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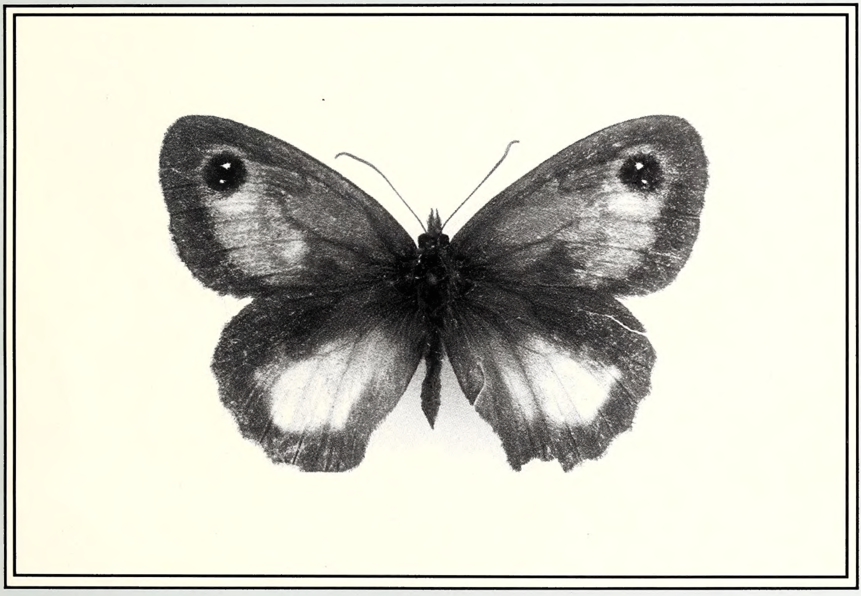

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Cover photograph: *Pyronia tithonus* L., male, upperside, Chilworth, Hampshire, 2003. Photo: L. Winokur.

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A STUDY OF THE WOOD ANT *FORMICA LUGUBRIS* ZETTERSTEDT (HYMENOPTERA: FORMICIDAE) IN ASHNESS WOODS, BORROWDALE, CUMBRIA, ENGLAND IN 2001 AND 2003

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ABSTRACT

A survey in 2001 of 198 *Formica lugubris* nests in a partly coniferised broadleaf woodland in Ashness Woods, Borrowdale, is described, with some additional work in 2003. Nests were found to be most commonly up to 1 m in diameter, but a wide range of sizes up to 9 m was recorded, the latter being much larger than the maximum found for *Formica rufa* L. in north west England. The density of nests was estimated at 5.7 per ha which is higher than had been found for *F. rufa* but was judged to be typical for an established population. The use of oak and conifers as forage trees was found to be about equal; birch was another important tree, but ash and hazel were little used; they probably avoided these trees. The nest sites were not found to be associated with particular tree species. It is noted that, unlike the Duddon valley where *F. lugubris* is widespread, the Ashness population is confined to two discrete groups which only occupy a small part of the available woodland. It is suggested that this ant has only been established in the Ashness Woods relatively recently and the possibility that it may have been introduced is considered. Implications of current management for the ant's conservation are considered and concluded to be beneficial.

INTRODUCTION

Formica lugubris Zetterstedt, the 'northern hairy wood ant', is an upland relative of *Formica rufa* L., the 'southern red wood ant'. In Europe it is found from Scandinavia in the north to Bulgaria and Italy in the south, and eastwards through France and Germany to Russia. In Britain it occurs in mainly upland situations in Scotland and North Wales, and in England in the Pennines, Northumbria, North Yorkshire Moors and Cumbria. Figure 1 shows its distribution as mapped by the Bees, Wasps and Ants Recording Society in 2002 (Edwards & Telfer, 2002). In Cumbria it is confined to the Lake District valleys of Borrowdale and the Duddon – figure 2 shows its distribution by tetrads and illustrates the separation of the northern population in Borrowdale (the subject of this study) from the much more extensive population in the Duddon Valley. Physically, it is only distinguished from *F. rufa* by the presence of minute hairs between the facets of its eyes and on the head and prothorax, but it is quite different in its colony structure and ecology. *Formica rufa* typically inhabits single nests (i.e. is monodomous) whereas *F. lugubris* colonies usually have a group of interconnected satellite nests around the main nest (polydomous). Many of the individual nests are small, but some very large nests are also formed. *Formica lugubris* is an upland species; in Europe it occurs in montane situations, up to and above the treeline (C.A. Collingwood, pers. comm., N.A.R. obs.). The fact that it occurs in the Lake District, in places with nearly the highest rainfall in England, shows that it is tolerant of extremely wet conditions. In contrast, *F. rufa* is a lowland species. The northern limit of its range in England is now along the southern edge of Cumbria in the Arnside-Silverdale Area of Outstanding Natural

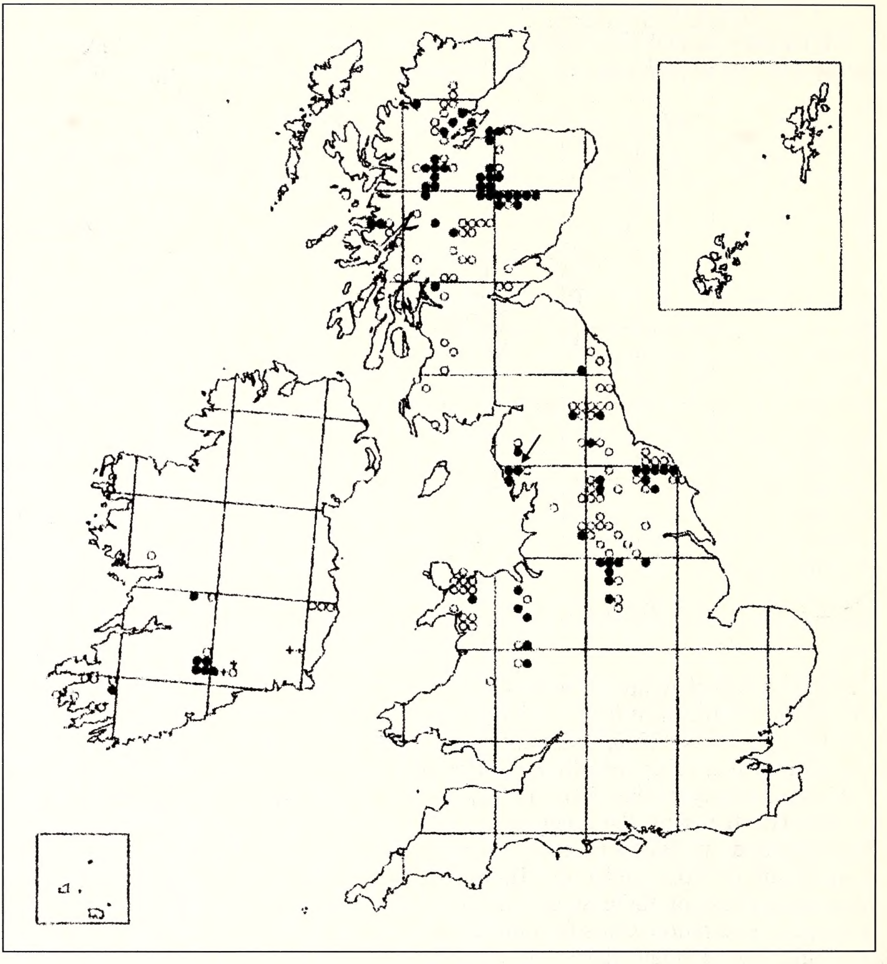

Fig. 1. Distribution of *Formica lugubris* in Britain by 10-km squares. +, before 1900; open circles, 1900–1969; closed circles, 1970–March 2002. Arrow indicates study region.

Beauty (Robinson, 2001) so the ranges of these two species do not overlap in the county.

In 2001, Jessica Woodgate carried out a survey of *F. lugubris* nests in the parts of the Ashness Woods owned by the Trust (Woodgate, 2001). In 2003 some further work was carried out (N.A.R.) recording nests outside the Trust property so that the study could report on the whole population.

The woodland

The woodlands which are the subject of this study are known by a variety of names. For the purposes of this account they are referred to as Ashness Woods, the

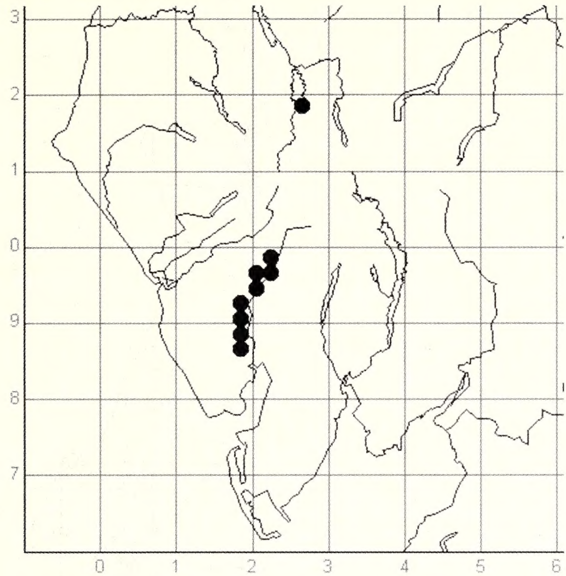

Fig. 2. Distribution of *Formica lugubris* in south-west Cumbria mapped by tetrads.

name by which they are most popularly known by their association with Ashness Bridge, one of the most famous viewpoints in the Lake District. They are located in O S 1 km square NY2010, in the ravine of Watendlath Beck, in the mouth of a classic glacial hanging valley overlooking Derwentwater. They constitute the northern c. 35 ha extremity of the 370 ha Lodore-Troutdale Site of Special Scientific Interest (SSSI). Together with the other SSSIs in the Borrowdale Woodland complex, and Scales Wood at Buttermere, it is proposed as a candidate Special Area of Conservation (SAC) under the Habitats Directive of the European Union. The primary interest of these sites is their extensive Atlantic sessile oak woodlands (National Vegetation Classification W17). They lie on rocks of the Borrowdale Volcanics and Skiddaw Slates. These produce mainly acid soils on which sessile oak *Quercus petraea* (Matt.) Liebl. is the dominant tree, with varying amounts of birch *Betula spp.* and rowan *Sorbus aucuparia* L., under which wavy hair-grass *Deschampsia flexuosa* (L.) Trin., bilberry *Vaccinium myrtillus* L. and bracken *Pteridium aquilinum* (L.) Kuhn predominate, with a rich bryophyte flora.

The part of the site owned by the National Trust lies in the altitudinal range of c. 140–250 m OD. Although predominantly sessile oak woodland, parts have been considerably modified through past management by the introduction of beech *Fagus sylvatica* L., sycamore *Acer pseudoplatanus* L., horse chestnut *Aesculus hippocastanum* L. and conifers: pine *Pinus sylvestris* L., spruce *Picea* sp. and larch *Larix decidua* Mill. – the latter in some places as solid plantations, elsewhere as underplanting. Current management by the National Trust has seen the enclosure of some areas in order to reduce sheep grazing and to encourage natural regeneration of native broadleaves, and the progressive removal of non-native species. The Trust hopes to have removed all of the planted conifers by 2005. Management will then follow the lines of limited intervention.

Methods

The 2001 Survey

The aims of the survey were to try to find out more about the ecology of the ants, how they were influenced by the surrounding woodland and why in particular the ants were in Ashness Woods, as their population appeared to be restricted to this woodland.

An area of about 35 ha (Fig. 3) was covered by means of transects walked north–south at 20 m intervals, recording 10 m on each side. To assist the survey the woodland was divided into named units and the following recorded:

i) Location – i.e. name of woodland unit.
ii) The length of the longest axis (i.e. maximum width of base) of the main nest.
iii) The height of the nest mound.
iv) The nearest four tree species.
v) Whether the nest was active (judged to be active if ants were seen moving around on the surface).
vi) Which tree species the ants were utilising.
vii) Ten figure grid reference (from a hand-held Global Positioning Satellite receiver). Because it was not possible to differentiate GPS readings for the individual nests in a group, only one grid reference, the main nest, was noted for each colony. These were used to map the locations of the colonies.

The 2003 Survey

On 14 March, a survey was carried out (N.A.R. with David Thomason) to find whether the population extended into the woodlands outside the National Trust boundary. Seven nests were found outside the foot of the wall of Mossmire Coppice but it was judged that these were satellites of nests which had been mapped previously inside the Coppice. A total of 14 large nests were found on Shepherds Crag, seven on the east side right on the lip of the ravine, and seven nests on the west side on less sheer slopes. With the addition of two nests not previously recorded on the Trust property, this raised the total number of nests to 214, but it confirmed that the bulk of the population was on the Trust property and that the the Trust survey was representative of it.

Results and Discussion

Size and distribution of the populations

During the survey in 2001 the locations of 198 colonies (i.e. ‘main’ nests, not satellites) of *F. lugubris* were accurately mapped by GPS (Woodgate, op. cit).They were situated in two discrete populations, separated by a distance of about 600 m. The lower one extended from the bottom of the woodland uphill to Ashness Bridge, where there were nests beside the adjacent car park. After a gap of about 600 m, the other, larger, population began close to the car parks for Surprise View, an equally famous viewpoint, and extended through the woods on both sides of the road to the limit of the woodland on the east and onto Shepherds Crag on the west. The fact that the two populations were separated and so limited in extent is a point of interest which is considered in more detail below. C.A. Collingwood recalls having seen a single *F. lugubris* nest in 1973 in Great Wood at NY272214, c. 1.5 km to north, but no nests are present there now.

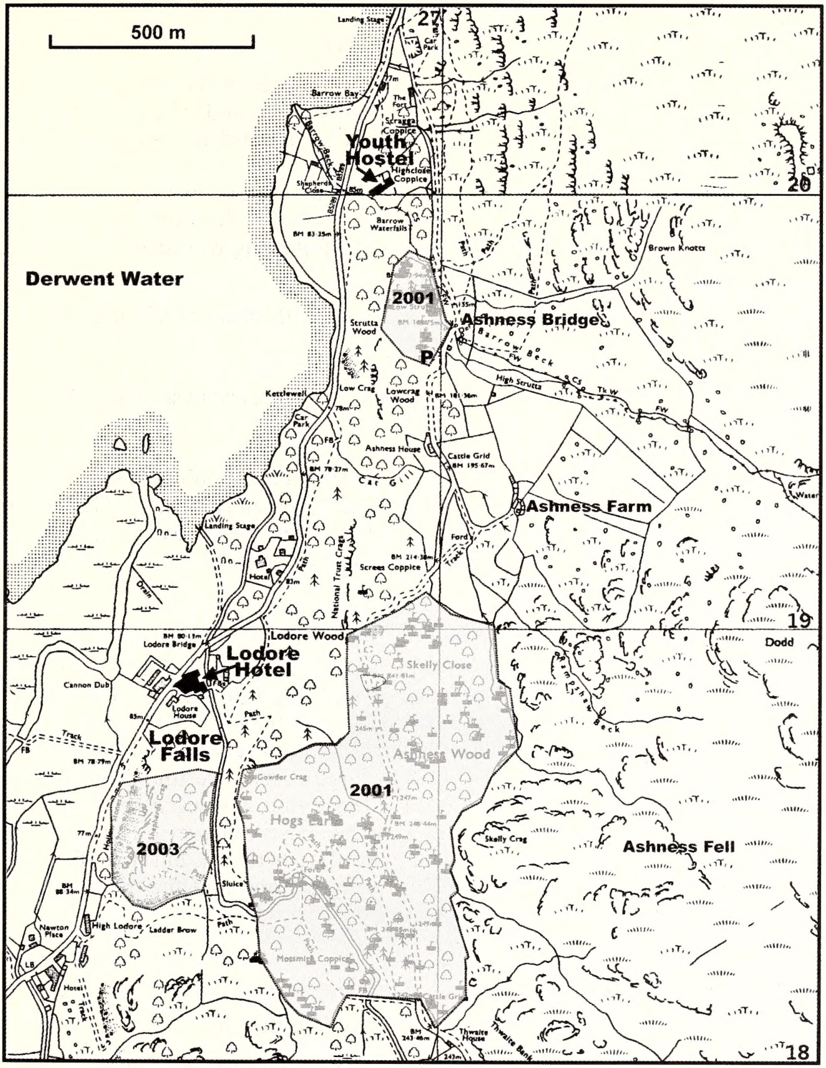

Fig. 3. Areas in which *Formica lugubris* nests were recorded in 2001 and 2003.

Size range of nests

Nests frequently had as many as six small satellites within about a 5 m radius. The largest nest in each group was measured (height and 'length' i.e. maximum basal diameter). Ninety-five per cent of the nests which were examined were found to be active. Table 1 shows the size class distribution of maximum basal widths of 196 nests. This demonstrates the predominance, even among 'main' nests, of those in the 0–1 m class, but some very large nests of *F. lugubris* were also present, with 19 (9.7%) exceeding the largest base dimension of 5 m observed for *F. rufa* in the Arnside-

Table 1. Distribution of *Formica lugubris* nests by basal diameter classes

	Nest diameter (m) ($n = 196$)								
	0–1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9
No. of nests	66	42	35	18	16	9	8	1	1

Table 2. Distribution of *Formica lugubris* nests by height classes

	Nest height (m) ($n = 195$)					
	0–0.5	0.6–1	1.1–1.5	1.6–2	2.1–2.5	2.6–3
No. of nests	56	57	54	16	11	1

Silverdale AONB (N.A.R. obs.). It was noted that these larger nests tended to be situated high up on rocky outcrops.

Even by the end of the season when nests were usually at their largest, 86% were less than 1.5 m tall, with a mean height of 0.76 m (Table 2). The relationship between nest height and diameter in wood ant nests is complex, being influenced *inter alia* by age, shade (in which mounds are usually higher), time of year (nests are often demolished or flattened during the winter and reconstructed by the end of the summer) and slope, so no analysis of this feature was attempted in the study.

Nest density

The area in which 198 nests were recorded in 2001 was estimated at 35 ha, which gives a colony density of 5.7 per ha. This is higher than an estimate of 4.3 per ha made for *F. rufa* nests in Gait Barrows National Nature Reserve (N.A.R. unpublished). Estimates of nest density are inevitably somewhat arbitrary due to the difficulty of measuring the areas occupied by populations which do not have clear boundaries. A study of 326 occupied nests of *F. lugubris* in 202 ha of Forestry Commission plantation in Langdale Forest, North Yorkshire in 1972 (Sudd *et al.*, 1977) gave an overall density of 1.6 nests per ha. However, densities ranged from about 1 per ha in plantations, where nests were confined to the edges, to 5.5 per ha in more natural areas which included gills and scrub. A study of populations in Wales (Hughes, 1975) found that the highest densities occurred in semi-natural woodlands where boulders caused spacing of the trees so that about one third of the woodland floor received direct sunlight, and in some revegetated ex-industrial sites with similar conditions. In Europe, densities of 3–6 nests per ha have been found in the Northern Alps (Sudd *et al.*, 1977). It seems that in Central Europe at altitudes around 1000 m, *F. lugubris* can occur at densities around 5 per ha, and that densities of this order can be found at altitudes of 150 m and lower in northern England (Sudd *et al.*, 1977). From this it appears that the nest density in Ashness Woods is typical of well established populations.

Table 3. Trees usage by *Formica lugubris* and nearest trees to colonies

	Oak	Conifer	Birch	Ash	Hazel
No. used	94	92	62	2	1
Nearest to colonies	139	100	91	46	15

Trees usage and association of colonies with trees

Wood ants forage mainly by making trails up trees where they 'milk' aphids for honeydew and collect small invertebrate prey. Oak was the most frequently used at 37.5%, but conifers at 36.7% were equally important (Table 3). Birch was also a valuable tree, but ash *Fraxinus excelsior* L. and hazel *Corylus avellana* L. were very little visited and probably avoided. That conifers were found to be collectively of equal value to oak equates with the fact that *F. lugubris* is known to occur in both conifer and broadleaved woodland. The four nearest trees to each main nest were recorded. Table 3 shows the results, which appear to reflect quite closely the proportions of species in the woodland. Sudd *et al.* (1977) also found that nests were associated with most crop trees and wild trees present, but were most abundant near to plantation margins and regenerating natural scrub.

The origin of the populations

Two immediately striking features of these populations are that they are separated by a short (600 m) length of apparently suitable habitat and that they only occupy such a small part of the available woodland.

The area occupied by these populations is only about 9.5% of the 370 ha Lodore-Troutdale SSSI, and an even smaller part (c. 6%) of the Borrowdale Woods as a whole. In contrast, in the Duddon valley *F. lugubris* is present throughout the woodlands from Furnace Wood at the mouth right up to Dunnerdale Forest above Seathwaite, a distance of about 14 km. They are so abundant in roadside woods near Seathwaite that they have been observed emerging and establishing nests on the verges (N.A.R. obs., September 2002). If they had been in Borrowdale as long as they have been in the Duddon it is reasonable to suppose that they would be as widespread as they are in the Duddon. This suggests that they were established in the Ashness Woods relatively recently, and raises the possibility that they may have been introduced. The existence of a nest in Great Wood, where there has been no known population, suggests that it could have been the survivor of an introduction.The earliest record of wood ants in Ashness Woods is in 1907 by F.H. Day, whose specimens are in Tullie House Museum, Carlisle. Sudd *et al.* (1977) studied a population which they believed had colonised Forestry Commission plantings after they began in 1920. The largest nest diameter which they recorded was about 1.5 m. The commonest nest diameter in plantings before 1945 was 0.6–0.8 m, and the commonest after 1945 was 0.2–0.4 m. The much larger diameters recorded in Ashness Woods suggest an earlier origin, i.e. 19th century at least. There appear to be three ways by which this might have happened:

(i) Natural colonisation from the Duddon populations,
(ii) Accidental or deliberate introduction through forestry,
(iii) Deliberate introduction to feed pheasants.

Considering these in turn: Hughes (1975) cites the case of a population which had developed on an old mine site at Snailbeach in West Shropshire and concludes that *F. lugubris* is capable of dispersion of 32 km from the nearest source. The nearest population in the Duddon Valley is about 18 km from Ashness Woods which is well within this range, but as they are also separated by the highest mountains in England, rising to almost 1000 m, it seems unlikely that they reached Borrowdale of their own accord. Furthermore, the so-called guest ant *Formicoxenus nitidulus* (Nylander) which inhabits wood ant nests and is known in the Duddon, was found in a nest in Ashness Woods by F.H. Day in 1907. It is unlikely to have been conveyed by a flying queen.

Introduction of plants with conifers is known to have occurred. At Ainsdale Sand Dunes NNR very localised patches of common wintergreen *Pyrola minor* L. and lesser twayblade *Listera cordata* (L.) R.Br., which do not occur in the sand dunes, have been found in the 20th century pine plantations. *Formica lugubris* occurs in many Forestry Commission plantations. In some cases it is known to have invaded them from pre-existing populations (Sudd *et al.*, 1977). On the Continent wood ants are believed to be of value in forestry for controlling defoliating insects and have been translocated widely for this purpose (Sudd *et al.*, 1977, Zahradnik, 1991). However, the present authors are not aware of any cases in Britain where wood ants are known to have been introduced deliberately for the benefit of forestry.

The practice of introducing wood ant nests into pheasantries with the objective of feeding the brood to the chicks was widespread in Victorian (and possibly earlier) times. A survey of *F. rufa* and *F. lugubris* in the Lake District in the 1950s (Satchell & Collingwood, 1955) found some written, and much anecdotal, evidence that *F. rufa* had been introduced into pheasantries in the centre of the Lake District, presumably from estates along the southern edge where there were populations of this species. Their paper reported only one case of an apparent attempt to translocate *F. lugubris*– an unsuccessful one from the Duddon to the Grizedale Estate. In 1971 another such translocation was attempted (J. Cubby pers. comm.), when the Forestry Commission moved several nests with a number of queens in plastic dustbins from Rainsbarrow Wood in the Duddon to Grizedale Forest to feed Capercaillie *Tetrao urogallus* L. which it was also attempting to introduce, but neither the ants nor the birds became established. There does not seem to be, however, any reason in principal why *F. lugubris* should not be capable of being translocated, e.g. from the Duddon to Ashness Woods. Up to the time of writing (July 2003), no information had been traced about the previous ownership or management of Ashness Woods which would indicate whether the estate was in the kind of intensive sporting management which might have involved introducing wood ants.

Conservation considerations

The current woodland management operations may affect the wood ants by damaging their nests, altering the woodland composition and removing their forage trees. During felling in 2002 one of the largest nests was demolished and covered with brash. However, *F. lugubris* is not intimidated by this sort of treatment and was observed in 2003 to have responded by rebuilding its nest up and over the material which had been dumped upon it. The increased admission of light in a patchy fashion is likely to benefit the ants since, as in *F. rufa*, populations seem to be most vigorous where there is a patchwork of light and shelter, and tend to become static under closed canopy. The conifers being removed will inevitably include some forage trees, but, as the ants must have been present in the woodland before coniferisation, they presumably will re-adapt to its restored condition. It is anticipated that the current management should, on balance, be beneficial to the ants, or, at least, not deleterious.

Acknowledgements

The authors are grateful to Maurice Pankhurst, National Trust, for supervising the original survey; Henry Arnold of the Biological Records Centre, CEH Monks Wood, for permission to reproduce the distribution map (Fig. 1); Stephen Hewitt, Tullie House Museum, Carlisle, for producing Fig. 2 using DMAP; Brian Gomm for preparing Fig. 3; English Nature Cumbria Team for SSSI and SAC information; Cedric Collingwood for advice and information, and David Thomason for assistance with the 2003 survey.

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SHORT COMMUNICATION

***Sphegina sibirica* Stackelberg (Diptera: Syrphidae) in West Sussex.** – During 2002 I was surveying a small deciduous woodland block just south of Fernhurst (Newlands Copse) at SU876295 for the Cowdray Estate. On the 25 May I collected a number of individuals of *Sphegina* species from *Torilis* sp. (Hedge Parsley) growing in dappled shade at the eastern edge of the wood and one from the interface between the deciduous woodland and a block of mature *Picea abies* (Norway Spruce) on the western boundary. Seven of these proved to be *Sphegina clunipes* (Fallén), and one was a female *Sphegina sibirica*. The possible association with *Picea* has been reported at other locations where this species has been found (Ball & Morris 2000, *Provisional Atlas of British Hoverflies* (*Diptera*, *Syrphidae*), BRC). This is the first record for this species from south-eastern England (A. Stubbs, pers. comm.). It was added to the British list by Alan Stubbs in 1994 from a Scottish specimen found in 1992 and has since been found in a number of locations in Scotland and on the Welsh borders. – Mike Edwards, Lea-side Carron Lane, Midhurst, West Sussex, GU29 9LB

INSECTS FROM AN EMERGENCE TRAP OVER A SMALL, DEAD OAK TRUNK

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ABSTRACT

The invertebrates emerging from a standing trunk of a dead oak tree in Sedlescombe, East Sussex during 2000–2001 are reported. Eighty-six species from eight Orders were noted, the majority (77%) of which were Diptera. Notable species included *Nemapogon ruricolella* Stainton, *Dolichopus arbustorum* Stannius and *Fannia speciosa* (Villeneuve).

INTRODUCTION

On 10 October 2000 I installed a long sleeve of fine mesh black netting over a small 'chandelle', a standing dead trunk, of oak, *Quercus robur* L., about 1.5 metres tall and 20 cm in diameter in a shady, woodland part of our garden in Sedlescombe, East Sussex (map ref.: TQ783188) with the aim of trapping emerging invertebrates.

The chandelle had, for some years, been part of a hedge, but had died naturally and was heavily decayed, with bark remaining on the east side and bare wood on the west. The common moss *Amblystegium serpens* (Hedw.) covered the base for a few centimetres above the ground and various fungi had colonised the wood.

The sleeve was long enough to reach the ground and entry from the outside was possible, but difficult. The top of the sleeve simply rested on the top of the chandelle. The trap was carefully removed as often as possible, usually daily, to extract with a pooter any insects that had gathered inside.

A few insects were found in the trap during the autumn and winter, but the main emergence did not start until the end of March 2001 and then continued steadily through the summer and autumn until the project was stopped on 10 October 2001, a year after it had started.

The number of species and individuals living in, or on, such a small log was surprisingly large, especially as many of the non-flying, or rarely-flying, invertebrates would not have been recorded. The number of Coleoptera was, however, small and some members of this order may have made their way out through the bottom of the trap, or simply fallen unnoticed to the ground when the sleeve was removed.

Some of the species recorded appeared in numbers or over a long period of time, others especially the larger kinds, were recorded as only one, or very few, individuals. This raises the question of whether females of these larger species laid only few eggs on this small piece of wood, or whether competition or predation reduced an originally larger number of individuals.

Many of the insects recorded are known to breed in dead wood or its associated fungi, or to be predaceous on other species in these situations. Some though were probably simply taking shelter under the bark, while others may have been passing one or another of their stages at the base of the chandelle where it was damper and graded into the soil. A few, such as the earwig, *Forficula auricularia* L., or the cricket *Meconema thalassinum* (De Geer), seem to be able to find their way into many kinds of trap. Because the trap was put in situ in October, the chandelle no doubt contained many non-saproxylic species that were already using the habitat to overwinter.

Table 1. Species emerging from a standing, dead oak tree-trunk, Sedlescombe, East Sussex, 2000–2001.

Collembola
Entomobryidae
Entomobrya ?corticalis (Nicolet)
Entomobrya nivalis (L.)
Sminthuridae
Sminthurus viridis (L.)
Orthoptera
Tettigoniidae
Meconema thalassinum (De Geer)
Dermaptera
Forficulidae
Forficula auricularia L.
Psocoptera
Caeciliidae
Caecilius flavidus (Stephens)
Stenopsocidae
Graphopsocus cruciatus (L.)
Lachesillidae
Lachesilla pedicularia (L.)
Psocidae
Trichadenotecnum sexpunctatum (L.)
Hemiptera
Lygaeidae
Kleidocerys resedae (Panzer)
Cimicidae
Anthocoris nemorum (L.)
Cercopidae
Philaenus spumarius (L.)
Cixiidae
Cixius nervosus (L.)
Issidae
Issus coleoptratus (Fabricius)
Coleoptera
Staphylinidae
Dromius linearis (Olivier)
Nitidulidae
Meligethes sp.
Lathridiidae
Aridius bifasciatus (Reitter)*
Curculionidae
Sitona sp.
Lepidoptera
Tineidae
Nemapogon cloacella Haworth*
Nemapogon ruricolella Stainton*
Diptera
Trichoceridae
Trichocera annulata Meigen*
Tipulidae
Tipula staegeri Nielsen
Tipula flavolineata Meigen*
Tipula scripta Meigen*
Limoniidae
Limonia nubeculosa Meigen*
Neolimonia dumetorum (Meigen)*
Austrolimnophila ochracea (Meigen)*
Ormosia nodulosa (Macquart)
Rhypholophus varius (Meigen)
Psychodidae
Psychoda sp.
Psychoda grisescens Tonnoir
Ceratopogonidae
Atrichopogon lucorum (Meigen)
Dasyhelea versicolor (Winnertz)*
Chironomidae
Bryophaenocladius ?furcatus (Kieffer in Thienemann & Kieffer)
Gymnometriocnemus brumalis (Edwards)
Limnophyes minimus (Meigen)
Metriocnemus albolineatus (Meigen)
Anisopodidae
Sylvicola punctatus (Fabricius)*
Keroplatidae
Orfelia fasciata (Meigen)*
Mycetophilidae
Mycomya ?cinerascens (Macquart)*
Acnemia nitidicollis (Meigen)*
Synapha vitripennis (Meigen)*
Anatella sp.
Anatella ?ciliata Winnertz*
Rymosia virens Dziedzicki
Exechia (*parvula* complex)*
? Exechiopsis leptura (Meigen)
Dynatosoma fuscicornis (Meigen)*
Sciaridae
Trichosia pilosa (Staeger)*
Trichosia viatica (Winnertz)
Lycoriella inflata (Winnertz)
Bradysia sp. *incert.*
Bradysia nitidicollis (Meigen)
Scatopsciara pusilla (Meigen)*
Cecidomyiidae
Campylomyza flavipes Meigen*
Hybotidae
Tachypeza nubila (Meigen)*
Platypalpus ciliaris (Fallén)
Platypalpus luteus (Meigen)
Oedalea flavipes Zetterstedt*
Oedalea tibialis Macquart*
Euthyneura halidayi Collin*
Dolichopodidae
Dolichopus arbustorum Stannius
Dolichopus trivialis Haliday
Medetera impigra Collin*

continued

Table 1. (*continued*)

Diptera (*continued*)	Lauxaniidae
Syntormon tarsatus (Fallén)	*Peplomyza litura* (Meigen)*
Sciapus platypterus (Fabricius)*	Heleomyzidae
Lonchopteridae	*Heteromyza rotundicornis* (Zetterstedt)
Lonchoptera lutea Panzer	Sciomyzidae
Phoridae	*Pherbellia ventralis* (Fallén)
Megaselia spp.	Sphaeroceridae
Anevrina thoracica (Meigen)*	*Spelobia nana* (Rondani)
Borophaga incrassata (Meigen)	*Spelobia* (*palmata* group) sp.
Diplonevra concinna (Meigen)	Clusiidae
Diplonevra pilosella Schmitz	*Clusia flava* (Meigen)*
Spiniphora dorsalis (Becker)	Tachinidae
Platypezidae	*Phytomyptera cingulata* (Robineau-Desvoidy)*
Paraplatypeza atra (Meigen)*	Fanniidae
Syrphidae	*Fannia speciosa* (Villeneuve)
Myathropa florea (L.)*	Muscidae
Criorhina berberina (Fabricius)*	*Phaonia palpata* (Stein)*
Xylota sylvarum (L.)*	

*Species specifically associated with dead wood, or dead wood fungi.

RESULTS

The following list includes only species that I have managed to identify (Table 1). There were, in addition, many Hymenoptera Parasitica which I have not, so far, attempted to determine.

Notes on some individual species

Nemapogon ruricolella Stainton (Lep: Tineidae). On 3 June about six males of this fungus-feeding 'Notable' species were on the outside top of the trap at about 7pm. They were running about over the flat surface of the material with their wings spread out and vibrating rapidly. Females had emerged within the trap and this was clearly the cause of this assembling behaviour. Their identity was confirmed by dissection of the genitalia.

Tipula staegeri Nielsen (Dipt: Tipulidae). A species normally associated with mossy stream sides (Stubbs, 1992) but breeding, perhaps, in the damp moss at the base of the chandelle.

Platypalpus ciliaris (Fallén) and ***P. luteus*** (Meigen) (Dipt: Hybotidae). Both these species occurred in low numbers over several weeks and were undoubtedly breeding in the chandelle. Their breeding site does not previously seem to have been recorded.

Dolichopus arbustorum Stannius (Dipt: Dolichopodidae). A 'Notable' species described in *Recorder* 3.3 as 'very scarce'. It is not infrequently found in association with decaying wood in our garden.

Borophaga incrassata (Meigen) (Dipt: Phoridae) has been recorded as a parasitoid of *Bibio marci* (L.) (Dipt: Bibionidae). Some bibionids are associated with rotten wood (Hövemeyer, 1998) and the fly may have been parasitising one of these. Alternatively it could have been in another of the larger dipterous larvae.

Phytomyptera cingulata (Robineau-Desvoidy) (Dipt: Tachinidae) has been recorded as a parasitoid of *Nemapogon* spp. (Lep: Tineidae) and members of this genus were probably its host in the chandelle.

Fannia speciosa (Villeneuve) (Dipt: Fanniidae). A 'Notable' species that seems to be primarily associated with woodland (Séguy, 1926) and which has been reared from leaf litter (Smith, 1989).

Conclusions

The invertebrates associated with dead wood can be divided into many categories and relatively few are obligatory, primary dead wood feeders. Kirby & Buckley (1994) divided captures from their dead wood emergence experiments into six groups:

Saproxylic species.
Fungus-breeding species not specific to saproxylic situations.
Species using deadwood as a pupation site only.
Species using deadwood for winter hibernation purposes only.
Species more or less ubiquitous in habits.
Species associated with epiphytes.

One might add to this:

Species that 'graze' on moulds and other microscopic plants growing on, or within, dead wood.
Species that are attracted to dead wood exudates or saproxylic fungi, but do not necessarily breed in them or in the wood.
Species that breed in very rotten wet wood as well as soil and similar situations.

There are also many insect predators or parasitoids that may be found in association with rotten wood but could equally be present in other habitats. The tachinid fly, *P. cingulata*, for example, is often a parasitoid of lepidopterous larvae that live in dead wood, but it has also been bred from moth larvae feeding on higher plants, lichens and fungi (Belshaw, 1993).

Most dead wood emergence trap experiments also record invertebrates whose presence is not easy to explain. While some of these are undoubtedly casuals that happened to get into the trap by some unknown means, others have been recorded with sufficient regularity to indicate that dead wood (or emergence traps) have some particular attraction for them. Common earwigs, *F. auricularia* and oak crickets, *M. thalassinum*, are examples and mentioned above. Various insects associated with open grassland also turn up quite often in dead wood traps: adults of the cuckoo spit insect, *Philaenus spumarius* (L.), for example. The beetle bug *Issus coleoptratus* (Fabr.) is also of frequent occurrence, both as adults and nymphs, in the dead wood traps the author has run. As well as being associated with ivy and holly, it occurs in moss (Le Quesne, 1960) and may occasionally hibernate in dead wood or, perhaps, any suitable sheltered habitat for short periods.

Another interesting case is that of the widespread, small cranefly *Ormosia nodulosa* (Macquart). This is thought to breed in woodland soil (Stubbs, 1994) which it may well do but, in my experience, adults are regularly found in dead-wood emergence traps. I think it is important to record these various 'accidental' occurrences since, as more experiments are undertaken in different places, the inexplicable may become explicable. The biotic effect of dead wood has many subtle ramifications in addition to its importance for obligatory, primary dead wood feeders.

There are some interesting comparisons between this project and other work on the insects emerging from saproxylic habitats. Kirby & Buckley (1994), for example, studied the insects from dead wood in Hatfield Forest that had lain on the ground for two years having fallen in the great storm of 1987. The Hatfield Forest study recorded far more Coleoptera, probably because of the rather different trapping technique used as well as the greater quantity of material studied. However, the chandelle in Sedlescombe produced micro-Lepidoptera and a number of Diptera from the Hybotidae, Dolichopodidae, Phoridae, Syrphidae and other families that were not represented at Hatfield. I imagine this is because the Sedlescombe chandelle had been a dead wood habitat for far longer.

With nearly 90 species from Sedlescombe, compared with 127 from Hatfield (where eight Owen traps and a range of woods were used) and 36 known saproxylics, or saproxylic-fungus breeders from Sedlescombe compared with 52 for Hatfield, there is a strong inference that the dead wood habitat continues to attract new species for far more than two years and may have a 'climax' period when the greatest number of species is reached.

A chandelle is, of course, a rather different habitat than a log of equivalent size lying on the ground. The wood tends to be drier and more powdery and there are different microclimates. There is also, of course, the decaying root system in the ground below. In the case of the chandelle in Sedlescombe, I have found all the species elsewhere in the vicinity, often in association with dead wood, and I have not been able to discern any particular characteristic that might be attributable to this particular type of dead wood habitat. However, since it is easy to fit a netting sleeve over a suitable chandelle, other entomologists may be interested in repeating this exercise elsewhere.

This small experiment shows, once again, the ecological importance of dead wood (Speight, 1989; Kirby & Drake, 1993) even in small quantities in semi-natural situations. A mixed field hedge of any length would, for example, contain hundreds of pieces of wood similar to this oak chandelle. If the invertebrates I did not find or have not identified were included it might double, or even treble, the number of species known to be using the chandelle and there are also the lower plants and micro-organisms. A rather dull looking log of wood is in fact a habitat of great richness and variety.

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SIXTY YEARS OF *VOLUCELLA ZONARIA* (PODA) (DIPTERA: SYRPHIDAE) IN BRITAIN

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ABSTRACT

The history of the hoverfly *Volucella zonaria* in Britain is reviewed. It shows that there was evidence of range expansion long before recorders were alert to such changes. Possible factors behind its expansion of range are examined and it is shown that the distribution maps closely fit those parts of England with the mildest winter temperatures and highest summer temperatures. Readers are alerted to the possibility that populations are reinforced by influxes from the Continent and that detailed recording of this species and known migrants might help to shed further light on this aspect of its biology.

INTRODUCTION

Volucella zonaria (Poda) is one of the largest and most readily identifiable of British flies. Its size alone marks it out as distinct, whilst its vivid chestnut and gold markings make it noteworthy as a hornet mimic. Thus, it is a species that can be recorded accurately by even the most casual natural historian. The only species with which it can be confused is *Volucella inanis* (L), which is smaller and yellower and has a yellow rather than black second sternite. Although it is more widespread, *V. inanis* occupies a similar range.

The arrival of *V. zonaria* in the 1940s was heralded by much interest in the popular entomological press. For a period of ten years, it featured regularly in notes and observations and was even reported in the national press. These reports, together with numerous museum specimens, provide the foundation for our knowledge of its arrival and establishment.

When compiling the provisional atlas of British hoverflies, we suggested that *V. zonaria* might be gradually spreading from the London suburbs into the wider countryside (Ball & Morris, 2000). As a relatively recent arrival from the Continent, *V. zonaria* is a potentially useful subject for monitoring as part of studies following the changes in invertebrate populations in response to climate change. This note tests the hypothesis that its distribution is expanding. It describes the establishment and spread of *V. zonaria* and evaluates its current status based on available data.

EARLY PUBLISHED HISTORY

Until the 1940s, *V. zonaria* was very rarely recorded (Fig. 1a) and, according to Goffe's analysis (1945), was represented by just six confirmed British specimens; although Hobby (1946) reported a further two old records. At that time it would seem that *V. zonaria* was a rare vagrant and it was treated as such in the annual migration reports until the 1950s (Danreuther, 1946, 1952). Goffe, however, also drew on records from Folkestone, Bournemouth and Bristol in the 1940s and suggested that breeding populations may have been established. Fraser (1945) reinforced this conjecture with a report of "at least 8 specimens . . . seen or captured in Bournemouth" in 1945. Further evidence of the establishment of a population at

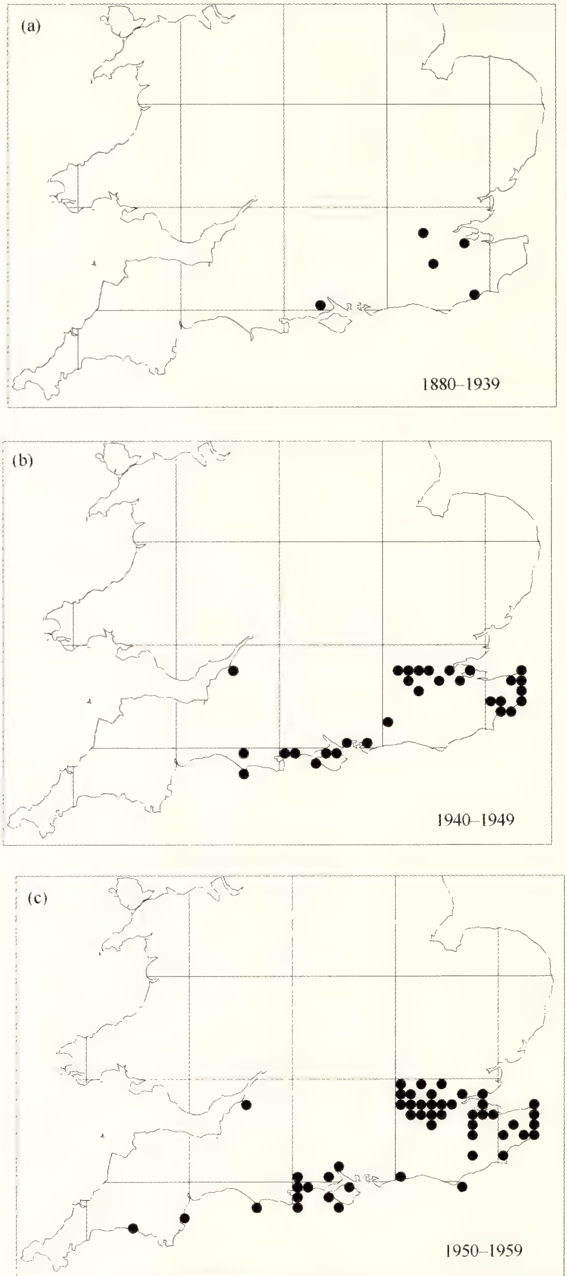

Fig. 1. Distribution of *Volucella zonaria* in Southern England, (a) 1880–1939, (b) 1940–1949, and (c) 1950–1959.

Folkestone was provided by Waller (1946) who reported the capture of five females and observations of a further 15+ specimens at ivy in September 1945. A report of regular records of *V. zonaria* from the Chatham area from 1938 onwards by Woodcock (1946) further reinforced the argument that *V. zonaria* had become established. This sequence of reports provides compelling evidence that there were established populations at a number of locations by 1945 and there is a strong probability of a population in the Chatham area perhaps as early as 1938.

The Bournemouth site provided the first evidence of a confirmed breeding population with a report by Fraser (1946a) of seventeen dipterous larvae recovered from the nest of the common wasp *Vespula vulgaris* (L.) in November 1945. Fraser subsequently reported (1946b) that he had bred out three *V. zonaria* and three *Volucella pellucens* (L.), and that on the basis of the proportions of the puparia, the overall ratio was eleven *V. zonaria* to six *V. pellucens*.

It is clear from the published literature that *V. zonaria* rapidly spread along the south coast e.g. Blair (1946) and O'Farrell (1946). The available evidence suggests that *V. zonaria* became established in south London soon after its initial arrival on the south coast. There is a published record for 27 August 1945 (Riley, 1946); but in his report to the South London Entomological and Natural History Society (SLENHS) on 28 August 1946, Riley fails to mention a capture the previous year. His account for the SLENHS reports the capture of this fly on 27 August 1946 (same date, different year) and that another had been taken two days previously by J.E.C. Riley-Irving (also Riley-Irving, 1947). However, Riley's 1945 record remains a conundrum because a report by Gardiner (1991) of *V. zonaria* on Wimbledon Common in 1945 supports the interpretation that this species was present there that year.

Between 1946 and 1960, the literature records and museum specimens showed that *V. zonaria* became widely established along the south coast as far as Torquay and Plymouth, and along the Kentish coast to London. Interestingly, the isolated population in the Bristol area is not linked to any obvious pattern of dispersal, but seems to have become established separately and has shown little evidence of further dispersal over subsequent years.

Interpretation of available data

We have identified over 1050 records, including specimens held in the Natural History Museum London and published accounts in the majority of relevant national journals. The data are not wholly complete, however, as we have not secured records from other major collections and regional collections.

There are two important sub-divisions within the data. Prior to the mid-1970s there was no co-ordinated means of collecting data, and we are largely left to the information available in the published literature. Between 1945 and 1955, there was a regular stream of new published records that tailed off towards the 1960s as *V. zonaria* became less noteworthy. The majority of museum specimens stem from this period and it is possible to locate many of the specimens reported at the time. From the mid-1970s, the Hoverfly Recording Scheme became an important focus for collecting data and around this time the published record largely dries up. However, the greatest emphasis on data collection by this scheme lies in the mid-1980s and again in the early 1990s.

Thus, the fluctuating fortunes of data collection are a factor that must be considered when evaluating apparent changes in the distribution and frequency of *V. zonaria*. A further factor that needs to be borne in mind is the inevitable problem of recorder bias arising from the recruitment and loss of active recorders over a

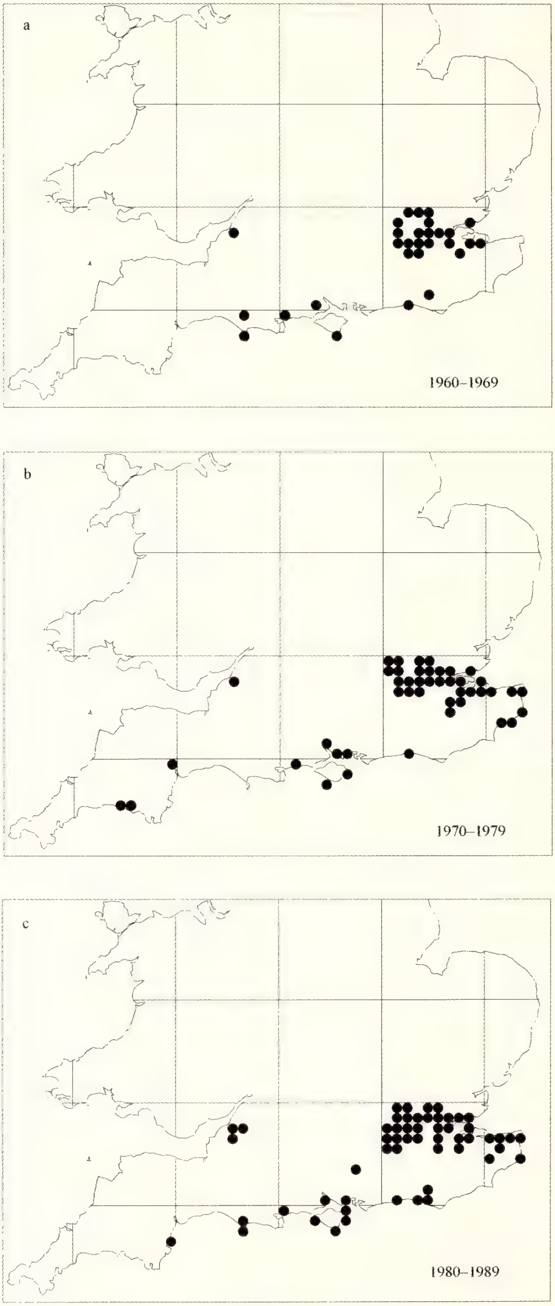

Fig. 2. Distribution of *Volucella zonaria* in Southern England, (a) 1960–1969, (b) 1970–1979, and (c) 1980–1989.

period spanning two or even three generations. Despite these difficulties, the data are robust enough to present a picture of the establishment and spread of *V. zonaria*, and to identify a number of key events over the past sixty years.

Distribution history

The changes in the distribution of *V. zonaria* are clearly demonstrated by the maps for the decades 1940 to 1949 and consecutively to 1979 (Figs 1–3). These maps show that between 1940 and 1959 the population seems to have expanded and consolidated along the south coast, the London suburbs and the Thames Estuary. This process appears to have halted in the 1960s before undergoing renewed expansion in the 1970s and 1980s.

A significant event in the 1960s was the extreme winter of 1962/1963 and it seems likely that this substantially reduced the population of *V. zonaria* except in the most sheltered situations. Unfortunately the 1960s coincided with a decline in interest in publishing records of *V. zonaria* and this hypothesis is hard to prove. Moreover, some observers report regular sightings in the London area from the 1960s onwards e.g. Wurzell (1980), suggesting that this was a period of under-recording. However, the records for the summers of 1976 and 1977, which were exceptionally hot, indicate that the fortunes of *V. zonaria* are highly dependent upon high summer temperatures. As the data show (Fig. 4), reported numbers peaked in 1977, consistent with reports of high numbers in Kent in 1977 by Dicker (1977), and of high numbers reported from the Tottenham area of London in 1976 by Wurzell (1980). The evidence therefore suggests that during the 1970s and 1980s, *V. zonaria* maintained relatively low but constant population levels with occasional noteworthy peaks following hot years and warm winters, slowly recovering from the 1960s population crash.

The 1990s have been established as a period of unprecedented warm temperatures (Bealey *et al.*, 1998) with a significant departure from previous temperature variations and a reduction in rainfall for much of the decade. During this period, *V. zonaria* has shown further signs of range expansion and indications that numbers have been increasing. Notably, its range extended westwards to Cornwall, northwards into Hertfordshire and eastwards towards the Suffolk borders. There is also a remarkable record of a specimen from Cambridge in 1991 (Gardiner, 1991) that was perhaps a harbinger of things to come. However, the numbers of records have not increased proportionately and Fig. 3b suggests that the Kentish population may have declined. This reinforces a similar observation by Clemons (1998): although some caution must be attached to this latter interpretation because his data also suggest that there was more recorder activity in Kent in the 1980s.

Between 2000 and 2001 two of the most remarkable records emerged, with a record from Sherringham in Norfolk (Paston, 2001) and from East Gloucestershire (D. Illif, pers.com.). These two records suggest that *V. zonaria* has moved considerably, but at the moment it is not possible to be sure that these specimens represent range expansion or primary migrants. The population at Harwich, which has been known since 1992, seems to coincide with a period of substantial activity amongst migratory insects as reported by Dr Chris Gibson (pers. comm.) "1991: one seen at Beacon Hill, Harwich, (TM262317), on a sunny day with much evidence of insect migration (lots of *Episyrphus*, Red Admirals, and a single Swallowtail butterfly); sunning itself on bramble leaves next to the promenade".

There is also an illuminating note by R. S. George (1991) which reported two specimens of *V. zonaria* brought for identification by Mrs Herbert-Graham from

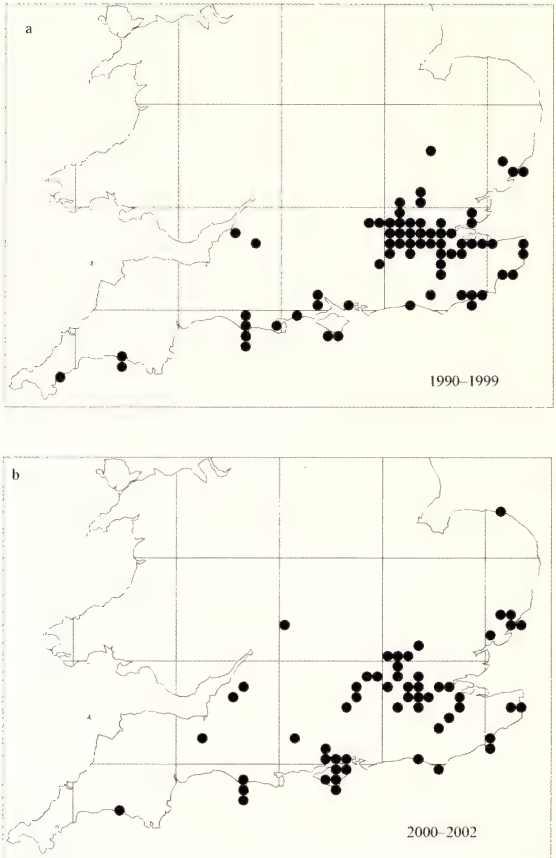

Fig. 3. Distribution of *Volucella zonaria* in Southern England and Wales, (a) 1990–1999, (b) 2000–2002.

Christchurch (Hants) because of concern that they might be hornets. These were seemingly part of a population of "scores, possibly hundreds, over a couple of days in early August" preceding an immense influx of syrphids later in the month. These accounts possibly lend support to the observation by Chandler (1969) that populations in the early years might have been supplemented by further influxes. It is possible that this remains a factor in the occurrence of *V. zonaria* and may explain the remarkable record from Cambridge in 1991, which could be coincident with the Christchurch observations (dates are not published).

In Surrey, one of the better-studied counties, *V. zonaria* showed few signs of spreading beyond the London suburbs after its establishment in the 1940s. Some westward movement along the Thames corridor is evident between 1970 and 1989, but apart from a record at Wisley, there are few indications of movement outside the urban environment (Fig. 2c). In the 1990s, however, a number of noteworthy records beyond the suburbs were reported. In addition to a further record from Wisley,

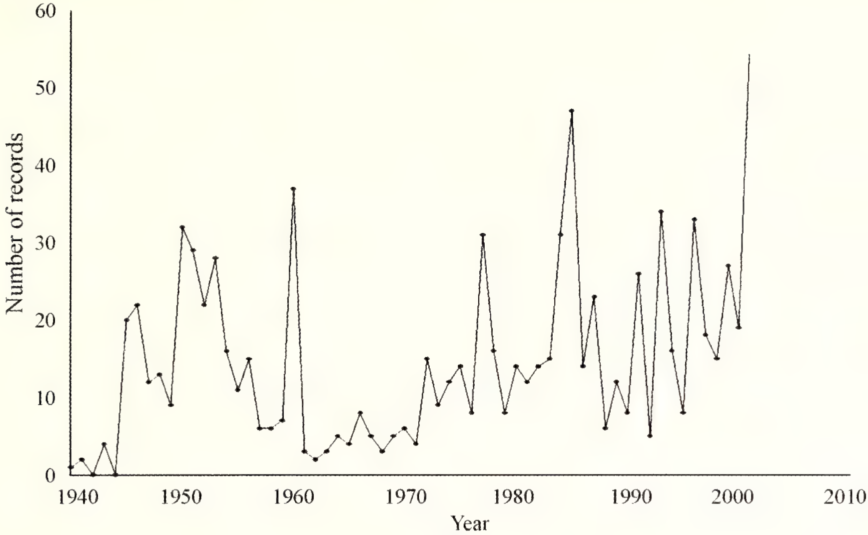

Fig. 4. Numbers of records of *Volucella zonaria*, 1940 to 2001.

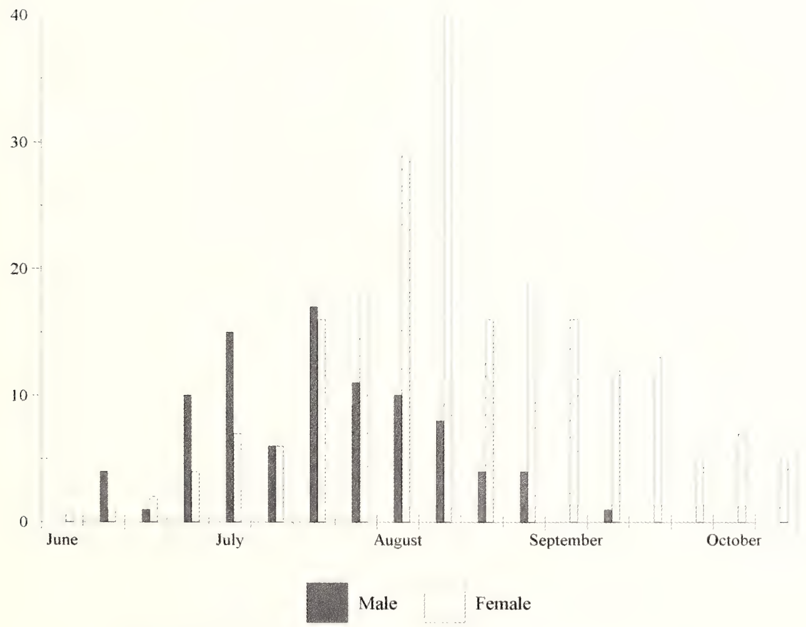

Fig. 5. Phenology of male and female *Volucella zonaria*.

indications of expanding distribution arise from reports of *V. zonaria* becoming increasingly frequent in the Woking area (Halstead, 2000) and clear evidence of a population in the Esher/Leatherhead area. Records from Gatton Park in central Surrey and from Elstead in south-west Surrey provide further indications of population movement to the south of London. Of course, this evidence is not conclusive but Surrey is a very comprehensively surveyed county. Records from the Box Hill area and Esher in 2001 provide further indications of an expansion of range.

Volucella zonaria is a continental species that is widely distributed and abundant in southern Europe. In England it is largely confined to the south coast, urban London and the Bristol area. Clearly there are fundamental controlling influences and we have investigated these further. The most likely factor, as we have already highlighted, is climate. Coastal areas are milder than inland and much less prone to frosts because of the proximity of the sea and its influence on adjacent land temperatures. Likewise, climate maps show that large urban areas such as London exhibit elevated temperatures in the summer and are less prone to frosts in winter. This is the so-called 'heat island effect' that leads to city centre temperatures being as much as 7 °C higher than surrounding countryside (USEPA, 1992).

We have found that comparison between the current distribution of *V. zonaria* with climate maps yields important and very close fits with temperature records. The climate maps shown in Plate 14 (Figs 6a and 6b) are based on work by New, Hulme and Jones (1999) and depict the distribution of average minimum January and maximum July temperatures between 1960 and 1990. Superimposition of areas where average minimum January temperatures remain at or above 1 °C with areas that experience average maximum July temperatures of 20.5 °C or above (Plate14, Fig. 6b) show remarkably close correlation with the distribution of *V. zonaria* (Fig. 7). These climate characteristics are more typical of southern European conditions. Thus, we believe that the future distribution of *V. zonaria* might be anticipated according to predictions of climate change that may lead to a more Mediterranean climate in southern England. Moreover, there is scope to predict where *V. zonaria* might occur in future. There are strong possibilities of a consolidation of range along the Suffolk and Norfolk coast, and movement through the Vale of Evesham perhaps as far as Birmingham: we therefore hope that recorders will maintain a vigilant watch for the appearance of *V. zonaria* in new areas.

Larval biology

Apart from *V. inflata* (Fabricius), the British *Volucella* are known to be associated with the nests of social bees and wasps. The published literature indicates that *V. zonaria* is solely associated with *Vespula vulgaris* nests, although Stubbs & Falk (2002) suggest that there is also an association with *Vespula germanica* (Fabricius), another ground-nesting species.

In his investigation of *Volucella* larvae in a *V. vulgaris* nest in Bournemouth, Fraser (1946b) secured eleven *V. zonaria* larvae. Else (1975) reports rearing more than a dozen *V. zonaria* from another *V. vulgaris* nest and there is a series of 17 specimens in the Natural History Museum (NHML), apparently from the same wasps' nest. He also reports the probability that adults emerge overnight. Apart from these two published records, we have found no other confirmed rearing records apart from one by Steven Falk in the Hoverfly Recording Scheme database and a puparium in the NHML collections from a wasps' nest in a roof.

From the limited information we have on rearing *V. zonaria*, it is apparent that wasp nests can support remarkable numbers of larvae, but it is clear that much more

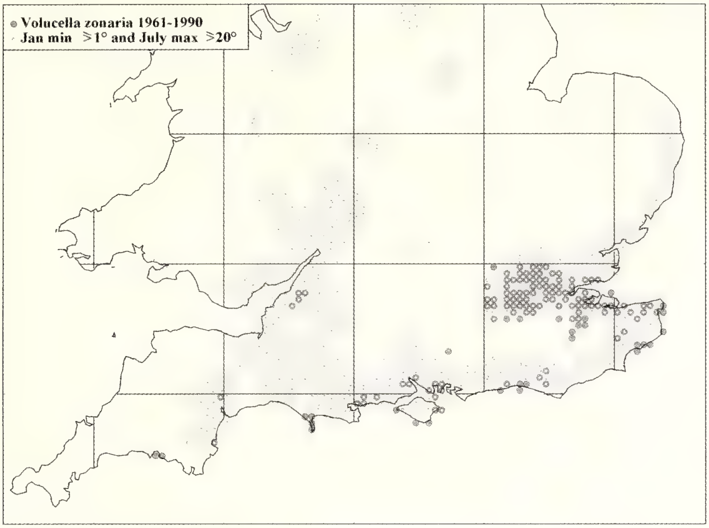

Fig. 7. Coincidence between occurrence of *Volucella zonaria* 1960–1990 in relation to January average minimum temperatures and July average maximum temperatures.

work is needed to understand its biology within the wasps' nest. Furthermore, rearing records do not support any presumed association with the hornet *Vespa crabro* Bequaert in England. Given the obligate association with social wasps and possibly only ground-nesting social wasps, the breeding success of *V. zonaria* is dependent on their breeding success. Anecdotally, it would seem that populations of social wasps, apart from the recent arrivals *Dolichovespula media* (Retzius) and *D. saxonica* (Fabricius) have experienced a number of unsuccessful years. This has important implications for *V. zonaria* and other related species [*V. inanis*, *V. pellucens* and *V. bombylans* (L.)]. At the moment, however, there would appear to be no reliable method of monitoring social wasp population fluctuations, without which it is difficult to investigate the relationship between the abundance of *V. zonaria* and the breeding success of its hosts.

Other biological information

The history of *V. zonaria* in Britain over the past sixty years suggests that its numbers fluctuate very considerably, as demonstrated in Fig. 4, which illustrates variations in the numbers of records on a yearly basis. This is supported by a number of reports by observers who have noted unusual peaks in numbers, among whom, Chandler (1969) who drew attention to these fluctuations and suggested the possibility of population reinforcement from time to time by further influxes from the continent.

The overall phenology of *V. zonaria* between 1940 and 2001 shows numbers increasing steadily from early June to peak in the first half of August before declining in September and October. As might be expected, males seemingly emerge earlier than females (Fig. 5) peaking in the middle of July compared with the second week of August for females. Many observations have reported a strong bias between male and female *V. zonaria*, with females substantially outnumbering males. From the data we hold this disparity is very apparent. Of the records with detailed information on the sex of the specimen, the ratio of males to females is 1:3.

Despite the plethora of published notes, it is remarkable how few report flower visits. Even so, the following list indicates that *V. zonaria* will visit a very wide range of flowers: Ivy, Buddleja, Hebe, Privet and Scabious figure most strongly. The list comprises:

Clematis vitalba L., *Rubus fruticosus* L. agg., *Rosa canina* L., *Hedera helix* L., *Angelica sylvestris* L., *Heracleum sphondylium* L., *Foeniculum vulgare* Miller, *Stachys* spp., *Mentha* spp., *Mentha aquatica* L., *Mentha spicata* L., *Buddleja davidii* Franchet, *Hebe* spp., *Ligustrum* spp., *Sambucus nigra* L., *Symphoricarpos albus* (L.), *Succisa pratensis* Moench, *Cirsium vulgare* (Savi) Ten., *Cirsium arvense* (L.) Scop., *Centaurea nigra* L., *Solidago virgaurea* L., *Aster novii-belgii* L., *Achillea millefolium* L., *Eupatorium cannabinum* L., *Mesembryanthemum*, *Sedum spectabile* Boreau, *Phlox*, *Hydrangea*, *Allium* spp. (cultivated onion), *Allium porrum* L.

Summary and conclusions

The data held by the Hoverfly Recording Scheme have been used to investigate the changing range of *V. zonaria*. They offer conclusive evidence that this hoverfly is undergoing a period of expansion away from its traditional strongholds in the London suburbs, on the south coast and in the suburbs of Bristol. This expansion is likely to arise from movement within the native population, but there is circumstantial evidence of new immigrants reinforcing the population and perhaps being responsible for the establishment of some outlying coastal populations. It has also been demonstrated that there is strong correlation between the distribution of *V. zonaria* and both winter and summer temperatures that approximate to more southerly European conditions.

Our literature search and data review also show that there are very few examples of rearing *V. zonaria* larvae from social wasp nests in the UK and that at the moment very little is known about the relationship between *V. zonaria* and social wasps. Perhaps recorders will be stimulated to collect the detritus from wasp nests in the autumn and to rear out hoverfly larvae (please try to secure adult wasps too, so that the species involved can be identified). In this way we may get a clearer picture of the specific associations between *V. zonaria* and ground nesting or arboreal Vespidae.

Detailed recording and evaluation of yearly fluctuations may help to cast light on the state of resident populations and reinforcement from the Continent. We would be especially pleased to receive full details of the daily occurrence of this fly from garden monitoring projects and hope to produce further updates as appropriate information arises.

Acknowledgements

This note would not have been possible without the help of the many recorders who have contributed to the Hoverfly Recording Scheme. In particular we would like to thank Dr Chris Gibson for his detailed comments on *V. zonaria* in the Harwich area. We would also like to thank Nigel Wyatt of the Natural History Museum of London for access to the collections, and the Librarians of the NHML for access to the diaries of the late Len Parmenter.

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BOOK REVIEW

Butterflies of Europe By Tristan Lafranchis. Diatheo, Paris, 2004. 351pp. 162 colour plates. Softcover: £25.00. ISBN 2-9521620-0-X.

With the subtitle "Identifying Butterflies is Easy!" this is a first, insofar as it provides keys for identification, by progressively identifying or eliminating specific features. It contains excellent photography of (almost) all European species, often with little arrows pointing out which features to look at, as well as species maps and brief notes on habitat and timing. Somehow this has been condensed into a 351 page flexible paperback, small and light enough to travel with you (much smaller than Tolman & Lewington).

The key has been nicely blended with colour photography to make it not only readable, but useable in the field. I took the opportunity to try it out on a selection of *Pyrgus* species (Grizzled skippers) photographed in Italy in June 2004. These are a notoriously difficult complex, with eleven species flying in the area I had visited. Fortunately, a colleague had provided excellent digital imagery of upperside and underside of each of the specimens we had netted, so the key could be worked and re-checked. My expertise was appropriate to the task; good knowledge of the only British member of the genus, slight familiarity with two others, and absolutely none of the remainder. I can report success, perhaps not to the degree that I can agree with the author that "Identifying Butterflies is Easy", but certainly to say that five of the six specimens imaged were identified with confidence, and the sixth after some difficulty, determined as a likely duplicate. The whole experience gave me a high level of confidence in Lafranchis' identification features, and certainly improved my grasp of what to look for in the skippers.

As a result, I have no hesitation in recommending it as a first-class volume for anyone travelling to the parts of Europe that can bring you into contact with unfamiliar species. The author lives in Greece, and covers the distribution of endemic and regional species with close-up maps in place of the standard thumbnails, not only for Greece, but also for Spain, Corsica/Sardinia and Italy, as appropriate. His definition of Europe is not as broad as Kudrna's MEB Atlas, and Cyprus and the Canary Islands are just cut off, but the scope is fine for most holiday trips.

Whilst acknowledging that the identification of some species requires microscopic examination, Lafranchis goes a step further than most guides by explaining how a hand lens may be used to separate some species when live specimens are properly held to expose the genitalia. Illustrations of the male genitalia of 28 species are given, along with a method of examining them which allows them to be released unharmed.

This is a practical guide, and care has been taken not to clutter the main text with bibliographic detail. There is a full systematic list for the 420 species covered, and a clear index, by English or scientific names. It is also the fruit of a great deal of expertise, and I expect my copy to get a lot of use.

ROB PARKER

THE FORM OF *NOMADA FULVICORNIS* F. (HYMENOPTERA APIDAE) ASSOCIATED WITH THE MINING BEE *ANDRENA NIGROSPINA* THOMSON

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Abstract

A distinctive form of *Nomada fulvicornis* Fabricius has been discovered within the British bee fauna. It is a special cleptoparasite of the mining bee *Andrena nigrospina* Thomson and shares with its host a univoltine life cycle that peaks in May and June. This form of *N. fulvicornis* appears to be genetically isolated from other forms of *N. fulvicornis*. It is therefore recommended that this form is referred to as subspecies *subcornuta* Kirby and the remaining forms associated with *Andrena bimaculata* (Kirby), *A. tibialis* (Kirby) and possibly *A. pilipes* Fabricius are retained within the existing subspecies *fulvicornis* pending further investigations. The brood dimorphism associated with bivoltine populations of *N. fulvicornis* is also described.

Introduction

Within Britain, *Nomada fulvicornis* Fabricius is traditionally regarded as a scarce, rather variable species known to be a cleptoparasite of various *Andrena* species of the subgenus *Plastandrena*, (*A. bimaculata* (Kirby), *A. tibialis* (Kirby) and *A. pilipes* (Fabricius)). Recently, Baker (1994) demonstrated that British *A. pilipes* actually consists of two very similar species, *A. nigrospina* Thomson and *A. spectabilis* (Smith) (the latter now regarded as the true *A. pilipes* according to G. R. Else, pers. comm.), which are only confidently separable in the male sex. In Britain at least, *A. nigrospina* is strictly univoltine, flying from May to July, with records mostly for inland heathland sites as far north as the Midlands. By contrast, *A. pilipes* is bivoltine with spring and late summer broods (as in *A. bimaculata*) and a mainly coastal distribution. Kirby (1802) interpreted British *N. fulvicornis* as comprising four species: *N. lineola* Panzer and three species he described as new, *capreae*, *cornigera* and *subcornuta*. Despite the variation within the material supporting these names, they were all synonymysed within *N. lineola* by Yarrow (1970) and are considered to be synonyms of *Nomada fulvicornis fulvicornis* by Alexander and Schwarz (1994) in their world catalogue of *Nomada* (which recognises five subspecies of *N. fulvicornis*).

The Highgate Common populations of *Nomada fulvicornis*

At Highgate Common, Staffordshire (SO938899) a strong population of *A. nigrospina* is present (one of only a small number of modern populations currently known in Britain), and also the bivoltine *A. bimaculata*. Both species support populations of a nomad bee that key out as *Nomada fulvicornis*, but these are far from identical in terms of appearance and ecology, and appear to be acting as two distinct species. Females of the form associated with *A. bimaculata* (the '*bimaculata* form') are relatively small and gracile (wing length typically 8.5mm) with a relatively large tubercle on the labrum (Fig. 1d). Tergite 1 bears a pair of yellow markings, which may be fused in the middle and are typically fringed with red and the yellow spots of tergites 2 and 3 are relatively narrowly separated (Fig. 1e). This form is bivoltine with a flight period that parallels that of *A. bimaculata*, i.e. it usually appears in early April, slightly later than its host, and persists to late May, which is a little later than the host. It then re-appears in mid July, persisting well into August. But in late May, when individuals of the *bimaculata* form are worn and disappearing, and long before the second generation of the *bimaculata* form appears, a significantly larger form (female wing length typically 10mm) associated with *A. nigrospina* (the '*nigrospina* form'), appears. The female always bears a pair of large, deep red spots on tergite 1 and more widely separated spots on tergites 2 and 3 (Fig. 1b). The tubercle of the labrum is relatively small (Fig. 1a), and there are a number of further differences, described in more detail in Table 1. Males of the two forms are less distinct, though the *nigrospina* form has the yellow markings on tergites 2 and 3 more widely separated (Fig. 1c versus Fig. 1f). Individuals of the *nigrospina* form are worn and dying off by the time the second generation of the *bimaculata* form appears. The *bimaculata* form exhibits a little brood dimorphism relating to length of pilosity of the thorax and legs in particular, and the extent of pale markings on the head and thorax. This is also described in Table 1. The two forms of *N. fulvicornis* are shown in Plate 15, fig. 2.

Further examination of material and data

Following discovery of the above, the author made visits to the Natural History Museum, London (NHM) and Oxford University Museum (OUM), which both contain good series of *N. fulvicornis* from a variety of localities (including much foreign material at the NHM). The author has also obtained Sussex and Suffolk female material of *N. fulvicornis* that is seemingly associated with *A. tibialis,* and has corresponded with a number of key workers, including M. Schwarz in Austria, a world authority on *Nomada*. The following has been ascertained:

- The *nigrospina* form of *N. fulvicornis* has been historically recorded at scattered localities in the southern half of Britain, which often coincide with old *A. nigrospina* sites (based on material in collections). All dates indicate it is invariably univoltine with a flight period that matches that of *A. nigrospina*. The typical female appearance remains different to the remaining variation found within the *N. fulvicornis* complex.
- The bivoltine *bimaculata* form is much more frequent in Britain and exhibits some brood dimorphism, generally being more hirsute in the first generation with orange markings on the thorax and head more reduced than in the summer generation.
- Further variation of the bivoltine form of *N. fulvicornis* (with pale thoracic markings particularly extensive) may be linked to populations attacking *A. pilipes*, or perhaps *A. bimaculata* at particularly warm sites. Such variants tend to be from the southern part of the range.
- A further univoltine form of *N. fulvicornis* exists which attacks the univoltine *A. tibialis* in April and May and appears to be indistinguishable from the spring generation of the *bimaculata* form and clearly different to the univoltine *nigrospina* form. This is likely to be the form of *N. fulvicornis* recorded in northern England, as *A. tibialis* is the only potential host occurring north of the Midlands.
- The *N. fulvicornis* complex exhibits tremendous variation when viewed at an international level and already has 39 form or synonym names associated with it, currently arranged within five subspecies (Alexander & Schwarz, *loc. cit.*), which makes it difficult to rank and name the variation found in the British populations.

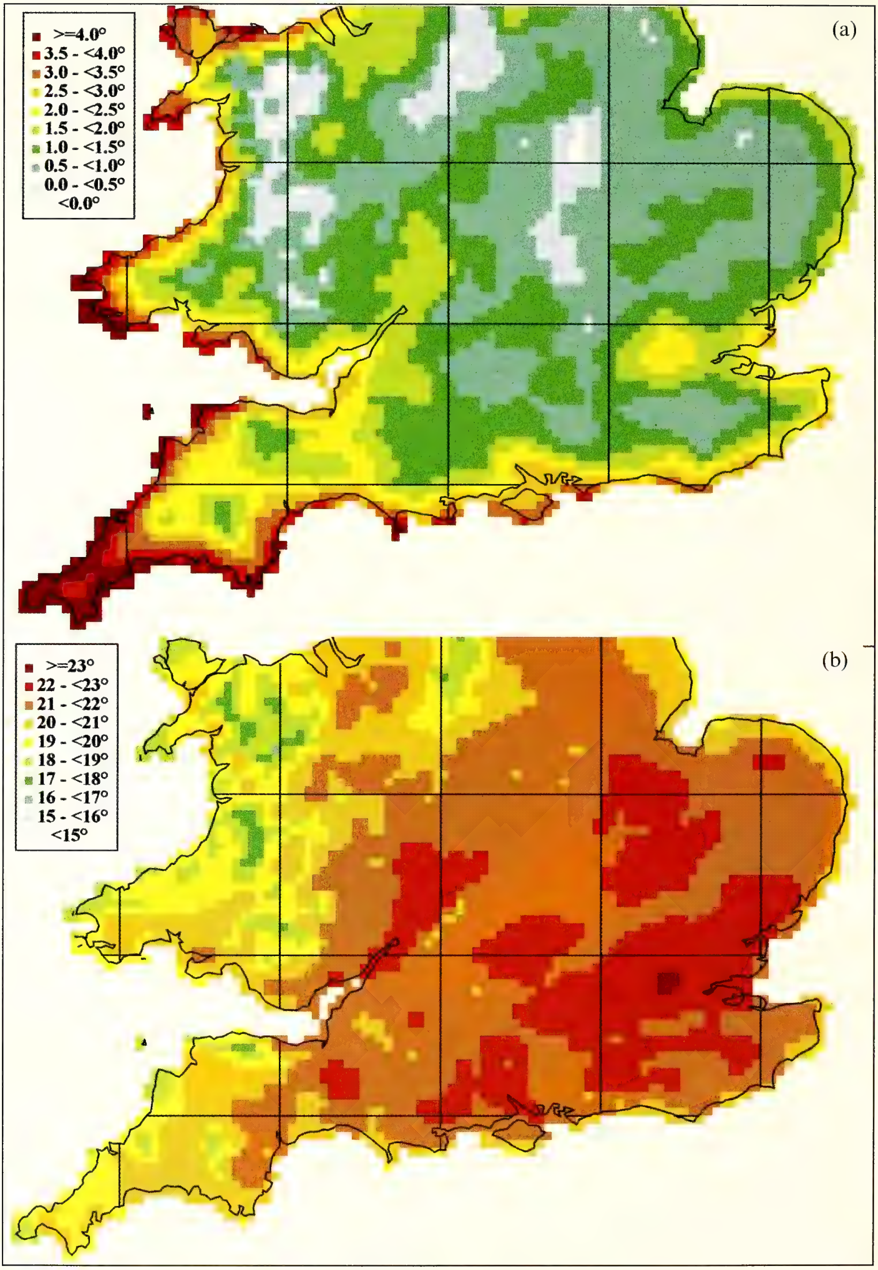

Fig. 6. Average minimum January (a) and maximum July (b) temperatures 1960–1990.

Plate 14

Fig. 2. The two *Nomada fulvicornis* races, top left – male of subspecies *subcornuta*, top right – female of same, bottom left – male of subspecies *fulvicornis*, bottom right – female of same.

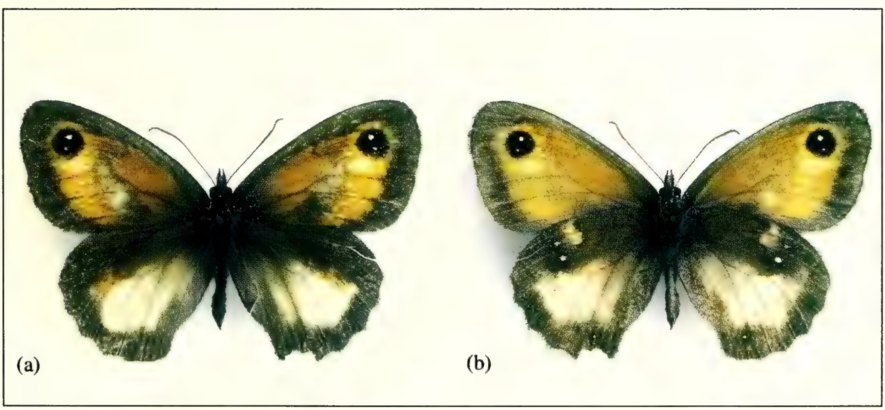

Fig. 1. (a) *Pyronia tithonus*, aberrant male upper side. Chilworth, South Hampshire, 2003. (b) Underside of *P. tithonus*. Photo: L. Winokur.

Fig. 1. Races of *Nomada fulvicornis* associated with *Andrena nigrospina* (a–c) and *A. bimaculata* (d–f). Race associated with *A. nigrospina* (subspecies *subcornuta*), (a) female lower face in profile showing small tubercle of labrum, (b) female abdomen showing extent of black, yellow and (stippled areas) red, and (c) male abdomen – ditto. Race associated with *A. bimaculata* (subspecies *fulvicornis*) showing (d) larger tubercle of female labrum and (e–f) more extensive yellow on the tergites of both sexes.

Table 1. The characteristics of the *nigrospina* race of *Nomada fulvicornis* contrasted with the *bimaculata* race, and a description of the brood dimorphism associated with the latter form.

	nigrospina race (ssp. *subcornuta*)	*bimaculata* race (ssp. *fulvicornis*)
Flight period	Males emerge in late May and females persist until late July, both sexes frequent in June.	First generation emerges in late March, with females persisitng until late May. Second generation appears in mid July and females persisting until late August. Not normally encountered in June or early July.
Female morphology		
Size	Typical wing length 10 mm.	Typical wing length 8.5 mm.
Abdomen	Tergite 1 with a dark red band occupying its full width, lacking any yellow and narrowly divided by a black stripe medially. Yellow spots of T2 & 3 more widely separated medially, those of T3 separated by at least their own width. Sternites extensively reddish but lacking yellow markings. (See Fig. 1b)	Tergite 1 with paired yellow spots of variable size and occasionally fused, set within a red band. Occasionally only red markings. T2 & 3 with yellow markings more narrowly separated, those on T3 usually separated by half their width or less. Sternites usually with yellow markings on at least ST4. (see Fig. 1e)
Thorax	Propodeum with a pair of orange spots of varying size and brightness, occasionally large and yellow approaching the state seen in *N. signata* Jurine. Pilosity relatively short, orange-brown on mesonotum in fresh specimens, silvery and sparse on mesopleuron. Mesopleuron with a red or yellow mark of varying size and brightness.	Propodeum and mesopleuron usually lacking pale markings, though occasionally present in second generation and sometimes very conspicuous in southern specimens. Pilosity long and dense in first generation, tending to be yellowish throughout, shorter and resembling the *nigrospina* race in the second generation, though usually yellower on mesopleuron.
Legs	Darker (extensively reddish-brown) and more robust. Mid and fore tibiae clear yellow at bases. All femora shorter haired below (hairs below mid femur 10–20% greatest width of femora). Mid femur with ventral black marking restricted to basal fifth or less and not extending along posteroventral surface, that of antero-ventral face of hind femur restricted to basal half. Hind coxa with adpressed silver hairs like *N. panzeri*.	Extensively orange and usually more slender in all parts (an allometric state with robusticity increasing in larger specimens). Mid and fore tibiae only obscurely yellow at bases (least yellow in first generation). Femora with longer hairs beneath in first generation (30–50% greatest width of femur on mid leg), but shorter in second generation. Mid femora with ventral black marking typically extending for basal third or more and usually extended much further along posteroventral surface in first generation, that of hind femur extending for much of length. Hind coxa with longer semi-adpressed yellow-tinted hairs in first generation, tending to approach state of *nigrospina* race in second

Table 1 *(continued)*

Wings	Membrane darker, especially at apical margin and in marginal cell (as in *N. panzeri* and *N. integra* Brullé), stigma orange brown, costa dark brown. Tegula usually less than half yellow.	Membrane paler (as in *N. flava* Panzer and *N. marshamella* (Kirby)), stigma orange, costa mid-brown. Tegula usually predominantly yellow.
Head	Face more extensively orange along clypeus and eye margins, usually with central orange spot in the centre below insertion point of antennae. Labrum with relatively small tubercle that is sharply produced (Fig.1a). Antennae always distinctly darkened towards tips.	Face more extensively black and usually lacking central spot in first generation, more extensively orange and sometimes with central spot in second generation. Labrum usually with relatively large tubercle that is produced into a distinct ridge above (Fig. 1d). Antennae usually less distinctly darkened at tips.
Male morphology		
Size	Wing length typically 9 mm.	Wing length typically 7.5–8.5 mm.
Abdomen	Yellow spots on T1 smaller, well separated and with red margins. Yellow spots on T2 & 3 more widely separated, those on T3 typically by at least their own width and bands on T4 often narrowly interrupted medially, producing an appearance not unlike *N. flavopicta* (Kirby). (See Fig. 1c)	Yellow spots on T1 larger, narrowly separated usually without conspicuous red margins. Yellow spots on T2 & 3 less widely separated, those on T3 often fused and T4 usually with a broad and complete band – this applying equally to both generations. (See Fig.1f)
Thorax	Pilosity relatively short.	Pilosity of first generation longer, especially that of mesopleuron, that of second generation resembling *nigrospina* race.
Legs	Tibiae extensively yellow at bases and tips. Mid femur with ventral black marking at base rarely extending beyond basal half, that of hind femur not extending beyond basal two-thirds on anteroventral surface. Pilosity relatively short, fringe beneath mid femur about a quarter the greatest width of the femur.	Tibiae with any yellow markings small and obscure in first generation, those of second generation more resembling *nigrospina* race, but less well defined. Mid femur with ventral black marking usually extending for basal three-quarters, that of hind femur extending beyond basal three-quarters on anteroventral surface. Pilosity much longer in first generation, fringe beneath mid femur about a half the width of the femur and hairs of hind coxa more outstanding.
Wings	Veins and stigma slightly darker than in *bimaculata* race.	Veins and stigma slightly paler than in *bimaculata* race.
Head	Face with yellow areas of clypeus and eye margins relatively extensive, the eye margins yellow up to a point level with the insertion point of the antennae.	First generation with face more extensively black with yellow of eye margins ending well below insertion point of antennae. Second generation variable with some specimens approaching state of *nigrospina* race.

Table 1. The characteristics of the *nigrospina* race of *Nomada fulvicornis* contrasted with the *bimaculata* race, and a description of the brood dimorphism associated with the latter form

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Thorax	Propodeum with a pair of orange spots of varying size and brightness, occasionally large and yellow approaching the state seen in *N. signata* Jurine. Pilosity relatively short, orange-brown on mesonotum in fresh specimens, silvery and sparse on mesopleuron. Mesopleuron with a red or yellow mark of varying size and brightness.	Propodeum and mesopleuron usually lacking pale markings, though occasionally present in second generation and sometimes very conspicuous in southern specimens. Pilosity long and dense in first generation, tending to be yellowish throughout, shorter and resembling the *nigrospina* race in the second generation, though usually yellower on mesopleuron
Legs	Darker (extensively reddish-brown) and more robust. Mid and fore tibiae clear yellow at bases. All femora shorter haired below (hairs below mid femur 10–20% greatest width of femora). Mid femur with ventral black marking restricted to basal fifth or less and not extending along posteroventral surface, that of antero-ventral face of hind femur restricted to basal half. Hind coxa with adpressed silver hairs like *N. panzeri*.	Extensively orange and usually more slender in all parts (an allometric state with robusticity increasing in larger specimens). Mid and fore tibiae only obscurely yellow at bases (least yellow in first generation). Femora with longer hairs beneath in first generation (30–50% greatest width of femur on mid leg), but shorter in second generation. Mid femora with ventral black marking typically extending for basal third or more and usually extended much further along posteroventral surface in first generation, that of hind femur extending for much of length. Hind coxa with longer semi-adpressed yellow-tinted hairs in first generation, tending to approach state of *nigrospina* race in second

Table 1 *(continued)*

Wings	Membrane darker, especially at apical margin and in marginal cell (as in *N. panzeri* and *N. integra* Brullé), stigma orange brown, costa dark brown. Tegula usually less than half yellow.	Membrane paler (as in *N. flava* Panzer and *N. marshamella* (Kirby)), stigma orange, costa mid-brown. Tegula usually predominantly yellow.
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Wings	Veins and stigma slightly darker than in *bimaculata* race.	Veins and stigma slightly paler than in *bimaculata* race.
Head	Face with yellow areas of clypeus and eye margins relatively extensive, the eye margins yellow up to a point level with the insertion point of the antennae.	First generation with face more extensively black with yellow of eye margins ending well below insertion point of antennae. Second generation variable with some specimens approaching state of *nigrospina* race.

233The form associated with *A. nigrospina* at Highgate Common, Staffordshire plus other material of the same form in the NHM and OUM is identical to three females from Barham, Suffolk, in the Kirby Collection at the NHM labelled "*lineola*", a taxon described by Panzer and cited in Kirby's 1802 *Monographia Apum Angliae*. The Panzer type cannot be found, but the illustration he provides resembles the *nigrospina* form (M. Schwarz, pers. comm.). Kirby's "*cornigera*" series (collected in Barham during April) accords to the *bimaculata* or *tibialis* form, whilst his single females of "*subcornuta*" and "*capraea*" (both from Barham in May) appear to be dwarfs of the *nigrospina* form. Kirby's description of *subcornuta*, which notes an almost obsolete horn on the labrum, seems to clearly accord with the *nigrospina* form.

Naming the forms

Various difficulties arise in attempting to place names on the British forms of *N. fulvicornis*, including:

- Does one regard the *nigrospina* form as a separate species, subspecies (race) or variant?
- Are any of the existing synonyms valid for naming any of the forms?
- How many forms are present, and does one assign a name to the *tibialis* form simply because it is univoltine?

I have taken advice from both M. Schwarz and G. R. Else (NHM) in arriving at a recommendation. The degree of morphological differences between the female of the *nigrospina* form and females of the other forms is greater than for other so called 'races' of *Nomada*, such as those described by Richards (1946) for *N. panzeri* Lepeletier, and is also correlated with a distinctly-timed univoltine strategy different from that of other forms of *N. fulvicornis*, a strategy that probably produces genetic isolation from other forms of *N. fulvicornis*. However the narrower differences between males of the various forms, the amount of nomenclatural confusion already surrounding the *N. fulvicornis* complex, plus our relative lack of understanding of the genetic relationships between host-specific forms of cleptoparasitic bees and wasps, suggests a compromise position is best adopted. It is therefore recommended that British recorders refer to the *nigrospina* form of *N. fulvicornis* as subspecies *subcornuta*, and that the remaining forms be retained within the existing subspecies *fulvicornis*, pending further investigations of the variation and genetics associated with these latter populations. Ideally, a critical review of *Nomada fulvicornis* populations from all parts of its Palaearctic range (which extends from Britain to Japan), and from all known hosts should be undertaken, a challenge that is beyond the resources of the author.

Records and observations of the *nigrospina* race of *Nomada fulvicornis* (ssp. *subcornuta*)

The following records of the *nigrospina* form have been obtained. **Cornwall**: St. Minver, 14.vi.1920 (Le Marchant, NHM); **S. Devon**: Budleigh Salterton, 8, 13 & 15.vi.1910 (G. Arnold, NHM, OUM), Dawlish, vi.1911, 5.vii.1911 (R.C.L. Perkins, OUM), Newton Abbot, 6.vi.1919 (R.C.L. Perkins, OUM); **Surrey**: Chobham, vi.1902 (E. Saunders, NHM), Oxshott, 28.vi.1903, 22.vi.1905 (Nevinson, OUM); **Essex**: Colchester, 1901, 1902 (W.H. Harwood, NHM, OUM); **Berkshire**: Tubney, 13.vii.1902, 12.vii.1903, 26.vi.1905 (A.H. Hamm, NHM), Silwood, 5.v.1952 (O.W. Richards, NHM); **Staffordshire**: Highgate Common, 11.vi.2000, 19.vii.2000 (worn females flying with fresh males and females of the *bimaculata* form), 26.v.2001 (fresh males alongside old females of the *bimaculata* form), 24.vi.2001 (S. Falk, personal collection); **Caenarvonshire**: Abersoch, 2.vi.1912 (ex. Coll. Nevinson, OUM).

Highgate Common is the only modern locality known for the *nigrospina* race, and the host is otherwise only recently recorded at Branscombe, Devon (G.R. Else), Papercourt Gravel Pit, Send, Surrey (D. Baldock) and the Chafford Hundreds, Essex (C. O'Toole). Both bees appear to have shown considerable national declines and are worthy candidates for RDB1 (Nationally Endangered) categorisation and Biodiversity Action Planning. At the time of writing, English Nature is preparing the notification of Highgate Common as an SSSI based mainly on its outstanding bee and wasp fauna. Management recommendations for all scarcer insects known from the site, including *N. fulvicornis,* have been made in Falk & Webb (2002) and the quality of the site for aculeates has benefited substantially from recent scrub clearance and turf stripping.

Adults have usually been encountered close to the nesting areas of the host, but have also been observed feeding on bramble *Rubus* spp. and rosebay willowherb *Chamerion angustifolium* (L.) J. Holub. The host nests in the firmer trodden sand of footpaths and mossy areas alongside and at Highgate Common is very loyal to certain specific stretches of footpath. Females forage on various umbellifers present, including hogweed *Heracleum sphondylium* L., rough chervil *Chaerophyllum tomentosum* L., cow parsley *Anthriscus sylvestris* (L.) Hoffm., ground-elder *Aegopodium podagraria* L. and upright hedge parsley *Torilis japonica* (Houtt) DC.; also bramble. Males of *A. nigrospina* characteristically swarm around broom *Cytisus scoparius* (L.) when in blossom, though no actual foraging by either sex has been noted there.

Acknowledgements

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NEW ABERRATION OF *PYRONIA TITHONUS BRITANNIAE* (L.) (LEPIDOPTERA: NYMPHALIDAE) AND ITS DEVELOPMENTAL BASIS

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ABSTRACT

An example of *Pyronia tithonus* with corresponding upperside and underside symmetrical white blotches, but which does not conveniently fall into any defined category of aberration, is described. The pattern formation processes affected, and the possible environmental and genetic causes, are considered.

OBSERVATIONS

On 5th July 2003, while collecting *Thymelicus* butterflies (Hesperiidae) at Southampton University's conservation area at Chilworth, Hampshire vice-county 11 (SU4018) for a study into species recognition by computer, my attention was drawn by a specimen of the Gatekeeper *Pyronia tithonus* (L.) with a prominent white blotch on the hindwing undersides and which I therefore retained. It required some coaxing to open its wings, when I noticed a similar blotch on the hindwing uppersides but could not discern any forewing sex brands. Its abdomen was distinctly slender, but as the claspers were also hard to discern and its worn condition suggested an older individual, I could not reliably exclude the possibility of it being a largely egg-depleted female which might yet yield some ova. I had attributed its small size to its aberrant nature, and only after observing typical females flying locally did I re-examine it, confirm it was male, and decide to set it (Plate 15, Figs 1a and 1b). It was shown at the BENHS Annual Exhibition 2003.

Superficially, it is closest to ab. *postalba* aberrations in which the hindwing orange ground colour is replaced symmetrically by pure white (Leeds, 1949), and as with many comparable aberrations (Russwurm, 1978; Harmer, 2000) both surfaces are affected. However it also shows features of *partimtransformis* aberrations in which the pale patches do not conform to the marking boundaries and are less perfectly symmetrical (Leeds, 1949). On the hindwing uppersides, the white coloration obscures the eyespot ring in s2 and in s1–3 extends as a suffusion onto the darker basal area, while in s4 some of the ground colour remains unobscured (Plate 15, Fig. 1a). The forewing uppersides have an asymmetrical white suffusion on the sex brand in s1b–3, and in s3 some pale scaling below the twin eyespot. The eyespot is itself unusually large, adding to the specimen's female-like appearance. These features are repeated in corresponding positions on the underside (Plate 15, Fig. 1b). The aberration does not fall conveniently into any of the categories described by Leeds (1949), Russwurm (1978), Harmer (2000) or Carter *et al.* (2004), and may be unique.

The nature and location of abnormalities can help identify their causes. *Pyronia tithonus* lacks the flavonoid pigments of some Satyrinae (Ford, 1957) and as in other Nymphalidae the matt white of the eyespot pupils is structural (Scoble, 1995). These are distinguishable from the pale patches which appeared translucent when held up to the light. Examination with a hand lens revealed these to be thinly scaled, with the scales themselves ranging from almost white to very pale grey, and a more obvious grey on the normally darker-brown wing areas. The orange and browns replaced by the pale patches are produced by melanins (Nijhout, 1981). Pigment synthesis occurs within the wing-scales as enzymes lodged in their cuticles interact with pigment precursors circulating in the haemolymph (Nijhout, 1980). The precursors are produced sequentially. In one model, scales within each colour area possess just one enzyme and can process just one precursor. In the other model, every scale has the full set of enzymes, but each substrate can only access scales of a given maturity and so the visible pattern reflects the initiation sequence or rate of scale development. The fact that the colours replaced by the pale patches appeared normally in their other locations rules out a global mutation in a gene coding for a pigment substrate or enzyme. Yellows and greys too are produced by melanins (Nijhout, 1981), and variations in the intensity of melanin-related colours can also arise from differences in their concentration (Nijhout, 1980). The abnormal coloration is therefore most likely due to a defect in the development of scale structure that interfered with the incorporation of melanin-synthesising enzymes in their cuticles or access to them by their substrates.

Bilateral symmetry is established early in egg development (Goodwin, 1984), at which time left and right sides become independent. The imaginal discs from which each wing develops comprise developmental units or 'compartments' (Sibatani, 1980) and start growing around the time the larva hatches (Nijhout, 1995). From the outset, the anterior compartments of both wings function as one collective unit and their posterior compartments as another. Their boundaries correspond to the borders of s5/s6 (Sibatani, 1980) and in the hindwings of some Satyridae possibly s4/s5 (Winokur, 1996). Upperside/underside independence (with the anterior and posterior of both wings still functioning collectively) then arises in early imaginal disc development, and finally forewing/hindwing independence is established (Sibatani, 1980). The positions of the pale patches thus indicate that they are confined to the posterior compartments, and their strong upperside-underside correspondence but poorer symmetry (Plate 15, Figs. 1a–1b) indicates that their ultimate cause can be traced back to an event occurring after the establishment of left/right independence but before the attainment of upperside/underside independence.

Despite the assertions of Windig & Nylin (1999), Lepidoptera do not exhibit directional symmetry or antisymmetry (where asymmetry is the rule but unpredictable in direction, Soulé, 1967), and the imperfect left-right correspondence is attributed to random non-directional 'fluctuating asymmetry' (FA). FA is a manifestation of the perturbation of developmental pathways, and its magnitude indicates how well they are buffered against this (Mpho *et al.*, 2000). Buffering ability can have a genetic basis though the genes involved need not be the ones responsible for producing the phenotypic trait in question (Reeve, 1961). Sources of perturbation include environmental stresses and genetic imbalances (Mpho *et al.*, 2000). Thus aberrant individuals and traits can be expected to show a higher than usual level of fluctuating asymmetry (Soulé & Baker, 1968), and this is consistent with the more perfect symmetry of the specimen's non-aberrant features.

It is not possible to tell from its appearance whether the aberration had a genetic or environmental basis because both kinds of factor can exert equivalent influences on patterning physiology. Indeed environmentally produced phenotypes often resemble known genetic or geographical forms, when they are described as 'phenocopies' (e.g. Tebbutt, 2002), though neither gene nor environment can be considered primary in the production of the common phenotype (Goodwin, 1988). Furthermore, susceptibility to environmental modification can itself have a genetic basis, with the resultant phenotypes disclosing this underlying genetic variation (Nijhout, 1984). As with 'classical' genetic traits this variation can be continuous (Nijhout, 1984) or discontinuous (Bailey, 2002) in its expressivity. The summer of 2003 was exceptionally warm and would have been conducive to the production of environmental variants.

Sensitive times include the late larva to early pupa when imaginal wing-disc growth is complete (Nijhout, 1985) and the late pupa when scale maturation and pigment synthesis are ensuing (Nijhout, 1991). In *P. tithonus* these stages correspond to the middle weeks of June and to mid-July to early August (Thomas & Lewington, 1991), though the warm spring had advanced many species by up to three weeks.

Alternatively, the warmer weather could have enabled the survival of a deleterious genotype that would otherwise have perished in an immature stage. A generally improved survival of immatures would also increase the likelihood of a rare genotype appearing in the adult population simply because individuals are more numerous (Ford, 1957), though hot dry summers do tend to shorten adult life span in the species (Asher *et al.*, 2001).

Given the occurrence of the Gatekeeper aberration at the site, it is notable that an ab. *marconi* Frohawk of the Marbled White *Melanargia galathea* (L.) (Russwurm, 1978) was seen (and photographed) there nine days later by Dr James W. Peat of Southampton University (pers. comm.).

It would have been desirable to pair the aberration with a virgin female to determine its genetic basis, though experiments on other species using artificially bleached specimens suggest it would be less attractive to mates (Ford, 1957). A genetic basis would require either a pre-existing gene or a newly arisen mutation. If due to a pre-existing gene then it would almost certainly be recessive, because a non-deleterious dominant would be expected to have been manifest in more individuals, while an ancestral deleterious dominant would become lost from the population or rendered recessive by evolution (Ford, 1957). In the latter case the aberration would be homozygous, and when backcrossing the F_1 heterozygotes should yield 25% homozygote recessives in the F_2 (Harmer, 2000). Since the proportion of heterozygotes in a population can be high even when the recessive homozygote is rare (Falconer, 1981), future observations at the site could also prove informative. If due to a newly arisen mutation, the chance of the mutation occurring in both alleles at the gene locus is so vanishingly small that the aberration can be considered heterozygous and hence dominant. Here, pairing with a wild-type female should produce 50% aberrants in the F_1. In both cases, a significantly lower than expected proportion would imply deleterious pleiotropic effects. However, even a dominant aberration may fail to appear among the F_1 adults if it is highly deleterious. Genetic loads in Lepidoptera mainly concern the metabolic integration of the individual and mostly manifest as death of the developing larva within the egg (Oliver, 1981). In this event, the frequency of aberrant genotypes among the F_1 might instead be estimated from the proportion of eggs failing to hatch; though failure of an entire egg-lay is usually indicative of a lack of insemination (Oliver, 1981).

Rearing under different temperatures and humidity regimes can reveal how seasonal conditions affect the fitness of aberrant genotypes, while pairings between individuals of given responsiveness to temperature ‘shocks’ and examining the expressivities of their F_1 under corresponding treatment, can help determine the role of genotype in conferring susceptibility to environmentally-induced pattern modification (Waddington, 1942; Shapiro, 1981).

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BOOK REVIEW

The Aculeate Hymenoptera of Wales. With special reference to the manuscript 'The Aculeates of Wales' by H.M. Hallett. By Mark Pavett and Adrian Fowles. 120 pp. Obtainable from Department of Entomology, National Museum of Wales, Cathays, Cardiff CF10 3NP. Price £5.00, £7.00 p&p.

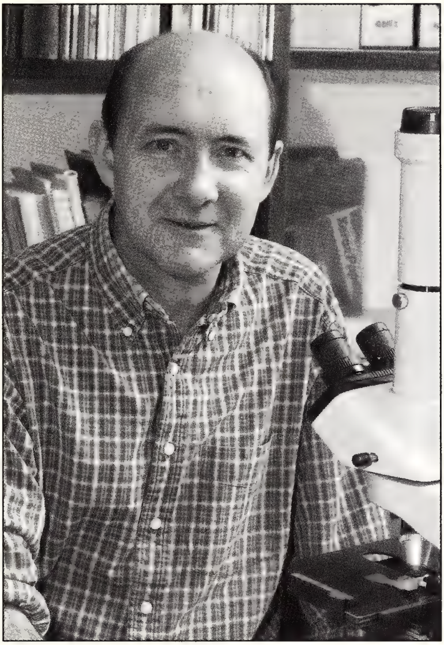
This, the first in the 'Biotir' series of publications produced by the National Museum of Wales, aims to increase the availability of the information stored within the museum. As a first production it does this job very well, which is a good thing, or H.M.H. would be turning in his grave. He put an awful lot of time and money into the Cardiff Museum and must have been keenly upset to see the relative disregard with which Natural History was held during his lifetime. As anybody who has been to the modern entomological section of the museum as part of a BWARS meeting, or for any other reason, will have seen, he has at last been satisfied; the Biodiversity and Systematic Biology (Natural History!) Department now has the room and staff to become not only a museum for Wales, but also the world.

H.M. Hallett apparently always intended to write-up and publish the Aculeate Hymenoptera of Wales, but, understandably, his wish to see it as complete as possible meant that he was never satisfied. Hence, the manuscript account which forms part of this publication is as far as he ever got. Not that this was an insignificant effort, not only in its geographical coverage, but also in the notes he made concerning the species recorded. In this it matches several long-quoted papers (on *Andrena* and *Nomada*; *Halictus* and *Sphecodes*) by R.C.L. Perkins and it is very useful to have a second opinion on the status of aculeates which is largely based on a different region of the UK. He agrees with Perkins in his assessment of *Lasioglossum nitidiusculum* (Kirby) as being common – oh where is it now! He also found *Andrena flavipes* Panzer almost unknown in Wales, although he knew it to be abundant elsewhere. Interestingly it now is common, in southern Wales, at least!

Mark and Adrian have updated the overall Welsh list by reference to their own and other collectors' records and by thoroughly going over all the material held in the museum. In the current publication, supplementary lists give those species which Hallett should have been aware of, but which never made it to the manuscript, and those species added to the Welsh list since Hallett's time. Inevitably anyone with direct knowledge of the area, or species, in question will have their own quibbles – what happened to the record for *Hylaeus signatus* (Panzer), taken by Mark and myself on Merthyr Mawr in June, 1998? I would also dearly love to see the specimen on which the record for *Ammophila pubescens* Curtis is based. However, these thoughts just serve to emphasise the value of the work. No longer does one have to go to Cardiff: Mark and Adrian have brought Cardiff to you, and all for a very modest sum. I urge all with an interest in Aculeates to rob their piggy banks and get a copy.

MIKE EDWARDS

SOCIETY NEWS
Dr Mike Wilson, BENHS President 2004–2005



I was born and grew up in Croydon and entomology in my early teenage years centred on Mitcham Common and other sites in southern England, where I collected butterflies and macromoths. I joined the Society in 1968, when it was still the "South London" and often attended meetings after school. I also attended some BENHS field meetings and remember very well seeing some of the 'greats' in action.

From that early age I saw that the social side and the communication of enthusiasm about entomology was as important as the scientific aspects.

In 1973, after three years studying Zoology & Botany in Cardiff University and including a project on *Phyllonorycter* (Lepidoptera), I was offered a position as research assistant to Professor M. F. Claridge, who was studying the host-relations of tree-associated leafhoppers. So I started to identify some of the smallest leafhoppers and began to enjoy working on the group. I was pleased to be able to add several leafhopper species to the UK fauna from that period – including two species from Mitcham Common, which I found while visiting my parents! Thirty years later I am still working on the taxonomy and biology of Auchenorrhyncha (leafhoppers and planthoppers). I worked in Cardiff University for ten years and then joined the (then) Commonwealth Institute of Entomology (CIE), based in the Natural History Museum. During the ten years I spent there I studied leafhoppers and planthoppers from many parts of the world, but especially from rice, sugarcane, coconut and other crops. In 1992, I left the International Institute of Entomology (as CIE had become) to become Head of Entomology, in the National Museum of Wales. Here after ten years I again started to study the British 'hopper' fauna in some detail, as well as collecting widely in Europe and wherever else I can manage to get to.

While actually working in London, like so many others, I never seemed to have the time to attend BENHS meetings as often as I might have. Strangely, I became more closely associated with the BENHS only after returning to work in Cardiff, taking over as Editor of the Journal from Richard Jones. Editing work was not wholly new to me having spent periods while in London as editor of *Antenna* (RES Bulletin) and assisting editing the *Bulletin of Entomological Research* (a CABI journal). I am keen that the Society is able to participate fully in the various issues that make up modern entomology – conservation, collecting and publishing the latest news on the British insect fauna.

9 September 2003

Mr DAVID BEVAN of the London National History Society (LNHS) chaired the joint meeting of the two societies.

Mr R. HAWKINS showed a green form of the larva of the Peppered moth, *Biston betularia* L. This had been beaten on 11.viii.03 from *Rhododendron ponticum* L. at Ottershaw, Surrey. The caterpillar was subsequently offered leaves of oak, birch and chestnut but the larva stayed with rhododendron. Mr Hawkins also showed a squashed green oak bush cricket, *Meconema thalassinum* (Degeer) found on the pavement at Horley, Surrey. He reminded the meeting that September was the time to look for the other *Meconema* species in Britain, the recently established Southern Green Oak Bush cricket *M. meridionale* Costa.

Mr R. SOFTLY showed a live plume moth, *Amblyptilia acanthodactyla* (Hübn.) taken the previous night in his Hampstead garden light trap. He had also taken this species there in September 2002. In Colin Plant's recent review of moths in Middlesex it is described as local. Mr Softly noted that it seemed to be confined to well-worked places.

Mr A. J. HALSTEAD showed two final instar larvae of the Death's Head Hawk moth, *Acherontia atropos* (L.) found feeding on potato in a garden at Godalming, Surrey. He also showed a live female of the wasp-mimic hoverfly, *Chrysotoxum festivum* (L.) collected at the Royal Horticultural Society Garden, Wisley, Surrey.

Mr L. WILLIAMS gave the ninth Brad Ashby Memorial Lecture on the subject of 'Butterfly monitoring in London'. For recording purposes the London area was defined by the LNHS as a 25 miles radius circle centred on St Paul's Cathedral. The principal means of monitoring butterflies was the use of standardised transect walks. These were developed at Monks Wood in the 1970s and the first known walk in the London area was started by Ray Softly on Hampstead Heath in 1978. There are now 20–30 transects in the London area that are contributing to the butterfly survey. A transect walk follows a set route, usually 1–4 km long and taking 1–2 hours between mid morning and mid afternoon, on a weekly basis during April–September. The species and numbers of butterflies seen in a notional corridor 5 m wide is recorded on each walk, with the transect being partitioned into different habitat types where appropriate. At the end of the summer the records are collated and statistical analysis used to give index numbers for each species. This enables comparisons to be made between different years or sites.

London's butterflies were surveyed during 1980–86 and the results published in Colin Plant's *The butterflies of the London area* published in 1987 by the LNHS. Since then there have been some significant changes in the distribution and abundance of some butterflies. Among those that had declined was the Small Tortoiseshell. Normally a common species, this had an index figure of 1091 in 1992 but in 2000 this had fallen to 16. The Small Copper and Small Heath had also undergone declines in numbers and had gone from some sites where they were formerly recorded. The Wall Brown had gone from much of southern England and was last recorded in the London area in 1998. Some other species had done better and were increasing in both numbers and range. These included the Brimstone butterfly, Gate Keeper, Speckled Wood and Marbled White. The London area also has sites for some of the scarcer species with specialist habitat requirements. These included the Dingy Skipper, Grizzled Skipper, Green Hairstreak, White-letter Hairstreak, White Admiral, Silver-washed Fritillary and Dark Green Fritillary. In general there seems to have been a decline in some grassland species while gains have been made with those species associated with woodland edge habitats.

11 November 2003

The President Mr B. H. HARLEY announced the deaths of Mr K. V. Cooper and Mr D. A. Porter.

Mr R. HAWKINS showed a tachinid fly, *Subclytia rotundiventris* (Fall.) reared from the shield bug *Elasmucha grisea* (L.). He had found the shield bug on an alder at Frimley, Surrey on 7.viii.03. He noticed an egg attached to the bug, though this had apparently hatched earlier as a larva soon emerged from the bug and pupated. The adult fly emerged on 23.viii.03. This is one of the few recorded rearings of tachinid flies from Heteroptera in the UK.

Mr M. J. BLECKWEN showed an unidentified beetle he had found on a washing line at Feltham, Middlesex that was subsequently identified as a chrysomelid beetle, possibly a *Phyllodecta* sp.

Mr B. K. WEST showed some aberrations of the Garden Tiger moth, *Arctia caja* L. that had been taken as adults. These were the forms ab. *schizomaculata* Gdn. Smith, 8.viii.1983; ab. *rivularis* West, 10.viii.1986; ab. *consolidata* Cockayne, 10.viii.1971. Sadly, this moth is no longer common in north west Kent.

He also noted that 2003 had been an excellent summer and that the Straw Dot moth, *Rivula sericealis* Scop. had produced three instead of the usual two generations. It produced its usual generations of adult moths in May–June and late July–August but adults were taken at light again on 17 September after five cold nights. A further 14 specimens were seen over the following six days.

The following persons were approved as members by Council: Mr Anthony J. Calvert, Mr Leslie J. Hill, Mr Byron J. Machin, Mr Graham N. Saunders, Ms Barbara Schulten, Mr Paul E. Bryant, Mr John Crouch, Dr Robin G. Field, Ms Kathy Meakin, Mr John M. Randall, Dr Susan A. Clarke, Mr David Evans, Mr Lee V. Gregory, Dr Andrew B. Lane and Miss Katie Walden.

Dr KELVIN CONRAD spoke on 'the hairy decline of British moths'. It was generally accepted that some moths, for example, the Garden Tiger moth *Arctia caja* L., had become less widespread than previously. Evidence in support of this came from long-term moth records provided by the Rothamsted light trap network. During its existence since 1968 there have been 450 trap sites, with between 70–129 operating in any year. Fifty-four sites had more than 15 years of continuous daily records. Records from the survey showed that *A. caja* had declined overall by about 45% from the earliest records in 1968. It had gone from about 30% of the trap sites and become less common in places where it continues to be found. The moth seems to be disappearing from the South East and retreating northwards and westwards. An analysis of weather records suggested that the overwintering caterpillars were favoured by relatively dry winters and cold springs. These conditions were provided when North Atlantic weather systems predominate. East Atlantic weather systems caused wetter winters and warm springs; this type of weather system had become more frequent in recent years.

This indicated that climate change could be the cause of the Garden Tiger's decline. However, when a broader look at the Rothamsted data on moth numbers was taken into account the situation was less clear. Of 338 species of macromoth, about two thirds had declined in abundance over the period of study. A comparison of the fortunes of species with hairy larvae showed no real difference with non-hairy species. Those species that had more than one generation a year were doing slightly better than univoltine species. Other analyses done on the type of overwintering stage, geographical distribution, habitat preferences or moth families showed no significant relationships to the pattern of declines or increases in abundance. Lichen feeders were doing better, possibly due to less pollution allowing more lichen growth. Conifer feeders were also doing well. The ten moths that had shown the biggest declines were the Lead Belle *Scotopteryx mucronata* Heydemann, Dusky Thorn *Ennomos fuscantaria* (Haw.), Hedge Rustic *Xestia agathina* (Dup.), V-moth *Semiothisa wauaria* L., Double-Dart *Graphiphora augur* F., Garden Dart *Euxoa nigricans* L., Grass Rivulet *Perizoma albulata* D. & S., Dark Spinach *Pelurga comitata* L., the Spinach *Eulithis mellinata* F. and the Figure of 80 *Tethea ocularis* Hubn.. The top ten moths for increases were the Least Carpet *Idaea vulpinaria* Lempke, Blair's Shoulder-knot *Lithophane leautieri* Boursin, Satin Beauty (*Deileptenia ribeata* Clerck, Treble Brown Spot *Idaea trigeminata* Haw., Scarce Footman *Eilema complana* L., Peacock moth *Semiothisa notata* L., Juniper Carpet *Thera juniperata* L., Grey Shoulder-knot *Lithophane ornitopus* Dadd, Broad-bordered Yellow Underwing *Noctua fimbriata* Schreber and the Devon carpet *Lampropteryx otregiata* Metcalfe.

The speaker considered that there were no general factors that could explain the declines. Species that were increasing included some that were recent colonists and those which occur in gardens and other managed habitats. Those which were declining were often associated with less well-maintained habitats. Further analysis of the data was needed to look at regional differences and to define moth associations with habitat types or host plants.

The lecture was followed by a lively discussion on the causes of declines in moth distribution and abundance.

13 January 2004

The President Mr B. H. Harley opened the meeting and announced the deaths of J. D. Bradley, an Honorary member, and M. Waterhouse.

Mr R. D. Hawkins exhibited a recently published book, *Atlas des Coccinelles de la Manche*, which was a local distribution atlas of ladybirds in the la Manche département of northern France. It was illustrated with watercolour pictures of all the ladybirds present in this part of France. Mr Hawkins also exhibited specimens of the east Asian ladybird *Harmonia axyridis* Pallas from South Haven, Michigan, USA. This species was introduced into the USA for pest control but occurred in plague proportions in 2003.

Mr J. Badmin exhibited a book from Scottish Natural Heritage; *Bumblebees* by Murdo Macdonald.

Mr Maxwell Barclay spoke about 'The National Beetle Collection at the Natural History Museum'. The beetle collections of the Natural History Museum contain around 17,000 drawers of specimens, dating back to the voyages of Captains Cook, Flinders and Bligh, and including much of the collections of Joseph Banks, Charles Darwin and Alfred Russel Wallace. Particularly significant are enormous holdings of types, including the majority of species described by Sharp, Champion, Pascoe, Murray, Blackburn, Broun and many others. The international significance of this collection is vast, and in addition to having over 80, 000 specimens on loan to specialists, visitors come from all corners of the world, visiting for anything from a day to several months. The majority are professional scientists from abroad. It is a strange irony that we have almost as many visitors from the New World or the former Soviet Union in an average year as we do from Britain.

The beetle section maintains a separate British Collection to house the slightly over 4000 species occurring in the UK. This collection is housed in its own room, generally known as the '*British Room*'. The reason for the separation of the British from world material is twofold. Firstly, there is the functional reason, that the collection is primarily used to address questions concerning the British fauna. Workers may be trying to identify material collected in the British Isles , or to look at the distribution of a British species. Foreign material incorporated alongside would only complicate the issue, and make synoptic identification of British specimens much more difficult. Secondly, there is the practical reason. Although British specimens account for less than 1% of the 400,000 + described species of Coleoptera, the British collection occupies almost 10% of the drawer space in the beetle section.

In the separate British Collection, a large number of specimens, from a large number of localities, is a very great strength. It allows (1) people who are constructing atlases to collect information on a species' distribution, (2) the possession of a large number of specimens for examination whenever a species is split, to see whether one or both species occur in in Britain, (3) the ability to guage the full extent, but not the incidence, of variation in a given species.

The British Collection is assembled from a large number of individual collections, including those of Sharp, Champion, Power, Donisthorpe, Leach, Tottenham, Easton and many others. It contains many staphylinid types of Sharp, and a lot of Donisthorpe's types, almost all of which are now synonyms. Donisthorpe was famous for naming new species of British beetles after the young ladies in his life, and his catalogue of types reads like a roll call of now rather quaint sounding girl's names that were in fashion at the beginning of the 20th century: *irenae*, *adae*, *theresae* and *florenceae* to name but a few. The bequest of private collections to the nation is probably the most important way in which our British Collection grows, but it is also supplemented by donations of smaller quantities of material by British specialists and by collecting by our own staff and associates.

Museum collections differ from private collections in several ways. Firstly they are subject to more handling, and secondly they are expected to be preserved for periods of hundreds of years in the best possible conditions. Therefore when new material comes in we aim to bring the material up to the highest museum standards, while maintaining as much of the original collection's character and integrity as possible. New material is first frozen to kill pests, it is then registered and a BMNH label is attached with the name of the collection it came from, the year it was acquired and a register number. The identification is verified and where necessary the specimen is repinned. Any data or determinations from associated notebooks are transfered. Therefore there can be quite a lot of work involved in incorporating material from private collections. It is to be hoped that, more and more, private collectors will keep their collections in a style that is compatible with the long term safety of the material and its data. The 1950s editions of the *Coleopterist's Handbook* have a lot to answer for, and have caused months, even years, of unnecessary work. They propagated the then prevalent fashion for low pinned, numbered specimens with the data in two series of notebooks, one for localities and one for determinations. At best this causes the curator and his students a great deal of repinning and labelling, at worst the Museum receives a pile of half-eaten specimens and the notebooks are thrown away.

Recently we have had opportunities to provide new and better housing for the collections. Health and Safety at Work legislation has led to the abolition of naphthalene, paradichlorobenzene and, most recently, dichlorvos from the work-place. However we have upgraded our furniture to such an extent that the new metal cabinets can provide a physical barrier against pests, as well as having other advantages over their rather beautiful but impractical mahogany predecessors. Although the new cabinets are not fireproof, they have the advantage that they are at least non-flammable. Better still, they have a seal that excludes pests, and creates a stable climate.

11 May 2004

The President Dr M. R. Wilson announced the death of Mr P. A. Lees.

Dr J. Muggleton gave an example of the sort of insect identification he was asked to make from a rudimentary description given to him in phone calls or e-mails. He had received a description of a brown furry small wasp with a sting in front found in a kitchen. He managed to work out this was a bee fly, probably *Bombylius major* L.

Mr R. Uffen reported the finding of a tiger beetle, *Cicindela campestris* L., near his doorstep in Welwyn, Hertfordshire. This is an uncommon beetle in Hertfordshire. He had been trying to rear the larvae in flower pots.

Dr C. Spilling noted that the red lily beetle, *Lilioceris lilii* (Scopuli) was abundant in his garden in Harrow, Middlesex this year. The President added that it had also been common in Cardiff in recent years.

The following persons were approved as members: Mr Andrew N. Keay, Mr Antony Lacey, Mr Dafydd Lewis, Mr Richard J. Moore, Mr Robert Pratley, Mr Paul Pugh and Mr Duncan C. Trew. The Surrey Biological Records Centre has become a corporate member.

Dr Keith Alexander spoke on "The Noble Chafer and other insects in ancient orchards". The Noble Chafer *Gnorimus nobilis* (L.) is a very scarce beetle in Britain. It is a UK Biodiversity Action Plan priority species, with the People's Trust for Endangered Species being the lead partner. The speaker was conducting a survey, jointly funded by the PTES and English Nature, to discover the beetle's current status and distribution. The larval stage feeds on dead wood and develops out of sight in the rotting heartwood of suitable trees, especially old orchard trees. The adult beetles are rarely seen, with a few records of them found on white umbelliferous flowers. This could present difficulties in identifying sites for this beetle, since it would not help the beetle if trees had to be cut up to locate the larvae. Fortunately, the larvae produce distinctive excrement pellets that can be found inside rot holes.

The Gloucestershire, Herefordshire and Worcestershire area has a long tradition of fruit growing and has many orchards with overmature trees. This area is where most records of *G. nobilis* have been made. Those orchards that contain old trees with rot holes have a high priority for conservation as sites for the beetle. Larval frass has been found in plum and apple trees. Trees with a white rot, caused by *Inonotus hispidus*, and a red rot caused by *Laetiporus sulphureus* (Chicken of the Woods), both support the noble chafer. The latter fungus causes rot in a wide range of trees but there appears to be something about orchard trees that makes them particularly suitable for the beetle. This may be the concentration of old trees grown in relatively open conditions, with a favourable climate for the beetle. A survey of orchards in Gloucestershire in 2002 produced 10 positive records in 90 orchards. In 2003, 109 orchards produced six records. In 2002, 65 orchards in Worcestershire produced two records. The noble chafer survey team is currently mapping known and potential sites for the beetle and assessing the size of populations.

There has in recent years been a loss of old orchards and this is an on-going problem. Old orchard trees support many saproxylic insects, as well as insects associated with mistletoe, lichens and meadows. The list of saproxylic insects found in some orchards is comparable with old growth forest and pasture woodland. There are, however, currently no SSSI guidelines for orchards. English Nature have a project to collate existing information and review the conservation status of this habitat.

FIELD MEETING REPORTS

Speyside, East Inverness & Moray, 10–20 May 2002

Leader: **James Cadbury**—Following a successful BENHS, Butterfly Conservation and RSPB mothing event on Speyside, Inverness-shire in late July 2001, a second meeting was held there between 10 and 20 May 2002. Once again it was based on the two RSPB nature reserves of Abernethy Forest and Insh Marshes, but several other sites in the area were also visited. There were 18 participants who at least attended one of the two week-ends. We greatly benefited from the presence of David Green, one of Butterfly Conservation's two moth officers, and two local lepidopterists, Roy Leverton (the Banffshire Moth Recorder) and Dr Mark Young (University of Aberdeen).

A total of 97 macro-moths was recorded; these included 23 species as larvae and another three as empty pupal cases or cocoons. There were two Red Data 3 species, both of which were Biodiversity Action Plan Priorities, ten Nationally Notables (including six Na) and nine local species. David Green, Mark Young and John Clifton identified 36 'micros', including three potential Red Data 1 species and five Notables (1 Na). A Global Positioning System (GPS) is proving an invaluable tool for the field worker with respect to accurate location and altitude information, particularly in mountainous areas.

A good deal of time was spent searching in daylight around Bearberry *Arctostaphylos uva-ursi* (L.), in the hopes of finding two target species whose larvae feed on this sprawling low shrub. We were pleased to find the Netted Mountain Moth *Macaria carbonaria* (Cl.)(RDB 3, BAP Priority) at three sites. Carn Ban Mor , where we found it locally plentiful at altitudes ranging from 380–640 m, is apparently in a new 10 km square for this species. In calm, sunny weather males were flying actively in the afternoon. In strong wind, however, these moths restricted their activities to a jerky crawl or short 'hopping' flights, rising only a few centimetres. It was disappointing not to record this small geometer on the Abernethy reserve, though it occurred as low as 234 m on Tulloch Moor within 100 m of the boundary. A search of an extensive area of bearberry at over 700 m on Meall á Bhuachaille above the Pass of Ryvoan between Abernethy and Rothiemurchus was unsuccessful.

The other target, the Small Dark Yellow Underwing *Anarta cordigera* (Thunb.) (Na), was more elusive. We saw it in rapid 'buzzing' flight in the early afternoon sunshine where bearberry was flowering at both Ralia (Newtonmore) and in Glen Feshie. A fresh specimen was found on a fence post at a known site near Nethy Bridge. This species appears not to extend its altitudinal range as high as the Netted Mountain Moth; we found it between 277 and 439 m.

Several hours were devoted to searching below mats of Crowberry *Empetrum nigrum* L. at over 700 m on Carn Ban Mor in the hopes of finding the pupae of the Northern Dart *Xestia alpicola* (Zett.) (Na). A single larva in the act of pupating, and three old pupal cases (probably from 2000) was our reward, together with a pupal case of the Black Mountain Moth *Glacies coracina* (Esp.) (Na). A nocturnal prowl by lamplight in the Rynettin birch wood in Abernethy Forest produced a number of moth larvae, including two of the Cousin German *Protolampra sobrina* (Dup.) (RDB 3, BAP Priority) on Eared Willow *Salix aurita* L., a previously unrecorded food plant. We recorded adults at this site in late July 2001. In the Caledonian pine forest of Abernethy, sweeping Bilberry *Vaccinium myrtillus* L. revealed the young larvae of the Rannoch Looper *Itame brunneata* (Na) in abundance, while Juniper *Juniperus communis* L. produced numerous larvae of the Chestnut-coloured Carpet *Thera cognata* (Thunb.) (Nb).

It was satisfying to be able to compare the superficially similar May and Ruddy Highflyers, *Hydriomena impluviata* (D.&S.) and *H. ruberata* (Freyer), and Lunar and Purple Thorns, *Selenia lunularia* (Hb.) and *S. tetralunaria* (Hufn.). The latter is very local this far north, but we found it frequent on Speyside. Thanks to Roy Leverton, a range of pugs was identified. The commonest were Edinburgh *Eupithecia intricata* ssp. *millieraria* Wnuk. and Ochreous *E. indigata* (Hb.) (Nb). Tulloch Moor produced three female Grey Scalloped Bar *Dyscia fagaria* (Thunb.) (Nb). We were not too late in the season to see adults of both Autumn Green Carpet *Chloroclysta miata* (L.) and Red Sword-grass *Xylena vetusta* (Hb.) which presumably had overwintered. Prominents were much in evidence, but outstanding was the Scarce *Odontosia carmelita* (Esp.)(local) which was widespread. Many fresh specimens of the Glaucous Shears *Papestra biren* (Goeze) and Light Knot Grass *Acronicta menyanthidis* (Esp.) rewarded those who troubled to search fence posts.

For many of us, pride of place went to three pristine Kentish Glory *Endromis versicolora* (L.) (Na) males, which somewhat surprisingly came to mv light at Abernethy. The first was rescued from a pot of water outside the trap! It is possible that a reduction in deer browsing pressure and the resulting birch regeneration is improving the habitat for this spectacular moth. Two of the known RV individuals occurred at a site where birch was absent but Alder *Alnus glutinosa* (L.), a known alternative larval food plant, was plentiful.

The 'micros' included five case-bearing *Coleophora* species: one associated with Petty-whin *Genista anglica* L., three (all Nb) associated with Cowberry *Vaccinium vitis-idaea* L. and *Coleophora arctostaphyli* Meder (Nb) associated with bearberry. Tulloch Bog produced the tortricid *Ancylis tineana* (Hb.) (pRDB1) associated with small birches stunted by grazing and the pyralid *Eudonia alpina* (Curtis) (Na) which is rarely found below 700 m (this site is 234 m). Three specimens of the plutellid *Rhigognostis incarnatella* (Steudel) (pRDB1) were recorded on the Insh Marshes reserve. Its larva is supposed to feed on Dame's Violet *Hesperis matronalis* L., a crucifer which in Britain is only naturalized near human habitation. To be confirmed is a glechiid *Xystophora pulveratella* (H.-S.) (p RDB1) which came to mv light near Forest Lodge, Abernethy.

The Highlands of Scotland are a long drive from the south, but even with some uncertain weather to contend with, mid-May is a fabulously beautiful time to be there and the rewards for the lepidopterist are considerable. Thanks everyone for making the effort.

Correction: Mark Young has informed the leader that the larvae recorded on Aspen *Populus tremula* L. at the Insh Marshes in July 2001 that were initially recorded as those of the Chocolate-tip *Clostera curtula* (L.) turned out to be those of the Small Chocolate-tip *C. pigra* (Hufn.) which is more widespread in Scotland.

Bernwood Forest, Bucks & Oxfordshire, 24 August 2002

Leaders: **Paul Waring (PW), Martin Albertini and Martin Townsend**. The Society has held two previous field meetings at Bernwood Forest in recent years. The report of the first of these, on 31 July 1993, provides much background information and references to the history of the recording of Lepidoptera on the site (Waring, 1993). Both meetings have had a target species, as well as the more general aim of up-dating the records over a broader spectrum of invertebrates. For example, during our field meeting on 14 June 1997(Albertini, 2003) we searched for and found the Common Fan-foot *Pechipogo strigilata* (L.), now a nationally scarce moth. The meeting on 31 July 1993 added two new species to the all-time list of 431 species of macro-moths recorded from the site, the Hornet Clearwing *Sesia apiformis* (Clerck) and the Pine Hawk-moth *Hyloicus pinastri* (L.) (Waring,1993). The meeting in 2002 was particularly aimed at investigating the current distribution and status of the False Mocha moth *Cyclophora porata* (L.) in this large woodland complex. The moth appears to be Nationally Scarce and declining (Waring *et al.*, 2003). PW recorded it in various places in Bernwood Forest in the 1980s (Waring, 2002a) but it has not been reported since (M. Albertini, County Moth Recorder for Buckinghamshire, pers. comm.). The date of this meeting was selected to coincide with the dates of peak captures in the 1980s.

We always seem to have a good attendance on field meetings at this site, which are held jointly with the Buckinghamshire Invertebrate Group and the Moths of Oxfordshire Recording Scheme, and this meeting proved no exception. It was an evening session only, with 18 people attending and the operation of 17 lights, some all night, by oaks throughout the forest; oak being the principal larval foodplant of the False Mocha. Waterperry Wood, Oxfordshire, was covered as well as the parts of Bernwood Forest in Buckinghamshire. In addition, Martin Corley placed an actinic trap by the large patch of Butterbur *Petasites hybridus* (L.) on the verges by the bend in the road from the village of Stanton St John en route to the meeting, before dusk, and inspected it just after midnight, on his way back home. Several of us have often wondered whether the Butterbur moth *Hydraecia petasitis* Doubl. might be breeding in this location and here was an opportunity to find out. Unfortunately, the result of this effort was only three moths in the trap when inspected and there was no Butterbur moth amongst them. On another occasion we shall have to try a larger scale attempt to find it.

Catches in all the traps were small, even though the dusk temperature was 20°C, later falling to a minimum night temperature of 10°C. In part the poor catches were thought to be a consequence of a deluge of heavy rain which fell an hour or more before dark, with water streaming down the road through Stanton St John on arrival. However, Martin Albertini and Peter Hall reported that they had experienced unusually small catches in Bernwood and at other sites in Buckinghamshire throughout much of 2002. There was no further rain after dark. To obtain a measure of how the catches compared with the 1980s, PW operated an actinic trap from dusk to dawn at Ride Intersection 7 (O.S. Grid Ref. SP 615 117) which is the main cross-rides at the south end of the fenced part of Oakley Wood, between Forestry Commission compartments 10, 11 and 12. This trap captured 12 macro-moths of 10 species compared with 70 individuals of 31 species in an identical trap on 22 August 1984 when the dusk temperature was 18°C, falling to the same night minimum of 10°C. PW also operated two standard-pattern Robinson light-traps with 125W MB/U bulbs on this meeting, one on the main ride by FC compartment 12 and the other amongst recently coppiced Hazel *Corylus avellana* L. under oaks on the west side of this ride, within compartment 12. These captured only 44 macro-moths of 11 species and 34 macro-moths of 13 species respectively.

Unfortunately no False Mocha were seen. This was despite PW, James McGill and Bill Urwin operating a total of eight MV light traps and one actinic trap all night in the Oakley Wood part of the Forest where PW found the moth consistently from 1984-1986. The most noteworthy changes in the habitat since the 1980s are that most of Oakley Wood has been fenced to exclude deer and allow more woody regrowth. Initially this should have been to the advantage of the False Mocha, which is thought to prefer shrubby growth of oak rather than mature trees (Waring, 2002a, 2004). Large areas of conifers have been cleared in Oakley Wood and elsewhere in the forest and some ride-side verges have been widened. Such changes should be to the benefit

Oakley Wood Ride Intersection 7 on the afternoon of 25 August 1985 (above) and morning of 25 August 2002 (below).

of many insects. The two accompanying photographs show views of Ride Intersection 7 on 25 August 1985 and 25 August 2002. These show that in this area the trees have grown outwards into the ride and the verges have become narrower and more shady. This may be to the benefit of some woodland insects which prefer moister, more shaded conditions, but the low oak regrowth is now tall or more shaded and all of these local changes near Ride Intersect 7 may not be to the advantage of the False Mocha. Because it was not found anywhere else in the wood, it may be that it was simply not a good night or a good season for the moth and further efforts should be made to locate it.

Another difference in the catches compared with the 1980s was the presence of large numbers of the hornet *Vespa crabro* L.. Bill Urwin had the most, with over two dozen in one of his light-traps in the thinned part of Compartment 10. PW recorded no hornets in Bernwood Forest in the mid 1980s although they were present in nearby Wytham Wood, about 16 km to the west. From the late 1970s PW recalls Professor Varley bringing a live hornet from Wytham to one of the evening meetings of the Oxford University Entomological Society during the time he was an undergraduate (1976-1980) and that the Professor commented that hornets were moving into this part of Oxfordshire at this time. PW also recalls a BENHS meeting on 5 September 1998 at Bladon Heath Wood just 5 km north of Wytham Wood in which one of the light-trappers decided to move his light-trap because it was attracting large numbers of hornets. He had set up his light by a mature Ash tree *Fraxinus excelsior* L. in the base of which we discovered the hornets had a nest. Frank Lowe and Warren Gilchrist were light-trapping elsewhere in the wood and also had their traps invaded by hornets.

A close relative of the False Mocha, the Maiden's Blush *Cyclophora punctaria* (L.) was well in evidence with one or two individuals in most of the traps set by oak trees, the larval foodplant. It always greatly outnumbered the False Mocha in the catches from 1984-86. The Maiden's Blush arrived from soon after dark. In contrast, Pale Eggars *Trichiura crataegi* (L.) all arrived after midnight. From the results in PW's traps, they were most numerous in the recently coppiced area (six in this trap compared to one or two in the others). They were the only moth most frequent in the coppiced plot. PW recorded larvae of the Pale Eggar from Hazel, Downy Birch *Betula pubescens* Ehrh. and both Common Hawthorn *Crataegus monogyna* Jacq. and Midland Hawthorn *C. laevigata* (Poiret) in this area during his Ph.D studies (Waring, 1990).

The most noteworthy of the other moths recorded were the Magpie Moth *Abraxas grossulariata* (L.) (both in Oakley Wood and Waterperry Wood) , Black Arches *Lymantria monacha* (L.), Satin Beauty *Deileptenia ribeata* (Clerck), Buff Ermine *Spilosoma luteum* (Hufn.) (a late date) , two male Vapourer moths *Orgyia antiqua* (L.), a Bulrush Wainscot *Nonagria typhae* (Thunb.) and the Straw Dot *Rivula sericealis* (Scop.) (particularly numerous in Waterperry Wood). A single Flame Carpet *Xanthorhoe designata* (Hufn.) was recorded in Waterperry Wood.

A larva of the Triple-spotted Pug *Eupithecia trisignaria* Herr.-Sch. was found by Martin Corley, on Wild Angelica *Angelica sylvestris* L. in Waterperry Wood.

Other insects recorded included a male of the scorpion fly *Panorpa germanica* L. and the shield-bug *Elasmostethus interstinctus* (L.). A few of the dung beetle *Aphodius rufipes* (L.) were present in some of the light-trap catches.

Note that a single False Mocha was light-trapped by Martin Albertini and Peter Hall a week before this Bernwood meeting, at Homefield Wood on 17 August 2002. This is the first record from Buckinghamshire since those from Bernwood in the 1980s. The moth arrived at the trap about 01.00h, in quite a densely wooded ride with much elm regrowth *Ulmus* sp. and large numbers of Clouded Magpie *Abraxas sylvata* (Scop.). Martin and Peter were searching for the White-spotted Pinion *Cosmia diffinis* (L.), which was not found.

The leaders thank all those who attended and made the event a good social occasion and the Forestry Commission for permission to hold the meeting. Copies of the full lists of moths recorded have been supplied to the Forestry Commission and the County Moth Recorders for Buckinghamshire (Martin Albertini) and Oxfordshire (Martin Townsend).

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Tilshead, Salisbury Plain, Wilts. 19th July 2003

Leader: **John Phillips**—As in the previous three years the purpose of the meeting was to continue to investigate the status of the Brighton Wainscot Moth *Oria musculosa* (Hb.) which is a BAP Species receiving attention as part of Butterfly Conservation and English Nature's 'Action for Threatened Moths in England' programme and supported by the BENHS Conservation Working Group.

Despite weather conditions which were good, only one member apart from the leader attended the meeting; however quality rather than quantity prevailed and the leader was delighted to have the company of Mark Parsons head of Butterfly Conservation's Threatened Moths Programme on what proved to be a most enjoyable evening.

Four MV lights were operated on Horse Down west of Tilshead, SU023476 in a trial area recently prepared in 2002 by Defence Estates Environmental Support Team and sown with barley with the aim of encouraging arable weeds as well as hopefully Brighton Wainscot and Corn Bunting; half the site was again ploughed in spring 2004 with plans to re-sow with barley.

Eighty three species of Lepidoptera were recorded comprising thirty Microlepidoptera and fifty three Macrolepidoptera; the majority of species were probably what one would anticipate from this type of grassland habitat; the only species considered worthy of note being *Euxoa nigricans* (L.) (Garden Dart), *Nemophora metallica* (Poda), *Gynnidomorpha luridana* (Gregson), and *Sitochroa palealis* (D.&.S.); needless to say no *O. musculosa* (Brighton Wainscot) were recorded.

This meeting concludes the initial BENHS survey effort over the last four years in respect of *O. musculosa*, although it is anticipated and hoped that members will continue to visit likely sites over the Salisbury Plain area in the hope that a thriving colony will be located and a conservation programme can be implemented. Consequently if any members have in the future any subsequent new records, both the leader and Mark Parsons of Butterfly Conservation would appreciate contact and information.

Once again the leader wishes to thank Paul Toynton and the Defence Estates Environmental Support Team for access to MOD's Salisbury Plain Training Area (SPTA).

South Blean Woods, near Canterbury, Kent, 20 July 2003

Leader: **John Badmin**—With the impending bid for two extensive tracts of woodland in the Blean Woods complex near Canterbury by Kent Wildlife Trust in 2003 (now successfully bought), it was decided to hold a meeting near the southern bloc to obtain baseline records for the area. The original meeting place, at Forester's Lodge off road, was chosen to reduce the time taken to reach the main tract of woodland, as all the footpaths into the woods are difficult to access and involve at least half an hour's walk. A visit by the leader immediately before the meeting indicated that most of the woodland just south of the A2 was either over-mature chestnut coppice or covered with conifers with virtually no open glades for 2–3 km in either direction. Some magnificent sessile oak and hornbeam standard trees were seen but these were few and far between. A decision was taken to begin the day meeting at Arnold's wood, immediately to the west, where there was a mix of open and wooded habitats.

The meeting started with breakfast outdoors at the leader's house in Perry Woods at 8.30 h. A quick tour of the garden was made while members arrived, and the wetland area by the stream noted where snipe used to occur in cold winters. The initial aim was to list the moths captured in the light-traps placed around South Blean woods. These were positioned west of Chartham Hatch (run for an hour and a half before closing down due to lightning and torrential rain), in Blean woods at the back of Rhode Common (run all night despite the weather), woods at Hickman's Green (Heath trap, all night), and Perry Wood (Rothamsted trap in the leader's garden). In the region of 120 macro-moth species were recorded, the largest number both in terms of species and individuals was from Rhode Common (Keith Palmer's Robinson trap). All of the species apart from the Blackneck and Waved Black were considered to be widespread in the area. Larger moths included Privet, Poplar and Elephant hawks, Buff-tip, Pale, Coxcomb and Pebble Prominents, Large, Lesser, Broad-bordered, Lesser Broad-bordered and Least Yellow Underwings, True Lover's Knot and Green Silver Lines. Among the geometers were Small and Common Emerald, Orange moth, Peppered moth (type and form *carbonaria* and Dwarf Cream Wave confirming its eastwards extension across the county. Although there were slight differences in the species composition between traps this was probably due more to the different types of light bulb used than to the habitats sampled.

Despite allocating more than a couple of hours for identification, we ended up in a mad dash trying to empty the various traps (not having the trap from Chartham Hatch on all night was fortunate) in order to meet the others at the pre-arranged meeting place in south Blean. We just about made it!

The weather was again dry and sunny and although we walked along open and shaded footpaths, and then south along the edge of Arnold's wood, the whole area had a very parched look about it. Various editions of the OS maps appeared to be wrong or out-of-date as we managed to find a rather rich open area of mixed grasses and forbs where woodland should have been. This was abuzz with crickets and Richard Moyse managed to locate *Metrioptera roeselii* (Hagenbach) and long and short-winged forms of *Conocephalus discolor* (Thun.). This area would obviously be worthwhile investigating at an earlier time of the year. The walk ended with a visit to the sand pit at Iron Hill where we noted Sand Spurrey *Spergularia rubra* (L.) in substantial quantity and some fast moving Hymenoptera. This spot was regularly visited by Gerald Dicker in the past so an extensive list of bees and wasps for the site is available.

Bowacre Wood, Hittisleigh, Devon, 26 July 2003

Leader: **Roy McCormick**. – The rain fell all day and although it stopped eventually in the evening, the prospects for moth recording did not look promising. Four of us turned up at John Milverton's home and chatted until around 20.45h, just in case anybody else turned up. The trapping equipment was transferred to the other vehicles as there was only room for two at the site and we travelled in convoy behind John in his Land Rover until we reached Bowacre Wood, an area of ancient mixed deciduous woodland. Here, eight traps were set up along the two tracks available, under rather muddy conditions. The weather soon turned to drizzle and although we all thought this was the start of more rain, it stopped! Naturally we did not dare go around tapping branches to flush out moths as we would have got soaked, so we waited until dusk to start the generators. The temperatures were good at around 14°C and the night stayed cloudy until around 23.30h when it cleared completely. A couple of rounds of the traps were completed with very little moth activity; the rain earlier having dampened it all down. Despite this, the list increased steadily during our visit. We left the site at around 01.00h with the species list reaching 85 after a few micros had been identified the next day. The most interesting moths were: one *Hypatima rhomboidella* (L.); one *Eudemis porphyrana* Hb.; several *Chloroclysta citrata citrata* (L.) (Dark Marbled Carpet); two *Deileptenia ribeata* (Cl.) (Satin Beauty); two *Alcis jubata* (Thunb.) (Dotted Carpet) one of our Biodiversity Action Plan species; *Amphipyra berbera svenssoni* Fletch. (Svensson's Copper Underwing) and one *Laspeyria flexula* (D. & S.) (Beautiful Hook-tip). The night was enjoyed by those who came and John Milverton had more species to add to his list for the wood where he is actively undertaking conservation measures.

Bingham Linear Park, Bingham, Nottinghamshire, 2 August 2003

Leader: **Paul Waring**. Bingham Linear Park is a stretch of cuttings and embankments along the line of a disused railway through rather flat, intensively farmed open land. The rail track has been taken up and the site is now owned and managed by Bingham Town Council. The site was chosen by the leader as a site for a BENHS field meeting for three reasons. Firstly the Four-spotted Moth *Tyta luctuosa* (D. & S.), a Red Data Book and UK Biodiversity Action Plan priority species, has been reported here twice in the recent past. The moth was first discovered on this site by Alan Birch, who saw several flying in sunshine on 14 July 1997 at approximately SK 708 389. Sheila Wright visited the site on 19 July 1999 and saw a moth which she is almost certain was a Four-spotted, but she was not able to get close enough to photograph or capture the individual for closer inspection. This appears to be the last record from the site. Searches in 2003 were needed to discover whether the moth still survives on the site. Secondly, Bill Bacon, the site manager and representative for Bingham Town Council, and a long-term resident of the village of Bingham, had expressed an interest in making an inventory of all the wildlife on the site to identify conservation priorities and guide management of the habitats. The third aim of the meeting was to examine plant colonisation of six scrapes made by a mechanical digger on 8 April 2003, as part of a joint project with Writtle College to improve some of the habitat for the Four-spotted moth (Fig. 1). Each is approximately 25 m × 4 m. All six sites were examined the summer before the scrapes were made to ensure that they contained no plant life that was either infrequent or highly localised on this reserve. At this field meeting, five months after the scraping, we found that five of the six scrapes had been colonised very successfully by Field Bindweed (the larval foodplant of *T. luctuosa*) and nowhere else was it as abundant as on the scrapes (see Fig. 2).

The leader was joined by Keith Corbett, Sue Cotton and Stuart Emmerson for the afternoon and evening sessions, commencing at 14.00 hrs, supplemented by Jeremy Fraser for the evening session only. Our rendezvous point for both the afternoon and evening sessions of the meeting was Mill Hill Lane, which runs parallel to part of the cutting on the outskirts of Bingham village. It was a very hot sunny afternoon when we gathered, with a clear blue sky and just a light breeze. On the lane a large bush of *Buddleja davidii* (Franch.) with white flowers was alive with butterflies. We counted twenty Small Tortoiseshell *Aglais urticae* (L.), ten Large White *Pieris brassicae* (L.), five Peacock *Inachis io* (L.), five Painted Lady *Vanessa cardui* (L.), three Red Admiral *V. atalanta* (L.), two Comma *Polygonia c-album* (L.), two Meadow Brown *Maniola jurtina* (L.) and one freshly emerged male Brimstone *Gonepteryx rhamni* (L.). The bush was about 4 m tall and 4 m wide in every direction. Large immigrations of Painted Lady had been reported on the south and east coasts during the previous fortnight, rivalling the great immigration of 1996. I had seen five Painted Lady on the Buddleja in our Peterborough garden before departing for the meeting. Numbers of Large White, Peacock and Small Tortoiseshell had also been building up in the garden throughout the week. The Brimstone was the first individual I had seen of the new summer emergence.

From the meeting point we negotiated a route of farm tracks from the lane which runs to Granby which enabled us to get cars and moth-trapping gear onto the site at the east end.

During the afternoon we recorded the following species of butterflies as we walked from one end of the site to the other along the bed of the former railway:

Essex Skipper *Thymelicus lineola* (Ochs.), Clouded Yellow *Colias croceus* (Geoff.), Large White, Small White *Pieris rapae* (L.), Green-veined White *P. napi* (L.), Small Copper *Lycaena phlaeas* (L.), Common Blue *Polyommatus icarus* (Rott.), Brown Argus *Aricia agestis* (D. & S.), Red Admiral, Painted Lady, Small Tortoiseshell, Peacock, Comma, Wall Brown *Lasiommata megera* (L.), Gatekeeper *Pyronia tithonus* (L.), Meadow Brown and Small Heath *Coenonympha pamphilus* (L.).

The Essex Skipper was confirmed by examining the underside of the antennal club, which was black.

The male Clouded Yellow was nectaring at flowers of Common Bird's-foot Trefoil *Lotus corniculatus* L. and St John's wort *Hypericum* sp. growing on the ballast. Of the two Wall Brown seen during the afternoon, one was in flight up the track-line, the other was basking and resting on the bare soil on one of the scrapes on the embankment.

The single fresh Brown Argus seen was nectaring at the flowers of Common Bird's-foot Trefoil.

The abundance of Painted Lady was amazing. There were large numbers of flowers of Greater Knapweed *Centaurea scabiosa* L. on the south-facing banks of the cutting in warm sheltered positions. These flowers were one of the main attractions for most of the butterfly species. Each clump had five or more Painted Lady nectaring. We counted between forty and fifty Painted Lady as we walked along the line and this was certainly an under-estimate of the total number present. The Small Tortoiseshell was also plentiful and both species continued nectaring avidly, still in sunshine at 18.15 hrs. Several Peacock were seen basking on the bare earth of the scrapes. In contrast, only two Small Heath were seen, again on the knapweed flowers, and just one Small Copper, at 18.30 hrs, feeding at a flower of Common Ragwort *Senecio jacobaea* L.

Adult moths seen by day included a number of Silver Y *Autographa gamma* (L.) and a worn female Narrow-bordered Five-spot Burnet *Zygaena lonicerae* (Sch.) visiting the knapweed flowers and several Dusky Sallow *Eremobia ochroleuca* (D. & S.), both active and at rest on flowerheads and the upper sides of leaves. A Latticed Heath *Chiasmia clathrata* (L.) was seen laying eggs on a plant of Common Bird's-foot Trefoil only 0.5 cm tall growing amongst short grass on the railway ballast at 19.06 hrs and another was seen earlier, basking on a clump of grass by one of the scrapes at 18.30 hrs. Several Common Carpet *Epirrhoe alternata* (Mull.) and Shaded Broad-bar *Scotopteryx chenopodiata* (L.) were flushed from vegetation.

During the afternoon the bushes we encountered along the track were beaten for larvae. Most of the bushes present were Common Hawthorn *Crataegus monogyna* Jacq., which produced larvae of the Yellowtail *Euproctis similis* (Fuess.) (one at 0.8 cm in length), a Grey Dagger *Acronicta psi* (L.) (one at 3 cm) and five larvae of the Chinese Character *Cilix glaucata* (Scop.), all less than 1cm in length, four from one bush. A fully-grown larva of the Large White was found on a knapweed stem, surrounded by the yellow cocoons of a braconid wasp.

Several of the Dark Brown Bush Cricket *Pholidoptera griseoaptera* (De Geer) were heard during the afternoon. A single Migrant Hawker dragonfly *Aeshna mixta* Latr. was seen. Puff-balls were just starting to appear along the bed of the track. A female Yellow-hammer *Emberiza citrinella* was seen with a beakful of small green larvae as it perched atop a hawthorn bush. Other birds recorded included a flock of some thirty Long-tailed Tit *Aegithalos caudatus*, while Linnets *Acanthis cannabina*, Goldfinches *Carduelis carduelis* and Greenfinch *C. chloris* were constantly within view or earshot.

After a picnic-style evening meal, two Robinson light-traps were operated all night at the far eastern end of the site by a dismantled bridge overgrown with scrub woodland in which Ash *Fraxinus excelsior* L., Common Hawthorn, Blackthorn *Prunus spinosa* L. and Grey Willow *Salix cinerea* L. were the main components. One trap was set on the track through the scrub, the other on the exposed bank some 50 m away. The traps were switched on well before dusk. Once they were running and darkness had fallen, four of us searched the central scrape on the embankment for ten minutes from 23.03 hrs for larvae of the Four-spotted moth, with five of us doing the same on the western scrape on the embankment for fifteen minutes from 23.18 hrs, in both cases spreading out to cover the whole of the scrape. In neither case were any larvae of the Four-spotted moth found. Next we examined a number of stands of Rosebay Willowherb *Chamerion angustifolium* (L.) Holub growing along the track, searching them until midnight for larvae of the Elephant Hawk-moth *Deilephila elpenor* (L.). None was found and feeding damage potentially by this species was seen in only three places. Possibly the exposed dry situation was less favourable for them; I have had more success searching Great or Hairy Willowherb *Epilobium hirsutum* L. on ditch banks and in other damp places.

The two light traps both had moths flying around them as soon as it was dark. Most were the Large Yellow Underwing *Noctua pronuba* (L.), which comprised the majority of the final catches, but at least 25 species were noted in the traps by midnight when the people attending departed for their beds. The dusk temperature was 15 °C but by midnight it had fallen to 10 °C. Among the early arrivals at the traps were a Gold-spot *Plusia festucae* (L.), a fresh Sallow Kitten *Furcula furcula* (Clerck), several Lime-speck Pug *Eupithecia centaureata* (D.& S.) and a Grey Dagger in good condition, even though we had earlier found the well-grown larva of the same species. When the traps were inspected just after dawn the total catches were 170 macro-moths of 32 species in the trap on the open track and 234 macro-moths of

Figure 1 Preparation of scrapes, 8 April 2003.

Figure 2 Plant colonisation of scrape, August 2003.

37 species in the trap amongst the scrub. The most noteworthy of the moths was a single Barred Rivulet *Perizoma bifaciata* (Haw.). The larval foodplant, Red Bartsia *Odontites vernus* (Bell.) Dumort., was seen in various places along the track. Despite seeing several Dusky Sallow at flowers or rest by day, only two were captured by the traps.

Grey Partridge *Perdix perdix* and Lapwing *Vanellus vanellus* were vocal just after dawn and several of each were seen, as well as a number of Brown Hare *Lepus europaeus* Pall. crossing the farm track as the leader left the site.

Note that on the way to Bingham, and on the way back to Peterborough, the leader visited a site in Lincolnshire where he had seen first generation adult Four-spotted moths earlier in the year, and had found final instar larvae on 26 June with Robin Field and Graham Watkins (see *British Wildlife* **14**(6): 441). He also conducted a transect count on a Northamptonshire site at Werrington near Peterborough on the morning of the meeting. At both sites no adult Four-spotted moths were seen on these occasions, even though a fresh adult had been recorded at the latter on 28 July, two were seen at Werrington allotments on 6 August and one in the leader's own garden at Werrington on 9 August (2003). The one on 28 July was considered at the time to be the start of what was thought might be a strong second generation in this area, because the first adults had been recorded unusually early at this site in 2003, from 27 April, and the weather since March had been predominantly warm and dry. In most years only a few adults are seen of the second generation at these sites, and 2003 proved to be no real exception. This result suggests that day-length rather than temperature and rainfall may be the most influential factor in determining whether larvae develop into adults later the same year or remain as dormant pupae until the following year at these latitudes.

The leader organised this field meeting as part of a project by Writtle College, Essex, with financial assistance from an English Nature grant, to help deliver the aims of the UK Biodiversity Action Plan for the Four-spotted Moth. Bingham Town Council funded the creation of the scrapes and Bill Bacon arranged the logistics of the scrape creation and other aspects of wildlife conservation on the site. All parties are closely involved with the Butterfly Conservation "Action for Threatened Moths Project" and with the local branch of Butterfly Conservation, and with Dr Sheila Wright, County Moth Recorder, based at Nottingham Museum, who are also helping to monitor the site. The leader would like to thank all those who attended the meeting and all the above parties for their support.

Bill Bacon has since reported that he saw eight Small Copper on the Linear Park on a visit on the weekend of 13/14 September 2003, seven of which were on the scrapes and the eighth adjacent. He states "this is the most I have ever seen there on a single day, and I have been concerned about its survival chances. With Sorrel now on the scrapes, I am much encouraged". It is hoped that both the Wall Brown and the Small Copper will benefit from the scrapes over the next few generations, and that the Four-spotted will make use of them if it is still present on this site—none was reported in 2003. Bill and others will be watching out for all of these species during 2004.

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