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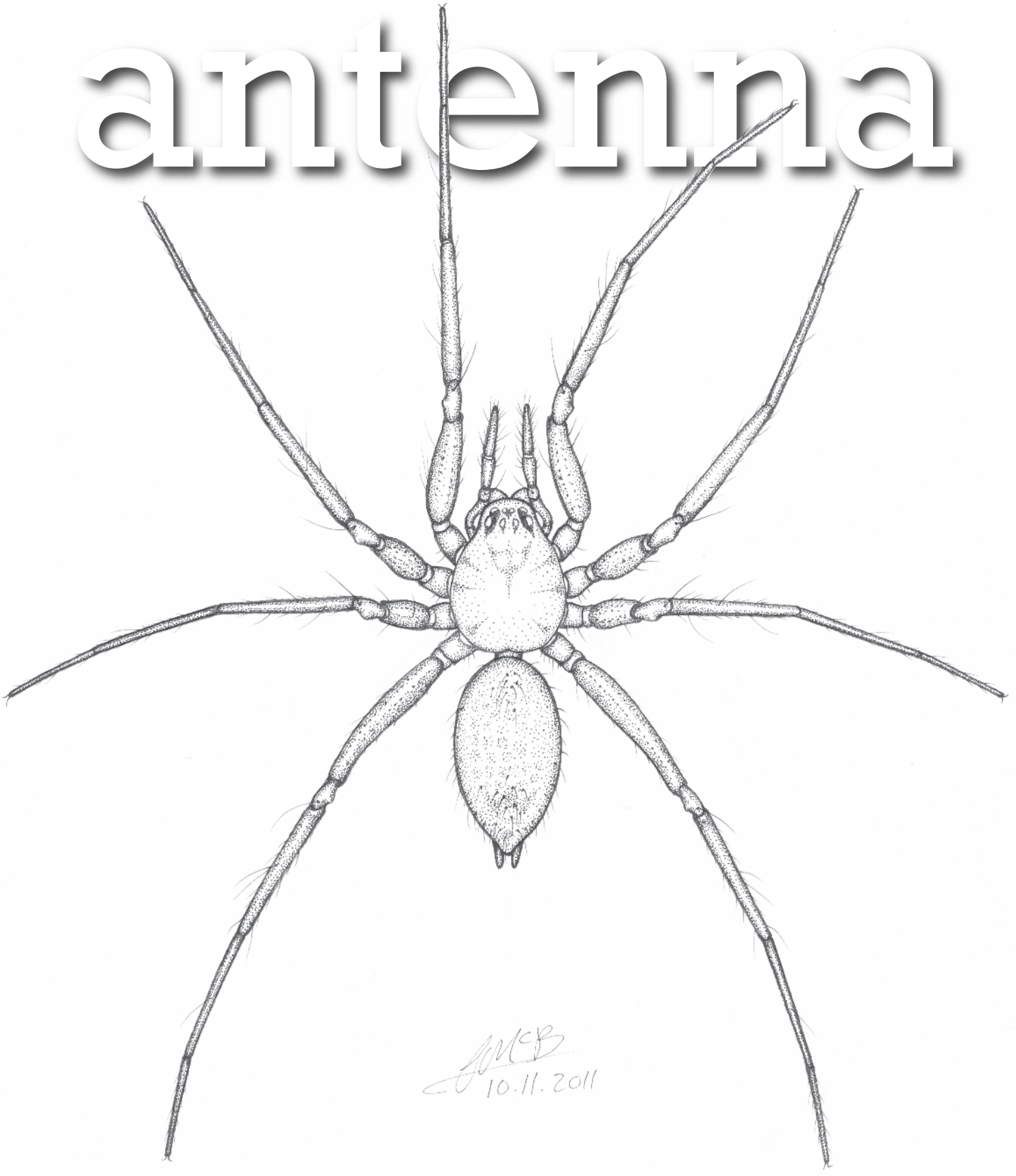

INSECT TRANSLOCATIONS

INVERTEBRATE ILLUSTRATORS

meetings of the society

for more information on meetings and contact details see meetings page on www.royensoc.co.uk

2012

Feb 1-2	**Postgraduate Forum** Venue: University of Liverpool Convenor: Mr Steven Parratt
Mar 7	**Verrall Lecture** Venue: Flett Lecture Hall, Natural History Museum **Professor Ilkka Hanski (University of Helsinki) on the topic of:** **The Glanville fritillary butterfly: ecology meets evolution**
Apr 18* **OR** 25	**Aphid Special Interest Group** Venue: James Hutton Institute (formerly SCRI) Dundee, Scotland **(*date to be confirmed, please check the RES Meetings website)** Convenor: Dr Brian Fenton
Apr 25	RES partnered meeting **Insect Decline: the causes and the role of agriculture in mitigation** Venue: Rothamsted Research, Harpenden, Herts, AL5 2JQ Convenor: SCI's BioResources Group
May 10	**Insect Ecology Special Interest Group Meeting** Insect-Fungus Interactions Venue: Rothamsted Research, Harpenden, Herts, AL5 2JQ Convenor: Dr Michael Bonsall
Jun 6	**RES Annual General Meeting** Venue: RES headquarters, The Mansion House, Chiswell Green Lane, St Albans
Jun 25 – 1 Jul	**National Insect Week**
Jul 17*	**Infection and Immunology Special Interest Group** **(*to be confirmed, please check the RES Meetings website)**
Jul 18 – 20	**Ento'12 – the National Meeting of the RES** Venue: Anglia Ruskin University, Cambridge Convenors: Dr Alvin Helden Dr Peter Brown Mr Alex Dittrich
Aug 19 – 25	**ICE 2012 - XXIV International Congress of Entomology** **Venue: Daegu, Korea**
Oct 24	**Scottish Regional Meeting** 'Great Scottish Insects' Venue: Scottish Agricultural College, King's Buildings, West Mains Road, Edinburgh Convenors: Ms Jenni Stockan Dr Andy Evans
Nov 7*	**Orthopterists' Special Interest Group Meeting** **(* subject to confirmation)** Venue: Natural History Museum Convenors: Dr. David Robinson Mrs Judith Marshall

Special Interest Group meetings occupy either a whole day or an afternoon (check www.royensoc.co.uk for details).

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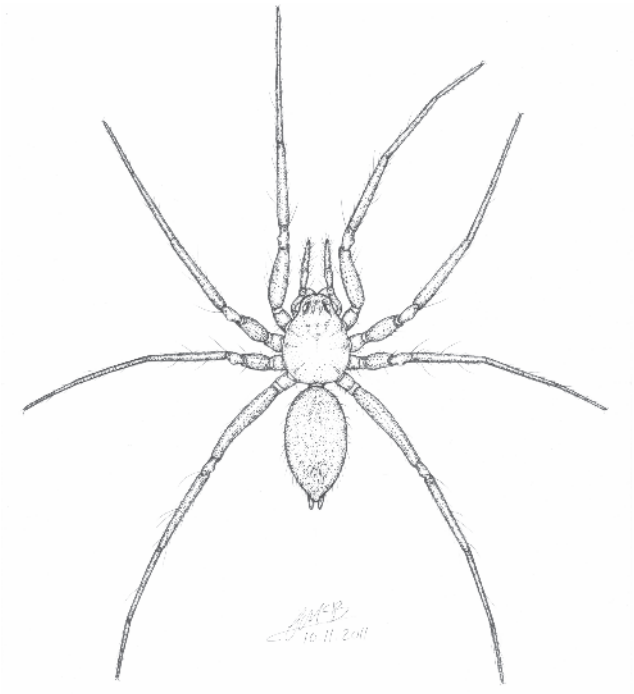

COVER PICTURE

Nothyphantes horridus drawing by Fergus McBurney.

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Bulletin of the Royal Entomological Society

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EDITORIAL

A belated happy new year to you all from Greg and myself. We hope that the coming year will provide some entomologically interesting times. A wish that is reflected in the rich and varied content of this edition of *Antenna*. We offer an insight into the fauna of birds nests and continuing the outreach theme from the last edition, Adam Hart's new column, and how to train the next generation of Dipterists. We also have news of the next annual meeting Ento 12 to be held at Anglia Ruskin University, Cambridge and news of entomological activities in the South-West. However, the main theme of this edition is a series of summery papers from the recent meeting that reviewed the translocation of insects. We also have a new section, Insects in Line, which will feature entomological illustrators and artists. Plus of course all the normal Society News.

We were greatly saddened by the news of Brian Hargreaves death late last year. His contribution to entomology was enormous and his absence will be keenly felt. His passing is a stark reminder that such talents are few and far between and as a result any up and coming biological illustrators and painters should receive every encouragement and opportunity from the entomological community. To this end *Antenna* will run occasional profiles of such illustrators in order to bring them to the attention of a wider entomological circle. The first appears in this edition. While the ability to produce detailed and accurate biological drawing may be a rare skill. Being able to produce a recognisable biological sketch in a field note book should not be. However over the last few decades these skills have been lost from the curriculum of most biology course in the UK. A level Zoology and Botany courses used to involve a vast amount of biological drawing to record the students observation but now there is none. Drawing was a crucial part of any undergraduate study but now it is encouraged in only a few institutions. The ability to record observation and maintain a field notebook is vital to any entomologist working in the field. The recent book "Field Notes on Science and Nature" by Michael Canfield offers a compelling argument in favour of field notes, yet we are producing graduates who have no concept of what a field note book is. Surely at a time when the documentation and understanding of our planets biodiversity has never been more vital, we should ensure that the next generation of entomologists have the tools to undertake the task.

Peter Smithers

Insect Field Guides

Many thanks to everyone who have sent in details of insect field guides to various regions of the world. I am still assembling the list so if you know of, or have any, can you keep on sending me the titles and supplier, and if possible, any comments? The final comprehensive list will then appear in a future edition of *Antenna*.

Many thanks, Peter Smithers

Guidelines for submitting photographs

To maintain a high quality we suggest that submissions for *Antenna* be presented via e-mail or on CD. Files must be in a PC-compatible format preferably in MS Word.

Electronic images can be embedded in the Word document but we will also require separate electronic images. These images should be at least 300dpi at an image size that is either equal to, or greater than the expected final published size.

Please do not submit images that have been printed from a computer on a domestic inkjet or laser printer. Even if the camera is a good one and photo quality paper is used, the graininess is very hard to deal with. If plain paper is used, the prints are virtually unusable.

Photos taken on film should ideally be submitted as slides or as reasonable sized prints for us to scan or alternatively they can be scanned in by authors provided the scanner is capable of scanning at up to 1200dpi.

If an image is intended for the front cover then the photograph should be in portrait format (i.e. the shape of the final image) and will need to be quite a large file size (at least 5,000kb) or a good quality slide or print.

To give an idea as to what happens when the image is not of sufficient size, take a look at these two photographs. One is 300dpi and the other is 72dpi.

300dpi

72dpi

Bugs are eating our grub! The tax that insect pests take from our food

Stuart Reynolds

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As I pointed out in a previous column (Reynolds, 2010) humans compete with insects for food, and probably always did so, even in preagricultural days. But now that almost all of our nutrition is derived from farming, we have created conditions that have inevitably resulted in some insects adopting the lifestyles of specialist pests of agriculture. Protecting our crops from the attentions of insect pests has always been a challenge, never more so than today.

How big is the problem? The first thing to say, is that it is surprisingly difficult to measure pest crop losses quantitatively. The presence of insects and an unexpectedly small harvest are easily noticed by the farmer. But how do we know how big the crop would have been had pests not intervened? An agronomist would grow the crop side by side in a randomised repeated plot design with a suitable control – i.e. the same crop that has been treated with effective pesticides so as to completely prevent pest damage. But of course farmers almost never do this, so how are we to figure out the pest-inflicted losses that actually occur on farms? Well, we can compare the per-hectare yields of ordinary farmers (as reflected in official statistics) with those achieved under pest-free conditions on nearby experiment stations. But now we are no longer comparing like with like. There are plenty of uncontrolled variables other than the pests themselves that not only affect crop yields whether or not pests are present, but also how susceptible they are to pest damage.

These other variables are well illustrated by a 1961 paper by Michael Way (a Fellow of the Royal Entomological Society) concerning the adverse effects of the aphid *Aphis fabae* on field beans (*Vicia faba*). The yield of this crop can be damaged by aphids in a number of ways, but heavy infestations (Way counted up to almost 7000 aphids per plant!) can render the crop totally unusable. The mean figure for losses due to aphids on untreated plots between 1952 and 1959 in test plots on the Rothamsted Experimental Station farm was 46%. This gives us an idea of how bad losses could be if the farmer didn't treat the crop at all.

But Way also found that the damage varied hugely from year to year, with losses varying anywhere between 6.3% and 100%. This kind of variability is much greater than we normally expect for a biological variable (for those of a statistical bent, the standard deviation was about the same size as the mean!). Percentage losses tended to be greatest when the "intrinsic" yield (i.e. without pest damage) was lowest, but this was not a significant relationship, implying interaction with still other variables. One of these was the time of year. Even within one season, losses due to aphids varied greatly according to the time of planting. For example, in 1955, early crops suffered the lowest losses beginning at 12.0% for crops planted in March, but those planted in mid May suffered losses of 77.1%. Moreoever, because the yield from the earlier crops was so much greater, the weight of beans actually harvested from the unprotected crop fell from 2.12 tonnes ha^{-1} to only 0.30 tonnes ha^{-1}; this decrease of 76% was clearly jointly related to both pests and planting time. Even these insights allowed only poor predictive power; when the experiment was repeated in 1957, the effect of the time of planting was reversed, with late season beans experiencing much lower levels of aphid damage, so that now yields were hardly different according to the time of planting. Clearly still further influences were at work (probably the migratory potential of the aphids, but perhaps also the weather).

Doubtless had he measured it (at least he didn't report it), Way would also have found that the extent of pest damage also varied remarkably within the crop, with some parts of the field

badly infested while neighbouring plants were free of pests. The extent of such heterogeneity in pest populations within a crop has strong effects on the total extent of damage, at least in part because there are strong edge effects on yield and also because crop plants may increase their own growth if their neighbours grow less well. This is called compensation. Experimental plots are typically quite small, and rarely reflect this kind of variation. Although it's well known that such pest density heterogeneity exists (see e.g. Ferguson et al., 2000) and its effect on yield can be modelled (e.g. Hughes, 1996), it's actually very laborious and difficult to measure it in practice.

So you can see that the general estimation of actual pest-related crop losses at national or even world level is going to be very difficult. In what follows, you should therefore keep a pinch of salt handy with which to season the figures. Nevertheless, we must suppose that if we gather enough data we will probably get at least some kind of idea of the scale of the problem. The assumption is that all those other variables will more or less cancel out.

Bearing in mind the above limitations, work by Erich-Christian Oerke and Heinz-Wilhelm Dehne of the University of Bonn (Oerke & Dehne, 2004; Oerke, 2006) probably represents the best attempt so far to quantify preharvest crop losses due to animals (mostly insects), along with other types of loss (those due to weeds and diseases). These papers compile vast amounts of data, and make fascinating if rather depressing reading. Worldwide and fairly recently (the figures are for 2001-03), these authors estimate that over the five quantitatively most important food crops (wheat, rice, maize, potatoes and soybeans), no less than 33 % of production is lost before it can be gathered; around one third of these losses (i.e.11%) are due to animal pests. Some crops are more susceptible to insects than others. Preharvest losses of wheat due to animals average out at only 8 %, but animal-related losses of rice represent 15 % of the potential crop. It's not just food crops either: no less than 12 % of cotton production is lost in this way.

But pest damage doesn't stop when the crop is harvested from the field. As I discussed in my previous column, the whole point of farming is that it produces an excess of food that can be stored against future hard times. But insects can get into those stores and wreak havoc. As well as the pre-harvest losses documented by Oerke and Dehne, alarming postharvest losses also occur, many of which are due to insects that specialise in attacking stored crops, especially beans and cereals (World Bank, 2011). The principal culprits are members of the Order Coleoptera, but Lepidoptera, Psocoptera and other insects and invertebrates also do substantial damage. Not all postharvest losses are due to insects, and some are caused by poor handling, fungal spoilage, rodents and birds. But insects are big players in this drama.

It's difficult to get good figures, partly because different methods of measuring losses give different answers (Alonso-Amelot & Avila-Núñez, 2011) and partly because, as was pointed by Boxall (2001), there's a tendency for the highest available loss figures to be uncritically accepted as representative. An important point here is that losses are not simply due to insects stealing the stored food; what's left after they have finished is very likely to be spoiled by secondary microbial attack, usually due to excess water being released into the stored grain from the metabolism of the insects. Effectively the whole of the stored crop can be rendered unfit to eat when it is infested, even when the extent of direct insect damage is quite limited.

But again, despite these difficulties, we can at least get a rough idea of the extent of the problem. According to the African Post Harvest Losses Information System (APHLIS, 2011) during the period 2003-08 an average of 16 % of harvested East and Southern African cereal crops was lost during storage. A particularly serious problem is the bostrichid beetle *Prostephanus truncatus*, a grain borer that attacks both stored maize kernels and cassava roots, and which has been reported to destroy between 10 and 45% of the stored maize crop of subsistence farmers in tropical and subtropical regions of both Africa and South America (Bergvinson and García-Lara, 2011). It seems likely that other stored crops in other less-developed countries also experience losses on a similar scale. Postharvest crop losses are however undoubtedly much less in developed countries, where technological solutions that prevent pest access (sealed grain silos) or kill them once they get in (fumigation etc.) are widely implemented (Hodges et al., 2011). But such solutions are expensive.

So it looks like we lose around 11% of worldwide crop production to animal pests, mainly insects, before harvesting, and up to another 16% after it has been gathered. That's more than a quarter! The proportion taken of the crop is thus considerably more than the income tax levied on basic rate taxpayers in the UK (currently 20% for those who need reminding). Nobody likes paying tax, but we grudgingly suppose that we are paying for government services that are at least mostly quite useful. But it's hard to argue that there are any benefits at all to be derived from paying the tax levied by crop pests. It's more like the "tax" demanded of small businesses by the Mafia.

So is it inevitable that we pay the crop pest tax? I can't imagine that pest damage can ever be totally eliminated, but I certainly hope that it can at least be reduced. Routine losses on the scale indicated above, whether they occur before or after the harvest, are very bad news indeed because we're going to need a lot more food in the future. It's salutary to think about the amount of food that will be needed in 2050, a milestone that is now less than 40 years away. The impending nutritional shortfall is partly because the world's human population continues to increase - it is projected to grow from 6.9×10^9 in 2010 to 9.3×10^9 in 2050, an increase of 35 % (United Nations, 2011) - and partly because rapidly increasing prosperity in countries like China and India means that a significant fraction of the world's population is switching from a largely vegetarian diet to a "western" style of eating that include much more meat and dairy products. This means, of course, that a lot of plant food that could be eaten directly by people instead goes to feed farm animals, which convert it into human nutrition only very inefficiently.

Moreover, many people are currently unable to eat as much food as they need. During 2006-08, a staggering 15 % of the world's human population was inadequately nourished in energetic (i.e. calorie) terms (FAOStat, 2011). If the world's poorest people are to be rescued from chronic starvation, much more food will be required. Even if people aren't going to be any better fed in 40 years' time than they are now, the projected world population for 2050

means that we would need to produce almost half as much food again in the mid-twenty-first century as we do now. But most people would consider that we are ethically bound to try to alleviate the food poverty that already exists. Taking all these factors into account, the UN's Food and Agriculture Organization has calculated (FAO, 2009) that agricultural production of all crops will need to increase by around 70 % to satisfy the probable demand for food in 2050.

And it gets worse. The FAO's 70% figure is computed even before we have started to think about the effect that climate change is likely to have on the world food supply. This is very uncertain (Parry et al., 2004; Jaggard et al., 2010), but it is likely that more frequent extreme weather events will significantly reduce output (Battisti and Naylor, 2011). Another problem that is hard to model is the possible impact of large scale farming of biofuel crops on the availability of land on which to grow food (Royal Society, 2008). It's largely because these factors are so unpredictable that they are not included in the FAO calculation – not because they are likely to be unimportant.

All this adds up to what John Beddington, the UK Government's chief scientist, has called a "perfect storm" (2009). If you're interested to learn more about the impending world food problem, and I would argue that everyone on the planet ought to make it their business to know more about it, the salient evidence and issues have been concisely summarized by Godfray et al. (2010). Of course it doesn't follow that because there is a storm that the boat will sink; this is a complicated and difficult problem, but there are plenty of actions that we can take to address it.

A number of strategies are available to increase world food production, but by far the most important will be to reduce the extent of the "yield gap" (i.e. the difference between the yields that could be obtained and those which are realized). Some of this gap is due to lack of potential plant growth, but as I have outlined above, a considerable part is the result of pre- and post-harvest crop losses imposed by pests and diseases.

Under these circumstances, it's obvious that more than ever it is necessary to protect our crops from those hexapod competitors. There's a lot to be done before we can be satisfied: a simple calculation reveals that present pest management efforts are actually not very effective. Oerke and Dehne (2004) computed the potential for preharvest damage (i.e. the maximum level of loss that would be expected if no protection measures were taken at all) and then compared this to that actually caused. This is, in effect, a measure of the "efficiency" of the crop protection measures taken by farmers. As I indicated above, an intellectual health warning must be attached to the figures that follow. But even if the numerical detail isn't precise, it is clear that crop protection is not very successful on a world-wide scale. Over all the five world food crops considered by Oerke and Dehne, only about 50 % of the potential loss due to all causes is in practice avoided. The success of measures taken against damage of stored crops by animals is even less; only 33 % of the damage that can potentially occur is actually prevented.

As I pointed out in my last column, Oerke and Dehne's figures for the actual preharvest losses of agricultural crops due to herbivores (about 11%) are quite similar to those estimated by ecologists for the approximately 15% of wild plant production that is lost to insect damage in natural ecosystems, like "wild" grasslands or forests (see McNaughton *et al.*, 1989; Cyr and Pace, 1993). What does this say about the success or otherwise of the programme of largely chemical crop protection on which world agriculture has become so dependent over the last century? Let's just say that an end-of-term report would probably read "Could do better".

Next time: the value of insects.

References

Alonso-Amelet, M.E. and Avila-Núñez, J.L. (2011) Comparison of seven methods for stored cereal losses to insects for their application in rural conditions. *Journal of Stored Products Research* 47: 82-87.

APHLIS (African post harvest losses information system) (2012) http://www.aphlis.net/index.php?form=home (accessed 23 January 2012).

Battisti, D.S. and Naylor, R.L. (2009) Historical warnings of future food insecurity with unprecedented seasonal heat. *Science*, 323: 240-244.

Beddington, J. (2009) Food, energy, water and the climate: a perfect storm of global events? http://www.bis.gov.uk/assets/bispartners/goscience/docs/p/perfect-storm-paper.pdf (accessed 23 January 2012).

Bergvinson, D.J. and García-Lara, S. (2011) Synergistic effects of insect-resistant maize and *Teretrius nigrescens* on the reduction of grain losses caused by *Prostephanus truncatus* (Horn.) *Journal of Stored Products Research* **47**: 95–100.

Boxall, R.A. (2001) Post-harvest losses to insects—a world overview. *International Biodeterioration & Biodegradation* **48**: 137-152.

Cyr, H. and Pace, M.L. (1993) Magnitude and patterns of productivity in aquatic and terrestrial ecosystems. *Nature* **361**: 148-150.

FAO (2009) How to feed the world in 2050: high level expert forum. http://www.fao.org/wsfs/forum2050/wsfs-background-documents/issues-briefs/en/ (accessed 23 January 2012).

FAOStat (2011) The Millennium Development Goals Report 2011: Addendum Goal 1. http://mdgs.un.org/unsd/mdg/Resources/Static/Products/Progress2011/Addendum_G1.pdf (accessed 23 January 2012).

Ferguson, A.W., Z. Klukowski, Z., Walczak, B., Perry, J.N., Mugglestone, M.A., Clark, S.A., Williams, I.H. (2000) The spatio-temporal distribution of adult *Ceutorhynchus assimilis* in a crop of winter oilseed rape in relation to the distribution of their larvae and that of the parasitoid *Trichomalus perfectus*. *Entomologia Experimentalis et Applicata* **95:** 161–171.

Godfray, H.C.J. Beddington J.R., Crute, I.J., Haddad, L., Lawrence D., Muir, J.F., Pretty, J., Robinson, S., Thomas, S.M. and Toulmin, C. (2010) Food Security: The Challenge of Feeding 9 Billion People. *Science* **327**, 812-818.

Hodges, R. J., Buzby, J. C. and Bennett, B. (2011) Postharvest losses and waste in developed and less developed countries: opportunities to improve resource use. *Journal of Agricultural Science* 149, Supplement 1: 37-45.

Hughes, G. (1996) Incorporating spatial pattern of harmful organisms into crop loss models. *Crop Protection* 15: 407-421.

Jaggard, A.W., Qi, A. and Ober, E.S. (2010) Possible changes to arable crop yields by 2050. *Philosophical Transactions of the Royal Society B* **365**, 2835-2851.

McNaughton, S.J., Oesterheld, M., Frank, D.A. and Williams, K.J. (1989) Ecosystem level patterns of primary productivity and herbivory in terrestrial habitats. *Nature* **341**: 142-144.

Oerke, E.-C. (2006) Crop losses to pests. *Journal of Agricultural Science* **144**: 31–43.

Oerke, E.-C. and Dehne, H.-W. (2004) Safeguarding production – lossses in major crops and the role of crop protection . *Crop Protection* **23**: 275–285.

Parry, M.L., Rosenzweig, C., Iglesias, A., Livermore, M. and Fischer, G. (2004) Effects of climate change on global food production under SRES emissions and socio-economic scenarios. *Global Environmental Change - Human and Policy Dimensions* 14: 53-67.

Reynolds, S.E. (2010) No golden age: competing with insects for food and the origins of agriculture. *Antenna*, 35, 153-157.

Royal Society (2008) Sustainable biofuels: prospects and challenges. Policy Document 01/08. Royal Society, London. http://royalsociety.org/WorkArea/DownloadAsset.aspx?id=5501 (accessed 23 January 2012).

United Nations, Department of Economic and Social Affairs, Population Division (2011) World Population Prospects: The 2010 Revision. http://esa.un.org/unpd/wpp/index.htm (accessed 23 January 2012).

Way, M.J. (1961) Crop losses by insects and the problem of control. *Proceedings of the Nutrition Society* **20**: 5-11

World Bank (2011) Missing food: the case of postharvest grain losses in sub-saharan Africa. Report 60371-AFR. The International Bank for Reconstruction and Development / The World Bank, Washington DC. http://siteresources.worldbank.org/INTARD/Resources/MissingFoods10_web.pdf (accessed 23 January 2012).

CORRESPONDENCE

More about species names and the ICZN Code

Dear Editor,

It was with absolute astonishment when I read Henry Disney's contribution (Under correspondence): "Species names and the ICZN Code" (Antenna 35(4)), and I was wondering, how this got past the Editor of Antenna. As one of the two Editors of The Catalogue of Palaearctic Coleoptera, of which seven out of eight volumes were already published, (including some 200.000 names of taxa) both Editors got used over the years to the fact that some of the contributing authors (many of them quite accomplished, recognized taxonomists) either accepted wrong nomenclatorial decisions published by other authors, or tried to introduce to the Catalogue their own, wrong nomenclatorial decisions. Reason? It is the inability and/or unwillingness to make proper use of the zoological nomenclature.

Henry Disney's contribution falls in the same category, but it is in a way unique in that a non- taxonomist (I assume he is an ecologist) considers two provisions of the Code to be "a cause of confusion and irritation to non taxonomic colleagues"and indirectly shows his disapproval. But as taxonomists, or at least most of them, found it necessary during the careers to get a command of at least basic ecological terminology, it would at the same token help the ecologists to acquire at least the basic knowledge of the zoological nomenclature, that is of the Code, or at least to know where to find answers to their queries in the Code. And indeed the two "problems' ventilated by the author are two simple, straightforward provisions of the Code. The first one, dealing with the ruling that the specific epithet must agree in gender with the genus to which it is currently assigned admittedly expects some knowledge of classical languages, but again for those who lack the knowledge, but are willing to get informed, the previous editions of the Code (up to 1985 edition) present ample information on this topic. This requirement only applies to Latin and Latinized Greek names and not to names based on "some other language", as the author postulates. His example of the species *punctipennis* Smith being transferred from the genus X (masculine or feminine) to the genus Y (obviously neuter because there is no other possibility) and changed into *punctipennem* (Smith) is entirely confusing, The specific epithet "*punctipennem*" is entirely wrong because the neuter form of *punctipennis* is *punctipenne*. And one has to wonder whether the author intentionally made a mockery of Latin here, because how else could he arrive to such a ridiculous form. The second problem is the author's statement, after he presented his "*punctipennem*", that "the author of the specific epithet is now in brackets", makes an impression that it is so, because the gender of the newly assigned genus is different from that of the original genus. The closing statement that "many ecologists and other non taxonomists have no idea as to when brackets are required" is a sad admittance that there is apparently no willingness out there to get the Code, go to the Index, find the item "round brackets around the author's name" under Punctuation and be referred to Article 51.3. In that Article the interested party would find a statement that the name of the author of the original specific epithet is put in round brackets only when the original specific epithet is transferred into a different genus, whether it is of the same or different gender as the original genus.

Zoological nomenclature, the Code, may appear complex and rigid, even intimidating at times, particularly for non-taxonomists. However, it is the only means allowing the universality, stability and unambiguity in communication among zoologists, and indeed among all biologists, who are using scientific names of animals. It is therefore reasonable to expect that the general principles of zoological nomenclature should be familiar to all zoologists, not only to taxonomists.

This case is likely symptomatic of the present lack of support of taxonomy in universities and other institutions in most countries. Professional biologists therefore lack adequate information and are severely handicapped when speculating about taxonomy or nomenclature.

Aleš Smetana

Species Names and the ICZN Code (Continued)

Dear Editor

May I also write in full support of the call by Dr Henry Disney (*Antenna* 35(4):150) to end the outdated and counterproductive requirement that the ending of the specific epithet must agree in gender with that of the generic name, and illustrate it with an apposite example of my own? In 2000 I wrote an article synonymising the conopid fly species *Leopoldius macrus* (Séguy) with *L. brevirostris* (Germar), noting in passing that the former had originally been called *Brachyglossum macrum* when first described (*Ent. mon. Mag.* **136**: 87-89). A subsequent issue of the same journal carried a response by the late Anthony Allen, the noted coleopterist and classics scholar, pointing out that when the species was transferred from *Brachyglossum* to *Leopoldius* the specific name should in fact have been changed to *macer*, based on the requirements of the ICZN and the correct use of Latin (*Ent. mon. Mag* **136**: 234). Bearing in mind that it is also possible to find this taxon referred to in the literature as '*macra*' (probably due to uncertainties about the gender of the name *Brachyglossum*, an unjustified emendation with several spellings – it is, in fact, neuter) we now have the bizarre situation that there are four possible species-names in the literature for one (non-existent) taxon, one of which is so different from the others that an 'all-endings' web or database search based on the root 'macr' would probably fail to find it. Given that the stated purpose of the *Code* is to 'promote stability and universality in the scientific names of animals' this seems utterly absurd to me, especially when one takes into account other arguments alluded to by Dr Disney concerning the non-Latin origins of many species-names, and the indeterminate or unspecified gender of many genus-names.

David Clements

Brackets and things

Dear Editor

Henry Disney (correspondence: *Antenna* 35(4)) points to two problems with the current ICZN Code of Zoological Nomenclature: gender agreement of genus and specific epithet, and the use of brackets. I agree.

Lepidopterists have been at the forefront in trying to get gender agreement dropped. In many Lepidoptera catalogues we simply ignore it, making use of original orthography wherever possible. However, attempts to get this formal requirement rescinded by ICZN have all failed to date. The arguments raised against regarding *all* species names as "arbitrary combinations of letters . . . formed to be used as a word" (ICZN Code Art. 11.3, 1999), which would not therefore require gender agreement, always seem obscure and defensive. With computerised databases and search engines, it would seem to me of the utmost importance to settle on one spelling of each species name, regardless of the 'gender' of the genus (which is by no means always obvious or certain, even to a Latin scholar) with which it is currently combined.

And this brings us neatly to the issue of brackets. When species names are combined in genera other than those in which they were first proposed, the authors (and dates if cited) are to be placed in brackets. Thus, for example, the Large White is *Pieris brassicae* (Linnaeus, 1758) while the Swallowtail is *Papilio machaon* Linnaeus, 1758. Why? Because Linnaeus in his *10th Systema* is deemed to have included all butterflies in the single genus *Papilio*. Many of us have long argued that this trivial bit of negative information is far more trouble than it is worth – not least because, as Henry Disney suggests, very few people other than taxonomic researchers have a clue what it means. I have lost count of the times that I have gone through a long checklist religiously adding or deleting brackets to fit with this useless requirement only to have some keen subeditor go through and add brackets to all those without, or take out all the brackets of those with, in a misbegotten but thoroughly understandable desire for consistency! And of course other subeditors, equally punctilious, ask for citations, as they think that an author name and a date within brackets must be a Harvard-style reference that you have failed to include in the bibliography.

So Hats Off to Henry – let's be rid of gender fixation and parenthetical nonsense in the world of animal names! Both changes would aid stability, and reduce much unnecessary confusion and wasted effort.

Dick Vane-Wright

Wind turbines, insects and wildlife interactions

Antenna **35**(3): 90-96

One point that was not mentioned in this interesting paper was insect colour perception. It is all too easy to think like a human when it comes to colours without thinking about the colours that other creatures see. Many insects can see UV which means that what might appear white or yellow to us is quite different to the 'colour' they see. Plain coloured flowers for example often appear to insects with patterns invisible to us. It is therefore important to test any paints before applying them to turbine blades to 'see' how they would appear to an insect. What paint we might think is dull and plain might well turn out to be brilliant and act like a come-hither beacon.

Attached are some images showing some flowers as we see them compared with their UV reflectance 'colour' that an insect might see.

Gerald Legg

OBITUARY

Gregory George Bentley

The Society's Registrar 1976-1999

24 May 1924 – 1 June 2011

Gregory George Bentley was born on the 24th May 1924 in Nottingham where also he went to school. At the start of the Second World War, he applied for and underwent Accelerated Officer Training at the Royal Military Academy, Sandhurst. As a Troop Commander in the Tank Corps, he was part of the D-day invasion of the continent, but the ramp on his landing craft failed to lower and had to return to the UK for repairs; he finally arrived in France three days later. At the battle of Arnhem he was wounded and hospitalised, but later rejoined his unit as soon as he was able and joined the fight all the way to Berlin. After the ceasefire, he was a negotiator with the Russians. These had confiscated the best horses of the German officers, and Greg had much enjoyment from being allowed to ride these splendid animals. He retired from the Royal Army in 1948 as one of the youngest Majors.

Greg's first thought in civvy street was to go into farming, but trying a farm job in Hampshire put him off this idea and instead he followed his love of horsemanship by using his army resettlement grant to set up a riding stable in Blackheath. There he tried to acclimatise his horses to traffic by riding them in the busiest streets in that part of London, only for one horse to take him straight into a costermonger's market stall and knock it for six! The stable lasted for only two years before financial reality set in and Greg knew it just would never succeed, and so in 1950 he 'changed horses' (pardon the pun) and joined the Malay Police Force, then a branch of the UK Colonial Service.

Learning Malay or Chinese was obligatory; Greg chose Malay and quickly became more fluent than most of his British colleagues. There are many words in Malay which sound the almost the same but mean often embarrassingly different things – and Greg had many stories of fellow expatriates who thus put their foot in it or caused huge hilarity among the locals. He was soon promoted to District Officer, and was honoured to be chosen as Lord Mountbatten's ADC when the latter visited Malaya. While in Malaya, Greg had the opportunity for plenty of horse-riding and polo, and rode (for at least part of each steeplechase!) as an amateur jockey. He often recalled the deftness with which his horses unseated him, but also that on just one occasion he was certain he was actually going to win a race – only to be 'pipped at the post'. His love of all things equestrian often surfaced as analogies in conversation. For example, he would indicate his dislike of a person by saying "Well, you wouldn't choose to breed from him/her". The conflict in Malaya against the communist guerrillas involved a joint operation by the Malay Police Force and Army, and so Greg found himself fighting again, now not in a tank in Europe but on foot in the Malayan jungle.

When in 1962 Malaya got rid of its expatriates, Greg joined the police in the Bahamas as Head of its Special Branch. I have seen the personal letter to him from Princess Margaret accompanied by the gift of gold cufflinks thanking Greg for his skill in ensuring privacy for her during a visit she made with Lord Snowdon. He also was in charge of security for the December 1962 summit meeting in Nassau between President Kennedy and Harold Macmillan, triggered by the Cuban missile crisis, to discuss NATO's Polaris capability. While in the Special Branch, Greg investigated and exposed some expensive scams in the local hospitals. In 1969, Greg moved to the post of Secretary of the Bahamas Gaming Board. He spent some time in Las Vegas to learn how gambling was regulated there. While there, he studied one far too successful punter at the card table through the one-way mirror, and was able to explain to the casino how the cheating was done.

When the Bahamas achieved independence, concern about his future prospects there caused him to return to the UK in 1970, and he and his wife set up a general store called "Treasure Traders" in Eastbourne. Shopkeeping

Greg saddled up for a race in Kuala Lumpur.

Greg with the full-time, part-time and volunteer staff of the Society outside 41 Queen's Gate.

was more his wife's interest than Greg's, and moreover was hardly producing enough profit to run the family. In 1972 Greg therefore took up a post at Doniford in Somerset, running a resettlement camp required for the flood of Ugandan Asians with British passports fleeing their home country at that time. The locals were very antagonistic towards the political migrants for whom Greg was now responsible, and the gentlemanly and diplomatic manner that many of us saw in him later proved an essential asset.

The distance of Doniford from Eastbourne took its toll on Greg's marriage, and it was to all intents and purposes over when in 1973 the resettlement camp closed and he returned to horses temporarily as a stable lad in Tiverton. He was close to Plymouth, and took the Diploma in Management Studies at Plymouth Polytechnic, passing with Distinction in August 1976.

Greg was now looking for a permanent job, and spotted an advertisement for Registrar of the Royal Entomological Society of London. He wrote for details, including the accounts for the last few years, and was called for interview. Quickly absorbing entomology from a children's book on insects bought at a bookstall, Greg travelled to London and 41 Queen's Gate. The first question at interview came from the Hon. Treasurer, one Dr Derek Gunn – "Do you know anything about insects?" Greg decided that the "Ladybird Book of Insects" might not cut the mustard, and confessed to total ignorance but added "I fear your Society is heading for bankruptcy, and I know how to turn it around for you". As the interviewing committee were only too aware of the parlous financial state of the Society when run by experts on insects, the members felt that "ignorance of entomology" was probably what they needed in a new Registrar, and Greg got the job, starting later that same year. Also in his favour was that he was the only applicant who had asked to see previous annual accounts. So he and now his partner Jo moved from Devon to London.

Greg was not bluffing when he claimed to know how to turn the finances around. The large area at 41 Queen's Gate not used by the Society itself had enormous financial potential, but this remained under-exploited because of a clause in the Royal Charter limiting tenancies to Societies with like aims – by definition therefore not able to pay commercial rents. Greg successfully appealed to the Privy Council to have this clause removed, which led to the departure of the Institute of Biology and the arrival of the much wealthier Army Benevolent Fund who remained our tenants until 41 Queen's Gate was sold. But Greg did not then rest on his laurels. With a natural flair for playing the stock market and 90 minutes each morning with the *Financial Times*, he succeeded in greatly building up the resources of the Society – not from the share dividends but by profit taking, selling high and buying low. One of his biggest scoops was to buy a large quantity of Asda shares at a low price, having spotted long before most other investors that ahead lay a take-over by Walmart. His other step was to recommend to Council that the Society cease acting as publisher of its scientific journals, and he negotiated very favourable terms for the transfer to Blackwells. Very soon rental income, dividends and profits on the journals were each as large as or larger than the income from Fellowship subscriptions. When complimented on what he had achieved financially, he used to say "I could do even better for the Society if the Charity Commissioners would only allow me to put the money on the horses!"

There is no better testimonial to Greg's financial management than to record how he left our affairs when he retired in 1999, already well into his 70s. He had enthusiastically supported several areas of pretty large expenditure: £46,487 on the complete re-design and refurbishment of the entry foyer and staircase at 41 Queen's Gate, £36,306 on an abortive Young Entomologists' Scheme involving a salary and vehicle, £36,000 to fund a Research Fellowship at the Museum and £25,000 on bringing the fire precautions in the building up to standard. Additionally, maintenance and repairs to the building had developed into a large annual commitment of between £20,000 and £40,000; the installation of the library compactor units in the basement (itself a considerable expense) revealed that the foundations to the building had eroded away and our floors were held up by the party walls of the buildings on either side! That cost some £43,000 to rectify. Council had also committed the Society to the logistically complex Wallace expedition to Sulawesi to mark the Society's 150th anniversary. The professional fundraiser Council employed raised little additional income to that needed for his fee. Greg made a valiant solo effort that succeeded in raising rather more, but a huge subsidy of £32,000 from the Society was still required. Finally, the huge sum of £113,374 was expended on installing an interior lift, but this enabled the Society to charge higher rents from tenants as well as increasing the value of the property.

During his last ten or so years as Registrar, these large single expenditure items had added up to about £550,000, yet the Society's assets (apart from income from bequests) had increased by £178,000 (even after deducting the outstanding depreciation owing on the

Greg in ADC mode for the Royal reception to mark the Society's 150th Anniversary.

lift). This amazing out-turn, which is more than a doubling, is a tribute to Greg's financial acumen.

Greg also helped to realise many changes and developments at the Society. These included an awards scheme, the introduction of an Annual Meeting of the Society, the establishment of a Fellowship Committee, regional secretaries and meetings, Special Interest Groups (which were his idea), and movement of the Society into the electronic age. In all this he gently, diplomatically but covertly, steered Council by the wording of the minutes of meetings and by which matters were and were not listed under "Matters arising".

As "stage manager" and projectionist, he stayed in the lecture room and listened to all the monthly talks; thereby his knowledge of entomology grew steadily from its zero origins. There were two things he mentioned to me time and time again. One was a regression line, which Greg felt was totally spurious, drawn through a cloud of points by a Fellow of the Royal Society. Another matter that really bothered him was that someone should specifically breed a *Drosophila* with a crumpled wing and unable to fly. To Greg this was most unkind and was taking scientific curiosity too far.

The event which Greg probably regarded as his favourite moment as Registrar was when he was introduced to the Queen and had her sign our Fellows' Obligations book. This was on the occasion of Her Majesty's attendance at the reception in the Zoological Society in 1983 to mark the 150th Anniversary of our Society.

Outside the office, this Greg Bentley was a man of many parts. A lover of classical music, he had in his youth played the piano to a standard that had made him contemplate a career as a concert pianist. He was very keen on Fine Art and, as a Friend of the Royal Academy, often visited each exhibition several times. As well as his love of horses, polo and racing, he played tennis close to professional standards. When in later life his body increasingly started complaining at the stress of playing, he just increasingly munched painkillers. He coached others, but offered to do this for free for the children of fathers in careers such as surveying and the law, in return for their free advice to the Society.

Soon after his retirement, Greg was elected an Honorary Fellow of the Society, the first time this honour had been accorded to an employee. Understandably, his long tenure of the post of Registrar at 41 Queen's Gate had instilled in him a deep love of that building, and so it was an enormous disappointment to him when Council decided to sell the property and move the headquarters of the Society.

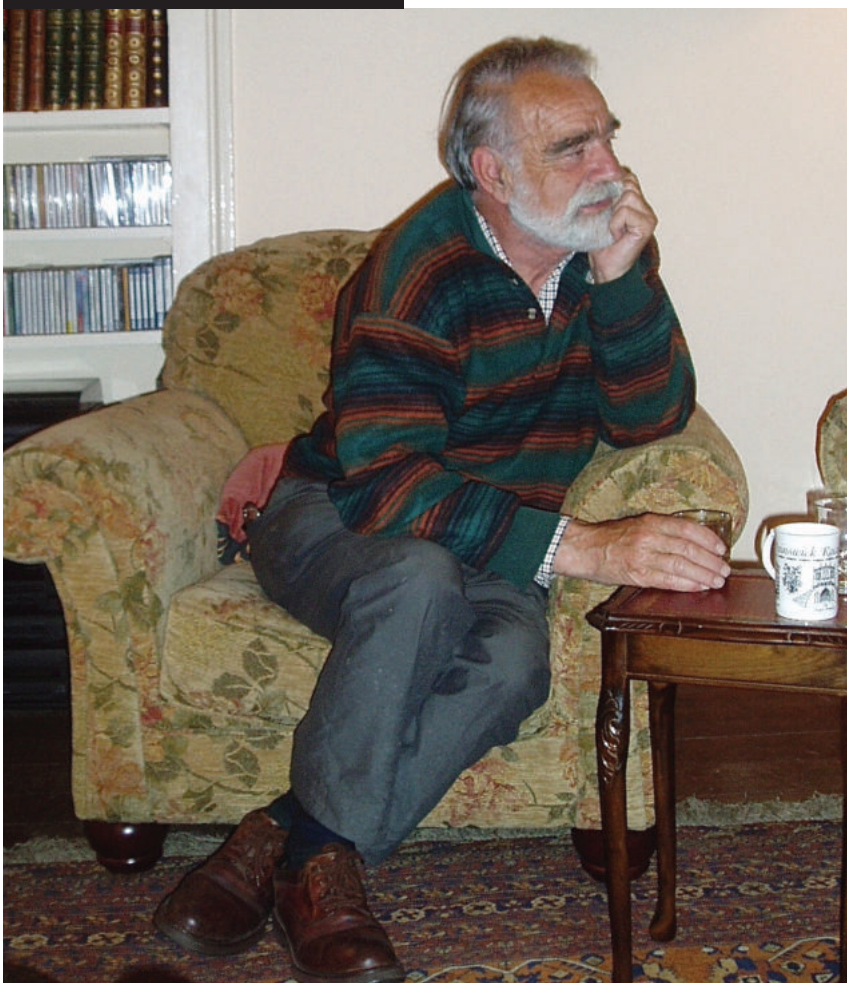
Greg had too good and active a mind to welcome retirement, and immediately sought volunteer activities to use his skills and help others. He acted as book-keeper for small clubs and charities, and encouraged his entomological friends to send him manuscripts for checking references, smoothing the English and proof-reading. For some time he went several days a week as a volunteer to the Royal National Archives at Kew to transcribe the difficult calligraphy of reports of trials of the "death for stealing a sheep" and "deportation to Australia" era into a form suitable for a database being compiled for the internet. Later he became the verger for St Nicholas' Church, Hammersmith, which required someone in daily attendance to welcome the many overseas tourists who visited the church to find and view the grave of the artist Hogarth. He was distressed to be 'sacked' from this post when he reached his 80th birthday, but in reality it was that the church's insurers were no longer willing to cover him. That he was considered too old even to do voluntary work really frustrated him.

Shortly before his death, I had lunch with Greg and Jo in London. Mobility had become difficult for him, even with a walking stick, but his conversation was lively and his enquiring mind still clearly active. Shortly after this meeting he fell in his flat and was taken to hospital, where advanced cancer was diagnosed, and he died soon thereafter. It is amazing that neither he nor others had any suspicion of his terminal condition till so late, and one can only be grateful for this. At that last meeting I never realised I was saying a final "Goodbye" to a highly intelligent and always courteous "officer and a gentleman" – two descriptions he epitomised.

Greg had two daughters from his earlier marriage and then two sons with his partner Jo. He had five grandchildren.

Helmut van Emden

OBITUARY



Russell Coope

1930 – 2011

Russell Coope died suddenly on November 26th 2011, in his Perthshire garden, feeding his latest batch of wild cat kittens. It must be about 20 years since his heart-bypass operation and, sadly he knew he was, in his own words, furring up again, and that further surgery was considered too risky.

Russell was born in Macclesfield on 1st September 1930. From the outset he showed a keen interest in natural history and like many schoolboys he was fascinated by lions and tigers. He recounted how, while at school at Stoneyhurst he claimed his promised book-prize for learning his catechism. The monks were rather taken aback by his choice, but, as Russell said, give them their due, the copy of "The Man-eaters of Tsavo" was duly produced.

Russell's first degrees (B.Sc. in Geology in 1952, M.Sc. for work on Rugose Corals in 1954) were from the University of Manchester. He began his academic career as a Demonstrator at Keele University and in 1955 was awarded a Research Fellowship in the Geology Department of the University of Birmingham where he was invited by Professor F. W. Shotton to do research of his choice! He duly scouted around for a suitable research topic and was introduced to the mid-last-glaciation site at Upton Warren in Worcestershire. This site was yielding fossils of Mammoth, Woolly Rhinoceros and other large mammals, but Russell immediately noticed large numbers of beetle remains. He told me that one of the things which hooked him was the sheer beauty of the material. He felt instinctively that he was looking at the remains of "real" (extant) beetles, though the wisdom of the day was that they were extinct precursors. He began to make direct comparisons of the material with modern specimens, and told how Jack Balfour-Browne in the Natural History Museum in London was particularly supportive in this. He, like Russell, saw very quickly that they were looking at modern species – though the process of identification always remained a challenge. The care and precision of Russell's identifications is one of the great strengths of his work. Accurate identification, and hence sound data, cannot always be taken for granted. Well, with Russell it was as good as it gets!

In 1957 Russell was appointed to a temporary lectureship in the Birmingham Geology Department, and he remained with the Department till his retirement in 1994. He was awarded his Ph.D. degree in 1962 and was elected a Fellow of the Royal Entomological Society in 1972. In 1973 he received the degree of D.Sc. for his work on Quaternary beetles. He became a Senior Lecturer in 1974 and was appointed Reader in Quaternary Sciences in 1978. On his retirement from Birmingham in 1994 he was appointed Honorary Professor in Geosciences, and he also accepted the position of Research Professor of Quaternary Science in the Department of Geography at Royal Holloway. Here he remained characteristically active in his research, and helped with supervision of Ph.D. students.

I first met Russell in autumn 1967. I was engaged in my D.Phil. research in Oxford and Russell, with Peter Osborne (an old Oxford man) came to the Hope Department of Entomology to check some fossil beetles. Word had reached him of my work on *Helophorus* and he duly brought some slides with unknown species. One pronotum was incredibly distinctive, and tentatively labelled as like a large *H. nanus*. It was clearly not *nanus*, but I didn't know what it was. Then, a few days later a parcel of unidentified Siberian material arrived from Helsinki – and there was the beast. In great excitement I rang Russell in Birmingham "You know that strange *nanus*-like *Helophorus*?" "Yes, have you got its name?" "No, but it lives near Irkutsk!" Once we knew where to look, the name was not long in coming – *H. jacutus* Poppius, now *praenanus*

jacutus Poppius, now *praenanus* Łomnicki. So began my long, profitable and very enjoyable association with Russell.

My next encounter was not long afterwards at the Royal Ent. Soc. Professor Shotton, Russell's Head of Department in Birmingham, gave a talk on Ice-Age beetles in England. It was a good and interesting talk, but in the ensuing discussion it was clear that some points had been missed by some of the audience. Then Russell stood up and spoke a few sentences of a dazzling clarity which to me set him apart from nearly all speakers I have heard. "Smarter than the average bear" as Yogi would say!

And so it went – as I continued my doctoral work I included taxonomic research on some of the fossil species – the supposedly extinct *H. wandereri* d'Orchymont was found to be modern *H. obscurellus* Poppius (Russell knew it wasn't really extinct!). Then I did my year in Russia followed by two postdoctoral years back in Oxford, before taking a postdoctoral position with Russell in Birmingham.

The late 1960s and early 1970s were an exciting time for the study of Quaternary Coleoptera in Britain, with a whole suite of exotic (mainly East Palaearctic) species being recognised as fossils in Europe (mainly England). Perhaps the most spectacular of these is the dung beetle *Aphodius holdereri* Reitter, now confined to the Tibetan plateau. This very distinctive species was by then well-known, though unnamed, in deposits from the middle part of the last (Weichselian) glaciation in England. Officially it was *Aphodius* species A of Upton Warren. Unofficially it was known as George! Russell's discovery of George's identity was one of those happy accidents which sometimes happen. Russell had just completed his planned work during a day-visit to the Natural History Museum in London, and was collecting himself for the drive back to Birmingham. He glanced out of the window and thought "I didn't know there was a car park there" – then he realised he was looking at Cromwell Road! He decided to postpone his departure till after the rush hour and asked Mick Bacchus if there were any unidentified accessions that might be worth looking at. Casually Mick pointed to the end wall of the room, lined floor to ceiling with store-boxes on shelving. Russell began looking through some of these and then, to his amazement – spotted a whole row of Georges! They had been collected in Tibet by Major Hingston, the medical man on the Mallory & Irvine 1930s Everest expedition. Once modern material from a known location was available, identification as *A. holdereri* was not long in following.

Russell's studies have revealed some dramatic patterns in the succession of English fossil beetle faunas. First, as Russell had realised very early on, most, if not all, of the species encountered were morphologically identical with their modern counterparts – there appeared to have been no evolution. Second, this evolutionary stasis was associated with massive range-changes of many of the species, as they tracked the climate across the Palaearctic, and third, perhaps the most controversial, some of these climatic changes had been exceedingly rapid.

The idea of evolutionary stasis caused some difficulty among zoologists. It was suggested that actually, although their morphology may have been stable, their physiology could not have been, especially in the face of the major climatic changes associated with the Ice Ages. The counter-argument to this is ingenious and delightfully simple: physiological changes would have resulted in changes in ecological requirements, and since the fossil assemblages included phylogenetically disparate species with diverse ecological niches, these changes could not have been even and harmonious across all the taxa involved, so that, in terms of modern ecologies, the communities would fall apart. But they don't – the fossil assemblages all consist of species which, from what is known of their present-day ecological requirements, could be expected to occur in the same area. So, morphological stability is mirrored by ecological, and therefore physiological, stability.

Next in the firing-line was the business of climatic change. The botanists had a scenario, especially for the closing stages of the last glaciation and the beginning of the present interglacial, of gradual climatic warming, with measured recolonisation of Britain by first coniferous, then deciduous woodland. They began by arguing that plant species tended to produce diverse ecotypes, so that you could not infer past climate from the presence of particular species. This is countered by the consistency of ecological assemblages through time, as mentioned above. With beetles "what you see is what you get"! So the next argument invoked microclimate – Pleistocene environments, the argument went, were peculiar and modern environments do not produce the range of particular microclimates that existed then. It is hard to see where this comes from, especially as many Pleistocene landscapes were very open, but it did stimulate the development of refined techniques for assessing climate from beetles – Mutual Climatic Range (Atkinson et al., 1986, 1987). This technique involves collation of annual maximum and minimum temperature data from meteorological stations within present-day ranges of each of the species, and plotting these graphically. The axes used are the maximum temperature during the warmest month of the year, and the temperature range – i.e. the difference between the maximum and minimum annual temperatures, a measure of climatic continentality or oceanicity. These plots give "thermal envelopes" for each of the species, and the overlap of these envelopes gives the thermal regime under which the fossil assemblage lived. It should be noted that the temperature observations used are general observations from meteorological stations, not recordings of peculiar microclimates. It may be added that this technique has been tested by "reconstructing" the climate of well-known sites such as Wicken Fen in Cambridgeshire from their beetle assemblages, and comparing the results with known measured values. There is good agreement!

So, here is Russell with his dazzling suite of fossil beetle data showing exciting range-changes of our species, evolutionary stasis and massive and at times very rapid climatic change. Discovering the speed of climatic change is dependent on good dating, mainly radiocarbon, and is at its best over the period of the late-glacial and beginning of the present interglacial. And the speed of change is now no longer controversial thanks to oxygen isotope work on both the Greenland ice cap and ocean floor sediments.

In 1997 a special issue (No. 5) of Quaternary Proceedings was published in his honour – "Studies in Quaternary Entomology: An Inordinate Fondness for Beetles. A collection of papers in honour of Professor Russell Coope".

This provided a fitting occasion to celebrate some of his many achievements, with an introductory review of Russell's career, discussion of the challenges and rewards associated with the identification of Quaternary beetles, and an interesting set of case-studies inspired by his work. Russell Coope has the rare distinction of having opened up a new frontier in taxonomic and zoogeographical entomology. He was not the first person to study Quaternary fossil insects, but it was he who demonstrated the mass of information they contained and their relevance to our present-day faunas.

More recently his trips to the south became less frequent but he visited the Natural History Museum (London) in summer 2010, and had the satisfaction of seeing that the distinctive *Nicroporus*-type burying beetle from the mid-Weichselian warm interstadial represented by deposits at Isleworth (Middlesex) and Tattershall (Lincolnshire) was not extinct after all, but is *Ptomascopus zhangla* Háva, Schneider & R ži ka, now living in western China. He continued his research from his home at Foss by the shores of Loch Tummel in Perthshire. His move to Foss illustrates another facet of his life – he was always a very enthusiastic and active field naturalist with a keen interest in mammals and birds. He knew more than many about the range-expansion of Polecats from Wales into the English Midlands!

His published legacy is truly impressive – more than 220 publications, 6 in 2010 and one in 2011! Intellectually he was by far the most exciting person I have ever met. But he was so much more than that – he was charming, witty, knowledgeable, always helpful and interested in a very wide variety of topics – and endowed with human warmth in full measure. A highly-valued friend.

His funeral was in Perth on December 6th, and was a humanist affair attended by a good selection of people reflecting his wide interests. He is survived by his widow Beryl, his daughter Fiona and his three sons Robert, James and Bernard, with their respective families. To them we extend our condolences. We share their sense of loss, but also their sense of privilege in having been associated with such a truly great man.

A list of publications has been compiled by Paul Buckland but due to lack of space it has not been possible to include it in this edition of *Antenna*. The list is available on request from the editor. Photographs kindly supplied by Mike Walker at Lampeter.

OPINION

Reaching out

Adam Hart

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In the last issue Greg Masters, Pete Smithers and I discussed some of the activities undertaken by entomologists under the general heading of "outreach". An older term for the sorts of activities we covered would be "public understanding of science". That term has tended to fall into disuse of late, perhaps because of the potentially patronizing tone and the often unhelpful division it reinforces between them (the public, in need of enlightenment) and us (the omniscient scientific community). However, the phasing-out of this widely understood term has not been accompanied by a phasing-in of any single unifying terminology. Thus, we have seen the rise of science communication, science outreach and public engagement, among other terms.

Regardless of what we call the interface between the scientific community and "the public", in this issue of Antenna I would like to explore and discuss some of the broader activities that fall into that interface. Inevitably, this will tend to focus on "us" and what "we" do. However, communication is a two-way process and in the next issue I will focus on the receivers of that communication, the public. You may not agree with the framework I outline for understanding outreach activities and I would appreciate your comments and views, particularly those that are grounded in, and illustrated by, experience. Whilst short comments and views are very welcome, please feel free to make a more formal contribution, perhaps as an article or case study for the next issue. As well as discussion of the wider points of outreach activities, descriptions of successful (and unsuccessful) approaches and any points of practice that might inform others would be very useful.

Broadly, I think outreach can be grouped into formal, semi-formal and informal activities. By formal, I mean those activities that are part of large, well-publicized, typically well-funded, multiple-event outreach "happenings" like our own National Insect Week, the many science festivals that take place nationally and internationally (including UK-based festivals such as Cheltenham, Brighton and Manchester as well as the Royal Society's Summer Science Exhibition) and National Science and Engineering Week (run by the British Science Association). Arguably, broadcasting activities could also be lumped into this category since they too reach large numbers of people and require considerable support and financial commitment to ensure success.

I include as semi-formal activities those single-focus events that are linked to formal and often national organizations like our own, the Royal Society of Chemistry, the British Science Association and so on. Many such organizations have a regional structure that allows for the planning of local lectures (both individual and as part of a lecture series), and single, stand-alone events that can attract considerable numbers of visitors. For example, I organize a series of lectures based at the University of

Gloucestershire under the auspices of the Bristol and Bath branch of the Royal Society of Chemistry (and sometimes in partnership with the Bristol branch of the British Science Association) and attendances of 300+ are not uncommon for evening events. Outreach programmes (as opposed to single visits) organized with schools but through a partner organization, such as the Royal Society's Partnership grant scheme or the (now sadly defunct) Researcher-in-Residence scheme might also fall under this heading.

Finally, there are the informal events. Though attracting the least publicity and individually often reaching the smallest audiences, these outreach activities might well reach the largest combined audience when summed across the UK. Here, I am including school visits organized directly with teachers, nature walks with local groups, bug hunts with children's groups in local libraries, and one-off talks given to small local groups that lack a national structure.

I have been fortunate over the past few years to have been involved with outreach at all three of my proposed levels and, interestingly, it is the informal events, often organized somewhat ad hoc and at the last minute that tend to stick in my mind. I especially enjoy visiting schools, where you can find yourself talking to a class for an hour or more about bugs and beasties of all kinds and where your knowledge and experience can help to join up some of the activities they have undertaken in the classroom with the wider world.

Conversations with entomologists and scientists in general certainly support the notion that a large amount of this informal work goes on across the country. However, whilst formal and semi-formal outreach events are often funded, with expenses paid and speakers receiving sometimes quite generous sums, the huge amount of "informal outreach" usually goes unrewarded. In fact, it generally comes at a cost to those undertaking it. Even driving a few miles to a local school has a financial burden that can escalate quickly over a few such visits. Furthermore, materials that you might use to help you get your points across often end up coming out of your own pocket. I received a National Teaching Fellowship from the Higher Education Academy in 2010 that, in part, recognized my outreach work and provided a grant to pay for its development. So far I have claimed close to 2000 pounds in travel expenses from that grant over 18 months to support the costs of outreach that I was previously absorbing personally without realizing. Clearly, it soon mounts up. Regardless of financial costs though, there is always a time cost and this is not always equally welcomed, recognized, respected or rewarded by employers regardless of the sector in which you work.

I strongly believe that we should look to develop ways to encourage and to fund informal outreach activities and I would welcome your opinions, knowledge and ideas on this subject. The last issue has already generated some interesting ideas and opinions and I will be presenting some of these in future issues. It is my hope that this section will serve as a catalyst for tying together some of the wide and varied outreach activities undertaken by RES members and fellows aside from the already successful National Insect Week. The strengths of NIW are clear, but the weaknesses are inevitable – it lasts for only one week in 104 weeks. We need to make sure that what we do is recognized and rewarded in the other 103 weeks.

In a Humeral Vein

"WAITER... THERE IS AN ENTOMOLOGIST IN MY SOUP!"

It is with my tongue firmly in cheek that I submit the above picture for the Humeral Vein. One of the best things about attending the RES postgraduate forum is the chance to meet up with fellow entomologists and being able to talk about all matters entomological freely, and it is quite possibly one of the very few places where a conversation about dung beetles is considered acceptable at the dinner table! It was during just such a conversation that the above cockroach made it's appearance scuttling across the wall behind the heads of my fellow postgrads during the forum meal. Needless to say it was duly snatched up and identified as the infamous *Blattella germanica*. Much to the relief of the waiter I decided to keep the cockroach (who had now become an honorary postgrad) which now takes a special place in my collection. Do not feel to upset at the cockroach's fate, as it was noted that they had turned up to the meeting and meal without paying their registration fees!

Duncan Allen

Bird nests: An overlooked ecosystem opportunity for specialised nest-dwelling arthropods

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Birds' nests are occupied by more than just birds: they are an important habitat for a diverse invertebrate fauna, with the nest structure effectively becoming a miniature ecosystem of specialised and generalised nest-dwellers. The conditions that favour the rearing of chicks also produce a favourable physical habitat for arthropods as well as providing a plentiful food supply. Food in the nest takes the form of feathers, discarded food, faeces, skin cells and other exuviae for scavengers as well as living and more-or-less helpless chicks for parasites. Studies have shown that intra-nidal arthropods, which include both ectoparasitic and free-living species, are a common component of a breeding bird's environment. Indeed, a large nest, such as that of an American kestrel, can harbour over 26,000 individual invertebrates from nearly 100 different species.

Interactions between birds and nest dwelling arthropods are highly variable. Some species are ectoparasites, and should therefore, by definition, have a negative impact on their hosts, while others are commensuals, taking advantage of a favourable habitat without affecting the birds in any way. Still others have a weak mutalistic relationship with their avian co-inhabitants, for example, by assisting in the decomposition process when chicks die. Most nest-arthropod research has focused more-or-less exclusively on ectoparasites. However, whilst these may be more ecologically "glamorous", and by definition have an impact on fitness, productivity, and population dynamics, they are only a small part of the story. With this in mind, we decided

Extracting hen flea larvae from a nest

to take a more holistic look at the arthropods of the bird nest ecosystem.

We collected 20 great tit nests from wooden nestboxes at Nagshead Nature Reserve (Forest of Dean, Gloucestershire, UK) for analysis under licence by English Nature. The nest structure was removed from the nestbox within 24 hours of the final chick fledging and before nest dwelling arthropods began to desert the nest. Nests were sealed in a 'zip-lock' air-tight polythene bag and any feather dust and parasites remaining in the nestbox were collected using a pooter (with suction provided by a battery-powered miniature vacuum to avoid inhalation of fine feather dust) or soft forceps. Once in the laboratory, nests were deep frozen to kill and preserve the arthropod assemblages. The nest material was then thoroughly searched for arthropods under a dissection microscope using tweezers and mounted needles to pull apart the nesting material and soft-tipped paint bushes to search the feather dust. Arthropods were extracted, identified as far as possible, and counted.

It was immediately clear that nests contained a rich and diverse arthropod fauna. In terms of free-living species, most abundant were herbivorous or scavenging Coleoptera, present as both adults and larvae, including Staphylinidae and Elateridae as well as the occasional *Clytus arietis* (wasp beetle; Cerambycidae) and a single specimen of *Trox scaber* (Trogidae). Parasitoid ichneumon wasps were found in low numbers in 15% of nests, possibly attracted by the presence of beetle larvae in the nest structures. Perhaps the most exciting free-living nest-dwelling arthropod species we found was an uncommon beetle, initially identified as *Gnathoncus buyssoni* (Histeridae), an identification subsequently verified by the Gloucestershire county Coleoptera recorder and by experts at the Natural History Museum. This is a nationally scarce species, being the rarest *Gnathoncus* species, and the second rarest (after *Teretrius fabricii*) in the Histeridae. The species was recorded in 90% of investigated nests, with a total of 101 individuals being found. This suggests either that the study site is nationally important for *G. buyssoni*, or, perhaps more likely, that the species is under-recorded. Bird nests are not commonly hand searched for arthropods and this is seemingly the first time that this species has been recorded as a nest resident, indicating that "hidden" habitats like nests may harbour further "rare" or "obscure" species in large numbers.

We also found several etcoparasitic arthropod species. These included, in order of prevalence, adult and larval *Ceratophyllus gallinae* (hen fleas; Siphonaptera: Ceratophyllidae) in 95% of nests, biting lice (Mallophaga:

Left: Avian biting louse (Mallophaga: Ischnocera), Right: Haematophagous blowfly larvae (*Protocalliphora* spp.)

Ischnocera) in 55% of nests, and *Protocalliphora* (haematophagous blowflies; Diptera: Calliphoridae) larvae and pupae in 45% of nests, together with ticks and mites in 15% and 5% of nests, respectively. With the exception of hen flea larvae, these are all parasitic, living within the nest structure and feeding off blood from the avian hosts (normally the young; rarely the adults).

Probably the most interesting of these avian parasites is *Protocalliphora*. *Protocalliphora* is one of two genera (along with *Trypocalliphora*) of so-called bird blowflies within the Calliphoridae family. Whereas most blowflies have a scavenger larval form, with adults laying eggs on carcasses so that the maggots can consume the dead flesh, bird blowflies have a parasitic larval form. Adult flies enter the nestbox only to lay eggs, usually when young birds are a quarter to a third grown (5-7 days in the case of great tits). After hatching, the larvae live in the nest material, generally only attaching to the chicks at night to feed. It is worth noting that there is some evidence that young are not equally parasitized by blowflies, with some chicks being preferentially selected over others (the so-called "tasty chick" hypothesis). Once the larvae pupate, the parasitic stage of their life cycle is complete and adults emerge from nestboxes as free-living individuals.

Hen fleas, meanwhile, undertake the most important part of their life-cycle, reproduction, during the bird nesting period. Adult fleas live on adult birds, and descend into the relative safety of the nesting environment to mate, after which the females lay their eggs. Once these eggs hatch, the white larvae live in the nest material and feed on feather dust and other organic material. They also feed on undigested blood excreted by adult morphs, after which they become blood engorged. The larvae then pupate in the nestbox over the winter and hatch into adult fleas the following spring. Note that in terms of bird conservation, the presence of overwintering hen fleas as pupae means that it is often recommended to remove nesting material from nestboxes during the winter in order to reduce parasite burdens for subsequent occupants. This action is probably one of the reasons that the breeding success of birds in nestboxes is often higher than birds using natural sites.

Larval hen flea (*Ceratophyllus gallinae*). Left: typical presentation, Right: blood engorged.

Adult hen flea (*Ceratophyllus gallinae*).

Order	Family/Sub-order	Scientific Name	Common Name	Taxonomic Authority
Coleoptera	Cerambycidae	*Clytus arietis*	Wasp beetle	(Linnaeus, 1758)
Coleoptera	Elateridae		Click beetles	Leach, 1815
Coleoptera	Histeridae	*Gnathoncus buyssoni*		Auzat, 1917
Coleoptera	Staphylinidae		Rove beetles	Latreille, 1802
Coleoptera	Trogidae	*Trox scaber*		Linnaeus, 1767
Diptera	Calliphoridae	*Protocalliphora* sp.	Haematophagous blowflies	Hough, 1899
Hymenoptera	Ichneumonidae		Ichneumonid wasps	
Phthiraptera	Ischnocera		Biting lice	Kellogg, 1896
Siphonaptera	Ceratophyllidae	*Ceratophyllus gallinae*	Hen flea	(Schrank, 1803)

Table 1. Taxonomic table of nest dwelling arthropods recovered from great tit nests. Information collated from the Integrated Taxonomic Information System (ITIS) in November 2011. Taxonomic authority is for species where a species-level identification was possible and for family/sub-order in all other cases.

Taking wing length and weight of a 15-day old great tit nestling

There were notable differences in ectoparasite communities between nests. In particular, the relative importance of lice (Ischnocera) in the nest ectoparasite community was highly variable, and there was a tendency for nests with abundant sheep's wool to support large lice populations. The time in the breeding season (early *versus* late nests) was an important influence on nest ectoparasite community: *Protocalliphora* larvae were present in 90% of late nests (those started after the mid-point of the breeding season) but absent from early nests (those started before the mid-point of the breeding season). The number of individual ectoparasites in the nests was high: 1,275 individuals were found in one nest (including non-parasitic life stages). There was, however, considerable variability in nest parasitic load, both overall and for individual species; for example, the number of adult hen fleas per nest ranged from 5 to 119 (mean = 36). Interestingly, there was no relationship between the number of chicks and either total ectoparasite abundance or the abundance of any individual species. Furthermore, no significant relationships were found between the abundance of different arthropod species in the nests (i.e. the presence or abundance of one species did not appear to influence the presence or abundance of any other species). The only significant relationship was between different life stages of the same species: the number of adult hen fleas correlated positively with the number of larval hen fleas (as would be expected).

By definition, parasites should reduce the fitness of their host and we also examined condition measures (relative mass, determined by dividing weight of chicks at day 15 post-hatching by wing length taken at the same age) to see if such a relationship existed. In fact, there was no relationship between the overall parasite burden and the condition of great tit chicks; a result that might seem surprising but is actually not unprecedented. Indeed, the absence of a (measurable) effect of parasitism agrees with studies in the USA on nestbox-breeding eastern bluebirds in relation to hen flea abundance and work on chestnut-backed and mountain chickadees parasitised by *Protocalliphora*. It is possible that young chicks have physiological or behavioural compensatory responses, such as increasing preening, to reduce the intensity of parasitism or to buffer its impact. Alternatively, parasitism might only cause measurable detriment to condition when nestlings are under stress, for example during food shortages, or costs could be passed on to parents if they have to forage more to buffer the impacts of parasitism.

It is clear that bird nests constitute an important habitat for a range of arthropods with differing ecological functions and life history traits. Although bird-parasite interactions are extremely interesting, and of importance to avian research and conservation initiatives, the findings here demonstrate that these "hidden" habitats support many more free-living species than is usually realised. Further surveys of these habitats for arthropods in general would be useful, and we suggest that a sensible first step would be to investigate patterns in prevalence, abundance and community structure of nest-dwelling arthropods in terms of location, host species, and time of year.

Training a new generation of Dipterists

Roger K.A. Morris and Stuart G. Ball

The Authors

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Picture previous page: Stuart Ball with students at the FSC hoverfly course at Preston Montford, August 2011.

Picture above: Stuart Ball (Right) with students at Preston Montford in March 2009.

Introduction

Many natural history groups and societies lament the lack of younger members. This has been the case for Dipterists Forum too, but we believe we have started to shift the balance. Membership is rising and small groups of active dipterists are developing. This is reflected in attendance of field meetings and in submissions to recording schemes. One reasons for these changes has been the Forum's commitment to engaging with interested groups by running training courses across the country.

Dipterists Forum offers several opportunities for enhancing identification skills. Firstly, it has run a regular training weekend at Preston Montford Field Studies Council (FSC) centre since 1993. This event offers a class for novices and a master class for


berghaus

Stuart Ball (Left) with Rob Wolton (Right) at the Introduction to Hoverflies course at Preston Montford in March 2009. Rob has subsequently become a major contributor to the Recording Scheme and has participated in field meetings as well as having presented a paper at the 6th International Symposium on Syrphidae in 2011.

more advanced Dipterists. The master classes attract between 20 and 30 participants and have covered subjects as diverse as fungus gnats, craneflies, Tachinidae and Muscidae. Attendance at beginner's classes has ranged from 4 to 12 participants.

For several years, RM and SB also ran an *Identification of Hoverflies* course at Preston Montford FSC. It was listed as one of the options open to students on Birmingham University's Certificate and MSc in Biological Recording and might therefore have been expected to attract good numbers; however in the end numbers attending fell and became too small to justify the effort. Consequently, the course was dropped for several years. It was re-started in 2009 following an upturn in interest from Birmingham University students and, so far, has been very well attended. We think the main reason for this upturn is that the students are now better acquainted with the work of the Hoverfly Recording Scheme (www.hoverfly.org.uk) and its relevance to biological recording, making hoverflies relevant and stimulating.

Our interest in running training courses was reinvigorated when the Wildlife Trust for Bedfordshire, Cambridgeshire, Northamptonshire and Peterborough started its 'Ecology Groups' programme. This initiative sought to encourage Trust members to participate in surveying and monitoring Trust reserves. It was funded by the Heritage Lottery Fund and included an outreach officer together with the purchase of sufficient microscopes to run courses at various centres. RM and SB were approached to run courses on flies and hoverflies. The courses were popular and we had no shortage of participants. This, together with the hugely popular one-day workshops run by the British Entomological and Natural History Society (BENHS) at their base at Dinton Pastures, showed that, provided courses could be offered at a price that was affordable, there was no shortage of interest. The main difference between our courses and those run by the BENHS is that ours run over two or three days, rather than a single day, and are based in a variety of locations rather than a single central point.

Once the potential of low-cost courses was recognised, Dipterists Forum developed its own outreach programme in which Forum members run courses at suitable venues where participants bring their own microscopes or where microscopes are already available. Members who have contributed in this way include John & Barbara Ismay, Nigel Jones, John Kramer and Alan Stubbs. When courses were run close to our homes, it was possible to provide tutors at little or no cost to the organisers. Forum members absorbed the cost of teaching materials and petrol. However, fuel prices have risen markedly and the course materials have become far more complex,

meaning that charging has become necessary. Even so, the ethos remains the same: costs should be minimised in order to attract as a big an audience as can be accommodated.

Course organisation and structure

The structure and content of our courses has evolved and today it follows a formula that we think works. It has involved a great deal of effort developing presentations, preparing teaching material and evolving the way we pace and structure the courses. Today's courses bear little resemblance to the ones run in the 1990s because we have learned from experience.

We originally ran courses during the summer months and combined indoor work with some field work. We have found that the time require to take a group into the field requires a course of more than two days to be practical. Therefore, apart from the 3-day course we run for the FSC, courses are now run as indoor events in the winter and focus entirely on identification skills.

Courses attract participants with a very wide range of academic backgrounds and from across the age- and ability ranges. Consequently, nothing can be taken for granted. Some pupils may not have encountered a dichotomous key or used a binocular microscope whilst others will already be partially familiar with the flies in question. It is therefore important to start at the very beginning by teaching students how to manipulate specimens and making sure that they can locate and recognise the basic anatomical features. Introductory talks explain some of these features and participants are led through early stages with the whole class viewing the same specimens. Although this can be a slow process and might be seen as 'holding back' the more able, it means that everybody gains a sound grounding in the core principles. In the case of the hoverflies, day one almost solely concentrates on the key to tribes so that participants start to recognise different forms and variations in basic anatomical features such as the humeri, arista, thoracic pleura and facial features.

We have found that it is best to explain anatomical features and nomenclature at suitable points whilst running through the keys with the whole class. We use short Powerpoint presentations on topics like 'Wing venation '. We used to set up specimens under a microscope and have the whole class queue up to view them. This was of course time consuming and could become tedious! Today, we use an USB camera mounted on a binocular microscope and attached to a digital projector. During the earliest stages, we explain each couplet as we go so that all participants progress at the same pace. This is a painfully slow process but necessary. We have found that the best way of doing this is to provide each pupil with the same set of specimens following several different lines through the key. This normally absorbs the first hour or more of the practical session. Subsequent course structure varies according to the subject area, but for the purposes of this account we will focus on the hoverflies.

The biggest challenge is to embed sufficient 'markers' or signposts in the participant's memory so that they understand what they are looking at and why it is relevant. Consequently, our course material has been selected from common and obvious species that are likely to be encountered during the early stages of field work. There are also practical reasons for this, as specimens are frequently damaged; so they must be easy to replace!

Once participants have been led through several specimens they are free to work at their own pace through further sets of specimens that we provide. The course tutors provide assistance as required. Occasional interventions and presentations punctuate proceedings as anatomical questions emerge. We have Powerpoint presentations available to explain most of the topics that may come up.

Once the basic principles of the key to tribes are embedded we return to a group exercise following several specimens through the keys to genera and species before allowing participants to work through material at their own pace. Day two is usually broken up by a series of presentations on fieldcraft, preparation and curation of specimens, and biological recording. Thus, at the end of a two-day course, participants should have a broad feel for the topic and should have the confidence to attempt to recognise some obvious hoverflies and to know where they sit within the keys.

Having established a foundation, we hope that participants will have the confidence to develop their skills working alone. We have found, however, that it is very helpful to run a follow-up session in the autumn where participants bring material they have collected during the intervening field season. Apart from providing assistance with identification of this material, we also may include one or more teaching sessions on more demanding taxa. By having a definite date by which they are expected to produce some material, people are far more likely to actual do something and hence to use and expand on what they have learned. We often run a competition with a bottle of wine as a prize for the best collection to help things along!

Course materials

We provide all course materials sufficient to accommodate up to 12 participants. This is the largest group we think we can handle with two tutors. There are several reasons for this limit. Firstly, course literature includes the major keys and has to be sourced: we use our own libraries to provide copies of the hoverfly key *British Hoverflies* (Stubbs & Falk, 2002) and other relevant publications. Access to microscopes is a major problem and until recently we relied on the facilities at bespoke centres or on participants bringing their own microscopes. Provision of teaching material involves a great deal of effort collecting and preparing sufficient specimens. And, finally, although there are stages when the demands on demonstrators are low, there are periods of intensive demand and the numbers reflect a balance between the time available to help individuals and the need optimise numbers to keep unit costs to a minimum.

The main component of the teaching 'pack' comprises two sets of specimens: a reference collection containing a broad suite of species (families in the case of the *Introduction to Flies* course), and quantities of working specimens. During a weekend course, participants work through between 25 and 30 species and consequently the working material consists of at least 12 specimens of each, and in practice, more like 15 to 20 are required. We also need smaller numbers of some additional, more challenging, species for those that get through the material quickly. In all, that means in the order of 1000 specimens! These numbers are essential because the rate of damage is considerable – between 5 and 10% of

Geoff Hancock with students: Glasgow Naturalists' hoverfly follow-up course at Rawendennan, September 2008.

specimens can be rendered useless during a course. Initially, we provided each participant with a plastic box containing the 25 or 30 specimens they would work through, but we found this led to damage as individual specimens were extracted or inserted from amongst the others. Today, we hand them out a few at a time, in unit trays and try to ensure there is plenty of room for them to be manoeuvred with less risk of damage.

Experience shows that it is best not to have data labels on the working specimens as they become loose, pivoting around the pin, and hence contribute to the carnage. Whilst properly curated specimens impart the correct ethos for collection management, labels are a hindrance in maintaining the teaching material in good condition. The reference collection however, is fully labelled and proper labelling is one of the items which is stressed during the presentation on preparation and curation of specimens.

The written and visual components of the courses are extremely important. Handouts for the hoverfly course include a revised copy of the key to tribes from Stubbs and Falk (2002) that uses photographs of anatomical features rather than line drawings. Participants get this to take home, together with an additional booklet that includes relevant drawings explaining nomenclature of the fly's anatomy, a current checklist, notes on ease/difficulty of identification and names and addresses of equipment suppliers. *The Introduction to Flies* course is accompanied by several handouts that include a test-key to families derived from several sources.

Running courses at venues other than field centres and universities means that equipment is a limiting factor. In 2010 we purchased a camera microscope with a grant from the Open Air Laboratories (OPAL) initiative, funded through the 'Big Lottery Fund'. In 2011 we secured a further grant to purchase 12 student microscopes so that we can use a wider range of venues where microscopes are not available. In addition, the first OPAL grant funded the printing of the hoverfly course handouts.

We remain reliant upon course organisers to provide the necessary digital projector and occasionally have to borrow one. We do, however, use our own laptop computer which has the software that drives the camera microscope.

The microscopes and package of materials are available to Dipterists

Forum members who wish to run local courses. In this way, we have provided assistance to initiatives in Shropshire and Oxfordshire. Currently we are developing a new pack of material for teaching *An Introduction to Soldierflies and their Allies*. This has been in gestation for 18 months and is hampered by the slow pace at which we have been able to assemble the teaching pack.

Costs and administration

Apart from Dipterists Forum's own training events, we expect the hosting organisation to handle advertising, bookings and other aspects of administration. Our training courses are designed to minimise the cost to participants. By taking the course to them, their travel and accommodation costs are minimised. We have done this partly by individually subsidising the running costs but, as these have risen, we have developed a basic charging structure.

As many courses are now run some distance from our homes, and often include the need for overnight accommodation, we make a basic charge for travel, bed and breakfast accommodation plus subsistence of £15 per day. In addition, we make a charge to cover the cost of re-printing handouts. Consequently, a two-day course will typically cost around £25 - £30 per head, assuming 12 participants. The organisation hosting the course may, of course, charge more than this and hence derive some income. It is common for the hosting organisation to keep charges low for their own membership, but to advertise any unfilled places much more widely to non-members at a higher rate.

Impact and effectiveness

Training programmes have two critical impacts. Firstly they generate local interest, perhaps temporarily increasing active field recording, and occasionally encouraging somebody to become a really active entomologist. Developing local activity and enthusiasm spreads the word and means that new enthusiasts can be recruited. Secondly, and maybe more importantly, participants will have had their interest awakened and may return to Diptera later in life. The fly courses that used to be run by Henry Disney at Malham Tarn FSC are an excellent example of this sort of impact. Several very active members of Dipterists Forum started through this route and some have returned to flies much later in life.

We have spent a great deal of time in the East Midlands with various groups and a key result has been the establishment of a Northamptonshire Diptera Group who have regular field meetings and are actively recording the County. Northamptonshire was once a glaring hole on maps but it is now noticeably well-recorded. Similarly we have run several sessions in Glasgow and there has been a very noticeable increase in recording in that part of Scotland. Both cases show that where one or two local enthusiasts are encouraged, their own energy and enthusiasm will help to embed skills, activity and enthusiasm. A similar effect can be seen in Surrey where the Wildlife Atlas Project (see Morris 2002) has maintained and enhanced enthusiasm for recording a wide range of taxonomic groups.

A key question is 'who attends our courses?' In the past, we found that courses were populated by older or retired people, but in recent years we have seen a change. We still get the occasional 'professional course-goer', but far more are now active field naturalists or countryside professionals. For example, the average age has been below 40 for our courses in Glasgow, which have attracted countryside rangers and other professionals. The average age for a course we ran at the Natural History Museum in January 2011 was below 30; and attendance at our courses at Preston Montford tends to be a younger cohort who are pursuing the Certificate or MSc in biological recording.

Occasionally a highly experienced natural historian attends our courses and may prove to be a real catch. Several have taken up diptera in a serious manner and now participate in Dipterists Forum field meetings; two have even joined the Dipterists Forum Committee and one has been its Chairman. Contributions to the Hoverfly Recording Scheme by former alumni have also grown. It is noteworthy that 21 recorders have contributed 50% of the data held by the Recording Scheme (745,000 records) (Ball, *et al.*, 2012) and of those 21 one attended our introductory course in the early 1990s. Several recent alumni lie amongst the most active current recorders and three have been major contributors in the past five years; each contributing between 2.5 and 6% of the annual data submitted. In addition, at least five attended the 6th International Symposium on the Syrphidae in Glasgow in 2011, three presented posters and one presented a paper.

Extent of outreach

We have run training courses in conjunction with several County Wildlife Trusts, Biological Records Centres and Museums and can now boast engagement across much of the British Isles, including Shetland, the Hunterian Museum (Glasgow), Cardiff Museum, the Natural History Museum, Wildlife Trusts in Bedfordshire, Buckinghamshire, Cambridgeshire, Leicestershire, Lincolnshire and Northamptonshire, and the extra-mural group at Birkbeck College in London. In 2010 nearly 90 participants attended Dipterists Forum introductory courses.

Next steps

So far, Dipterists Forum has relied upon local organisers to co-ordinate the venue and the participants. However, we think there is scope to do more, and in particular to generate greater interest in Diptera amongst new graduates. Consequently we are planning to develop a longer residential course specifically aimed at undergraduates and recent graduates who are looking for a development opportunity during the summer vacations.

This is starting in a modest way in 2012 with proposals for a four-day meeting at a venue in western England that will combine field work with teaching and practical sessions. Unlike the existing training programme, this project will attempt to give participants a flavour of some of the skills developed during Henry Disney's days at Malham Tarn. We will visit a variety of wildlife sites, various trapping techniques will be trialled and field craft and taxonomic skills will be covered. If it succeeds, we hope to make this a regular event. Costs will be kept to a minimum but are likely to be in the order of £40 per day unless grant aid can be secured.

We also think there is sufficient interest amongst Dipterists Forum members and members of other entomological and invertebrate societies to develop training initiatives. We therefore hope and intend to run a 'training for trainers' course.

Concluding comments

Our experiences highlight the potential demand for taxonomic training amongst a wide spectrum of field naturalists. Interest amongst wildlife professionals is notable, but there also appears to be scope for encouraging a wider constituency of naturalists, especially those who have worked their way through birds, butterflies, dragonflies and moths and now seek a bigger challenge. In the past there have been obvious impediments to reaching this pool, most notably cost.

Funding provided from various lottery funds has helped to pave the way for a new approach and there is scope for much more. Biological recording by active field naturalists contributes substantially to the dataset held in the NBN Gateway and thus data available through the Global Biodiversity Information Facility (GBIF). For example UK data comprise 37% of the 2,829,360 Diptera records accessible via GBIF (Pointed out by F. Christian Thompson in a presentation at Dipterists Day, 2009, but figures updated on 04/11/2011) and the Hoverfly Recording Scheme comprises 86% of the hoverfly records on GBIF!

These data are used in many ways to inform Government policy on wildlife conservation and to develop Red Lists such as the recently published status review for hoverflies (Ball & Morris, in press). Maintaining this network is important to both the non-vocational and professional communities because data can be accessed for many purposes. For example, work by Leeds University on pollinators has drawn heavily on the data assembled by the Hoverfly Recording Scheme and made available via the NBN. Outreach to generate taxonomic skills is therefore an obvious benefit to all of society and deserves much more attention. All it takes is commitment and enthusiasm.

Acknowledgements

This outreach programme has been hugely helped by OPAL, without whose help we would have been much less able to encourage and foster a new generation of biological recording. Our experiences show what can be done using technically competent non-vocational commitment to deliver skills and information that are needed to help invertebrate conservation in coming decades.

References

Ball, S.G. & Morris, R.K.A. in press. A review of the scarce and threatened flies of Great Britain. Syrphidae. *Species Status*. Joint Nature Conservation Committee, Peterborough.

Ball, S.G., Morris, R.K.A., Rotheray, G.E. & Watt, K.R. 2011. *Atlas of the Hoverflies of Great Britain (Diptera, Syrphidae)*. Wallingford, Biological Records Centre. 183 pp.

Morris, R.K.A., 2002. The future of the county invertebrate atlas. *British Journal of Entomology & Natural History*, **15**: 141-151

Stubbs, A.E. & Falk, S.G., 2002. *British Hoverflies an Illustrated Identification Guide.* (2nd edition) revised and updated by Ball, S.G., Stubbs, A.E., McLean, I.F.G, Morris, R.K.A, Falk, S.J. and Hawkins, R.D. British Entomological and Natural History Society, Reading. 469 pp.

Insects in Line

Entomological Illustrators and Artists

Fergus McBurney

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Throughout my childhood, my interests in the natural world and drawing were heavily influenced and nurtured by my parents, both of whom had been involved with live stock and agriculture during their time at university. The result of which was a fairly ''Earthy" upbringing for myself and many joyous hours, spent rooting around in the garden pond for interesting bugs, often, shortly followed by much scribbling with felt-tip pens and crayons.

My first real illustrative influences came from my Mother, who is particularly skilled with a sketching pencil and watercolour brush and from my Grandfather who was an avid falconer and illustrator of birds of prey, with their guidance I started to become familiar with different forms of illustration and the corresponding techniques. During my late teens, I sought to further my abilities, with two years in the Sheffield College of Art and Design.

And finally, fast-forwarding to 2008, I was spotted sketching arthropods, in a natural history practical at Plymouth University, by non-other than Antenna's very own Peter Smithers, who kindly offered me the chance to be involved with the illustration of an entomological field guide. Needless to say, I jumped at the opportunity and was delighted to make a ''first step" towards a potential future career.

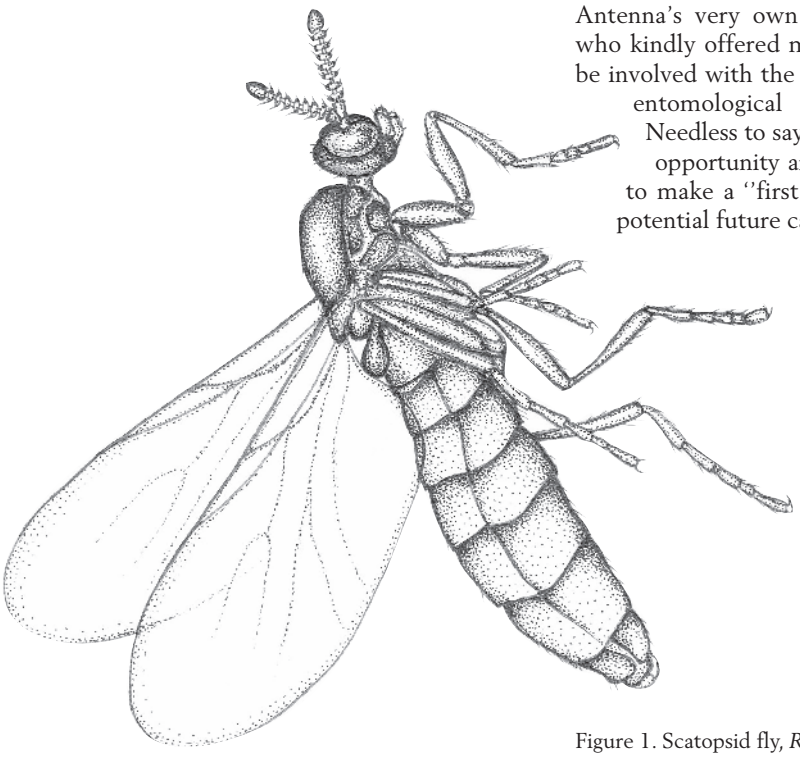

Figure 1. Scatopsid fly, *Reichertella* sp.

Figure 2. False scorpion, *Lamprochernes savignyi*.

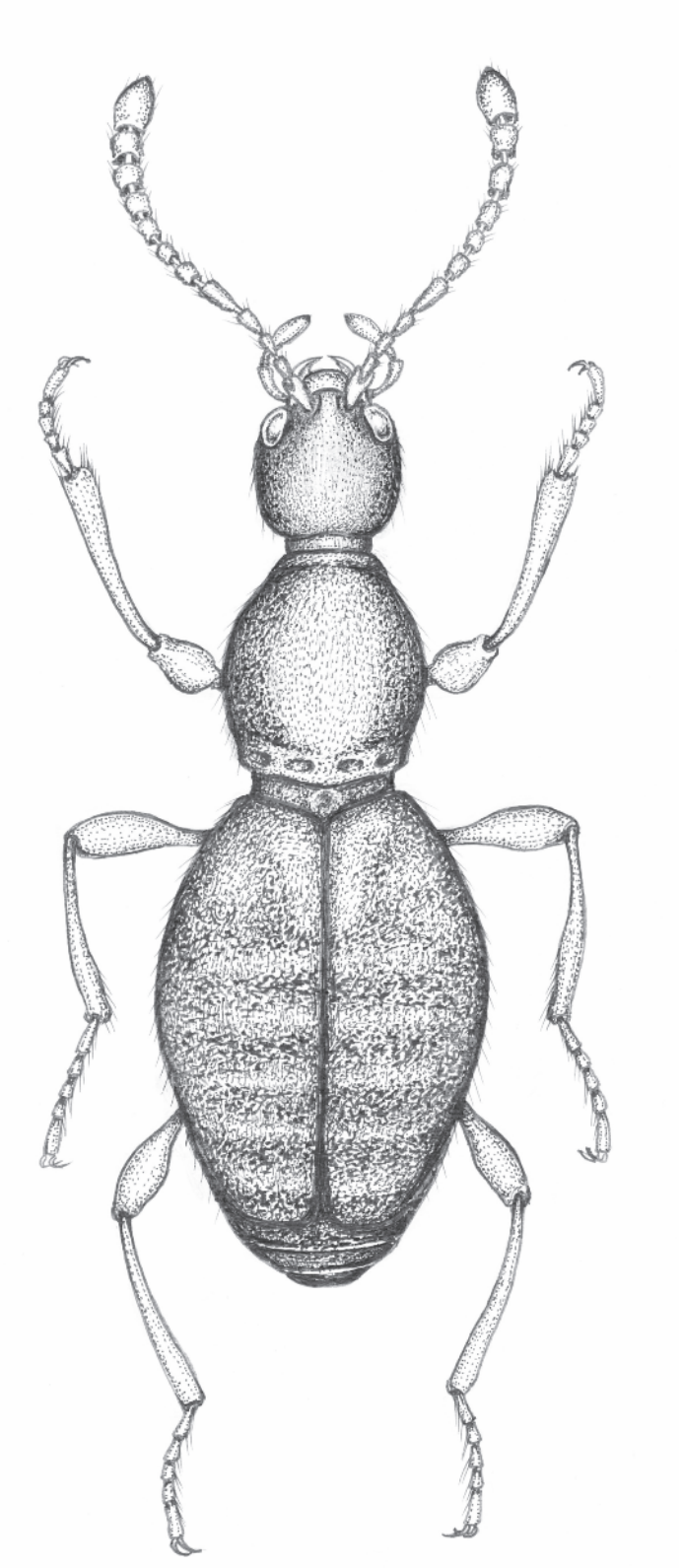

Figure 3. Staphylinid beetle *Scydmaenus* sp.

Meeting Reports

Insect translocations: should we move insect species that are faced with local extinction to new areas?

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At a time of rapid environmental change, insects are faced with many severe challenges, but perhaps the most serious are widespread changes in land use resulting in degradation or destruction of habitats and changes in the climate. These pressures will mean that many sites that currently hold rare insect species or communities will either no longer be present or will not be in a suitable condition for them in future. Species that can readily disperse to find new sites where suitable conditions prevail may not suffer too much, assuming such sites exist. However, there are many species with poor powers of dispersal that will become trapped and will gradually disappear as local conditions deteriorate.

One solution to this problem may be to give a helping hand by physically moving species to new sites: so-called translocation. This idea is gaining popularity as the impacts

of land use and climate change become more apparent. However, there are many issues to consider before rushing ahead. One guiding principle should be clear from the start: individual species or communities should never be moved to new sites simply because they represent inconvenient obstacles to development. Apart from several other considerations, translocations cannot be guaranteed to work; there are many cases of failure that never get widely publicised.

Conventionally, translocations were considered justifiable only if they were either to re-establish a species at a site from which it had previously been lost or to establish new populations that were nevertheless still within the species' existing range. Climatic warming might force us to rethink that principle as species' ranges move towards the poles and long-established populations struggle to survive when their sites become climatically unsuitable. Stephen Willis and colleagues have recently shown that translocations of butterflies beyond their existing and historical range is possible. They successfully introduced marbled whites and small skippers into two sites in northern England that were outside their existing range but where climate-species distribution models predicted the sites to be climatically suitable (*Conservation Letters* 2: 45-51, 2009).

But how far should we go in terms of moving species around? Chris Thomas has recently taken the debate one step further by suggesting that some southern European high-altitude endemic species (including certain butterflies and water beetles) that are running out of space as their habitats move progressively higher up the mountains could be rescued from imminent extinction by bringing them to Britain, i.e. well outside their current range (*Trends in Ecology & Evolution* 26: 216-221, 2011).

Clearly, there are many issues to think about. Invertebrate Link (formerly the Joint Committee for the Conservation of British Insects) has been considering how best to ensure that proposals for future translocation attempts are considered carefully and not done simply as an apparently easy option. Their conclusions are now enshrined in a code of practice that has been formally endorsed by twenty organisations including the Royal Entomological Society. The full code was recently published in the British Journal of Entomology & Natural History (23: 207-217, 2010) and can also be downloaded from the Invertebrate Link website (http://www.royensoc.co.uk/InvLink/Index.html). However, the Executive Summary reproduced below provides an overview of the main points. Each of these is discussed in much greater detail in the main body of the document.

1. Translocation should be considered only in conjunction with other conservation measures.
2. When attempting to maintain a population whose habitat could be damaged or destroyed by human activity, opt for translocation only as an absolute last resort.
3. Consult widely before deciding to attempt any translocation.
4. Determine a clear objective for every translocation, based on an understanding of the population structure of the species concerned.
5. Understand the ecology of the species to be translocated in sufficient detail.
6. Undertake research to establish the suitability of the proposed reception site(s).
7. Select the stock to be released, according to appropriate genetic and ecological criteria.
8. Obtain permission (in addition to any licences that may be legally required) to use both the reception site and the source of material to be translocated.
9. Consider carefully whether the proposed activities will harm any donor population and whether evidence of a lack of harm can be provided if required.
11. Ensure that appropriate long-term management of the reception site(s) is feasible and is implemented.
11. Include host-specific parasites in (re)establishment.
12. Ensure that sufficient individuals are released to secure (re-)establishment.
13. Record the details of the translocation meticulously.
14. Ensure that the outcome of (re)establishment or reinforcement is continually assessed and adequately recorded.
15. Report all translocations to the relevant repositories of records, subject to any essential need for confidentiality.

To illustrate the wide variety of insects that have been the subject of reintroduction attempts, *Antenna* asked four entomologists who have been centrally involved in insect translocation programmes to describe the approach that they took and the challenges that they faced. Three of the projects have been successful whilst only time will tell for the fourth one. Each case study describes a number of lessons learnt. Perhaps the most important general take-away message is that translocation is not a trivial exercise; it needs to be planned carefully, completed following an agreed protocol and then monitored to ascertain how successful it has been. We need to learn the lessons from each case so that we can improve the chance of success for the next time. Such interventions are likely to become increasingly important in future if we want to preserve some of our rarest and most

Monitoring a translocation of Silver-studded Blue in Suffolk

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A glance at the UK distribution map for the Silver-studded Blue, *Plebejus argus* (L.), gives the impression of a strong belt stretching 40 miles up the Suffolk coast. In reality, the relict chunks of heathland in the Sandlings feature fragile populations in two main clusters, with isolated sites at the fringes. The Suffolk Local Biodiversity Action Plan (BAP) set a target for translocations to strengthen the presence of this UK BAP species, and in 2006 the Suffolk Branch of Butterfly Conservation set about planning a translocation to Blaxhall Common, a site lying five miles inland from Aldeburgh, that last held an enduring colony around 1920. Currently a Site of Special Scientific Interest (SSSI), the common has been maintained by the Suffolk Wildlife Trust (SWT) and selected squares of heather had been forage harvested in preparation for a possible attempt at re-establishment.

As this was to be executed by a team of amateurs, special attention was paid to the procedural detail and makes this an

interesting case study. The 1986 code prepared by the Joint Committee for the Conservation of British Insects (JCCBI) and the parallel rules issued by Butterfly Conservation for re-establishments both provided useful guidance. As a result, the planning process was conducted briskly, and with all the necessary approvals. The JCCBI Code has since been refined and re-issued as Invertebrate Link (JCCBI) 2010.

The plan specified two separate translocations, one from each of Lower Hollesley and the Sawmills colony near Minsmere, one to be conducted at the peak flight period, and the other two weeks later. Both of the donor sites were SSSIs, Lower Hollesley lying seven miles south of Blaxhall, and Sawmills lying nine miles to the north-east. The intention was to move as many mating pairs as possible, with the balance made up to 30 adult butterflies from each donor site. Translocating gravid females is more easily achieved than moving the insects at any other stage of the life-cycle; furthermore, the female's mobility allows the insect to select the most appropriate site for oviposition. In this case, the insects would be free to choose suitable microhabitat in the vicinity of ant activity. Using two separate donor colonies introduces an element of genetic diversity, and importing them with a separation in time mimics a natural spread across the flight period, as well as reducing the chance of hitting a period of inclement weather.

The necessary consents were obtained in advance from Natural England, Butterfly Conservation Head Office, landowners at the two donor sites - R.H & R. Paul, and RSPB, and at the receiving site, Blaxhall Parish Council. The detailed proposal was submitted to Natural England on 30 January 2007. A final check for the presence of *Lasius* ants was successfully conducted on 9 May 2007, and letters of consent were issued on 13 June 2007.

Following an unusually hot April, the 2007 season began early, and the first Silver-studded Blues made their appearance in Suffolk on 4 June, two days earlier than ever previously recorded. In view of this, the first translocation was conducted on 18 June, earlier than had originally been planned. A volunteer team of five entered the Sawmills site at 11am with the weather as forecast: 17°C and overcast with a light breeze. Initially, butterfly numbers were low, particularly females, but by noon the day was warmer, with a few sunny intervals, and we had little difficulty finding roosting Silver-studded Blues and potting them. Shortage of sun meant that there was limited flight activity, and we saw no pairings, so we concentrated on collecting females. Their condition was variable; some were very fresh, whilst others had evidently been on the wing for some days, so the chances they had already mated were good. The proportion of females of the blue form (similar to ssp. *masseyi*) seemed higher than normal, but perhaps this was noticed simply because we were handling and inspecting them, rather than just counting them. The butterflies were collected in clear plastic pots and transferred to a fine mesh enclosed cage, which gave them an opportunity to pair, but none did so. In all, 20 females were taken, and 10 males. Some rejection behaviour was noted, suggesting earlier pairing had occurred. Fortunately the threatened showers avoided Minsmere and Blaxhall, where the releases were made at 2.30pm at three pre-planned spots. Behaviour on release was encouraging. Although a few drifted off in the westerly breeze, most remained feeding on the *Erica* very close to the release sites, which were separated by about 100m. Each was close to a recently foraged area with pioneer growth already visible, and ant activity in evidence.

The translocation from Lower Hollesley was executed in bright weather on 3 July during a generally showery week. All 30 butterflies were taken from Lower Hollesley 'A', where they were sufficiently abundant that there was no need to visit the 'B' colony. One mating pair was found and moved in cop. The balance comprised 19 females in variable condition and 9 fresh males, making another batch of 10 males and 20 females in total. These were released at Blaxhall Common by 12.30pm, using the same three release points as the first batch 15 days previously.

Five showery days after the second release, at least 14 were still flying, generally close to the release points, although two had moved a few hundred metres to an area of mature heather, and none lingered at the high point of the common. Targets for success were set, and monitoring arrangements settled, both for the new site and for the donor colonies.

The established monitoring regime for Silver-studded Blue includes an annual count at all Suffolk sites. A warden, or volunteer team seeks to count all adults flying on one day at the peak of the season, ideally in good weather. The method is generally standardized at each site, but may vary between sites, and the total counts are recorded in the annual Butterfly Report published in Suffolk Natural History (the proceedings of the Suffolk Naturalists' Society). The results have provided reassurance that there has been no material impact on the donor colonies as a result of removing 30 insects from each. Our target is for site counts to recover to 100% of the "good year" datum of 2006 by 2013. This numerical target is less easily evaluated than might have been hoped, as most years since 2006 have produced counts well below the 2006 datums at all sites. In this context, the donor colonies are no worse than other sites. The table below, extracted from Suffolk Natural History Vols 44-47, shows the fluctuating nature of these counts, the deviation from average of individual sites, and the general weakness since the 2006

	2006	2007	2008	2009	2010	2011
Combined (16 main sites)	3811	1530	2654	2855	3607	1705
% of 2006 datum	100	40	70	75	95	45
Mins. Sawmills	1094	231	563	383	868	345
Sawmills % of 2006	100	21	51	35	79	32
Lower Hollesley 'A'	271	131	176	231	124	58
LH"A" % of 2006	100	48	65	85	46	21

It could be said that by 2009, Lower Hollesley produced better than average percentage counts, whereas Sawmills was still below average. 2010, the year with an overall count closest to 2006, left both donor sites below average, yet with a total count of 868 at Sawmills, there is scarcely any cause for concern. The dramatic drop of 2011 brought the average down towards 2007 levels, with both donor sites again looking weaker than the average. Is the glass half empty, or half full? It would have been nice to see stronger results, but counting butterflies, whilst hit and miss, does at least use an established monitoring regime.

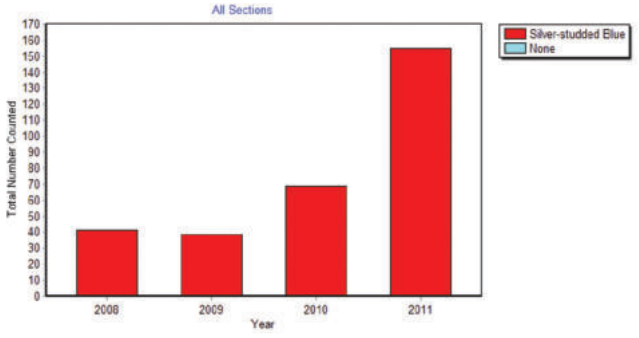
A single-species transect was set up at Blaxhall Common, with a route aimed at detecting any extension to the flight area, as well as making a weekly count. In this way, a fair year-on-year comparison has been made possible for the new colony. The relevant guidelines invite a commitment to monitor the site for 10 years.

Volunteers walked it for the remainder of the 2007 season for familiarisation. The next season's results showed that eggs

to emerge as adults for a normal flight period. The maximum single day count was 15 in 2008, and this has risen progressively to 45 in 2011, whilst the flight period has stretched from an interrupted 9 week span to a continuous 11 week period, as tabulated below:

Blaxhall Common				
Year	**2008**	**2009**	**2010**	**2011**
Max single-day count:	15	19	31	45
Flight Period (Weeks):	9	9	9	11
Total season count;	41	38	70	155
Index:	57	38	83	164

The total transect count for each season has also risen, notably with 2011 doubling the previous year's count to 155. The Transect Walker software has calculated an index for each year, rising to 164 (chart below).



In 2010, it was clear that the flight area had extended across an area of pioneer heather close to the road, so a check was made in 2011 to see if any were flying on the far side of the road (a target for 2018), but they are not yet there.

The Silver-studded Blue depends on ants during its life-cycle. Eggs are laid close to the ground in areas frequented by ants, sometimes on plants that the larvae can eat, but also on bracken and under stones, where they lie until the following winter. The main larval host plants are heather, bird's-foot trefoil and gorse, but only tender shoots are eaten. The young larvae are found and tended by ants of a few species within the genus *Lasius*. *Lasius psammophilus* (prior to Seifert, 1992, referred to as *L. alienus*), nests all over the common, but particularly where vegetation is sparse and sunlight reaches the ground. *Lasius niger* is also present, but in lesser numbers. The ants are attracted to a sweet substance which the lycaenid larva secretes from a honey gland on its back. The ants protect the larvae from predators and parasitic wasps, and their reward is the honey. When the larvae are ready to pupate, they are accompanied underground by the ants, usually into an ants nest. They do not eat the ant grubs in the way of the Large Blue, but remain protected until they are ready to hatch. The butterfly emerges from its pupa in late June, and crawls out of the nest in the company of a cluster of ants, giving it continued protection during the vulnerable period whilst it dries its wings. Clearly this relationship necessitates managing the habitat for ants as well as butterflies.

Already an SSSI, the common is managed in pursuit of Suffolk's Lowland Heathland Habitat Action Plan. It had been brought up to a suitable condition for *Lasius* ants and Silver-studded Blue by SWT staff and a team of local volunteers. Heather cutting, silver birch removal, bracken control and the creation of bare areas had all been accomplished before 2007. This work was done with financial support from a landfill grant and Natural England. A continuing commitment to heathland management is essential to maintaining the right habitat for the butterfly. Furthermore, care must be taken to avoid adverse impact on

Proforma Report

JOINT COMMITTEE FOR THE CONSERVATION OF BRITISH INSECTS

RECORD OF INSECT ESTABLISHMENT

SPECIES
Plebejus argus

NAME OF RECEIVING SITE
BLAXHALL COMMON — Grid Reference TM 378568
COUNTY SUFFOLK

ORDER Lepidoptera

CONSERVATION STATUS
Site of Special Scientific Interest

DATE OF LAST RECORD DD/MM	YYYY	DATE OF ESTABLISHMENT DD/MM	YYYY
	1920	*3-Jul*	*2007*

REASONS FOR ESTABLISHMENT
Species Conservation
Notes: *as per Species Action Plan*
Last record date disregards 1997 sightings attributed to a clandestine release.
Translocation in 2 stages 30 on 18 Jun, 30 on 3 Jul.

SITE OWNER
Blaxhall Parish Council
c/o Pack Gate Cottage
Mill Common, Blaxhall
Suffolk, IP12 2ED

SPECIFIC MANAGEMENT OF RECEIVING SITE
By SWT as Sandlings Heath SSSI.
Scrub clearance, bracken control.
Heather areas foraged periodically.

DETAILS OF INTRODUCED STOCK
LIFESTAGE AND NUMBERS INTRODUCED

Ova	Larva	Pupa	Adult male	Adult female	Total	Dates
nil	nil	nil	10	20	30	18-Jun-07
nil	nil	nil	10	20	30	3-Jul-07
					60	

ORIGIN (18 Jun) — Grid Ref TM452692
Site Name: Minsmere Sawmills
County: Suffolk
Owner: RSPB
Address: Minsmere Nature Reserve, Westleton
Saxmundham, Suffolk IP17 3BY

ORIGIN (3 Jul) — Grid Ref TM 342465
Site Name: Lower Hollesley Common
County: Suffolk
Owner: R. H. & R. Paul
Address: Broxtead Estate Office
Sutton, Woodbridge, Suffolk IP12 3HL

SPECIFIC PARASITES INTRODUCED
Nil.

CONSULTATION	DD/MM	YYYY	NAME OF PERSON CARRYING OUT ESTABLISHMENT
Owners, Stock Sites	13-Nov	2006	Mr R. PARKER
Owner Receiving Site	13-Nov	2006	66, Cornfield Rd
Natural England	8-Nov	2006	Bury St Edmunds
Butterfly Conservation	24-Nov	2006	Suffolk, IP33 3BN
Suffolk Wildlife Trust	1-Nov	2006	

NAME OF FORM COMPILER
Mr R. PARKER
as above

DATE: 17-Jan-08

JOINT COMMITTEE FOR THE CONSERVATION OF BRITISH INSECTS

RECORD OF INSECT ESTABLISHMENT (2)

SPECIES
Plebejus argus

NAME OF RECEIVING SITE
BLAXHALL COMMON — Grid Reference TM 378568
COUNTY SUFFOLK

SUBSEQUENT HISTORY
Single-species transect established for future population monitoring.
2007 flight period finished by 26 Jul (to be expected).

other nationally protected species: both the ant-lion *Euroleon nostras* and a lygaeid bug, *Aphanus rolandri* are present, and their microhabitats will be preserved. This project has harnessed the endeavours of the existing team of Blaxhall Common volunteers, led by Terry Peake, and of active members of the Suffolk Naturalists' Society, Butterfly Conservation and the Suffolk Wildlife Trust. At least 33 individuals contributed to work during the first year.

This is a well-documented translocation which followed the procedures and guidelines required for an authorized release on a SSSI. It has got off to a promising start, but can certainly not yet be declared a successful re-establishment. Another year and it will be time for a follow-up report to Invertebrate Link. A further five years will be required before Nature's judgement becomes clear.

A few thoughts on the arithmetic of translocation are worthy of consideration here. Firstly, was the number of butterflies taken sufficient to assure success at the receptor site, and secondly was it a sufficiently small percentage of the donor colonies to avoid the risk of colony collapse? If each of the 40 translocated females were to lay 100 eggs, a total of 4000 would have been placed on Blaxhall Common. Given a 2% rate of survival to maturity and pairing, 80 could be expected to fly the following year, 40 of which would be females, merely perpetuating the same number of breeding females as those released. In the second season, if all females were mated promptly and each laid all its eggs at the new site, the number laid might be up to 6000, laying the ground for an increasing colony. If the new site began with a low population of parasitoids, the survival rate might be higher than 2% for a few years at least, and the prospects would be even brighter. It is worth noting here that it would have been difficult to introduce as many as 4000 larvae or pupae without an elaborate captive breeding programme. The figure of 30 to be removed from each donor site represented 2.7% of the 2006 strength of the Sawmills colony and 5.9% of the combined strength of the adjacent 'A' and 'B' colonies at Lower Hollesley. Our planning was done in autumn 2006, so we were using the latest available figures. In the event, all the population counts for 2007 were much lower, and the figure of 30 represents 7.8% of the numbers seen at Sawmills in 2007 (231 in the table above was the number counted after 30 had been removed). The corresponding percentage for Lower Hollesley can be presented as being as (frighteningly) high as 18.6% if the 2007 figure for the 'A' colony alone is used. I doubt we would have proceeded with the translocation had we known that 30 would be such a high percentage of the donor colony's peak count. In fact, the presence of the 'B' colony in the next field provided a healthy buffer, and the 2008 season brought much better counts at all the colonies. The lessons to be learned here are perhaps that natural fluctuations can distort well-planned calculations, that taking from more than one donor site reduces the risk, and that adjacent populations provide an additional safety buffer. Another safety margin lies in the reality that each population contains many more butterflies than those countable on a given day.

As for the question: *"should we move insect species that are faced with local extinction to new areas?"*, it is worth noting that Blaxhall Common is not a totally new area, but one where local extinction occurred. In the long term, it could play a role as a stepping stone for the recolonisation of a wider area, eventually linking to other surviving colonies, 10 miles distant. Hopefully, it is a case study which can provide lessons for those who will organize future translocations; one booklet has already been circulated for this purpose (Parker, 2008), and the present article will reach a fresh readership.

References

Invertebrate Link (JCCBI) (2010). Invertebrate Translocation – A Code of Conservation Practice. Br. J. Nat. Hist., **23**: (2010) 207-217.

Joint Committee for the Conservation of British Insects, 1986. Insect re-establishment – a code of conservation practice. *Antenna* 10: 13 – 18.

Parker, R. (2008). Report on 2007 Translocation of Silver-studded Blue, *Plebejus argus*, to Blaxhall Common, Suffolk. Special Edition of "Suffolk Argus" (Newsletter of Suffolk Branch of Butterfly Conservation).

Seifert, B. (1992). A taxonomic revision of the Palaearctic members of the ant subgenus *Lasius* (Hymenoptera: Formicidae). *Abhandlungen und Berichter des Naturkundermuseums Görlitz* 66:1–67.

Suffolk Biodiversity Working Group (2000). Local BAP & SAP for Silver-studded Blue. Suffolk County Council.

Figure 1. Male *Blera fallax*.

Translocating the Pine Hoverfly, *Blera fallax*

***Graham E Rotheray*[1]**
and
***Ellen L Rotheray*[2]**

[1] National Museums of Scotland, Edinburgh

[2] Biological and Environmental Sciences, University of Stirling

Based on pine pollen found in sediments of known age, Scots pine, *Pinus sylvestris*, was one of the first tree species to colonise the British Isles following the retreat of the ice about 10,000 years ago (Roberts, 1998). Organisms dependent on pine probably arrived at the same time; one of these is the hoverfly, *Blera fallax*. Thus like pine, this insect is an early coloniser of the British Isles, although unlike its host, no sub-fossils are known in support of such pioneering origins.

B. fallax possesses the advantage, not infrequent among hoverflies, of a unique appearance enabling identification at a glance. At about 1.5cms long, it is dark-coloured but for a yellow face and a striking, orange-red apex to the abdomen (Fig. 1). Furthermore, the extent of this colourful mark distinguishes the sexes. Apart from its distinctive appearance and probable status as an early coloniser, it belongs to a threatened functional group, the saproxylics. Saproxylics require dead wood which in the case of *B. fallax*, involves breeding in dead pine wood. The larva feeds on microbes filtered from wet, decaying wood, such as occurs in roots and at exposed surfaces of snapped trees. Like the better-known larva of the drone fly, *Eristalis tenax*, that of *B. fallax* also has a long 'tail', a sheath formed by an extension of the anal segment (Fig 2). This sheath supports the coiled breathing tubes. When anchored at the water surface by feathery setae, the paired breathing tubes unravel from the sheath and enable the larva to remain underwater for extended periods.

About 5000 years ago, the European climate warmed and, being cold adapted, boreal pine survived only in

the cooler north, as did its similarly adapted flora and fauna. This probably explains why *B. fallax* has only ever been found in Scotland in the UK. *B. fallax* is unique in another way too, as the only species ever to have been added to the British fauna on the basis of having been discovered in a hotel bedroom. In July 1873, the great British Dipterist, GH Verrall, was staying at a Braemar hotel when he was annoyingly woken in the night by a loud buzzing. He killed the responsible insect and only the next morning, realised that what he had so casually dispatched, was a hoverfly never before seen in the British Isles (Verrall 1874).

Over the subsequent 100 years or so, *B. fallax* was fairly regularly collected but records decline from the 1940s (MacGowan and Rotheray 2000). By 1980 it was considered sufficiently rare to be included as a category 1, endangered species in the red list of UK insects (Shirt 1980). The Scottish-based Malloch Society (www.mallochsociety.org.uk) made a special search for it, but it took them over a decade to discover the breeding site, the most frequent instance of which was water pockets at the cut surface of pine stumps (Fig 3). If sufficient heartwood is present and softened by xylophagous fungi, these pockets tend to develop as stumps age. Currently in Scotland *B. fallax* seems to rely on these semi-natural breeding sites, reflecting the manner in which over the centuries, Scottish pinewoods have been managed, essentially harvesting them too soon for natural breeding sites to develop.

Surveys across Scotland in the 1990s revealed that *B. fallax* existed at only two Inverness-shire localities (MacGowan and Rotheray 2000). On the basis of such evidence, *B. fallax* was, in the 1990s, included in the UK Biodiversity Action Plan process and the Malloch Society wrote an action plan for it, the chief recommendation of which was to increase the amount of breeding resource. Finally, in 2007, Scottish Natural Heritage (SNH) included *B. fallax* in a special programme, the Species Action Framework (SAF), which was implemented to help conserve a range of threatened, showcase species occurring in Scotland. Under the SAF, the Malloch Society was asked to actively conserve it and in 2007, with funds from SNH and the RSPB, the Society appointed a project officer for the work. Thus, in one of the first projects of its kind, an individual species of saproxylic fly would be the subject of tailored conservation and the project would stand as a test case for what could be done. Targeted actions were felt to be important for *B. fallax* because, as noted above, Scottish pinewoods were generally in an unfavourable state and habitat-level conservation aimed at restoration would take too long. A major objective of the recovery plan agreed with SNH was that by the end of the five-year SAF programme, *B. fallax* would, in addition to being conserved in its existing populations, be established in at least three others.

Figure 2. Larva of *Blera fallax*.

The only way to establish new populations is by partial translocation. But of the various obstacles in the way, a major one was low levels of abundance whereby removing individuals to new localities could threaten source populations. To overcome this problem two approaches were taken: increasing breeding resources for source populations and, from populations so boosted, culturing the species for translocation.

To boost source populations, shallow holes were cut into heartwood at the cut surface of large stumps (Fig 4), seeded with a variety of materials and left to accumulate rainwater. The most successful holes were those filled with pine chips and sawdust and partially covered by pieces of bark or wood (Fig. 5). Chips and sawdust provide places for larvae to hide, surfaces for microbial growth and a means of escape for earthworms and slugs that otherwise tend to drown and spoil the breeding site. Partially covering the hole with pieces of bark or wood limits desiccation during dry periods and excessive dilution from rain. Each year, colonisation rates of cut holes have been high, frequently 80% or more with anything from one to dozens of larvae per hole (Fig 6). Empty puparia were a final demonstration of their

Figure 3. A semi-natural breeding site, a hole at the cut surface of a pine stump.

Figure 4. Creating breeding opportunities by cutting holes in pine stumps; Figure 5 (inset left). Cut hole with pine chips and accumulated rainwater; cover removed to show contents; Figure 6 (inset right). Successful colonisation of a cut hole.

success. Thus, source populations were boosted and a simple, cost-effective technique was available for providing breeding conditions at localities selected for translocation.

Culturing hoverflies is thought to be problematic due to the difficulties of replicating conditions required for mating. For instance, the males of many species form aerial leks in forests or woodland edges (Rotheray and Gilbert 2011). In the case of *B. fallax* another issue was adult food. Most hoverflies require pollen to mature their reproductive systems, but foodplants were insufficiently known. In the event, larvae were taken from one of the boosted populations, reared to emergence and adults released in a large, walk-in cage set up in a pinewood (Fig. 7). Under these conditions, mating was frequent (Fig 8) and adults fed on a range of presented flowers including Greater Stitchwort *Stellaria holostea*, Heath Bedstraw *Galium saxatile*, Dog-rose *Rosa canina* and umbellifers, but preferentially, they fed on Rowan *Sorbus aucuparia*. An unexpected discovery was that adults regularly require water to drink. They often visited damp or dark patches of soil in search of moisture where they were rather too successfully preyed upon by ants. The latter were probably attracted into the cage by sugar-soaked cotton provided as an extra source of nutrition for *B. fallax*. The large cage was abandoned in favour of smaller, indoor ones which worked just as well and were more convenient. They are about 60x60x30cm in size and consisted of a wire frame, white netting and strip lighting. Oviposition is obtained by sealing gravid females in plastic bags over containers with wet, pine sawdust. Using these culturing techniques, several hundred larvae per year for the past three years have been obtained (Figs 9-11).

Figure 7. Field cage used for mating and feeding tests.

Sites for translocation were selected from the short list of those known to

Figure 8. Mating inside a cage.

Figure 9. Mass rearing.

have recently held *B. fallax* populations: one is in private ownership, one owned by the RSPB and the other owned by Forestry Commission Scotland (FCS). Each of these very different types of landowner gave a lot more to the project than passive permission. Each in different ways, and for varying reasons, have enthusiastically taken up more active roles. But at each locality, the translocation procedure was similar. Before any translocation could take place, permission was sought not just from landowners but also SNH who had to be satisfied that IUCN guidelines were being followed. These guidelines were developed with vertebrates in mind, but did not present insuperable barriers. Following sanction from SNH and agreement from landowners (both RSPB and FCS had their own, internal procedures to follow before permission was granted), sites were prepared by either boring holes in existing stumps or felling pine trees to provide stumps for hole-boring. At each site, three larvae each were released into twenty to thirty holes before winter and one hundred captive-reared adults were released in the spring.

Figure 10. A second stage, captive bred larva.

At least twice a year following release, holes are surveyed and at the first translocation site, in the summer after release, a new generation of larvae were recorded. Hence, not only had adults mated, but females had found the cut holes and used them for breeding, first evidence that translocation had been successful (leaving aside the remote possibility that such breeding came from an undetected natural population). It is still too early to be certain whether breeding will be maintained and whether it will be repeated at the other two sites, one of which has only just been set up. The weather was not favourable in 2011 and we must wait and see. Meanwhile, culturing continues and source and translocated populations will be boosted, both with releases of cultured individuals and by creating more holes in stumps. Monitoring will continue until clear evidence emerges that populations are established and thriving. Longer term measures to manage pinewoods to meet the requirements of *B. fallax* are another set of issues that are in process of being tackled.

However, genetic viability is an issue. Comparison with a Swedish *B. fallax* population has shown that the main source population is significantly less diverse genetically and may have originated from just twelve individuals after a severe bottleneck about 150 years ago. We will need to monitor Scottish populations for signs of inbreeding depression and assess the feasibility of carrying out a genetic rescue attempt. This would involve translocating *B. fallax* from a more genetically healthy population in Europe, such as those in Sweden, hybridising them in the lab with Scottish individuals, and if successful, adding the offspring to extant *B. fallax*

So far, the translocation of *B. fallax* has been successful but as noted above, there is a long way to go. Was translocation necessary? With only two extant populations, unforeseen events at either could be disastrous. Establishing additional populations would spread the risk. This could be very timely perhaps, as at the locality of the main source population, a felling licence has just been granted to remove up to a third of the pine trees.

References

Roberts, N. 1998. *The Holocene, an Environmental History*. Blackwell Scientific Publications, Oxford.

Rotheray, G.E. and Gilbert, F.S. 2011. *The Natural History of Hoverflies.* Forrest Text, Ceredigion.

Rotheray, G.E. & MacGowan, I. 2000. Status and breeding sites of three presumed endangered Scottish saproxylic syrphids (Diptera, Syrphidae). *Journal of Insect Conservation* **4**: 215-223.

Shirt, D.B. 1987. *British Red Data Books: 2 Insects.* Nature Conservancy Council, Peterborough.

Verrall, G.H. 1874. Diptera at Braemar, Aberdeen and Aberfeldy, including six species not hitherto recorded as British. *The Scottish Naturalist*. 1873-74, 199-202.

Figure 11. Captive bred puparia, larvae move out of holes to pupate in sheltered places such as soil and leaf litter; in cultures moss is provided for this purpose.

Restoring the Marsh Fritillary butterfly to Cumbria

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In September 2004 the future of the marsh fritillary (*Euphydryas aurinia*) in Cumbria teetered on the brink; the total population in Cumbria consisted of 155 caterpillars grouped into two small feeding webs. After decades of decline this butterfly was about to become extinct in a key part of its natural range in the United Kingdom. By the summer of 2011 marsh fritillary butterflies were flying on eight sites in Cumbria, and by autumn there were at least 1,038 larval webs going overwinter. This phenomenal shift in fortune is the direct result of an active programme of recovery undertaken by a partnership of volunteers and the public sector organisations.

Death by a thousand fragments

The marsh fritillary is recognised as a threatened species across Europe, and the situation in the United Kingdom has been graphically portrayed by many authors (Warren, 1994; Asher et al., 2001; Fox et al., 2006). The pattern of extinction reflects the loss of suitable habitats through 'improvement' for agricultural production and is exacerbated by the ecology of this butterfly. The marsh fritillary forms dense breeding colonies that vary tremendously in size from year to year. Viable populations of marsh fritillary are believed to require multiple habitat patches within large geographical areas (Bulman, 2001; Schtickzelle et al.,

2005) and are a typical metapopulation species; under natural situations the local population will consist of many sub-populations spread across many habitat patches. The main cause of declines is attributed to the overall loss of habitat, and the fragmentation and isolation of remaining patches.

A key factor contributing to these changes, and one of the most intriguing aspects of the ecology of the marsh fritillary, is the relationship between it and braconid parasitoids. The caterpillars and adults of marsh fritillary contain toxins that deter avian predators, hence the parasitoids are the main cause of mortality (Porter, 1981). In the British Isles there are two host-specific internal parasitoids of the marsh fritillary, *Cotesia melitaearum* Wilk. and *C. bignellii* Marsh. The former has been recorded only in marsh fritillary populations in Cumbria and Scotland; *C. bignellii* is only recorded from populations in Ireland, Wales and Southern England. Both have multiple generations within a single annual cycle of marsh fritillary caterpillars and have the potential to achieve high levels of mortality in the dense breeding colonies of marsh fritillary. Research (Wahlberg et al., 2002; Lei and Camara, 1999; Betzholtz et al., 2007) has shown the important role that these parasitoids play in both dampening population fluctuations of marsh fritillary and driving the natural metapopulation system of this butterfly. In metapopulations, local extinctions occur due to parasitoid load or changes in habitat quality, with subsequent re-colonisation from adjacent extant colonies. This dynamic of extinction and re-colonisation across extensive tracts of countryside is a key part of the ecology of the marsh fritillary. In fragmented landscapes, where habitat continuity is disrupted, the increasingly isolated small populations of marsh fritillary dwindle to extinction with little or no chance of re-colonisation (Junker & Schmidt, 2010).

Local circumstance

The history of marsh fritillary in Cumbria is well documented, with detailed records going back to the mid 19th Century (Porter & Ellis, 2011). The records show the steady loss of populations during the 20th Century until the last known site held just a handful of caterpillars in 2004. The final demise of the species had been monitored in some detail by a local interest group in Cumbria, but despite attempts to restore habitat condition, and two unsuccessful attempts to reintroduce in 1997 and 1998, by the summer of 2004 only a single female and a few male adult butterflies were recorded on the last site. After a thorough search, two small larval webs were found in close proximity; their small size and location suggesting that they were the progeny of a single female. This situation had been foreseen; we were prepared to remove these last Cumbrian caterpillars into captivity, under licence from English Nature, and attempt to increase their number through captive breeding. Experience from a previous research study suggested that captive breeding marsh fritillary was a viable option (Porter, 1981).

Practicalities of a captive stock

Given the isolation of the last Cumbrian site and the high likelihood that all these caterpillars were the progeny of a single mating, there were concerns over the genetic viability of this stock. The aim was to increase a pure Cumbrian breeding line for reintroduction, but it was recognised that this might not be possible. To reduce the risk of any potential genetic 'weakness' of the last Cumbrian caterpillars a hybrid line was established, using wild collected larvae from the nearest viable population in Western Scotland. Given the concern that a pure Cumbrian line would not be capable of creating a viable stock, it was important to ensure that any future reintroduction should include some Cumbrian genes! To this end, marsh fritillary larvae were collected in March 2005 under licence from Scottish Natural Heritage. The licence allowed the removal of five caterpillars from any given location ranging from Islay to the mainland around Oban. Field collection produced 95 caterpillars from across 19 sites.

In 2005 the caterpillars from the last Cumbrian site and the Scottish sample were reared outdoors in large, sleeved pots of growing Devil's-bit Scabious (*Succisa pratensis*) by a volunteer breeder in West Cumbria [Fig 1]. The two sources were kept as discrete breeding lines, with a third 'hybrid'

Figure 1. In captivity 2006 – growing food plant and netted captive stock growing in Cumbria. The netted pots in the front of the picture contain overwintering larval webs.

Figure 2. Aurinia rearing – large rearing cages used to encourage adult mating and egg-laying; often a spectacular sight with hundreds of adult butterflies.

stock established by crossing the two 'pure' lines. In 2006, captive stock was distributed across six volunteer breeders in Cumbria to reduce the risk of loss through accident or disease. Nursery-grown plants of *S. pratensis* were used within large, outdoor, netted cages [Fig 2] to secure egg batches and feed the early instar caterpillars within their silken feeding webs. Adult marsh fritillary mate readily within enclosed spaces and females lay an initial large batch of approximately 300 eggs within a short time of mating.

Caterpillars are easily reared on potted *S. pratensis* throughout the summer until they hibernate as freshly ecdysed fourth instar larvae within a communal silken web. The caterpillars emerge from hibernation in the first sunny days of early spring and browse on the sparse leaves of their foodplant. As they grow rapidly, aided by active warming through basking (Porter, 1982), captive stock are difficult to maintain at high density using *S. pratensis* and readily accept alternative foodplants including wild Honeysuckle (*Lonicera periclymenum*) evergreen shrub Honeysuckle (*Lonicera spp*) and Snowberry – (*Symphoricarpos albus*). This method of outdoor, large-scale rearing enabled a rapid increase in numbers to support a programme of reintroduction back to the wild. From the initial 250 caterpillars in 2005 we had increased the captive stock to an estimated 50,000 caterpillars by the spring of 2007. These were mostly the hybrid strain with the Cumbrian line failing completely in 2007 when all egg batches proved infertile; a situation not experienced before in captive breeding over many years.

Release sites and networks

The recent history of marsh fritillary in Cumbria shows that there were four main geographical groupings of colonies, each group equivalent to a single network or metapopulation. In each of the four network areas there had been a strong colony in the past 50 years, presumably the remnant of a wider set of colonies that would have supported each metapopulation. Each of the four network areas were assessed for existing, or recent habitat patches that would support marsh fritillary and an initial core site identified for reintroduction. In some areas the core site was already in good condition with a sward and species composition suitable for marsh fritillary; in others restoration management was initiated to create the target condition [Fig 3]. The aim was to create networks of sites that would allow individual colonies to interact as a single metapopulation and thus reduce the future risk of extinction. The first phase of reintroduction was to release onto the core sites to ensure that the methodologies worked effectively to establish populations. The next phase was to identify adjacent patches and either colonise these through direct release or encourage natural colonisation from a core site.

The target habitat for reintroduction in Cumbria is the Purple moor grass – rush pasture described in the UK Biodiversity Action Plan. These are wet grasslands dominated by purple moor grass (*Molinia caerulea*) and typically made up of the plant communities M25 or M24 in the National Vegetation Classification (Rodwell, 1991). These communities can contain high densities of *S. pratensis* under suitable management regimes and contain the necessary mixture of adult nectar sources, larval foodplant, and the sward structure that supports good basking and hibernation sites. Purple moor-grass – rush pasture is of low agricultural value and has been greatly reduced in extent by drainage, coniferous plantation and neglect. The best remaining examples are within sites managed for nature conservation and are highly fragmented and isolated within intensively managed agricultural landscapes. The restoration of patches through scrub removal, remedial cutting or through supplementary planting of *S. pratensis* has been possible through targeted funding under the Environmental Stewardship

Figure 3. Aurinia site 2 – overview of one of the core sites showing extensive Purple moor-grass – rush pasture grasslands in a landscape setting.

schemes in England (Natural England, 2011). On all reintroduction sites an agreed management regime is now in place to ensure continuity or increase in habitat extent.

Return to the wild

In April 2007 around 42,000 caterpillars were released over four core sites in northern, western and eastern Cumbria [Fig 4]. These releases were done using fourth instar larvae in groups of 100 individuals; this equates to the average size of naturally overwintered groups in April when the reintroductions were made. Each group was placed adjacent to a plant of *S. pratensis* and within dense clumps of foodplant. The early instar larvae form basking groups that move onto adjacent foodplant as they feed. The final, sixth, instar larvae are highly mobile and will forage over large areas for food; individual sixth instar larvae have been recorded moving 30 metres in an hour when seeking food.

This method of release was adopted to ensure that caterpillars utilise the habitat as naturally as possible and subsequent emerging adult males establish territories and are effective in locating females. Adult marsh fritillary behaviour reinforces the tight colonial nature of the population, with large

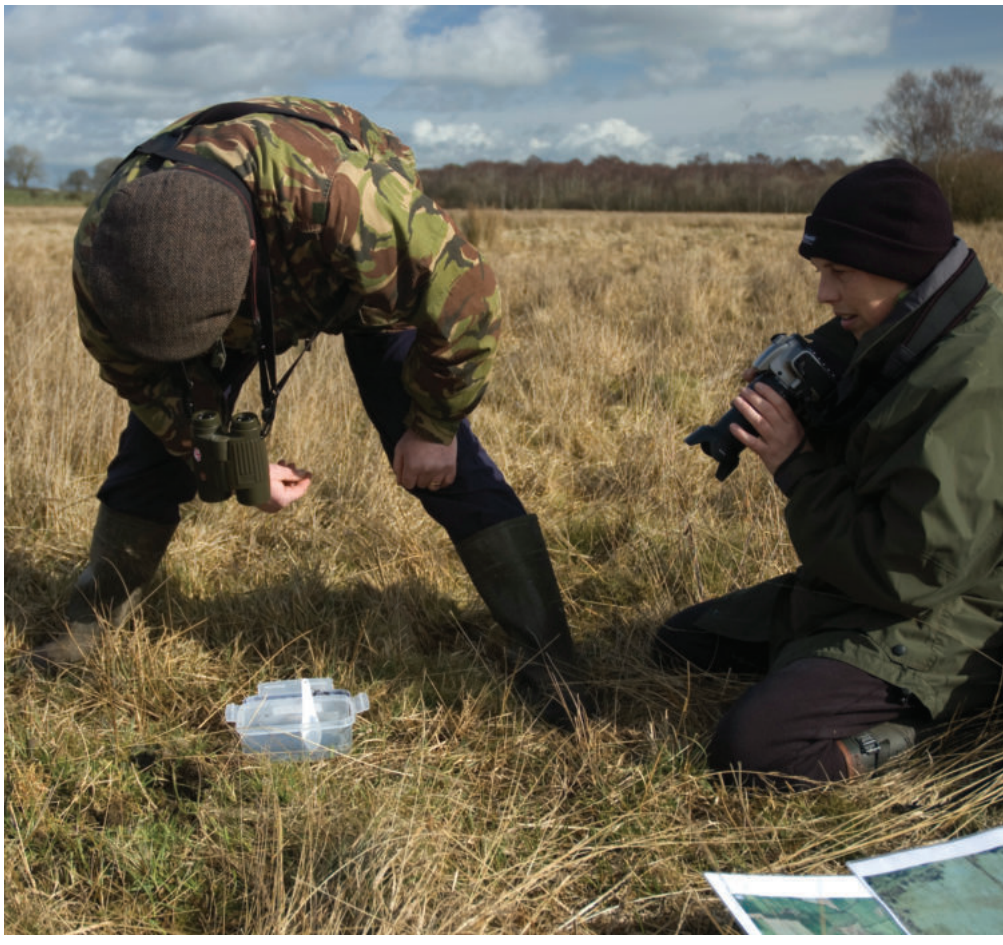

Figure 4. The first release – The first release of fourth instar larvae in March 2007 on Finglandrigg Woods National Nature Reserve in Northern Cumbria. This site is the heart of the network on the Solway in Cumbria.

Figure 6. First adult – One of the first adults resulting from the reintroduction in 2007, nectaring on lady's smock (*Cardamine pratensis*).

fecund females laying their main egg batch within a short distance of where they emerge [Fig 5, see first page of article], and with both sexes flying in short bursts within a relatively small area (Porter, 1981). Longer dispersal flights obviously occur, as new breeding sites have been colonised outside some of the core release sites, but represent different behaviour from that which maintains colony integrity.

The release of IV instar caterpillars has the advantage of reducing the burden of feeding large numbers of livestock in captivity, but losses are likely to occur as caterpillar groups try to find fresh reserves of foodplant at a time when *S. pratensis* growth is very slow. In addition there are likely to be some natural losses through invertebrate predation. The main 'predator' in Cumbria was *C. melitaearum*, but this has not been recorded in any wild collected larvae here for many years and probably became extinct before the final demise of the butterfly. The absence of the parasitoid greatly increases the chances of survival for reintroduced stock in Cumbria.

In releases after 2007, a different technique was adopted that uses later instar larvae which are more mobile and able to forage widely. This means more work for the volunteer breeders in feeding hordes of voracious caterpillars, but gives a better ratio of released larvae to emerged adults [Fig 6]. This method has now been adopted for all releases.

Figure 7. Summer web – A typical feeding web in August, with third instar larvae feeding within a silken web.

Has it worked?

A key part of any reintroduction is checking if, and how well, it is working. Most of monitoring in the project is carried out by Butterfly Conservation volunteers, using standard methods and training. This is a huge task, with some large sites to cover and a wide geographical spread. In many ways this is the most demanding activity within the whole reintroduction programme and needs a long-term commitment from volunteers and organisations.

Luckily, the ecology of the marsh fritillary facilitates monitoring; the adults are relatively easy to see and can be counted on transects covering the breeding sites, and the late summer larval webs are easily seen and counted as a reliable measure of population strength [Fig 7]. Each larval web is typically the product of a single egg batch. Both adult and larval web counts have been used in the first four years of the reintroduction programme. However, variable weather conditions and the time constraints of volunteer recording make adult counts difficult to standardise and from 2011 most adult counts have been dropped in favour of larval web counts. These are a more reliable measure of population size and can be assessed in a range of weather conditions. Web counts are undertaken by systematically walking across the whole habitat area and counting webs as they are encountered. Larval webs always occur in close vicinity to *S. pratensis* plants and in August and early September, when the webs are most easily found, the foodplant is in full flower and easily detected.

In addition to monitoring the butterfly, we also assess habitat condition using a modified version of a standard approach developed by Butterfly Conservation that involves a zig-zag walk covering all of the pre-defined habitat patch. At set intervals, the recorder stops to assess sward height, using a sward stick, the presence and number of *S. pratensis* plants, scrub, and selected indicator plant species within a 1 metre diameter of the stopping point. This provides a repeatable measure of frequency of foodplant and measure of positive and negative factors.

Good progress is being made on all the original core reintroduction sites with an increase in population size across all sites [Fig 8]. The whole programme offers a unique opportunity to assess the dispersal capability of marsh fritillary, as any new sub-populations that occur must have been created by spread from existing known locations. Within two years of initial reintroduction adults have been seen at distances of one kilometre or more from the core population, with egg batches being laid in at least two remote locations so far. In one case a female had travelled at least 1.22 km as measured in a straight line through terrain that was previously thought to deter movement. In 2011 we established the first 'complete' network with five sub-populations, each between 1.25 km and 4.0 km apart. Future monitoring of vacant habitat patches in this network and

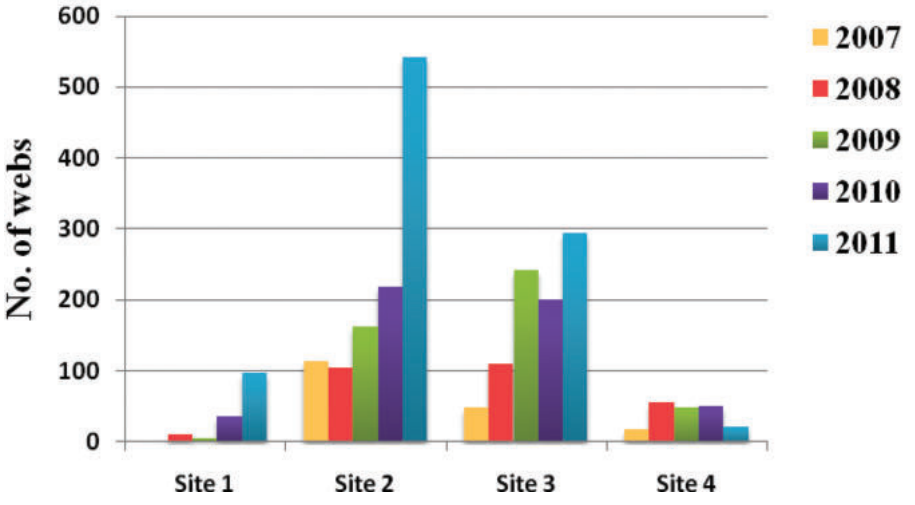

Figure 8. Number of larval webs per site.

observations of butterfly sightings will provide valuable information on the dispersal power of the marsh fritillary.

Lessons learned!

The key conclusion is that captive breeding is a very effective way of producing sufficient livestock to support an ambitious reintroduction programmes for the marsh fritillary and larval release gives good results. Many practical lessons have been learned during the course of this release programme with the first important lesson being the division of captive stock across several breeders to reduce the risk of stock failure; this has proved a life saver in some years where poor weather or equipment problems have

Figure 9. Marsh Fritillary Action Group – The whole programme has been overseen by a steering group comprised of farmers and members of nature conservation bodies and agencies in Cumbria – here visiting one of the core sites to assess management effectiveness.

led to total loss of stock by individual breeders.

An unexpected outcome has been that the last site for marsh fritillary in Cumbria has been the worst performing in terms of reintroduction! This proved to be the most difficult one on which to establish a new population, despite excellent habitat condition and it was not until 2011 that the population began to show any real response. This is the only release site that was adjacent to a pheasant rearing facility and there may be some, as yet unproven, impact from this.

Restoring habitat condition [Fig 9] has been a key part of the programme and scrub removal and restoration cutting and removal of litter have been very successful at bringing back good swards. The seed of Devil's-bit Scabious has the unfortunate trait of not persisting in seed banks, thus where swards have been damaged by attempts at agricultural improvement this is one of the first species to disappear. Considerable success has been had in transplanting pot-grown scabious into swards that were in good condition but had simply lost this species; this has proven more reliable than re-seeding.

The most valuable findings relate to filling gaps in our understanding of the ecology of marsh fritillary. The new evidence on dispersal ability and utilisation of swards will prove valuable in taking forward further phases of restoring this species to Cumbria, and inform similar work elsewhere. The reintroductions are being made into areas that lack the natural parasitoids of this species, and thus are predicted to increase over time until they become limited by food supply. At some point, yet to be decided, we plan to reintroduce *C. melitaearum* to one of the networks. This will provide a unique opportunity to monitor the host-parasitoid under natural circumstances.

The winter floods of 2009-10 that devastated the West Cumbrian town of Cockermouth also affected one of the core reintroduction sites. In particular, one of the key fields that holds the main concentration of larval webs, was inundated to the depth of up to 1.25 metres for at least six days. The hibernating larvae showed no adverse effects of this submersion and the caterpillars appeared as normal in the spring and went on to show an increase in numbers over the previous year. This confirms other observations that hibernating larval webs are capable of surviving flooding.

Moving forward

The programme continues and the next few years will see the consolidation of existing networks through targeted restoration and limited reintroduction. The main ongoing activity will be to monitor the progress of populations and gather information on how the butterfly can disperse and establish new sub-populations. Progress is very reliant upon the commitment and goodwill of local volunteers who undertake the bulk of the rearing and monitoring. The whole programme of reintroduction, at landscape scales, provides a wonderful opportunity to apply our knowledge of this species and hopefully restore viable populations. Hopefully this model can inform conservation activities elsewhere to restore the fortunes of the marsh fritillary, and species with a similar ecology.

Acknowledgements

I am deeply indebted to the members of the Cumbria Marsh Fritillary Action Group who have steered and supported this programme, and without whom none of this would have been possible. Particular thanks go to the volunteers of the Cumbria branch of Butterfly Conservation who give many days of their time to rear marsh fritillaries and count webs and adults. Key to success of this work is the support and enthusiasm of landowners and bodies including Natural England, the Environment Agency, the Forestry Commission and National Trust who have all contributed to securing restoration of habitats. Finally, thanks to my colleagues in Butterfly Conservation who have supported what was initially seen as a controversial project.

References

Asher, J., Warren M., Harding, P., Jeffcoate, G., and Jeffcoatre, S. (2001) The3 millennium atlas of butterflies in Britain and Ireland. Oxford University Press, Oxford.

Betzholtz, P.E., Ehrig, A., Lindenborg, M. and Dinnetz, P. (2007) Food plant density, patch isolation and vegetation height determine occurrence in a Swedish metatpopulation of the Marsh Fritillary *Euphydryas aurinia* (Rottemburg, 19775) (Lepidoptera, Nymphalidae). J. Insect Conserv. 11 343-350.

Bulman, C.R. (2001). Conservation Biology of the Marsh Fritillary Butterfly *Euphydryas aurinia*. PhD thesis, University of Leeds.

Fox, R., Asher, J., Brereton, T., Roy, D. and Warren, M. (2006) The State of Butterflies in Britain and Ireland. Nature Bureau, Newbury, England.

Junker, M. and Schmitt, T. (2010) Demography, dispersal and movement pattern of *Euphydryas aurinia* (Lepidoptera: Nymphalidae) at the Iberian Peninsula: an alarming example in an increasingly fragmented landscape? J. Insect Conserv. 14: 237-247.

Lei, G.C.N. and Camara, M.K.D. (1999) Behaviour of a specialist parasitoid, *Cotesia melitaearum*: from individual behaviour to metapopulation process. Ecological Entomology 24: 59-72.

Natural England (2011) Environmental Stewardship at http://www.naturalengland.gov.uk/ourwork/farming/funding/es/default.aspx

Porter, K. (1981) The Population Dynamics of small colonies of the butterfly *Euphydryas aurinia*. D. Phil. Thesis. Oxford University, UK.

Porter, K (1982) Basking behaviour in larvae of the butterfly *Euphydryas aurinia*. Oikos 38: 308-312.

Porter, K. and Ellis, S. (2011) Securing viable metapopulations of the Marsh Fritillary butterfly, *Euphydryas aurinia*, (Lepidoptera: Nymphalidae) in Northern England. J. Insect Conserv. 15: 111-119.

Rodwell, J. (1991) British Plant Communities. Volume 2 – Mires and Heaths. Cambridge, England.

Schtickzelle, N., Choutt, J., Goffart, P., Fichefet, V. and Baguette, M. (2005) Metapopulation dynamics and conservation of the Marsh Fritillary butterfly: Population viability analysis and management options for a critically endangered species in Western Europe. Biol. Conserv. 126:569-581.

Wahlberg, N., Klemetti, T. and Hanski, I. (2002) Dynamic populations in a dynamic landscape: the metapopulation structure of the Marsh Fritillary butterfly. Ecography 25: 224-232.

Warren, M S. (1994) The UK status and suspected metapopulation structure of a threatened European butterfly, the marsh fritillary, *Eurodryas aurinia*. Biol. Conserv. 67:239-249.

Species Re-introductions – Going ... Almost Gone ... Back

The Field Cricket, 1991-2011

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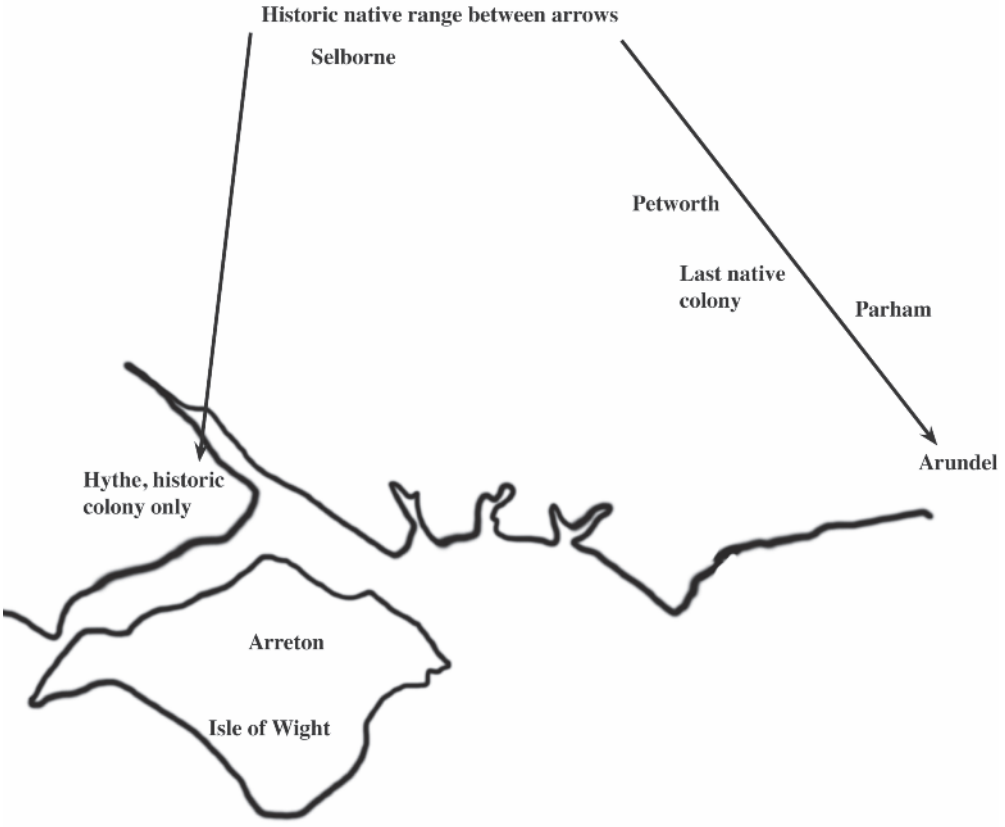
The Field Cricket, *Gryllus campestris*, like many iconic species, has long enjoyed an English reputation far in excess of its proven presence in England. This is largely due to the lasting popularity of the insect through the writings of Gilbert White, who described parts of its life history, as well as small boys tickling adult crickets from their burrows with grass stems. What has been much less well recognised is that it always was an insect with a very restricted distribution in the UK; White (1789) wrote '*though frequent in these parts, is by no means a common insect in many other counties*' – Natural History of Selborne.

In 1991, at Peterborough, during the meeting called to inaugurate the flagship *Species Recovery Programme* for the newly created Natural England, I took a perverse delight in informing the assembled multitude that the Field Cricket – officially declared as not being in immediate danger in the grand review produced for this occasion – was represented in the UK by a maximum of fifty pairs, all in one small area in West Sussex, the second known colony having gone extinct two years previously. To the great credit of Andrew Deadman, the supremo of the SRP, The Field Cricket was on the SRP that afternoon.

By 1992, mediated by David Sheppard, my long-term reporting officer at NE, we were in touch with Paul Pearce-Kelly, at the Zoological



Overall native range of Field Cricket and approximate locations named in text.

Society of London and attempting to rear crickets in captivity.

I had reared and overwintered crickets some years before, under the tutelage of Chris Haes, who had done the same thing even earlier. Both times the intention was to release the reared adult crickets into suitable habitat (which was achieved, but without the establishment of a long-term population). It therefore struck us that it the obvious route would be to bulk up the crickets by captive rearing and release them into suitable habitat, given somewhere with the facilities to do this – hence the contact with London Zoo.

At the same time, we tried to quantify the habitat features present at the remaining site, a rather dangerous activity as there was no evidence that this site was particularly favourable, rather than chance.

Getting nymphs from adult crickets removed from the last native colony was readily achieved, the Zoo having had good experience with other crickets as part of their exhibits. However, keeping them proved to be less easy. The first year the cricket nymphs were kept over winter in a constant-environment unit – high tech, but completely unsuitable for this insect: the nymphs slowly desiccated, with complete loss by February.

All was not lost: knowing that we were able to get captive adult females to lay readily in captivity and that this provided many good-sized nymphs by late summer, we decided to release most of these in August 1992, retaining a small number to overwinter. The first of these releases was to be at the former Arundel Cricket Ground SSSI, where the species had gone extinct just before the start of the project. The second was at Parham Park, a large area of acid grassland providing the sort of habitat we thought suitable. This was just out of the natural range, but only by virtue of being on the wrong side of the River Arun. We were, we thought, on the road to success.

In the winter of 1995/6 I tried overwintering crickets in my greenhouse where the humidity and temperatures reflected the natural background, albeit a little more sheltered. The crickets were doing well until a different disaster struck – mice. These got past the chicken wire I had protecting the open tops of the small tanks and ate the lot in one night.

By 1996 it was clear that there were unresolved problems in trying to over-winter nymphs to provide captive adults for the breeding programme, notably poor development of ovipositors, leaving females unable to oviposit. However, the previous year had seen the outcome of the first releases in the form of new adults which had completed their life-cycle on site at both original release sites and we decided to concentrate on captive rearing from adults removed from the native colony in April, with nymphs released that August. The numbers of nymphs available for release were impressive, regularly reaching over a thousand from three females.

Meanwhile, as implied above, things were going rather more smoothly with the investigations of the habitat requirements. We had found out where the crickets laid their eggs and where young crickets lived, which was not in burrows in the ground like the older nymphs and adults, but in the small areas of bare ground between the short tussocks which would later form ideal bases for burrows. Hence the role of bare and re-vegetating ground was established, largely through a number of observations made during fairly intensive field observations.

Our list of potential release sites grew, all, bar the Parham site, within the restricted historical distribution of western West Sussex, southern Surrey, eastern Hampshire and the Isle of Wight. It appeared very likely that the most extensive areas of suitable habitat were now to be found in the Brecks and Sanderlings of East Anglia, but that the crickets had failed to make the crossing into this area before the land bridge disappeared. A conscious decision not to move them this far from the historic range was made.

Our euphoria at our early successes in re-introducing Field Crickets was to be tempered. The crickets refused to establish at a number of sites, with apparently suitable habitat, and, after reaching several hundred singing males and providing adults for the rearing programme, the population at Parham went extinct in 2002, as had that at Arundel in 2000. Both populations were re-introduced, the Parham one increasing to a still extant and vibrant one in 2011, the Arundel one declining to another extinction in 2007. In the latter case, we concluded that the release area was just too small.

In 1995 the overwintered cricket nymphs at the Zoo were found to be harbouring internal commensal or parasitic unicellular organisms called gregarines. The assumption was made that these came from infection during their time at the Zoo, there being plenty of opportunities for this given the presence of large numbers of captive reared orthopterans used for feeding other inmates and the lack of evidence of these in the wild population. There was no alternative but to destroy the carefully reared stock.

By 1996 knowledge of the autecology of Field Crickets had been further boosted by a number of visits to populations in western Europe, notably the Netherlands, France and Spain. Individuals from all three countries were screened for the presence of gregorines – it appeared that this was a widespread situation, but that not all populations were infected. Nevertheless, as they had not been detected in the UK population, it was decided that only clean stock should be released in the UK.

Routines to keep stock at the Zoo in isolation, with strict rules about where and how they were reared, appeared to overcome the gregorine problem and releases were resumed in 2000. However, gregorine infection eventually reappeared in 2006 and, once again, all stock was destroyed. The following year samples taken from the native population tested positive for gregorines; no stock had been released here, so it appeared that the presence of gregorines was natural in the UK as well, but that its expression at detectable levels was variable, therefore a release this year went ahead as planned. We still do not know whether these organisms are commensal or parasitic, but the precautions had to be followed, just in case.

I had gradually become less enchanted by the lure of thousands of nymphs reared easily in captivity. Apart from the gregorine issue, there was the problem that the success of releases in establishing a population seemed generally inverse to the numbers of nymphs released. I suspected that Field Crickets are at least mildly distasteful, but that, as in classic experiments, a super-abundance of prey overcomes the repulsion: easy food, even if not particularly palatable, is at least easy living. Hence the very large releases were attracting very large numbers of predators.

Areton Down on the Isle of Wight.

Broad Half Penny.

Lord's Piece.

Other issues related to the fact that often our choice of suitable habitat did not seem to match that of the crickets and released stock would spend the next two weeks (tracked by calling males) high-tailing it away from the release area. A pattern of small numbers released over a wide area, rather than lots released on the, to us, most suitable one, was developed. This was very successful at the re-release at Parham, but variable elsewhere. Above all, the weather pattern in the years following the release seemed to have an influence above all other factors. This had been the conclusion of the work by Remmert *The Mechanisms Underlying Population Dynamics* in *Ecology, a Textbook*, Hermann Remmert, Springer-Verlag, Berlin 1980: cricket numbers build enormously in good years, only to spend the next few heading for extinction. Sometimes everything just didn't match up as required.

I had come to realise that dispersion naturally took place at two points in the life cycle: one as the nymphs moved from open-living to digging their own burrows, around September, and one at maturation, when the call of males aggregating around suitable areas of bare ground would attract females, who would then wander off to find suitable oviposition spots. The males effectively formed a 'spotters' club' for the ideal re-vegetating turf structures: joining the club and chanting loudly was a good strategy for attracting the ladies.

For some time I had been toying with the idea of translocating near-adult nymphs directly to new areas and, in April 2007, three pairs were moved by David Sheppard and myself to a new area close to the native site, but effectively isolated from it. Our delight in 2008 at finding that this translocation had resulted in eleven calling males knew no bounds and a new protocol was established.

By this time we had reasonably well-established, but not necessarily permanent, populations in three main areas, having tried many more. One of the written-off sites was Arreton Down on the Isle of Wight where, after four releases, the 'last' cricket was heard in 2006. Just to show how capricious monitoring can be, a chance visit by Richard Grogan of the Hants and Isle of Wight Wildlife Trust recorded a singing male, with more being heard in 2010 and 2011!

To complete the circle, 2011 has seen the biggest translocation event of the entire project, involving well over 100 insects, all without any direct intervention by humans: yes, the creation of suitable habitat and juxtaposition of a large enough donor population resulted in large-scale natural colonisation.

During 2009 some 8 ha of pine plantation adjacent to the native population had been cleared, together with a small field which had last held crickets in 1969. This was judged to be in a suitable condition to receive crickets, but, as it had been like this before and no crickets had established, it was suspected that entry to the field, which was over a stream via a 3m wide bridge, was an effective barrier to colonisation.

As reported in the 2011 Field Cricket Project report, a visit to the native colony to find translocation stock was not having much luck;

After much searching and many empty burrows we managed to find one female to go with the three males we had found, and, as it was falling dark, went over the road to the Sleeping Field/Broad Halfpenny area. On entering Sleeping Field were became aware of a cricket calling from shortly inside the gate, and then realised that the background noise wasn't the fairly distant calls of crickets on Lord's Piece, but many crickets on Broad Halfpenny.

3.4 *We released the captive crickets in Sleeping Field and walked round Broad Halfpenny in the gathering gloom, there were many crickets calling and they were spread throughout the entire area. Clearly the rain of the previous evening, falling on very dry and warm ground, had triggered a mass movement of crickets, such as I had recorded several times before over the course of the project. As then, the conjecture is that they were responding to the smell of rain on bare ground which is so noticeable under such conditions.*

3.5 *As the area had been cleared for just one year and little vegetation was established, it was extremely unlikely that these crickets had grown up on Broad Halfpenny, but that the large numbers of empty burrows on Lord's Piece were the result of this movement. The distance moved by the furthest crickets was in excess of 400m, across an intervening section of over 50m of completely unsuitable habitat.*

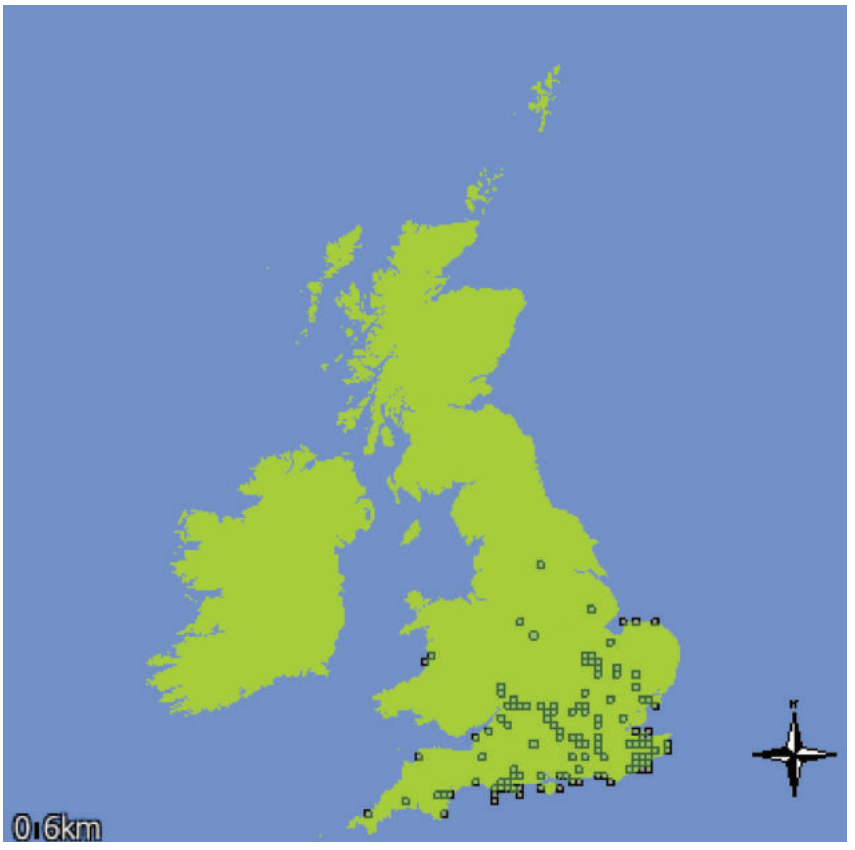
The project has moved along steadily, iterating our understanding of the life history and then the rearing, : sometimes winning sometimes losing, but overall moving steadily in a positive-enough direction to maintain the funding, which has been at a relatively low level compared with mammal or bird re-introductions, for twenty years.

Nothing would have been possible without the dedication of Natural England/English Nature staff, some fantastic landowners and land managers who were prepared to go the extra mile, the volunteers helping with monitoring and removal of breeding stock, the staff at London Zoo and the support from the various Countryside Stewardship schemes which have supported the management of the target areas - and not least the Field Crickets themselves, who have refused to lie down and die when all the signs said they should.

Reintroduction of the short-haired bumblebee into the UK

Dr Nikki Gammans collection in New Zealand (Rob Jones)

Nikki Gammans
Visiting researcher Biological and Environmental Sciences
University of Stirling



The distribution of B. subterraneus in the UK, prior to their extinction. Data from NBN gateway using BWARS datasets.

The short-haired bumblebee *Bombus subterraneus* was last recorded in the UK at Dungeness, Kent in 1988. Specific surveys to find it came to no avail, and it was officially declared extinct in 2000. It is believed that extensive loss of habitat has been the cause of this bee's decline and extinction along with other late-emerging, long-tongued bumblebees (of which one other is extinct and seven others classified as BAP species). Over the last 60 years the UK has lost over 97% of its wild flower meadows due to intensifying agricultural practices (Carvell *et al.*, 2006; Goulson, 2010).

The queens and workers have the same colour morphology of black and yellow stripes; two yellow bands on the thorax, the second band always being narrower than the first (Sladen, 1912) and the first having a black notch in the centre of the band (Gammans, pers obs). Two faint yellow bands appear on the 2nd and 4th tergites on the abdomen which terminates with a white tail. The males are yellow in colour and similar to *B. distinguendus* (Edwards & Jenner, 2009). In some parts of Europe a melanistic form of *B. subterraneus* is seen which is black with a chocolate brown tail. Research by Williams *et al.* (2011) has shown that colour is determined by a single gene, so these different forms do not represent sub-species. Nests are made underground, usually in former rodent holes (Sladen, 1912; Edwards & Jenner 2009).

The short-haired bumblebee partnership project was set up by Natural England, Hymettus, The Bumblebee Conservation Trust and RSPB in 2009 with the aim of reintroducing *B. subterraneus* back to the UK.

The RSPB reserve at Dungeness and surrounding area of Romney Marsh in south Kent was selected as the release site following earlier studies by Mike Edwards and Brian Banks on the creation of new hay meadows using various mixes of pollen and nectar producing plants in conjunction with local farmers.

The original aim of the project was to collect *B. subterraneus* queens from New Zealand as these were known to be direct descendants of the extinct UK population. This species along with three others, *B. ruderatus*, *B. hortorum* and *B. terrestris*, were introduced to New Zealand over 120 years ago . . .. But why? Once they had arrived in New Zealand, ex-patriot farmers sowed red clover but this failed to set seed as no native long-tongued bees were present to carry out pollination. Four species were subsequently sent over to provide pollination services. *B. subterraneus* still exists today in New Zealand on the South Island.

To initiate the reintroduction programme, queen *B. subterraneus* were collected in New Zealand as they emerged from hibernation in November and December (six months out of seasonal synchronisation with the UK). They were then sent to breeders in Christchurch to captive rear and to hibernate the new queens that emerged. The aim was to send hibernating queens to the UK for release at the end of May. Unfortunately, this proved to be very difficult and many queens died, either immediately or second generation queens died during hibernation. In the second year, nest boxes were placed in areas where *B. subterraneus* had been collected previously. There was some success but again mortality of queens was unacceptably high.

Genetic research was undertaken using molecular markers on populations of *B. subterraneus* from New Zealand (introduced population), Sweden (native range) and set specimens from England in the Hymenoptera collections at Oxford Museum (Lye *et al.*, 2011). Results demonstrated high levels of genetic differentiation between the three populations (= 0.197 ± 0.031, P < 0.001). Pair wise comparisons revealed that differentiation between populations from Britain and New Zealand and those from Sweden and New Zealand were comparatively higher (= 0.256, P < 0.001 and = 0.225, P < 0.001, respectively) than those between populations from Sweden and Britain (= 0.113, P < 0.001). Furthermore Approximate Bayesian Computation estimates indicated that the effective number of individuals introduced into New Zealand was between one and five. These results suggested that the population introduced from the UK to New Zealand went through a significant genetic bottleneck, due to the small size of the founder population, followed by over one hundred years of isolation and genetic drift. Ironically, the genetic

Above: Red clover hayfields at MoneyPenny farm, Romney Marsh (N. Gammans)
Below: Wild flower fields, Hastings Country Park (N. Gammans)
Inset: ; *B. subterraneus* queen (continental form) New Zealand (N Gammans)

composition of the New Zealand population is now more different from the former UK population than the Swedish population.

On the strength of these results, the decision was taken by the project Steering Group to use a source population from Sweden rather than New Zealand even though the latter holds the direct descendants of the original UK population with the same morphology and genetics (although now more distinct). Permission has been granted by both the Swedish authorities and the relevant UK government bodies to export and import *B. subterraneus*.

An initial trial expedition to Sweden took place in May 2011 to collect queens for disease screening and to establish the local abundance of *B. subterraneus*. Sixty queens were collected from two 30-mile transects from the province of Skane, South Sweden, (one south coast and one west coast). All queens collected were found to be foraging on white dead nettle, *Lamium album*, obviously an important spring nectar source for this bee. *B. subterraneus* was found to be relatively abundant locally and it was deemed that taking between 30-100 individuals annually over the proposed next five years should not do the donor population any harm. Sweden does have both colour forms of *B. subterraneus*. Both were collected for disease screening but only the continental (black and yellow striped) form will be reintroduced to the UK because no melanisitic specimens have ever been reported from here.

Dr Mark Brown of Royal Holloway University examined the queens for micro and macro parasites. The queens were then sent to the National Bee Unit (FERA) for virus screening. Specimens of the five most common bumblebee species present on the RSPB Dungeness reserve were sent for virus screening for comparison. The methodology involved dissection of the abdomen and visual searching for macro parasites under x40 magnification with a dissecting microscope. For micro parasites, the method was tissue scanning of fat body, Malphigian tubules and gut contents under x400m with a compound microscope. The viruses were screened for using rtPCR and standard primers by the National Bee Unit. Of 57 *B. subterraneus* queens screened (reduced from 60 due to deaths), four queens had *Sphaerularia bombi* (a nematode) and three *Crithidia bombi* (a trypanosome) (Brown *et al.*, in prep). Of all viruses screened for, only one specimen proved positive: for ABP virus from a *B. hortorum* individual collected from the release site. The apparently low infection rates for both the source population and the resident bumblebees are very encouraging.

Final preparations are now being put together for the 2012 Swedish expedition. The release date at Dungeness is set for May 2012. Newly collected queens will spend two weeks in quarantine at Royal Holloway University. Faecal screening will take place and any queens with parasites will not be released. After the release, bumblebees will be monitored regularly.

Over 97% of the wild flower meadows in the UK have been lost over the past century. This is equally true of Kent and so the partnership has been working extensively with farmers, land owners and conservation groups over the last three years to recreate flower rich bumblebee habitat across the release area of Dungeness and Romney Marsh. The latter site was chosen because its status as a NNR, SSSI and proposed Ramsar site provides it with a considerable degree of long term protection. We encourage the use of both agricultural legume mixes (for non permanent plots) and wild flower mixes (for permanent plots). The flower species suggested are the 'favourites' of the long-tongued bumblebee species such as red clover, *Trifolium pratense*, greater knapweed, *Centaurea scabiosa*, birds foot trefoil, *Lotus corniculatus*, tufted vetch, *Vicia cracca* and white dead nettle, *Lamium album*. To date, the project has created over 650 hectares of bumblebee habitat across the release site. Transect monitoring across the release site has also led to the rediscovery of other rare bumblebee species in the area. For example, *B. sylvarum* has now returned to RSPB Dungeness after 25 years absence, *B. ruderatus* has returned to Pett Levels and Romney Marsh after 10 years absence and *B. humilis*, *B. muscorum* and *B. ruderarius* have all increased their distributions in the area.

To adhere to the IUCN guidelines (mainly concerned with large animals) we must also have the acceptance of the local people. In order to meet this requirement we have given various public talks and undertaken local bumblebee walks and educational outreach events. Fundraising events such as bumblebee garden parties and quiz afternoons have also raised money for the reintroduction. Public awareness of the declining status of bumblebees in the UK has also been raised by a series of national and local press releases.

Bumblebee identification walk (Rob Jones)

The reintroduction of *B. subterraneus* is still in its early stages and improvements will no doubt be made in methodology as our knowledge and experience of this species increases. We aim to write regular articles for the press and submit scientific papers on the release and associated habitat creation to maintain awareness of the project. By the time you read this in May 2012, the release date will be upon us.

References

Carvell, C. Ray, D.B. Smart, S. Pywell, K.F. Preston, C.D. Goulson, D. 2006. Declines in forage availability for bumblebees at a national scale. Biological Conservation 132:481-489.

Edwards, M. Jenner, M. 2009. Field Guide to the Bumblebees of Great Britain and Ireland, Ocelli.

Goulson, D. 2010. Bumblebees, their behaviour and ecology, Oxford University Press.

Lye, G.C. Lepais, O. Goulson, D. 2011. Reconstructing demographic events from population.

genetic data: the introduction of bumblebees to New Zealand. Molecular Ecology vol 20; 14, 2888-2900.

Sladen, F. 1912. The humblebee, Facsimile Edition Logaston Press 1989.

Williams, P.H. Jaindong, A.N. Huang, J. 2011. The bumblebees of the subgenus *Subterraneobombus*: integrating evidence from morphology and DNA barcodes (Hymenoptera, Apidae, *Bombus*). Zoological Journey of the Linnean Society 163; 813-862.

Society News

Library News

Val McAtear
RES Librarian

I am amazed to find that I have now been Librarian for The Royal Entomological Society for five years and have to accept that I can no longer explain my ignorance of the Entomological world due to being new in the post! However I think you will all still accept that I still have a lot to learn and even if I am here for 30 years that will not change. I am very grateful to everyone who patiently explains exactly what they mean when they pose a library information request. I will keep trying to understand this fascinating world.

So what is new in the RES Library? As usual you will find below a list of new books purchased or donated to the library. Our good *Antenna* editor has been most generous with books received for reviewing.

In addition in 2012 we hope to trial BioOne which will allow all Fellows and Members online to full text and PDF access from your home computer to a limited yet useful list of Entomological journals as well as many other journals. More information regarding the trial is/will be available on the Library pages of the Society's website. I hope you find this new service useful and look forward to receiving your feedback

New books to the Library

Barnard, Peter – The Royal Entomological Society Book of British Insects

Brock, Paul – A photographic Guide to Insects of the New Forest & surrounding area

Van Harten, Antonius – Arthropod Fauna of the UAE 3 volumes

Butterfly Conservation – The State of the UK's Butterflies 2011

Clifton, Jon & Jim Wheeler – Bird Dropping Tortrix Moths of the British Isles

Dover, John, Martin Warren & Tim Shreeve – Lepidoptera Conservation in a changing World

Plant, Colin W. – The Moths of Hertfordshire

Thomson, George – The Meadow Brown Butterflies a study in genetics, morphology and evolution

Zoltan, Dr Varga – Macrolepidoptera of Hungary

Redfern, Margaret & Peter Shirley – British Plant Galls

Redfern, Margaret – Plant Galls

Chinery, Michael – Britain's Plant Galls: A photographic guide

Kunz, Gernot, Herbert Nickel & Rolf Niedringhaus – Photographic Atlas of the Planthoppers & Leafhoppers of of Germany

Den Bieman, Kees, Biedermann, R, Nickel, H & Niedringhaus, R. – The Planthoppers & Leafhoppers of Benelux

Moravec, Jiri – Tiger Beetles of the Madagascan Region

Bouchard, Patrice – Family –Group Names in Coleoptera (Insecta)

Prys-Jones, Oliver E. & Sarah A Corbet – Bumblebees 3rd edition

Knutson, Lloyd Vernon & Jean-Claude Vala – Biology of Snail-killing Sciomyzidae Flies

Sinclair, Bradley J. – The Systematics of New World Clinocera Meigen (Diptera: Empididaer:Clinocerinae)

Brown, B.V. – Manual of Central American Diptera Volume 2

SCHEDULE OF NEW FELLOWS AND MEMBERS

as at 7th December 2011

New Honorary Fellows
Professor B S Hansson
Professor J Pettersson
Dr P Smithers

New Fellows (1st Announcement)
Dr Pathipati Usha Rani
Dr Karim Vahed

Upgrade to Fellowship (1st Announcement)
None

New Fellows (2nd Announcement and Election)
Professor Raymond John St Leger (First Reading as at 5-10-11)
Professor Walter Soares Leal (First Reading as at 5-10-11)

Upgrade to Fellowship (2nd Announcement and Election)
Dr Alexander Hayward
Dr Andreas Wessel (First Reading as at 5-10-11)

New Members Admitted
Miss Caroline Nicholls
Mr Alex Dittrich
Dr M J O'callaghan
Miss Hannah Jane Robson

New Student Members Admitted
Miss Nicola White
Miss Catherine Reavey
Miss Jasmine Parkinson
Mr Lewis Collins
Mr Craig Perl

Re – Instatements to Fellowship
None

Re – Instatements to Membership
None

Deaths
Professor R Killick-Kendrick (Hon.Fres), 1987, France
Mr C Furk, 1981, York
Mr M J Cripps, 1980, Wymondham

Ento' 12
RES Annual National Meeting

18-20 July 2012
Anglia Ruskin University, Cambridge

The National Meeting will run from the morning of Wed 18 to the afternoon of Fri 20 July 2012.

Organisation and theme

The theme of the meeting will be Insects in a Human Dominated World. Within the conference will be two sessions entitled Fifty Years Since Silent Spring, focusing on the 50th anniversary of Rachel Carson's famous book, and a memorial lecture in honour of Mike Majerus, given by Helen Roy. There will be optional visits to: the Insect Room of the Cambridge University Museum of Zoology; Wicken Fen; and Coe Fen and the Mill Road Cemetery, two sites of entomological interest within the city. We hope that the theme of the meeting will appeal to a broad range of entomologists from those interested in molecular science to ecology and all areas in between. A range of sessions are planned including: Biodiversity & Conservation, Land Use and Climate Change, Genomics, Biological Control, Invasive Species, Chemical Ecology and Insects and Human Health.

There will be two plenary speakers at the meeting, Ingolf Steffan-Dewenter (University of Würzburg, Germany) and Andrew Liebhold (USDA Forest Service, USA).

Andrew "Sandy" Liebhold's research focuses on the spatial dynamics of insect outbreaks and the population biology of invasions. Ingolf Steffan-Dewenter is interested in the consequences of habitat fragmentation, land use intensification, climate change and invasive species on insect diversity and their biotic interactions.

Andrew Liebhold

Ingolf Steffan-Dewenter

Further details of the meeting can be found at:

http://www.royensoc.co.uk/content/meeting-18th-20th-july-2012

We look forward to welcoming you to Anglia Ruskin in July.

Alvin Helden
Peter Brown
Alex Dittrich
(conveners)
ento12@anglia.ac.uk

A young entomologist engineering a new taxa of insect at the Children's University. Photograph courtesy of the Children's University.

News of entomological activities in the South-West

by Peter Smithers (SW Hon Sec)

Life in the SW of England has been a little hectic last autumn as we have tried to shoehorn in as many activities as possible.

Wild About Plymouth

We began with Wild about Plymouth, a family friendly natural history group which is run as a joint venture between the City Museum and the University of Plymouth. As a founder member the SW Hon sec ensures that there is plenty of entomology involved which always goes down a storm with the children and parents alike. The Terrible Ttaxonomy meeting brought the group into the teaching laboratories at university to experience an introduction to how scientists classify the natural world. Each family began by building an invertebrate for household junk, then we discussed how we might divide them into groups. Having successfully sorted our plastic fauna into recognisable groups the audience was then invited to view the specimens laid out around the lab and make annotated drawings of a selected few to illustrate the features required to classify them. Prizes were offered for the best offerings. This resulted in a remarkably high standard of drawings. The day was a great success and ended with a parade of strange invertebrates and grinning young entomologists leaving the university.

The Children's University

A few weeks later we ran a similar event for the rapidly expanding Children's University, which is run locally by Plymouth City Council. On this occasion we began with a talk entitled so what does an entomologist do in which the author outline some of the projects, trips and expeditions he had been involved in. Outlining the

Clitostethus arcuatus. Photograph by Simon Springate

diverse range of invertebrates he had worked with. As knowing what things are had been indicated in the talk as a crucial skill for an entomologist, we then repeated the build and classify an invertebrate activity. Again this generated a diversity of invertebrate forms but a uniformity of smiling faces.

Invertebrate ID courses

Following discussions with Buglife the University had agreed to host and support a series of invertebrate workshops for local naturalists. The first one would be on spiders but would be followed by others on Myriopods and Beetles in order to take advantage of local expertise. We decided to cap the course at 25 but did not anticipate approaching this number. It was then a great surprise when after just 4 days we had a full house and by the time we ran the course there was a waiting list of another 20 hopeful applicants. The day was an enormous success, attracting a very mixed audience ranging from local naturalists to university students. The day ended with the assembled class clamouring for more.

Joint RES/PIF meeting

The annual joint meeting of the SW RES section and the Peninsular Invertebrate forum "Hunting for Unicorns" focused on the difficulties involved in studying rare of difficult invertebrates. We had an excellent turnout with almost sixty people attending, these being a mixture of local entomologist and students from the university. We were also delighted to have the president of the RES , Stuart Reynolds in attendance. The author welcomed everyone and thanked the president for travelling down from Bath for the evening. He then gave a brief overview of rarity as a concept before introducing the three speakers.

The first was Simon Springate from the University of Greenwich

Simon reported on the early stages of his work on the small ladybird *Clitostethus arcuatus*. This species, a specialist predator of whiteflies, is at the northern edge of its range in the UK and appears to be distributed in areas with the highest average temperatures. Few records exist and it is classified as endangered. By targeted searching of whitefly host plants, new vice-county records and plant associations have already been produced. Such subjective sampling, possibly informed by niche-based modellingmodeling, may help to determine if such species are rare or simply under-recorded.

The next speaker was Duncan Allen from Buglife who spoke about the distribution, ecology and conservation of the spider *Nothophantes horridus* (the Horrid Ground-weaver)

The Horrid ground-weaver is a small species of Linyphiid spider (total body length of just 2.5mm.). The name comes from the Greek *Notho* meaning spurious and *Hyphantes* meaning weaver and *horridus* from the Latin for bristly referring to the characteristic bristly body and palps. Little is known about the natural history and ecology of this spider but it is thought to be nocturnal and troglodytic coming to the surface to feed at night amongst the screes on the quarry slopes. The horrid ground weaver is a UK Biodiversity Action Plan priority species BAP-2007 and due to the type locality having been extensively developed is listed as Critically Endangered. It is also listed as a Natural Environment and Rural Communities Act 2006 - Species of Principal Importance in England. The conservation of this species is of national concern but there are currently no conservation guidelines available due to the lack of ecological and habitat data. This study is an attempt to elucidate the ecology of this spider.

Project Aims

To confirm the current status and distribution of *N. horridus* in South Devon.

To develop more effective sampling methods for future surveying and monitoring of the species.

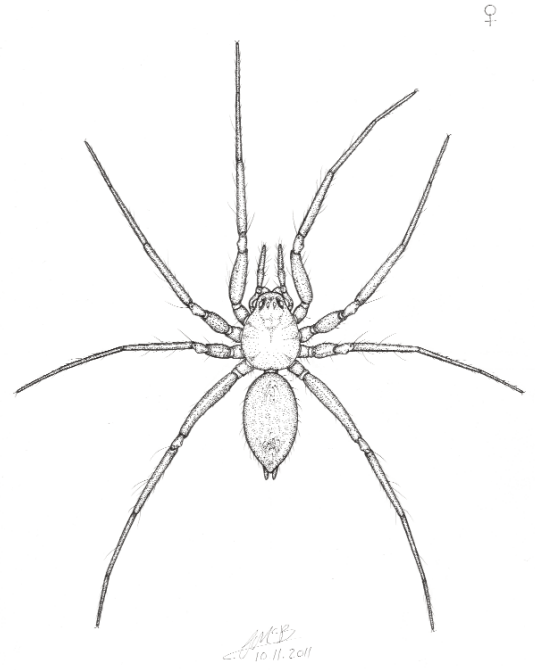
To advance our understanding of the ecology of the species.

To develop an informed conservation strategy for the species.

Due to the size and cryptic nature of the ecology of this spider developing a range of surveying techniques is an important and essential part of the project so that future studies can be more targeted and effective.

Platform Pitfall Trapping

As it is thought that this species is trogloditic, leaving fissures and cracks in the cliff face at night to hunt on the scree slopes surrounding the quarry most likely feeding on collembola and other small arthropod prey. It was decided that pitfall traps sunk into the



Nothyphantes horridus
drawing by Fergus McBurney.

quarries scree slopes could be an effective way of capitalizing on this behaviour. In order for the pitfall traps not to fall into the scree and to have debris fall in platform pitfalls were used. Platform pitfalls are currently used by the University of Plymouth for canopy invertebrate sampling, the pitfall has a square plywood (17.8 x 17.8 cm) platform attached to the rim of the pitfall trap (which has a diameter of 10.5 cm) in order to increase the surface of the catchment area this has the added bonus in scree as acting as an anchoring point and allows scree and stones to be placed around the trap allowing for better interface with the environment.

Cavity straw traps

Cavity straw traps are a simple and effective trapping technique used in the collection of terrestrial arthropods especially small arachnids (Cuthbertson and Murchie 2005). Drinking straws were placed into crevices and fissures in the cliff face, if *N horridus* is using these as a refuge or as a means of navigating from underground to the surface it was hoped that these would prove effective in trapping the spider as it sheltered during the day.

Straw traps

This design of straw trap follows the more conventional straw trap used in environmental monitoring (Cuthbertson and Murchie 2005) where the sterilized barley straw is substituted for paper art straws. The traps are made from tin cylinders lined with corrugated cardboard and filled with paper art straws this acts as artificial refugia and were placed into the scree slopes as well as in suitably sized crevices and small cave entrances.

Rock turning and pootering

After looking over some of the old field data from the original surveys for *N .horridus* it was found that one of adults form the Radford quarry site was caught under a stone on the quarry floor. In order to explore the possibility of *N. horridus* being found on the quarry floor an extensive sweep of the quarry was undertaken using standard pooters to collect any spiders observed. A group of volunteers from the University of Plymouth were taken to the site and arranged in a line across the site and proceeded to rock turn and pooter up all small spiders these spiders were put into 70% IMS and taken back to the laboratories at Plymouth University for identification.

Suction sampler

In order to maximise out time in the field sampling, two suction samplers were employed to allow us to sample harder to reach and denser vegetation that could not be sampled by pootering. Suction samplers are known to be a very efficient method of sampling the smaller organisms associated with short vegetation (Bell & Wheatear, 2001). A suction sampler is a portable vacuum cleaner which is used to suck invertebrates off vegetation and the surface of the ground. The suction samplers employed in this study were modified conventional garden leaf blowers, by inserting a fine net in the intake of the machine, small invertebrates are sucked up and collected in the net, the nozzle is most effective when the nozzle is held as close too or against a surface and swept back and forth covering a known area (Wright & Stewart, 1992). once the area had been sampled the collection net was emptied into a large white tray and all spiders were pootered up and collected stored in 70% IMS and brought back to Plymouth University.

Further study and recommendations

It is proposed that this study be resumed again in the spring of 2012 in the months of March and April, as this is when the adults of *N. horridus* have traditionally been found.

Whilst the current survey has been unable to confirm or deny the presence of *N. horridus* at either of the sites (Radford Quarry or the Royal Mail Depot), we cannot discount the possibility that this species is still living at the quarry site as we have not sampled at the time of year when the initial find was made and there has been no discernible changes of management or changes in the quarry habitat in recent years that would lead to the loss of this species.

References

Andrew Stevens. R. & Merrett. P. (1995) A new genus and species of Linyphiid spider from South-West England (Aranea: Linyphiidae). *Bull. Br. Arachnol. Soc.* **10** (3) 118-120.

Andrew Stevens. R. & Merrett. P. (1999) The male of Nothophantes horridus Merret & Stvens (Araneae: Linyphiidae). *Bull. Br. Arachnol. Soc.* **11** (4) 129-130.

Bell, J. R. & Wheatear, C. P. (2001) Analysis of the most popular techniques for sampling spiders in large scale ecological experiments in grasslands. *Newsl. Br. Arachnol. Soc.* 91: 1012.

Cuthbertson A. G. S. and Murchie A. K. (2005) Techniques for environmental monitoring of predatory fauna on branches of Bramley apple trees in Northern Ireland Int. J. Environ. *Sci. Tech*. Vol. **2**, No. 1, pp. 1-6.

Wright, A. F. & Stewart, A. J. A. (1992) A study of the efficiency of a new inexpensive type of suction apparatus in quantitative sampling of grassland invertebrate populations. *Bull. Br.Ecol. Soc.* **23** (2): 116 – 120.

The final speaker was John Walters who gave a fascinating insight into the biology of the Heath Potter Wasp

The Heath Potter Wasp *Eumenes coarctatus* is a scarce species found on heathlands in southern England. Its range is centred on the heaths of Surrey, the New Forest and Dorset with outlying populations in West Sussex, Devon and Buckinghamshire.

The females collect mud pellets from a bare patch of exposed clay, the 'quarry' and combine this with water collected from ponds to form balls of clay. The wasp then flies out onto the heath to build her pot. The pots are usually built on heather, gorse and occasionally on dead grass stems. Each pot takes between 20 and 30 loads of clay and is completed in about 2 hours. After completion the wasp lays an egg inside it. She then collects between 20 and 38 caterpillars and puts these in the pot. When it is full a single ball of clay is used to seal the pot. The wasp then either flies off to find another site or constructs a new pot adjacent to the first. Up to seven pots may be built together. The wasps are active between May and early October. Pots built in May and June can produce a partial second generation that emerges in late July and August. The larvae over winter in the pots and pupate in late spring.

A four-year quest to observe the wasp in action building a pot began at Stoborough Heath in Dorset in August 2007. Several unsuccessful attempts were made to track wasps from their quarry sites out on to the heath so that the building behaviour could be filmed. Further attempts were made in 2008 and 2009 at the same site and on the East Devon pebblebed heaths but although the wasps could easily be observed collecting clay tracking them

The Heath Potter Wasp *Eumenes coarctatus*. Photograph by John Walters

to their pots proved to be almost impossible.

In 2010 Pat Carter found several pots at Bovey Heathfield in south Devon, a relict area of heathland close to Bovey Tracey. An intensive study of the heath potter wasps at this site commenced and this led to the successful tracking of building wasps in August 2010. Tracking skills were honed during the late summer and some interesting observations were made. It was possible to follow some wasps through the process of building three pots. After completing each one the wasp always returned to the same quarry site so could be followed to consecutive pots.

During 2011 the study concentrated on ten marked wasps that were using one quarry. This was very successful and one of them was tracked to nine pots built during June and July. The distance travelled varied between one metre and 130 metres with wasps travelling further to build in hot conditions. About 40 wasps were tracked during the season including several at Stoborough Heath. This work has revealed some fascinating information about these wasps. There is still much to learn so further work is planned including a paper on the ecology of this fascinating insect.

Each talk was followed by a lively discussion and following the close of the meeting the assembled company talked with old friends and made new ones until we were thrown out by security. The only recourse at that point was to continue our discussions in a local hostelry.

So what does 2012 offer on its entomological menu:

In March there is a lecture to the Children's University on Tropical Entomology and a talk on Insects as Human food to the Teignmouth Cafe Scientifique. Science week brings a week long marathon of activities which focus on movement in invertebrates. The second Insect Film Festival will feature a range of entomologically inspired films and a plethora of related activities.

In June it is of course NIW and among the activities is an exhibition of insect photography organised by the Devonshire Association in conjunction with the RES. SW representatives will also be entertaining and informing the public at the Cheltenham Science Festival with an entomological question time panel.

In July we have Capturing Coleoptera, an exhibition that explores how beetles have been perceived by and presented to the world. A beetle hunt in a local nature reserve and a spider walk in a local park.

So here in the SW the future looks entomologically hectic but bright.

The Royal Entomological Society Travel Award 2011

Samia Elfekih: Recipient of the Royal Entomological Society Travel Award 2011

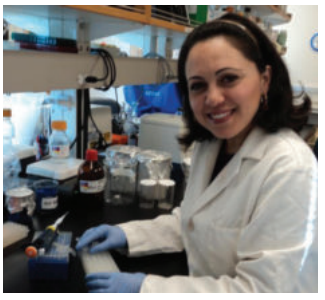


Photo courtesy of Samia Elfekih

Samia Elfekih graduated with a PhD degree from the Department of Biology of the University of Tunis (Faculté des Sciences mathématiques, physiques et naturelles de Tunis, Tunisia) in 2010. During her PhD degree, she focused on studying the genetic diversity and phylogeny of tephritid fruit flies (*Ceratitis, Dacus & Bactrocera*). She particularly used mitochondrial DNA markers to study the genetic diversity within and between populations of the Mediterranean fruit fly *Ceratitis capitata* and to make inferences regarding the mechanisms of bio-invasions of this pest. She used the same markers to also develop molecular-based diagnostic keys for the identification of agricultural pests at quarantine control sections.

Dr Elfekih conducted her research project at the University of Hawaii at Manoa under the framework of the Fulbright fellowship, an International exchange programme sponsored by the US department of State (USA). After finishing her PhD, she conducted a short-term visit at the University of California Riverside, where she developed her molecular and genomic skills. In 2011, she has been awarded the highly prestigious Unesco- L'Oréal co-sponsored fellowship for women in Science to pursue a postdoc on fruit fly genomics and evolutionary biology. She holds a joint postdoc position between Imperial College and the Natural History Museum London.

Dr Samia Elfekih, receiving her UNESCO-L'Oreal co-sponsored fellowship award from Mrs Irina Bokova (General director of UNESCO) at UNESCO headquarters in Paris (France), March 28th, 2011.

Postdoctoral research project: Evolutionary mechanisms of Insecticide resistance in the Mediterranean fruit fly *C. capitata*

The Mediterranean fruit fly *C. capitata* (Photo by S. Elfekih)

The Mediterranean fruit fly *C. capitata* is one of the most invasive agricultural pests worldwide. It is highly polyphagous and causes considerable economic losses in fruit production. Despite environmental concerns, chemical control remains the most important strategy used in medfly pest management. The most frequently used pesticides are organophosphates and carbamates. Both classes target acetylcholinesterase (*Ace*), a key enzyme in the nervous system of insects, and inhibit its activity. Intensive applications of such pesticides generated a widespread resistance that was hypothesized to be caused by amino-acid changes in the enzyme.

The main aim of my project is to further corroborate the mechanism of resistance in order to better understand its origin (recurrent versus single) and its spread across the large geographic range and diverse environmental conditions. I am investigating how resistance originates and how mutant genes coding for resistance have spread geographically and across diverse environmental conditions. I am currently comparing gene sequences from resistant and non-resistant medflies collected from across the world and, using next-generation sequencing technology, I will determine which genetic mutations are due to natural evolutionary adaptation to changing environmental conditions and which are due to adaptation to insecticide use. As both the date of introduction of populations of medfly into different parts of the world and the date of the emergence of insecticide resistance in these same regions are well documented, I will be able to analyze the link between these two types of evolutionary adaptation. Understanding this link will contribute to the development of better alternatives to classic pesticides with respect to changing climatic conditions and increasing demands for eco-friendly strategies.

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The Royal Entomological Society Scholarships

2011-2012

Jim Hardie

In order to address the lack of Entomology training in Higher Education, the RES initiated three scholarships to be awarded, on an annual basis, to students attending the MSc course in Entomology at the Silwood Park campus of Imperial College London. The first of the RES Scholars started in October 2010 and the recipients for 2011-2012 are introduced below, in their own words.

Emily Aldridge

I first began to appreciate wildlife whilst growing up in the Cotswolds surrounded by nature. During my biology degree at Bristol University, I developed a particular interest in insects. The study of their basic systematics and biology highlighted their outstanding diversity and adaptations for survival. Since then I have been on the constant lookout for interesting new insects to magnify and observe. Since graduating, I have sampled the life of an entomologist by working in a number of related jobs. As a field assistant looking at ecological interactions in forests, long working days presented regular phenomena. For example: wood ant colonies showcasing team work that humans can only envy; hidden bodies of water surrounded by dragonflies and damselflies searching for mates; lacewing larvae thrashing their heads violently in search for aphids. Whilst working in museums, inspection of entomological collections allowed me to observe further the diversity of insects and their delicate designs. Through opportunities like these and reading, I have discovered that entomology is never dull, and that there will always be new species to discover and new characteristics to analyse.

Whatever I specialise in after my MSc, I plan to continue in entomological research. I would like to

observe insects in diverse habitats around the world, and I am interested in many research areas including biocontrol, disease vector control, insect conservation and taxonomy. Being awarded this scholarship will allow me to broaden my knowledge and refine my areas of interest. I am thus extremely thankful to the RES for this opportunity.

Lucy Cooper

Why study Entomology? Why not study Entomology! To use the vernacular; insects are cool. How many taxa, besides man, are able to lay claim to representatives that can successfully co-ordinate massive 'armies', engage in 'farming' (both pastoral and arable) and build, maintain, defend, and regulate the internal conditions of structures many, many, times the size of a single individual? How many vertebrate taxa are so diverse, or so numerous, or to occupy so many niches per square metre of space as many of their arthropod equivalents? Their gross anatomy is fascinatingly divergent from that taught at school, but also defined by a surprising number of genes for which there are vertebrate orthologs. Their behaviour encompasses practically everything seen in vertebrates and a few more things besides.

I do have other reasons to be interested in insects beyond the curiosity of an enthusiast; insects include some of the worst banes of cops, both in the field and in storage, can be vectors for various unpleasant diseases, and provide many vital ecological services (pollination and carrion disposal are two of the biggies). I hope I can take my fascination with all things arthropod and make something useful of it, such as PhD, and a career in pest or vector control. None of this will be at all possible without the help of the RES; gratitude does not even begin to describe where I stand.

Nichola Plowman

When I was eight I unwittingly stumbled into a wasps' nest and provoked the wrath of an angry swarm of stinging machines. I ran home and had no choice but to peel off my clothes to escape the seemingly merciless attack. Little did I know then that I would grow up with a passion for entomology! Thanks to the Royal Entomological Society scholarship I have the wonderful opportunity to study it in the ideal setting of Imperial College London's Silwood Park campus.

During my undergraduate degree at the University of St Andrews I became interested in insect behaviour and ecology. I discovered a fascination for social insects, and the ways in which the simple actions of co-operating individuals can result in unimaginably complex structures like hives and behaviours such as swarms. For me, studying insects helps make sense of what can appear from a distance to be a chaotic world with no rules.

Insects interact with just about everything, leaving many avenues of biology open for an entomologist to explore and as someone who is passionate about natural history this is very appealing. These myriad interactions, many just waiting to be discovered, have an enormous impact on our health, economy and agriculture so it is an exciting field to be working in.

Beyond colourful butterflies, it can be difficult to get people to engage with the conservation of creatures that lack the immediate charisma of elephants or orangutans, and are often armed to the teeth with spines, acid sprays and poisonous stings. Yet the loss of insects would be far more disastrous considering their diverse roles in our ecosystems. My goal is to transmit my enthusiasm for these innovative and diverse creatures by contributing to research and helping inform the public and policy makers to manage and protect out native insect diversity.

First RES Scholars

Congratulations are due to the 2010-2011 RES Scholars (see Antenna 34(4), 188) who successfully completed the Masters course. Hayley Brant and Kyle Shackleton obtained Distinctions, and

International Congress of Entomology – Certificates of Distinction for Outstanding Achievements

Jim Hardie
Director of Science
Member of Council for the International Congresses of Entomology

The Council for the International Congresses of Entomology has been awarding Certificates of Distinction for exemplary achievements in entomology since 1996. Previous recipients have included E. O. Wilson (1996), M. Locke and G. Robinson (2000), and J. Bitsch, J. Lawrence, S. S. Liu, S. Masaki, and J. Oliver (2004), A. Raina, L. Simmons and O. Yamashita (2008). Now one of our Honorary Fellows has achieved this accolade, will receive the award at the Opening Ceremony of the next International Congress of Entomology in Daegu, South Korea in 2012 and will present a special lecture on his work.

Professor John Pickett CBE DSc FRS FRES is the Michael Elliott Distinguished Research Fellow at Rothamsted Research and has collected many honours during his illustrious career. Originally a chemist with a particular interest in natural products, he joined the Insecticides and Fungicides Department at Rothamsted Experimental Station some 35 years ago. John later became Head of Department, renamed as the Biological Chemistry Department, and remained so until last year.

Once at Rothamsted, John's attention rapidly encompassed both the plant and the insect world and he has been very much involved in the development of Chemical Ecology as a discipline, as well as its exploitation for pest control. His horizons expanded and moved from plant health to human and animal health with work on haematophagous insects and fish lice. There was even a move from the pest to the pet industry when his laboratory identified one of the components of aphid sex pheromones as nepetalactone. This is the active factor in catnip, which has potent behavioural effects on domestic and wild cats. Protocols were developed to extract nepetalactone from plant material, easier than chemical synthesis, and the pure compound was used to investigate the sex lives of aphids as well as to impregnate furry toys for felines. The photograph shows John wearing a new-ish 'hat' as his interests move to include insect biodiversity and conservation. Field traps releasing nepetalactone caught a lacewing species that was new to UK whilst diminishing populations of stag beetles may well benefit from semiochemical investigation and manipulation.

John comments, "I feel particularly honoured as, although I am a long standing member of the Royal Entomological Society and recently received their Honorary Fellowship, my own original discipline is chemistry. To be internationally recognized by a Certificate of Distinction from the Council

of the International Congresses of Entomology for multidisciplinary work, involving both entomology and chemistry, demonstrates how entomology can direct and exploit other areas of academic scholarship and development specifically for food security."

Certificates of Distinction will also be awarded to Professor Joop van Lenteren (Wagenigen University, The Netherlands) who studies foraging behaviour and population dynamics of natural enemies/parasitoids, and Professor Hugh Robertson (University of Illinois at Urbana-Champaign, USA), whose interests lie in olfactory and taste receptors.

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ICE 2012 DAEGU KOREA

XXIV International Congress of Entomology

August 19-25, 2012 | EXCO, Daegu, Korea(Republic of.)

IMPORTANT DATE

Registration

- Early Bird Registration : Before March 31, 2012
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- On-site Registration : From July 28, 2012

Abstract Submission : November 1, 2011 - April 30, 2012

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Book Reviews

Royal Entomological Society Book of British Insects

by Peter C. Barnard

Print ISBN: 9781444332568,

Hardcover 400 pages, October 2011, Wiley-Blackwell.

Purchased via Wiley website - www.wiley.com/buy/978-1-4443-3256-8.

Price £39.95 / €48.00 / US$99.95 (discount of 25% to fellows and members of RES with code obtainable from sarah@royensoc.co.uk or 01727 899387).
Also available on line with ISBN: 9781444344981

From its inception in 1833, *The Royal Entomological Society* has aimed to promote knowledge about insects. Publications on the identification of British insects have been amongst the most durable (and continuing) products especially the *Handbooks for the Identification of British Insects* series beginning in 1949. Now, our Society has joined with Wiley-Blackwell (the publishers of all the RES journals) in a landmark publication to celebrate the diversity of the British insects, and to promote the work of the RES. Peter Barnard, the author of this book entitled *The Royal Entomological Society Book of British Insects*, writes in a most engaging style. Peter will be known to members of the society and the wider world of entomology for his research into, and popularisation of, the caddisflies (Trichoptera), and for his bibliographic work compiling sources to identify the British insect fauna. The task of preparing this book, entrusted to Peter (as sole author) by the Council of the RES, was aided immensely by the images provided by four excellent photographers, Roger Key, Robin Williams, Colin Rew and Stuart Crofts who are thanked graciously at the outset.

So one might ask, what differentiates this book from the many other popular accounts, illustrated so profusely with coffee-table book quality photographs of exotic butterflies, beetles and floral-deceptive mantids ? I think that it lies in the breadth and detail of the coverage: all 558 families of British insects are covered, and the 6,000 genera are mentioned, at least listed (and indexed), and often with detail provided. Even the smallest and least known get a mention, including those that are present in Britain as incursive, perhaps recorded only as exotics from greenhouses. Phasmids owe their presence in the book to the several stick insects that established probably after escape from the exotic insect trade. So the coverage is complete, pending arrival of further refugees from global warming or from breaches in biosecurity. For each family, a summary covers classification, biology, economic importance and any formal conservation status of included species. Referencing is kept short and to the point, with onward guidance to other sources for more detail and further references for detailed identification. Web sources are restricted judiciously to those that can be authenticated and may outlast the ephemeral lifespan of a server.

This work, above all, is a systematic presentation with a clear underlying evolutionary (phylogenetic) framework – but don't let this deter the natural historian reader. Despite the frequent 'Science' or 'Nature' papers proposing radical evolutionary relationships based on new genetic data and/or inclusion of 'weird' insects, a consensus is growing concerning the relationships and organisation of the hexapods. As a co-author of a textbook requiring updating every four to five years, and an editor of *Systematic Entomology*, I find that keeping track of this evolving consensus is a time-consuming and challenging exercise. Yet rarely in the *RES Book of British Insects* is there any accepted recent change in proposed evolutionary relationships that Peter has missed – the termites are cockroaches, *Boreus* the snow flea may bridge the Mecoptera-Siphonaptera gap, and the Phthiraptera lie within a broadened Psocoptera. In the Lepidoptera chapter, the explanation for the abandonment of the incorrect terms Rhopalocera, Macrolepidoptera and Microlepidoptera is both correct phylogenetically and tactfully but firmly made. Readers that have not kept up-to-date may find the primary divisions of the Neoptera into Polyneoptera, Paraneoptera and Endopterygota somewhat novel, but a decade or more of molecular studies suggest this is tenable, even if the Polyneoptera (orthopteroids in the broadest sense) lack clear unifying morphological features. Three parts comprising the 'Entognatha', 'Apterygota' and 'Palaeoptera' are followed by the major part of the text (near 75% of the pages) using these supraordinal groupings of Polyneoptera (part 4), Paraneoptera (part 5) and Endopterygota (part 6), within which the orders are treated alphabetically. This arrangement works just fine for me, especially as the entry for each order commences with a short paragraph on the relationships as understood currently.

At the outset, and because the depauperate groups are treated first, I was worried by the generosity of layout, with several empty or part-filled pages early on, but as I advanced into the 'major orders' – with some 50 pages allocated to each of Coleoptera, Diptera and Hymenoptera – the virtues of this layout are clear. The interpolation of many photographs into what could be a dense text provides pages that are easy on the eye and undemanding logical flow of the passages for each family. Almost universally the selected photographs are chosen to illustrate specific insects, including immature stages or behaviours, and nearly all appear on the same page as the referring text. No photographs are extraneous and the 'weak' ones are amongst the few that derive from 'creative commons' rather than the named photographer contributors or Peter himself.

One fact that intrigued me on reading the book, and after a quarter of a century living in more entomologically diverse places than the UK, is how many families with which I am only now familiar do occur in Britain, but only through a sole representative. Many of these are aquatic insects; for example, the pleids, aphelocheirids, naucorids, mesovelids and hebrids (Hemiptera), and the

limnichids and an introduced ptylodactylid in the Coleoptera, are each included based on single species. I do not recall encountering any of these while 'guddling' in streams while seeking my favourite insects, and thus their presence comes as a surprise – evidently the book would have been appreciably shorter were it not for their fortuitous presence.

Perhaps I should forestall possible criticism of this being a single-authored work of such wide scope rather than the multiauthored approach that might have been taken (as for instance in the *Encyclopedia of Insects*, edited by Resh and Cardé (2009), and cited often in this book). For me, the coherence of writing and contents is unarguable – this book can be read from start to finish. I like Peter's style which conveys the science behind it all, lightened by some more colloquial sentences and certain hints of irony as well as some illuminating asides. The use of common names enlivens – I liked especially the 'brush-thighed seedeater' and 'early sunshiner' amongst the carabids. Unlike in the USA, there is no official listing of common names for insects in UK (and in my opinion there should not be) but as shown by the freshwater fishing fraternity, matches between anglers' 'flies' and real insects helps in broadening our communications with a large group of interested lay people. I liked especially the incorporation of details of conservation issues, organised by 'species of conservation concern' as listed in UK Biodiversity Action Plan (UKBAP). These are elaborated with the impacts of specific environmental threats such as climate change, decline in ancient forests, and losses of natural waterways and even reduction in urban horse dung.

In some ways this book reminds me of one of my favourite 'popular' works by an entomologist, namely the long-out-of-print *How Insects Live* by W.M. (Wally) Blaney, in which a scientist writer's erudition is displayed with a lightness of touch. Although of necessity this work is prepared to a formula regarding its arrangement, in no way is the writing formulaic – it is an accessible 'good read' and yet will be a key reference work for students, amateur entomologists and anyone that want to know more about the diversity of the natural world around them.

Peter Cranston

As editor I could not resist adding a few lines to this review. At last a book that presents an overview of the entire British insect fauna, a book which provides a brief account of the biology every family along with references to their identification.

The introduction is an inspiring call to arms for taxonomist (*Antenna* wishes we had been able to use it as an article). A call that we hope will be heard in political circles.

British Insects is destined to become the standard reference and the starting point for any investigation of the British insect fauna. It will be an essential addition to the libraries of Universities, research centres, natural historians and academics. Quentin Wheeler's quote that "Taxonomy is the oldest profession practised by people with their cloths on" is a humorous reference to our innate desire to organise and make sense of the world around us. Let us hope that this book will inspire a new generation of entomologist who will ensure that this process continues way into the future.

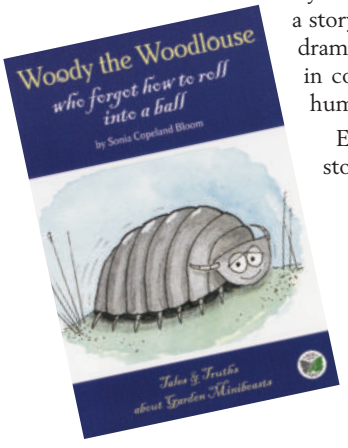
Peter Smithers

Books for younger or future entomologists

Basil the beetles scary adventure
Woody, the woodlouse who forgot how to roll into a ball
Crystal the Small Miracle

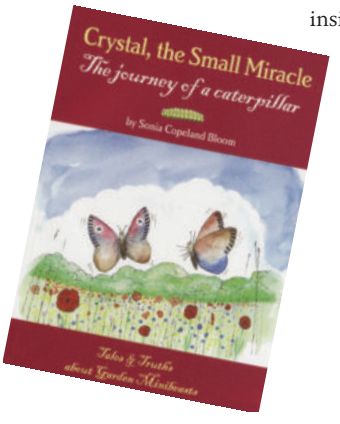
By Sonia Copeland Bloom

Published by the Amateur Entomologists Society



If you want to introduce young children to the fascinating world of minibeasts these books are ideal. The books have a storyline that is easy to follow and are full of wonderful characters. Rooted in real biology the cast play out mini dramas that highlight fundamental aspects of invertebrate biology and in Basils case show how we can play a part in conserving the wildlife in our gardens. They characters are brought vividly to life by a series of bright and humorous cartoons from Nick Page.

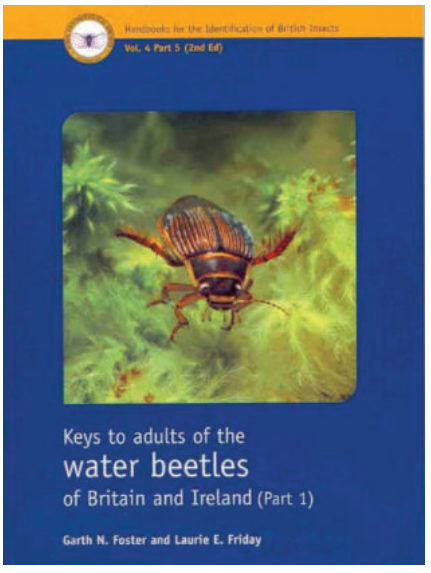
Each book contains an introduction that sets the story in context, a glossary of entomological terms used in the story, a short article about beetles or woodlice, fascinating facts about minibeasts and a section on how to keep the stories hero as a pet. It also lists societies to join, books to read and museums to visit. The inside covers present a montage of labelled photographs illustrating the diversity of form within the group. These combine to form a wonderful package that should inspire a new generation of entomologists and natural historians. Sonia Copeland Bloom and the A.E.S. are to be congratulated on a winning formula. Every school in the UK should have a set.



Peter Smithers

Keys to adults of the water beetles of Britain and Ireland (Part 1)

by Garth N. Foster & Laurie E. Friday. Softcover, 144 pp., 315 figs., 162 colour images. Handbooks for the Identification of British Insects, Vol. 4 part 5 (2nd Ed.). ISBN:9780901546937. Royal Entomological Society 2011.
Price £24.00 (also Member/Fellow discount via RES).



Extremely good value and an important volume suitable for beginners and specialists, it marks a new level for British water beetle literature. Richly illustrated, the well balanced text presents sufficient technical detail to satisfy the experienced and yet remains easily digestible for the initiate. I can see this book occupying a wide range of bookshelves far beyond those of the committed Coleopterist, it will certainly stimulate wider interest in this fascinating group.

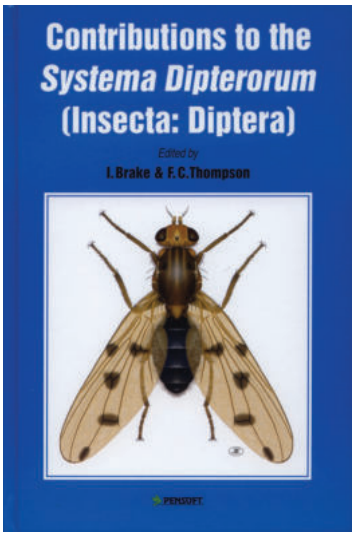
The once murky world of water beetle identification is no more. Any thought that this is a colour guide to water beetles is quickly dispelled as you delve deeper. The colour plates allow you to see the difficulty in separating some species using dorsal features and rather usefully direct you to discover more from the informative text and figures. Some illustrated species can only be confirmed by dissection and it is reassuring, and somewhat novel, that you are allowed to see this for yourself. This book boasts an impressive average of more than three illustrations per species, all high quality and neatly tied into the text. The figures are very clear, of good size, consistently crisp and very informative. Excellent colour plates (prepared by Jirí Hájek) illustrate all the species on the current checklist in taxonomic order. Name, size and page number presented under each example make for very easy reference. Firmly grasping the opportunity to show each species in detail, image size differences have been generally avoided to promote a very useful focus on morphology. Under each species the provision of size range adds value and neatly counteracts any comments on scaling.

Inevitably, the keys are based on the previous work by Friday but have been comprehensively revised with illustrations adjacent to the couplets. Each taxa starts with an informative introduction to the group followed by a key and individual species accounts with notes on morphology, behaviour, distribution and habitat. A key to higher water beetle taxa is presented as an appendix, unusual positioning but very logical considering that regular users will quickly outgrow it. Labelled habitus figures under most families provide a useful point of reference for those unfamiliar with the terminology used in the keys. A table of distribution provides easy reference to general range in an easy to use visual representation with fossil, pre- and post 1980 records demarcated. To the relief of many, common names have been kept to a bare minimum by using only the few relatively stable terms. The latest taxonomic updates have been integrated, including: various shifts between *Ilybius* and *Agabus* albeit with acknowledgement that more changes are likely, the recent generic addition *Boreonectes* Angus 2010 with a single species and an early sight of the recognition by Bergsten and Nilsson that *Suphrodytes dorsalis* (F.) is actually two species.

The useful treatment of the checklist in its entirety allows the reader to identify some of the more unusual species on the British list including, amongst others, the intermittent *Cybister lateralmarginalis* (De Geer) and *Hyphydrus aubei* Ganglbauer once found on the Channel Islands. The checklist itself underpins the construction of this work and must not be ignored. A considerable amount of detailed research spanning several decades of the recording scheme (run by Garth Foster) resulted in an increasingly stable and accurate list that, significantly, is now long past its youthful flux. Finally, I can't miss this opportunity to point out the touching dedication of this volume to Derek Lott, a stalwart of the Balfour-Browne Club he would most certainly have enjoyed this volume. Another excellent key from the RES.

Clive R. Turner.

This review was first published in the Entomologist's Monthly Magazine to whom we are grateful for permission to reprint it in *Antenna*.



Fly Files: *Contributions to the Systema Dipterorum (Insecta: Diptera)*

Myia (International Journal of the North American Dipterists' Society) Volume 12. Edited by Irina Brake & F. Christian Thompson. 2011. NADS & Pensoft, Washington–Sofia–Moscow, viii + 564 pp, 235 x 155 mm
(with 22 colour figures, 3 half-tones and 3 line figures, all in the text). Hardback (ISBN: 978-954-642-599-7).
RRP €80.00. Available from Pensoft.

This, the latest volume of *Myia*, is a work for fly aficionados. Either solo or in various duos, the 10 authors contribute 15 papers. The individual authors are David Barraclough, Irina Brake, Stephen Gaimari, Wayne Mathis, David McAlpine, Adrian Pont, Alessandra Rung, Masahiro Sueyoshi, F. Christian Thompson, and Norman Woodley. Their metier is the world catalogue: eleven of them, covering the families Carnidae, Coelopidae, Dryomizidae, Diastatidae, Helcomyzidae, Heterocheilidae, Odiniidae, Periscelididae (all Schizophora), Stratiomyidae (a supplement), Xylomyidae and Xylophagidae. These overviews include valuable synoptic

Image by Taina Litwak of the North American *Hemeromyia obscura* Coquillett, 1902, from Brake's catalogue of the 92 species included in the Carnidae (pp. 113–169).

Helcomyza mirabilis Melander, 1920, a North American member of the Helcomyzidae (from Mathis's catalogue of the family, pp. 267–280; image by Taina Litwak).

accounts of the biology, distribution and classification for each of the families and, with two exceptions (family Heterocheilidae, which includes just one genus and two species; and the supplementary stratiomyid paper), a key to world genera. The species entries give full citations for the original descriptions, type locality data, type specimen data, type depositories, synonyms, and general distributions.

As a duo, editors Brake and Thompson make three further contributions: a paper on the work of the very important Austrian dipterist Friedrich Hendel (1874–1936), a list of abbreviations used for type depositories, and a list of abbreviations used for serials. The editors also provide a brief Introduction that summarises the various taxonomic acts made throughout the volume as a whole, including the establishment of 1 new genus (*Coganodinia* Gaimari & Mathis, Odiniidae, named for my good friend Brian H. Cogan), 10 new generic synonyms, 10 new species-group synonyms, 29 new combinations, and 3 lectotype designations.

The final paper to note is a 96 page account by Adrian Pont of the Diptera described by Ferdinand Kowarz (1838–1914) or named from material collected by him. Kowarz was born in what is now the Czech Republic. From 1859 until his retirement in 1901, he held posts as a telegrapher in Austria and Slovakia, and in various parts of his homeland. Dipterology was very actively pursued in Vienna in the mid 19th century, and it was here that Kowarz came into contact with such specialists as Schiner, Mik and, especially, Hermann Loew. Loew later described numerous species from materials that his amateur protégée soon started to collect in the South Tyrol, Hungary, Serbia and Romania (having collected Diptera with Brian Cogan in Romania myself, I can imagine the excitement of the early exploration of such a wonderful fauna).

Pont describes Kowarz as a "pivotal figure" in European dipterology, a view that seems amply justified by his account. Kowarz was very competent at identification across almost the entire range of Diptera families, and developed a special interest in the Dolichopodidae. One of the four major collections of Diptera that Kowarz formed during his lifetime was sold by him to G.H. Verrall which, as a result, through J.E. Collin, came to the Oxford University Museum of Natural History in 1967 as part of the Verrall-Collin collection of Palaearctic Diptera. This is important because the history of how collections are passed on, often moving country as well as ownership along the way, is of major significance for entomological 'culture'—although this is not always fully appreciated. Think of the influence on dipterology, and entomology even more generally, of Verrall and Collin, and then imagine how important the acquisition of Kowarz's collection was in that process. And it seems that Kowarz himself was not always as well appreciated as he should have been. However, as Pont is quick to point out, his importance did not escape the attention of Baron Osten Sacken who, in 1903, wrote about how he thought that Kowarz would come to be recognised as "among the foremost dipterologists of the latter half of the nineteenth century."

This paper (submitted in July 2005) is presented as a "by-product" of a far-reaching curatorial and cataloguing project on the Oxford Palaearctic Diptera collections, with much information now accessible via the OUM website (www.oum.ox.ac.uk). "In order to make this review as fully comprehensive as possible", the author travelled to over a dozen other European institutes, ranging from Leeds City Museum to the National Museum in Prague and the Zoological Institute in St Petersburg. The results of all this painstaking work are summarised in the paper, which deals with well over 150 species (belonging to 34 different families) named by Kowarz himself, or based on material that he collected. The work concludes with a gazetteer of over 300 collecting localities represented among the OUM Kowarz material (including specimens collected by many other important European dipterists).

Pont's paper is an outstanding account by a researcher who is not only actively contributing to the advance of dipterology in the 'information age', but also exceptionally sensitive to the development of the subject in Europe and its multifaceted cultural heritage.

Although this volume is generally very well edited and presented, in places it is not always clear what the aims or intentions are. Most notably, the paper on Hendel devotes two pages to some rather eclectic points about his life and approach to work (much of it said to be taken from separate obituaries published by Erwin Lindner and Martin Hering in 1936), together with some rather curious summary statistics (apparently Hendel "described 37.4 species per year"—giving rise in my too literal mind of an annual paper on half a species new to science!). The paper then finishes with nine pages headed "Literature". This includes citations for the Lindner and Hering obituaries, one other citation, an entry for a paper by Duda & Hendel, and 140 entries for papers by Hendel alone. As on the opening page we are told that Hendel "published more than 120 scientific papers", one can only presume that the real point is to provide a (complete?) bibliography of Hendel's entomological publications. If so, why not tell us that? If not so, just exactly what is the scope or purpose of this "Literature" section? I feel sure that it must be the former (with each paper very carefully dated, even to the day of publication where known), but not being certain is disconcerting. Moreover, we are not told how this list has been arrived at—has there been no previous bibliography of Hendel's work? Again, if so, I would like to see that clearly stated.

Such a minor criticism aside, overall this is a very significant and original contribution to world knowledge of Diptera and dipterologists, essential for the library of any institution concerned with the taxonomy of the two-winged horde, or any specialist interested in the particular families or scientists dealt with. A veritable set of fly files. Long may this remarkable series continue.

R.I. Vane-Wright

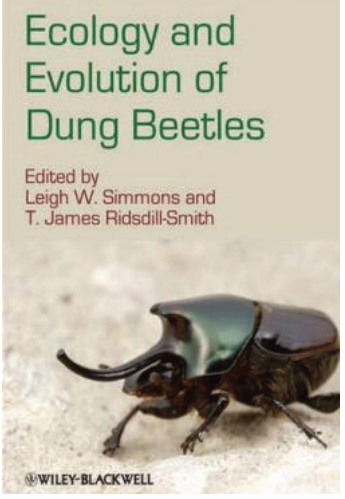
Ecology and Evolution of Dung Beetles

Edited by Leigh W Simmons and T James Ridsdill-Smith

Wiley-Blackwell, UK

ISBN: 978-1-4443-3315-2

Price £65.00 / €78.00



Entomologists' don't need reminding that beetles make up over a quarter of all animal species, the Scarabaeoidea arguably being one of the more successful lineages within the Coleoptera, comprising over a tenth of all described beetles. This book focuses on the ecology and evolution of around 6,000 of these; the scarabaeine dung beetles. In doing so it makes an excellent case for their use as models to address a range of fundamental biological questions, as well as summarising some fascinating information on the natural history of individual groups. In the various chapters one can gain insight into current developments in evolutionary theory, as well as discover that some scarabaeines have actually shifted from feeding on dung to things as diverse as fungi, giant land snail mucous, dead millipedes and living leaf-cutter ants. In short, there is much here to interest ecologists and evolutionary biologists on the one hand, as well as those who want a better overview of the beetles themselves. The first chapter sets the scene for a lot of what follows, making the central argument that much of the current diversity of scarabaeines is driven by reproductive competition. This leads into an excellent summary of the evolutionary history and diversification of the group, although here I would have liked a few illustrations of the beetles themselves, to capture morphological variation across groups. A couple subsequent chapters focus on sexual selection, covering contest competition and the evolution of male weapons (accompanied by striking illustrations of horn diversity, including the aptly named *Onthophagus rangifer*), sperm competition and cryptic female choice. There are also thorough summaries of work on threshold trait expression and intraspecific horn polymorphism, the evolution of parental care, and the evolutionary developmental biology of horn expression. On the ecological side, contributions deal with physiological and visual ecology, dung beetle population biology and diversity, biological control and the functional importance of scarabaeines, and the use of these insects as indicators of habitat change and conservation status. At the end of their introductory chapter the editors state: '*Mostly, researchers choose their subjects because of a passion or admiration for the animals in their own right, but they are also driven by research agendas, using their chosen taxon to test or advance some general scientific theory*'. With this in mind, I found the blend of theory and natural history in this volume just right.

David Bilton

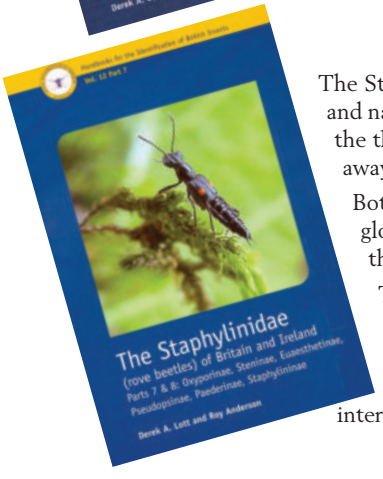
Handbooks for the identification of British Insects Vol 12 part 5 The Staphylinidae (rove beetles) Scaphidiinae,Piestinae & Oxytelinae

Derek Lott

The Staphylinidae (Rove beetles of Britain and Ireland) Vol 12 part 7 Oxyporinae, Steninae, Euaesthetinae, Pseudopsinae, Paederinae & Staphylininae.

Derek Lott & Roy Anderson.

Published by the Field Studies Council for the Royal Entomological Society



The Staphylinidae have always been a challenge to any one not familiar with the group. Entomologist and natural historians alike have often struggled to identify this group of beetles and often left them to the those who have persevered and gained the necessary expertise. These two handbooks have swept away the mystique and have provided a clear, well illustrated guide to this fascinating group of beetles.

Both volumes have a short introduction to the morphology and biology of the group, followed by a glossary. There is then an illustrated key to subfamilies and a check list of the species dealt with in this volume.

The rest of each volume comprises keys to each of the genera and species in each subfamily with illustrations of the genitalia, plus a set of colour photographs depicting each species dealt with in the key.

These two volumes are a wonderful addition the handbook series and should encourage a fresh interest into this once neglected family of beetles.

Peter Smithers

Spider

Katarzyna & sergiusz michalski
Reaction Books
Price £9.99
ISBN 9781861897756

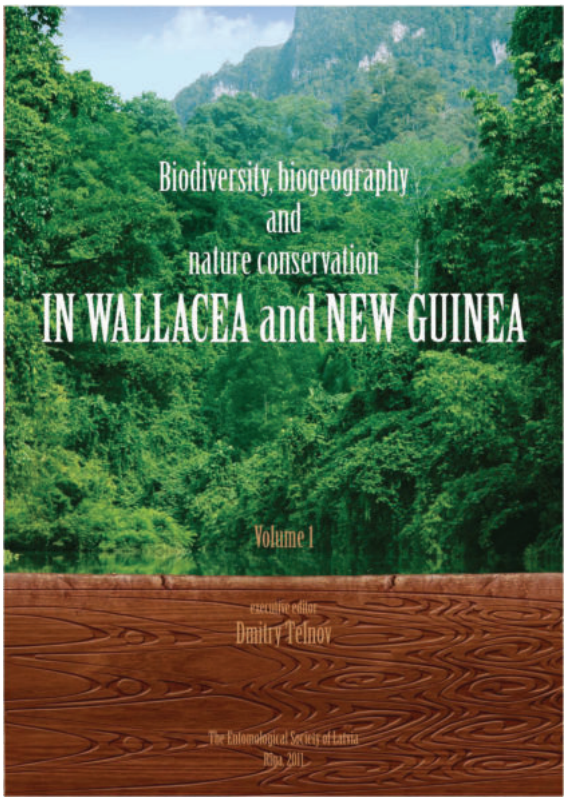
Spiders feature in all our lives to a greater or lesser degree and this book examines the way that these creatures have been embedded in cultures around the globe and throughout human history, from miss Muffet to the worldwide web.

It examines our relationship with these emblematic animals from prehistory to the present day. Spiders looks at mans depiction of them in literature, folk lore and propaganda as agents of evil, threats to the stability of the society of the day and corruptors of moral and spiritual values. From references in the Bible and the Koran to the insubstantial and fragile nature of the spiders web as an allegory for the frail nature of the teachings of non believers to the use of the image of female spiders consuming their mates as propaganda against women's emancipation. There are many political caricatures depicting dictators and governments at the centre of a controlling web and dark images of spiders in our dreams and fantasies as discovered by the early psychoanalysts. The book also looks at the web as a recurring feature in art deco design to the first accurate paintings of spiders in their natural habitats by Maria Sibylla Merian. From the giant mechanical spider, built by the French group La Machine, which terrorised and enchanted the city of Liverpool in 2008 to the work of the American sculptor Louise Bourgeois. Spiders also deals with some fascinating but perturbing urban myths and the relationship of Hollywood with this branch of the Arachnids. There is also a short section on the biology of spiders.

Here is a book that cannot be missed by anyone with an interest in cultural entomology, it is thought provoking and entertaining. It is well illustrated with a wide range of both colour and black & white images from woodcuts to photographs and drawings. Many of the images are strangely macabre but all help to set in a historical, social and political context the complex and uncertain relationship the societies across history have had with this amazing group of invertebrates.

Peter Smithers

Biodiversity, biogeography and nature conservation in Wallacea and New Guinea



The new book series focuses on the biodiversity, biogeography and conservation of one of the richest and scientifically most interesting areas of the earth - the islands of Wallacea and New Guinea.

The first volume is now available. It contains 17 scientific papers by 20 researchers from 12 countries on 526 A4 pages (including 92 colour plates). The foreword was written by William F. Laurance, the Australian science professor and laureate in tropical biology. A table of contents and a few example contents are presented below.

The price for the 1st volume is EUR 85 (P&P costs are extra).

To order Volume 1, please use the following e-mail: anthicus@gmail.com or the order form which is available electronically: http://leb.daba.lv/book/order.doc

By ordering Volume 1 you are already contributing to the production of the 2nd volume.

GREAT BRITISH INSECTS: NATIONAL INSECT WEEK RETURNS

25 June – 1 July 2012

The Royal Entomological Society will be celebrating all that is 'great' about British insects next year with the return of National Insect Week 2012.

This summer's National Insect Week will take 'Great British Insects' as it's theme drawing upon the celebrations around the Olympic Games and the Diamond Jubilee of the Society's Patron HM The Queen.

The success of National Insect Week rests on our partners' events and the experts we can supply to support them. We would be delighted if members and Fellows of the society would support us and get involved in National Insect Week. Please register your interest now by contacting jane@cicada-comms.com.

2012 will be the fifth time the Royal Entomological Society has celebrated National Insect Week, the biennial initiative to promote the importance of insect. Through a high profile launch and a nationwide programme of fun events and interactive activities for all the family, National Insect Week brings the insect world to life.

An interactive website www.nationalinsectweek.co.uk gives visitors all the information they need to get involved, from finding out more about events taking place locally to a photography competition and advice on bringing more British insects into our gardens.

Supported by more than 50 national partner organisations concerned about natural history and biodiversity, National Insect Week first took place in 2004 and has built year on year.

Luke Tilley, National Insect Week coordinator, said: "We already have some exciting plans in the pipeline including an exciting week-long event at RAF Museum Hendon exploring how insect and aircraft flight compare . We'll also be working with a high profile chef to create some insect-themed menus to promote insects as a sustainable food source here in the UK. We will be marking the Diamond Jubilee of our Patron, HM The Queen, by presenting her with specially bound copies of the Society's definitive guide to British insects which is being published in 2012."

"As usual, there will be a whole host of activities for kids including the gruesome, yet fascinating 'Crime Scene Insects' to get children interested in forensic entomology. Local and regional wildlife organisations will be hosting their own events up and down the country to allow children and adults to explore the wonderful world of insects for themselves."

To learn more about National Insect Week and how you can get involved please visit www.nationalinsectweek.co.uk

All National Insect Week enquiries to Jane Chamberlain or Annabel Hutchison at Cicada Communications on 01423 567111 or jane@cicada-comms.com/ annabel@cicada-comms.com

Diary

Assistant Editor: Duncan Allen (e-mail: antennadiary@gmail.com)
Contributions please! Your support is needed to make this diary effective so please send any relevant items to the diary's compiler, Duncan Allen, E-mail: antennadiary@gmail.com. No charge is made for entries. To ensure that adequate notice of meetings, etc. is given, please allow at least 6 months' advance notice.

Details of the Meetings programme can be viewed on the RES website (www.royensoc.co.uk/meetings) and include a registration form, which usually must be completed in advance so that refreshments can be organised. Day meetings usually begin with registration and refreshments at 10 am for a 10.30 am start and finish by 5 pm. Every meeting can differ though, so please refer to the details below and also check the website, which is updated regularly.

A quick apology on my behalf for adding the wrong contact for the BENHS meetings and field days. I had put John Muggleton (jmuggleton@aol.com) – it was meant to read Ian Mclean (ianmclean@waitrose.com). I am sorry for any confusion, apologies to both Ian and John for the mix up. With best wishes, Duncan Allen

MEETINGS OF THE ROYAL ENTOMOLOGICAL SOCIETY 2012

Mar 7 **Verrall Lecture**
Venue: Flett Lecture Hall, Natural History Museum
4.00 pm for tea / coffee in the anteroom. Lecture 4.30 pm to 5.15 pm to depart sharp at 5.30 pm (to safely vacate the Museum).
Professor Ilkka Hanski (University of Helsinki)
Title: The Glanville fritillary butterfly: ecology meets evolution
Demographic population dynamics, gene flow and local adaptation may influence each other and lead to coupling of ecological and evolutionary dynamics especially in species inhabiting fragmented heterogeneous environments. Studies on the Glanville fritillary butterfly Melitaea cinxia in Finland have documented reciprocal influence between ecological and evolutionary dynamics in dispersal, in inbreeding and population extinction, and in female host plant preference and population establishment. The most striking example involves genetic polymorphism in the gene phosphoglucose isomerase Pgi, which is associated with dispersal, recolonization and local population dynamics. In this case extinction-colonization metapopulation dynamics influence allele frequency changes in Pgi and vice versa. Eco-evolutionary spatial dynamics in heterogeneous environments may not lead to directional evolutionary changes, unless the environment changes, but eco-evolutionary dynamics may contribute to the maintenance of genetic variation due to fluctuating selection in space and time.

Apr 18* **Aphid Special Interest Group**
OR 25 **Venue: James Hutton Institute (formerly SCRI) Dundee, Scotland**
Convenor: Dr Brian Fenton (brian.fenton@hutton.ac.uk).
*Note that we are trying to move from the 25 to 18 April because of a clash with the below SCI meeting. Please check the RES Meetings website to confirm.
Provisional main speakers are:

Georg Jander (The Boyce Thompson Institute, Cornell University)
The Jander Lab uses genetic and biochemical approaches to study plant-insect interactions and plant amino acid metabolism. We employ the small crucifer Arabidopsis thaliana (Arabidopsis) as a model system for most of our research.
Aart van Bel (Justus Liebig University Giessen)
Our work focuses on cell biology of sieve element / companion cell modules in seed plants, but extends to many aspects of phloem physiology from the molecular up to the ecophysiological level.

We plan to arrange for a minibus from Edinburgh airport to Dundee leaving at around 9.00 arriving in Dundee at 10.00. The meeting will start at 10.30. The meeting will end by 16.00 and the minibus will return to the airport by 17.00.

Apr 25 **RES partnered meeting**
Insect Decline: the causes and the role of agriculture in mitigation
Venue: Rothamsted Research, Harpenden, Herts, AL5 2JQ
Convenor: SCI's BioResources Group
This event will discuss to what degree modern agriculture is responsible for insect decline and determine how new technologies and initiatives within the industry can reduce the impact on insect populations.

May 10 **Insect Ecology Special Interest Group Meeting**
Insect-Fungus Interactions
Venue: Rothamsted Research, Harpenden, Herts, AL5 2JQ
Convenor: Dr Michael Bonsall (michael.bonsall@zoo.ox.ac.uk)
Plenary Speaker: Prof. Alan Gange (Royal Holloway)
Understanding the interactions between insects and other organisms has predominantly focused on the relationships between plants or other animals. However, the interaction with Fungi represents a dominant and diverse relationship for insects ranging from the direct effects of fungi as resources, the pathogenic effects of fungi on insects through to the indirect effects of mycorhizzae and endophytes on insect-plant interactions.
In this meeting of Royal Entomological Society Insect Ecology SIG there will be an opportunity to hear the latest research on Insect Fungus Interactions Ecology. The broad scope of this Insect Ecology SIG will appeal to a wide range of entomologists, ecologists and natural historians.

Jun 6 **RES Annual General Meeting**
Venue: RES Headquarters, The Mansion House, Chiswell Green Lane, St Albans

Jun 25 – 1 Jul **National Insect Week**
National Insect Week (NIW) is coordinated by the Society and supported by almost 40 partner organisations. The aim of NIW is to encourage the public to take an interest in insects as one of the most abundant and accessible forms of biodiversity surrounding us. This is achieved through a variety of talks, 'bug-hunts', demonstrations, open days and workshops.
www.nationalinsectweek.co.uk

Jul 17* **Infection and Immunology Special Interest Group**
(*to be confirmed, please check the RES Meetings website)

Jul 18 – 20 **Ento'12 – the National Meeting of the RES**
Venue: Anglia Ruskin University, Cambridge
Convenors: Alvin Helden (alvin.helden@anglia.ac.uk)
Peter Brown (peter.brown@anglia.ac.uk)
Alex Dittrich (alex.dittrich@anglia.ac.uk)
Please see article inside for more details.

Aug 19 – 25 **ICE 2012 - XXIV International Congress of Entomology**
Venue: Daegu, Korea

Oct 24 **Scottish Regional Meeting**
'Great Scottish Insects'
Venue: Scottish Agricultural College, King's Buildings, West Mains Road, Edinburgh from 10.00 to 17:00
Convenors: Jenni Stockan (jenni.stockan@hutton.ac.uk) and Andy Evans (andy.evans@sac.ac.uk)
A celebration of the 14,000 insects that inhabit Scotland and the entomologists who have studied them, both past and present.
Confirmed speakers:
Dr Alison Blackwell
Dr Garth Foster
Dr John Clark

Nov 7* **Orthopterists' Special Interest Group Meeting**
***subject to confirmation**
Venue: Natural History Museum
Convenors: Dr. David Robinson and Mrs Judith Marshall

Diary of other Meetings

2011

Feb 25 **Staphylinidae identification workshop**
Venue: Pelham-Clinton Building, Dinton Pastures Country Park, Davis Street, Hurst, Reading
Contact: ianmclean@waitrose.com

Feb 26 **BENHS Open day**
Venue: Pelham-Clinton Building, Dinton Pastures Country Park, Davis Street, Hurst, Reading
Contact: ianmclean@waitrose.com

Mar 3 **The Second Insect Film Festival, Rowland Levinsky Building, Plymouth University**
Doors open at 11.00am. Films include Miniscule, Small Talk Diaries, James & the Giant Peach. Also the Beetle Queen Concurs Tokyo and the Fly. Tasty treats from Peter Gorton in the Ento Café, music from Café concrete and a host of stands and activities.
Information available from Peter Smithers ,email psmithers@plynouth.ac.uk

Hemipterists' Day
Venue: Pelham-Clinton Building, Dinton Pastures Country Park, Davis Street, Hurst, Reading
Contact: ianmclean@waitrose.com

Mar 6 **Aberdeen Entomological Club**
Phenological changes in the insect world – Gabor Pozsgai, The James Hutton Institute
Venue: The James Hutton Institute, Aberdeen
Contact: Jenni Stockan jenni.stockan@hutton.ac.uk

Mar 10 **Ground Beetle (Carabidae) identification workshop**
Venue: Pelham-Clinton Building, Dinton Pastures Country Park, Davis Street, Hurst, Reading
Contact: ianmclean@waitrose.com

Mar 11 **BENHS Open day**
Venue: Pelham-Clinton Building, Dinton Pastures Country Park, Davis Street, Hurst, Reading
Contact: ianmclean@waitrose.com

Mar 17 **BENHS Annual General Meeting and Presidential Address**
Venue: University Museum of Natural History, Parks Road, Oxford
Contact: ianmclean@waitrose.com

BMIG Annual Field Meeting and AGM will be held in March-April 2012. Please consult the BMIG web site for details (http://groups.google.com/group/bmigroup/web/index-2).

Mar 24 **Sawfly identification workshop**
Venue: Pelham-Clinton Building, Dinton Pastures Country Park, Davis Street, Hurst, Reading
Contact: ianmclean@waitrose.com

Mar 25 **BENHS Open day**
Venue: Pelham-Clinton Building, Dinton Pastures Country Park, Davis Street, Hurst, Reading
Contact: ianmclean@waitrose.com

Mar 31 **Starting Aculeates**
Venue: Pelham-Clinton Building, Dinton Pastures Country Park, Davis Street, Hurst, Reading
Contact: ianmclean@waitrose.com

Apr 21 **Identifying Ichneumonidae workshop**
Venue: Pelham-Clinton Building, Dinton Pastures Country Park, Davis Street, Hurst, Reading
Contact: ianmclean@waitrose.com

Apr 22 **BENHS Open day**
Venue: Pelham-Clinton Building, Dinton Pastures Country Park, Davis Street, Hurst, Reading
Contact: ianmclean@waitrose.com

May 12 One day BENHS Regional Meeting
Breckland Invertebrates
Venue: Elveden, Thetford, Norfolk
Contact: ianmclean@waitrose.com

May 13 BENHS Open day
Venue: Pelham-Clinton Building, Dinton Pastures Country Park, Davis Street, Hurst, Reading
Contact: ianmclean@waitrose.com

June 10 BENHS Open day
Venue: Pelham-Clinton Building, Dinton Pastures Country Park, Davis Street, Hurst, Reading
Contact: ianmclean@waitrose.com

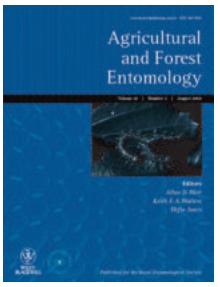
July 7 Capturing Coleoptera
An exhibition that examines the way that beetles have been presented and perceived. Plymouth City Museum 7th July to 7th September. More information is available from Jan freedman (Curator of Natural History). Jan.Freedman@plymouth.gov.uk or psmithers@plymouth.ac.uk

July 8 BENHS Open day
Venue: Pelham-Clinton Building, Dinton Pastures Country Park, Davis Street, Hurst, Reading
Contact: ianmclean@waitrose.com

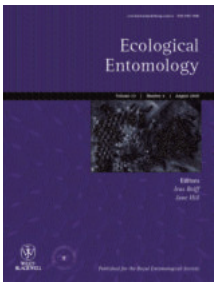
July 23 -29 Combined Annual Meeting of the Lepidopterists' Society and the Societas Europaea Lepidopterologica
Venue: Denver Museum of Nature & Science, Denver Colorado, U.S.A
Registration opens from December 2011

Sep 3-5 Hedgelink's first International Symposium on Hedgerow Ecology, Conservation and Management 'Hedgerow Futures'
Venue: Staffordshire University, Stoke-on-Trent, UK.
Contact: Dover j.w.dover@staffs.ac.uk

Publications of the Royal Entomological Society

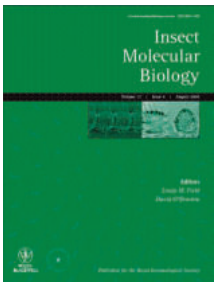


Agricultural and Forest Entomology provides a multi-disciplinary and international forum in which researchers can present their work on all aspects of agricultural and forest entomology to other researchers, policy makers and professionals.
2012 print or online prices: UK £625, Euroland €1,311, USA $1,908, Rest of World $2,225
2012 print and online prices: UK £719, Euroland €916, USA $1,331, Rest of World $1,551

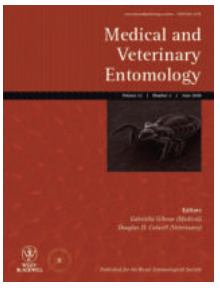


Ecological Entomology publishes top-quality original research on the ecology of terrestrial and aquatic insects and related invertebrate taxa. Our aim is to publish papers that will be of considerable interest to the wide community of ecologists.
2012 print or online prices: (with Insect Conservation and Diversity) UK £1,031, Euroland € 1,311, USA $1,908, Rest of World $2,225
2012 print and online prices: UK £1,186, Euroland € 1,508, USA $2,195, Rest of World $2,559

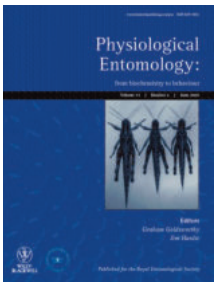
Insect Conservation and Diversity explicitly associates the two concepts of insect diversity and insect conservation for the benefit of invertebrate conservation. The journal places an emphasis on wild arthropods and specific relations between arthropod conservation and diversity.
2012 print or online prices: UK £625, Euroland €797, USA $1,157, Rest of World $1,349
2012 print and online prices: UK £719, Euroland €916, USA $1,331, Rest of World $1,551



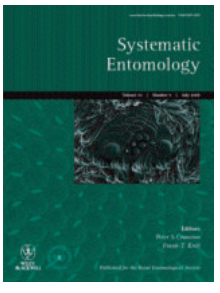
Insect Molecular Biology has been dedicated to providing researchers with the opportunity to publish high quality original research on topics broadly related to insect molecular biology since 1992. *IMB* is particularly interested in publishing research in insect genomics/genes and proteomics/proteins.
2012 print or online prices: UK £1,043, Euroland €1,324, USA $1,928, Rest of World $2,248
2012 print and online prices: UK £1,199, Euroland €1,524, USA $2,217, Rest of World $2,585



Medical and Veterinary Entomology is the leading periodical in its field. The Journal covers all aspects of the biology and control of insects, ticks, mites and other artropods of medical and veterinary importance.
2012 print or online prices: UK £600, Euroland €765, USA $1,111, Rest of World $1,297
2012 print and online prices: UK £690, Euroland €880, USA $1,279, Rest of World $1,492



Physiological Entomology is designed primarily to serve the interests of experimentalists who work on the behaviour of insects and other arthropods. It thus has a bias towards physiological and experimental approaches, but retains the Royal Entomological Society's traditional interest in the general physiology of arthropods.
2012 print or online prices: UK £553, Euroland €704, USA $1,023, Rest of World $1,194
2012 print and online prices: UK £634, Euroland €810, USA $1,177, Rest of World $1,373



Systematic Entomology encourages the submission of taxonomic papers that contain information of interest to a wider audience, e.g. papers bearing on the theoretical, genetic, agricultural, medical and biodiversity issues. Emphasis is also placed on the selection of comprehensive, revisionary or integrated systematics studies of broader biological or zoogeographical relevance.
2012 print or online prices: UK £996, Euroland €1,267, USA $1,844, Rest of World $2,151
2012 print and online prices: UK £1,145, Euroland €1,458, USA $2,120, Rest of World $2,475

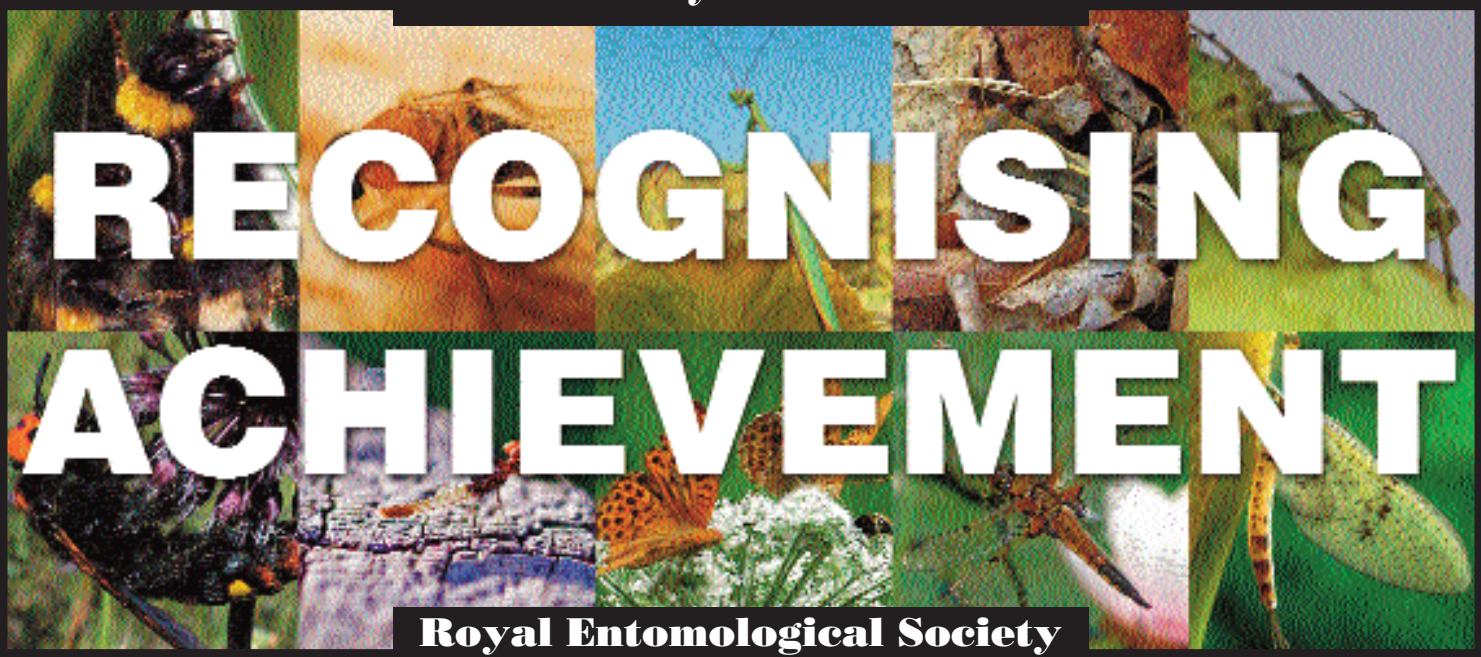
Subscriptions and correspondence concerning back numbers, off-prints and advertising for the seven principal journals of the Society should be sent to the publishers, Wiley-Blackwell Publishing Ltd, 9600 Garsington Road, Oxford OX4 2DQ. (customerservices@blackwellpublishing.com)

Antenna (Bulletin of the Society). Free to Members/Fellows. Published quarterly at an annual subscription rate of £40 (Europe), £42 (outside Europe), $70 (United States). This journal contains entomological news, comments, reports, reviews and notice of forthcoming meetings and other events. While emphasising the Society's affairs, *Antenna* aims at providing entomologists in general with a forum for their views and news of what is going on in entomology. Subscriptions and advertising enquiries should be sent to the Business Manager at The Mansion House, Chiswell Green Lane, Chiswell Green, St. Albans, Hertfordshire AL2 3NS and any other enquiries to the Editors.

Handbooks for the Identification of British Insects. This series now covers many families of various Orders. Each Handbook includes illustrated keys, together with concise morphological, bionomic and distributional information. A full list of Handbooks with order form is available. See website www.royensoc.co.uk

Symposia. Nos. 1-3 were published by the Society; Nos. 4-10 by Blackwell Scientific Publications: Nos. 11-17 by Academic Press and No. 18 by Chapman & Hall, No. 19 by Kluwer, No. 20, 21, 22 and 23 by CABI.

www.royensoc.co.uk



Royal Entomological Society – Society Awards –

For more details on these Society Awards please see www.royensoc.co.uk

THE ROYAL ENTOMOLOGICAL SOCIETY STUDENT AWARDS

Award Criteria: Any article about an Entomological topic that would be of interest to the general public. The article to be easy to read, in a popular style and no longer than 800 words.

Prize: Winner £300, runner up £200, third place £100, all three articles published in *Antenna*.

RES JOURNAL AWARDS SCHEME

Award Criteria: The best paper published in each Society Journal over a two year period. Each of the Society Journals participate biennially.

Prize: £500 and Certificate for each participating Journal.

THE LJ GOODMAN AWARD FOR INSECT BIOLOGY

Award Criteria: For advancing the education of the public in the knowledge, understanding and appreciation of all aspects of Insect Physiology, thereby promoting the control and conservation of insect species.

Prize: £1,000, also additional awards may be given.

THE MARSH AWARD FOR INSECT CONSERVATION

Award Criteria: For an outstanding contribution to Insect Conservation; on the basis of 'Lifetime Achievement', or 'Considerable and Exemplary Contribution' to a significant project or undertakings. In exceptional circumstances two prizes may be awarded to reflect each criterion.

Prize: £1000 and Certificate.

POSTGRADUATE AWARD: THE ALFRED RUSSEL WALLACE AWARD

Award Criteria: For post-graduates who have been awarded a PhD, whose work is considered by their Head of Department to be outstanding. The research involved should be a major contribution to the Science of Entomology.

Prize: £750 plus Certificate, plus one year's free Membership. The winner will also be invited to present their work at a Society Meeting.

JO WESTWOOD MEDAL – AWARD FOR INSECT TAXONOMY

Award Criteria: The best comprehensive taxonomic work on a group of Insects, or, related Arthropods (including terrestrial and freshwater Hexapods, Myriapods, Arachnids and their relatives). Typically, this will be a taxonomic revision or monograph.

Prize: A specially struck silver gilt medal inscribed with the winners name. Also costs incurred in attending the International Congress of Entomology, European Congress of Entomology, or other major meeting (specified by the Adjudicators) to present his/her work.

THE WIGGLESWORTH MEMORIAL LECTURE AND AWARD

Award criteria: The outstanding services to the science of Entomology. The award will be made to a researcher who has contributed outstanding work to the science and who best reflects Sir Vincent Wigglesworth's standards of personal involvement in every aspect of his/her research.

Prize: A specially struck gilt medal inscribed with the winners name. Also the costs of attending the International Congress of Entomology to give the Wigglesworth Lecture.

BOOK PURCHASE SCHEME FOR FELLOWS AND MEMBERS IN DEVELOPING COUNTRIES

Award Criteria: To provide assistance in purchasing specialist Taxonomic books, that will assist in the identification of Insect groups being studied in developing countries and their regions. Applicants will be required to demonstrate need and specify particular texts.

Prize: Any one applicant may be awarded up to £200 in a three year period. The Society will purchase the texts awarded and send them to the applicant. The applicants may, themselves, provide any additional funds in excess of the amount awarded.

OUTREACH AND CONFERENCE PARTICIPATION FUNDS

Award Criteria: ORF: Grants to support activities which further the Society's aims. This may range from, help to purchase equipment, to help in funding expeditions/meetings. CPF: Grants to assist applicants who are participating in a meeting or conference in some way, e.g. presenting a paper/poster.

Prize: ORF: Monetary grant. CPF: Monetary grant.

MARSH AWARD FOR EARLY CAREER ENTOMOLOGIST

Award Criteria: For an early career contribution to Entomological Science (up to 30 years of age, or, in the early stage of a research career) that is judged to be outstanding or exemplary with single or ongoing impact on the science. The Award is 'open' and not restricted to any particular discipline or specialised area of entomological science.

Prize: £1000 and Certificate

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www.royensoc.co.uk

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