetic ways of management—subject to finance—his tenant is only interested in modern commercial farming. It seems likely therefore that this site will be lost fairly soon—despite the best efforts of local conservationists.

In addition to the important saproxylic invertebrates, the trees are also of interest for some of their other inhabitants. Both the silverfish *Lepisma saccharina* L. and its predator, the fly-bug *Reduvius personatus* (L.), are generally regarded as synanthropic in Britain, but it is a measure of the impact that "global warming" is already having that both species have established viable populations on these old oaks. Silverfish are remarkably frequent beneath loose bark on the old hollow trunks, and single full-grown fly-bugs were also found beneath loose bark on both visits. Whitehead (1992) has previously reported *Lepisma* from an old pear at Broadway, Worcestershire. Dead adult beetles of *Alphitobius diaperinus* (Panzer) have also been found in these oaks—the presence of this typically synanthropic beetle in old open-grown trees in the county has been reported previously (Alexander, 1998).

Assessing the conservation importance of sites like this is problematic. The current list of saproxylic Coleoptera stands at only sixteen species after two visits, and yet a very high proportion of them have conservation status. Application of the two systems available results in wildly contradictory results. The Index of Ecological Continuity (Alexander, 1988; Harding & Alexander, 1994) currently stands at 20, a figure which suggests regional importance or perhaps, with more recording, national importance. Site Quality Index (Fowles *et al.*, 1999) should not really be applied as it is suggested that a minimum of forty species is needed. However, finding that many can be difficult in a site like this. If we ignore the recommended restriction, the SQI calculates at 1100—a figure which far exceeds the quality of Windsor Great Park and Forest and would indicate high European importance! Presumably the answer is somewhere in between. Thanks to Rosie Cliffe of the Gloucestershire Wildlife Trust for facilitating access and to the various members of the Gloucestershire Invertebrate Group.

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THE MAITLAND EMMET BENHS RESEARCH FUND

In 2001 the family of the late Lt. Col. Maitland Emmet, a distinguished amateur microlepidopterist, made a generous donation to the Society's Research Fund in his memory As a result the Society has renamed its Research Fund the Maitland Emmet BENHS Research Fund. The objectives of the fund and criteria for awarding grants remain the same. The Society is very grateful to the Emmet family for their generosity.

The Society invites applications for grants, from the Maitland Emmet Research Fund, to be awarded in December 2002. Awards are open to both members and non-members of the BENHS and will be made to support research on insects and spiders with reference to the British fauna, and with emphasis on:

(a) the assistance of fieldwork on insects with relevance to their conservation,
(b) work leading to the production of identification guides and distribution lists.

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Preference will be given to work with a clear final objective (e.g., leading to publication or the production of a habitat management plan). Work on leaf miners and gall forming insects should be submitted to the Society's Professor Hering Memorial Research Fund.

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(d) general entomology

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Cover photograph: Female horse chestnut scale, *Pulvinaria regalis* (Hemiptera: Coccididae) with white waxy egg-mass, feeding on the bark of a broad-leaved lime tree. Photo: Richard A. Jones.

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.

DESCRIPTION OF A NEW WESTERN-EUROPEAN *TACHYDROMIA* SPECIES (DIPTERA: HYBOTIDAE) OF THE *TACHYDROMIA CONNEXA*-GROUP

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Abstract: A new species of *Tachydromia*, belonging to the *T. connexa*-group and most closely related to *T. tuberculata* (Loew), *T. elbrusensis* Chvála and *T. costalis* (von Roser), is described from the River Eden in the north west of England. *Tachydromia edenensis* sp.n. is found on the middle reaches of the River Eden, where it actively runs and readily flies short distances on sandy shingle banks.

Introduction

On 28.vi.2000 SMH collected a small series of an undescribed species of *Tachydromia* (Meigen) belonging to the *T. connexa*-group from a shingle bank on the River Eden at Temple Sowerby, Cumbria (NY605277). This area of fine to medium-grade shingle forms a point bar on a bend of the river at an altitude of 100 m (Fig. 8). Towards the top of the shingle bank an area of sand with some pebbles is deposited (Fig. 9). The specimens were collected from the area of sand and scattered pebbles and were not noticed elsewhere on the shingle bank. Individuals of this species appeared decidedly quicker and more ready to fly than specimens of other *Tachydromia* species also present. On 3.vii. SMH returned to the location in the company of J.B. Parker and the species was found to be present in some numbers. Again specimens were restricted to the area of sand and scattered shingle.

The same day a visit was made to an area of similar sandy shingle some 25 km upstream at Great Musgrave on the Swindale Beck, where it joins the River Eden (NY771133) at an altitude of 150 m. Here too the new species was found to be plentiful. Again it was restricted to the sandier areas of the shingle bank, usually with some pebbles present, but some individuals were also noticed on patches of pure sand. The new species was again seen at Great Musgrave on the 15.vii but was not found at either site on subsequent visits during August and September.

Other species of *Tachydromia* collected at both sites were *T. morio* (Zetterstedt), *T. ackland*i Chvála, *T. halidayi* (Collin) and *T. aemula* (Loew). In addition, *Stilpon nubilus* Collin was present in numbers on vegetated sand at Temple Sowerby and *T. costalis* (von Roser) was identified from Great Musgrave.

These two sites are situated in the middle reaches of the River Eden, which is a spate river some 90 km long flowing north through Cumbria. The site at Great Musgrave is actually on the Swindale Beck where it joins the River Eden rather than the main river. Rising on the Pennine moors of the Yorkshire/Cumbria border the Eden flows over Carboniferous limestones in its upper reaches before cutting across the Permian and Triassic sandstones of the middle and lower Eden Valley and finally emptying into the Solway Firth north west of Carlisle. The Eden with its tributaries is a Site of Special Scientific Interest, being regarded as an outstanding northern river on sandstone and hard limestone. It has one of the most diverse aquatic plant floras

of any river in Britain and is recognised to be of significant interest for invertebrates associated with river shingles (English Nature, 1997).

TACHYDROMIA EDENENSIS SP.N.

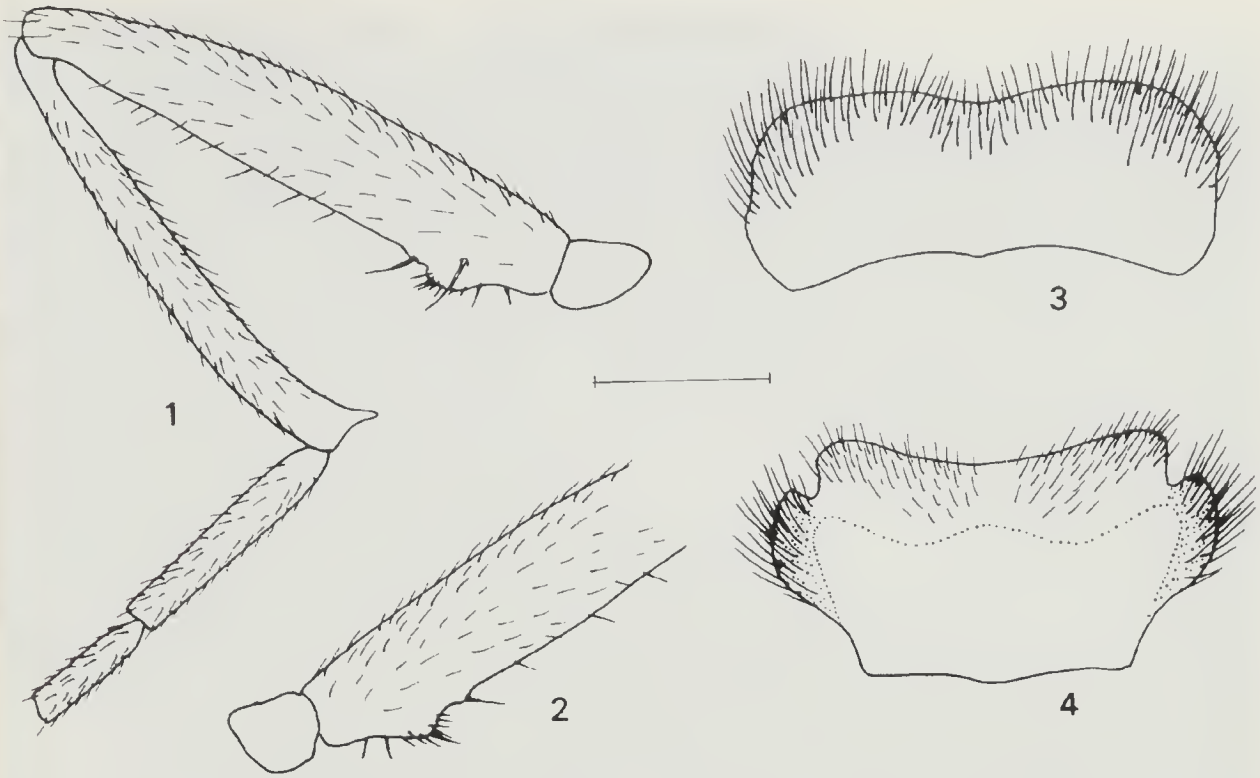
A species of the *Tachydromia connexa*-group with a similar wing pattern to *T. tuberculata* (Loew) and *T. costalis* (von Roser), differing from both of them by the extensively yellowish legs with dark annulated tarsi, shining black occiput and dorsum of abdomen in both sexes, and the very distinctive male genitalia.

Male. Frons narrow, as wide below as anterior ocellus and slightly widening above, entirely shining black including vertex. Occiput with only a small greyish area just above neck, which narrowly extends and broadens to level of base of post-verticals, otherwise uniformly polished black. A pair of black anterior ocellar bristles slightly shorter than a pair of widely separated postvertical bristles, otherwise occiput clothed with a few scattered fine black hairs. Antennae brownish-yellow on the globular 2nd segment, 3rd segment blackish, pointed, only slightly longer than deep; the slightly supra-apical arista scarcely twice as long as antenna. Palpi blackish, covered with minute adpressed dark hairs and a long black terminal bristle about as long as palpus.

Thorax polished black, only prothorax below humeri, and metathorax (metapleuron) including hypopleura (katepimeron) densely silvery-grey dusted. Large thoracic bristles black, confined to 2 notopleurals (the anterior one much smaller and finer), 1 postalar and a pair of usually crossing scutellars with a small hair on either side. Mesoscutum almost bare with only an indication of small uniserial dorsocentrals in a form of small paler points.

Wings large, apically rounded with the brownish to somewhat brownish-grey pattern of the *T. tuberculata-costalis* complex, i.e. the dark crossbands broadly connected along costal margin right up to cell R5 (submarginal cell), the hyaline mid-stripe almost invisible, the posterior half of wing mostly faintly greyish, leaving only both basal cells (cells BR and BM) and a patch beyond the apical section of vein Cu quite clear (Fig. 10). Halteres whitish with base of stem brownish.

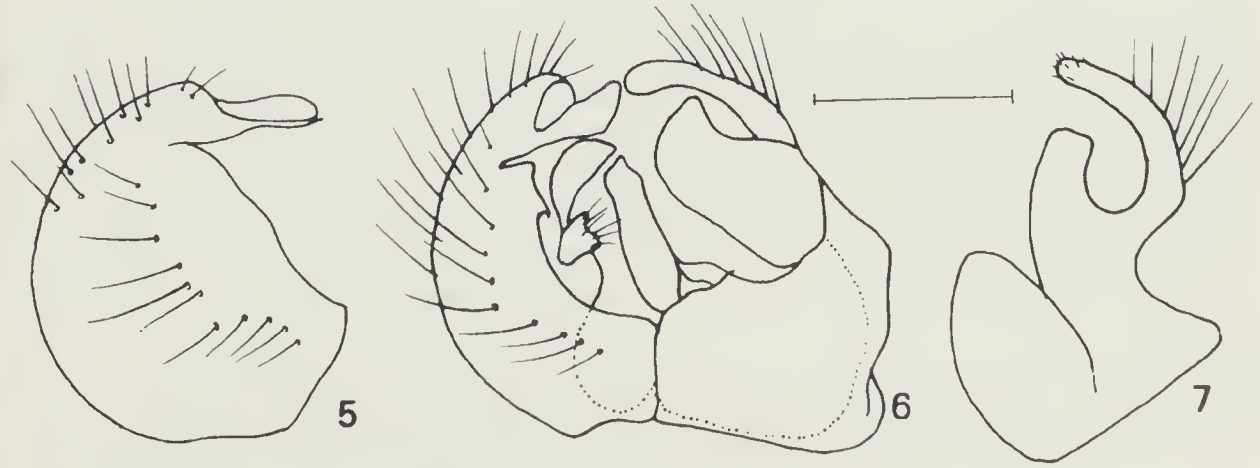
Legs rather slender and apparently longer than in both *T. costalis* and *T. elbruseusis* Chvála, resembling more *T. tuberculata*. Legs extensively yellowish on coxae, femora and base of tibiae. Femora with a brownish longitudinal streak above, more distinct on outer face of hind femora which, viewed from the side, have only base and tip yellow; tibiae extensively darkened towards tip, but tarsi again paler and broadly blackish annulated; at least base of all tarsal segments yellowish. Fore femora not very swollen, with only an anteroventral row of very small black bristly hairs. Mid femora almost equally stout, but ventrally with a double row of similar short black bristles and with a small round spinose swelling near base (Fig. 1 & Fig. 2). Hind femora longer and more uniformly slender, covered with only minute pubescence, no longer hairs or bristles. Fore tibiae and basitarsi almost bare (those of *T. costalis* and *T. elbruseusis* have long, ventral pubescence) and only slightly spindle-shaped. Middle tibiae slender, in the middle two-thirds of their length with a ventral row of small, black, spine-like bristles and a small shovel-like apical projection (Fig. 1), which is larger than in *T. tuberculata* but smaller than in *T. costalis*. Hind tibiae almost bare, very slender on basal half, then slightly broadened and curved towards tip, posteriorly with a distinct terminal comb of brownish spines. Tarsi fairly long, especially the basitarsi, which are on all pairs about twice as long as the 2nd tarsal segment.



Figs 1–4. *Tachydromia edenensis* ♂ 1. Middle leg, anterior view, 2. Base of mid femur, posterior view, 3. 6th tergum, 4. 6th sternum scale 0.2 mm.

Abdomen extensively shining black both above and below, terga finely dark-grey pollinose along anterior margins, pubescence fine and sparse, dark. Tergum 6 with uniformly long blackish-brown pubescence along posterior margin (Fig. 3), the corresponding sternum (Fig. 4) with shorter pubescence along the wide apical margin, but there are broad lateral lobes turned upwards and covered with long black bristling. Genitalia (Figs. 5–7) large and globose, very characteristic in having only a simple dorsal process on the right lamella (Fig. 5), simple naked cerci (Fig. 6), and a curiously long and slender posterior projection on the left lamella (Fig. 7): the whole lamella is quite bare except for an outer row of long bristles on the posterior projection and some microscopic hairs around the apex.

Length: body 1.8–2.2 mm, wing 2.1–2.3 mm (holotype body 2.2 mm, wing 2.3 mm). **Female**. Head, thorax and wings as in male, but antennae almost uniformly blackish,



Figs 5–7. *Tachydromia edenensis* ♂ genitalia. 5. Right lamella of epandrium, 6. Epandrium and cerci, 7. Left lamella of epandrium.

Fig. 8. Type locality; shingle point bar on the River Eden at Temple Sowerby.

even on 2nd segment. Legs with a tendency to be darker, more brownish-yellow on the pale parts, also tarsi darker and the annulations less distinct. The structure and bristling of legs very much as in the male; except for the mid legs where the femur is without the ventral spinose tubercle near base and the ventral bristles become longer towards base, ending in a pair of black bristly hairs nearly as long as femur is deep; also the mid tibia lacks the apical projection. Tarsi as in male, although hind tarsus longer—the 2nd tarsal segment being two-thirds the length of basitarsus. Abdominal segments 1–5 extensively polished black and almost bare as in male, apical three visible segments are narrowed and, including cerci, dull grey.

Length: body 2.2–2.6 mm, wing 2.2–2.3 mm.

Differential diagnosis. *Tachydromia edenensis* sp.n. has already been mentioned by Chvála (1970: 480), on the basis of a single male in the Loew Collection in Berlin Museum, as an "undescribed species" close to *T. tuberculata*. The differences given in that text (shining occiput, yellow legs with distinctly black annulated tarsi, fore femur with a single anteroventral row of minute dark hairs, 6th tergum with a row of long brownish hairs and with a brush of shorter black hairs at sides—actually on 6th sternum) may well be accepted as the main differential features for this new species. The ventral spinose tubercle on middle femur in male of *T. edenensis* resembles more that of *T. costalis* or *T. elbrusensis* (see Chvála 1970, Figs 59, 62) but the shallow distal excavation is missing. On the other hand, the above two species have long ventral pubescence on the fore tibiae and basitarsi in the male, and the legs are generally shorter; in both of them the male mid-basitarsus is as long as the following tarsal segment (twice as long in *T. edenensis*). The wing pattern in *T. edenensis* is almost exactly the same as in *T. costalis* (see Chvála 1970,

Fig. 9. Type locality; detail of the sand/shingle substrate.

Fig. 58). The other very good distinguishing feature is the bristling of the 6th abdominal segment; the tergum in *T. edenensis* (Fig. 3) is covered along the posterior margin with equally long dense pubescence on its whole length, and the sternum possesses curious lateral lobes covered by dense black bristling. However, the most decisive differential feature is the structure of male genitalia, which are made very distinctive by the almost bare left genital lamella with a curious long posterior appendage (Fig. 7). Male genitalia of the closely related species *T. tuberculata*, *T. costalis* and *T. elbrusensis* were fully illustrated by Chvála (1970, Figs 57, 60 and 63 respectively), those of *T. costalis* also by Collin (1961: 88, Fig. 40, under *Sicodus submorio* Collin).

Holotype: ENGLAND. Male; River Eden, Temple Sowerby, Cumbria, NY605277; 3.vii.2000; S.M. Hewitt (Tullie House Museum, Carlisle).
Paratypes: ENGLAND. Male and female; Swindale Beck, Great Musgrave, Cumbria, NY771133; 3.vii.2000; S.M. Hewitt (Collection of M. Chvála, Charles

Fig. 10. *Tachydromia edenensis*; wing.

University, Prague). Male and female; Swindale Beck, Great Musgrave, Cumbria, NY771133; 3.vii.2000; S.M. Hewitt (National Museums and Galleries on Merseyside). Female; River Eden, Temple Sowerby, Cumbria, NY605277; 3.vii.2000; S.M. Hewitt (Tullie House Museum, Carlisle). Male; Swindale Beck, Great Musgrave, Cumbria, NY771133; 3.vii.2000; S.M. Hewitt and female; River Eden, Temple Sowerby, Cumbria, NY605277; 3.vii.2000; leg S.M. Hewitt (British Muscum (Natural History), London). Male and female; River Eden, Temple Sowerby, Cumbria, NY605277; 3.vii.2000; S.M. Hewitt (Royal Scottish Museum, Edinburgh). **Additional material:** A single male of *Tachydromia edenensis* is in the Loew Collection, Berlin Museum (Chvála *op. cit.*); the data label is indecipherable, although the specimen is likely to be from Germany/Austria.

Etymology: This species is named after the River Eden in Cumbria, where the Holotype was collected.

Acknowledgements

We are grateful to Hella Wendt of the Museum fuer Naturkunde, Berlin and Nigel Wyatt of the Natural History Muscum, London for lending specimens from the collections in their care. *Tachydromia edenensis* was discovered in Cumbria as part of a wider study of insects of exposed river sediments in the county undertaken by members of Carlisle Natural History Society, for which the financial support of English Nature and the Environment Agency is gratefully acknowledged. SMH wishes to thank the other members of the survey team and particularly John Parker for his help and encouragement during the research into this species. MC wishes to acknowledge the financial support of the Ministry of Education of the Czech Republic (grant No. 21-3130046).

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OBSERVATIONS ON REARING AND PROTANDRY OF *BANKESIA DOUGLASII* (STAINTON) (LEP.: PSYCHIDAE)

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Abstract. Observations on rearing and protandry of *Bankesia douglasii* (Stainton) (Lep.: Psychidae) are documented over two generations.

INTRODUCTION

On 19.i.1999 I received 12 cases of *Bankesia douglasii* from Dennis O'Keeffe who had collected them from the wall of a workshop in Fareham, Hampshire two days before. I was interested in the potential of *B. douglasii* as a candidate for biomonitoring air pollution.

On inspection I found that the pupae had already hatched, as evidenced from the dried remains of several apterous female moths amongst the debris. As the females of this species oviposit in their old larval cases I retained the cases hoping they contained fertile eggs. I was encouraged when, amongst the debris in the box, I found 10 or so loose eggs. These were pale yellow/white, oval in shape and without any obvious sculpturing of their soft chorion. On 20.iii reddish-brown head capsules of the developing larvae were visible within the loose eggs and on 25.iii newly emerged larvae were found amongst the old cases. By the 28.iii a total of around 220 larvae had emerged from nine female cases, an average of approximately 25 larvae per female.

METHODS

Initially the newly emerged larvae were placed in a perspex box with the old female moth's cases that they had emerged from. I added some powdered garden soil, which was pale orange in colour, and the larvae immediately started to construct miniature cases from this material. Even at this early stage the cases were clearly triangular in cross-section, but with the rear third to one half constructed from the creamy white hairs of the female moth's anal scale tuft, which had been deposited along with the eggs. So they were very obvious at this stage. After a few days I transferred the larvae to a larger box containing a 1 cm layer of sieved John Innes No. 3 potting compost, a much darker material than the soil with which they had commenced case building. I added food to these boxes in the form of dead dry Lepidoptera and algae (*Desmococcus* sp.) on oak bark. Little interest was shown in these, so moist yellow grass cuttings from my lawn were added a day or so later. The larvae showed some interest in this, though I suspect this was more for the moisture it contained than for sustenance. Consequently I gave them a light spray of water, droplets of which they were seen to drink. Thus, spraying was continued periodically throughout the period of culturing.

Being concerned over the lack of visible feeding signs, I asked Dennis O'Keefe about their habitat and the possible foods present there. He informed me that the only material available was organic debris amongst grass at the foot of their wall, so I gathered such from my lawn, including moss, dandelion leaves and dead grass. I added this material to the culture box in discrete piles to see if the larvae fed preferentially on one or other type. Although no obvious preference was noted at

first, later that day I observed several larvae protruding from their cases and feeding, chiefly on moss. Their guts contained green material so feeding had been established.

On 31.iii I noted that dead fresh Diptera (*Eristalis* sp. adults) I had added a few days before were being consumed. A yellow crusty lichen (*Xanthoria parietina*), found growing on dead blackthorn and oak twigs at Lower Earley (Reading), was then provided and this was avidly consumed. At this time larvae were also feeding, but to a lesser extent, on moss, algae (*Diplococcus viridis*) and dead fresh insects. They were ignoring fresh and dry grass cuttings and wilted dandelion leaves. However, their preferred food was clearly *X. parietina*. By 4.iv some larvae began to excise the hair-scale portions of their cases that were still present and often contained many frass pellets. By 8.iv all larvae had done this.

Second instar larvae were first seen on 11.iv.1999, third instars on 29.iv and fourth instars on 14.v. Final (fifth) instar larvae were present on 2.vi. Instars were assessed on the basis of the size of the larval head capsule. During growth the larvae enlarged their cases by slitting these along their corner edges and adding grit and peat all the way round at these points. This was evident as the paler orange garden soil they were initially supplied with, and which was used for early case construction, was present as a light patch positioned centrally and slightly to the rear of each flat side of their triangular cases. This was surrounded by the much darker John Innes potting compost that they had used subsequently.

By 5.vii the larvae had fixed their cases loosely to the undersides of pieces of bark or the angle of the box lids and remained in this position in a state of aestivation. One case was opened on 9.vii and was found to contain a healthy larva. On 23.ix perambulating larvae were observed, so more *Xanthoria* lichen was added and feeding on this resumed. The lichen material was collected from local stone walls and no doubt accounted for the rapid growth of these larvae compared with those of other species of Psychidae I have reared. By 29.ix many larvae were seen climbing the walls of their culture boxes and fixing their cases firmly in the corners and angles of the lids with white silk. Unusually (compared with other members of this group I have reared) they chose to fix their cases in tightly packed aggregations of up to 20 or 30 individuals. By 15.x all had fixed their cases and on opening one on 29.x I found it still contained a larva. On 25.xi I opened another case to find it contained a female pupa and on 16.i a male pupa was found in this way. By 16.i both developing adults were clearly visible through their pupal shells but eclosion of the female did not occur until 7.ii. The male failed to emerge.

Results

Moths began to emerge on 27.i and by 13.iii a total of 134 had hatched (75 males and 59 females). A total of 37 cases failed to produce adults and a further 20 or so were given to Mr Colin Hart in early January. Pairing of this species was not difficult, indeed it was hard to prevent. On hatching, males would quickly locate a virgin female by fluttering along the base of the box, presumably following an increasing pheromone gradient. Pairing lasted from 30 minutes to two hours, after which the female immediately commenced ovipositing in her old larval case beneath her extruded pupal exuviae. On completion, hair scales from the female's anal tuft were packed on top of the eggs. Oviposition was usually complete within six hours, after which the female would usually fall from her case. Such females lived for a further two or three days before dying. Males, mated or unmated, lived for 48 hours but were usually too weak to fly after 24 hours. Subsequently, from a total of 6

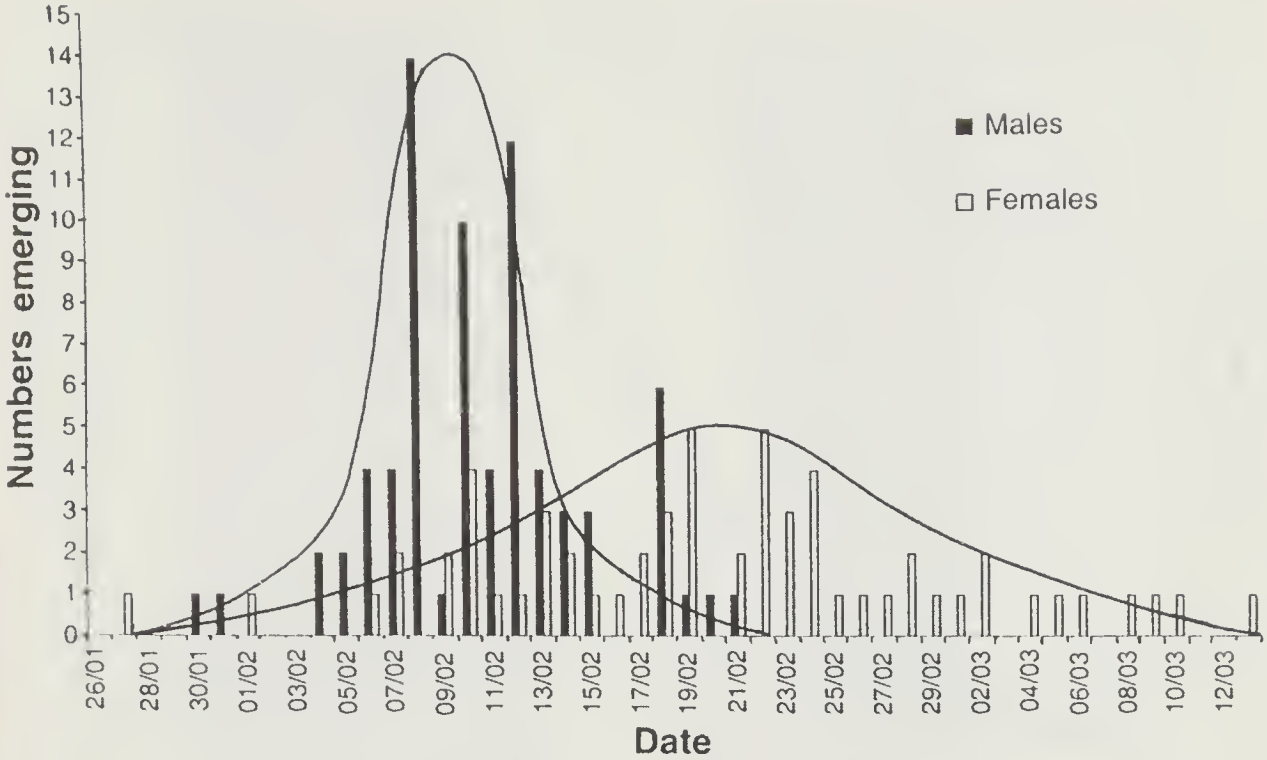


Figure 1. Emergence dates for *B. douglasii*.

paired females. I obtained 171 F_1 larvae between 13–21 March (mean 28). This is approximately the same date of hatching and the same average number of eggs per female as seen with wild material collected by Dennis O'Keefe and suggests that day-length rather than temperature is the environmental trigger dictating adult eclosion with this species. It must be remembered that the environmental conditions these moths were reared under were highly artificial. Despite being cultured indoors throughout their lifecycle the seasonal timing of both larval and adult emergences was not dissimilar to that in nature as the parental stock collected on 17.ii.1999 had all hatched by this date. This is further evidence that the main environmental factor controlling larval growth, pupation and adult eclosion is day-length rather than temperature. The unheated room they were kept in was several degrees warmer than outdoors during the winter months of October to March, but the adult emergence period was unaffected by this.

I made close observations of the emergence times of the adults as they occurred, and noted which sexes were involved. This was a tiring process involving around 170 observations, many made during the early morning and late evening, but produced some useful data. A histogram comparing male and female emergences with date (Fig. 1) shows that the peak of male emergence occurred around 10.ii, approximately 11 days before the peak of female emergence (21.ii). This figure also shows that, for both sexes, the data were normally distributed (note the typical bell-shaped distribution curves). The same data, presented as cumulative percentage emergence against time (a transformation to equalise the proportions of each sex emerging), show that 50% of the males had hatched by 10.ii, while for females 50% hatch was not reached until 9 days later (19.ii). Furthermore, on completion of the male emergence approximately 45% of the females had still to emerge. This is strong evidence of protandry, where males emerge before the females, a common phenomenon amongst the Lepidoptera (Wiklund & Farerström 1977).

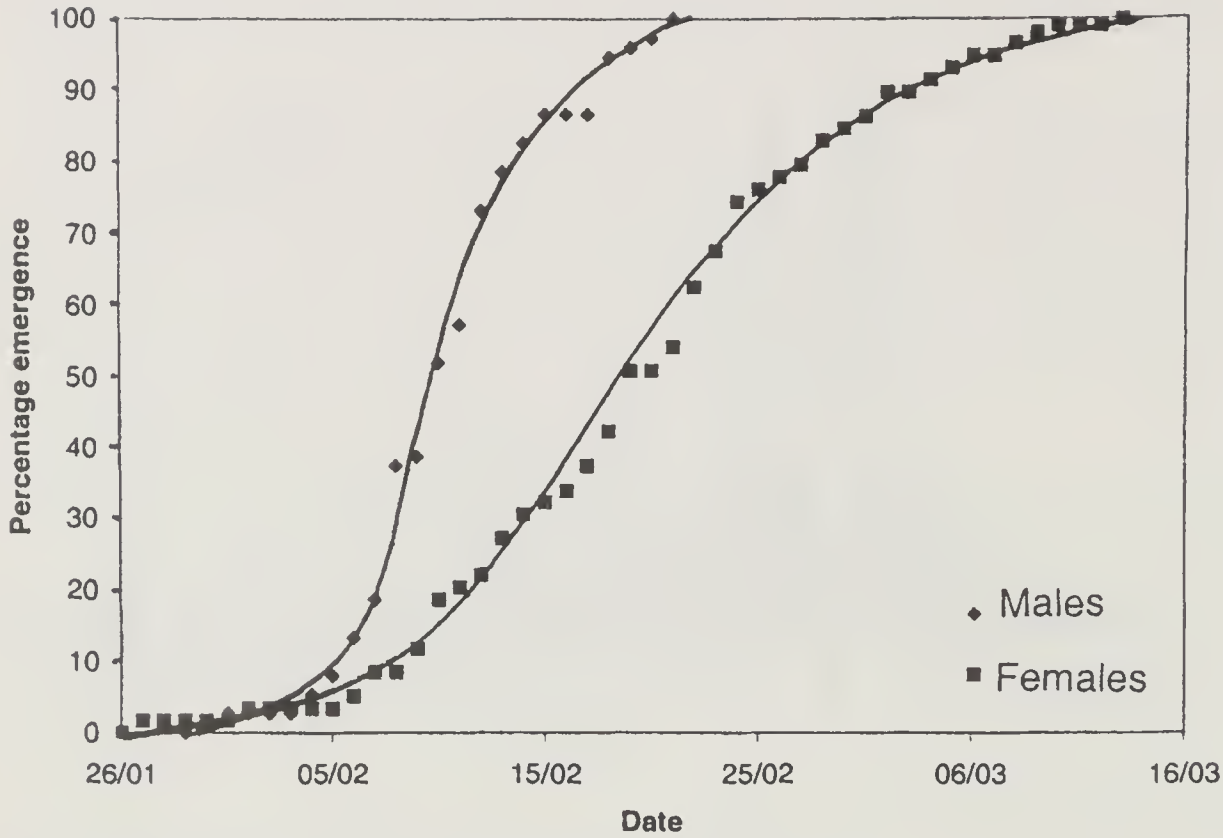


Figure 2. Cumulative percentage emergence of *B. douglasii*, by sex.

Discussion

The times of day when the sexes emerged (Figs 3 and 4) are at variance with the statement of Hättenschwiler (1985) who, commenting on this species, states that males emerge nocturnally and females in the early morning. Males showed two peaks of emergence, both occurring during the hours of daylight. Most emerged in the morning from dawn up to two or three hours later, but there was a second smaller emergence peak in the evening for an hour or two before dark. The pattern of female emergence was different, having a single peak during the two or three hours before dawn. These data should be interpreted with care, as day-length increased over the six-week period covered by these emergences. The times of sunrise and sunset for the Reading area, taken from the GreyStel Star Atlas 2 software package, are included on Figs 3, 4 and 5 to show the extent of this change over the period in question. The hours of darkness are represented as shading. With this information it can be seen that females emerged nocturnally while males emerged during the early morning and late evening, probably in response to changing light intensity. Also, it can be seen that the change in day length over this period was not significant.

The emergence times of female moths during the period when males were emerging (27.i–24.ii) and after male emergence was complete (25.ii–13.iii) differed (Fig. 5). Females emerging with males showed a clear tendency to emerge before dawn, while those emerging after male eclosions were complete tended to hatch after daybreak. This is a significant observation, though somewhat perplexing. It may explain Hättenschwiler's statement regarding the time of day when female emergence occurs, but the reason for this difference in the timing of female eclosion is difficult to understand. Why should females emerge during the night when males had still to emerge, but by day when all male emergences were complete; and furthermore, how

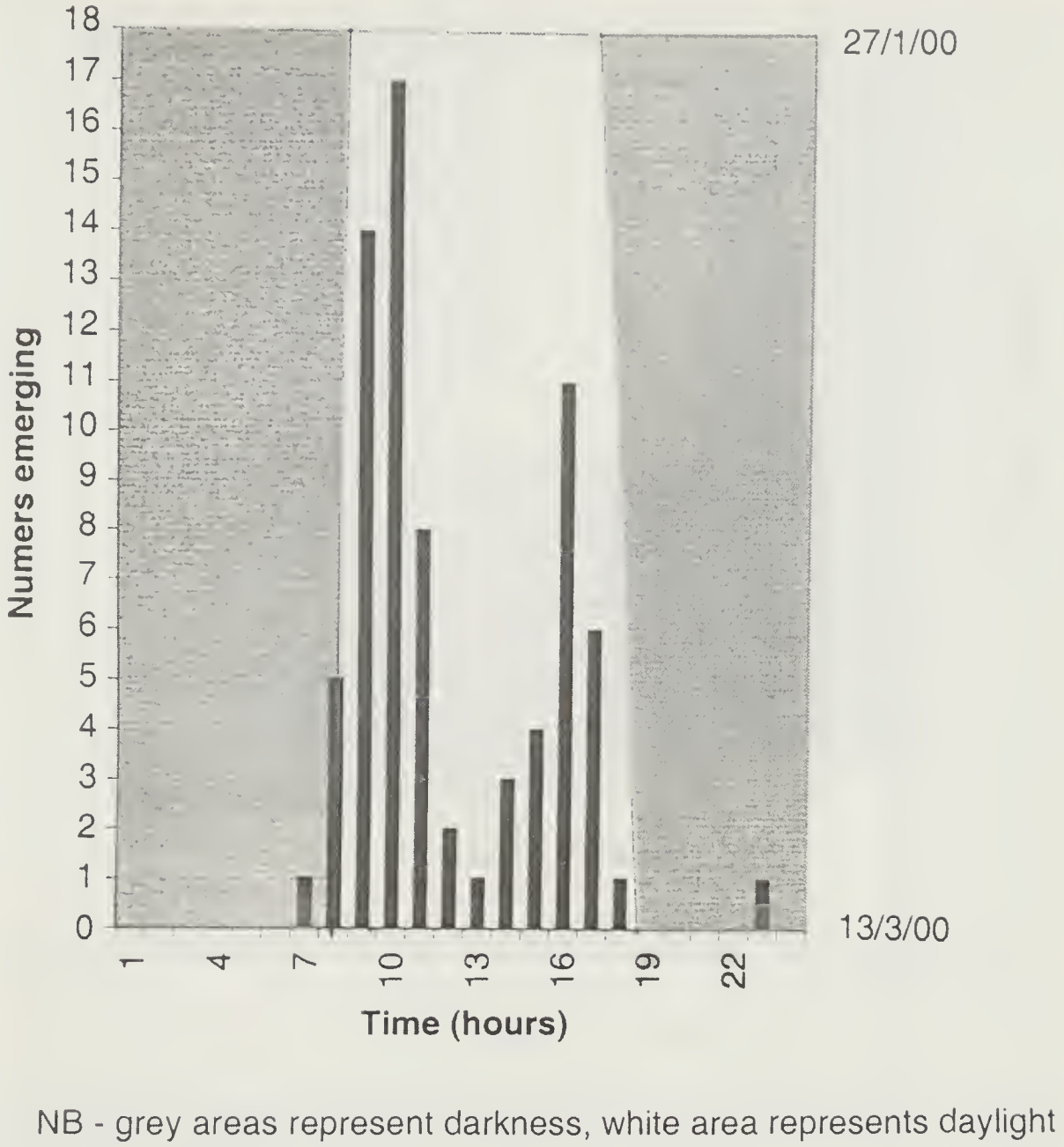
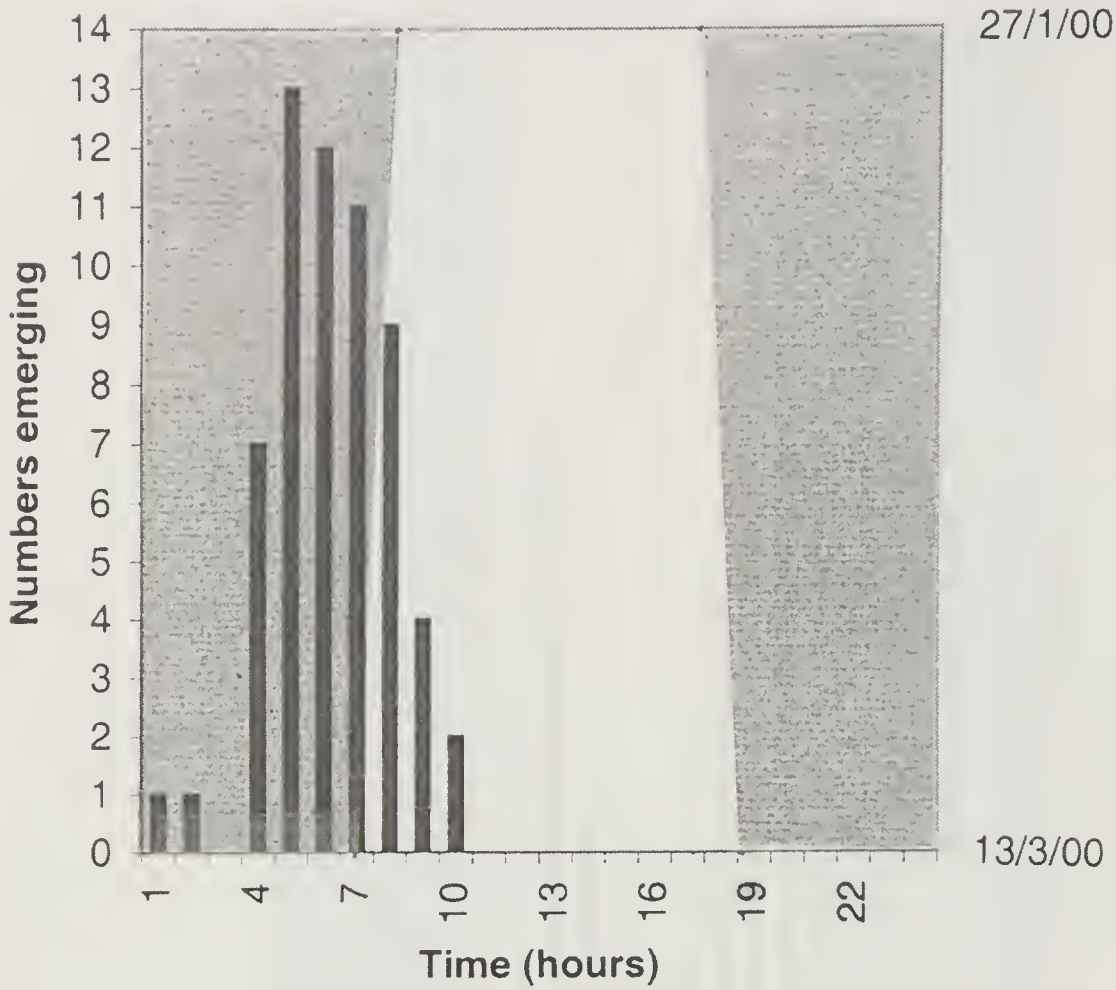


Figure 3. Emergence times for male *B. douglasii*.

did the females know the extent of male emergence? The presence or absence of a male pheromone could be the causative agent of this effect, particularly in the confines of these culture boxes. But could such a substance be potent enough to operate in the wild? The tendency of larvae to fix their triangular (in cross-section) cases prior to pupation in tight aggregations, packing them together like segments of an orange, would enhance the potency of such a chemical message, if this is the factor responsible for this effect. However, not having observed the pre-pupation case-fixing behaviour of this species in the wild, I am unable to comment on the significance of this in the natural environment.

One possible evolutionary advantage of this protandry strategy may be postulated if we accept the theory of metapopulations, whereby populations of a species may exist in discrete colonies separated from each other by some considerable distance. With isolated populations there is a danger of inbreeding resulting in a weakened gene pool. Gene mixing between such pockets of individuals could be increased if the emergence



NB - grey areas represent darkness, white area represents daylight.

Figure 4. Emergence time for female *B. douglasii*.

times of the sexes were slightly different between different populations. In a given population, females emerging with males would stand a better chance of pairing with the freshly emerged males if they hatched a few hours before the males, i.e. assuming the males emerged around dawn there would be an advantage for females to emerge a few hours before dawn. However, let us suppose that all the males of population A have hatched but that some females (perhaps up to 40% as seen here) have yet to emerge. We have seen that males of this species live for only a couple of days, hence those females hatching more than 3 or 4 days after the last male (Fig. 1) would be destined to remain unmated and die without ovipositing. However, if a second population (population B) still has males emerging several days after the males of population A have finished, B's males could, theoretically, mate with A's virgin females, assuming that they could find them. The strong attraction of males to the female pheromone is well known in this family of Lepidoptera and was observed while culturing this species. Pheromone attraction of males to females would be a mechanism which could enable population B's males to locate A's females over considerable distances, and would result in increased genetic diversity in population B. Obviously, with most of A's males moribund and probably incapable of flight it would be advantageous for A's virgin females not to delay hatching until the hours of darkness, i.e. until the following night. Rather, one would expect them to hatch coincidental with

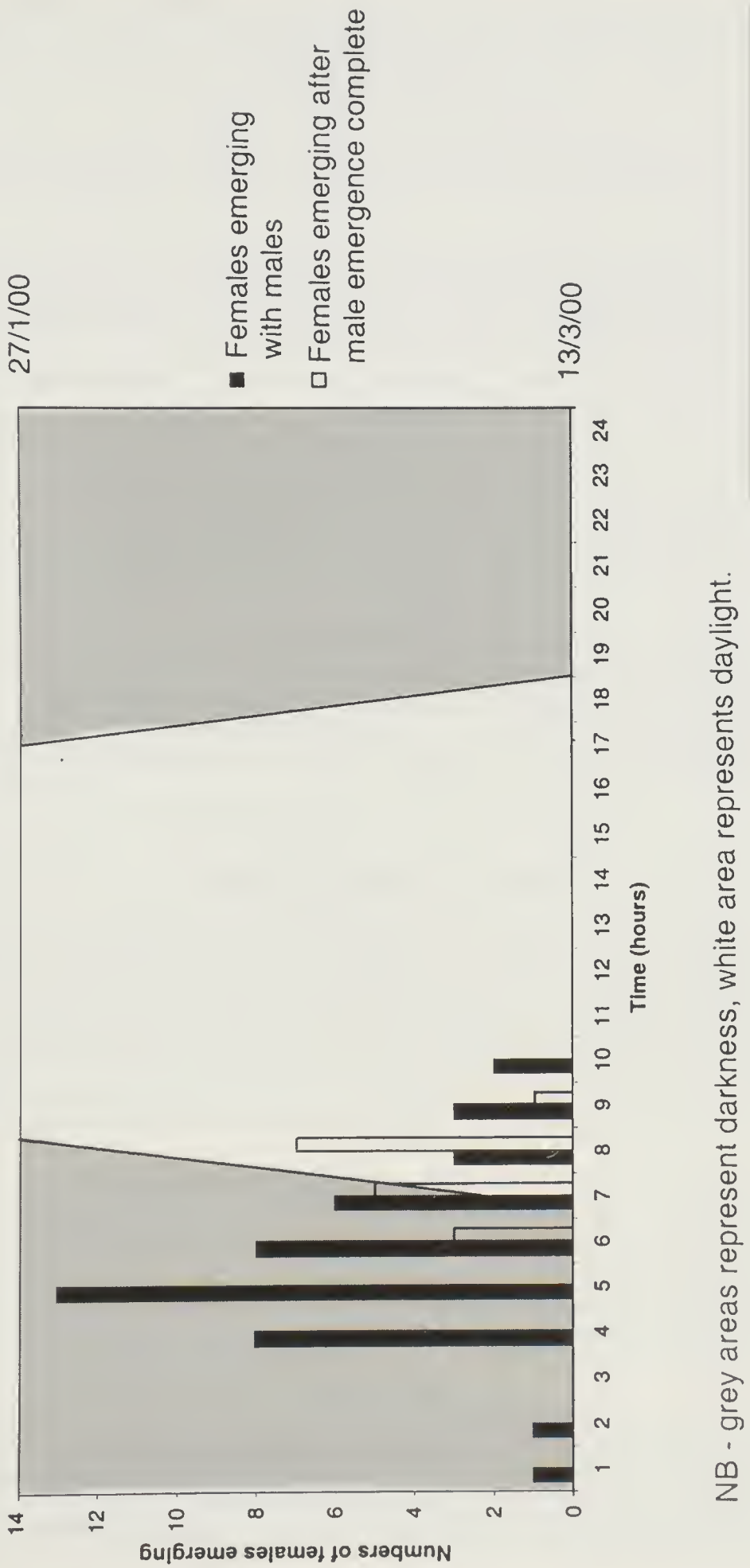


Figure 5. Female emergence against time, while males emerging and after full male emergence.

the emergence of B's males, i.e. at or just after dawn, release their pheromone and trust that this assembles B's freshly emerged males to them.

This is a somewhat convoluted argument, but it has its attractions. The isolated nature of known UK populations of *B. douglasii* fit this model well, its distribution (*MBGBI* **2**, 1985) being Hampshire, Worcestershire and both vice-counties of Kent. However, in view of the large distances between these areas it is doubtful whether we should consider these colonies as a metapopulation in the sense of our theoretical A and B colonies.

A further occurrence of note occurred with the emergence of the F_2 generation. Protandry was again in evidence, as out of a total of 30 males emergences, 29 (96.7%) occurred between 25.i–20.ii, while all the female emergences occurred between 21.ii and 10.iii.2001. However, it is interesting to note that the total number of F_2 females involved was only 3, and that one of these (33%) emerged many days after the last male had died. The biasing of the sex ratio of psychids has been reported before, see for example Baker's entry for *Psyche casta* (Baker, 1994). However, this is usually in favour of the female sex. I am not aware of an almost exclusive male emergence being reported with any members of this group.

It would be interesting to learn of others' experience in rearing this moth, especially if there are data concerning the emergence dates and sex ratios for wild pupae.

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SHORT COMMUNICATION

***Dipogon bifasciatus* (Geoffroy in Fourcroy) (Hym., Pompilidae) in Derbyshire**.—A spider wasp was found investigating the nooks and crannies in the rugged bark of an ancient open-grown parkland oak in Alderwasley Park (SK336527), Derbyshire, 31.vii.2001. The specimen was sent with a batch of aculeates to Mike Edwards for identification. It proved to be *Dipogon bifasciatus*, a species listed in the British Red Data Book as "Rare" in Shirt (1987) and Falk (1991), and having a very southern distribution—Suffolk and Bedfordshire the counties furthest north with confirmed records.

Alderwasley Park is an old deer park on the plateau behind the National Trust's Shining Cliff Woods, overlooking Crich Chase in the Derwent valley to the south of Matlock. The general area includes a substantial number of ancient open-grown oak trees—relicts of an earlier landscape.

Thanks to Mike Edwards.—K.N.A. Alexander, 14 Partridge Way, Cirencester, Gloucestershire GL7 1BQ.

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ACERIA FICUS (COTTE) AND *RHYNCAPHYTOPTUS FICIFOLIAE* KEIFER (ACARI: ERIOPHYOIDEA) FIRST RECORDS IN THE BRITISH ISLES

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Abstract. Between July and October of 2000 the eriophyid mites *Aceria ficus* and *Rhyncaphytoptus ficifoliae* were discovered in the British Isles for the first time. Live specimens of both species were collected from the leaves of fig, *Ficus carica* L. *Aceria ficus* was found at a location in Cheshire and *R. ficifoliae* was collected from a nursery in West Sussex.

Introduction

On the 21.vii.2000 four leaves of *Ficus carica* were received from Andrew Halstead of the Royal Horticultural Society (RHS) at Wisley, who in turn had been sent the specimens from a private garden near Northwich in Cheshire. The leaves were taken from well-established conservatory-grown fig plants, that had in the course of the preceding five years developed scattered yellowish-green chlorotic blotches that were most obvious on the upper surfaces of the leaves. These symptoms are typical of infection with fig mosaic disease (FMD). Both the upper and lower surfaces of the leaves had a slight brown speckling, particularly in the chlorotic areas, symptoms associated with the presence of two species of mites. Twenty or so live specimens of a dark red tetranychid and several thousand live specimens of a pale yellow eriophyid were removed from the leaves, mainly from the lower surfaces.

The tetranychids were identified as *Panonychus ulmi* (Koch), a common polyphagous and cosmopolitan pest known from a variety of hosts in the British Isles, and the eriophyids were identified as *Aceria ficus* (Cotte), a host-specific pest of *Ficus carica* and a first record for the British Isles.

A sample of twenty-two *Ficus carica* leaves exhibiting similar symptoms to those seen in Cheshire was received at CSL on 26.x.00. These were taken from a nursery in West Sussex, off plants imported from Italy. Numerous dead specimens of the 'red spider mite' *Tetranychus urticae* Koch were found with over 30 live specimens of *Rhyncaphytoptus ficifoliae*, which like *A. ficus* is host-specific to *F. carica*, and is recorded in the British Isles for the first time.

Aceria ficus

Adult specimens of *Aceria ficus* are yellowish, slender, spindle-shaped mites, measuring 140–202 microns in length (Keifer *et al.*, 1982). This species was described from specimens collected in September 1917 from an unspecified species of fig growing wild in the small valley of Saint-André near Nice in France. At the time it was noted that large numbers of mites were present but they did not appear to be causing any damage to the host (Cotte, 1920).

Since 1920, *A. ficus* has been recorded from the following countries: Egypt, India, Iran, Israel, Italy, Japan, Mexico, South Africa, Turkey, and the United States (California, Florida and Oregon), invariably on *F. carica*. Many species of eriophyid mites have limited host ranges, and often, as in the case of *A. ficus*, are restricted to a single host species. It seems certain that the host from which Cotte describes *A. ficus*

was also *F. carica*. Jeppson, Keifer & Baker (1975) state that *A. ficus* 'ranges everywhere figs are grown'. Having searched a wide variety of reference sources, I have been unable to find records of this mite in countries other than those already listed. The specimens referred to here are therefore the first to be recorded in the British Isles.

The biology of *A. ficus* is described by Baker (1939) in some detail for populations occurring in California on outdoor-grown *F. carica*. In summary, the mites overwinter in and around the buds. When the buds begin to break they move out on to the developing foliage and start to lay eggs. The generation time given is between 20 and 28 days. A recent paper by Abou-Awad *et al.* (2000) gives a generation time of 17.9 days for populations of *A. ficus* in Egypt.

Under glass, feeding by this mite may completely prevent new growth. In addition to any physical damage it can cause through feeding injury, *A. ficus* is of economic importance as it is a proven vector of FMD (Frock & Wallace, 1955; Oldfield, 1970; Proseler, 1969 & 1972).

Apart from *F. carica* and *Cudrania tricuspidata* (Carr.) (which like *Ficus* is a member of the family Moraceae), FMD is known to affect at least 18 other *Ficus* species (Burnett, 1962; Blodgett & Gömeç, 1967). Symptoms of FMD in *F. carica* vary greatly in severity between different cultivars, from blotchy discoloration of the leaves and fruits to leaf distortion and in severe cases leaf and fruit drop (Condit & Horne, 1933). It has been clearly demonstrated that *A. ficus* is an efficient vector of FMD. A single infected mite is able to transmit the disease to an uninfected plant within 15 minutes of feeding commencing on the new host (Proeseler, 1969 & 1972). Although *A. ficus* is a vector of FMD, its host-specificity prevents it from spreading the disease to other *Ficus* species. The disease is most commonly spread unwittingly by vegetative propagation or by grafting (Blodgett & Gömeç, 1967).

The first published account of the disease in the British Isles is that of Ainsworth (1935) from the RHS research station at Cheshunt in Hertfordshire. This account also includes anecdotal evidence that the disease was known from Wisley and other localities on the mainland and also on Guernsey at least twenty years prior to this.

The material collected from Cheshire was originally sent for diagnosis of the FMD symptoms that had developed over a period of five years on well-established and previously healthy conservatory-grown fig plants. It is reported that during this period new fig plants had been introduced to the conservatory. The new plants were purchased from a nursery in Norfolk, which in turn had imported them from Italy. Since no symptoms or eriophyoid mites had been observed on the original plants prior to this, and no grafting had taken place between the old and new plants, it is assumed that the new plants were the source of the mites and the FMD.

Rhyncaphytoptus ficifoliae

Adults of *R. ficifoliae* differ from *A. ficus* in being light amber to brown in colour with an elongate fusiform and curved body that measures between 180–195 microns in length. This species was described from specimens collected in California (Keifer, 1939) and is also recorded from Chile, Egypt, India, Iran, Iraq, Madeira and Yugoslavia. Jeppson, Keifer & Baker (1975) state that *R. ficifoliae* 'undoubtedly occurs widely in the Mediterranean region'.

By habit *R. ficifoliae* is a vagrant eriophyid species, i.e. it is free-living on the surface of the host and does not induce the formation of galls or erinea. The biology of this species has been investigated by Al-Mallah & Mohammad (1989) in Iraq and by Abou-Awad *et al.* (2000) in Egypt. In summary, the adult females overwinter in bark crevices and under the milky layer formed at leaf scars. The females migrate to

the newly emergent leaves in March and April and begin to lay eggs (Iraq). The generation time is recorded as 14.61 days (Egypt).

Unlike *A. ficus*, *R. ficifoliae* is not a vector of FMD and is considered to be of no economic importance.

Discussion

It is possible that both *A. ficus* and *R. ficifoliae* are already more widespread under glass than current records suggest, as both species are very small and easily overlooked. International trade from countries where *A. ficus* and *R. ficifoliae* are endemic is undoubtedly the route by which these mites were first introduced into the British Isles.

The heavy infestation of *A. ficus* in Cheshire is being controlled with a combination of pesticide treatments and biological control agents, but no statutory action was taken against the interceptions of *R. ficifoliae*. The discovery of FMD on newly imported fig plants has led to the precautionary destruction at RHS Wisley of a newly acquired fig plant exhibiting similar symptoms.

Other than *A. ficus* and *R. ficifoliae*, two other species of eriophyid mites have been recorded on *F. carica* (Amrine & Stasny, 1994), namely the host-specific vagrants *Asetadiptacus emilae* Carmona (Carmona, 1970) described in Portugal and *Diptilomiopus ficus* Attiah (Attiah, 1967) described in Egypt. Neither species is known to be of economic importance nor has yet been found in the British Isles.

The finding of *A. ficus* and *R. ficifoliae* highlights the importance of the work done by the Plant Health and Seeds Inspectorate (PHSI). Monitoring of imported plants is essential in order to prevent further introductions of destructive non-native pests and diseases.

Several hundred alcohol-preserved specimens of *A. ficus* have been deposited in the collection of the Natural History Museum in London (Accession Number BMNH (E) 2000-170), and retained at CSL, together with slide preparations. Two slides of ten specimens of *R. ficifoliae* are retained at CSL.

Acknowledgements

My thanks go to Andrew Halstead (RHS) for submitting the original samples of *A. ficus*, Mr. E. Birchall (PHSI) for obtaining additional information and material from the original site of discovery, and Mr. S. Eales (PHSI) for submitting specimens of *R. ficifoliae*.

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SHORT COMMUNICATION

Moths and paint – the case of the yellow subway.—Chawton underpass is a 30m long subway under the A31 between Winton Rd., Alton, and Chawton Village, North Hampshire (SU709379). I have regularly passed through the tunnel over the past 6 years. Until 2000 the walls were unpainted, rendered concrete which was dirty grey in colour, but in early 2000 it was painted with a bright, shiny yellow pigment.

The underpass is lit both by day and night, and between 1994–2000 the lights attracted large numbers of moths, craneflies and other insects, which settled by day on the walls. These were found along the full length of the tunnel, but were most numerous towards the open ends. I recorded many species of moths including; *Geometra papilionaria* L., *Ligdia adustata* D. & S., *Selenia dentaria* F., *Crocallis elingnaria* L., *Colotois pennaria* L., *Peribatodes rhomboidaria* D. & S., *Ectropis bistortata* Goeze, *Theria primaria* Haworth, *Laothoe populi* L., *Orthosia incerta* Hufnagel, *O. gothica* L., *Colocasia coryli* L. plus various other plumes and pyralids. Since the paint was applied the only moths found resting on the walls have been two *Opisthograptis luteolata* in July 2001, one *Enpithecia centaureata* D. & S. in early August, and a single *Hepialus sylvina* L. on 24.viii.2001. *O. luteolata* was regularly found on the unpainted walls, but matches the new colour well.

I do not know if the paint has some sort of insect repellent added, but this seems unlikely, as it was obviously intended to make the tunnel brighter for pedestrians. The paint job has certainly had a knock-on benefit for insects, which are no longer trapped, although an *Aeshna cyanea* (Odonata: Aeshnidae) was rescued on 24.viii.01, with little prospect of escape as it was caught up in a spider's web at the middle of the tunnel. Presumably moths still come to the lights but are reluctant to settle and pass back out of the tunnel in search of a more suitable substrate on which to alight. This behaviour would seem to suggest that the increase in daylight at the tunnel openings must be sufficient to overcome the attraction of the lights and acts as a trigger to draw the moths away. J. S. Denton, 2 Sandown Close, Alton, Hants GU34 2TG.

A REVISION OF THE BRITISH SPECIES OF *MORDELLISTENA* (COLEOPTERA, MORDELLIDAE) BELONGING TO THE *PARVULA* GROUP AND THE SUBGENUS *PSEUDOMORDELLINA* ERMISCH

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Abstract. *Mordellistena (Pseudomordellina) imitatrix* Allen is synonymised with *M. (P.) acuticollis* Schilsky. *M. (s.str.) eludens* Allen is synonymised with *M. (s.str.) pseudoparvula* Ermisch. A key is given to the British species of the *parvula* group and the subgenus *Pseudomordellina* Ermisch. Information on the host associations, British distribution and secondary sexual differences is provided.

INTRODUCTION

Allen (1995 & 1999) described two new species of *Mordellistena* based on British material, *M. (Pseudomordellina) imitatrix* Allen and *M. (s.str.) eludens* Allen. Allen (1986) had previously revised the two groups of species in which these new species belong, and pointed out the similarity in general appearance of British members of the *parvula* group and the subgenus *Pseudomordellina* Ermisch.

Shiyake (1994), in a study of Japanese species of these groups, concluded that the *parvula* group and the subgenus *Pseudomordellina* should not be placed in separate subgenera, based on his study of pairs of sibling species. He showed that one species of the pairs he studied had a small outer spur and the other lacked the small spur, and concluded that the smaller outer spur was readily lost in the course of evolution.

With regard to the British species it should be noted that it is often difficult to see the smaller of the two tibial spurs in the *parvula* group which can be stuck to the side of the longer spur. *M. (Pseudomordellina) acuticollis* Schilsky is, in external appearance, almost identical to *pseudoparvula*, and the latter species may be misidentified as the former if the tibial spurs are not examined carefully. Fortunately the parameres are quite different.

HOST ASSOCIATIONS

Shiyake (1994) says that many of the species in these two groups are associated with *Artemisia*, as is the case with British *imitatrix*, host mugwort, *A. vulgaris* L. and *nanuloides*, host sea wormwood, *A. maritima* L.

However it is possible that hosts other than *Artemisia* may be used by species in these two groups. Hodge (1999) has found *pseudoparvula* at two locations associated with creeping thistle *Cirsium arvense* (L.) and spear thistle *C. vulgare* (Savi), and Batten (1976) gives *Artemisia* spp., cultivated *Chrysanthemum* sp., cultivated sunflower, *Helianthus* sp., cultivated hemp, *Cannabis sativa* L., marsh valerian, *Valeriana dioica* L., and marjoram, *Origanum* sp. as putative hosts of *parvula*. Given the difficulties in identifying Mordellidae, the reliability of some of these host records is open to question.

In this connection it should be noted that Ford & Jackman (1996) in a study of some Mordellidae from N. America, bred one common species of *Mordellistena* from

11 different genera of Asteraceae. They also suggest that adults may also frequent flowers of non-larval hosts, as is certainly the case in some British Mordellidae.

Comments on the British species

M. (s.str.) eludens Allen 1999 = *M. (s.str.) pseudoparvula* Ermisch 1956 **syn. n.**

Horak (1996) synonymised *M. parvuloides* Ermisch with *M. psuedoparvula* Ermisch. I have examined the female holotype of *parvuloides* in the Staatliches Museum für Tierkunde, Dresden (SMTD) collection and agree with Horak (1996) that there appears to be no significant difference between it and the male holotype of *pseudoparvula*, also in SMTD, which I have examined.

Owen (1999) in bringing this synonymy to the notice of British coleopterists, commented on the difference in the published figures of the parameres of *parvuloides* (Ermisch, 1969, Kaszab, 1979, and Batten, 1986) and that of *pseudoparvula* (Ermisch, 1969). It is evident that all the published figures of *parvuloides* have been based on those of Ermisch (1969). There are two dissected male specimens labelled as *parvuloides* in the material I have borrowed from SMTD. The parameres of a specimen from Landshut, Bay., O. Müller are missing and those of a specimen from Düsseldorf, 13.vii.1956, C. Koch do not conform to those of *pseudoparvula* or Ermisch's figure of *parvuloides*. I am not certain as to the identity of this specimen. Its external characters and the general form of the parameres suggest it is closely related to *pseudoparvula*. It may be an undescribed species as the parameres are unlike those of the other two species in the *pseudoparvula* group as defined by Horak (1996).

I have compared the holotype of *eludens* Allen with the holotype of *pseudoparvula* and externally there appears to be no difference. The parameres of the holotype of *pseudoparvula* are slightly different from that of *eludens* but appear to fall within the range of variation one might expect. The acdeagus of the holotype of *eludens* is also very like that of a specimen of *pseudoparvula* from Lainzer Tieg., Wien, identified by Ermisch in the SMTD collection. I also have a male specimen of *pseudoparvula* from Santon Downham, W. Suffolk, kindly given to me by John Owen. This specimen was identified by Batten as *pseudoparvula*. Apart from the small size it agrees very well with the holotype of *eludens* and the form of the parameres of the two are very similar. I therefore have no doubt that *M. eludens* and *M. pseudoparvula* are the same and formally synonymise them here.

Allen (1999), in his description of *eludens*, highlights the differences between the parameres of *eludens* and *parvula* but does not mention *parvuloides* = *pseudoparvula*, though he does mention the slightly sinuate side-margins of the pronotum of *eludens* which would suggest that it was *parvuloides* if using the key of Batten (1986). Possibly Allen did not consider the latter species because of the differences between the parameres of *eludens* and the figure of the parameres of *parvuloides* in Batten (see comments above). The drawings of the parameres in Ermisch (1969) are not always sufficiently accurate to allow positive identification of species. This, taken together with the very similar structure of the parameres of some closely related species and the individual variation within species, makes the identification of many *Mordellistena* species problematic without recourse to the examination of type specimens.

Unfortunately, Allen has misinterpreted the left and right parameres, and the nomenclature concerning their parts. This is not surprising since Ermisch (1969) does not give a full explanation of the nomenclature concerning the parameres. I have followed Franciscolo (1957), on which Ermisch (1969) based his schematic drawing

of the male genitalia, in interpreting the nomenclature of the parameres. Following Franciscolo, Allen's left paramere is the right paramere and vice versa.

Horak (1996) says that in *pseudoparvula* and the two closely related species he mentions, the anterior part of the head is completely black. This is not true in the case of the holotype of *eludens*, the male specimen from Santon Downham and the specimen from Lainzer Tieg., where the part of the head anterior to the antennal insertions is at least partly brown. However the holotype of *pseudoparvula* and a female specimen from Ashtead Common both have the head entirely black. Most specimens of *parvula* I have examined have the head entirely black, but a few specimens have the extreme anterior part brown. The size ranges given by Horak (1996) in his key to *pseudoparvula* and two closely related species are also not diagnostic. The length of *pseudoparvula* is given as 3.8–3.9 mm, however, the small male from Santon Downham is 2.8 mm long excluding the pygidium.

M. (Pseudomordellina) imitatrix Allen 1995 = *M. (P.) acuticollis* Schilsky 1895 **syn. n.**

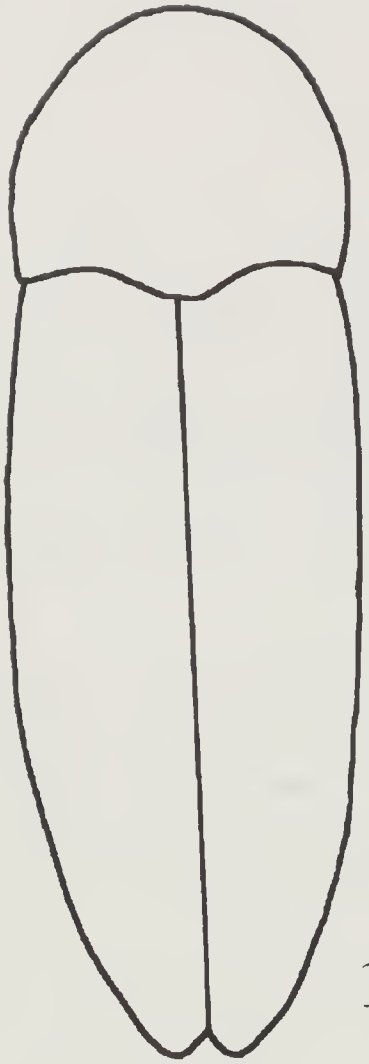
I have examined the male holotype of *imitatrix* in the BMNH collection. The form of the male genitalia and hind-tibial ridges of this specimen is the same as continental specimens of *acuticollis* identified by Ermisch (SMTD). I have examined about twenty specimens of what appear to be the same species from a number of British localities, many collected on *Artemisia vulgaris* L., the host of *imitatrix*. I have not found any specimens with the tibial ridges of the form figured by Allen (1995) as being diagnostic of *imitatrix*, but amongst the material examined there is considerable variation in the ridges (Fig. 5). Amongst the material examined are several specimens from Woolwich Common, the type locality of *imitatrix*, collected on *Artemisia* by John Owen. Allen (1995) says that the parameres of the two species are not or scarcely different and that "in practice, the difference in the hind-tibial ridges may not always be as clear-cut and satisfactory as one could wish". Given the fact that the parameres are identical in both species and one quite often gets individuals of *Mordellistena* in which the hind-tibial ridges are atypical (e.g. short extra ridges between the main ridges, or incomplete ridges), I have no doubt that *imitatrix* and *acuticollis* are one species. The putative different host plants of the two species may also have misled Allen into believing he was dealing with two species (see introduction).

It should be noted that Allen's (1995) figure of his left paramere (right paramere following Franciscolo (1957)) of *imitatrix* is viewed from the other side to that of Batten's (1986) figure of the same paramere of *acuticollis*. Batten (1976) points out that Ermisch (1969) figured his paramere of *acuticollis* from the outer side and not the inner side as he intended. No doubt Allen was following Ermisch when he drew his figure.

Sexual differences

Males of *acuticollis*, *pseudoparvula* and *parvula* have a brush of longer bristle-like pubescence on the dorsal face at the inner margin of the base of the fore tibia, but it can be difficult to see in poorly set specimens. This is not present in the females. This brush is also present in some male *nanuloides* but is less obvious. Males of *parvula* have the anterior tibia widened at the base (Fig. 6).

The males of all species in these groups usually have the fore femora and tibiae of a lighter colour than the females. However I have seen females with legs almost as light as males so this difference is not absolute.



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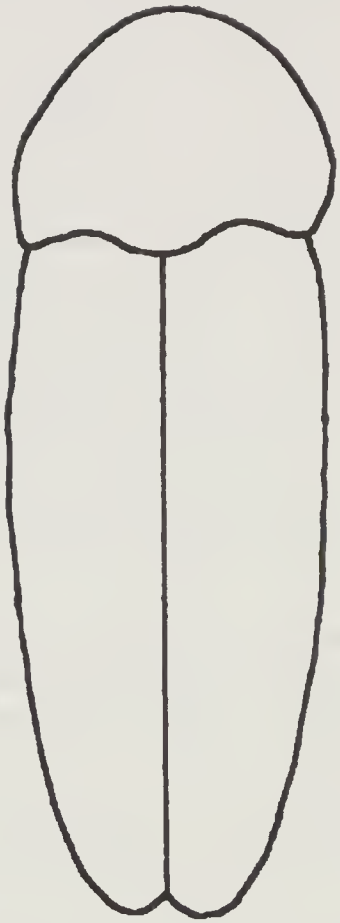

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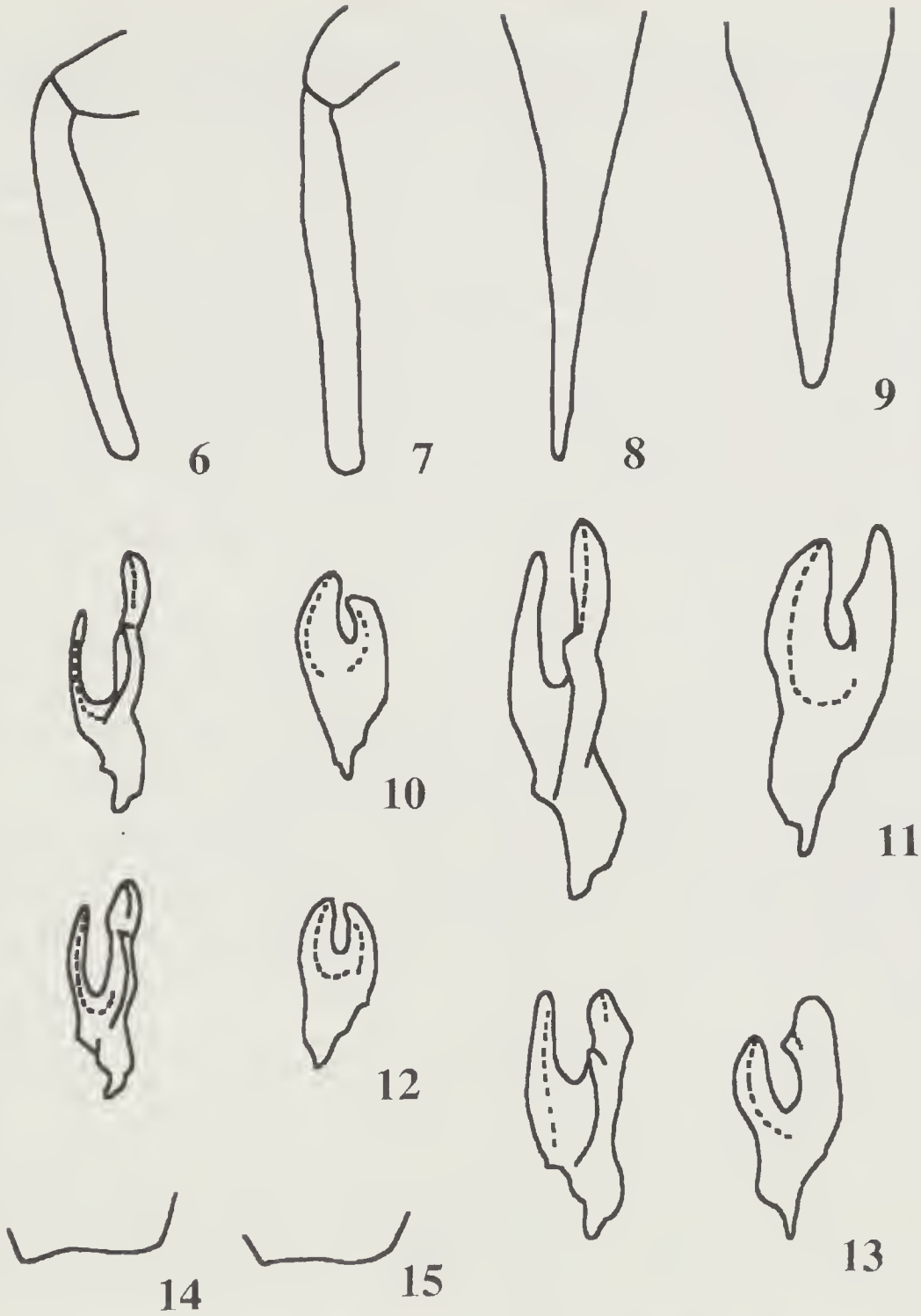

Figs. 1–15: *Mordellistena* species. 1–2: Pronotum and elytra, 1 *M. pseudoparvula*. 2 *M. parvula*. 3–4: Pronotum, 3 *M. acuticollis*, 4 *M. nanuloides*. 5: Hind tibia of *M. acuticollis* showing variation in ridges. 6–7: Fore tibia of male, 6 *M. parvula*. 7 *M. pseudoparvula*, 8–9: Pygidium, 8 *M. pseudoparvula*. 9 *M. parvula*. 10–13: Parameres of male (left paramere on left; ventral branch of left paramere on left; ventral branch of right paramere on right). 10 *M. pseudoparvula*. 11 *M. parvula*. 12 *M. nanuloides*. 13 *M. acuticollis*. 14–15: Lateral margin of pronotum viewed from the right side, 14 *M.* 8 *pseudoparvula*. 15 *M. parvula*.

Males of *nanuloides* and *acuticollis* often have the clypeal region of the head reddish; however I have seen some males with a completely black head like the female. Males of *parvula* and *pseudoparvula* usually have the head black like the females, but I have seen males with the clypeal region reddish.

British distribution

M. acuticollis is now widespread in S. E. England, with records from most vice-counties between W. Suffolk in the north and S. Hampshire in the west. The earliest known record is from 1985, and suggests that the species is a recent migrant or importation.

M. nanuloides is a rarely collected species known from W. Kent, W. Sussex and S. Hampshre. It may well occur in other coastal areas where its host sea wormwood, *A. maritima* L. occurs.

M. parvula is widespread in S. E. England and also recorded from Cornwall, Leicestershire and S. Wales. Many localities are from areas with calcareous soils and the species probably has a requirement for open well insolated habitats. There are records of specimens taken in pitfall traps and by suction sampling, which suggest that it may spend part of its time at ground level.

M. pseudoparvula is recorded from a few localities in E. Sussex, W. Kent, Surrey, S. Essex and W. Suffolk. The earliest known record is from 1939. Due to its similarity to *parvula* there may be earlier collected specimens standing in collections as *parvula*.

Key to the British species of the *parvula* group and Pseudomordellina

1 Hind tibia with two apical spurs, the shorter about half or less than half the length of the longer (sometimes difficult to see); *parvula* group.....2
– Hind tibia with a single long apical spur; sub gen. *Pseudomordellina*.....3

2 Lateral margins of pronotum strongly curved and strongly convergent to the hind angles when viewed from above, almost straight when viewed from the side (Figs. 2, 15); pronotum slightly but distinctly wider than the elytra at its widest point (Fig. 2); fore tibia much wider near the base than the apex in the ♂ (Fig. 6); pygidium less elongate (Fig. 9); ventral branch of right paramere angled on its inner margin, left paramere with ventral branch only slightly shorter than dorsal branch (Fig. 11); length excluding the pygidium 2.8–3.5 mm.....*parvula* (Gyllenhal)
– Lateral margins of pronotum less strongly curved and less strongly convergent to the hind angles when viewed from above, sinuate when viewed from the side (Figs. 1, 14); pronotum about as wide as elytra at its widest point (Fig. 1); fore tibia of ♂ only slightly wider near the base than the apex (Fig. 7); pygidium more elongate (Fig. 8); ventral branch of right paramere not angled on its inner margin, left paramere with ventral branch much shorter than the dorsal branch (Fig. 10); length excluding the pygidium 2.4–3.4 mm.....*pseudoparvula* Ermisch = *parvuloides* Ermisch = *eludens* Allen

3 Antennae shorter than the combined length of the head and pronotum; segments 5–10 of antennae about one and a half times as long as wide; lateral margins of pronotum usually convergent to hind angles (Fig. 4); ventral branch of right paramere without a notch near the apex, ventral branch of left paramere thin, shorter than dorsal branch (Fig. 12); length excluding the pygidium 2.1–3.0 mm;.....*nanuloides* Ermisch
– Antennae about as long or longer than the combined length of the head and pronotum; segments 5–10 of antennae about twice as long as wide; lateral margins of pronotum almost parallel before hind angles (Fig. 3); ventral branch of right paramere notched near the apex, ventral branch of left paramere thicker, as long or slightly longer than dorsal branch (Fig. 13); length excluding the pygidium 2.8–3.5 mm.....*acuticollis* Schilsky = *imitatrix* Allen

Material examined: Full data is only given for type material or uncommon species.

M. parvula: 12 ♂, 5♀ from the following localities. Isle of Wight: Sandown; Niton. S. Hampshire: Portsdown Hill. E. Sussex: Ditchling; Barcombe. E. Kent: Blean Woods. Surrey: Weybridge. S. Essex: Temple Mills; Canvey Island (TQ7683); Thurrock (TQ587795). Hertfordshire: Bushey. W. Suffolk: Brandon; Santon Downham.

M. pseudoparvula: Holotype ♂ *M. pseudoparvula*: Rheinprovinz, Boppard, vi. 39, K. Ermisch (SMTD). Holotype ♀ *M. parvuloides*: Torre del Lago, (Lucca), 1939, A Gagliardi (SMTD). ♂ Lainzer Tierg., VIII. 54, Wien, leg. F. Schubert (SMTD). Holotype Y *M. eludens*: England, E. Sussex, below Mount Caburn, 19.vi.1993, R.A. Jones (NMGW). ♂ E. Sussex, Barcombe Mills, 27,vii.1939, C.J. Saunders (BMNH). ♀ Surrey, Ashtead Common, 30.vii.1992, B. Levey, beaten from Sallow. ♀ S. Essex, Temple Mills (area 2), pitfall trap, 13–27.vii.1999, P.R. Harvey (NMGW). ♀ Surrey, Richmond Park, 26.vi.1983, P.M. Hammond (BMNH), (this specimen was questionably identified as *M. klapperichi* Ermisch by Batten.) ♂ W. Suffolk, Santon Downham, 5.viii.1983, malaise trap, J. Owen (NMGW).

M. nanuloides: 1♂ N. & St Joosl Z., 25.vii.1943, P.J. Brakman. Zuid sloc. This specimen is labelled as a paratype but the original description indicates that the type series consists of a male and female specimen with the above locality and date. Therefore this specimen should be treated as a syntype. 1♀ same data as the specimen above, but lacks paratype label. Should be treated as a syntype. 1Y same data as above but collection date 17.vii.1944. This specimen is labelled as the holotype, but date on the locality label does not agree with date given in the original description. 1♂, 1♀ same data as above but collection date vii.1941. The male is labelled as a paratype and the female as an allotype, but collection date does not agree with date given in the original description. 1♂ Meissen, Knorre, 27.vi.1926, Dr Maertens; all in SMTD. E. Kent: 1 Isle of Sheppey, G.C. Champion Coll. (BMNH); 4 Sheerness, J.R. le B. Tomlin Coll. (NMGW). 3 W. Sussex: W. Wittering, 14.vii.1971 A.E. Gardner Coll. (NMGW). 1♀ S. Hampshire, Portsdown, 9.vii.1991, D.M. Appleton (in D.R. Nash coll.).

M. acuticollis: Holotype ♂ *M. imitatrix*: N.W. Kent, Woolwich Common, 15.vii.1992, *Artemisia vulgaris*, A.A. Allen (BMNH). 1♀ Neusiedler See, Neusiedel, vi.1924, Th. Kriege (SMTD), identified by K. Ermisch. 1♀ Schönebeck a. E., 25.vii.1932, W. Borchert (SMTD). 1 Mark: Eberswalde, 6.vii.1969, L. Dieckmann (SMTD). 1 Hungaria, Kalocsa (SMTD). W. Sussex: W. Lavington. W. Kent: Woolwich Common; Bexley; Thamesmead. Surrey: Ashtead Common. Middlesex: Staines. S. Essex: Low Hall Wood (TQ359881); Marsh Lane Fields (TQ370868). W. Suffolk: Lakenheath (TL749829); Wangford Glebe (TL7583).

Depositories

BMNH	Natural History Museum, London, UK
NMGW	National Museums and Galleries of Wales, Cardiff, UK
SMTD	Staatliches Museum für Tierkunde, Dresden, Germany

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of the holotype of *M. eludens* and John Owen for the donation of a male specimen of *pseudoparvula* and other material, and providing me with a copy of the paper by J. Horak. Martin Brendell of the Natural History Museum, London, Daniel Hackett, David Nash and Colin Plant for the donation or loan of specimens.

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SHORT COMMUNICATION

***Eriocrania chrysolepidella* (Zell.) (Lep.: Eriocraniidae) at Homefield Wood, Medmenham, Buckinghamshire.**—On 16.vi.2000 I paid a short lunchtime visit to Homefield Wood, a nature reserve on the Chiltern Hills near Medmenham in Buckinghamshire. My intention was to search for larvae of the elachistid *Stephensia brunnichella* L. in calamint, *Calamintha vulgaris*. This was successful but as I was leaving the reserve I happened upon a group of coppiced hazel bushes. I immediately noticed that many of their leaves contained mines of *Eriocrania chrysolepidella*. Closer investigation showed that most of these had been vacated but approximately 20% were still tenanted.

This is a species I am familiar with from Unhill Wood near Streatley in Berkshire but one I had not met with in Buckinghamshire before. I reported the find to the Reserve Warden who I met on the day. Subsequent enquiries of the County Recorder for Buckinghamshire Lepidoptera, Martin Albertini, indicated that this species is known from few localities in this county, and that Homefield Wood is not one of these.—I. Sims, 2 The Delph, Lower Earley, Reading, Berkshire RG6 3AN.

THE ACULEATE HYMENOPTERA OF AMBERSHAM AND IPING (WITH STEDHAM) COMMONS IN WEST SUSSEX, INCLUDING STATISTICAL PROCEDURES FOR ESTIMATING SPECIES RICHNESS

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Abstract. A total of 263 aculeate (230 solitary and 33 social) species, about 51% of the British list, were found on Ambersham and Iping Commons between 1974 and 1998. Using these data the Jaccard Index of similarity between the two sites was 64.8% for the solitary species and 78.8% for the social species. Three hypotheses are developed to explain these differences. Three non-parametric estimates of the potential number of species for each site are in general agreement and agree with the number of species recorded. Thus the species lists may be considered sufficiently complete to carrry out further comparisons. Since species diversity estimates are not available for other inland sandy sites in south-eastern England, a species–area relationship method is used to justify further comparisons between these sites and the West Sussex sites. Species quality scores for good inland sandy sites in south-eastern England vary between 4.5 and 5.5. The narrow range in values of the cleptoparasitic load for the solitary wasps and bees supports Weislo's hypothesis. There is a good representation of the aerial-nesting solitary species.

INTRODUCTION

The aims of this paper are, firstly, to give an account of the aculeate wasp, ant and bee fauna of Ambersham and Iping (with Stedham) Commons, both in West Sussex, and to develop hypotheses to account for any differences. Secondly, a subsample of the data for the solitary species is used to investigate three non-parametric statistical methods for determining potential species diversity for each site. Thirdly, having shown by the species diversity estimates that the solitary species lists are sufficiently complete, further comparisons using the summarising indices of cleptoparasitic load, aerial-nester frequency and quality assessment can be justified. Fourthly, a species–area procedure is used to justify comparisons between the two West Sussex and other inland sandy sites of south-eastern England.

Ambersham Common (212 ha, SU91) is situated about 3 km south-east of Midhurst, and Iping (with Stedham) Common (172 ha, SU82) is situated about 3 km west of Midhurst. Iping and Stedham Commons are continuous with each other and elsewhere in this paper are referred to as Iping Common.

Ambersham Common is owned by the Cowdray Estate who currently manage the Common under a Countryside Stewardship Agreement. For most of the time covered by the records used in this paper, however, it was essentially unmanaged and suffered increasing invasion by pine and loss of structure within the heathers. A sheltered section of old railway line has been altered dramatically through use as a forestry thoroughfare, leading to the total loss of an area of heath verge during the period covered by this paper. Likewise the heath verge along the road has suffered both by shading from trees and from trampling from the large number of polo ponies which are exercised here. The ponies have also churned up many of the trackways over the Common, rendering the former areas of open sand unsuitable as nesting

sites. These habitat changes have led to the apparent loss of several species which were recorded during the early 1970s. Such losses are, to some extent, off set by the appearance of newly recorded species during the 1990s. The Common has not experienced extensive fires during the study period.

In contrast, Iping Common was three-quarters burnt over during 1976, just after it was declared a Local Nature Reserve, under the management, initially, of West Sussex County Council and, latterly, The South Downs Board. This event, however, has not resulted in the loss of any of the species known for the area prior to the fire, whereas several species recorded during the period of the study appear to be currently extinct as the habitat which supported them is now not present. This loss is due both to succession to woodland over an area of open grassy habitat and to the cessation of use of this part of Stedham Common as a dumping ground for locally extracted timber which was unfit for use in the local sawmill. This area provided many records of aerial-nesting species at the start of the study period but is of little use to these insects now.

Ambersham Common has always had more areas of comparatively flower-rich heath verge than Iping Common, which off sets the historically greater opportunities for aerial-nesting species at Iping Common. Both these effects are, however, somewhat a result of having to set boundaries to the sites as most of the 'missing' species are known from areas nearby each Common. The loss of directly heathland-associated species such as *Nomada baccata* and *Andrena tarsata* due to changes in the nature of the heathland is far more serious from the conservation perspective. Fortunately, both sites are now under active management, which includes in its aims the conservation of the heathland-insect assemblages present.

The soils of both sites are predominately free-draining and acidic, being derived from the Lower Greensand, and support a *Calluna vulgaris*/*Erica cinerea*-dominant dry-heath vegetation. Within these areas are heathy grasslands, often dominated by bracken, which has been the target of concerted conservation action during the latter part of the study period. There is a localised calcareous influence on both Commons, leading to a greater variety of flowering plants in some parts. This influence is due both to the effect of previous activity, such as the importation of chalk ballast for the railway line, and the presence of local veins of basic clay and calcareous streams arising at the base of the nearby South Downs. There are small areas of impeded drainage on both sites, giving rise to *Erica tetralix*-dominated wet heathland.

This paper has been mainly written by M.E. Archer (MEA), with M. Edwards (ME) providing a description of the sites, contributing to the three hypotheses concerning differences between the two sites, and providing the data of the species of aculeate Hymenoptera.

Sampling Methods

Between 1972 and 1997 ME made 120 visits to Ambersham Common distributed throughout the year as follows: February (1 visit), March (8), April (5), May (11), June (29), July (26), August (34) and September (6). Most recording was carried out during the 1970s and 1997 with less recording in the intermediate years. Between 1974 and 1998 ME made 113 visits to Iping Common distributed throughout the year as follows: March (1), April (5), May (12), June (15), July (31), August (44), September (5). Most recording was carried out during the 1980s, 1996 and 1997 with less recording during the 1970s and early 1990s. During these visits specimens were usually collected with a hand net for identification, but a few specimens were trapped

with a Malaise trap and a very few specimens were bred from inside bramble stems. On a few visits to Ambersham Common ME was accompanied by the following people who contributed some records: G. Allen (2 visits), P. Chandler (1), S. Church (1), J. Field (1), J. Felton (1), R. Morris (1) and K. Side (1). The number of species recorded on each visit varied from one species to a more-or-less complete list of species encountered. For the species-diversity investigation the only visits used are those where the largest number of solitary wasp and bee species were recorded. From Ambersham Common 25 samples were selected which were distributed throughout the year as follows: March (2 visits), April (2), May (3), June (4), July (6), August (6) and September (2). From Iping Common 21 samples were selected which were distributed throughout the year as follows: March (1), April (1), May (3), June (3), July (6), August (6) and September (1).

Species Present

A full list of recorded species is given in the appendix, and, at the family level, Table 1 shows the taxonomic distribution of species. The total list of 263 species represents about 51% of the British list. The Pompilidae are particularly well represented with 71% of the British list and the Anthophoridae poorly represented with 36% of the British list.

Of the 230 solitary species (Table 1), 149 species were present on both sites, 41 species were only recorded from Ambersham Common and 40 species only recorded from Iping Common. The Jaccard Index (Ludwig & Reynolds, 1988), which depends

Table 1. The number of aculeate species recorded from Ambersham and Iping Commons

	Ambersham	Iping	Total
Solitary wasps			
Chrysididae	7	9	11
Tiphiidae	3	2	3
Mutillidae	3	3	3
Pompilidae	25	23	29
Eumenidae	7	6	9
Sphecidae	51	65	71
Total solitary wasps	96	108	126
Solitary bees			
Colletidae	9	8	10
Andrenidae	32	23	33
Halictidae	24	24	27
Melittidae	0	2	2
Megachilidae	15	12	17
Anthophoridae	13	11	14
Xylocopidae	1	1	1
Total solitary bees	94	81	104
Total solitary wasps & bees	190	189	230
Social species			
Formicidae	13	14	15
Vespidae	5	7	7
Apidae	11	9	11
Total social species	29	30	33
Total aculeate species	219	219	263

upon the presence or absence of species, gives an index of 64.8% of species common to both Commons. Of the 33 social species (Table 1), 26 species were present on both sites, three species only from Ambersham Common and four species only from Iping Common. The Jaccard Index for the social species was higher than that for the solitary species at 78.8%.

Three hypotheses can be advanced to explain the differences in species lists between the two sites:

1) Species rarity—The populations of some species on the sites are so small and diffuse that the probability of recording them is very small. Such species may be reasonably expected to be recorded at only one site; greater recording effort may provide records for the second site. 2) Resource scarcity—The micro-habitats and resources for some species may be present only on one of the sites. 3) Recorder and sampling bias.—The possible effects of each of these hypotheses on the recorded species lists for the two sites is considered below.

Firstly, species rarity. The higher Jaccard Index for the social species, compared with that of the solitary species, would support this hypothesis, since each of the social species will be represented by more individuals than each of the solitary species (Archer, 1988). Further support for this hypothesis could be gained if it is considered that the cleptoparasitic species are represented by fewer individuals than their host species. The less well represented Anthophoridae, particularly the cleptoparasitic genus *Nomada*, can be used to support this hypothesis. The following species of *Nomada* have been recorded from only one of the Commons but their *Andrena* hosts have been recorded on both Commons: *N. baccata*, *N. fulvicornis*.

Secondly, resource scarcity. Evidence for this hypothesis is the presence of the pompilid *Anoplius concinnus* at Iping, where it hunts spiders at the edge of the lake in the old sand-pit workings, a habitat not present at Ambersham Common. The oligolectic bee *Melitta tricincta* was regularly found on the grassland of the old dumping ground until its food-plant, red bartsia (*Odontites vernus*), was swamped by the invading sallow scrub. Red bartsia is unknown on Ambersham Common. The bee *Megachile circumcincta* is often associated with bird's foot trefoil on sandy sites; this habitat has never been present at Iping Common whilst it has been worked, but was plentiful at Ambersham Common before the destruction of road verge and old railway track—it has not been found since, despite several directed searches over a number of years.

Thirdly, recorder and sampling bias. Over the 26 years of study the recording effort, the reasons for recording and the search image have changed. The data were not collected with any idea of treating them statistically or with producing total lists for each day, although the very large sample helps to overcome this effect. It is well known anecdotal fact that two recorders at the same site will only have a partial overlap of species recorded on any day. With a long-term set of data as this, ME is aware that his ability to find particular species has varied over the years. His increasing experience, his changing search image and even the changing nature of his physical sight all interact to increase, or decrease, his ability to find a specific species. Hence, in some sense, over the period of the study ME can be regarded as two different recorders. This is relevant to the argument about whether the differences between sites are real or artefacts of the method, when it is realised that the data sets were not collected in parallel but that his attentions to the two sites occurred at largely non-overlapping times.

Evaluating the relative importance of the three hypotheses is not possible on the current set of data but would be an interesting study. It goes without saying that the effects of the third hypothesis would be the hardest to control.

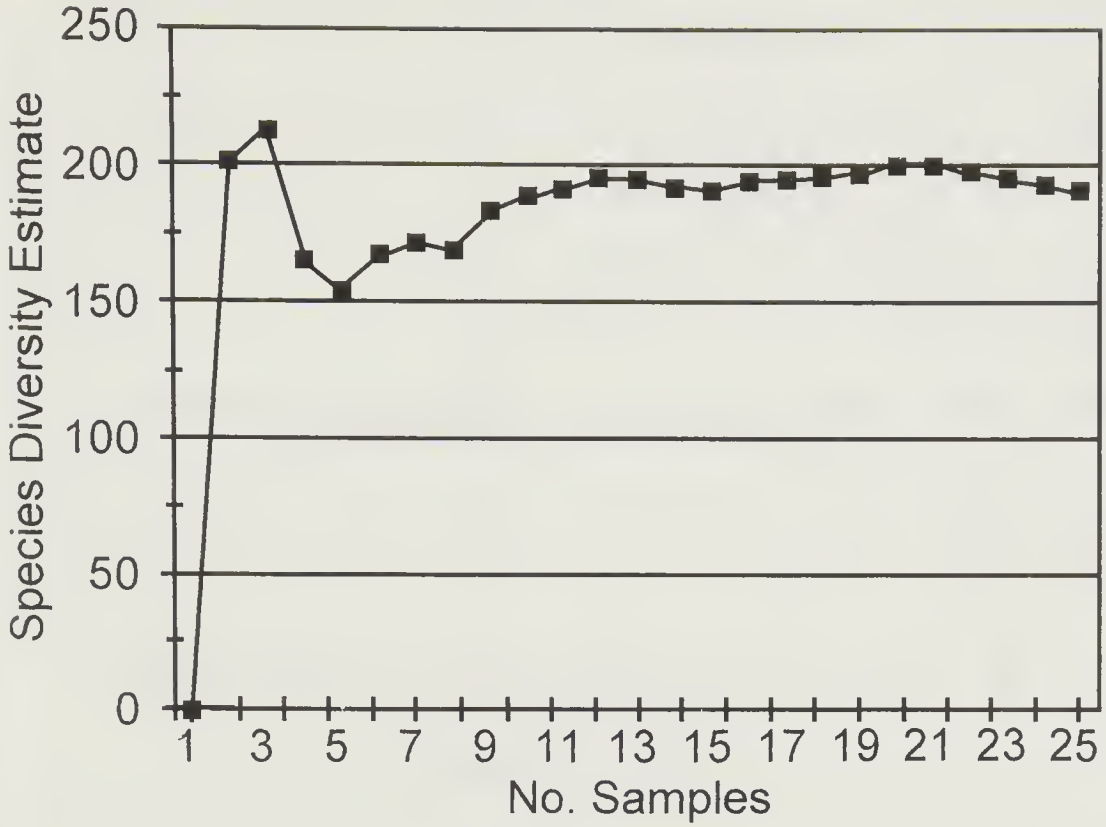

Fig. 1. Species-diversity estimate based on the presence/absence quantitative estimate of Chao for Ambersham Common.

Estimating the Potential Number of Solitary Wasp and Bee Species

One of the problems in the study of any site is the difficulty of not knowing how many more species are present at a site, but as yet are unrecorded. Recent advances in non-parametric statistical procedures offer a way of addressing this problem. Chao (in Colwell & Coddington, 1994) describes procedures to estimate the potential number of species (species richness) likely to be found on a site after a number of samples have been taken. The presence/absence quantitative estimate of Chao is based on the number of species that are observed in one (unique species) or two (two-occasion species) samples. Because some aculeate species are only active in the spring or summer it is advisable that samples be distributed throughout the months of adult activity. The software to carry out this statistical procedure was provided by Pisces Conservation Ltd.

The statistical procedure was run 20 times for each Common and the resulting estimates are given in figs 1 & 2. In practice the software takes 1, 2, etc. samples at random from the 25 samples of Ambersham or 21 samples of Iping Commons 20 times, each time calculating a mean estimate of species diversity. With a small number of samples the estimates are erratic, but as more samples are selected the estimates stabilise giving confidence in the estimates. The 95% confidence limits (meaning that there is a 95% chance that the potential number of species falls within this range) are given at the maximum sample size selection in Table 2. Thus the estimated species diversity with the 95% confidence limits for Ambersham Common is 190 (163–217) species and for Iping Common is 189 (162–217) species. The total number of solitary species of wasps and bees actually recorded from Ambersham Common during the 120 visits was 190 species and from Iping Common during the

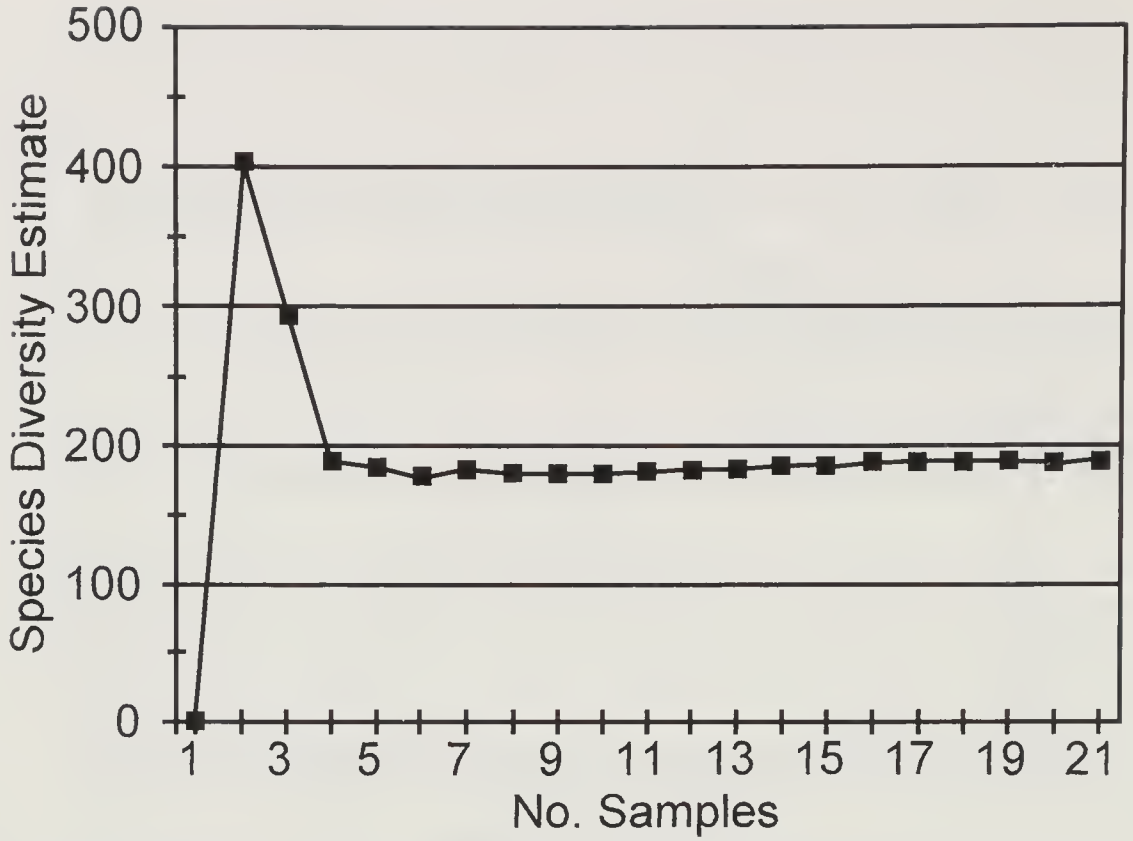

Fig. 2. Species-diversity estimate based on the presence/absence quantitative estimate of Chao for Iping Common.

113 visits was 189 species. Since the recorded species diversity for Ambersham and Iping Commons is within the 95% confidence limits, the Chao estimator is seen to be a good estimator of the potential species diversity.

Since the use of the Chao estimator is a relatively new statistical procedure caution is needed in accepting its estimates. Two further non-parametric statistical estimators are the jackknife (Heltshe & Forrester, 1983) and bootstrap (Smith & van Belle, 1984) procedures (software by Pisces Conservation Ltd). The jackknife procedure gives higher estimates than the Chao quantitative estimator (Ambersham 209 species, Iping 205 species) and the bootstrap procedure lower estimates (Ambersham 181 species, Iping 178 species). However the jackknife and bootstrap estimates are included within the 95% confidence limits of the Chao quantitative estimator so that the three estimates are in general agreement and confidence can be placed on the use of these relatively new statistical procedures.

A possible complication in making these estimates may be that some of the unique species were accidentally present, being outside their normal range (vagrant species). Vagrant species would artificially increase the estimate of species richness. Both authors have looked carefully at the unique species and do not regard any of them as vagrant species. Many of the unique species in the species diversity study cease to be unique species when the samples from all the visits are considered.

Species-Area Relationship

Another problem in the study of any site, particularly when the potential estimate of the number of species is greater than the number of species recorded, is the difficulty of knowing when the species list is sufficiently complete so that comparisons with other sites may reasonably be carried out. This is less of a

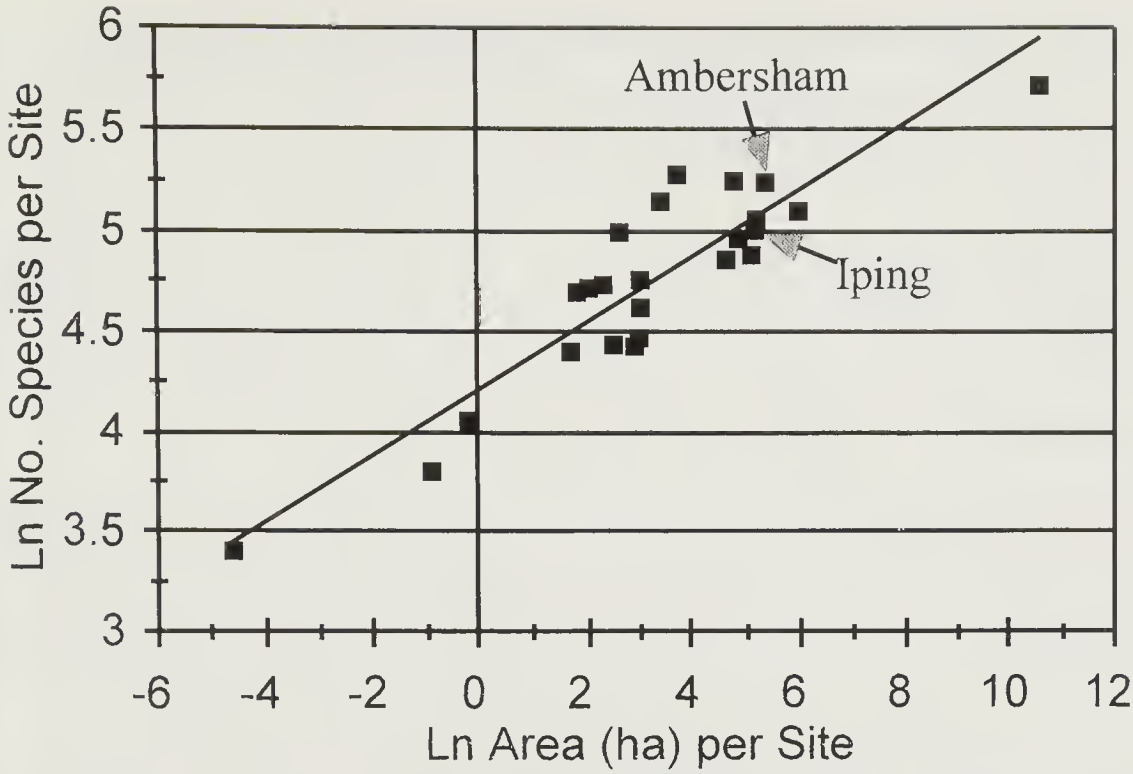

Fig. 3. A species–area relationship plot based on the solitary aculeate species from 24 inland sandy sites in south eastern England.

problem for Ambersham and Iping Commons since the recorded number of species and species-diversity estimates are in agreement with each other. However, for other sites from south-eastern England species-diversity estimates are not available so some other method must be used. In these circumstances one way to resolve this problem is the use of the species–area relationship where the number of species and the area of the sites, both expressed as natural logarithms (ln), can show a positive linear relationship (Usher, 1986). If the number of species in relation to the area of a site falls within the range of other sites which show a statistically significant species–area relationship, then the site may reasonably be compared with other sites. If the number of species in relation to the area of the site falls below the values of the other sites then this could indicate either many more species could be found on that site, or that the site consists of habitats which are particularly unfavourable for aculeates (Archer, 1999b). If the number of species in relation to the area occurs above the values of the other sites, then the site is more favourable for aculeates, perhaps because the local climate is more favourable or the habitats present at the site are particularly variable and favourable for aculeates.

With the help of many entomologists a species–area plot of 24 inland sandy sites, including Ambersham and Iping Commons, using only the solitary species of wasps and bees, has been constructed for south-eastern England (fig. 3). The other 22 sites are from Bedfordshire (Cooper's Hill, V.H. Chambers, pers. comm.), Suffolk (Elvedon, B. Collins, S. Falk, pers. comm.), Essex (Mill Wood Pit, Mill Land Fields, Alphamstone Pits, Broom Hill, Kent Road, Alsa Sand Pit, P. Harvey pers. comm.), Oxfordshire (Shotover, Steel 1984, Dry Stanford and Hitch Copse, C. O'Toole, pers. comm.), Dorset (Holt Heath, S. Roberts, pers. comm.), Hampshire (New Forest, Archer 1999a, M. Harvey, pers. comm., C. Palmer, pers. comm. and B.J. Pinchen, pers. comm.), London (Mitcham Common, Morris 1997), Surrey (Horsell Common, Bagmoor Common, Mare Hill Common, Ham Common, Sheepleas, Thursley

Common, D. Baldock, pers. comm.) and Kent (Tunbridge & Rusthal Common, I.C. Beavis, pers. comm. and Thameside, P. Harvey, pers. comm.). Bagmoor and Thursley Commons are treated as separate sites although they are continuous with each other. Data from other sites, e.g. Chobham Common and Oxshott Heath, Surrey (Guichard, 1977), could not be used because the recording area of these sites is unknown.

The correlation coefficient of the species–area relationship of the 24 sites indicates a highly significant linear relationship ($r = 0.91$, $p < 0.001$) with 83% of the variation of the number of species between sites being explained by the variation in the area of the sites. The species–area regression equation is: ln number of species $= 4.22 + 0.164 \times$ ln area (ha). The dots for Ambersham and Iping Commons fall within the range of the other 22 sites, and so the species lists for the 24 sites, including Ambersham and Iping Commons, can be considered sufficiently complete to make valid comparisons between them. Two other statistics from this regression equation are: 1. the mean number of species of solitary wasps and bees expected to be found on one ha is 68 species (anti-ln 4.22) and, 2. to double the number of solitary species of wasps and bees the mean area would need to be increased about 69-fold (2 raised to the power of 1/0.164). Possible reasons why the number of species should increase in relation to area are discussed by Archer and Burn (1995).

The species–area relationship is likely to be different for different regions of the UK. Thus, the mean number of species of solitary wasps and bees expected to be found on one ha from a sample of 19 sites from the north and north midlands of England is lower (47 species) than on the sites from south-eastern England, and the mean doubling factor is higher at about 475-fold (Archer, 1999b). These differences may be called the latitude variable and almost certainly reflect the more favourable climate in south-eastern England for aculeates.

For the Channel Islands a mean of 97 species of solitary wasps and bees are expected to be found on one ha which is higher than that expected for south-eastern England, again reflecting a further improvement in climate (Archer, unpublished). The mean doubling factor for the Channel Islands is about 66-fold which is similar to that of south-eastern England.

Other variables, e.g. altitude and habitat differences between sites, are also likely to affect the species–area relationhip, although more information is needed before the effects of these variables can be tested. Archer (1999b) found that, for the north and north midlands of England, open habitats from inland and coastal sandy sites and calcareous, clay and silty sites could all be grouped together into a single species–area relationship, so here the habitat variable would seem to be less important.

Species Quality

The status of each solitary species recorded from Ambersham and Iping Commons is given in the appendix. These statuses are the Archer's national statuses (Archer, 1999) rather than those given in Shirt (1987) and Falk (1991), since all species are considered, not just national priority (Simonson & Thomas, 1999), RDB or nationally scarce species. In addition, up-to-date information on distribution from the Newsletters of the Bees, Wasps and Ants Recording Society has been used. Caution must be exercised in the use of statuses since the status for a species is not fixed and can change as knowledge of the distribution of species improves or the species undergoes changes in range.

Species with very rare, rare and scarce statuses are called the high-quality species and are regarded as those species in most need of conservation. Overall, 59

Table 2. Non-parametric estimates of species richness of solitary wasps and bees at Ambersham and Iping Commons based on the species-diversity samples and using the presence/absence Chao quantitative estimator

	Ambersham	Iping
No. species in species-diversity samples	154	152
Estimated	190	189
95% confidence limits of estimated	163–217	162–217
Total species recorded	190	189

high-quality solitary species (9 very rare, 20 rare, 30 scarce) have been recorded from both sites.

Summing the status values for the solitary species gives the quality score for the site (Table 2). Dividing the site quality score by the number of solitary species recorded from a site gives the species quality score (SQS) 4.5 for both Ambersham and Iping Commons.

The investigation of species quality of aculeate wasps and bees has not been published for other sites in south-eastern England although Morris (1997) used another kind of site score and site quality index. Archer (unpublished) has carried out species quality investigations for Bagmoor Common and Thursley Common, Surrey and Holt Heath, Dorset. From Bagmoor Common 148 solitary species have been recorded with a quality score of 730 and a SQS of 4.9; from Thursley Common, 163 species with a quality score of 756 and a SQS of 4.6; and from Holt Heath 189 solitary species with a quality score of 1041 and a SQS of 5.5. Thus a SQS for the solitary aculeate species of between 4.5 and 5.5 is to be expected from a good inland sandy site in south-eastern England.

Sites from the north and north midlands of England usually have lower SQSs of between 1.5 and 3, although the SQS of the Ainsdale–Formby sand dunes is exceptionally large at 3.8 (Archer, 1999b). The variation of SQSs between northern and southern England is a latitude variable and is probably a consequence of a more favourable climate in southern England.

Only the ant *Formica sanguinea* among the social species is a high-quality species, probably with a scarce status.

Table 3. The Archer national quality scores of the species of solitary wasps and bees recorded from Ambersham (AC) and Iping (IC) Commons (species quality score 4.5 for both Commons)

	Status value (A)	No. species (B)		Quality scores (A × B)	
Status		AC	IC	AC	IP
Universal	1	70	71	70	71
Widespread	2	64	65	128	130
Restricted	4	14	13	56	52
Scarce	8	22	21	176	168
Rare	16	13	11	208	176
Very rare	32	7	8	224	256
Total		190	189	862	853

Table 4. The relative frequency of the cleptoparasitic (or parasitoid) species among the species of solitary wasps and bees from Ambersham (AC) and Iping (IC) Commons

	No. hosts (H)		No. cleptoparasites (C)		Cleptoparasitic load $CL = 100 \times C/(H + C)$	
	AC	IP	AC	IP	AC	IP
Solitary wasps	78	92	15	13	16.1	12.4
Solitary bees	73	62	21	19	22.3	23.5

Cleptoparasitic Load

The cleptoparasitic load (CL) is the percentage of aculeate species that are cleptoparasites (or parasitoids) on other host aculeates. Wcislo (1987) showed that parasite behaviour among aculeate Hymenoptera correlated with geographical latitude. Thus the parasitic rates are higher in temperate regions as host populations are more synchronised in their life-history characteristics. This finding probably does not hold for desert climates where the occurrence of rainfall would tend to synchronise life history characteristics. From a review of the literature Wcislo (1987) found that the CLs for bees in Europe varied between 16% and 33%, a range of 17%. The solitary bee CL for Ambersham Common is 22.3% and Iping Common 23.5% (Table 3). These values are within the range of values for Europe and thus support Wcislo's speculation.

Wcislo (1987) gives no CL values for wasps, but Archer (1999b) found that values for solitary wasps varied between 10% and 22%, a range of 12%, for sites from northern and the north midlands of England. The solitary wasp CL for Ambersham Common is 16.1% and Iping Common 12.4% (Table 3) which fall within the range for northern and the north midlands of England. Thus Wcislo's speculation for bees could also apply to solitary wasps. Archer & Burn (1995) discussed why the CLs for the solitary bees are higher than the CLs for the solitary wasps. They argue that it is probably a consequence of food-chain relationships.

All the social species are host species, except for the species of *Psithyrus*, which are social parasites on the species of *Bombus*.

Aerial-Nester Frequency

The aerial-nester frequency (AF) is the percentage of host aculeate species that have aerial nest sites. Aerial nesters use old beetle burrows in dead wood, central

Table 5. The nesting habits of the host species of solitary wasps and bees recorded from Ambersham (AC) and Iping (IC) Commons

	No. aerial nesters (A)		No. subterranean nesters (S)		Aerial-nester frequency $AF = 100 \times A/(A + S)$	
	AC	IP	AC	IP	AC	IP
Solitary wasps	30	39	48	53	38.5	42.4
Solitary bees	17	13	56	49	23.3	21.0

stem cavities (e.g. bramble), old snail shells, or crevices in cob wall, old mortar or exposed on the surface of rock or other hard material. Subterranean nesters nest in the soil, usually in burrows dug by themselves, but sometimes holes and crevices are used after being altered.

The AFs for the solitary wasps and bees from Ambersham and Iping Commons are given in Table 4. The AFs for all the British species of solitary wasps is 46.2% and solitary bees is 17.9%. Thus the AFs for both Ambersham and Iping Commons are similar to the national values indicating that Ambersham and Iping Commons have a good representation of aerial nesters. It might be considered that sandy habitats could be poor in aerial-nesting species, but this observation does apply to Ambersham and Iping Commons.

The ants and host species of *Bombus* are subterranean nesters. Of the social wasps, *Vespula* species are usually subterranean nesters and *Dolichovespula* species aerial nesters, except for *D. sylvestris* which on heathland can be a subterranean or aerial nester.

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APPENDIX—Species list for Ambersham (A) and Iping (I) Commons with national statuses as Universal (U), Widespread (W), Restricted (RE), Scarce (S), Rare (R), Very rare (VR)

Chysididae: *Omalus auratus* (L.) (A,W), *O. panzeri* (Fab.) (A,I,W), *Hedychridium ardens* (Latreille in Coquebert) (A,I,U), *H. roseum* (Rossius) (A,I,RE), *Chrysis angustula* Schenck (I,W), *C. helleni* Linsenmaier (I,S), *C. impressa* Schenck (A,I,U), *C. gracillima* Förster (I,VR), *C. rutilans* Dalhbom (A,R), *Trichrysis cyanea* (L.) (A,I,U), *Cleptes nitidulus* (Fab.) (I,R).

Tiphiidae: *Tiphia femorata* Fab. (A,I,RE), *T. minuta* Vander Linden (A,S), *Methocha ichneumonides* Latreille (A,I,S).

Mutillidae: *Myrmosa atra* Panzer (A,I,W), *Mutilla europaea* L. (A,I,S), *Smicromyme rufipes* (Fab.) (A,I,S).

Formicidae: *Myrmica rubra* (L.) (I), *M. ruginodis* Nylander (A,I), *M. sabuleti* Meinert (I), *M. scabrinodis* Nylander (A,I), *Leptothorax acervorum* (Fab.) (A,I), *Tetramorium caespitum* (L.) (A), *Formica cunicularia* Latreille (A,I), *F. fusca* L. (A,I), *F. rufa* L. (A,I), *F. sanguinea* Latreille (A,I), *Lasius alienus* (Förster) (A,I), *L. flavus* (Fab.) (A,I), *L. fuliginosus* (Latreille) (A,I), *L. niger* (L.) (A,I), *L. umbratus* (Nylander) (A,I).

Pompilidae: *Dipogon variegatus* (L.) (A,U), *Caliadurgus fasciatellus* (Spinola) (A,I,RE), *Priocnemis agilis* (Shuckard) (A,S), *P. exaltata* (Fab.) (A,I,U), *P. fennica* Haupt (A,W), *P. gracilis* Haupt (A,I,S), *P. hyalinata* (Fab.) (I,S), *P. parvula* Dahlbom (A,I,U), *P. pusilla* Schiodte (A,I,W), *P. schioedtei* Haupt (A,I,U), *P. coriacea* Dahlbom (A,R), *P. perturbator* (Harris) (A,U), *P. susterai* Haupt (A,I,RE), *Pompilus cinereus* (Fab.) (A,I,U), *Agenioideus cinctellus* (Spinola) (A,I,R), *Arachnospila anceps* (Wesmael) (A,I,U), *A. trivialis* (Dahlbom) (A,I,W), *A. wesmaeli* (Thomson) (I,R), *A. minutula* (Dahlbom) (A,I,S), *A. spissa* (Schiodte) (A,I,U), *Evagetes crassicornis* (Shuckard) (A,I,U), *E. dubius* (Vander Linden) (A,I,R), *Anoplius concinnus* (Dahlbom) (I,S), *A. nigerrimus* (Scopoli) (A,I,U), *A. infuscatus* (Vander Linden) (A,I,W), *A. viaticus* (L.) (A,I,W), *Episyron rufipes* (L.) (A,I,W), *Aporus unicolor* Spinola (I,R), *Ceropales maculata* (Fab.) (A,R).

Eumenidae: *Eumenes coarctatus* (L.) (A,I,S), *Gymnomerus laevipes* (Shuckard) (A,R), *Microdynerus exilis* (Herrich-Schäffer) (I,S), *Ancistrocerus gazella* (Panzer) (A,I,W), *A. nigricornis* (Curtis) (A,S), *A. oviventris* (Wesmael) (A,U), *A. trifasciatus* (Müller) (A,I,U), *Symmorphus gracilis* (Brullé) (A,I,W), *S. bifasciatus* (L.) (I,U).

Vespidae: *Dolichovespula media* (Retzius) (I), *D. norwegica* (Fab.) (A,I), *D. saxonica* (Fab.) (A,I), *D. sylvestris* (Scopoli) (A,I), *Vespula rufa* (L.) (A,I), *V. germanica* (Fab.) (I), *V. vulgaris* (L.) (A,I).

Sphecidae: *Astata boops* (Schrank) (A,I,RE), *Tachysphex pompiliformis* (Panzer) (A,I,U), *T. nitidus* (Spinola) (A,S), *Miscophus concolor* Dahlbom (A,I,RE), *Trypoxylon attenuatum* Smith (A,I,U), *T. clavicerum* Lepeletier (A,I,W), *T. figulus* (L.) (A,I,U), *T. medius* de Beaumont (A,I,U), *Crabro cribrarius* (L.) (A,U), *C. peltarius* (Schreber) (A,I,U), *C. scutellatus* (Scheven) (A,I,S), *Crossocerus elongatulus* (Vander Linden) (A,I,W), *C. ovalis* (Lepeletier & Brullé) (A,I,U), *C. pusillus* Lepeletier & Brullé (A,I,U), *C. tarsatus* (Shuckard) (I,U), *C. wesmaeli* (Vander Linden) (A,I,U), *C. cetratus* (Shuckard) (A,I,W), *C. megacephalus* (Rossius) (I,U), *C. nigritus* (Lepeletier & Brullé) (I,W), *C. walkeri* (Shuckard) (I,S), *C. podagricus* (Vander Linden) (A,I,U), *C. quadrimaculatus* (Fab.) (A,I,W), *Ectemnius borealis* (Zetterstedt) (A,I,VR), *E. dives* (Lepeletier & Brullé) (I,S), *E. cavifrons* (Thomson) (A,I,U), *E. lapidarius* (Panzer) (A,I,U), *E. ruficornis* (Zetterstedt) (A,I,W), *E. sexcinctus* (Fab.) (I,W), *E. continuus* (Fab.) (A,I,U), *E. cephalotes* (Olivier) (A,I,W), *E. lituratus* (Panzer) (A,I,RE), *Lindenius albilabris* (Fab.) (A,I,U), *L. panzeri* (Vander Linden) (A,I,RE), *Entomognathus brevis* (Vander Linden) (I,W), *Rhopalum clavipes* (L.) (I,U), *R. coarctatum* (Scopoli) (A,U), *Oxybelus mandibularis* Dahlbom (A,I,S), *O. uniglumis* (L.) (A,I,U), *Psen dahlbomi* (Wesmael) A,I,U), *P. unicolor* (Vander Linden) (I,R), *P. spooneri* (Richards) (I,VR), *P. bruxellensis* (Bondroit) (I,R), *P. equestris* (Fab.) (A,I,U), *P. lutarius* (Fab.) (A,I,W), *Psenulus pallipes* (Panzer) (A,I,W), *P. concolor* (Dahlbom) (I,W), *P. schencki* (Tournier) (A,I,R), *Spilomena troglodytes* (Vander Linden) (I,W), *Pemphredon lugubris* (Fab.) (A,I,U), *P. inornatus* Say (I,U), *P. lethifer* (Shuckard)

(I,U), *P. morio* Vander Linden (I,S), *Diodontus insidiosus* Spooner (A,I,VR), *D. luperus* Shuckard (I,W), *D. minutus* (Fab.) (I,U), *Passaloecus corniger* Shuckard (A,I,W), *P. eremita* Kohl (A,I,W), *P. gracilis* (Curtis) (I,W), *P. singularis* Dahlbom (A,U), *Ammophila pubescens* Curtis (A,I,S), *A. sabulosa* (L.) (A,I,W), *Mellinus arvensis* (L.) (A,I,U), *Nysson spinosus* (Forster) (A,U), *N. trimaculatus* (Rossius) (A,S), *Gorytes quadrifasciatus* (Fab.) (A,I,W), *G. tumidus* (Panzer) (I,U), *Argogorytes mystaceus* (L.) (A,I,U), *Cerceris arenaria* (L.) (A,I,W), *C. ruficornis* (Fab.) (A,I,S), *C. rybyensis* (L.) (A,I,RE), *Philanthus triangulum* (Fab.) (A,I,W).

Colletidae: *Colletes daviesanus* Smith (I,U), *C. fodiens* (Geoffroy in Fourcroy) (A,I,W), *C. similis* Schenck (A,I,W), *C. succinctus* (L.) (A,I,U), *Hylaeus communis* Nylander (A,I,W), *H. confusus* Nylander (A,I,U), *H. gibbus* Saunders (A,I,VR), *H. brevicornis* Nylander (A,I,W), *H. hyalinatus* Smith (A,W), *H. annularis* (Kirby) (A,RE).

Andrenidae: *Andrena clarkella* (Kirby) (A,I,U), *A. fucata* Smith (A,U), *A. helvola* (L.) (A,W), *A. praecox* (Scopoli) (A,I,W), *A. synadelpha* Perkins (A,W), *A. varians* (Rossius) (A,S), *A. scotica* Perkins (A,U), *A. trimmerana* (Kirby) (A,S), *A. bicolor* Fab. (A,I,U), *A. augustior* (Kirby) (A,I,W), *A. pubescens* Olivier (A,I,W), *A. thoracica* (Fab.) (A,W), *A. denticulata* (Kirby) (A,I,U), *A. fuscipes* (Kirby) (A,I,U), *A. haemorrhoa* (Fab.) (A,I,U), *A. binaculata* (Kirby) (A,I,S), *A. flavipes* Panzer (A,I,RE), *A. florea* Fab. (A,I,VR), *A. tarsata* Nylander (A,W), *A. coitana* (Kirby) (A,I,W), *A. argentata* Smith (A,I,R), *A. barbilabris* (Kirby) (A,I,U), *A. labiata* Fab. (A,R), *A. falsifica* Perkins (A,R), *A. minutula* (Kirby) (A,I,U), *A. saundersella* Perkins (A,I,U), *A. subopaca* Nylander (A,I,U), *A. congrueus* Schmiedeknecht (I,R), *A. dorsata* (Kirby) (A,I,W), *A. ovatula* (Kirby) (A,I,W), *A. wilkella* (Kirby) (A,I,U), *Panurgus calcaratus* (Scopoli) (A,I,RE), *P. banksianus* (Kirby) (A,I,W).

Halictidae: *Halictus rubicundus* (Christ) (A,I,U), *H. confusus* Smith (A,I,VR), *H. tumulorum* (L.) (A,I,U), *Lasioglossum lativentre* (Schenck) (I,W), *L. leucozonium* (Schrank) (A,I,W), *L. prasinum* (Smith) (A,I,RE), *L. zonulus* (Smith) (A,I,RE), *L. albipes* (Fab.) (A,I,U), *L. calceatum* (Scopoli) (A,I,U), *L. fulvicorne* (Kirby) (A,I,W), *L. malachurus* (Kirby) (A,S), *L. minutissimum* (A,I,W), *L. nitidiusculum* (Kirby) (I,U), *L parvulum* (Schenck) (A,I,W), *L. punctatissimum* (Schenck) (A,I,W), *L. villosulum* (Kirby) (A,I,U), *L. leucopum* (Kirby) (A,I,U), *L. morio* (Fab.) (A,I,W), *Sphecodes crassus* Thomson (A,I,S), *S. ephippius* (L.) (A,I,W), *S. geoffrellus* (Kirby) (A,I,U), *S. gibbus* (L.) (A,I,W), *S. longulus* von Hagens (A,R), *S. monilicornis* (Kirby) (A,I,U), *S. pellucidus* Smith (A,I,W), *S. puncticeps* Thomson (A,W), *S. reticulatus* Thomson (I,R).

Melittidae: *Melitta leporina* (Panzer) (I,W), *M. tricincta* Kirby (I,S).

Megachilidae: *Anthidium manicatum* (L.) (A,I,W), *Stelis ornatula* (Klug) (A,R), *Heriades truncorum* (L.) (A,I,VR), *Osmia rufa* (L.) (A,U), *O. caerulescens* (L.) (A,I,W), *O. leaiana* (Kirby) (A,W), *O. bicolor* (Schrank) (A,S), *Hoplitis claviventris* (Thomson) (A,I,W), *Megachile centuncularis* (L.) (A,I,U), *M. ligniseca* (Kirby) (A,I,W), *M. versicolor* Smith (A,I,U), *M. willughbiella* (Kirby) (A,I,U), *M. circumcincta* (Kirby) (A,U), *M. maritima* (Kirby) (A,I,W), *Coelioxys elongata* Lepeletier (I,U), *C. inermis* (Kirby) (I,W), *C. rufescens* Lepeletier & Serville (A,I,W).

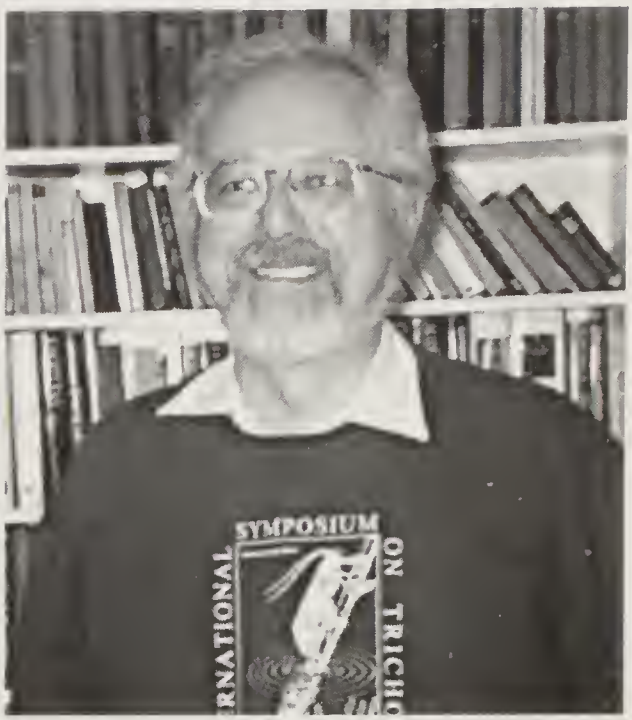
Anthophoridae: *Nomada baccata* Smith (A,R), *N. fabriciana* (L.) (A,I,U), *N. flava* Panzer (A,I,W), *N. flavoguttata* (Kirby) (A,I,U), *N. fulvicornis* Fab. (A,VR), *N. goodeniana* (Kirby) (A,I,U), *N. leucophthalma* (Kirby) (A,I,W), *N. marshamella* (Kirby) (A,I,U), *N. rufipes* Fab. (A,I,U), *N. striata* Fab. (A,W), *Epeolus cruciger* (Panzer) (A,I,W), *E. variegatus* (L.) (I,U), *Anthophora furcata* (Panzer) (A,I,W), *A. binaculata* (Panzer) (A,I,RE).

Xylocopidae: *Ceratina cyanea* (Kirby) (A,I,R).

Apidae: *Bombus lucorum* (L.) (A,I), *B. terrestris* (L.) (A,I), *B. lapidarius* (L.) (A,I), *B. jonellus* (Kirby) (A,I), *B. pratorum* (L.) (A,I), *B. hortorum* (L.) (A,I), *B. pascuorum* (Scopoli) (A,I), *Psithyrus bohemicus* (Seidl) (A), *P. campestris* (Panzer) (A,I), *P. sylvestris* (Lepeletier) (A), *P. vestalis* (Geoffroy in Fourcroy) (A,I).

SOCIETY NEWS

Dr Peter C. Barnard, BENHS President 2002–2003



Peter Barnard joined The Natural History Museum in 1974 after completing a PhD on the reproductive biology of caddisflies (Trichoptera) at the University of Reading. His taxonomic research on this group of insects and on the Neuroptera has led to fieldwork in several countries, including the first accounts of the caddisflies of Lake Naivasha in Kenya, and of the island of Madeira. During his time at the Museum he has taken on a variety of roles, including being editor of the Entomology series of the *NHM Bulletin* for six years, a Collection Manager and Deputy Head of the Entomology Collection Management Division, and compiling the NHM's first Annual Report for Science.

Outside the Museum he was Editor of the *Handbooks for the Identification of British Insects* for five years, Assistant Editor of *Entomologist's Gazette* for 19 years, and has served on councils and committees of several societies. He is Associate Editor of *Archives of Natural History*.

Peter leads the British Insect Research Group at The Natural History Museum, and his current research interests include the production of taxonomic literature on British insects, including identification guides and checklists, both as conventional publications and web-based products. He edited the book *Identifying British Insects and Arachnids: an annotated bibliography of key works* published in 1999 by Cambridge University Press, which included contributions by many members of the NHM's Entomology Department. He is also gathering checklists of all the British animals and plants. These are being compiled on a comprehensive searchable database shortly to be launched on the NHM's website. This project forms part of the Museum's contribution to the National Biodiversity Network.

Other projects include writing a new handbook to the British caddisflies; the preparation of a European list of caddisflies with country-based distributional information for the EU-funded Fauna Europaea project; and writing a history of the NHM Entomology Department.

During his presidency of the BENHS Peter plans to strengthen links between the Museum and the BENHS by encouraging more amateur entomologists to use the Entomology Department's collections and other resources.

OFFICERS' REPORTS FOR 2001

Council Report 2001

The Society continues to build on its strengths and it has been a quiet year for the Council, which met on seven occasions during the year with an average of 14 members attending on each occasion. In the course of these meetings the Council approved 50 applications for membership and was informed of 5 resignations and 7 deaths. The Council struck off 16 members for non-payment of their subscription. It is a matter of regret, but perhaps symptomatic of modern manners, that so many cannot be bothered to send a letter of resignation. A simple letter of resignation would save the Society expense and its volunteers some precious free time. On a more positive note the Council is pleased to record that three members, J. R. Langmaid, I. S. Menzies and A. D. A. Russwurm, completed 50 years' continuous membership at the end of 2001 and were elected Special Life Members. In respect of his service to the Society and to entomology, David Wilson was elected an Honorary Member of the Society. As a result of these changes, at the close of the year the membership stood at 875, an increase of 22 on the previous year. It is anticipated that a larger than usual number of members will be lost next year as they are struck off for non-payment following this year's subscription increase. However, even if these are allowed for, there has been a small net increase in membership this year.

A major event this year was the long-awaited publication of *British Soldierflies and their Allies*, the latest in the Society's list of publications. The official publication day was on the date of the Society's Annual Exhibition and the stock taken there was sold out well before the end of the exhibition. Sales have continued at a very promising level and we must thank Gavin Boyd for his efficient and cheerful management of the sales of this and the Society's other publications. In order for the Society to be able to produce and sell such a book at an affordable price much voluntary effort has to be put in by a number of members, in addition to that of the authors, Alan Stubbs and Martin Drake, and the photographer, David Wilson. If we could thank only one of these members, on behalf of all the others, it would be Malcolm Storey for his efforts in typesetting a book of 500 pages. Progress continues with the Society's other publication projects. It is hoped that a second edition of *New British Beetles* will be published in 2002 and negotiations are taking place with E. W. Classey Ltd in the hope that this will coincide with a further reprint of Joy's *British Beetles*.

The matter of invertebrate conservation has continued to occupy the Council's time with a number of discussions about the development of the Invertebrate Conservation Trust (ICT). The Society has continued to give its support to the ICT when requested. On a practical front a group of members continue to contribute to the Heathland Flies project and much new data has been collected this year. Individual members continue to support Butterfly Conservation's Action for Threatened Moth Species project.

A new air conditioning maintenance company has been contracted to maintain the air conditioning in the Pelham-Clinton Building. As a result of their first visit both the humidity and the temperature have remained within the required limits for the first time in several years. We hope that this improvement will continue. In the early part of the year we were concerned when the worst flooding for many years led to floodwaters reaching the far end of the car park adjacent to the Pelham-Clinton Building. Fortunately the building is sited on a small rise and this protected us from the floods. However, access to our building was restricted a little later in the year when the Country Park was closed as a result of foot and mouth disease restrictions.

Nevertheless five workshop meetings and fifteen open days were held. The average attendance at the workshops was 12 and the open days were attended by between 6 and 20 people, the average attendance being 11. Members travelled to our rooms from places as far apart as Doncaster and Guernsey. So the library and collections continue to be well used and visitors will no doubt have joined the Curator and Librarian in thinking that space for new material is rapidly running out. As a result, at the end of the year, the Council decided that the possibility of expansion on the site should be examined.

A full programme of meetings was arranged. There were 11 indoor meetings including a joint meeting with the London Natural History Society. The average attendance at meetings was 22 which is similar to recent years. A comprehensive programme of thirty-eight field meetings was arranged by Paul Waring and these ranged from as far apart as Devon and Inverness-shire. For most weekends at the height of the season more than one meeting was planned. In the event the foot and mouth disease outbreak caused some meetings to be cancelled, some to be curtailed and some moved. Nevertheless most meetings did take place. The highlight was probably the July weekend meeting at Abernethy Forest and Insh Marshes in Inverness-shire which was attended by over 30 people. This was probably the largest ever meeting of British lepidopterists in Scotland. However even meetings that attract only two or three people can have a big impact on invertebrate recording. Most meetings seem to attract six or seven people. The lack of reports from some field meeting leaders is still a concern. The Annual Exhibition remains the main event in the meetings programme. This year there was a welcome increase in the number of members attending and 202 signed the attendance book together with 35 visitors. The number of exhibits also increased in spite of foot and mouth disease regulations restricting access to the countryside. The exhibition theme of 'Hedgerow Insects' attracted only 3 exhibits, but the Council has decided to continue with a theme for a further year. The theme for 2002 will be 'Wetland Insects'. The Annual Dinner was attended by 52 members and their guests, the largest number for many years. It is gratifying to see that this event which, a few years ago the Council had considered dropping for lack of interest, has returned to popularity. We have become used in recent years to credit the success of the Annual Exhibition and Dinner to the behind-the-scenes work by the Exhibition Secretary, Mike Simmons, and this year is no exception. On the day, a more helpful approach by Imperial College to the provision of facilities was noted and is welcomed. On a final positive note we would like to report that those present at the exhibition ate and drank enough to ensure that we were not charged for the provision of the bar and refreshments.

In February the Honorary Secretary attended a second meeting called by the Linnean Society to consider the response of those societies involved with whole organism biology to the Institute of Biology's (IOB) initiative to set up a Bioscience Federation. He expressed the Society's reservations, in particular that it was naive of the government to expect so diverse a group as biologists to speak with one voice, as the IOB felt was necessary. It was also felt that the views expressed by the "great and the good" in such a federation would not necessarily be representative of biology as a whole. It seems probable that this initiative offers little of relevance to this Society but it was gratifying to find that the role of amateurs in whole organism biology was appreciated by those present at the meeting. The meeting agreed that the Linnean Society would represent the interests of the societies involved in our branch of biology in the discussions on setting up the federation.

At this year's exhibition our official exhibition photographer, David Wilson, announced that after photographing the exhibits for 30 years he felt that he deserved

time in the future to look at the exhibits. Peter Baker, after serving the Society in various roles for a similar number of years, felt that he should resign as Building Manager as his move to Devon meant that he could no longer give the post the attention it deserved. The Council expresses its greatest thanks to both these gentlemen for their long service to the Society. Our Editor, Mike Wilson, has also decided to resign as the pressures of the job were making it difficult for him to publish his own work. Although his service to the Society has not been so long as that of the above two gentlemen, the post of Editor is critical to the Society's health and we thank him for his excellent work in this post. Our best wishes go to all three members for the future.

JOHN MUGGLETON

TREASURER'S REPORT

I have been reading our Society's proceedings from which I learn that I am the fifteenth treasurer since J. G. Marsh took up the reigns in 1872. They have each served for an average of seven and a half years and only three have been treasurer for longer than my twelve years. I say this not to boast, but because I am concerned that it is nearing the time when fresh insight and enthusiasm should be brought to the managing of the Society's finances. We have to thank Dennis O'Keeffe, who has been one of our auditors since 1994, and Alec Harmer for their independent examination of the accounts once again. Dennis has indicated that he may not be able to carry out this duty next year although Alec has indicated that he is eager to continue.

Our investments have been adversely affected by world events of the last year in common with most investors and we have sustained an unrealised capital loss of £17,783. We have no need to draw on the capital of these assets and expect that the losses will never materialise but will be reversed as the market recovers. Income from these investments has not suffered significantly.

Overall there has been a reversal in our net income before these paper losses from last year, when we spent £18,775 more than we received. This year our net incoming resources were £6,491 which resulted from not only a slightly reduced charitable expenditure, but a sharp increase in publications sales and the handsome bequest of £22,500 from the estate of Maitland Emmet. In terms of specific expenditure we should note the reduction in library costs as the rebinding programme draws to a close and capital expenditure of £3,000 on new insect cabinets. Our expenditure on grants has increased by over £5,000 partly because we have been able to pay more from the renamed and enhanced Maitland Emmet BENHS Research Fund and partly because of a grant from the General Fund to assist the publication of *The Moths of Devon*.

To sum up our position, we have assets of £438,000 despite the stock market fall and we have no financial constraints which will cause us to restrict our activities in the foreseeable future.

A. J. PICKLES

Trustees' Report

The principal activities of the Society are to hold meetings at the Society's Rooms for the reading of original papers, discussions and lectures; to hold an annual exhibition and field meetings; to issue publications and to form typical collections

and a library. These activities are carried on with the object of promoting and advancing research in Biological Science and its diffusion.

The Society has enjoyed another successful year with a varied programme of Field Meetings, Indoor Meetings and Workshops. Further grants for entomological research have been made from the Maitland Emmet BENHS Research Fund, renamed from the Research Fund, and from the Hering Fund. The extensive programme of rebinding and repair of books and journals has been continued. A bequest of £22,500 has been received from the estate of our prominent member, the late Maitland Emmet and this has been included in the research fund mentioned above.

A detailed risk assessment was carried out during the year.

Signed on behalf of the Trustees

J. MUGGLETON, Secretary

Independent Examiners' Report

We report on the accounts of the Society for the year ended 31 December 2001, which are set out on the following pages.

Respective Responsibilities of Trustees and Examiners

As the Charity's Trustees you are responsible for the preparation of the accounts, you consider that the audit requirement of Section 43 (2) of the Charities Act 1993 does not apply. It is our responsibility to state, on the basis of procedures specified in the General Directions given by the Charity Commissioners under Section 43(7)(b) of the Act, whether particular matters have come to our attention.

Basis of Independent Examiners' Report

Our examination was carried out in accordance with the General Directions given by the Charity Commissioners. An examination includes a review of the accounting records kept by the Charity and a comparison of the accounts presented with those records. It also includes consideration of any unusual items or disclosures in the accounts, and seeking explanations from you as Trustees concerning any such matters. The procedures undertaken do not provide all the evidence that would be required in an audit, and consequently we do not express an audit opinion on the view given by the accounts.

Independent Examiners' Statement

In connection with our examination, no matter has come to our attention:

1. which gives us reasonable cause to believe that in any material respects the requirements
   a. to keep accounting records in accordance with Section 41 of the Act, and
   b. to prepare accounts which accord with the accounting records and to comply with the accounting requirements of the Act, have not been met; or
2. to which, in our opinion, attention should be drawn in order to enable a proper understanding of the accounts to be reached.

D. O'KEEFFE AND A. S. HARMER

Statement of Financial Activities
for the year ended 31 December 2001

		Unrestricted Funds	Restricted Funds	Endowment Funds	Total Funds 31.12.01	Total Funds 31.12.00
Incoming Resources:						
Bequests and donations	note 10	22500	–	–	22500	–
Subscriptions		9481	–	–	9481	11575
Investment Income		6113	4314	823	11250	11590
Trading Income	note 2	1658	16144	–	17802	4541
Sundry Income	note 3	2174	–	–	2174	3859
Total Incoming Resources		41926	20458	823	63207	31565
Resources Expended:						
Direct Charitable Expenditure:						
Cost of Journal & Distribution		13290	–	–	13290	14042
Cost of facility at Dinton Pastures		–	4573	–	4573	4112
Members Meetings & Services		6356	–	–	6356	6771
Library & Curation		2754	–	–	2754	8416
Grants	note 11	7450	–	400	7850	2349
Sundry Income costs	note 3	–	–	–	–	1000
Depreciation		4466	2210	–	6676	6839
		34316	6783	400	41499	43529
Other Expenditure:						
Management costs		4090	–	–	4090	4031
Trading costs	note 2	642	10485	–	11127	2780
		4732	10485	–	15217	6811
Total Resources Expended		39048	17268	400	56716	50340
Net Resources before transfers		2878	3190	423	6491	(18775)
Net Incoming/Outgoing Resources		2878	3190	423	6491	(18775)
Gains & Losses on Investment assets:						
Realised		–	–	–	–	(13)
Unrealised		(5226)	(12325)	(232)	(17783)	(1566)
Net movement in Funds		(2348)	(9135)	191	(11292)	(20354)
Fund Balances brought forward at 1 January 2001		131913	301065	16968	449946	470300
Fund Balances carried forward at 31 December 2001		129565	291930	17159	438654	449946

Summary Income and Expenditure Account

	2001	2000
Gross Income of continuing operations	63207	31565
Total expenditure of continuing operations	56716	50340
Net Income/Outgoings for the year	6491	(18775)

Balance Sheet as at 31 December 2001

	Notes	2001	2001	2000	2000
Fixed Assets:					
Tangible Assets	4		174996		178656
Investments	5		222205		239988
			397201		418644
Current Assets:					
Stocks		16187		9852	
Debtors	6	10117		9638	
Cash at Bank and in hand	7	21359		15074	
		47663		34564	
Creditors: amounts falling due within one year	8	6210		3262	
Net current assets			41453		31302
Net assets			438654		449946
Funds:	9				
Endowment Funds—Hering Fund			17159		16968
Restricted Funds—Housing Fund		219277		229104	
Special Publications Fund		72653	291930	71961	301065
Unrestricted Funds:					
Maitland Emmet BENHS Research Fund		54670		36873	
General Fund		74895	129565	95040	131913
			438654		449946

The accounts were approved by the Trustees on 20 February 2002 and signed on its behalf.

Notes to the accounts
for the year ended 31 December 2001

1. Accounting Policies

The Accounts of the Charity are prepared in accordance with the Charities (Accounts and Reports) Regulations 1995, the statement of recommended practice,

Accounting by Charities, and with applicable accounting standards. They are drawn up on the historical accounting basis except that investments held as fixed assets are carried at market value.

1.1 Income

Donations and legacies are accounted for as soon as their amount and receipt are certain. In the case of donations this is usually when they are received. All other income is accounted for under the accruals concept. Gifts in kind are valued at their estimated value to the Charity.

1.2 Expenditure

Expenditure is accounted for under the accruals concept. The irrecoverable element of VAT is included with the item of expense to which it relates. Depreciation is allocated over the expenditure headings on the basis of the use of the assets concerned.

1.3 Tangible Fixed Assets

Tangible fixed assets are stated at cost or trustees' valuation less depreciation which is calculated at rates to write off the excess of cost over estimated residual values of individual assets over their estimated useful lives as follows

Leasehold Buildings at Dinton Pastures	1/70th of cost
Fixtures and Equipment	10% of written down value

1.4 Investments

Fixed asset investments are stated in the balance sheet at mid market value at the balance sheet date.

1.5 Stock

Stock is valued at the lower of cost, including irrecoverable VAT, and market value and consists of publications and sundries held for resale.

1.6 Restricted Funds

Restricted funds are subject to specific conditions laid down by the donors as to how they may be used.

2. Trading Income and Expenditure

Trading income is derived from the sale of the *British Journal of Entomology* to non-members of the Society and from sale of the Society's other publications and products, costs are those of printing and distributing these items.

3. Sundry Income

Sundry income has been derived from the sale of surplus insect cabinets and specimens, photocopying and income from the annual dinner.

4. Tangible fixed assets

Cost	Leasehold Property £	Fixtures & Equipment £	Total £
At 1 January 2001	154736	65022	219758
Additions	–	3016	3016
Disposals	–	–	–
At 31 December 2001	154736	68038	222774
Depreciation			
At 1 January 2001	17680	23422	41102
Charge for year	2210	4466	6676
On disposals	–	–	–
At 31 December 2001	19890	27888	47778
Net book values			
At 31 December 2001	134846	40150	174996
At 31 December 2000	137056	41600	178656

Leasehold premises represents the cost of building and equipping the headquarters at Dinton Pastures Country Park. The total cost of these premises which were completed during the year to 31 December 1993 are being amortised over the seventy year term of the lease.

Fixtures and equipment includes a value for the library and collections as well as computers, microscopes and other ancillary equipment. Additions consist of amounts spent on new insect cabinets out of funds previously derived from sale of old cabinets.

5. Investments

In accordance with accounting requirements investments are shown in the balance sheet at market value.

	2001		2000	
	M.V.	Cost	M.V.	Cost
Shell T & T	5831	1250	6138	1250
Unilever	11356	248	11588	248
M & G Charifund	65224	20238	64551	20238
Hendersons Bond	59662	58000	63921	58000
Sun Life Bond	56040	56000	69398	56000
Barings Bond	24092	25000	24392	25000
	222205	160736	239988	160736

6. Debtors

	2001	2000
Due within one year		
Trade debtors	1724	825
Recoverable Taxation	4530	4529
Prepayments and accrued income	3863	4284
	10117	9638

7. Cash at Bank and in Hand

	2001	2000
National Westminster Bank		
Societies Reserve	15205	14483
Current Account	6006	443
Eurocheque Account	148	148
	21359	15074

8. Creditors: amounts falling due within one year

Trade Creditors	3710	2662
Accruals	2500	600
	6210	2695

9. Funds

Analysis of net assets between funds

	Tangible Fixed Assets	Investments	Net Current Assets	Total
Endowment Funds:				
Hering Fund	–	17159	–	17159
Restricted Funds:				
Housing Fund	134846	84431	–	219277
Special Publications	–	56694	15959	72653
Unrestricted Funds:				
Maitland Emmet BENHS Research Fund	–	35654	19016	54670
General Fund	40150	28267	6478	74895
	174996	222205	41453	438654

The Hering Fund was endowed to make grants out of income for research in specific areas of entomology.

The Housing Fund consists of the property at Dinton Pastures and money put aside to finance its upkeep and eventual replacement. The funds were derived principally from bequests from the late Duke of Newcastle, Mr Crow and Mr Hammond.

The Special Publications Fund finances the Society's publications other than the *British Journal of Entomology* and surpluses from such publications are credited to this fund to finance future publications.

10. Bequest & Donations

The Maitland Emmet BENHS Research Fund was established in 1996 with the intention of financing future grants for entomological research which would be less narrowly defined than those made by the Hering Fund. This year the renamed fund has been augmented by a bequest of £22500 from the estate of Maitland Emmet.

11 Grants

Grants of £400 were paid from the Hering Fund and of £3484 from the Maitland Emmet BENHS Research Fund. Additional grants have been made in respect of the Heathland Flies Project and to support the publication of *The Moths of Devon*.

BENHS Research Fund Report for 2001

The sum available for grants was £3100, and eleven applications were received. The panel considered that all the applicants should receive a grant. To achieve this the panel decided that smaller awards than had been requested would be given to all applicants. This is in line with the policy of the Fund which is to favour smaller awards over larger ones. In addition the Treasurer's approval was obtained for a small overspend. As a result, eleven awards, totalling £3150, were made as follows:

1. Dr J. Chapman, £400 to assist with the development and field trials of a pheromone attractant for stag beetles (*Lucanus cervus*).
2. Dr D. Goulson, £440 to support a survey of the bumblebees of the Salisbury Plain Training Area, an area of around 40,000 hectares of semi-improved and unimproved chalk grassland used for military training and believed to be the only remaining bumblebee stronghold in southern England.
3. Mr J. Harold, £100, to assist with the pre-publication costs of a report on the moths recorded in north-west Wales in 2001.
4. Dr J. W. Ismay, £475 to enable visits to be made to the Humboldt Museum in Berlin and the Natural History Museum in Budapest to examine their collections of Chloropidae (Diptera) in connection with his revision of the RES Handbook on this group of flies.
5. Ms Jenni Johnstone, £340 for travel costs involved in a survey of the aculeate Hymenoptera of the Orkney Islands.
6. Mr M. Kilner, £150 for travel costs to the National Museum of Wales, Cardiff, to extract data from arachnid specimens in the museum's collection as part of a survey of arachnids in South Wales.
7. Dr M. L. Luff, £150 for travel costs to the Natural History Museum in London to enable him to examine critical material needed for the completion of the Carabid section for the first volume of the "Beetles of the British Isles" project.
8. Dr M. G. Morris, £250 to assist with the funding of museum visits necessary for the completion of his work provisionally entitled 'True Weevils, part II, the Ceutorhynchinae' for the *Handbooks for the Identification of British Insects* series.
9. Mr T. Prescott, £480 towards the purchase of a moth trap, generator and identification books for use in surveying the moths of the Badenoch and Strathspey areas of Scotland. Matching funding for the purchase of this equipment has been given by the Royal Society for the Protection of Birds. The equipment will be available for use by BENHS members visiting the area.
10. Dr A. J. A. Stewart, £265 to assist a survey of sites for the BAP-listed chrysomelid beetle *Donacia aquatica*, in the Norfolk Broads, from where there has been only one recent record.
11. Mr W. G. Tremewan, £100 for travel expenses connected with his research on the genetics of zygaenid moths.

This year the Research Fund has gone from three years of undersubscription to one of oversubscription. While it is gratifying to report that the Fund has attracted more applicants these bring with them a different set of problems and we regret that we were not able to be as generous to some applicants as we might have wished. The Fund's panel is pleased at the diversity and quality of the projects we have been able to assist this year. Such diversity does, of course, bring its own problems when trying to assess the relative value of projects. Nevertheless we would rather deal with the

problems caused by a greater number of applications than those caused by too few applications.

At the end of the year the Fund received an unexpected and much appreciated donation of £22,500 in memory of Maitland Emmet. This donation was made by the late Col. Emmet's family with the particular request that it should go to the Society's Research Fund. As a result, from 2002 the Fund will be renamed the Maitland Emmet BENHS Research Fund. The objectives of the Fund will not change.

Reports have been received from Maxwell Barclay who received a grant in 1998 and from John Kramer, Glenda Orledge and Alan Stewart who received grants in 1999. Time does not permit details of these reports to be presented tonight but a summary will be published in the Society's *Journal* in due course.

The Society invites applications for future awards in the fields of insect and arachnid taxonomy, field biology and conservation in the British Isles. Applications should be sent to the Society's Hon. Secretary (from whom further details can be obtained) before 30 September in any year.

JOHN MUGGLETON

PROFESSOR HERING MEMORIAL RESEARCH FUND

The Committee agreed to award just one grant, of £400, for the year 2002. This enabled Dr Margaret Redfern, who is associated with Sheffield University, to attend the Third International Symposium on the Biology of Gall-Inducing Arthropods in Stellenbosch, South Africa, 14–18 January 2002, and to deliver a paper. I have already received a report from Dr Redfern and this will be presented to the Society next year.

Last year, the Fund supported Mr Bob Heckford, from Plymouth, in his taxonomic study of South-East Asian Gelechiidae. He worked for four weeks (from 1–30 March 2001) at the Natural History Museum, London, in association with Dr Klaus Sattler, who has provided a report on the outcome of the work. Genitalia preparations were made of key specimens to provide an overview of the South-East Asian Gelechiinae. Dr Sattler emphasized that these preparations are of an exceptionally high quality and very useful for demonstrating standards to those who make use of the Museum's gelechiid collections. As a result of Bob Heckford's work, the initial idea, that the South-East Asian Gelechiinae belonged mostly to a diverse but well-defined genus close to but clearly distinct from *Gelechia* s.str., had to be revised; the latter genus was previously believed to be exclusively Holarctic. It now seems certain that the South-East Asian species have links with *Mesogelechia* Omelko, a subgenus of *Gelechia* described from the Russian Far East. As a result, the boundary of the genus *Gelechia* has to be reassessed. It was also discovered that in the Museum's material there exist even more undescribed species than originally thought and many more genitalia preparations are required to clarify species limits.

Another recipient of an award for the previous year was Dr Sergey Sinev, from the Zoological Institute, Russian Academy of Sciences, St Petersburg. Dr Sinev used his grant to visit, last December, the Natural History Museum, London, to study material, particularly types of selected families of Microlepidoptera. Specimens examined have enabled several taxonomic problems to be resolved, and the results have been included in a large manuscript that will be published as volume 5 of the *Microlepidoptera of Europe*, which is to be published by Apollo Books by the end of 2002.

The Pelham-Clinton microscope, which has been on loan to Peter Skidmore for an extended period of time, has been returned. It is now housed at Dinton Pastures.

I am very sorry to have to report that Dr Kenneth Spencer, who was instrumental in setting up the Hering Fund, has had to retire from the Committee owing to ill health. I am sure that the Hering Committee and the Society will wish me to record our grateful thanks to Dr Spencer for his work in setting up the Fund and for being an active member of the Committee for so many years. I am very grateful to my other colleagues on the Committee for their work in assessing applications and for their advice.

Recent Publication

Puplesis, R. & Robinson, G. S. 2000. A review of the Central and South American Nepticulidae (Lepidoptera) with special reference to Belize. *Bulletin of the Natural History Society, London* (Entomology) **69**: 3–114.

Malcolm Scoble

Librarian's Report

2001 has been a year of more of the same. The journal-binding project continues, with the following titles having been processed this year: *Nachrichtenblatt der Bayerischen Entomologen*, *Nota Lepidopterologica*, *Nachrichten des Entomologischen Vereins Apollo*, *Society for the Promotion of Nature Reserves*, *The Scottish Naturalist*, *Proceedings of the Dorset Natural History and Archaeological Society*, *Entomologica Scandinavica*, *Isle of Wight Natural History and Archaeological Society*, *Seaford Naturalist*, *South Eastern Naturalist*, *The Microscope and Entomology Monthly*, *Proceedings and Transactions of the Lancashire and Cheshire Entomological Society*, *Phegea*, *Proceedings and Transactions of the Croydon Natural History and Scientific Society*, *Stuttgarter Beiträge zur Naturkunde*, *British Journal of Entomology and Natural History*.

At last I have nearly completed this project and I am pleased to report that one more batch should see the process complete. It will then be a relatively simple matter to progressively maintain the binding of the new acquisitions.

The "red rot" identified as affecting the old leather bindings on some of our journals has been, and continues to be, addressed by the careful application of a treatment compound to the leather. Titles dealt with so far include *The Entomologist*, *The Entomologist's Gazette* and *The Entomologist's Monthly Magazine*. This procedure has occupied much of my time over the past year, as treated items have been found to require four or five weeks to absorb the dressing before they can be put back on the shelves. If this period is not observed the treated leather feels "sticky" to the touch, as one member curtly pointed out, and damage may occur due to adhesion between abutting bindings. There remain many more journals and books that require attention in this respect.

I am pleased to report that new journal exchanges have been agreed with the Dutch Natural History Museum, who produce *Zoologische Mededelingen*, and the Sorby Natural History Society who produce the *Sorby Record*.

A total of 19 new books, purchased as a result of the deliberations of the last Library Committee, have arrived and are awaiting processing. These items will be available for loan by members as time allows.

I am very grateful to the estate of the late Patrick Roche who bequeathed to your society a large selection of books, including many on African Lepidoptera and Hemiptera, many journals and separates and several boxes of 35ml slides. These were

duly delivered to the Pelham-Clinton building in nine large boxes and will be processed as time allows.

You will have noticed that I have frequently used the phrase "as time allows" during this report. I have identified the software we use on our computer for maintaining the library database as a major bottleneck affecting the efficient use of my time. Currently, data entry is slow and cumbersome. Maintaining and checking the consistency of entries is hard and there is a real risk of the wrong accession numbers being assigned to new acquisitions. In addition, printing letters for the recall of overdue books and labels for new books is problematic, and producing reports of holdings for circulation to members is impossible. In order to streamline this process Peter Verdon has succeeded in transforming our current database from PC-File to an Access database. This new software will circumvent all these problems, and more besides, but its use will necessitate the upgrading of our hardware. I am pleased to report that your Council has authorised this, and consequently a new system will be installed and commissioned by Mr Verdon in the near future.

A report of my attendance at the first conference of Entomological Libraries and Information Network (ELIN) has appeared in our Journal. I hope that those who read it will appreciate the importance of this meeting for the future of entomological research, both amateur and professional. It is envisaged that further meetings of this conference will be held in the future, and that these will form the basis for a co-ordinated world-wide development of entomological library resources. I wish to thank Council for sponsoring my attendance at this event.

Lastly I would like to thank, as always, John Muggleton for sorting and logging the receipt of new journals. His help with this is greatly appreciated. My thanks are also due to Mark Telfer, John Muggleton, Roger Gaunt, Peter Verdon, Roy McCormick, Ted Wiltshire, Jim O'Connor, Peter Chandler, Jonty Denton, John Bradley, John Kramer, John Campbell, David Corke, Keith Alexander, Alan Stubbs, Laszlo Papp and Bernard Nau for their generous donations of books and journals to the library over this period.

IAN SIMS

CURATOR'S REPORT

I will first deal with the one major acquisition that we have received during the year. At the time of the last AGM I had heard that we were to receive the greater part of Maitland Emmet's collection which came to us in May. I am grateful to John Langmaid for being the contact between the Society and Maitland's family, and to Tony Harman and his son for assisting with transport of the collection to Dinton Pastures.

The microlepidoptera were of course the most significant part of the Emmet collection and have increased by some 72 species the Society's holdings of this group. This means that excluding the many dubious species asterisked in the 1986 edition of Bradley & Fletcher's list, there are now only about 115 species of British Lepidoptera of which we lack British specimens (this figure being based on the more recent 1998 Bradley list). Of the 100 "micros" that fall in this category, 28 are nepticulids so it is particularly sad from the Society's point of view that Maitland's collection of this family in which he specialised went in its entirety to the Natural History Museum, who also received his leaf-mine collection.

There were also two cabinets of British butterflies and macro moths, from which David Moore has removed about 150 specimens that usefully augment the Society's collection of these groups. We need to decide what to do with the remainder of this collection, as is also the case with most collections of British "macrolepidoptera" received by the Society, given the constraints on space. The practice has been disposal, principally via the duplicate collection available to members. There is concern about the disposal of collections, both due to loss of data and obligations to the donors. Enquiries about the fate of a collection received 30 years ago have highlighted this problem and a subcommittee of the Council has been instituted to consider the most appropriate action with collections received that are surplus to our needs.

It is also sad that the Emmet collection had suffered some attack by pests, although this was fortunately of limited extent within the cabinets themselves, mainly affecting the first and last drawers of the "micro" cabinet resulting in some losses of swifts and plumes. Both attack by *Anthrenus* and by larvae of the brown house moth (*Hofmannophila pseudospretella*), showing a degree of cannibalism, were involved. The losses due to *Anthrenus* were, however, much worse among Oriental butterflies which also came to us with the Emmet collection. These had been collected by Maitland during his service career in India during the Second World War and were in store boxes or papered; about half the store box contents had been destroyed. So that some information could be retrieved from this material, it was agreed that the specimens and data would be catalogued by Tony Harman and Roger Kemp, who are working on the papered and pinned material respectively. It has been agreed that they may retain or dispose of as they wish any specimens retrievable from this material, of which the scientific value is limited. This will, however, provide a partial record of the results of Maitland's activities in India.

In addition to the pest problems with the Emmet collection, some specimens had also succumbed to mould growth due to the collection having remained at his home during the winter after it was vacated. Unfortunately the Society did not know that the collection was coming to us until shortly before his death and no steps could be taken to conserve it in advance of receipt. It is of course always helpful if any person intending to bequeath collections to the Society can let us know of their intentions in advance.

Some limited reorganisation of the collection room was necessary to receive the Emmet collection but we are fortunate that no other collections have been received in the year as we are now once again in the position of all available space being occupied. Specimens have, however, continued to be donated by members to enhance the collections of other orders and I thank Jonty Denton, David Gibbs, Andrew Halstead, Bernard Verdcourt and others I have no doubt forgotten for these acquisitions.

No progress has been made in laying out the collections this year. The new cabinets obtained at the beginning of last year for the Hemiptera have remained empty because the new checklist has not yet appeared. It is still hoped to carry this out in the near future in order to free Hill units for the start of a new layout of the "micro" moths of which we now have four separate collections. I intend to unify these, with the Emmet and Bradford collections forming the most important part. There is also the problem of the many unnamed specimens (mostly sorted into families) from Eric Bradford's collection. Any assistance in checking these for anything of value for the collections would be appreciated. David Gibbs began the cataloguing of the genitalia slides from the Bradford collection and has provided a catalogue of the first 500 slides. Brian Gale has continued sorting of the leaf mines from this collection.

Some assistance has also been provided with determinations in other orders. Peter Barnard completed determination of the Trichoptera, Raymond Uffen has named some further aculeates and Roger Hawkins is making progress on the European Orthoptera; he has also corrected some long-standing misidentifications among the British grasshoppers. Some particular species of beetles have also been checked by Jonty Denton, Maxwell Barclay and Darren Mann.

I reported last year that preliminary sorting of the parasitic Hymenoptera had been done by David Notton and some further sorting of the Braconidae has been done by Chris Raper. While visiting us in September Mark Shaw kindly determined to species some of the Braconidae and several subfamilies of Ichneumonidae, principally the Pimplinae but also the relatively fewer numbers of Alomyiinae, Anomaloninae, Xoridinae, Collyriinae and Stilbopinae.

Mark's visit was for the collection managers' meeting, which was as predicted hosted by the Society. Despite some difficulty in finding accommodation to everyone's liking and budget in the Reading area (involving some 50 phone calls to hotels and guest houses) this was eventually overcome and the meeting was attended by representatives of eight of the nine British and Irish museums included in the group. Six of the party attended the dinner on the eve of the meeting, which was held at the Wheelwrights' Arms situated conveniently almost opposite the entrance to Dinton Pastures. This was enjoyed by all and I thank Ian Sims for this recommendation.

The opportunity was taken by those attending to view the Society's collections and library. Remarkably, only one of the visitors had been to our building before. We hope that some will come again. The matters covered at the meeting followed the same format as the 2000 meeting in Belfast. The vulnerability of our building to infestation from incoming collections was one of the issues discussed. The practice of several museums of freezing future acquisitions will be considered, but intrusion directly from outside and in material brought in on open days and workshops means that we are always open to reinfestation. Recent checks have shown no current evidence. I again raised the point that the Society has in recent years specified no tropical hardwoods in the construction of cabinets purchased from Stephenson Blake, while traditional mahogany still predominates in their sales to museums. This time there was some result as I have since been contacted by the Company, to inform me that they will in future include the availability of cabinets without tropical hardwoods in their advertising literature. I don't know if this action has yet been taken by them.

Although we have again had a year free of small intruders triggering our alarm system, two species not previously recorded in our building have occurred. On two days in July, single individuals of the rust-red or flat grain beetle *Cryptolestes ferrugineus*, which flies actively, were observed to alight on tables. I thank Jonty Denton for confirming the specific identification. The usual food of this species may suggest an origin from crumbs dropped from sandwiches consumed in the building but the means of access is unknown. Then in November when I was about to leave after the door had been left open for a short time I heard some rustling behind the cabinets by a window. On investigation a specimen of *Erithacus rubecula* (a robin to mere entomologists) was discovered. This was captured in a teacloth and released unharmed outside, thus avoiding any subsequent police activity at the building. As it is a protected species it was not practicable to add it to our collections.

My involvement in alarms and air conditioning will thankfully now be reduced following my move to Wiltshire but I still hope to attend most open days and workshops.

PETER CHANDLER

Editor's Report

Publication dates for Volume 14 were March, July, October 2001 and March 2002. The unfortunate slippage in the last part of the year was due to computer problems at the typesetter before the Christmas break, which delayed the final production just after. Sufficient material was available to sustain the total page number of 256 (average 64 pages per issue) but Part 3 was 56 pages and Part 4 was 72 pages. Unfortunately no Annual Index was published for 2000 (Vol. 13), David Young having decided that he was unable to continue with its compilation. If anyone wishes to assist in indexing Council would be very pleased to hear from them.

The year reflected the usual mix of reports of Society Indoor and Field meetings, the Annual Exhibition report and Officers reports, original articles and short communications. Volume 14 included 19 articles (3 more than in 2000) and 10 short communications (9 fewer than in 2000). There were 4 articles on Lepidoptera, 3 on Hymenoptera, 5 on Diptera, 2 on Coleoptera, 1 on Acari, and 1 on Orthoptera (a species of oak-bush cricket new to Britain no less!) Yet again I am pleased to see the results of so much effective fieldwork reflected in the pages of the Journal. Significant numbers of pages were devoted to the obituaries of three prominent Members, Maitland Emmet, Bob Craske and Laurie Christie, who died during 2001 and a bibliography also included for Maitland Emmet, which is a trend I would like to encourage.

This report has become rather more than just the annual report for 2001, for during the year I decided it was time to try find a successor as Journal Editor. I am pleased to say that John Badmin has offered to take over as editor and the transfer will take place during summer 2002. Here though, I have taken the opportunity to analyse the published output in the Journal over the past 5 years. Having recently questioned (14:4) where the Lepidoptera papers were—(responding to a verbal comment) I was interested to see what exactly we do publish each year in terms of the number of pages on each Order and other topics. In most cases it was relatively easy to assign articles and short communications to the various Orders. Only in a few cases are they 'mixed'. I decided to keep "Proceedings and Transactions" as a separate category. The activities reflected under this heading such as Field Meeting reports, Council reports etc more or less occupy the same number of pages each year. The Annual Exhibition report had started to get larger but has become more concise for 2000. I did not assign the coverage to different Orders separately—I will leave long term analysis of the exhibition to others if they wish! What is clear though is that just under 40% of the published pages each year are devoted to formal recording of activities of the Society. That seems reasonable enough to me but it will for Council to decide if that balance is acceptable. Of course if the number of pages devoted to these activities becomes greater (for whatever reason) and the total size of the Journal remains at 256 pages then space devoted to original studies becomes squeezed—this also affects the speed of publication.

On average 60% of the Journal is available for articles and short communications. Over 5 years by far most pages have been occupied by Diptera studies. This is merely a reflection of a highly-motivated, well-organised group of very active Diptera workers! Over the same 5 years British Lepidoptera studies tied with Hymenoptera, followed by Foreign Lepidoptera. Coleoptera papers lagged well behind, followed by Hemiptera. I can now seen that I should have been asking about the absence of Coleoptera papers and not Lepidoptera! The importance of these figures (if they are important) is if the published pages reflect the interests of the membership. I could have compared the published pages against the proportions of the different

Analysis of Journal content 1997–2001

Journal Content	Vol. 10 1997 pages (%)	Vol. 11 1998 pages (%)	Vol. 12 1999 pages (%)	Vol. 13 2000 pages (%)	Vol. 14 2001 pages (%)	5 year average %
Diptera	26 (10)	26 (14)	28.5 (11)	59 (23)	44 (17)	15
Coleoptera	7 (3)	14 (8)	11.5 (5)	15 (6)	4.5 (2)	5
British Lepidoptera	15.5 (6)	33 (18)	18 (7)	29.5 (11)	10.5 (4)	9
Foreign Lepidoptera	41.5 (16)	2.5 (1)	19.5 (8)	4 (1)	29 (11)	7
Hymenoptera	19 (7)	10.5 (6)	31 (13)	35 (14)	16.5 (6)	9
Hemiptera	12.5 (5)	2.5 (1)	12.5 (5)	7.5 (3)	5.5 (2)	3
Orthoptera	—	—	—	11 (4)	6.5 (3)	1
Spiders/Acari	—	0.5 (0.03)	—	3 (1)	4.5 (2)	<1
Isopoda		2.5 (1)	—	0.5 (0.02)	—	<1
"Mixed"		2 (1)	20 (8)		1.5 (0.05)	2
"Conservation"		16 (9)	9 (4)	—	—	3
"Legislation"		—	—	—	2.5 (1)	<1
Techniques	2 (0.08)				12 (4)	<1
Proc & Transactions						
Council reports	14 (5)	14.5 (8)	16 (6)	18 (7)	16 (6)	6
Field meetings	27 (10)	16.5 (9)	10 (4)	11 (4)	11 (4)	6
Annual Exhibition	38 (15)	35 (19)	45 (18)	45 (18)	35 (14)	17
Indoor meetings	26 (10)	4 (2)	15.5 (6)	6 (2)	14 (5)	5
Obituaries	5 (2)	2 (1)	—	2 (1)	21.5 (8)	2
Book reviews	18 (7)	6 (3)	10 (4)	4.5 (2)	4 (2)	4
Letters	1	—	—	—	2 (1)	<1
Total Proc. & Trans.	119 (46)	78 (42)	86.5 (35)	86.5 (34)	103.5 (40)	39
Total pages in year	256	184	248	256	256	

invertebrates in the UK, or the interests of the membership. However, we can only publish what is received but still encourage everyone to submit articles and short communications or at the very least to exhibit material and prepare notes on these exhibits.

I take this opportunity to thank all those who have assisted in so many ways over the past 5 years in reviewing papers, in the writing of the Annual Exhibition reports and to proof reading (especially to Roger Hawkins and Raymond Uffen) as well as other aspects that help the production. I wish John Badmin every success in editing the Journal over the next few years!

MIKE WILSON

THE 2001 PRESIDENTIAL ADDRESS—PART 1—REPORT

RICHARD A. JONES

135 Friern Road, East Dulwich, London SE22 0AZ.

Before I sat down to write this part of my address, I had a quick flick through what some past presidents had written in theirs. There is a formula. Tradition dictates that

I should praise the other officers, council and members who do all the work of the society, while I sit resplendent in the president's chair and look on. Without hesitation I continue that tradition and thank them too, for without their selfless hard work and enthusiasm, the society would soon grind to a halt. 'Quiet efficiency' is a phrase that regularly pops up in presidential addresses to describe the council machinery. The efficiency I certainly concur with, but many council members can be quite noisy, especially at the height of an exciting council meeting. I won't go so far as one of my predecessors and claim that John Muggleton is 'unobtrusive'; I'm not sure, but I think that might be regarded as damning him with faint praise!

Seriously though, it is fitting at this meeting to consider some of the monuments of the society's last year and in particular to pay tribute to some of the people behind them. *British soldierflies and their allies* is such a monument and its publication stands this society in exceptionally good stead. Alan Stubbs and Martin Drake have produced a remarkable identification guide, all the more remarkable because of the colour photos by David Wilson. Ian McLean and other members of the publications committee put a lot of work into pushing this important project through several years of preparation.

Another very important, but perhaps less tangible monument was the rewriting of what will now be 'A code of conduct for collecting insects and other invertebrates'. What was previously a negative, down-beat and proscriptive document is now a very positive statement of the importance of collecting specimens. As well as urging restraint in some quarters, it also emphasizes 'best practice' to ensure collections are well-constructed and well-maintained for future scientific benefit. The code will shortly be published in full in the society's journal. John Phillips and David Lonsdale were the co-ordinators and editors when it came to incorporating the many changes and agreeing its content with the other interested parties who were involved through Invertebrate Link (Joint Committee for the Conservation of British Invertebrates).

The 2001 Annual Exhibition, as ever the Society's major event, had a new component this year—the memorial address in honour of Maitland Emmet. David Agassiz and Basil Harley delivered moving tributes to one of this society's most distinguished members. The memorial was held in the presence of Maitland's sister and other close relatives who had travelled down to London for the day. After the short speeches several people came up to me during the rest of the day and said how glad they were to have been present for the occasion. It also gave the opportunity to announce a generous gift to the society of £22,500 from Maitland's family in his memory. At the family's request this has been incorporated into the society's research fund, which will in future be called the Maitland Emmet BENHS Research Fund.

These monuments of the past year were all major events for the society, but it is the mundane, seemingly insignificant events that really make this society what it is. The machinery of organizing the society purrs gently and, on the whole, we need never know that it is happening unless something goes wrong. During my year as president, I don't think anything has gone wrong. The burden of this bureaucracy is borne by the various officers and council members, but unfortunately it is increasing each year as the society becomes more complex and more active and as charity law becomes more complicated. I can only hope that officers and council continue to find the strength to keep this society afloat.

At the close of the society's year, the other tradition of the president's report is to remember the members lost to the society. Eight deaths were reported during my year as president.

Don Goddard died in June 2000, but the society did not learn of his death until 2001. During the early 1970s he worked on the British Antarctic Survey as an invertebrate ecologist studying soil mites. After returning to Britain he joined Worcester College of Higher Education and eventually became Head of the Biology Department. Don joined the society in 1969 and although he had wide interests in natural history he concentrated particularly on the Coleoptera.

Ernest Barnett died on 13 March 2001. Although he only joined the society in 1999, he had a long-time interest in butterflies and moths. Unfortunately he had to give up entomology when he married since, apparently, his wife could not endure any close association with creepy-crawlies. But a short while ago he met Ray Softly when on holiday in Swanage and his interest was rekindled enough to join the society. It is touching that when informing Ray of her husband's death Mrs Barnett was able to thank him for stimulating Ernest's interest anew.

Bob Craske died on 4 May 2001. He was a well-known and long-standing member of the society, a special life member in fact, having joined in 1937. He was a lepidopterist of the 'old school', a collector of butterfly aberrations from the woods and downs of Sussex. He particularly sought forms of the chalkhill blue and the pearl-bordered and small pearl-bordered fritillaries and a form of the marbled white, ab *craskei* Tubbs is named for him. He was the last of a line of a family of collectors, which began with his great-grandfather in the 1840s. I first met him on the South Downs above Brighton or Lewes, in about 1970 when I was a boy of about 12. And later I remember him as a regular and prominent character at the society's annual exhibitions. In addition to a formal obituary, we have, from his son, a charming memoir for the society's journal. In it he recounts how, when out on the South Downs his father insisted that they hide their nets, and on one occasion lie full length on the hill, whenever a Lewes–Eastbourne train went by in case they were spotted by one of his 'competitors'.

Bernard Jones died on 11 September 2001. He lived in East Sussex and was interested in Lepidoptera. He joined the society in 1997.

Don Russwurm died on 15 December 2001, just a few days after learning that, having been a member for 50 years, he had been elected a special life member of the society. He was well known as an illustrator of butterflies, having contributed to South's *British butterflies*, Howarth's *Colour identification guide to butterflies of the British Isles* and *The observer's book of British butterflies*, and Harmer's *Variation in British butterflies*. He also wrote and illustrated his own book: *Aberrations of British butterflies*. He contributed numerous articles and several plates of illustrations to the society's journal, mostly in the 1970s, and his butterfly aberrations often featured in the colour plates from annual exhibitions of the period.

Dougie Sterling died on 24 December 2001. I first met him when I joined the council of the Society in the early 1980s. I was the youngest and most junior officer of the Society, having had the quaint title of 'Lanternist' bestowed upon me, whilst Dougie was the Treasurer, one of the most senior officers about whom the Society revolved. It is one of the most important features of a society such as ours that people from completely different places, different backgrounds, and different ages get to meet to enjoy a common interest. Even as a fresh-faced 20-something-year-old, feeling rather daunted by the machinations of a learned society, I well remember Dougie for his friendly warmth and kindness to a nervous youngster.

Richard Fairclough died on 2 January 2002. He was a well-respected entomologist and a past president and special life member of this society. He studied both macro- and micro-lepidoptera and was an acknowledged national expert on *Acleris cristana*. He bred thousands of this moth and had a collection of about 100 different named forms.

Laurie Christie died on 2 May 2001. He was a well-known and well-loved member of the society, having joined in 1945. I think I must have first met Laurie in the mid-1960s when, as a boy, I accompanied my father to the Amateur Entomologist's Society exhibition each year in London. Laurie became a family friend after he visited Newhaven, where my father lives, looking for various 'beasts' on the under-cliff there. He was ever the bustling enthusiastic man, always with some snippet of useful information or an amusing anecdote. One of the prizes in my library is a copy of Norman Joy's *A practical handbook of British beetles*. It had belonged to the late Freddie Buck, past editor and president of this society. Knowing of my growing interest in beetles, Laurie offered the book to me when it came into his hands and I snapped it up. At the AES exhibition in 1975 it cost me £30, a princely sum for a 17-year-old, that I had laboriously saved from my meagre earnings at an after-school job in a local supermarket. It was heavily annotated by Buck, with notes of generic revisions, name changes and new species and later it was one of the major stimulants behind the book on *New British beetles* that Peter Hodge and I wrote. The book is still one of my most treasured possessions. It was also Laurie who suggested, 26 years ago now, that I join the BENHS and, as was the stilted formality of those days, he was my 'proposer' on the application form. I hope I have done his nomination justice.

We have already stood in silent memory of these men at previous meetings, so I will not ask you to stand again now.

It was a great honour and privilege to be asked to be president of this exceedingly auspicious society. The blurb describing the society on its website and in its publications proudly proclaims 'Britain's leading field entomological organization'. Rightly so, I believe. For although there are other entomological societies in Britain, with greater membership, greater financial turn-over, higher public and media profile, this is the society that really promotes the first-hand scientific study of insects.

When I first attended meetings of this society, field entomology, actually going out and collecting insects, was still regarded my many as a mild eccentricity, practised by a few gentlemen of leisure. But things have changed. At the beginning of the 21st century, an interest in the environment is no longer just the preserve of a few naturalists, ecologists or conservationists. There used to be a feeling that anyone who was interested in or spoke out about the countryside must be some sort of fanatic—a twitcher, an eco-warrior or a dusty academic. Nowadays everyone has an interest in the environment—it is almost politically incorrect not to have one. I feel very proud to be part of this society as it continues to take a major role in leading and guiding that interest.

SHORT COMMUNICATION

Is the leafhopper *Platymetopius undatus* (Hemiptera, Cicadellidae) extinct in Britain? Most leafhoppers are fairly insignificant looking insects and only relatively few species are noticed by non-specialists in the group. However, the striking brown and yellow leafhopper *Platymetopius undatus* (DeGeer) (Fig. 1) could not easily be mistaken for anything else. Curiously, it does not seem to have been found for around 50 years, even though it was formerly known from a wide scatter of localities across southern Britain (Fig. 2).

There are around 50 *Platymetopius* species known in the Palaearctic but *P. undatus* is one of the few species that occur in northern latitudes. The habitat requirements of the species remain obscure (Kirby, P. 1992. *A Review of the Scarce and Threatened Hemiptera of Great Britain*. JNCC). Host plant associations are generally poorly documented. Early British records refer to specimens caught off trees such as oak and sallow, but also from lower vegetation such as bracken. It is possible that it is one of a number of species in which the nymphs emerge and feed on low-growing herbaceous vegetation but the adults migrate up into trees where they tend to elude collectors. Most records are from woodland habitats, often in open clearings. Adults have been recorded from June to September.

It would be strange if such a distinctive species had been consistently overlooked for such a long time, suggesting that perhaps it has gone extinct in Britain. However, there are no obvious reasons why this should have happened, since neither the habitat nor the putative host plants are rare. We would very much like to learn of any records that readers might have, especially of recently-found specimens, although all records would be welcomed. Contact: Dr A. J. A. STEWART, School of Biological Sciences, University of Sussex, Falmer, Brighton, Sussex BN1 9QG, UK or Dr M. R. WILSON, Dept of Biodiversity & Systematic Biology, National Museums & Galleries of Wales, Cardiff CF10 3NP, UK.

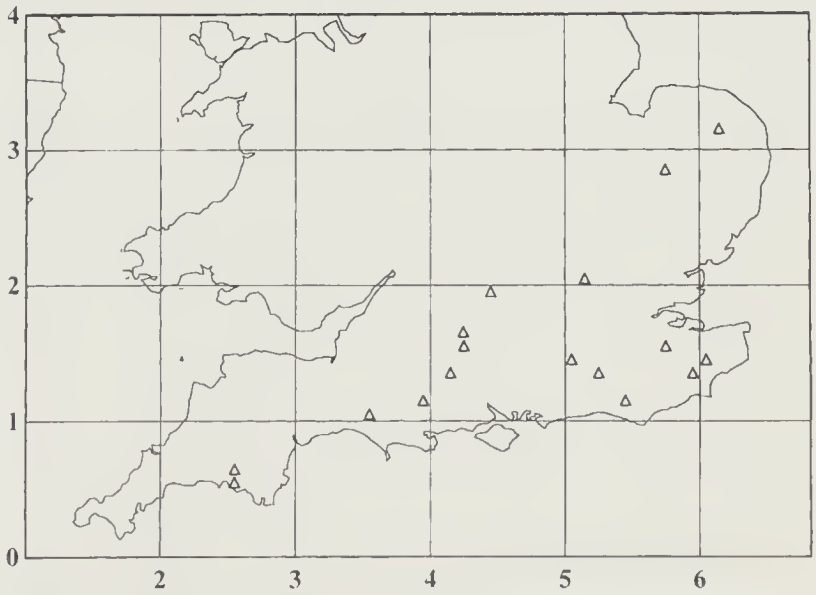


Figure 2 10-km square distribution based on data in Auchenorrhyncha Recording Scheme. All records are pre-1960.

Figure 1 *Platymetopius undatus* (Hemiptera, Cicadellidae) body 5–8 mm in length.

BOOK REVIEW

Provisional atlas of British hoverflies (Diptera, Syrphidae), by Stuart G. Ball and Roger K. A. Morris, soft cover, 167 pp., ISBN 1-870393-54-6. Published by Centre for Ecology and Hydrology (CEH) (Biological Records Centre), Monks Wood, Abbots Ripton, Huntingdon PE28 2LS. Price £8 inclusive of postage.

This work presents and summarises over twenty years' recording effort which has produced a database of almost 350,000 individual hoverfly records. The information has been drawn, somewhat unevenly, from some 82.5% of the 2862 10-km national grid squares covering Great Britain. In future years other authors will (one hopes) quarry the database for new insights into syrphid distribution, phenology and ecology but this, as the first analysis of the records, will have by far the widest general circulation.

The book opens with a brief account of the development of the recording scheme from its launch in 1976 to the publication cut-off date of June 1999. There follows a comment on the degree of coverage achieved in recording over Britain as a whole with two maps highlighting the under-recorded areas. An interesting 6½ pages on the status of selected species of hoverfly in Britain (and Ireland) ends with a tabulation of 119 species which are classed as endangered, vulnerable, rare or notable, and/or considered (Stubbs, 1982) to be "primary woodland indicators".

The main section of the book deals with 272 species or species aggregates, presenting data on two taxa in column format on each A4 page. For each taxon an outline map of Britain is printed on which all appropriate records have been plotted as dots on a 10-km grid. Below the maps histograms chart the numbers of records of adult flies in each standard two-week recording period between 11 February and 3 November. Below this again appear brief accounts of each species' biology and of its distribution throughout England, Wales, Scotland and the Isle of Man. At the end of the book follow acknowledgements to the army of dipterists (more than 1200 in number) whose records have been used in the recording scheme; then comes a select bibliography and finally a species index.

The book is cleanly printed on a smooth but non-glossy paper. The twin column layout is attractive and there appear to be few typographical errors (although one wonders why two columns in the tabulation on pp. 10–11 have been left completely blank). The A4 format is a pain to those of us with bookshelves of restricted height, but is uniform with other CEH distribution atlases. Although the so-called "perfect" binding is likely to deteriorate with time and use, it certainly makes the work more affordable to a wide public than would a conventional sewn binding; in any case, before the book has disintegrated completely it will (one hopes) have been superseded by something even better—this is a provisional atlas only!

The introductory pages do not adequately illustrate the great disparity in coverage from one area to another. The map in figure 2 (showing numbers of species recorded in each 10-km square) would have been better keyed logarithmically rather than linearly, and a further map plotting the total number of records from each grid square—again on a logarithmic basis—would have been of great service. The authors cannot be faulted for weaknesses in the database that they are trying to analyse; entomologists (including the present writer) who have been too idle to submit their records during the past 20 years have only themselves to blame if they get a partial and sometimes confusing picture of syrphid distribution as a result. The authors should, however, have put greater emphasis on the limitations of available knowledge and of the conclusions which can be drawn from it.

In the main section of the book the printed maps are on the rather small scale of about 1:10,000,000, which leaves little scope for imaginative cartography. Records pre-1960, 1960–79 and 1980 onwards are differentiated but otherwise there are no elaborations. It would be churlish to complain because Messrs. Ball and Morris have stuck with the old, well-tried format for their maps; the pitfalls of dot mapping have racked the brains of naturalists for years and no-one has yet devised an economic means to distinguish between a dot denoting a single insect found at a single locality on one isolated occasion and a dot denoting numerous discrete colonies of insects (within a single grid square) recorded over many years. The authors have, however, made very little effort to relate their mapped data to physical, climatic or geological variation across the mapped terrain. One could hope that the CEH, as publishers of numerous distribution atlases, might produce a set of standard transparent overlays to help with the interpretation of all its maps. Overlays could show political and natural biological region boundaries, altitude, seasonal temperatures, rainfall, insolation, land use, surface geology etc.—the possibilities are almost endless.

The phenological histograms concisely and clearly summarise available information on syrphid flight dates, but it would have been helpful if certain basic statistical information could have been added for each species—total number of records; total number of occupied grid squares; possibly the total number of discrete sites. For a few of the commonest and most widespread species separate histograms might have been drawn for southern and northern England, Wales and Scotland to illustrate possible changes in life history with geographical location. This would have highlighted any tendencies towards multivoltinism, seen in any case quite clearly in the plots for certain species such as *Cheilosia bergenstammi*, but only ambiguously shown in the histograms for (say) *Melanostoma scalare* or *Eupeodes luniger* because of the merging of data from across the whole of Britain.

The summary accounts of species' biology and distribution are admirable. As with almost all such synopses there are occasional ambiguities in the use of the term "widespread"—which the authors employ to qualify distribution on both a local and national scale.

For hoverfly enthusiasts the question after publication of this atlas must be "Whither now?" Messrs. Ball and Morris have completed an heroic task in writing the book (and now, surely, deserve a break from the minutiae of record-processing and proof-reading) but this cannot be the end for the recording scheme. From considerable areas of Britain (not to mention Ireland) scarcely any records have been received—from populous and accessible districts, too, not merely from remote moorlands on the Celtic fringe. These areas, now that they are identified, need to be surveyed properly. In the heartlands of syrphid recording—Surrey, South Yorkshire, Peterborough and Somerset, for instance—the future tasks may be to monitor changes in species distribution over time and to investigate year-on-year population fluctuations. Further studies using survey data already compiled may, as the reviewer has tried to suggest, provide novel insights into hoverfly biology, ecology and life history. All this requires that the recording scheme is not sealed down but kept going actively to serve the fresh enthusiasm which this atlas will certainly engender. Perhaps it would be appropriate to start planning now for a second (enhanced) provisional atlas of British hoverflies to be published in 10 years' time?

GAVIN BOYD

BOOK REVIEW

The changing wildlife of Great Britain and Ireland, edited by David L. Hawksworth. Taylor & Francis, 2001, xvi+454 pages, £150.—This is but a bit of a book. And as such it is a real missed opportunity for biological science. What could have been one of the most important natural history books of the year turns out to be an expensive mistake.

Twenty-five years ago, *The changing flora and fauna of Britain* was published (1974). Also edited by Hawksworth, it reported on the 'recent' changes to British wildlife, often brought about by human action. There has always been a fascination with the new—the newly arrived, the newly discovered, the newly invaded—and monitoring spread and change has been a major strength of the field entomologist, witnessing these changes as they occur. Recognizing the importance of a quarter-century gap, the Linnean Society of London sought to organize a 2-day conference to re-examine the continuing changes at the cusp of the new millennium. But they failed to market the event and decided to cancel because of lack of interest. Instead, potential lecturers were invited to contribute a chapter to a book—the proceedings of a conference that never was. This fact is never, as far as I can discern, ever admitted anywhere in the present book.

The book duly appeared, and the chapters it includes are excellent. They make fascinating reading, they are beautifully produced and they intrigue with the potential of further work. Even now I look forward to the next study in 2026. But I am rather disappointed by the major gaps in this book. Although there are superb chapters on many groups, including, amongst the invertebrates, the Diptera (A. E. Stubbs), Hemiptera (P. Kirby *et al.*), Lepidoptera (R. Fox), Orthoptera (J. A. Marshall), Odonata (S. J. Brooks) and Mollusca (R. A. D. Cameron & I. J. Killeen), there are huge gaps. Where are the chapters on Coleoptera, Hymenoptera and Arachnida? These are three of the greatest orders of British invertebrates, but we will never know how they fared at the end of the 20th century.

The publishers are more than partly to blame for the shortcomings of the book. They failed to produce a decent species index, they failed to fill the important editorial gaps mentioned above and they failed to formulate a reasonable price for the book. Unfortunately, hardly anyone will pay the £150 price tag for this book. Some reference libraries will buy it and bury it on their reference shelves. So at least it will be available to a privileged few. What a waste.

RICHARD A. JONES

British Entomological and Natural History Society

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