

antenna



**THE ANT COURSE IN AFRICA
SMART ENTOMOLOGY**

meetings of the society

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

2013

- Oct 10 **RES sponsored Wallace 100 lecture**
Venue: Natural History Museum
Dr Tom Fayle on "*Wallace's legacy to biogeography and conservation biology*"
- Oct 16 **Climate Change Special Interest Group**
Venue: Rothamsted Research, Harpenden
Convenors: Richard Harrington, Howard Bell
- Oct 23 **Joint Aquatic Insect / Insects and Sustainable Agriculture Special Interest Groups**
Venue: Newcastle University
Convenors: Jenni Stockan, Craig McAdam, John Holland
- Oct 24-25 **Irish Regional Meeting**
Venue: Dublin Botanic Gardens, Glasnevin
Convenors: Eugenie Regan, Brian Nelson, Archie Murchie
- Nov 6 **Orthoptera Special Interest Group**
Venue: Natural History Museum
Convenor: Bjorn Beckmann
- Nov 14 **South-East Regional and East Malling Centenary Meeting**
Venue: East Malling Research, Kent
Convenors: John Badmin, Jerry Cross
- Dec 5 **Northern Regional Meeting joint with Medical Veterinary Entomology Special Interest Group**
Venue: Northumbria University, Newcastle upon Tyne
Convenors: David George, Prof. Steve Torr

2014

- Jun 23-29 **National Insect Week**
- Aug 2-8 **European Congress of Entomology**
Venue: University of York, Heslington, York

2015

- Sept 2-4 **Ento' 15 Annual Science Meeting and International Symposium**
Insect Ecosystem Services
Venue: Trinity College Dublin
Convenors: Drs Jane Stout, Olaf Schmidt, Archie Murchie,
 Eugenie Regan, Stephen Jess, Brian Nelson

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COVER PICTURE

Heather Campbell with a male army ant (Dorylini) © Heather Campbell

antenna

Bulletin of the
Royal Entomological Society

The Royal Entomological Society
The Mansion House,
Chiswell Green Lane, Chiswell Green,
St. Albans, Hertfordshire AL2 3NS
E-mail: antenna@royensoc.co.uk

Editors:

Peter Smithers
(University of Plymouth)

and

David R. George
(Northumbria University)

Editorial Assistant:
Jennifer Banfield-Zanin
(Imperial College, London)

Consulting Editor:
Prof Jim Hardie

Assistant Editors:
Duncan Allen (Diary), Adam Hart (Outreach)

Business Manager: Registrar

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The Royal Entomological Society

The Mansion House, Chiswell Green Lane,
Chiswell Green, St. Albans, Hertfordshire AL2 3NS.
Tel: 01727 899387 • Fax: 01727 894797
E-mail: info@royensoc.co.uk

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EDITORIAL



The comets that I alluded to in my first editorial of the year may have been coincidental, but a year of change and the unexpected it is certainly proving to be. As Dick Vane-Wright takes to the stage in the company of Blues musicians, here at *Antenna* we welcome a new team on board.

As you will have seen from the last edition changes have taken place here at *Antenna* as Greg Masters has stepped down after many years of distinguished service. I would like to offer our thanks and good wishes to both Greg as departing editor and to Vanja Cvetanovic who was editorial assistant for many years. We wish them both well for the future.

As a result I would like to offer a very warm welcome to the new team; David George as the new co-editor and Jennifer Banfield-Zanin as editorial assistant. I hope they will derive as

much fun and enjoyment from their roles as I have over the years. With new colleagues come new ideas so watch this space.

Dick Vane-Wright reports on an evening of entofusion, mixing the Lycenidae with some delta blues at a fundraising event in which he shared the stage with musical legends, Brendon Power (harmonica) and Charlie Grima (keyboard).

Biodiversity is a theme that permeates this issue, with a history of the Checklist of Irish insects from J. P. O'Connor. Alexander Hays reviews of some of the smart tools and solutions that are being developed to speed up the assessment of insect diversity and ecology and tentatively explores the role of citizen science in this area.

Exploring diversity in Africa, Heather Campbell and Claudia Grey relive the excitement of Brian Fisher's famous Ant Course held in Uganda, where sociality is not confined to the ants. Hugh Loxdale gives an account of the life of Fred Merifield, a real boys' own hero and entomologist who worked in West Africa observing insects amongst other things. Hugh also provides a fascinating account of a mass emergence of mayflies in Bavaria.

We also have reports from the Verrall supper, the parasitoid SIG and news from Janine Heath that the UK's last remaining professor of entomology is alive and well. Plus all the normal society news and updates. We hope the diversity of themes in this edition will keep you entertained and informed during these long evenings and wish you all an excellent autumn.

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

CORRESPONDENCE

Ladybird Research

An Italian postgraduate student has fuelled his passion for insects by spending three months researching ladybirds at Harper Adams University.

Maurizio Benelli, from Rome, is studying Plant Protection at the University of Bologna. Previous to this, he gained a degree in Agricultural Sciences and Technologies at Tuscia University in Viterbo.

He arrived at Harper Adams, in Shropshire, in May and was given the task of conducting field and laboratory experiments on the Asian ladybird *Harmonia axyridis* - an invasive species across Europe.

The 25-year-old, said: "During my time at Harper Adams, I tested the hypothesis that the invasiveness of this particular species of ladybird may be due to its higher resistance to pesticides, when compared to native species such as the two-spot ladybird, *Adalia bipunctata*.

"This work will contribute to existing studies that have shown that despite never being imported, the Asian ladybird population is rapidly spreading."

Although not being from a traditional farming background, Maurizio developed a passion for nature and agriculture throughout school. During his time at university, he began to gain an interest in insects, focusing his final research project on the importance of ladybirds to agriculture.

It is thanks to a scholarship that he was able to spend three months in England working with Professor Simon Leather and the entomology team at Harper Adams.

Making the most of his time on campus, Maurizio has helped at open days and school visits, demonstrating the importance of insects to children. He has also completed an English training course and spent time travelling around the United Kingdom.



Maurizio, added: "I'm extremely pleased with what I have achieved at Harper Adams and would like to thank everyone for the support and making me feel welcome.

"I have met incredible people from all over the world and can say that I now feel even more open-minded."

Maurizio is now returning to Italy to complete his degree, after which he intends to apply for a PhD and continue his work with insects.

He added: "It seems like everything I have been doing has led me to work in entomology and I'm so proud of my choice.

"Harper Adams has definitely given me even more motivation. My mission is to become part of the next generation of researchers, demonstrating that insects aren't to be feared, they are amazing animals on our planet."

Janine M. Heath
Acting Communications Manager,
Harper Adams University

Tyranny of Publishers

Dear Howell,

Many thanks for taking the trouble to write-in to *Antenna* (Vol. 37 (1), page 3) regarding the above.

Regarding your notion of forming a consortium of libraries to take over the publication of journals. It's unlikely that could be done 'for free'. Libraries also have costs and among those are the maintenance of their buildings and staff salaries. If we went down the route you are suggesting, I think we would simply transfer the costs from publishers to become substantial additional costs to libraries which would then have to be borne by them. The libraries would need to recoup their costs which would be passed-on, with probably no net saving compared to using publishers. In fact, we have a very fair profit-sharing deal with our publishers (Wiley-Blackwell Publishing Ltd.) which I doubt could be bettered.

Regarding your second point about our decision to unsubscribe to certain journals. You are dead right in saying that we are in a much stronger financial position than many

societies. That did not happen by accident. It is the result of prudence by a succession of treasurers and more especially the diligence and foresight of our current Registrar and the efforts of our Publications Committee and Editors in deriving our major income stream. As part of the general prudence and good housekeeping that the Society exercises the Library Committee spent a considerable amount of time reviewing and updating the list of journals we subscribe to. Three journals, which together cost over £6k per year, had not been referred to for over six years and it would have been madness to continue pouring that sort of money into publications that no-one requested. We can use the money much more wisely elsewhere, which as it happens includes doing much as you suggest in buying minor publications and supporting them.

Thanks again for your letter. I hope the above explains the situation more fully.

R O Clements
Chairman of Library Committee

FSC Young Darwin Scholars



In 2012 the Field Studies Council (FSC) launched the Young Darwin Scholarship (YDS) to provide encouragement, support and opportunities for 16 and 17 year olds who have a real passion for the natural world – the Darwins of the future. Fifteen Scholarships were awarded bringing together a group of young people from different areas of England and Wales with differing levels of expertise; from

the curious generalist, to the budding wildlife film-maker and the 16 year old whose passion for moths enables him to identify micro moths to species level. All had one thing in common: their willingness to explore, investigate, observe and find out more.

All 'Young Darwins' attended an introductory residential 'What Would Darwin Do Today' at FSC Preston Montford in August 2012. Over the five days the young people followed in Darwin's footsteps exploring parts of Shropshire, including Shrewsbury and the Stiperstones, and journeying by canoe along a section of the River Severn. Throughout the course they observed habitats, geology and landforms, identified plants and animals and developed their skills and knowledge to understand more about the natural world. Spending a whole day on Preston Montford Estate gave them a chance to work with expert botanists and entomologists who helped and encouraged observation and identification skills – this was enjoyed by both the scholars and the experts. A course species list was compiled resulting in over 126 entries with around half being invertebrates (many to species level).

"The YDS was seriously one of the most enjoyable courses ever. Being given the chance to speak to and get taught by experts in their fields was extremely inspiring, as was meeting a mixture of people of similar ages who have linked interests. Thanks FSC for an experience I'm sure none of us will forget!" Abbie Barnes, Young Darwin Scholar 2012.

The long term aim of the YDS is to provide opportunities for training and support on an ongoing basis during the period when young people make life and career choices – ideally until they reach the age of 25. A visit to the Angela Marmont Centre for UK Biodiversity at The Natural History Museum in the spring was an opportunity for the Young Darwins to



YDS Freshwater Identification.



YDS Sweep net.



YDS Looking at collections with Florin Feneru.

learn about the wide ranging work of the Museum and see some of the collections not open to the public. Staff shared details of how their careers had developed, providing useful food for thought as the Scholars approach university and other career choices.

"The NHM tour was a brilliant opportunity to meet up with the other Young Darwin Scholars and have a unique look at one of the country's' greatest naturalist hotspots." Josh Evans, Young Darwin Scholar 2012.

Due to the generous support of Royal Entomological Society, BSBI, Trust Funds and donations from FSC Members, a further 15 scholarships will be awarded in 2013. From the applications received it is clear to see that once again in 2013 there are inspiring and enthusiastic young people, with extensive knowledge and interest for their years, who wish to grasp this opportunity.

As FSC celebrates its 70th Anniversary it is reassuring to look back and see that we are true to our founder's vision of enabling "children to study living plants and animals in their natural environment". As the Scholarship develops over the coming years we hope that the forthcoming 'generations' of Young Darwin Scholars will go some way towards providing knowledgeable and skilled individuals who can play an important part in the future of the environmental sector, both in the UK and worldwide.

You can find out more about the scholarship and watch a short film made by the Young Darwins at www.field-studies-council.org/yds

Cathy Preston

Professor Simon Leather at Harper Adams University



The UK's only Professor of Entomology, Professor Simon Leather, welcomed friends, colleagues and invited guests to attend an inaugural lecture at Harper Adams University recently.

Professor Leather was welcomed to the university in Shropshire last year, to head up a new suite of courses and associated research in the fields of entomology and integrated pest and disease management.

He is a member of the Royal Entomological Society Council and is on the Steering Advisory Group of the Environmental Change Network. He is also a Fellow of the Royal Entomological Society and holds professional memberships of the Association of Applied Biologists, Society of Biology, Fauna and Flora Preservation Society, and British Ecological Society.

Since joining Harper Adams in September, Professor Leather has soon become a respected member of the academic community, enhancing the established foundations of the Crop and Environment Sciences Department.

Professor Leather and the team have fast settled into life at Harper Adams, with recruitment for the September intake of the entomologists of the future already appearing favourable.

The lecture – a celebratory event that shares past achievements and future aspirations, took place in the Regional Food Academy on campus and welcomed past and present colleagues, friends, family and influential figures from industry.

Commenting on the occasion, Professor Leather, said: "I was of course delighted to become the UK's only Professor of Entomology, here at Harper Adams University.

"I have never found it that easy to blow my own trumpet, so the thought of standing in front of an audience and doing just that was a little daunting to say the least.

"I do, however, feel that one should always take the opportunity to publicize entomology when possible, so agreed to do so."

During his presentation, Professor Leather told of his journey, beginning with his first experience of biology when he was only three years old.

He shared with the audience how his interest in entomology had developed during his university days and early research projects.

Professor Leather highlighted the results of various projects that had been completed during his career, including collaborations with academics across the country and work for the Forestry Commission.

He outlined his current research projects and collaborations, as well as his thoughts for the future - including the newly created Centre for Integrated Pest Management at Harper Adams.

This Centre is a multidisciplinary team addressing UK and global issues in agricultural, forestry and horticultural crop production with active research interests in entomology, chemical ecology, pest monitoring, application technology, nematology, pesticides, plant pathology and weed science.

To conclude, Professor Leather gave thanks to everyone that had contributed to his career thus far, and his friends and family for their support.

Janine M Heath
Acting Communications Manager
Harper Adams University

The Butterfly House Industry

Dear Sir

I was interested to read (Correspondence, *Antenna* 37(1), your comments concerning the recent paper by Michael Boppré and Dick Vane-Wright about "The Butterfly House Industry" (BHI).

Readers of *Antenna* may also like to know that the latest (second) edition of the book "Invertebrate Medicine" edited by G. A. Lewbart (published by Wiley-Blackwell in December 2011) includes a chapter on butterfly houses by John E Cooper (UK) and Daniel Dombrowski (USA). Other publications relevant to the subject, some published a few years ago, are cited in the book "The Management and Welfare of Invertebrates in Captivity" that was edited by N.M. Collins and published in 1990 by the National Federation of Zoological Gardens of Great Britain and Ireland, now BIAZA.

Boppré and Vane-Wright were, on their own admission, unaware of the chapter on butterfly houses in "Invertebrate Medicine" until they had completed their paper. The two publications should, therefore, make complementary reading for those interested in the complex issues and dilemmas raised by the BHI. A particular feature of the Cooper and Dombrowski chapter is discussion of the health and diseases of the insects that are kept in butterfly houses and similar establishments – an aspect that has attracted relatively little attention elsewhere.

Yours faithfully
John E Cooper FRES

ARTICLE



Fig. 1a (main photo). Evening view of the Canal parallel with the River Wertach, Augsburg, c. March-April, 2012; Fig. 1b. Caddisflies settling on the sides of one of the bridges along the Canal in Augsburg; Fig. 1c and Fig. 1d. Closer view of caddisflies on bridge inner walls, 10th April, 2012. Photos: HDL

A bridge too far... at least for Caddisflies and Mayflies

Hugh D. Loxdale¹,
Nicola von Mende-Loxdale²
& **Craig MacAdam**³

¹ Royal Entomological Society,
The Mansion House,
Chiswell Green Lane,
St Albans, AL2 3NS, UK.
Loxdale@web.de

² Brambleby Books Ltd,
c/o, The Mansion House,
Chiswell Green Lane,
St Albans, AL2 3NS, UK.
Info@bramblebybooks.co.uk

³ Scotland Director, Buglife -
The Invertebrate Conservation Trust,
Balallan House, 24 Allan Park,
Stirling, Scotland, FK8 2QG, UK.
Craig.MacAdam@Buglife.org.uk



Last Spring (2012), my wife Nicola and I witnessed a most amazing sight. At around 6.00pm on Tuesday, 10th April, we were taking our daily late afternoon walk southwards along the towpath by the canal parallel to the River Wertach on the southwest edge of Augsburg in Bavaria, Germany (48.36° N, 10.89° E; Fig. 1a). The air temperature was quite warm, probably around 20°C, after a recent cold spell following on from the March heat wave of a few weeks back. Suddenly Nicola noticed huge numbers of flying insects near the surface of the water, sometimes appearing to dance under the branches of nearby trees. At first I thought they might be moths (like *Adela* spp., Family Adelidae), but as I saw on close inspection they were caddisflies (Order Trichoptera). They formed a vast throng (millions of individuals) slowly flying upstream in a south-westerly direction, maximally about a few metres above the water's surface, only being largely halted by bridges, which seemed to confuse their movements, although many of the insects nevertheless poured up and over the top of the bridges or went under them to continue on their way. They seemed to be using the light reflecting from the water surface as a migration cue. At one point, as the light faded with the approach of dusk, vast masses of individuals settled on the lower surface of the white painted stonework near one of the bridges or on the stonework bordering the canal nearby, we assumed to roost. We took photos of this phenomenon (Figs 1b-d).

I e-mailed Craig at Buglife on the 11th April 2012 and he replied later that same day to the effect that this is a well-known phenomenon with *Brachycentrus subnubilus* Curtis (Trichoptera: Brachycentridae, Fig. 2), which he thought the insects probably were, known colloquially in the UK as 'The Grannom'. He also said that the question of bridges blocking such 'migrations' upstream of aquatic species was discussed recently in a paper relating to giant mayflies, *Palingenia longicauda* Olivier (Ephemeroptera: Palingeniidae, Fig. 3a and b) by Málnás *et al.* (2011; see

below). I replied by e-mail on the 12th April, and sent him a couple of voucher specimens to confirm the identity of the species. He then replied on the 11th May to say that they definitely were Brachycentridae. He also went on to say 'There are a number of European species in this family. However, your specimens look very similar to *Brachycentrus subnubilus* which is also found in the UK. In addition, the swarming behaviour described is, as I mentioned before, a well-known phenomenon in this species in the UK. I'm not sure however whether other species swarm in such high numbers.'

According to Eutaxa.com (see websites), this species '...is mainly distributed in Northern and Western Europe; the spreading area includes Scandinavia, East- and North-Russia, Western Europe with the British Islands, the Iberian Peninsula, Central Europe, Italy and the northern Balkans.'

In terms of its habitat, life cycle and nutrition, the same website states that the aquatic stages develop in 'large rivers and streams in lower regions and can even be found in brackish water. The larvae require 'moderate current and structures to attach the case to, for they filter particles from the water stream with their second and third legs.' Merritt & Wallace (1981) give a detailed description of the feeding behaviour of *Brachycentrus*-larvae, whilst the adults are present from March to June (Waringer & Graf, 1997). Also of interest is the observation that this species is vicariating with *B. montanus* Klapalek' [i.e. which I assume means that it replaces this species in a given region].

In reference to the giant mayfly, *P. longicauda* (Fig 3a,b), which as aforementioned also shows bridge-inhibited flight behaviour, the entry for Wikipedia states that this insect is known as the 'Tisa or Tisza mayfly after the European Tisza river [Central Europe; see websites] where it is found and also as the long-tailed mayfly and giant mayfly since it is the largest mayfly species in Europe, measuring 12 cm (5 in) from head to tail.' The article also relates that unlike most mayflies,



Fig. 2. The Grannom, *Brachycentrus subnubilus*

Photo: Henrik Stenholt (<http://www.fugleognatur.dk>)



Fig 3a. Europe's largest mayfly, the giant mayfly, *Palingenia longicauda* (Photo: www.riverfly.co.uk): Fig. 3b. (inset) *P. longicauda* swarming (Photo: cabinetoffreshwatercuriosities.com)

adult *P. longicauda* 'never leave the water; their cerci are constantly touching or sweeping the surface. The slow-moving river and absence of surface-feeding fish help make this possible. The presence of *P. longicauda* is an indicator of clean unpolluted water. Now extinct in many European countries, it can be found in Serbia and Hungary on the Tisza river, as well as in Romania, on the Prut and in the lower Danube basin.'

The paper by Málnás *et al.* (2011) describes the interesting life cycle of this species. This includes the fact that 'After mating, masses of females fly up to 3–4 km upstream 5–15 m above the river midline. This "compensation flight" presumably serves to compensate for the river flow so that eggs reach the site where females emerged and for the larval drift that occurs during the aquatic life. At the end of the compensation flight, females lay their eggs into water. Some females (up to 50%) do not copulate with males, and their eggs develop parthenogenetically. Because the male is the heterogametic sex in mayflies, unfertilized eggs develop into female larvae.' The authors further state that field experiments by Kriska *et al.* (2007) 'suggest that *P. longicauda* has water-searching and water-following flights. In the former, mayflies fly up to heights of 15–30 m in search of horizontally polarized light signals. This flight can be observed only if the mayflies are captured and released on the riverbank. *Palingenia longicauda* shows positive polarotaxis, similarly to other mayfly species and aquatic insects in general. Mayflies receive the polarized light signals reflected from the water surface by their ventral polarization-sensitive eye region and identify water by exactly or nearly horizontally polarized light.....When mayflies approach surfaces reflecting weakly polarized or vertically polarized light, such as water surfaces shaded by the riverbank vegetation, they suddenly turn back towards the river midline.' (see Málnás *et al.*, 2011 for further details and other references cited therein).

In the study, the authors documented mayfly swarming on the river Tisza at the bridge between Kisar and Tivadar villages in Hungary (48°03'N, 22°31'E) on 25 June 2009, recording the mass-swarming flight of the insect on video sequences on both sides of the bridge. As they state in the Abstract of their

published paper: '...upon approaching the bridge, upstream-flying mayflies typically turned back and 86% of them never crossed the bridge. Lack of physical contact showed that the bridge was an optical, rather than a mechanical barrier for the polarotactic mayflies. Imaging polarimetry revealed that the bridge disrupted the horizontally polarizing channel guiding the flight of mayflies flying above the river. Energy loss, demonstrated by calorimetry, and time constraints forced females to lay eggs only downstream from the bridge. Counts of larval skins shed by swarming individuals showed nearly 2 to 1 females per male downstream from the bridge, while the sex ratio above the bridge was slightly male-biased.' From this, the authors suggest that the excess of parthenogenetic females (which produce only female larvae) downstream from the bridge may have led to the observed sex-ratio bias since the construction of the bridge in 1942. They conclude that bridges can act as optical barriers for aquatic insects which may cause population-level impacts in natural populations, for example, biased sex ratios, and that this may have decreased the effective population size and genetic variability of the insects, in turn contributing to the recent decline of the species over much of mainland Europe.

Discussion

Personally, I (HDL) think it is a bit of an overblown statement by Málnás *et al.* (2011) that by distorting sex ratio bridges are likely to decrease effective population size and hence genetic variability, in turn contributing to the widespread extinction of the species from most of Europe. Nevertheless, it may well have some effect of population densities, survival and hence genetic structuring (in this context and in relation to mayflies and especially caddisflies, see for example, Kelly *et al.*, 2001; Smith & Collier, 2001 and Wilcock *et al.*, 2007). Probably, pollution of rivers by agricultural run offs (fertilizers and pesticides) is more likely to have an effect, along with changing the nature of the flow speed of rivers, perhaps by bridges and locks and such like physical impediments, thereby influencing the insect's fundamental physiology, behaviour and ecology.

Either way, it is certainly impressive that bridges may significantly influence

the aerial movement of migrating mayflies (see also Blakely *et al.*, 2006) and with the caddisfly, *B. subnubilus*, an aquatic species from a totally different Order of insects (Trichoptera vs. Ephemeroptera). Both are ancient groups of insects, the former going back to the Triassic period (some 250-200 MYA), and the latter much further to the late Carboniferous (~ 359-299 MYA; Grimaldi & Engel, 2005). It is of special interest that in both disparate insect orders, which are not taxonomically closely related, physical barriers (here bridges) are certainly having a large effect on the aerial movements and dispersal of species. As with mayflies, it is likely that bridges disrupt the polarizing channel guiding the flight of the caddisflies above the river. If this is so, it means that a common physiological mechanism occurs in two very different insect taxa. This in turn argues that the fundamental physical-physiological mechanism/s guiding both mayflies and caddisflies during their movements along rivers is clearly a very ancient one, perhaps going back to some amazingly remote time in the past when they shared a common ancestor.

And what exactly do these mass flights represent? Probably they are, as with the giant mayfly, nuptial flights in which the sexes meet and mate, and the females then lay eggs in new regions which may have more in terms of resources than those vacated *en masse*. The weather in the early Spring of last year was very odd: several weeks of very warm, dry weather, then a cold snap in late March, following on from a severe winter (2011/12, especially for the period ~ 27 January - 10 February 2012; see websites). This may well have contributed to the favourable conditions allowing such a mass emergence event and accompanying dispersal (the hatches of many of these early aquatic insects are thought to be governed by day length rather than temperature). Certainly, the mass emergence/dispersal is a rare event and we (HDL/NL) have not seen anything like this prior to this occasion, either in Germany or the UK, although I (HDL) did see a weaker movement of swarming *B. subnubilus* this April (25th), i.e. with very much fewer individuals, at the same bridge on the canal running parallel to the River Wertach, and with the same confusion of individuals and mass settling on the bridge walls and concrete-lined canal

banks. This smaller emergence and migration follows on from a very severe winter here (as in the UK and much else of Europe), March 2013 being the coldest ever recorded in Germany, which may well account for the reduced adult caddisfly numbers.

Such *lotic* movements (of, relating to, or living in moving water), including *mass aerial movements* as here observed, have certainly been previously reported in other species of Ephemeroptera and Trichoptera. For example, Bagge (1995) sampled larvae and winged adults and sub-adults (subimagos) of both these orders (20 spp. mayflies, 78 spp. caddisflies) in a

stream and rapids flowing out of Lake Konnevesi in Finland. In his Tables 3 and 4, he notes 11 species of both orders sampled as imagoes and subimagos using floating emergence and slit traps making short (≤ 0.2 km) or moderate (≤ 0.6 km) flights upstream and 8 species making longer flights (≥ 3 km), including *B. subnubilus* (see Bagge, 1995 for further details). The peak emergence of *B. subnubilus* in 1983 (his Table 5), a univoltine species (as indeed were all the caddisflies investigated in his study), occurred in May and June in Finland, but is probably earlier in Bavaria, especially following a warm period, as was the case in Spring 2012. Bagge cites

Müller's (1954, 1982) 'colonization cycle hypothesis' in which he proposed that stream populations are "maintained through a dynamic interplay between downstream and upstream dispersal that he called the colonization cycle. The colonization cycle is a dynamic view of stream populations in which upstream and downstream dispersal, as well as reproduction, have major influences on stream populations." (see websites). From Bagge's (1995) study in Finland in 1983, the author concludes that the prolonged upstream dispersal of egg-bearing females that he observed is supportive of Müller's hypothesis.

References

- Bagge, P. (1995) Emergence and upstream flight of lotic mayflies and caddisflies (Ephemeroptera and Trichoptera) in a lake outlet, central Finland. *Entomologica Fennica* **6**: 91-97.
- Blakely, T.J., Harding, J.S., McIntosh, A.R. & Winterbourn, M.J. (2006) Barriers to the recovery of aquatic insect communities in urban streams. *Freshwater Biology* **51**: 1634-1645.
- Grimaldi, D. & Engel, M.S. (2005) *Evolution of the Insects*. Cambridge University Press, Cambridge, U.K.
- Kelly, L.C., Bilton, D.T. & Rundle, S.D. (2001) Population structure and dispersal in the Canary Island caddisfly *Mesophylax aspersus* (Trichoptera, Limnephilidae). *Heredity* **86**: 370-377.
- Kriska G, Bernáth B, Horváth G (2007) Positive polaritaxis in a mayfly that never leaves the water surface: polarotactic water detention in *Palingenia longicauda* (Ephemeroptera). *Naturwissenschaften* **94**: 148-154.
- Málnás, K., Polyák, L., Prill, E., Hegedüs, R., Kriska, G., Dévai, G., Horváth, G. & Lengyel, S. (2011) Bridges as optical barriers and population disruptors for the mayfly *Palingenia longicauda*: an overlooked threat to freshwater biodiversity? *Journal of Insect Conservation* **15**: 823-832.
- Merritt, R. W. & Wallace, J.B. (1981) Filter-feeding insects. *Scientific American*. **244** : 132.
- Müller, K. (1954) Investigations on the organic drift in North Swedish streams. *Drottningholm Institute of Freshwater Research Report* **35**: 133-148.
- Müller, K. (1982) The colonization cycle of freshwater insects. *Oecologia* (Berlin) **52**: 202-207.
- Smith, P.J. & Collier, K.J. (2001) Allozyme diversity and population genetic structure of the caddisfly *Orthopsyche fimbriata* and the mayfly *Acanthophlebia cruentata* in New Zealand streams. *Freshwater Biology* **46**: 795-805.
- Waringer, J. & Graf, W. (1997) *Atlas der Österreichischen Köcherfliegenlarven*. Facultas Univeritätsverlag, Wien, pp.286.
- Wilcock, H.R., Bruford, M.W., Nichols, R.A. & Hildrew, A.G. (2007). Landscape, habitat characteristics and the genetic population structure of two caddisflies. *Freshwater Biology* **52**: 1907-1929.

Websites

- <http://www.eutaxa.com/Brachycentrus%20subnubilus.htm>
- <http://en.wikipedia.org/wiki/Mayfly>
- <http://www.nipccreport.org/articles/2012/feb/15feb2012a3.html>



CICADA: Reproduced with kind permission from Jaroslav Maly

Bits and Bugs – Making the most of Technology in Entomology



Alexander Hay

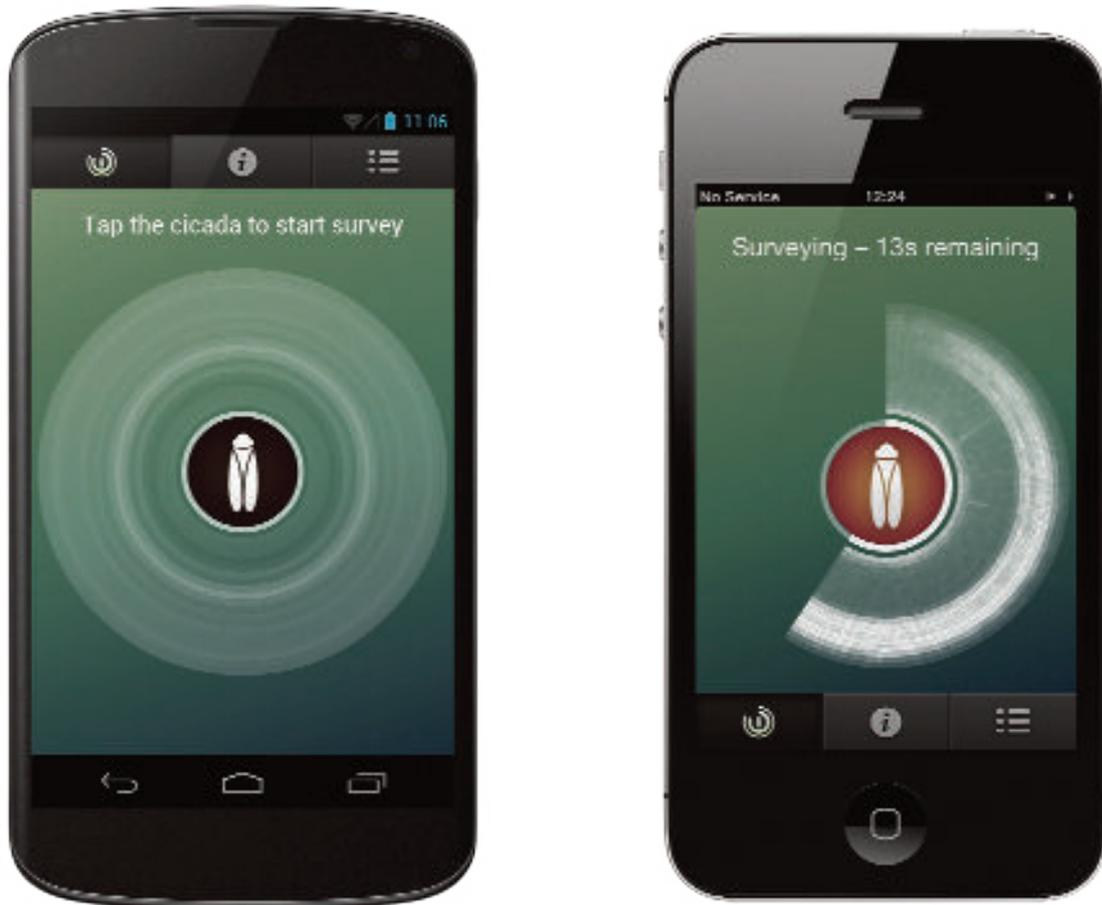
Software Sustainability Institute
www.software.ac.uk

Entomology and computing might not necessarily seem to be natural bedfellows. After all, they both often involve bugs, but not quite in the same context in either case. While many an entomologist might be fascinated to find a colony of insects in an unusual place, computer scientists may be less keen under the same circumstances, especially if it's their computer the creepy crawlies are emerging from. (Search YouTube for some horrendous videos of what happens when cockroaches set up shop in Xbox 360s, should you ever feel the need to scream in horror.)

Yet from the perspective of myself and the rest of the Software Sustainability Institute, a collaboration between the Universities of Southampton, Edinburgh and

Manchester, research as a whole can always benefit with a bit (or perhaps BITS) of microprocessing power added to the mix. It supports and advocates research software, as well as provides resources, guides and training sessions with Software Carpentry and software evaluation.

It also researches policy and organises and runs events. It supports collaborative projects and community engagement. Moreover, it has a network of fellows and agents, all academics using software in their work, to both spread the word and bring an insider's take on the computing needs of researchers. It also has a site, naturally, at www.software.ac.uk, with a blog that's always publishing material by new writers from across the disciplines. (Feel free to visit.)



APP SCREENSHOTS: Reproduced with kind permission from the the New Forest Cicada Project

Nonetheless, you may still be wondering what benefits software can bring to entomologists. As it happens, a great many. For this article, we interviewed four researchers, all involved in exciting developments where the latest technology has been used to bring new insights into the world of insects, sometimes with surprising results, in ways that bring clear benefits to the discipline and those who work within it.

A child's ear in every pocket

Davide Zilli is a second year PhD student at the University of Southampton, where he works at the Institute for Complex Systems Simulation. He also has an interest in cicadas - in particular, the New Forest Cicada (*Cicadetta montana*), which is the only native UK species. Unlike its more famous US cousins, this creature emerges every seven to eight years and its emergence is random, with some hatching every year (see also Mike Claridge's book review at the end of this issue).

There is one problem however. "It's endangered because no one has seen it in the last 20 years... the last confirmed recording dates back to 1992", Davide admits. "Some people claim that they

have heard it more recently, but there is no evidence for that."

Indeed, it's looking grim for the species. While Davide points out that "most entomologists think that there is no reason to believe it's extinct", due to the insect being in a relatively stable habitat, and that "it's hard to believe that it has vanished like this", he also points out that 21 years is a long time to not see something.

That's not to say that the species is done for. "It should be mentioned that there was a similar period in the past, between the 1940s and the 1960s, when the cicada disappeared for some 20 years, but it was found again after that." Part of the problem lies in the cicada being "very elusive, and the population is thought to have reached only about 100 individuals at its peak."

Which brings us to Davide and his Cicada Hunt app (www.newforestcicada.info), which is designed to detect the cicada's call - a long hiss, which it gives out between May and July of every year. His involvement began when his PhD supervisor, Alex Rogers, suggested he get involved with the project. Since Alex was also the primary investigator in the project, it fitted in well with Davide's aims including an on-going interest in developing apps and "an

application of computer science to the natural environment."

This is not without precedent. "Entomologists in Slovenia have taught us that updating to bioacoustic techniques made a real difference to their work", Davide says.

The app itself both records and analyses sound input on the spot, using a common machine learning technique called the Hidden Markov Model. "It runs an algorithm that we have developed and notifies the user whether there is a cicada in the proximity or not." The app also means that cicada hunters will be able to actually hear them in the first place. "The cicada call is very high pitched and difficult for most adults to hear, because it's at the edges of our hearing range. Therefore the app also visually represents the sound recorded, so that people can see what they can't hear."

In that sense, and if you'll forgive the creepy metaphor, Davide's app is very much like having a child's ear in your pocket. "Children can hear the cicada much better", Davide explains. "In some of our public engagement activities, we tested the hearing of our audience, and children can often hear all the way to 19kHz. The cicada sings mainly around 14kHz."

Since carrying around a six year old is impractical for most entomologists, Davide's app is an ideal solution. "Having the phone app is much like having a pair of good ears. On top of that, it can also show you what you've just missed, if you were distracted."

Creating the app meant dealing with some challenges. There was the issue of battery life, as the app's computational requirements were power hungry, and there was also the small matter of coding it. Davide solved this by programming the sound analysis in native platform code, whether it be Java for Android or Objective-C for iOS (which runs iPhones). "It's much more efficient and allows us to access low-level libraries", he notes. He also ensured that the app was designed with efficiency in mind, so keeping the batteries going for longer.

Davide's experiences on the project have demonstrated how useful technology can be to field researchers. "Some of the entomologists we met use very outdated techniques, and maybe they could really benefit from some of these new devices" he says. "Phones can help because they know your precise location through their GPS, the time, the weather, the temperature, and most important of all, they are connected to the Internet. They can automate simple tasks like recording the observation of a certain species by submitting a quick geo-located and time-stamped report directly to a central database, without the need to transcribe pages of paper records."

For now, Davide wants to get involved in more projects like this, and hopes someone will finally hear the New Forest Cicada once more.

Buzzing about bees

I met Microsoft researcher and ecologist Matthew Smith as he was helping run the "Technology for nature" exhibit at the 2013 Royal Society Summer Science Exhibition. The exhibit itself was a presentation by Microsoft Research, the Zoological Society of London and UCL, and was demonstrating how technology can track changes in biodiversity and the environment. It also had what could only be described as an electronic seagull.

Once we'd found a quiet place to talk, Matthew explained that the work of his group (Computational Ecology and Environmental Science, or CEES)

included understanding "ecological interactions in communities, which includes plant and animal interactions in particular." While this work is relevant to all kinds of animals, and Matthew himself is not an entomologist, it ties in with entomology care of its interest in insects visiting and pollinating flowers. CEES is also working on algorithms that acquire data on other insects, based on computer analysis of camera footage.

This has had some immediate benefits. In a recent study, CEES and the University of Cambridge attempted to recreate experiments from the 1980s on bee-flower interactions. This originally demonstrated that bees favoured certain flowers based on their colour and texture, as well as chronicling the history of other bee visitors to them.

The main difference between now and then, of course, is the amount of labour required. "You'd have people sitting there, for hours on end, recording what interactions went on. But now the technology has become sufficiently sophisticated, in terms of the algorithms and the cameras themselves, that we can now record that data autonomously. One of the projects has been recreating that experiment, but taking the human out of the loop in order to see how much of that data we can acquire by using algorithms and cameras."

Apart from the humble woodlouse (which isn't, obviously, an insect, but even carcinologists can benefit from technology), most of CEES' efforts in this regard have been focussed on bees. This is fitting, given the dire straits that bees have been going through, both in the UK and worldwide.

Matthew agrees, and sees the work of his group as a great way of keeping track of the problem and identifying it in the first place. "Anything that would allow us to acquire the relevant data and respond to it quickly would be helpful."

This means involving people from across the disciplines. CEES participated in a recent hack-a-thon amongst computer scientists and biologists "to see how they would go about developing sensors and other devices that we could put into bee hives, and get the data biologists need to answer questions as to what is going on in terms of temperature, noise, and the signals of the health of the hive."

Naturally, Matthew thinks technology can bring a great deal to entomology. That is, namely more time – as mentioned above. "Well, in terms of collecting data now, you really are able to think about the question you want to ask rather than what you are constrained to ask by your available time and resources. It's much easier to build the devices to acquire the data you need to answer the question you're asking, and for it not to break the budget. So we can now build very sophisticated, low cost devices."

Best of all, this can be DIY in nature, rather than having to buy expensive ready-made sensors or software. "Some of the things we're showing at the Royal Society are devices that you build yourself, solutions for coding them up and things like that. It is a scientific revolution right now where we really can now go for the responses and biological characteristics that we really want to get."

On the other hand, Matthew sounds a note of caution. In order to get the most out of new technology, you need to learn how to use it, and there is a possibility that the discipline will attract more tech-happy students and edge out others as a result. While costs are coming down, you will still need to stop your batteries running out and find a way to access the internet or otherwise store your data.

Also, while the technology is becoming more available, you still need to program it. "Writing the algorithm to recognise all those signals from all of the data you are collecting, that's more of a challenge and it will be a big research area for the next ten years. It might be easy to get the data and go through the footage manually, but to then get a computer to start filtering that data is a hot research area."

A solution lies in reusing and repurposing software that's already there. (Something which just so happens to be a field of endeavour close to the Software Sustainability Institute's heart and mission statement.) Once again, Cicadas emerge into the conversation, thanks to me mentioning Davide's work to Matthew earlier on. "For example, I was just thinking of detecting cicada emergence. One could imagine listening out for the buzz of these cicadas when they emerge and are in the field, and adapting algorithms designed for detecting bats by sound to detect them."

Matthew also thinks that entomology is an area that requires much more work and attention. "Insects are particularly poorly studied globally in terms of understanding their importance in eco-systems and their interactions. We know a lot of general principles as to why they are important, but having a detailed understanding has been lacking because it is so demanding conducting that research."

With technology, however, those demands are and continue to be lessened. As such, Matthew says now is a good time to go all entomological – "if scientists are wanting to have an impact in a particular area, then embracing the sorts of technology that we are developing and showcasing and applying it to big entomological questions such as changes in distributions and timing of events associated with insects around the world, it's all in their grasp now. I think it would be a very exciting career area to go for."

Bugs on film

I didn't have to go far to find my next interviewee. Matthew's colleague at Microsoft, Lucas Joppa, was also running the exhibit and wanted to talk. After we relocated to the same quiet spot, Lucas introduced himself. A lifelong nature lover, he also had a scientific interest in "just watching animals, seeing what they're doing and trying to figure out, more importantly, why they're doing what they're doing and why they are where they are." This led to his first degree in Wildlife Ecology, a two year spell as a US Peace Corps volunteer in Malawi and, finally, a PhD in Conservation Biology, undertaken in the auspicious environs of Duke University. (As you may have probably noticed, he is American.)

His current area of research is developing a new application called AMPtrack, which uses a combination of computer vision and machine learning to 'teach' hardware to identify particular species of insect and track their movements by analysing video footage. This is so "we can understand their pollination preferences, how they respond to individuals of their own species, and, probably more interestingly, individuals of other species."

Like Matthew, Lucas is also focussing on bees and testing this software. These are neatly combined in one current experiment. "At the moment, we've been looking at the Common Bumble

Bee, watching it in a box actually. We're watching it fly around a 'wooden arena' to make sure that our systems actually work in a stable environment." Well, it can't all be rock and roll.

Lucas also thinks his work will, once again, free up researchers to do more work rather than spend all day waiting for something to happen. "Undergraduates and graduates have to spend a great deal of time in the lab or in the field and are just not flexing the intellectual muscle I think a lot of them want to be flexing. Instead, they're just sitting there and watching insects fly around and trying to record furiously in a notebook the choices these insects are making. And of course, those have really created some really, really rich data sets that evolutionary and ecological hypotheses have been tested against, but it's not really a scalable solution. It's as many hours as a human being can possibly stand to sit there and watch."

The answer lies in using technology to gather the data instead, with the added bonus of making it more accessible for other researchers. The problem with the present system is that it is much less versatile. "I mean, at the moment you just have someone's notebook. They took down the data that they needed for that particular experiment and if your new idea doesn't fit the way those data have been formulated, then you have to start all over again. By computerising the data and its collection, Lucas concludes, entomologists would be "vastly unlocking the potential of this data."

Lucas does warn, however, that there is a risk of "this 'black box syndrome' where maybe scientists themselves don't feel comfortable using the software, because they don't quite understand what it is doing, or the people who are reading the results of those experiments might not trust them because they don't understand what the system is doing."

His answer is to keep people involved at various key points of the process. "So, because it is video and because humans respond intuitively to visual stimuli, the computer is playing the track over the path the insect is taking. At any point, the scientist can then stop that video and correct the computer. That changes the model that the computer is trying to build and so if you're trying to track bees and the computer says, 'oh, I think the bee goes that way!' and it's wrong, you can, in real time, stop the process

and fix the tracking."

Lucas sees this as the best of both worlds. "Instead of clicking on every point, or watching the whole video, you can still feel involved in the data collection process. It's just that the manual, tedious side is taken out of your way."

As for the future, Lucas hopes for research technology to be moved out of the lab and into the field, "even if it was just in backyard gardens." This would allow systems to develop further, pressure tested by an environment that's just not anywhere as well behaved as a laboratory. "Now that really incurs quite a lot of computational complexity, because it's not trivial but it is easier to film bees in a controlled laboratory setting where you know the wind isn't going to blow a tree into the way of the computer or the video camera."

Eventually, this would lead to cheap and easy to use video and web cameras being set up in the field, and cloud computing used to analyse the data straight away. Getting there might not be easy, though. "That would be hugely exciting, but it would also be a bit daunting at the same time," Lucas says, unwilling to downplay how much work is still required.

Finally, and while he is in favour of citizen science, he is quick to point out the potential pitfalls of "relying on the skills and expertise of the great unwashed masses, as it were" and so advocates an approach that combines this with computer analysis at the same time. "So instead of taking a picture and sending it out to the community and saying 'I don't know what this is,' the computer instead should be saying 'I think it's this – is it?' If it is, then you say yes and score one for the computer and the model is a bit solidified, but if not, the model gets better and it learns. And maybe when the community gets back with an answer, that data point gets entered into the data set as well."

With nothing further to add, Lucas heads back to the busy exhibition and the many visitors to his exhibit.

Ladybird bonanza

I met my final interviewee for the first time at the London Science Communications Conference in May of this year. Doctor Helen Roy, an ecological entomologist at the Centre for Ecology & Hydrology, gave a brief talk on the UK Ladybird Survey



coordinates, which was high profile enough to be featured in the national media (The Times went so far as to have its own Ladybird-festooned front page) and be featured in international science exhibitions.

An exemplar of citizen science, the survey both engages and captivates the public, not to mention getting them out there, reporting their findings. The red and black beetles have in fact figured large throughout Helen's career – you can probably guess what her PhD was on. Yet what stood out was how Helen has used a combination of social media, mobile phone technology and the Web to gather the data she needed and to bring that work to public attention.

Being busy, Helen still found time to answer my questions. For her, computing has assisted a great deal indeed. "Perhaps the most exciting aspect is the use of the internet for receiving and compiling data on the occurrence of ladybirds across the country," Helen explains. "The response to the launch of the on-line survey in 2005 has been simply amazing."

The project itself was a collaboration between Helen and the Biological Records Centre, part of the Centre for Ecology & Hydrology. Its latest iteration, in the form of a phone app called iRecord Ladybirds, has been downloaded thousands of times already since its launch, in May of this year, and Helen has received a surge of recorded data from the public as a result.

Helen is more than happy with the results. "Such data received year on year from people across the country is invaluable - we can use it to address major ecological questions in relation to changes in the distribution of species over time. Of course, computing is also essential for analysing all the data we receive - analysis of these large datasets require lots of computing power."

Social Media plays its role too. "Additionally computing provides opportunities to communicate findings - the UK Ladybird Survey has almost 1,800 followers on Twitter. So from the content-rich UK Ladybird Survey website to the data-rich iRecord and communication tools such as Twitter, computing is essential to my research" Helen concludes.

She is also optimistic about the role computers and the Internet play in entomology, noting that sites run by British Bugs (www.britishbugs.org.uk) and The Bees, Wasps and Ants Recording Society (www.bwars.com) are both informative and able to engage the public in a compelling fashion. She is also impressed by iSpot (www.ispot.org.uk), which allows both scientists and the public to swap and share nature photos, and the NBN Gateway (data.nbn.org.uk) which allows immediate access to the latest UK biodiversity data. Helen also notes the many entomologists using Twitter and using the latest technology to process images of

insects. She is also impressed by Davide Zilli's project.

However, Helen says that there is still a need for tried and tested methods too. Whereas Lucas and Matthew want to save entomologists time, Helen thinks that time is still well spent at present. "I think the only limitation is the time available to commit to these fantastic resources and tools - after all time spent in the field with net and notebook (or ladybird smartphone app) is also essential!"

Helen also thinks that entomologists don't so much need computer training as just a willingness to get online and make the most of the Web. "I don't think there is a need to be prescriptive - certainly using the internet provides opportunity and access to information that would otherwise be tricky to acquire. Additionally blogs, social media and e-mail are fantastic methods of communication and link entomologists with one another." It is this social side that Helen is taken by. "It is always a delight to read of other entomologists' discoveries ... the internet makes it possible to receive almost instantaneous updates - I thoroughly enjoy seeing ladybird records appearing in iRecord straight from the field via the app."

However, what is really needed is for the disciplines to communicate well. "I think the collaboration between computing experts and entomological experts ensures that each can gain from the skills of the other. So working together is critical."

Beetling off

What these four researchers each demonstrate is that using technology in entomology not only makes the process of data collection much less painful (it's much easier to get good data, for example), but also provides new possibilities to share information, analyse in the field and make discoveries in ways previously seen as impossible. Also key is being able to adopt new devices and software when and as they become available – Davide's app and Helen's survey taking to smart phones being good examples.

What is most important, however, is being willing to try out new ideas or seek innovative solutions to old problems. As the cost of technology falls, the opportunity for entomologists to get the most out of it becomes ever more apparent. Just keep an eye out for any bugs.

Gorillas were his neighbours... and lots of large tropical insects too

ARTICLE

Frederick George Merfield (1889-1960) is best remembered as the author of a wonderful book about his exploits in the French Cameroons of West Africa with the engaging title, *Gorillas Were My Neighbours* (1957) (Fig. 1). I first read this book whilst still at school and was immediately captivated by its amazing descriptions of the wildlife and people of the region in the 1930s, as well as the author's acts of derring do, and lucky escapes from many a seriously dangerous situation, including ferocious animals (not so much gorillas as such, generally peaceful herbivores) and cannibals. Time has passed and I had largely forgotten about the book, until quite recently, whilst wishing to write a short article about insect mimicry for *Antenna* following an observation I made whilst watching wild birds interacting with insects. I thus decided to buy some up-to-date background reading on the subject: *Dazzled and Deceived: Mimicry and Camouflage* by Peter Forbes (2011), plus another book with a similarly engaging title: *How Not to be Eaten: The Insects Fight Back* (2012) by Gilbert Waldbauer, Emeritus Professor of Entomology at the University of Illinois, USA, along with the classic tome on the topic, Hugh B. Cott's famous *Adaptive Coloration in Animals* (1940).

I especially liked *How Not to be Eaten* and thought it truly a masterpiece of descriptive writing about insect behaviour, especially including camouflage and mimicry, and learnt a lot from reading it. However, when I got to page 31 in the chapter entitled *The Eaters of Insects*, I came across something that jarred with me. It boldly stated that, and I quote [square brackets are my inserts]:

"Primates such as lemurs, tarsiers, monkeys, baboons, chimpanzees, and humans are omnivores that, to varying degrees, feed on insects. In the early

1960s, Jane Goodall [b. 1934] made the famous discovery [in the Gombe Stream National Park, Tanzania] that chimpanzees create tools from twigs and use them to "fish" for one of their favourite snacks, termites – the tropical species that build large cement-like mounds. Early in the rainy season, swarms of thousands of male and female termites of the reproductive caste leave the mounds through tunnels dug by workers, who keep the exit holes thinly sealed until conditions are favourable for the reproductives to fly off and found new colonies. When a hungry chimpanzee spots one of these lightly sealed holes, Goodall observed,

Hugh D. Loxdale
DPhil, FRES, MBE
RES Treasurer

Loxdale@web.de

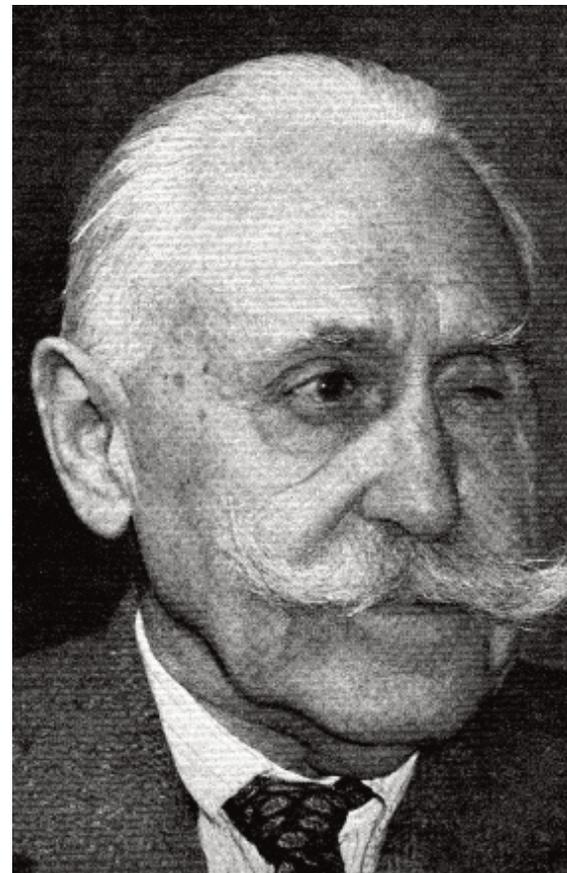


Fig. 1. Fred. Merfield in c.1957. (Photo: Harry Miller, FZS; from Merfield & Miller, 1957).

it removes the seal with its index finger and pokes a tool into the hole. A moment later, the chimpanzee withdraws the tool and then eats the termites clinging to it.”

She has deservedly received many international awards for her lifetime’s studies of the behaviour of these animals, perhaps our closest living relatives. In Dale Peterson’s biography of her: *Jane Goodall: The Woman Who Redefined Man* (2006), he quotes the British archaeologist and naturalist Louis Leakey (1903-1972), famous for his discoveries of the origin of ancient humans from studies of bone fragments found in Olduvai Gorge, Tanzania, who, on first hearing about Jane Goodall’s discovery that chimps fashion and use tools, sent her a telegram: “Now we must redefine tool, redefine man, or accept chimpanzees as human.” All heady stuff, for sure. But is it *actually* true that Jane Goodall was the first person to observe chimpanzees fashioning tools, in her case to extract termites from their nests? I have read other claims that she was. Then again, like all great discoveries and inventions, there are usually other contenders for the glory of priority in a particular field or sphere – for example, fungal antibiotics (e.g. the French physician, Ernest Duchesne, 1874-1912) and powered flight (e.g. the English engineer and flight pioneer, John Stringfellow, 1799-1883), to name but two.

Enter English planter, hunter, explorer and naturalist, Fred Merfield. In his *Gorillas Were My Neighbours* book he states the following on pages 63-64 in reference to observations he made in the French Cameroons:

I was tracking the rare bongo antelope through very thick forest when my attention was attracted by the noise of chimpanzees. They appeared to be highly excited and I decided to stalk them and see what they were doing. With my gun bearer N’Gombie I crept through the bush and found eight chimpanzees – six of them almost full-grown – sitting in a circle at the edge of a small clearing. Like gorillas, they have a poor sense of smell, and since we moved silently they did not detect us. They were making a lot of noise and kept beating and pushing each other aside, but for a time I could not see what they were up to. I sought the opinion of N’Gombie, who was a very experienced hunter.

“What t’ing dey to do?” I whispered.

He replied “Massa, dey do chop honey what dem small beef do make for ground”.

The ‘small beef’, in this case, was a small black bee which makes a nest in the ground and produces a rather coarse kind of honey. Watching through my binoculars, I could see the chimps were sitting round the entrance of one of these nests. Each ape held a long twig, which it poked down the hole, and though for the most part they took turns at using their twigs, quarrels were constantly breaking out, and those who had licked off most of the honey tried to snatch the newly-coated twigs. We watched them for over half an hour at a range of fifty yards, before creeping away as silently as we had come, so as not to disturb the party. This is one of the few examples I have known of a wild animal employing a tool.

So I would boldly assert that it was Fred Merfield, rather than Jane Goodall, who was in fact the first to observe and record the use of tools by chimpanzees. Though Goodall’s chimpanzees extracted insects from their nests (i.e. termites) and Merfield’s honey from the nest of a species of small black bee, the principle is the same and Merfield observed the behaviour some 25-30 years before Goodall. Nevertheless, he seems to have been largely overlooked for this discovery, and certainly never received any ‘big splash’ or honour from so doing.

If Fred Merfield was the initial discoverer of this exciting animal behaviour, who was he and what happened to him. Surprisingly, I have been unable to discover that much about him from the librarians of various learned societies, e.g. The Linnean Society and Zoological Society of London, although Merfield provides some biographical information in *Gorillas Were My Neighbours*. On one website ‘Shakari Connection’ (see websites, below) which sells ‘Old-Time Professional Hunter Books’ it states:

Fred G Merfield was an English planter in the Cameroons before the First World War and collected 115 gorillas and other rare creatures for European museums. During the 2nd World War, he had the distinction of becoming a French Commissioner of Police in the French Cameroons, despite being English. Merfield was the first author to describe the chimpanzees’ use of ‘tools’.

It goes on to state that *Gorillas Were My Neighbours* by Frederick G. Merfield with Harry Miller FZS (1957) (1923-98, journalist, writer, photographer and naturalist who lived most of his life in Madras, India):

... is the true story of Fred Merfield’s life among the gorillas of the west African forests. Merfield was described as the greatest white hunter in Africa, for he sought out the most difficult terrain for his activities and constantly belied the theory that only Africans have the necessary stealth, skill and endurance for tracking and hunting in their dense tropical forests. Fred Merfield’s chief interest was always the rare gorilla of West Africa, and he eventually penetrated the remote, little known Mendjim country where, by the exercise of courage and persistence, he made friends with the wild natives.

In another book: *Gorilla Hunter: The African Adventures Of A Hunter Extraordinary* by Fred. G Merfield with Harry Miller (1956), it states that:

... [these] are the memoirs of a professional hunter who spent 35 years in the French Cameroons, collecting rare animals for museums and zoos. This book contains much information about the gorilla in his native habitat and dispels of many false myths.

That is clear then. True he was a big game hunter and true he did kill animals for British museums, including for Major Percy Horace Gordon Powell’s Museum at Quex Park, Birchington-on-Sea, Kent (see websites, below). Luckily he was a crack shot, since he also saved his wife Hilda’s life on one memorable occasion when three buffalos, including a bull, unexpectedly charged at her and Merfield managed in quick succession to either shoot them dead or deflect them during the charge. The leading animal came sliding to a grinding halt at the feet of the somewhat terrified Hilda, a scene undoubtedly re-played (without credit) in the charging North American bison scene in the blockbuster hit film *Dances with Wolves* (1990) starring Kevin Costner (see pp. 238-240 in *Gorillas Were My Neighbours*). According to the entry in Wikipedia, Powell-Cotton, FZS, FRGS (d. 1940) (Fig. 2) was a Major in the Northumberland Fusiliers and

... founded the Powell-Cotton Museum at Quex Park [in 1896] to display his collection of mammals and artefacts acquired on his



Fig. 2. Major Percy Powell-Cotton, intrepid big game hunter and founder, in 1896, of the Powell-Cotton Museum within the family home at Birchington-on-Sea, Kent (Photo: Powell-Cotton Museum at Quex Park website).

to Africa and Asia. The animals were mounted by the noted taxidermist Rowland Ward. His expeditions were conducted for scientific research, and would sometimes take 18 months (see websites).

But Merfield was also, I get the strong impression, more than just a hunter and killer of animals (Fig. 3). If he were just that, he would have been very much a man of his own times, a collector and skinner, stuffer, pinner and preserver of wild creatures, much as Charles Robert Darwin (Darwin, 1845; Browne, 2003) and Alfred Russel Wallace (Wallace, 1869; Raby, 2001) had initially been on their expeditions into remote regions of the world many decades before him (a century in the case of Darwin). But like these other great naturalists, he was also interested in the behaviour of living animals, as the above quote about tool-using chimpanzees clearly demonstrates. With time, he seems to have become more interested in the lives of the animal species he formerly hunted, and was concerned about their conservation and welfare, especially the gorillas (Merfield, 1954; Merfield & Miller, 1956, 1957). As he states in the Introduction of *Gorillas Were My Neighbours* (p. 13):

Live animals in zoos have a tremendous popular appeal, but they are of limited importance to the zoologist. For obvious reasons, it is not possible to study the anatomy of living animals. Although shooting is distasteful, the larger part of



Fig 3. Merfield with native spear-men at a camp-fire in gorilla country in the French Cameroons, c. mid-1930s. 'They were hunting gorillas which had destroyed their plantations'. (Photo: Powell-Cotton Museum at Quex Park; from Merfield & Miller, 1957).

zoological research would not be possible without it.

Being interested in genealogy as well as biology, especially insects of course, I decided to do some research into Merfield's background. I soon discovered some interesting things. He was born at 10, Cresswell Road, Twickenham on the 10th March, 1889 to John Louis Frederick Merfeld (1859-1939) and Anna (Annie) Maria Elizabeth Marx (c.1866-1945) of St. James's, Piccadilly, the couple having previously married at St. James's, Westminster in June, 1888. Frederick George had a sister, Gertrude, born in Islington in 1890. The father is described as a 'West India merchant',

according to the 1901 Census (9, Petherton Road, St. Mary's, Islington). He and an elder sister, (Elfride) Amelia (born 1858 in St Luke's, Islington, London) were the only children of Joseph Levy Merfeld, a general merchant and naturalised British subject (1881 Census) born in Bielefeld, Westphalia, Germany in 1821 and his wife, Johanna Frederieke Meyer, born in Hanover, Germany in c.1826, the couple marrying at St. Luke's in London in 1857. Frederick Merfield's mother was the eldest of two boys and three girls of Louis Charles Marx, a leather bag/ dressing box maker, born in Germany in c.1841 and Phillippa Sophia Henrich, also born in

Germany at around the same time, and who married at St. James's, Westminster in 1865. So Frederick George was of German descent on both sides of his family, probably changing his surname name to the anglicised *Merfield* at the time of the First World War, as the British Royal Family did from Saxe-Coburg-Gotha to Windsor in 1917.

Merfield briefly returned from the Cameroons to England in the mid-1930s and was married at age 45 to Hilda Jane Baker (1901-87) of 179, Queens Road, Peckham. The groom is described as a bachelor and 'Big Game Hunter' on the wedding certificate, dated 24th November, 1934. Hilda was one of seven children, three boys and four girls, descended from English stock on both sides of the family and traceable back to the early 1830s. Fred and Hilda initially had two daughters, Mary (b. in Senegal in 1935) and Gertrude (b. 1937; Trudie) (Fig. 4). Fred, Hilda and Mary returned from the Cameroons in the S.S. *Usaramo* (German East Africa Line), docking at Southampton on June 11th, 1937, presumably so that Hilda could give birth to Gertrude in England. Later, tragically, Mary seems to have died and the couple had two more children, Gordon and Brian, which he refers to on page 263 of *Gorillas Were My Neighbours*.

In fact our only concession to life in the tropics were that we slept under a mosquito net, took daily doses of quinine and always boiled and filtered our drinking water.

Later on we brought up three sturdy children under the same conditions, much to the astonishment of our friends, whose offspring were nearly always sickly and pallid. Trudie, Gordon and Brian ran half-naked with our servants' children and ate much the same food as they did. Among the delicacies highly prized by the natives are fried ants and Trudie, who is now twenty, remembers with delight how she used to join in the great feasts of them that took place whenever they swarmed. After all, was that so very different from children in England collecting and eating periwinkles?

... [She slept in]..a sort of gigantic meat safe [which] protected her from mosquitoes.

Merfield also recounts how he saved Trudie from disfigurement by driver ants (*Dorylus* sp.; Hymenoptera: Formicidae) entering their house when she was barely a year old. After Fred,



Fig. 4. Hilda Merfield and baby Trudie next to a shot bull gorilla, c.1938. 'The prodigious size of the animal is clearly shown by comparison.' (Photo: Fred Merfield; from Merfield & Miller, 1957).

Hilda and their servants had rid their bodies of the ants, they tried to stop the marching ants:

For hours we tried to stem the advancing hordes of ants, using hot ashes, burning newspapers and coal tar as well as various native methods like burning certain leaves. When daylight came it looked as though we had won and we returned to bed, standing the legs of our camp beds in small tins filled with paraffin to protect us in case the ants returned.

Which the ants did, and again, Merfield only just got his baby daughter out of her cot, which was black with them, before they seriously damaged her. As it was she...

... had been bitten on her face, hands and feet, but not badly. Had we awakened half a minute later she might well have suffered serious and permanent injuries.

At the end of *Gorillas Were My Neighbours*, as the author explains, when the Second World War broke out and following the Fall of France in 1940, Hilda and the children were evacuated to the British Cameroons, whilst the French of the French Cameroons declared for General de Gaulle. After general mobilisation, he spent the war years as *Monsieur Le Commissaire* in the towns of Yabassi and Bafang and later, was awarded an Order of Merit, and Colonial Medal by the French government for his services. As he says:

I wonder if any other Englishman has ever become a French policeman?

Merfield died of natural causes at Dulwich, Camberwell on the 16th December, 1960, being survived by his wife and children.

What has this article really got to do with insects (besides chimps eating

a





Fig. 5a (previous page). Pair of Coppery Swordtail butterflies, *Graphium latreillianus theorini* (Aurivillius, 1881) (Lepidoptera: Papilionidae) upperside, collected by F. G. Merfield in the Cameroons in the 1930s. (Photo: NHM, London). According to the Wikipedia entry for this species, “the subspecies *theorini* is found in Nigeria, Cameroon, Sao Tome and Principe, Equatorial Guinea, Gabon, Congo, Democratic Republic of Congo, Angola, Central African Republic, Chad, western Uganda, and Tanzania. The habitat consists of primary forests.” It also states that “Males mud-puddle and are also attracted to urine-soaked sand, human perspiration and camp rubbish tips.”

Fig. 5b. General view of *G. latreillianus theorini* butterflies in a cabinet drawer at the NHM. (Photo: NHM, London).

Fig. 5c. Close up of female *G. latreillianus theorini* upperside (same specimen as lower insect in Fig. 5a) with data label showing the location and date of its capture. (Photo: NHM, London).



termites and the honey of small black bees and the ravages of driver ants as aforementioned), you may well ask with some justification and thus why publish it in *Antenna*? The answer is that as well as shooting mammals and other creatures (and sending specimens back to the Powell-Cotton Museum for example), Merfield and his wife also took a considerable interest in insects, especially butterflies and beetles, e.g. stag beetles. Thus, on a safari trip to the remote region of Mendjim Mey in the far eastern part of the French Cameroons, he explains:

With such a large and noisy safari we saw no game, but there were plenty of monkeys and birds about and I was able to show Hilda some elephant spoor, including one foot-print that measured twenty-one inches [53.3 cm.] across. The villagers had many kinds of live animals which we bought as we went along – wide-eyed bush-babies and pottos, baby mangabey and putty-nosed monkeys, and many insects and birds. Insects became Hilda’s department and took up a substantial part of our collecting activities. She spent much of her time in Arteck wandering along the forest paths in search of rare and gorgeous butterflies or iridescent beetles, and our evenings were spent identifying them with the aid of our many

textbooks. She soon learned the curious and disillusioning fact that butterflies, however lovely they are, prefer animal dung to flowers. The dung of animals like duiker and other antelopes is seldom seen on the forest paths, but leopard and civet cat dung is common and is always the best place to find butterflies. [L. Hugh] Newman [1909-93], the famous butterfly man of Bexley, Kent, bought large numbers of our specimens.

But besides selling butterfly specimens to private individuals, he also apparently donated many larger insects to the Natural History Museum (NHM) in London (formerly the British Museum, Natural History), as I found courtesy of Dr Andrew Polaszek, Head of the Division of Terrestrial Invertebrates in the Department of Life Sciences, Max Barclay, Collections Manager of the Museum’s Beetle (Coleoptera) and True bug (Hemiptera) collections, and Blanca Huertas, Curator of Lepidoptera in the same department. So far, five butterfly species (e.g. Fig. 5a-c) and three stag beetle species (Fig. 6a-c) collected by the Merfields at two main localities in the Cameroons between 1934 and 1936 are known from the NHM collections (see Table 1). According to Max Barclay “We undoubtedly have a lot more than this, because at present only the stag beetles,

swallowtails and a few other popular groups have been comprehensively data-based at the specimen level.”

These insects remain testimony, along with his larger wildlife finds and trophies and his books, to a remarkable man and his similarly remarkable wife who bravely went into regions where few white European men and apparently no white woman had been before and did and saw remarkable things, and miraculously survived to tell the tale. Fred Merfield was no great philosopher of science like Darwin and Wallace (Loxdale, 2010), but he was an energetic and intelligent man and did his best to aid science, including entomological science, by sending back specimens of the creatures he encountered on his many journeys, including into the very ‘heart of darkness’ during his 15 year sojourn in gorilla country.

Acknowledgements

I most sincerely thank Andrew Polaszek, Max Barclay, Blanca Huertas and Helena Maratheftis of the NHM, London for their help in tracking down insect specimens collected by the Merfields and sent to the museum in the 1930s, and Blanca and Helena for kindly sending me high quality colour photos of some of these.



Fig 6a (i)

CAMEROONS:
Batouri District.
24.iii.1934.
F.G.Merfield.
B.M.1935-473.

BMNH(E)

604494



Fig 6a (ii)

CAMEROONS:
Batouri District.
24.iii.1934.
F.G.Merfield.
B.M.1935-473.

BMNH(E)

604521



Fig 6b (i)

CAMEROONS:
Batouri District.
Savannah Country.
I.i.-24.ii.1936.
F.G.Merfield.

Brit. Mus.
1936-373.

BMNH(E)

607056



Fig 6b (ii)

BMNH(E)

607055

*Nigidius
laevigatus*, Hal.
Determined from
description G.J.A.

Brit. Mus.
1936-373.

CAMEROONS:
Batouri District.
Savannah Country.
I.i.-24.ii.1936.
F.G.Merfield.

Fig. 6a-c. Stag beetles (Coleoptera: Scarabaeoidea: Lucanidae) captured by the Merfields in the Batouri District ('Savannah Country') and D'Ja Posten, (Forested 'Maka Country' situated near the D'ja River), French Cameroons in the mid-1930s. Photos: NHM, London.

Fig 6a (i) *Homoderus mellyi* Parry, 1862, male, (ii) female, both top and left hand side view.

Fig. 6b, (i) *Nigidius laevigatus* Harold, 1878, male; (ii) female, both top and left hand side view.

Fig. 6c. *Prosopocoilus savagei* Hope, F.W, male, top and left hand side view.



Fig. 6c.

FRENCH CAMEROONS:
D'Ja Posten.
Lat.3.15.N. Long.13.30.E.
15.v-l.vii.1936.
F.G.Merfield.

Brit. Mus.
1936-654.

BMNH(E)

604093

Table 1. Summary Data: 'Merfield' collecting localities yielding specimens deposited in the NHM collections (extracted from Ke-Emu, 1st February 2013, M. V. L. Barclay)

F G Merfield; Batouri District; Cameroon; 4 9 0 N; 14 9 0 E; Batouri District; Cameroon; 4 9 0 N; 14 9 0 E
 F G Merfield; 13/04/1935 to 20/04/1935; Batouri District; Cameroon; 3 27 0 N; 13 27 0 E
 F G Merfield; /05/1935 to 03/05/1935; Batouri District; Cameroon; 3 45 0 N; 13 45 0 E
 F G Merfield; /06/1935 to 06/06/1935; Batouri District; Cameroon; 3 45 0 S; 13 45 0 E
 F G Merfield; 28/03/1935 to 06/06/1935; Batouri District; Cameroons; 3 45 0 N; 13 45 0 E
 F G Merfield; 06/06/1935 to /06/1935; Batouri District; Cameroons; 4 15 0 N; 14 15 0 E
 F G Merfield; /03/1935 to 01/03/1935; Batouri District; Cameroon; 4 15 0 N; 13 45 0 E
 F G Merfield; /03/1935; Batouri District; Cameroon
 F G Merfield; /08/1935; Batouri District; Cameroons
 F G Merfield; 24/03/1934; Batouri Dist.; W. Africa, Cameroons
 F G Merfield; 24/03/1934; Batouri District; W. Africa, Cameroons
 F G Merfield; 15/05/1936 to 01/07/1936; D'ja Posten; W. Africa, French Cameroons; 3 15 N; 13 30 E
 F G Merfield; 01/01/1936 to 24/02/1936; Savannah Country; Batouri District; Cameroons
 F G Merfield; 15/05/1936 to 01/07/1936; D'ja Posten; French Cameroons; W. Africa; 3 15 N; 13 30 E

Swallowtail butterflies (Papilionidae)

136382, *Graphium (Arisbe) antheus* (Cramer, 1779) — Papilioninae; Papilionidae; Rhopalocera; Lepidoptera;
 136383, *Graphium (Arisbe) antheus* (Cramer, 1779) — Papilioninae; Papilionidae; Rhopalocera; Lepidoptera;
 138835, *Graphium (Arisbe) auriger odin* (Strand, 1910) — Papilioninae; Papilionidae; Rhopalocera; Lepidoptera;
 141295, *Graphium (Arisbe) latreillianus theorini* (Aurivillius, C., 1881) — Papilioninae; Papilionidae; Rhopalocera; Lepidoptera;
 143810, *Graphium (Arisbe) latreillianus theorini* (Aurivillius, C., 1881) — Papilioninae; Papilionidae; Rhopalocera; Lepidoptera;
 141296, *Graphium (Arisbe) latreillianus theorini* (Aurivillius, C., 1881) — Papilioninae; Papilionidae; Rhopalocera; Lepidoptera;
 142938, *Graphium (Arisbe) policenes* (Cramer, 1775) — Papilioninae; Papilionidae; Rhopalocera; Lepidoptera;
 143368, *Graphium (Arisbe) schubotzi* (Strand, 1910) — Papilioninae; Papilionidae; Rhopalocera; Lepidoptera;
 143370, *Graphium (Arisbe) schubotzi* (Strand, 1910) — Papilioninae; Papilionidae; Rhopalocera; Lepidoptera.

Stag Beetles (Lucanidae)

604494, *Homoderus mellyi* Parry, 1862 — Lucanidae; Scarabaeoidea; Coleoptera;
 604521, *Homoderus mellyi* Parry, 1862 — Lucanidae; Scarabaeoidea; Coleoptera;
 604522, *Homoderus mellyi* Parry, 1862 — Lucanidae; Scarabaeoidea; Coleoptera;
 607055, *Nigidius laevigatus* Harold, 1878 — Lucanidae; Scarabaeoidea; Coleoptera;
 607056, *Nigidius laevigatus* Harold, 1878 — Lucanidae; Scarabaeoidea; Coleoptera;
 607057, *Nigidius laevigatus* Harold, 1878 — Lucanidae; Scarabaeoidea; Coleoptera;
 604093, *Prosopocoilus savagei* Hope, F.W. — Lucanidae; Scarabaeoidea; Coleoptera.

References

- Browne, J. (2003) *Charles Darwin: Voyaging* (Vol. 1). Pimlico, London.
 Cott, H.B. (1940) *Adaptive Coloration in Animals*. Methuen & Co. Ltd., London. (Reprinted 1966).
 Darwin, C.R. (1845) *Journal of Researches into the Natural History and Geology of the Countries Visited during the Voyage of H.M.S. Beagle round the World, under the Command of Capt. FitzRoy, R.N.* John Murray London, 2d ed. (First edition 1839 as a three-part volume, with an appendix *The Narrative of the Voyages of H.M. Ships Adventure and Beagle*. Henry Colburn, London, Darwin writing the third volume).
 Forbes, P. (2011) *Dazzled and Deceived: Mimicry and Camouflage*. Yale University Press, New Haven & London.
 Loxdale, H.D. (2010). Setting the scene...meeting up with Darwin and Wallace. Royal Entomological Society Celebratory Meeting 'Insect Evolution below the species level: ecological specialization and the origin of species', 22nd April, 2009. (ed. by H.D. Loxdale, M.F. Claridge and J. Mallet) *Ecological Entomology* (special issue) 35: 1-9.
 Merfield, F.G. (1954) The Gorilla of the French Cameroons. *Zoo Life London* 9 (3): 84-94.
 Merfield, F.G. (with Miller, H.) (1956) *Gorilla Hunter: The African Adventures of a Hunter Extraordinary*. Farrar, Strauss & Cudahy, New York.
 Merfield, F.G. (with Miller, H.) (1957) *Gorillas Were My Neighbours*. The Companion Book Club, London.
 Peterson, D. (2006) *Jane Goodall: The Woman Who Redefined Man*. Houghton Mifflin Harcourt, Boston.
 Raby, P. (2001) *Alfred Russel Wallace: A Life*. Princeton University Press, Princeton.
 Waldbauer, G. (2012) *How Not to Be Eaten: The Insects Fight Back*. University of California Press, Berkeley and Los Angeles, California.
 Wallace A.R. (1869) *The Malay Archipelago* (2007 reprint). Stanford Travel Classic, JB Publishing (Star Books Sales), Exeter, U.K.

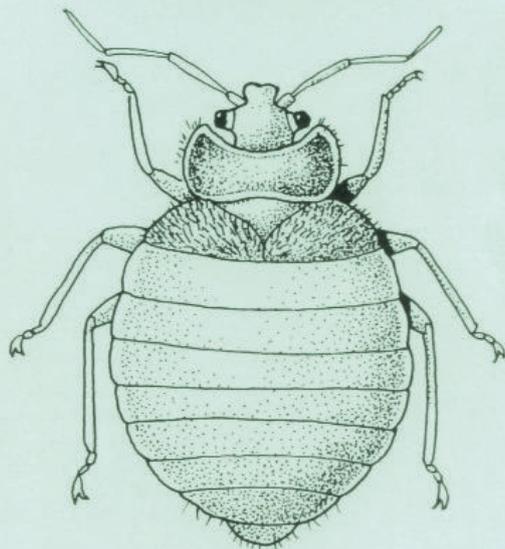
Websites cited

- <http://museumsatnight.wordpress.com/2011/04/07/keith-dunmall-percy-powell-cotton-museum/>
<http://www.quexmuseum.org/home.aspx>
<http://www.shakariconnection.com/old-time-professional-hunter-books.html>
http://en.wikipedia.org/wiki/Dances_with_Wolves
http://en.wikipedia.org/wiki/Quex_Park

AN ANNOTATED CHECKLIST OF THE IRISH HEMIPTERA AND SMALL ORDERS

compiled by

James P. O'Connor and Brian Nelson



The Irish Biogeographical Society

ARTICLE

Checklisting the Irish insects

J. P. O'Connor

Emeritus Entomologist

National Museum of Ireland,
Kildare Street,
Dublin 2, Ireland

Fig. 1. Cover of *An annotated checklist of the Irish Hemiptera and small orders*.

The basic checklisting of the Irish insect fauna was finished in 2012 with the publication of *An annotated checklist of the Irish Hemiptera and small orders* (O'Connor & Nelson, 2012).

This volume completed a project which had commenced over twenty-nine years ago. Robert Nash, then the entomologist in the Ulster Museum (now National Museums Northern Ireland), Belfast, suggested to Mike Boston and the author that we should co-operate in compiling a checklist of the Irish insects. At the time, Mike was employed on contract entomological work in the Ulster Museum while I was the entomologist in the National Museum of Ireland. We agreed with Robert's idea and as a result, "A proposal for a checklist of Irish insects" was published in the *Irish Naturalists' Journal*, inviting assistance from anyone interested in the project (Nash, Boston & O'Connor, 1983). Unfortunately, Mike left the Museum before any of the checklists were finalised.

Robert had been inspired by A. H. Haliday's *Catalogue of Irish insects*

preserved in the National Museum of Ireland. Haliday (1806-1870) is the most famous of the Irish entomologists. He is primarily known for his work on the Hymenoptera, Diptera and Thysanoptera but he worked on all insect orders (Nash & O'Connor, 2011).

John Curtis's *A guide to an arrangement of British Insects; being a catalogue of all the named species hitherto discovered in Great Britain and Ireland* was published in London between 1829 and 1831. A second edition published in 1837 incorporated substantial additions and name-changes. James Francis Stephens' *A systematic catalogue of British Insects* was also published in 1829. Over a hundred years later, G. S. Kloet and W. D. Hincks' *A check list of British insects* appeared in 1945. Subsequently, numerous authors contributed to the Royal Entomological Society's five part revision of Kloet and Hincks' work, the first part of which was published in 1964 and the last in 1978. There

was no distinction between the insects of Britain and those of Ireland in these works. Sometimes, insects only known in Ireland were included in the lists while others were omitted without explanation or for any obvious reason.

As a result, it was decided that all the Irish checklists should enable the reader to trace why a species was on the Irish list. Although, it would be impossible to check the identities of all the listed species, all relevant synonymies and references would be included. The lists were to be for the island of Ireland ignoring man-made political boundaries. It was also decided, for convenience, to divide the work into five volumes similar to those published by the Royal Entomological Society. The first of the new checklists, *Irish Coleoptera. A revised and annotated list*, was published by the *Irish Naturalists' Journal* as a Special Entomological Supplement (Anderson, Nash & O'Connor, 1997). It updated the classic work of Johnson and Halbert (1902). Roy Anderson, the senior author, was then employed by the

THE
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IRISH COLEOPTERA

A REVISED AND ANNOTATED LIST

by R. ANDERSON, R. NASH AND J. P. O'CONNOR

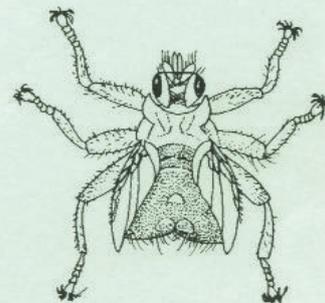
SPECIAL ENTOMOLOGICAL SUPPLEMENT 1997

Fig. 2. Cover of *Irish Coleoptera. A revised and annotated list.*

AN ANNOTATED CHECKLIST
OF THE IRISH TWO-WINGED
FLIES (DIPTERA)

compiled by

Peter J. Chandler, James P. O'Connor and Robert Nash



The Irish Biogeographical Society
in association with
The National Museum of Ireland



Fig. 3. Cover of *An annotated checklist of the Irish two-winged flies (Diptera).*

A CATALOGUE OF THE IRISH ICHNEUMONIDAE
(HYMENOPTERA: ICHNEUMONOIDEA)

by

J. P. O'Connor, R. Nash and M. G. Fitton



Occasional Publication of the Irish Biogeographical Society

Number 10, 2007

Fig. 4. Cover of *A catalogue of the Irish Ichneumonidae (Hymenoptera: Ichneumonoidea).*

Occ. Publ. Ir. biogeog. Soc. No. 7 (2004)

Leptacis tipulae (Kirby, 1798)

synonym *Synopeus scutellaris* (Nees, 1834)

DOWN: Hollywood, on willows *Salix*, AHH (Walker, 1835: p. 232 as *Platygaster scutellaris*); WEXFORD: Killoughrim, ♀ 16.vi.1982, swept in mixed woodland, JPOC (NMI) (O'Connor, 2003: p. 280).

Ireland (Walker, 1835: p. 221 as *Platygaster*, Mr Haliday has found the female on *Cerealia*, in...Ireland; Kieffer, 1926: p. 639; Kieffer, 1926: p. 684 as *Synopeus scutellaris*).

Metaclisis areolatus (Haliday in Walker, 1835)

DOWN: Hollywood, on grass in drains of the seacoast, AHH (Walker, 1835: p. 272 as *Inustemna*. Sometimes, like *Ino. Menippus*, infested by a small red parasite; Vlug and Graham, 1984: p. 133 lectotype female...in NMI: "H. Wood"; green label: "1223-4"; "Haliday N.M.I. 20.2.82"; "Box 16"; det. and type labels (H. J. Vlug, 1982). Two females are glued together on one card: nos 1223 and 1224; the right female, no. 1224, has been chosen as lectotype. Four males and ten females in NMI are paralectotypes (nos 1121, 1210, 1211 and 1213-1223). The female in the Vienna Museum is considered to be a paralectotype; Vlug, 1995: p. 40). Ireland (Kieffer, 1926: p. 570).

Piestopleura catilla (Walker, 1835)

DOWN: Hollywood, once, under the shade of trees, AHH; GALWAY: Galway, once, under the shade of trees, AHH (Walker, 1835: p. 220 as *Platygaster*; Kieffer, 1926: p. 629; Vlug and Graham, 1984: p. 120).

Piestopleura mamertes (Walker, 1835)

DOWN: Hollywood, September, on willows *Salix*, AHH (Walker, 1835: p. 227 as *Platygaster*; Vlug and Graham, 1984: p. 120 lectotype male...in NMI; white label: "mamertes"; "953"; "lectotype" (handwritten by Graham); "Box 23. Stood in original Haliday collection under *Platygaster mamertes*"; det. and type labels (H. J. Vlug, 1982)).

Ireland (Kieffer, 1926: p. 654 as *Ectadius*).

**Piestopleura seron* (Walker, 1835)

Ireland (no locality, specimen (badly damaged) with green label stating "seron" and green headed pin, AHH (NMI, Haliday Collection) (det. HJV)).
New to Ireland.

17

Fig. 5. Sample page from *A catalogue of the Irish Platygastroidea and Proctotruoidea (Hymenoptera)* showing why species are on the Irish list.

CERATACIS THOMSON 1859+*flavipes* (Thomson, 1859)

Footnote: added from Co. Clare by Buhl and O'Connor (in press).

EUXESTONOTUS FOUTS, 1925+*clavicornis* Buhl, 1995

Footnote: added from Co. Wexford by Buhl and O'Connor (in press).

+*error* (Fitch, 1861)

Footnote: added from Co. Kilkenny by Buhl and O'Connor (2008).

+*hasselbalchi* Buhl, 1995

Footnote: added from Co. Cork by Buhl and O'Connor (2008).

FIDIOBIA ASHMEAD, 1894*syngororum* (Kieffer, 1921)**INOSTEMMA HALIDAY, 1833**+*boscii* (Jurine, 1807)

Footnote: added from Co. Clare by Buhl and O'Connor (2009).

curtum Szelényi, 1938*favo* Walker, 1838*hyperici* Debauché, 1947+*melicerta* Walker, 1835

Footnote: added from Co. Clare by Buhl and O'Connor (2009).

spinulosum Kieffer, 1916*walkeri* Kieffer, 1914Footnote: *boscii* (Jurine, 1807)

misidentification.

IPHITRACHELUS HALIDAY, 1835*lar* Haliday, 1835**ISOXYBUS FOERSTER, 1856***erato* (Walker, 1835)*walkeri* Kieffer, 1926Synonymy: *ruficornis* (Latreille, 1805) *sensu* Walker, 1835.**ISOSTASIUS FOERSTER, 1856***punctiger* (Nees, 1834)Synonymy: *scrutator* (Walker, 1835).**LEPTACIS FOERSTER, 1856***buchi* Buhl, 1997*laodice* (Walker, 1835)+*orchymonti* (Debauche, 1947)

Footnote: added from Co. Waterford by Buhl and O'Connor (2009).

ozines (Walker, 1835)*tipulae* (Kirby, 1798)Synonymy: *scutellaris* (Nees, 1834).**METACLISIS FOERSTER, 1856***areolatus* (Haliday, 1835)**PIESTOPLEURA FOERSTER, 1856***cutilla* (Walker, 1835)*mamertes* (Walker, 1835)*seron* (Walker, 1835)**PLATYGASTER LATREILLE, 1809***abisares* Walker, 1835+*acrisius* Walker, 1835

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Fig. 6. Sample page from *An annotated checklist of the Irish Hymenoptera*.

Department of Agricultural and Environmental Science of The Queen's University of Belfast. An index was omitted but one was subsequently compiled by Roy and is still available from him. Additions since Johnson and Halbert were indicated by a + sign in the left-hand margin. This convention was continued in the later volumes to indicate additions since the source references. An on-line version of the coleopteran checklist was later provided (Anderson, Nash & O'Connor, 2005). Altogether, 2154 Irish species were included in these lists.

The second volume was *An annotated checklist of the Irish butterflies and moths (Lepidoptera)* (Bond, Nash & O'Connor, 2006). It was published by the Irish Biogeographical Society in association with the National Museum of Ireland which sponsored the printing costs. The senior author, Ken Bond, was carrying out research on Lepidoptera in the Department of Zoology and Animal Ecology in University College Cork. Updating Beirne (1941) and Baynes (1964), it contained information on 1412 species and common names were given. A comprehensive index was included. In 2008, an on-line version was made available (Bond, Nash & O'Connor, 2008). In the same year, the third

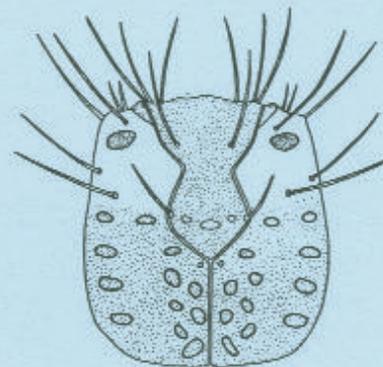
volume appeared. *An annotated checklist of the Irish two-winged flies (Diptera)* was also published by the Irish Biogeographical Society in association with the National Museum of Ireland and contained 3313 valid Irish species (Chandler, O'Connor & Nash, 2008). The senior author, Peter Chandler, had previously compiled a checklist of the Diptera of the British Isles which unusually had indicated the Irish species (Chandler, 1998). This work was an invaluable aid in compiling the Irish publication.

The next planned volume was to be on the Hymenoptera. This presented special problems as there were few older works which could be used as source references for the new checklist. It was necessary therefore to prepare and publish a series of individual checklists dealing with separate groups. The larger ones (Braconidae, Chalcidoidea, Ichneumonidae, Platygastroidea & Proctotrupoidea) were covered by volumes in the Occasional Publication series of the Irish Biogeographical Society (O'Connor, Nash & Achterberg, 1999; O'Connor, Nash & Bouček, 2000; O'Connor, Nash, Notton & Fergusson, 2004; O'Connor, Nash & Fitton, 2007). These contained precise bibliographic references to included species as well as numerous additions to the Irish fauna.

A Checklist of Irish Aquatic Insects

by

P. Ashe, J. P. O'Connor & D. A. Murray



Series Editor: J. P. O'Connor

Date of Publication: 30 July 1998

Occasional Publication of The Irish Biogeographical Society
Number 3, 1998Fig. 7. Cover of *A checklist of Irish aquatic insects*.

In addition, checklists of the smaller groups were published in various journals. Wonderful help was provided by British and Continental hymenopterists. As a result, it was possible for the Irish Biogeographical Society to publish *An annotated checklist of the Irish Hymenoptera* in association with the National Museum of Ireland based on these works (O'Connor, Nash & Broad, 2009). A total of 3194 Irish species and a comprehensive index were included. Fortunately, Gavin Broad of the Natural History Museum, London, agreed to assist with the compilation and provided essential advice and expertise.

As stated above, the final volume, *An annotated checklist of the Irish Hemiptera and small orders*, was published by the Irish Biogeographical Society in 2012 (O'Connor & Nelson, 2012). Due to the current economic situation, the Museum was unable to sponsor the publication but the Society managed to fund the printing costs from its own resources. This proved to be a particularly difficult checklist to compile due to the diversity of orders included and the ever changing nomenclature which necessitated innumerable revised drafts. Although no longer considered insects, the Entognatha (Collembola, Diplura and

completeness. The Insecta were represented by the Dermaptera, Dictyoptera, Ephemeroptera, Hemiptera, Mecoptera, Megaloptera, Microcoryphia, Neuroptera, Odonata, Orthoptera, Phasmatodea, Phthiraptera, Plecoptera, Psocoptera, Siphonaptera, Strepsiptera, Thysanoptera, Trichoptera and Zygentoma. The volume was dedicated to the memory of the late Dr Courtenay Smithers (1925-2011) in recognition of his research on the Irish Psocoptera. Excepting the included migrants and importations, 1583 species were recorded. There was also a comprehensive index. Robert Nash having retired, Brian Nelson (then also in the National Museums Northern Ireland) became a co-author. Brian is now with the National Parks and Wildlife Service in Dublin.

The Irish Biogeographical Society checklist volumes were produced on good quality paper and thread sewn so that they would be durable. The print run was 200 copies. Since it had been so difficult to annotate the Royal Entomological Society's checklists due to the A5 format, the Irish volumes were printed on A4 paper leaving ample space for annotations, corrections and updates. With the exception of the coleopteran one, the cover illustrations of the main checklists were by the British natural history artist Sean Milne and are taken from *Irish indoor insects* (O'Connor & Ashe, 2000). Copies of the checklists have been deposited in libraries in Ireland, Great Britain and many other countries for future consultation by anyone interested in Irish insects. The basic checklisting is now completed and the Irish insect (*sensu lato*) fauna recorded in the checklists total 11,656 species. However, new additions are constantly being added often after consultation of the new checklists. As a result, Peter Chandler regularly updates the Irish dipteran checklist in the *Dipterists Digest* and that total has now reached 3359 species, an increase of 46 species (Chandler, 2012). In addition, since publication of the lepidopteran checklist, 68 species have been added to the Irish fauna (Bond & O'Connor, 2012). Regan *et al.* (2010) noted that the number of undiscovered Irish species is certainly sufficient to increase the total fauna to more than 12,000 species. Indeed, it may be over 13,000 species as, for instance, many parasitic Hymenoptera and Cecidomyiidae

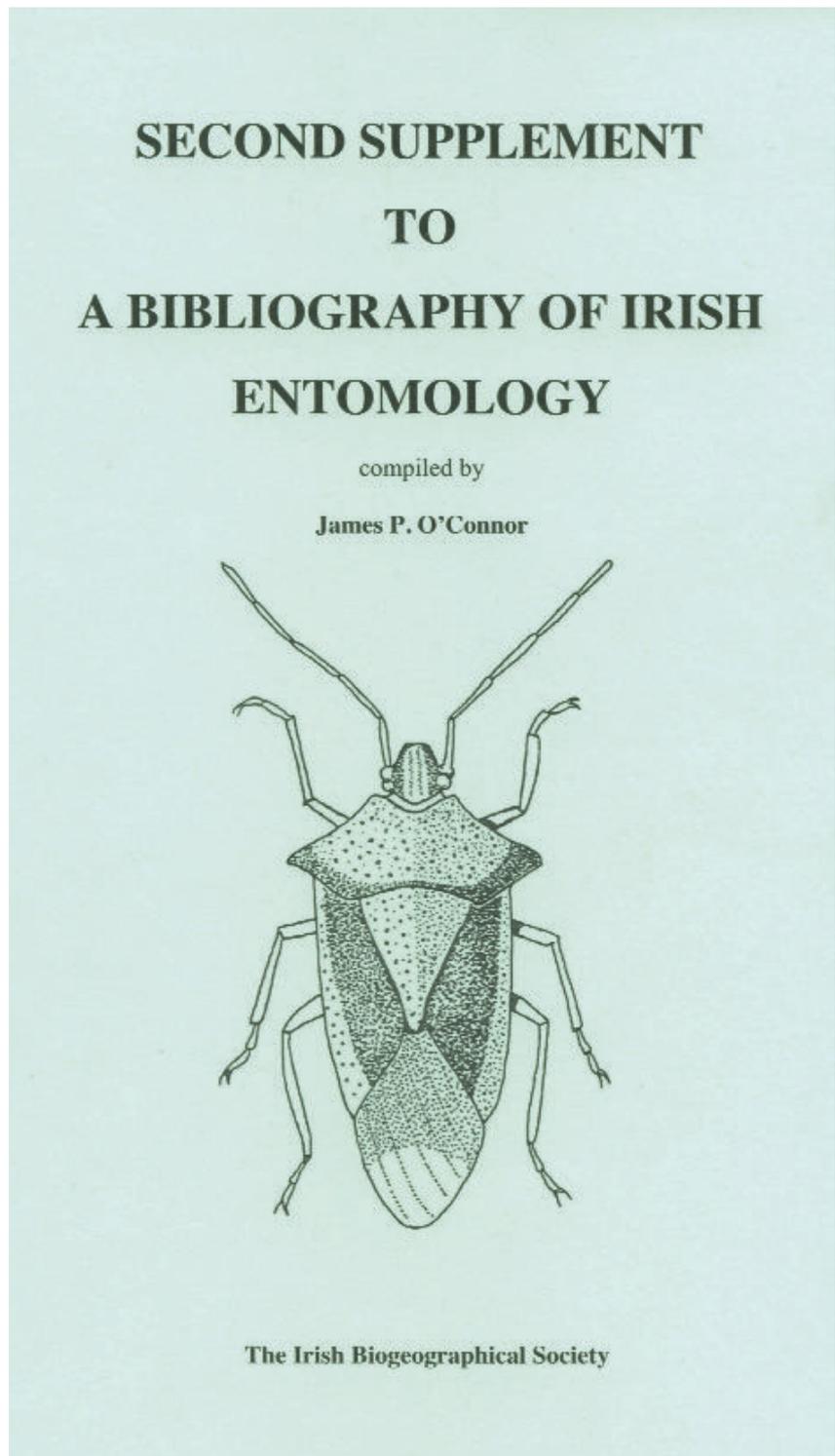


Fig. 9. Cover of *Second supplement to A bibliography of Irish Entomology*.

(Diptera) undoubtedly await discovery on the island.

Two other projects assisted in the compilation of the checklists. To celebrate the holding of the XXVII Congress of the International Association of Limnology in University College, Dublin, in August 1998, *A checklist of Irish aquatic insects* was published (Ashe, O'Connor & Murray,

1998). Bibliographic support was provided by *A Bibliography of Irish Entomology* and its two supplements (Ryan, O'Connor & Beirne, 1984; O'Connor, Ashe & Walsh, 2005; O'Connor, 2012). This work has now also been completed. The Second (and final) Supplement contains an author index to all three volumes.

References

- Anderson, R., Nash, R. & O'Connor, J.P. (1997) *Irish Coleoptera. A revised and annotated list*. Irish Naturalists' Journal Special Entomological Supplement.
- Anderson, R., Nash, R. & O'Connor, J.P. (2005) Checklist of Irish Coleoptera. InvertebrateIreland Online. Ulster Museum, Belfast and National Museum of Ireland, Dublin <<http://www.habitas.org.uk/invertebrateireland/speciesstats.asp?Checklist=1>>.
- Ashe, P., O'Connor, J.P. & Murray, D.A. (1998) *A checklist of Irish aquatic insects*. Occasional Publication of the Irish Biogeographical Society No. 3.
- Baynes, E.S.A. (1964) *A revised catalogue of Irish Macrolepidoptera (butterflies and moths)*. E.W. Classey, Hampton.
- Beirne, B.P. (1941) A list of the Microlepidoptera of Ireland. *Proceedings of the Royal Irish Academy* 47B: 53-147.
- Bond, K.G.M., Nash, R. & O'Connor, J.P. (2006) *An annotated checklist of the Irish butterflies and moths*. Irish Biogeographical Society & National Museum of Ireland, Dublin.
- Bond, K.G.M., Nash, R. & O'Connor, J.P. (2008) *An annotated checklist of the Irish butterflies and moths*. InvertebrateIreland Online. Ulster Museum, Belfast and National Museum of Ireland, Dublin <<http://www.habitas.org.uk/invertebrateireland/speciesstats.asp?Checklist=11>>.
- Bond, K.G.M. & O'Connor, J.P. (2012) Additions, deletions and corrections to *An annotated checklist of the Irish butterflies and moths (Lepidoptera)* with a concise checklist of Irish species and *Elachista biatomella* (Stainton, 1848) new to Ireland. *Bulletin of the Irish Biogeographical Society* 36: 60-179.
- Chandler, P.J. (ed.) (1998) Checklists of insects of the British Isles (New Series). Part 1: Diptera (Incorporating a list of Irish Diptera). *Handbooks for the Identification of British Insects* 12(1): i-xix, 1-234.
- Chandler, P.J. (2012) Changes to the Irish Diptera list (18) – editor. *Dipterists Digest* 18(2): inside rear cover.
- Chandler, P.J., O'Connor, J.P. & Nash, R. (2008) *An annotated checklist of the Irish two-winged flies (Diptera)*. Irish Biogeographical Society & National Museum of Ireland, Dublin.
- Johnson, W.F. & Halbert, J.N. (1902) A list of the beetles of Ireland. *Proceedings of the Royal Irish Academy Third Series* 6: 535-827
- Nash, R., Boston, M. & O'Connor, J. (1983) Checklist – insects. A proposal for a checklist of Irish insects. *Irish Naturalists' Journal* 21: 188.
- Nash, R. & O'Connor, J.P. (2011) Notes on the Irish entomologist Alexander Henry Haliday (1806-1870). *Bulletin of the Irish Biogeographical Society* 35: 64-112.
- O'Connor, J.P. (2012) *Second supplement to A bibliography of Irish Entomology*. Irish Biogeographical Society, Dublin.
- O'Connor, J.P. & Ashe, P. (2000) *Irish indoor insects*. Town House, Dublin.
- O'Connor, J.P., Ashe, P. & Walsh, J. (2005) *First supplement to A bibliography of Irish Entomology*. Irish Biogeographical Society & National Museum of Ireland, Dublin.
- O'Connor, J.P., Nash, R. & Achterberg, C. van (1999) *A catalogue of the Irish Braconidae (Hymenoptera: Ichneumonoidea)*. Occasional Publication of the Irish Biogeographical Society No. 4.
- O'Connor, J.P., Nash, R. & Bouček, Z. (2000) *A catalogue of the Irish Chalcidoidea (Hymenoptera)*. Occasional Publication of the Irish Biogeographical Society No. 6.
- O'Connor, J.P., Nash, R. & Broad, G. (2009) *An annotated checklist of the Irish Hymenoptera*. Irish Biogeographical Society & National Museum of Ireland, Dublin.
- O'Connor, J.P., Nash, R. & Fitton, M.G. (2007) *A catalogue of the Irish Ichneumonidae (Hymenoptera: Ichneumonoidea)*. Occasional Publication of the Irish Biogeographical Society No. 10.
- O'Connor, J.P., Nash, R., Notton, D.G. & Fergusson, N.D.M. (2004) *A catalogue of the Irish Platygastroidea and Proctotrupoidea (Hymenoptera)*. Occasional Publication of the Irish Biogeographical Society No. 7.
- O'Connor, J.P. & Nelson, B. (2012) *An annotated checklist of the Irish Hemiptera and small orders*. Irish Biogeographical Society, Dublin.
- Regan, E., Nelson, B., McCormack, S., Nash, R. & O'Connor, J.P. (2010) Countdown to 2010: can we assess Ireland's insect species diversity and loss? *Biology and Environment: Proceedings of the Royal Irish Academy* 110B: 109-117.
- Ryan, J.G., O'Connor, J.P. & Beirne, B.P. (1984) *A bibliography of Irish entomology*. The Fly Leaf Press, Dublin.

The Biology of Butterflies: the history and future of an international symposium

ARTICLE

Niklas Wahlberg,

Felix Sperling

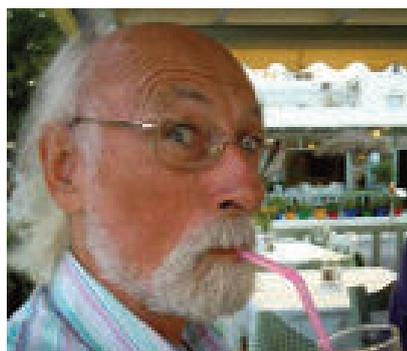
R.I. Vane-Wright



Niklas Wahlberg

Laboratory of Genetics, Department of Biology, University of Turku, Turku, Finland.

Niklas Wahlberg is an evolutionary biologist working on the evolution of Lepidoptera, with a focus on the family Nymphalidae. He has been using molecular methods to elucidate the history of diversification of the family. He is currently a university researcher at the University of Turku, Finland.



R.I. Vane-Wright

Department of Life Sciences, the Natural History Museum, Cromwell Road, London SW7 5BD, UK; and Durrell Institute of Conservation and Ecology (DICE), University of Kent, Canterbury CT2 7NR, UK

Dick Vane-Wright was responsible for the tropical butterfly collection of the British Museum (Natural History) from 1967–1984. During this period, in collaboration with Phillip Ackery, he organised the first meeting in the *Biology of Butterflies* symposium series. Pictured here as a G&T butterfly.



Felix Sperling

Department of Biological Sciences, University of Alberta, Edmonton, AB, Canada T6G 2E9

Felix Sperling is a professor at the University of Alberta whose lab encompasses a broad range of projects on the systematics and population genetics of insects. His personal interests focus on Lepidoptera, particularly swallowtail butterflies and speciation. Pictured here with several friends.

Origins of The Biology of Butterflies symposia

The origin of the international meetings on butterfly biology can be traced back, informally at least, to a speculative visit to the Department of Entomology of the then British Museum (Natural History) by the late Professor Dietrich Schneider. Schneider, one of the great pioneers of insect pheromone biology and co-discoverer of bombykol, was in London during spring 1974 to attend a meeting at the Royal Society, and took the opportunity to visit the 'NHM' in the hope of getting a definitive identification for an *Amauris* butterfly from Kenya. He had become interested in the complex pheromone system of milkweed butterflies, and what Michael Boppré was later to term their *pharmacophagous* relationship with pyrrolizidine-alkaloid-containing plants. At the museum Schneider met Dick Vane-Wright, then a 31-year old butterfly curator specialising on Satyrinae, who offered to give him an identification of his small sample of Danainae, if he was able to call back later in the week—time enough to make dissections.

Schneider duly returned two days later, to be informed that his samples of *Amauris*, which all looked very similar, actually comprised two species. This example of Müllerian mimicry excited Schneider's interest, and a long discussion ensued about species, mimicry, phylogenetics, signalling systems, and Lepidoptera biology in general. Eventually Schneider had to leave but, as a parting shot, he invited Dick to visit his laboratory at Seewiesen—the famous Max-Planck

Institut für Verhaltensphysiologie where Konrad Lorenz had studied, and where ethologist and mimicry specialist Wolfgang Wickler was then in charge of one of the departments, alongside Schneider and his team.

The lure proved too much to resist, and that summer Dick travelled to Bavaria. There he met numerous wonderful physiologists and experimental biologists, including a very young Michael Boppré. Not only did this cement lifelong friendships with both Dietrich and Michael, but it also led Dick to abandon his research on the phylogenetics and biogeography of Satyrinae in favour of a similar programme on the Danainae. In 1975 Dick joined forces with colleague Phillip Ackery to research and write a book-length account of the milkweed butterflies. Initial progress was slow, as Dick was then seconded for two years to the Museum's *New Exhibition Scheme*, but by 1977 he was back full-time with Phillip, and they decided to pick up the pace.

As Dick and Phillip were primarily taxonomists, in endeavouring not only to create a cladistic classification for the

known milkweed butterfly species, but also to review their very extensive biology, they realised that they did not know anywhere near enough about the biology of butterflies in general. And so they hit upon the idea of organising and promoting butterfly biology “workshops”, to be held at the Royal Entomological Society's meeting room (then in nearby Queen's Gate, almost opposite the museum's old entomology building), and inviting a mixture of both “leading lights” and students to talk about their work. The idea was borne out of pure laziness—why not just get others to tell you what butterflies get up to rather than try to read a mass of scattered and often difficult literature yourself?

The first workshop was held at 41 Queen's Gate on 20th April 1977, under the title “Current Research on the Evolution and Genetics of Butterflies”, and proved to be a great success (Huxley & Vane-Wright, 1977)—so much so that there was an instant demand for a further meeting, held eight months later in December 1977, on “Ecology and Evolution of Butterflies” (Vane-Wright, 1978). Both

meetings were attended by about 80 very enthusiastic people, and by the end of the second meeting (organised by Jeremy Thomas) it was clear that there was a demand for further events. By the end of the third meeting, held in September 1978, the emergent special interest group had decided to call itself the Butterfly Research Association—and, more significantly, was already “planning an international symposium on the evolution and biology of butterflies for 1982 [sic]” (Turner, 1979). Two further ‘BRA’ meetings were held, in October 1979 (Burton, 1980), and in November 1980 (Howse, 1981).

London, 23–26 September 1981

A rather odd series of events then led to acceleration of the first international conference on the biology of butterflies, which took place during September 1981. In 1979 Dick had formally approached the Royal Entomological Society to see if they would sponsor a 4 or 5 day event, to take place in 1982, as part of the Society's regular biennial symposium series. The proposal was not well received. The Society was understandably nervous about the costs of such a large venture. Moreover, the Society at that time catered largely for professional entomologists concerned either with insects as model organisms for general disciplinary studies, or groups that had major impacts on humanity, such as locusts, aphids and biting flies.

Butterflies, a group of Lepidoptera strongly associated with the interests of the amateur fraternity, no longer sat well with this dominant culture. This was so despite the prominence at the time of great scientists such as Miriam Rothschild and Sir Cyril Clarke, who regularly used butterflies in their research. Disappointed, Dick turned his attention elsewhere, notably plans to support the work of recently arrived PhD student Ian Kitching. This involved the need for extensive fieldwork in the Malay Archipelago to be carried out in August–October 1980, following attendance at the International Congress of Entomology in Kyoto, and a visit to China *en route*. But just a few weeks before leaving for Beijing, in June 1980, Dick was approached by the Society—which had suddenly found itself without any proposal for that year's expected biennial symposium.



Following early work on *Maniola jurtina* reported at the 1981 symposium, Paul Brakefield, organiser of the 4th ‘BoB’, established the African mycalesine *Bicyclus anynana* as a butterfly ‘Drosophila’ now used in biology laboratories around the world. Photo © Yale University; image created by William Piel and Antónia Monteiro.

Reluctantly the Society had already accepted that organising a symposium for 1980 was by then impossible, but insisted that if the butterfly event were to go ahead, it must do so by September 1981 at the latest. Even so, with less than 15 months to arrange such a large and novel meeting, and being about to leave on a 13-week overseas trip, the sensible thing would have been to refuse. But this seemed like too good an opportunity to miss. And with the Society now keen to support any reasonable scheme, some concessions could be extracted. It was agreed that the meeting could be up to four days long, twice the length of the Society's normal symposia. However, the key to success lay in the fact that Dick was able to call on Phillip Ackery to carry almost the entire load of initial organisation. Following frenzied discussions in July 1980 about the structure of the meeting and who to invite, Phillip undertook the groundwork with his usual understated brilliance. By the time Dick returned at the end of October, it was clear that the programme was viable. In the end, the meeting was a vibrant event, with almost 150 registrants, and very well received (Anonymous, 1982).

However, the anticipated symposium volume, originally intended for 1982, was long delayed—largely due to waiting, in vain, for one of the key contributions. The main speakers and their topics had been chosen with the intention of covering the field of organismic biology, and to go without any of the plenary presentations involved great reluctance. As the costs of the meeting had been greater than the receipts, the delay in publication and potential loss of sales were of great concern to the Society. Publication in large format, so different from the Society's modest symposium volumes of the past, also caused consternation.

When it finally appeared (Ackery & Vane-Wright, 1984), even though not immune from criticism (e.g. Gall, 1987), the hardback proved a great success—in terms of sales, it did better than any previous volume in the *Symposia of the Royal Entomological Society of London* series, and was reprinted by Academic Press, with minor corrections, in 1985. Moreover, thanks to Phil DeVries, a paperback edition was later published in the USA (Ackery & Vane-Wright, 1989). Even so, more than a decade was to pass

before the idea of having a second biology of butterflies symposium took wing.

Stockholm 10–12 October 1994 – a new beginning

In about 1993 Sören Nylin found himself talking to Bengt Karlsson about how strange it was that there were no meetings dedicated to basic research on butterflies. Both were recently graduated PhDs at the University of Stockholm, and had heard stories from their supervisor Christer Wiklund about the 1981 London meeting “where “everyone” was present” (Nylin, 2010). But since then little seemed to have happened, at least with respect to butterfly meetings in Europe, and the two thereupon decided to organise a new event.

In Sweden there is a tradition of yearly gatherings for ecologists, the *Oikos* meetings, and Sören and Bengt thought that the simple way they were then organized would be a good and manageable model. They decided on an event to last three days, with no parallel sessions, and no proceedings to be published. Moreover, delegates were invited, with a bit of guidance, to find their own food and lodgings in Stockholm.

But would anyone else really be interested? They sent out their first circular, with 10–12 October 1994 as the suggested date. The response was very encouraging, and they became committed. The next step involved inviting some well-known people, with the implication that extra funding would be needed to keep registration costs low.

As Sören (Nylin, 2010) recalls “. . . this was the decisive point; this was when the Stockholm meeting became *Biology of Butterflies II*, even though it was in fact *Butterfly Ecology and Evolution I*. After all, the London meeting was a one-off thing, and over a decade had gone by since . . . However, to get financial help from the Swedish Research Council and the Wenner-Gren Center Foundation, we had to pretend to be organizing a meeting that was part of a series, so that it was Sweden's turn to do its duty (this was part of their funding rules). Not being sure that actually starting a series was OK for getting the grants, and not knowing if there would ever be a next meeting, we decided that the series started already in London 1981.”

With Carol Boggs, Paul Brakefield, Mamuro Watanabe, Konrad Fiedler, John Thompson and Dick Vane-Wright already signed up to give keynote talks, Sören and Bengt asked their senior colleagues Christer Wiklund and Olof Leimar to co-sign the applications for funding. Not only was the money obtained sufficient to pay the travel costs of the invited speakers, enough was left over to buy the department a freezer that is still in use today! (Nylin, 2010).

As the meeting approached, with over 120 delegates expected, further developments occurred. The department had a testimonial grant fund that could be used, and Naomi Pierce was invited to give a special Ester Lager lecture, to take place immediately after the main meeting ended. In addition, Ilkka Hanski organized a satellite meeting on “*Butterfly Population Ecology & Dynamics*”. This was held before the meeting—remarkably, in part on a return ferry journey between Stockholm, Turku (Finland) and back.

The meeting comprised 43 talks, including 8 plenary presentations, and 35 posters. The conference dinner took place on the first evening, “and featured singing at the tables in the traditional Scandinavian way, and a very funny spontaneous talk by Mike Singer” (Nylin, 2010). Following the last day of the main event there was a morning excursion to Uppsala, and to Linnaeus's home at Hammarby. Brilliant autumn weather made for a most enjoyable trip. This was followed in the afternoon by the last act of the whole conference—Naomi Pierce's special lecture, on “*Ants, Plants and Blue Butterflies*”.

Crested Butte, Colorado, 15–19 August 1998

During the Stockholm meeting Carol Boggs and Ward Watt had risen to the challenge of organising another meeting in the series. Working in collaboration with Paul Ehrlich, Carol and Ward put together the Third International Butterfly Ecology and Evolution Symposium, held at Crested Butte, Colorado, 15–19 August 1998. Over 140 researchers attended the event, from 19 different countries representing every continent (except Antarctica!) (Boggs, 2010).

As e-mail was by 1998 already in wide use, an electronic database of

5th International Conference on the Biology of Butterflies



Villa Mondragone, 2 - 7 July 2007
Tor Vergata University, Roma, Italy

Organising Committee:
Valerio Sbordoni
Donatella Cesaroni
Renata Landolfi

SYMPOSIA

A symposium in honour of Lincoln Pierson Brower

Organisers: K. Oberhauser, M. Rappé and D. Vano-Wright

Evolution and development of colour patterns

Organisers: P. Bédélac and A. Mouton

Developmental plasticity, hormones and Evo-Devo

Organiser: P. Brakefield

Life histories: ecology and evolution

Organisers: R. Zwaan and K. Fischer

Recent developments in the phylogeny of butterflies and their relatives

Organisers: N. Pierce, A. Brower and A.V. Locei Freitas

Mimicry and Evolution of the Heliconiinae and Ithomiinae

Organisers: J. Müller, C. Jiggins and N. Thorn McMillan

Mechanisms of speciation in butterflies

Organisers: D.D. Kapan, M. Kronfort and C. Jiggins

Ecology and Conservation of Large Blue Butterflies (Maculinea)

Organisers: P. Neebcke and J. Strate

Ecology of parasitoids of butterflies

Organisers: S. van Nothuis and C. Steffaniga

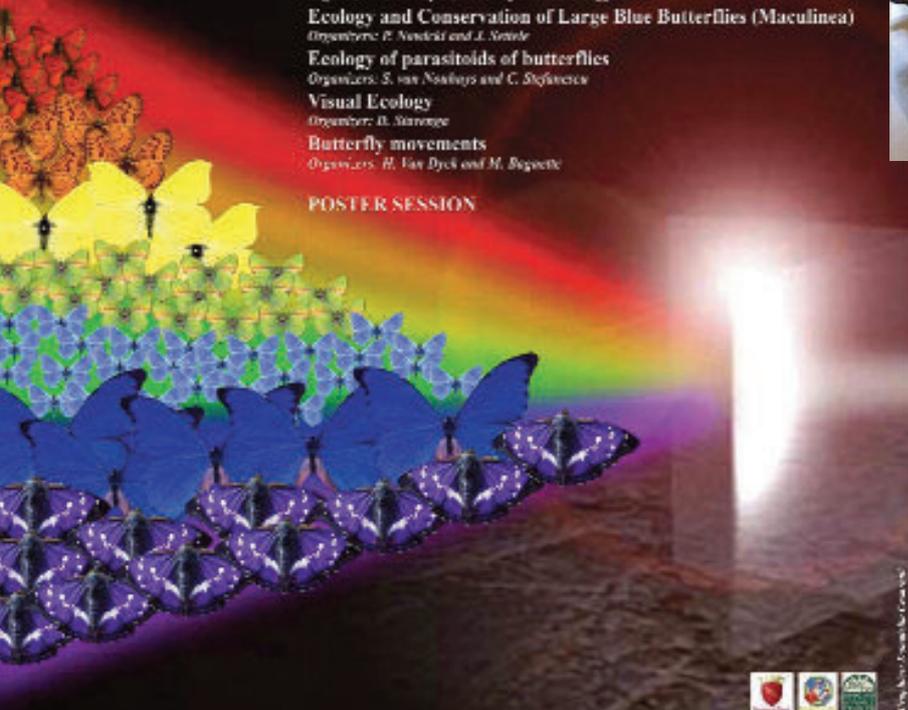
Visual Ecology

Organiser: D. Starmer

Butterfly movements

Organisers: R. Van Dyck and M. Begon

POSTER SESSION



Images from the 2007 symposium: the audience. Organiser-in-Chief Valerio Sbordoni is in blue-checked shirt, front row. From: <http://biobutterfly2007.uniroma2.it/Conference.htm>

basis by the majority of those butterfly researchers—even now mostly located in North America or Europe—unlikely to have ready funds for inter-continental travel (Boggs, 2010).

Leiden, 23–27 March 2002

The Fourth International Conference on the Biology of Butterflies was held during 23–27 March 2002, at Leeuwenhorst, near Leiden (Brakefield, 2010). Plenary talks were given by Carol Boggs, Doekele Stavenga, Sean Carroll, Fred Nijhout, Jeremy Thomas, John Thompson, Chris Thomas, Jim Mallet, Andy Brower and Carla Penz. Major topics included reproductive strategies, vision, development, genetics of mimicry, social parasitism, co-evolution, climate change, origins of diversity, molecular systematics and phylogenetics. Two parallel sessions accommodated 55 other talks that, along with many posters, emphasized the excitement and sheer diversity of work then being pursued on butterfly biology. Bob Pyle gave an extensively illustrated evening presentation on the Monarch. The main meeting was followed by a final symposium on March 28th of the European Network FRAGLAND on metapopulation biology, co-ordinated by Ilkka Hanski. A total of 184 delegates registered for this very successful meeting. See also Lewis & Bryant (2002).

Rome, 2–7 July 2007

At the Fifth International Conference on the Biology of Butterflies, the focus

participants was constructed to facilitate further communication among delegates, and to help any future meeting organisers. At Colorado the late Charles Remington served as honorary President—paralleling the dedication to E.B. Ford made at the London symposium. Talks were held in plenary sessions so that all presentations, as well as posters, could be appreciated by everyone. Topics ranged from ecology through the emerging field of evo-devo to genetics and conservation biology. The conference banquet was held at Mt Crested Butte.

Talks presented at the meeting, along with selected poster presentations, were updated and expanded as chapters in a major book published by the University of Chicago Press, edited by Carol Ward and Paul (Boggs, Watt & Ehrlich, 2003). The 26 chapters are organized in broad disciplinary areas, addressing the use of butterflies in the study of behaviour, ecology, genetics, evolution, systematics, and

conservation biology. As such, it is so far only the second proceedings to be generated by the biology of butterflies series. The long 'gestation' times of both of these volumes indicate the difficulties faced in gathering together and publishing such diverse materials, even though they are nominally all on a single topic.

For the Colorado meeting partial funding for graduate students and researchers from developing countries was obtained from the US National Science Foundation. The small but useful residual funding from registration went to support needy attendees at later meetings. During the last plenary at Crested Butte, Paul Brakefield volunteered to organise a meeting in The Netherlands. A view emerged that these symposia should alternate between Europe and North America, at a minimum, with forays into Latin America, Asia, Australia and Africa if and when an opportunity arose. The rationale was to allow participation on at least an occasional

was again on developments in biology achieved using butterflies as model organisms for research—particularly in evolutionary biology. Masterminded by Valerio Sbordoni in collaboration with Donatella Cesaroni and Renata Landotti and a local organising committee, the event took place at Villa Mondragone, the beautiful conference venue of Tor Vergata University, Rome, during 2–7 July 2007. Over 140 participants registered for the event (<http://biobutterfly2007.uniroma2.it/Lista.html>). The 11 separate symposia that made up the conference are listed on the striking conference poster, with details still available on the conference website (<http://biobutterfly2007.uniroma2.it/program.htm>). One of the symposia, in honour of Lincoln Brower's 75th birthday, was made possible through generous joint sponsorship, including funds from the RES (Fink & Vane-Wright, 2007), in part reflecting the importance of Lincoln's major contribution to the 1981 meeting.

Edmonton, 29 June–2 July 2010

The Sixth International Conference on the Biology of Butterflies took place in 2010, 29 June–2 July, at Edmonton, Canada. Sponsored by the Department of Biological Sciences, University of Alberta, and chaired and organised by Felix Sperling and Jens Roland together with a six-strong organising committee, the meeting attracted 205 delegates from over 23 countries. An exceptionally diverse assortment of oral and poster presentations made the conference academically stimulating and intellectually engaging. The very extensive programme can still be downloaded through the conference website (<http://icbb2010.biology.ualberta.ca/index.html>). Based on the long-standing theme of the biology of butterflies symposia, focus was again on recent developments in biology that rely on butterflies as research models, particularly in ecology and evolutionary biology. Following the conference, Jens Roland led a well-attended tour to the Kananaskis region of the Alberta Rocky Mountains.

Turku, Finland, 11–14 August 2014 – and the future

The Seventh International Conference on the Biology of Butterflies will be hosted by the Department of Biology,

University of Turku, Finland, during 11–14 August 2014, with Niklas Wahlberg in collaboration with Marjo Saastamoinen (University of Helsinki) acting as the principal organisers, with Chris Wheat (Stockholm University), Patrícia Beldade (Instituto Gulbenkian de Ciência) and André Freitas (Universidade Estadual de Campinas) acting as co-organisers of the scientific content. The conference will continue to follow the tradition of presentations in all fields of biology with butterflies as the focal study organism. Morning sessions will cover four major topical issues, and two parallel afternoon sessions will accommodate contributed talks. A field trip to visit the famous *Melitaea cinxia* metapopulation in the Åland archipelago is also being planned. Registration will be possible from early 2014 via the conference website (<http://nymphalidae.utu.fi/icbb2014/organization.html>).

The Biology of Butterflies (Vane-Wright & Ackery, 1984, 1985, 1989) proved influential, with several of the papers widely cited in the following decade—and some still cited today. In addition to those already feted and well known by 1981, many of the younger participants went on to become leading names in butterfly biology—Naomi Pierce and Paul Brakefield to mention just two among the contributors to the 1981 conference. Subsequent conferences have propelled many others into the “butterfly biology limelight”. Indeed, the conferences have proved to be an excellent venue for budding researchers to meet many famous biologists in fields as diverse as ecology, evolution, systematics and genetics, in a very relaxed atmosphere, which has led to new collaborations. However, the real achievement is that the seeds sown unwittingly by Dietrich Schneider almost 40 years ago have finally grown into a thriving and permanent commitment to charting and encouraging progress in our scientific understanding of these most charming, charismatic and endlessly fascinating insects—the butterflies. If you want to be part of that ongoing tradition, do register for Turku 2014. And, with the study of butterfly biology long established in Japan and Australia, and growing rapidly in South America and Asia, can we look forward to “2018” somewhere outside Europe or North America?

References

- Anonymous (1982). The Biology of Butterflies (23–26 September 1981). *Antenna*, London 6(1): 179–181.
- Boggs, C.L., Watt, W.B. & Ehrlich, P.R., eds (2003). *Butterflies. Ecology and Evolution Taking Flight*, xvii+739 pp., [14] pls. University of Chicago Press, Chicago. Abstracts and additional material at <http://press.uchicago.edu/books/boggs/index.html> (accessed 27th June 2013).
- Boggs, C.L. (2010). History of the Conference. 1998 – Mt. Crested Butte <http://icbb2010.biology.ualberta.ca/1998.html> (accessed 30th June 2013).
- Brakefield, P.M. (2010). History of the Conference. 2002 – Leiden <http://icbb2010.biology.ualberta.ca/2002.html> (accessed 30th June 2013).
- Burton, G.N. (1980). Pierid workshop [meeting held on 17th October 1979]. *Antenna*, London 4(1): 22–23.
- Fink, L.S. & Vane-Wright, R.I. (2007). Lincoln Brower's European Tour. *Antenna* 31(4): 203–207.
- Gall, L.F. (1987). The Biology of Butterflies [book review]. *Journal of Research on the Lepidoptera* 25(2): 149–155.
- Howse, D. (1981). Butterfly population size [meeting held on 27th November 1980]. *Antenna*, London 5(1): 34–35.
- Huxley, J. & Vane-Wright, R.I. (1977). Butterfly drinking party [meeting held on 20th April 1977]. *Antenna*, London 1(1): 20–21.
- Lewis, O.T. & Bryant, S.R. (2002). Butterflies on the move [meeting report]. *Trends in Ecology and Evolution* 17(8): 351–352. doi: 10.1016/S0169-5347(02)02536-3 (accessed at <http://users.ox.ac.uk/~zool0376/onthemove.pdf>, 27th June 2013)
- Nylin, S. (2010). History of the Conference. 1994 – Stockholm. <http://icbb2010.biology.ualberta.ca/1994.html> (accessed 27th June 2013).
- Turner, J.R.G. (1979). Two models of biogeography and three studies of *Heliconius* [meeting held on 26th September 1978]. *Antenna*, London 3(1): 40–41.
- Vane-Wright, R.I. (1978). Ecology and evolution [meeting held on 14th December 1977]. *Antenna*, London 2(2): 47–48.
- Vane-Wright, R.I. & Ackery, P.R., eds (1984). The Biology of Butterflies. *Symposia of the Royal Entomological Society of London* (11): xxiv+429 pp., 4 pls. Academic Press, London. [Reprinted 1985, with minor corrections.]
- Vane-Wright, R.I. & Ackery, P.R., eds (1989). *The Biology of Butterflies*, paperback edition, xxvi+429pp, 4 pls. Princeton University Press, New Jersey. [With Introduction to the Paperback Edition and Additional Bibliography by RIVW & PRA, pp. x–xii, xiii–xxv.]

Society News

Council Matters March 2013

The Westwood award for excellence in insect taxonomy was discussed at Council, in particular the need to advertise internationally. Prof. Mordue wondered about the criteria for the award and whether molecular taxonomy was covered.

The Registrar reported that Dr Greg Masters was stepping down as co-editor of *Antenna* and that Dr David George (Regional Hon. Secretary North) was taking up the helm. Council expressed much gratitude to Dr Masters for all his considerable work during his tenure as co-editor. Jennifer Banfield-Zanin has also joined the *Antenna* team as an editorial assistant.

Prof. Reinhardt advised that, in his role as review editor for *Ecological Entomology*, he had secured a Wallace Centenary review paper. Efforts were being made by the Hon. Editorial Officer to secure a general Wallace article for *Antenna*.

Council considered a written progress report on the European Congress of Entomology from Prof. Stuart Reynolds, chair of the organising committee. Comments were offered about the structure of the meeting and the Hon. Secretary was asked to convey these to the organising committee.

The Hon. Treasurer advised that the Finance Committee proposed no increase in subscription for the 2014/15 financial year and this was endorsed by Council.

Council Matters May 2013

Prof. Claridge explained that he had consulted with Prof. Wheeler (Arizona State University) over the criteria for the Westwood Award, as both had been instrumental in establishing the Award. After consideration, Council agreed to remove the word 'descriptive' from the Award criteria. It was not felt that this would

substantially alter the rationale or remit behind the Award. Council agreed to remove the reference to a specific age in the criteria for the Marsh Award for an Early Career Entomologist.

Dr Tilley, Director of Outreach, gave an overview of the Insect Festival 2013 to be held in York Museum and grounds in July. He circulated a schedule of trade stands and exhibits, and explained that the event was now at capacity. A lecture by Dr James Miller, Westwood Award winner, will form the basis of an *Evening of Entomology* on the Saturday preceding the Insect Festival.

Council discussed the draft annual reports from the Society's sub-committees [finalised versions of which were presented at the June AGM]. The Hon. Editorial Officer outlined the Society's activities with regard to publications. In particular, the major issue facing the Society is the question of open-access publishing. This could have the potential effect of reducing journal subscription income for the Society but also make it more difficult for non-funded entomologists to publish in the Society's journals. Prof. Field explained how she had lobbied on the issue in conjunction with Wiley-Blackwell but that the full implications remain to be seen.

The Hon. Secretary led Council through the Meetings Committee's report. He felt it had been a successful year and that the SIGs, Regional Meetings, Postgraduate Forum and National Meeting (Ento'12) had all gone reasonably well. He outlined the Society's major outreach event, National insect Week, which had attracted 63 partner organisations and resulted in over 300 events taking place. He also drew attention to the Membership Committee's report, which had been provided by Dr Gordon Port. The Membership Committee had circulated a postal / on-line questionnaire concerning the Society's activities and direction. Council felt that this was an extremely valuable exercise and looked forward to seeing the Membership Committee's analyses and recommendations.

Dr Clements, as Chair of the Library Committee, reported on their activities. He started off by saying that he felt fortunate that the Society's Librarian made his role a straightforward one. As with all libraries, storage was a problem but we were in a better situation than ever before. BioOne had proved to be popular and the Society's subscription had been extended allowing Members and Fellows access to a wide range of online publications. The Librarian had saved the Society approximately £4 K per annum by moving away from SWETS and purchasing journals directly. Some expensive but little-used journals had been discontinued.

The Registrar circulated copies of the draft accounts. He commented in particular on the surplus of income over expenditure, and the sources thereof. He also outlined areas of increased expenditure and the reasons for this. The Hon. Treasurer endorsed the Registrar's comments and thanked him for his financial management. The draft annual accounts were unanimously accepted by Council.

The President recommended that Prof. John Pickett be endorsed by Council as President Elect at the forthcoming AGM. This proposal was carried unanimously.

Society Awards

Student Essay Award

1st – Ciaran Pollard – National University of Ireland (Maynooth)

The trials and tribulations of a researcher – the case of the mysterious iron capsules

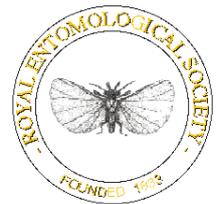
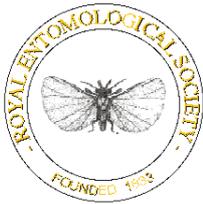
2nd – Isobel Routledge - Oxford University (Wadham College)

Parasitic Pupperty: Modification of Host Behaviour

3rd – Kayla G Barnes – Liverpool School of Tropical Medicine

The Chosen One

The Hon. Editorial Officer advised that this is a very popular award with some 30 entries and the judging was difficult as all were good essays.



SCHEDULE OF NEW FELLOWS AND MEMBERS

as at 5th June 2013

New Honorary Fellows

None

New Fellows (1st Announcement)

Dr Philip Iain Buckland
Professor Philip Charles Stevenson
Dr Muhammad Saeed
Professor Joon-Ho Lee

Upgrade to Fellowship (1st Announcement)

Dr Zain Ul Abdin

New Fellows (2nd Announcement and Election)

Dr R Sundararaj
Dr Mark Kerry Greco
Dr Lars Vilhelmsen
Dr Shaun Leslie Winterton
Mr Steven Falk
Dr Eugenie Christine Regan (as at 1.5.13)

Upgrade to Fellowship (2nd Announcement and Election)

Dr Stephen P Yanoviak
Professor William Owen Hamar Hughes

New Members Admitted

None

New Student Members Admitted

Miss Georgina Milne
Ms Ashley Lauren Buchan

Re-Instatements to Fellowship

None

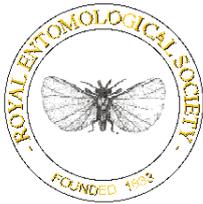
Re-Instatements to Membership

Dr Nicola Cook

Re-Instatements to Student Membership

None

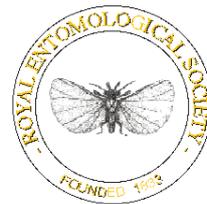
Deaths



HONORARY FELLOWS OF THE SOCIETY

(HON. F.R.E.S.)

as at June 2013



1974

Professor C D Michener – USA

1985

Dr C G Butler – UK

1986

Dr W J Knight – UK

1999

Professor H F van Emden – UK

2000

None

2001

Dr G L Bush – US
Professor J Crampton – UK
Professor T Jones – UK
Professor J H Lawton – UK
Professor M Locke – Canada
Professor A Minelli – Italy
Dr P Price – US
Professor G H Rothschild – Australia/UK
Dr G A Vale – Zimbabwe
Professor E O Wilson – US

2002

Professor A N Clements – UK
Dr N Moore – UK

2003

None

2004

Professor T Lewis – UK
Dr R I Vane-Wright – UK
Professor K G Davey – Canada

2005

Mr B Marsh O.B.E. – UK

2006

Professor M F Claridge – UK

2007

Professor L Riddiford – USA

2008

Professor J B Whittaker – UK
Professor G J Goldsworthy – UK
Dr R Wootton – UK

2009

Dr R O Clements – UK
Mr J S Badmin – UK
Professor A J Mordue – UK
Professor Dr N P Kristensen – Denmark
Dr G R Port – UK

2010

Professor C P Haines – UK
Professor J A Pickett – UK
Professor J Hemingway – UK
Professor P S Cranston – USA
Professor G A Matthews – UK
Mr C P Farrell – UK
Professor D J Bellamy – UK
The Earl of Selborne – UK

2011

Professor B S Hansson – Germany
Professor J Pettersson – Sweden
Mr P Smithers – UK

2012

Professor M Ashburner – UK
Professor M R Berenbaum – USA
Professor D L Denlinger – USA
Professor I Hanski – Finland
Professor J G Hildebrand – USA
Professor J A Hoffmann – France
Professor F C Kafatos – UK
Dr P A Lawrence – UK
Professor B Lemaitre – Switzerland
Professor G A Parker – UK
Professor N E Pierce – USA
Professor J W Truman – USA
Dr P Barnard – UK

2013

Professor S J Simpson – Australia
Dr J P Dempster – UK

Meeting Reports

The Verrall Supper 2013 New Organiser – New Venue

It was with some trepidation that I took on the role as the Verrall Supper Member for the Entomological Club (<http://entomologicalclub.org/>), the oldest entomological society in the world. The first reason was that Van (Professor Helmut Van Emden to be more formal) had run it very successfully for the previous 40 years and second, he was, of course, going to be present at the first Supper organised by me. A very daunting task as you might imagine. Things seemed to be going alright until suddenly I receive an email from Imperial College with whom Van and I had booked the usual venue, informing us that the Rector, Sir Keith O’Nions was hosting an event to be attended by Boris Johnson and that the Senior Common Room was no longer available, despite our signed contract. Something of a body blow I must admit. The Events Team did, however, offer us some alternative venues nearby, one of which, The Rembrandt Hotel, seemed to meet our requirements. I made an inspection visit and was impressed with what was on offer and confirmed the booking.

I was, however, still somewhat concerned at how the regular Verrallers would find the change of venue. After all, over the last thirty years or so I can only remember not being in the Imperial College SCR on one occasion, the ill-fated Baden-Powell House year. Van and I arrived early on the day, so missed Mike Siva-Jothy’s excellent talk on bed bugs, but first night nerves on my behalf and mentoring worries on Van’s, dictated that we be on hand far too early just in case. With everything set up, including Van’s Bookstall (visible in the background of the in the photo at the top of the page), we sat back, pints in hand, to await the onslaught. Actually we had one very early-comer who had thought the lecture was at the hotel as well as the Supper. I had also instigated a new procedure for seating arrangements, round tables instead of long tables and the supper tickets also doubled up as place markers (yet another innovation).

I also wanted to collect everyone’s email addresses so that in future years we could save postage costs. Clive Farrell did a great job overseeing this part of the operation.

The evening progressed well, despite a bit of queuing at the sign-in desk (something to look at for next year) and we had a grand total of 184 happy Verrallers sit down for their supper. They were even happier when they found out that each table had two bottles of wine on them. The usual suspects were there but also a good number of the younger generation.

The meal was very good and a great time appeared to be had by all, and even Van looked quite pleased.

Jeremy Thomas was the Chairman this year and welcomed the overseas guests and made the sad announcements of those Verrallers who had left us since the last Supper (any omissions were the fault of the new organiser) and the formal part of the gathering was then over, although there were some impromptu speeches from the floor. The general view from the assembled revellers was that the Rembrandt was a satisfactory venue, which is just as well as I have booked it again for next year. Emails received after the event also seem to indicate that the new venue was a success, and so I leave you with a rare photograph of Simon Leather looking relatively smart!



Entomological Club Secretary, Chris Lyall, on desk duty.



Clive Farrell soliciting email addresses



David Agassiz (the Grace-Sayer) and Keith Bland enjoy a beer together



Two Older Hymenopterists – Donald Quicke and Mark Shaw.



Van taking a break.



Fran Sconce, Andrew Johnson & Chris Jeffs (all ex-MRes Entomology students).



Rare photo!



The Younger Generation!

Meeting report: Insect Parasitoid Special Interest Group, Department of Biology, University of York, 12th April 2013

Peter Mayhew (University of York)

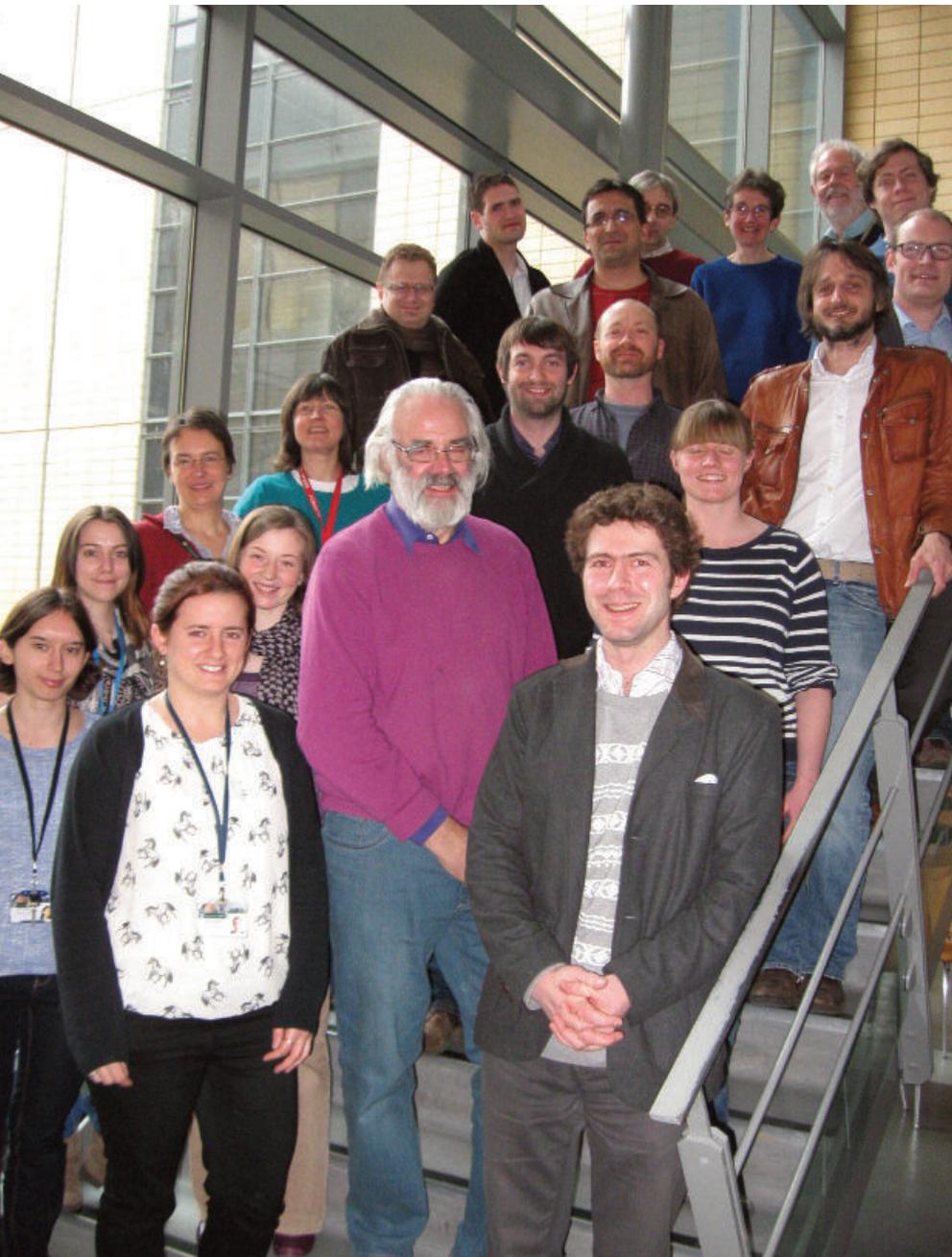
Twenty-four participants arrived at a warming York campus on a spring-like Friday morning to share their latest parasitoid research findings. Of course, these meetings are not just about sharing research findings, but also about meeting new, like-minded

colleagues and catching up with old friendships. It was good to see a broad range of both new and familiar faces amongst the attendees, and it made for a relaxed, informal and collegiate atmosphere.

Several themes recurred amongst the

seminars given; aphids, and their symbionts and parasitoids, appeared several times both in an experimental lab context and a field (agricultural biodiversity) context, reflecting their importance as pests, but also value as model experimental organisms. Contest behaviour between adult parasitoids also made more than one appearance, reflecting its growing prominence in the behavioural literature on parasitoids. New techniques figured, with the use of metabolomics to assess the nutritional status of both hosts and parasitoids. Finally, accurate taxonomy showed its ongoing essential value.

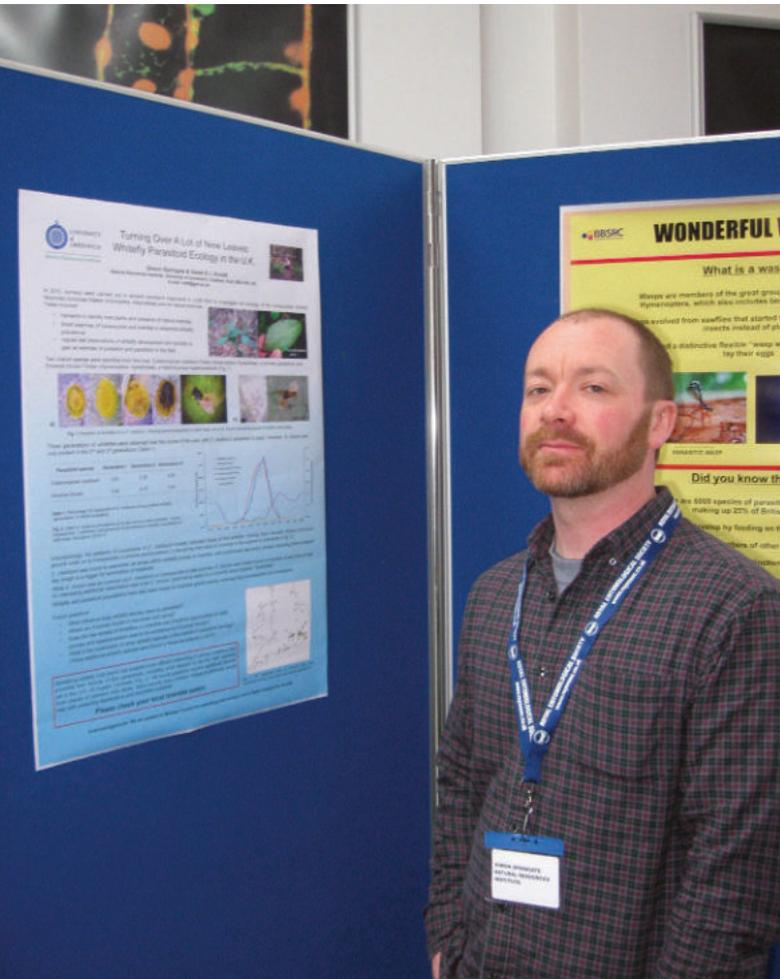
First up was Eleanor Heyworth (University of York), who discussed her experiments on the newly discovered pea aphid bacterial symbiont, "X-type". Eleanor showed through the use of cured and non-cured aphid lines that the bacterium provides improved resistance to parasitoids in some aphid clones, as well as higher survival after heat shock, though at a cost of dramatically lower fecundity. These benefits and costs may help explain why the bacterium is not ubiquitous in the field. Apostolos Kapranas (University of Nottingham) then described how host and adult nutrition affected contest outcome in the bethylid wasp *Goniozus* by manipulating wasp access to carbohydrates. Carbohydrate had no significant effect on contest outcome independent of other factors, perhaps due to the opposing effects of increased fighting ability and decreased motivation to fight. Finishing the morning session, David George (University of Northumbria) described work to devise field margin flower mixes that optimize biodiversity and ecosystem services for farmers. Interestingly he showed that certain flowers are attractive to parasitoids but not bees or hoverflies, and *vice-versa*. An optimized mix shows significantly higher numbers of parasitoids attracted to crops, although the identity of these wasps remains to be determined.



Survivors at the end of the talks.



David Penney at the Siri Scientific Press publishing stand.



Simon Springgate at his poster.



Gavin Broad enjoys the view of lunch.



The slug-like caterpillar of the Festoon moth *Apoda limacodes* on an oak leaf, being attacked by the parasitoid wasp *Sphinctus serotinus*, which is probably extinct in the UK. See text for further details. Photo © Mark Shaw, with thanks.

Press publishing stand manned by David Penney (University of Manchester), and a poster by Simon Springate (University of Greenwich) on the biology of native UK whitefly parasitoids living on honeysuckle and bramble. Documenting the native distributions of these species is important to determine the natural reservoirs of both pests and natural enemies.

After lunch, Peter Mayhew (University of York) described data collected by Margarete Macedo (University of Rio de Janeiro) on a *Eurytoma* parasitoid of a gall-forming braconid living inside the seeds of a leguminous shrub. Male wasps visit seed pods to mate with emerging females and fight in pairwise contests at the female emergence sites. Male size (particularly the thorax size) strongly predicts contest outcome in the field, but unexpectedly, females were still larger than males on average, although the largest wasps were males. Perhaps small males are fitter than these results suggest through mating away from the female emergence site, or perhaps small females are very unfit because they cannot reach the hosts inside galls. Charles Snart (University of Nottingham) then reemphasized the themes of contests and nutrition as he outlined his PhD project on the metabolomics of host nutrition for parasitoids in *Goniozus* bethylids. Mass spectroscopy is used to identify the biochemical profiles of the host and adult parasitoid, and host

manipulations can then assess the effect of these on parasitoid fitness.

Ailsa McClean (University of Oxford) then took us back to aphid symbionts by describing the effect of another, better known bacterial symbiont, *Hamiltonella*, on pea aphid fitness. Different bacteria strains appear to provide different degrees of protection against different parasitoid species, raising a whole host of questions, including what mechanisms might be in operation. Mark Shaw (National Museums of Scotland) brought us up to tea with a well-illustrated description of the parasitoid community of the taxonomically isolated Festoon moth (*Apoda limacodes*). The moth is extremely slug-like in appearance and feeds on the underside of oak leaves, being attacked by five koinobiont parasitoids, three of which are absolute specialists. Only two of these have been recorded in the UK, but both are probably now extinct, although the moth survives, demonstrating the problems of concentrating conservation on herbivorous insects and ignoring their natural enemies. Mark reared the wasps and caterpillars from Dutch material and photographed wasp behaviour, oviposition, and development (see accompanying photo).

After tea two talks rounded off the academic side of the day. First, Gavin Broad (Natural History Museum, London) recounted horror-stories of how using museum material and

catalogues uncritically can lead to erroneous scientific conclusions. Some of the most widely collected groups of parasitic wasps are often misidentified, with only tiny numbers of the material in museum collections being correctly labelled. Gavin recounted an example of a study in a high profile journal based on such material that contains almost wholly erroneous data as a result, rendering the paper's conclusions invalid. This has serious consequences for how digitized collections should be used and trusted when they become available online. Finally, Mark Ramsden (University of Lancaster) brought us back to aphid parasitoids in agro-ecosystems, and showed that the most effective method for promoting parasitoids in winter wheat fields is through provision of both winter refuge and floral resources, with access to a relatively high abundance of aphids. Individually, winter habitat and additional prey were less important than access to floral resources.

Those able to continued discussion down at the Deramore Arms in Heslington Village, where both the beer selection and food menu were much admired and enjoyed. The organizer wishes to thank all participants for their contributions, the Department of Biology at the University of York for use of facilities, Kirsty Whiteford at the RES for web and organizational support, and Luke Tilley for manning the registration desk and chairing a session on the day.

REPORT

Beautiful Butterflies and Blues.

Charity event in aid of Rett Syndrome Research Trust UK,
St Mary Bredin Church, Canterbury, Saturday 18th May 2013

Dick Vane-Wright

“I’ve got the blues” evokes feelings of melancholy and sadness. Blues music came from the Deep South, based on Afro-American spirituals, work songs and chants. The blues are also one of the major families of butterflies, small in size but often exquisite in colour and pattern. Not all blues music is sad or melancholy. Not all butterflies belonging to “the blues” are blue, and not all blue butterflies belong to “the blues” . . .

One of my neighbours has a granddaughter afflicted by Rett Syndrome – a terrible brain disorder caused by a mutation on the X-chromosome. Named after the Austrian physician Andreas Rett, who first recognised the condition in 1966, “Rett” is almost invariably fatal in boys: the few that survive birth all die within the first two years of life. But girls – with one functional copy of the gene – do survive. Most cruelly, for the first 12 months or so they seem and are almost invariably proclaimed normal. Parents and child bond. Then, around 18–24 months, signs of regression begin. From then on, Rett affects nearly every aspect of the child’s life, taking away the ability to walk, talk and use their hands. Many have problems with breathing and eating, and many also have seizures.

Particularly distressing, those with Rett know and understand much more than their bodies allow them to reveal – but they are “locked-in”, trapped in a body that cannot obey signals from the brain. The little girl is frustrated, and will often shout and make seemingly angry outbursts. Unfavourable, hurtful comments about the child are often made to the increasingly baffled and worried parents. At this stage a misdiagnosis of autism is common. But the child is not autistic – Rett is a completely different condition, for which there is no known treatment.

The disorder is not unique to humans however—it occurs in other mammals. By using mice suffering from the same or a similar mutation, a potential cure has been discovered – a cure, moreover, that might have the capacity to reverse the regressive

effects if applied soon enough. This disease is not inherited because those afflicted never get the chance to reproduce: the condition becomes so severe that all require 24 hour care before they reach puberty, and it also has a strong negative impact on longevity. So it occurs at the background mutation rate for the gene involved. It can affect any family, anywhere. In the UK this means about 20–30 new cases per year, in the USA about four times as many. As a result ‘Rett’ is classed as a rare disease, and currently there is little or no public money available for research. Almost all work on this terrible condition is funded by the voluntary and charitable sectors. *Beautiful Butterflies and Blues* was a one-off, local community response to try to help this exceptionally good cause.

The idea grew out of conversations with blues musician and music therapist Iain Spink. What could we do? Modern western popular music, in almost all its forms, has been hugely influenced by the blues. And the blues are also the Lycaenidae. Is there any connection? Well, there is at least a strong cultural and linguistic link. If you say “I’ve got the blues” you imply a depressed psychological state. The word psychology comes from the Greek word $\Psi\Upsilon\chi\eta$ (psyche), meaning breath, life, spirit and the human soul. But psyche can also be used to mean butterfly – because of the analogy between metamorphosis (well understood by Aristotle) and re-birth. Butterflies, to the ancient Greeks, were often thought to be souls of the departed (see also review of *Flight of the Butterflies*). So the idea of linking butterflies and blues through the story of Cupid and Psyche was hit upon.

The evening presented four music sets. In between, three short audio-visual presentations on butterflies also related the Cupid and Psyche story, in its three mandatory parts – boy meets girl; boy and girl separate; after many trials boy and girl get together again – but in this case, only in heaven. Oh, and

of course, the girl-now-goddess gets butterfly wings in the process.

The music was provided by child therapist, pianist, singer and drummer Charlie Grima (best known for his time with glam-rock band *Wizzard*: Roy Wood, *See My Baby Jive*, *I Wish It Could Be Christmas Everyday*, etc.), multi-award winning international harmonica superstar Brendan Power (whose father was an entomologist!) and his partner Laura, and, led by Iain, the excellent Canterbury-based semi-pro blues band *Spade and Archer*. There was also a surprise appearance from former comedian and “Voice of Radio 2 Folk Music” legend Mike Harding. In addition to mythology, the entomology included a brief account of the Lycaenidae, how butterflies make their colours, and a seven minute video about Monarch migration, graciously made available by Lincoln Brower. Amongst gifts from other organisations and individuals, through the generosity of Natural History Museum Publications, copies of their 2003 book *Butterflies* were offered as raffle prizes.

Although beforehand practically dismissed by a local paper as “an unlikely combination”, *Butterflies and Blues* really rocked – the audience and performers all had a great time – including a further impromptu session from the musicians at local hostelry *The Phoenix* immediately afterwards. Even weeks later people still come up to me and say how much they enjoyed it, and there has been talk of a repeat . . .

But did it work as a fund-raiser? After unavoidable expenses were paid, a cheque for just over £2000 was sent to and gratefully received by Rett Syndrome Research Trust UK. That was the target the organisers had set themselves. And, like all such events, it had the unquantifiable benefit of increasing awareness. So yes, it was a success—*Beautiful Butterflies and Blues* proved to be a most enjoyable, even if unlikely combination.

Information about Rett Syndrome can be found at: <http://www.reverserett.org.uk/>



Ant adventures in Uganda



Heather Campbell is an ecologist based at the University of Reading. She is interested in the behavioural and community ecology of African ants and is currently finishing a PhD on ant-plant interactions in Namibia. School of Biological Sciences, University of Reading, Reading, UK
Email: h.campbell@pgr.reading.ac.uk or follow me on Twitter @scienceheather



Claudia Gray is a PhD student, based at the University of Oxford. She is interested in evaluating the conservation value of different management strategies and is currently researching the impact of riparian forest reserves within oil palm plantations in Sabah, Malaysia. Department of Zoology, University of Oxford, Oxford, UK
Email: claudia.gray@zoo.ox.ac.uk

As we stepped off the bus, four hours from our starting point in Entebbe, the collective instinct of the group was not the usual dash to the toilets or scramble to get the best room. Instead everyone started crouching on the ground. Others wandered off to the nearest tree and began snapping open twigs or peeling back loose bark. These were not your usual safari tourists. They were entomologists, or more specifically myrmecologists. And every single one of them couldn't wait a second longer to start looking for their creatures of interest: ANTS!!!!

So began Ant Course 2012 in Uganda, with the arrival of scientists from around the globe. All of them ready to discover more about the exciting ants of Africa. With the support of the RES, we were able to take part in the fantastic 10 day trip, and we wanted to make sure that any other ant enthusiasts out there get to hear about this brilliant experience!

The Makerere University Biological Field Station, in Kibale Forest, is a

zoologist's dream and well worth a visit for any tropical biologist. It has an abundance of loud, colourful and exotic wildlife. The headline-grabbing chimpanzees are the usual focus for visiting tourists and researchers, although our half day trek in the forest yielded nothing more than squishy chimp handprints in the mud. We also ended up 50 metres behind a hungry forest elephant, close enough to hear its stomach rumble! Their presence even disrupted attempts at night walks. Meeting an elephant in a pitch black forest is certainly not to be recommended. If these charismatic megafauna don't take your fancy, however, there are enough birds, reptiles and insects around to interest a specialist in any group. Even better than that, the field station is a wonderful place for "looking at the little things", as we were told by Innocent, the Field Station manager.

Ant Course is something of an institution in the world of ant research. The whole thing is the brainchild of the inexhaustibly enthusiastic Brian Fisher from the California Academy of Sciences. He's been organising the course every year since 2001. Each year Ant Course moves to a different location, gradually touring round all the continents. In 2012 the course was notable for being the first year it was held in Africa.

The course provides training in ant identification, survey techniques and specimen processing. It covers all the essential skills for any research utilising ants, whether it be in ecology, conservation or phylogenetics. The importance of putting a name to a specimen cannot be underestimated in any study and this principle is at the core of the ten days.

One of the major reasons for the success of the course is the calibre of the professional ant scientists that attend as instructors every year. Their excitement at being involved tells you everything you need to know about the importance of this annual event in the ant lover's calendar. We were fortunate to have a mix of instructors with specialist expertise in a huge range of ant biology, from taxonomy and evolutionary biology, to conservation and wildlife photography.

Our time in Uganda was an intensive learning process, starting with 8am lectures and continuing with specimen mounting and identification well into the night. In addition to lectures and

lab work we enjoyed a number of field trips into the forest around the field station. Inevitably, specimen collecting took on a somewhat competitive element. Our mission: to find as many different genera of ants as we could.

Turning out an army of around 50 ant biologists was bound to yield some exciting finds. We were schooled in different collecting methods that led to us hunting under every log and sorting through each millimetre of soil for elusive species, and we found some treasures.

If we asked you what word you'd use to describe ants, probably "cute" would not immediately pop into your head. However, we had several species from Kibale competing for the title of cutest ant. The first, chubby looking, cuddly species we encountered was *Discothyrea mixta*. These ladies were found nesting with spiders eggs, which they carefully collect for food. The second ant species, *Tetramorium pulcherrimum*, was nicknamed the teddy bear ant for its rounded, fuzzy appearance. However, it was a late competitor on the cute-ant scene that we would back as the winner; *Melissotarsus weissi*. These ants tunnel galleries in bark and are so well adapted to life in confined spaces that the workers actually walk with their middle pair of legs pointing upwards. We are pretty sure that some of the live individuals viewed under a microscope were waving up at us. Either that or they were simply a little wobbly at trying to walk on a flat surface!

It wasn't all about the cuddly ants though. We came across many fearsome species, including the Siafu (as bravely photographed by Alex Wild on page 146). These *Dorylus* ants will be familiar to most visitors to Africa, with their large, mobile colonies and huge jawed soldiers. They forage in huge columns, devouring everything in their path. We shivered at the tales some of our course-mates had of cowering in tents whilst these army ants poured over them, desperately hoping that there were no holes in the canvas!

Phrynoponera gabonensis was also a sight to behold with its spiny waist. Several species of *Tetraponera* elegantly made their way under the lens to have their slender figures admired. The extraordinary trap-jaws of the crocodile like *Odontomachus troglodytes* impressed us greatly. However, the rarest, and possibly the most exciting find of all, was the second record ever made of *Aenictogiton* workers, a genus of ants

comprising only seven species, all of which are described only from males.

A highlight of the course, as any past attendee will tell you, is the very strictly enforced "happy hour". Hard though it may be to believe, students on Ant Course become so excited by preparing specimens and working away on identifications that it can be hard to drag them away from their work. In a stroke of genius the course organisers combat this diligence by timetabling in an hour of socialising every day. Microscope lights are forcibly switched off and everyone is marched outside to interact with other humans (quite a shock after a day spent interacting with ants!) This may sound like a frivolous activity but in many ways it illustrates what Ant Course excels at - bringing together people who are passionate about ants.

Chatting about our exciting ant find for the day, discussing interesting quirks of ant life history, or discussing our own research projects over a happy hour beer were some of the most memorable parts of the course. The connections that we made with each other will enable us all to work collaboratively over the course of our careers. As a result of the course we are receiving assistance with identifying specimens from a number of experts, and have embarked on collaborations to build future research projects. The two weeks in Uganda gave us a really special chance to appreciate a beautiful place filled with spectacular wildlife, but it has also provided us with valuable opportunities to develop as ant researchers.

Acknowledgments

We are extremely grateful to have been the recipients of a Royal Entomological Society outreach grant. HC received additional funding to attend the course from the University of Reading Arthur Hosier and Meyer Sassoon Travel Awards, the British Ecological Society Specialist Course Grant and an Ant Course Fellowship. CG received additional funding from Brasenose College, Oxford University and the UK Natural Environment Research Council. All photos have been kindly provided by Alex Wild (www.myrmecos.net).

Ant Course 2013 was held in Peru and in 2014 will take place in Borneo.

Please check the California Academy of Sciences website for further details (<http://research.calacademy.org/ent/courses/ant>).

Peter Thomas Haskell

1923 – 2012

A Personal Reminiscence

Mike Claridge, Emeritus Professor of Entomology, Cardiff University

Peter Haskell was one of the last of an influential group of entomologists to have fought in the last World War (1939-45). Among this group who graduated either just before or immediately after the war, many went on to serve in the employ of the then Ministry of Overseas Development and the Colonial Office of the UK Government. Peter saw active service during the war and notably took part in the campaign for the liberation of Italy, often vividly recounted in after dinner speeches! He returned to London after the war and completed his first degree in Entomology with First Class Honours at Imperial College and went on to PhD studies on the acoustic behaviour and physiology of British grasshoppers, which led to several important pioneering papers, published from 1956 to 1959, and for which he was awarded the Huxley Gold Medal for biology by the University of London.

In 1955 Peter was recruited to the Anti-Locust Research Centre (ALRC) in London under the founding Director, Dr Boris Uvarov, with a free remit to develop research in any field that might help our understanding of locusts and their enormous pest potential. Part of his time was spent visiting British universities with offers of grants and PhD studentships for such studies – how different to more recent times! He rapidly rose up the hierarchy at ALRC and succeeded as Director in 1962.

At ALRC he further developed studies on the sensory physiology of locusts and grasshoppers. Of particular significance was work on the sensory hairs on the head and their role in initiating and maintaining flight behaviour – pioneering work which was taken on by various students and colleagues. In 1961 Peter published his seminal book on *Insect Sounds* which greatly influenced and encouraged work on this previously neglected aspect of entomology, particularly in



Figure 1. Peter Haskell receiving a retirement gift at the final meeting of the Olive pest project in Athens, 1993.

the English speaking world. He organised many symposia and meetings both within and outside COPR, perhaps most notably in his early years, including the 1965 Symposium of the Royal Entomological Society on *Insect Behaviour*. He subsequently edited the ensuing multi-author volume in 1966, *Insect Behaviour*, *R. Entomol. Soc.*

During a period of considerable political change during the 1970s, a new Centre for Overseas Pest Research (COPR) was formed by the merger of

four of the scientific units of the Overseas Development Administration (ODA) of the Foreign and Commonwealth Office – ALRC, The Tropical Pesticides Research Unit, the Tropical Pesticides Research headquarters and the information Unit and the Termite Research Unit. As overall Director, Peter went on to become a stimulating and very supportive leader until his retirement in 1983. In addition to his massive institutional responsibilities, he also

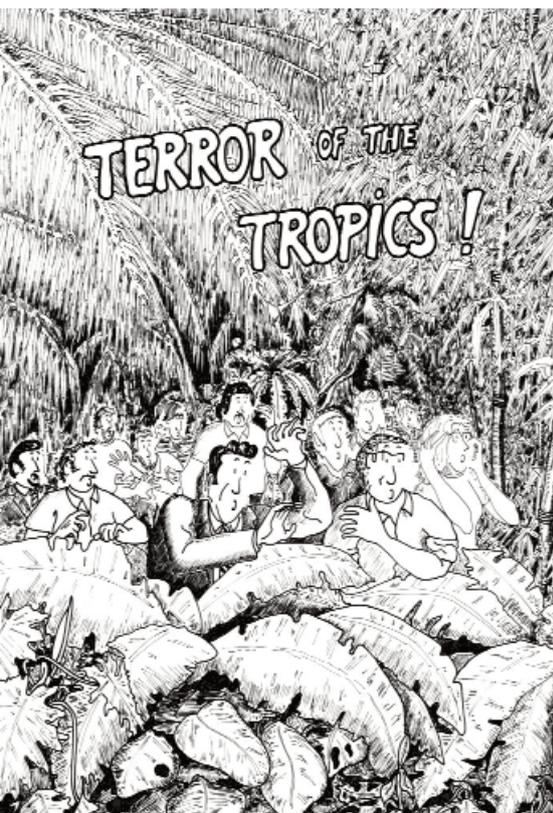


Figure 2. Front cover of the unofficial life at COPR by David Padgham, showing Peter Haskell leading his team in the field.

served the Ministry of Overseas Development and the Overseas Development Administration as their Chief Adviser on Pest Control from 1971 to his retirement in March 1983. He acted as consultant to FAO, OECD, UNDP, UNEP and WHO and also served on numerous international, government and academic committees. In recognition of these services he was appointed Companion of the Order of St Michael and St George (CMG) for services to overseas pest research and control. Despite his many administrative responsibilities, Peter retained a deep interest in all aspects of insect and pest management research. For example, he developed collaborative research programmes with many laboratories around the UK and overseas, notably with the Agricultural University, Wageningen, The Netherlands, and the International Centre for Insect Physiology and Ecology (ICIPE), Kenya. Such international collaboration characterised the rest of Peter's career and extended to broad areas of pest management and environmental concerns. For these he was presented with the Joseph van den Brande

International Scientific Prize for his outstanding contributions in the field of crop protection at the 34th International Symposium on Crop Protection in Ghent, Belgium, in May 1982.

Links with Cardiff

Peter's longstanding relationship with the University in Cardiff started when, as Deputy Director of ALRC, he visited the then Zoology Department in the 1960s when he was developing research links between the Centre and interested universities around the UK. It was on one of these visits in 1960 when I first met Peter in Cardiff, where I had recently been appointed as a young lecturer. Although I was not working on locusts or indeed at that stage, on acoustic behaviour, he immediately took an interest and encouraged me in a department then not rich in entomological research. He was subsequently a regular visitor and participated enthusiastically in teaching courses on insect behaviour to final year honours students. In 1973 he was formally recognised in Cardiff by the award of an Honorary Professorship. His annual visits to Cardiff were enthusiastically anticipated by staff and students alike, especially as a breath of fresh air during a period of institutional crisis in the university. He was influential in securing major roles for Cardiff scientists in the large scale ODA funded COPR Rice Brown Planthopper control project in Asia during the 1970s and 80s when a largely ODA-funded Cardiff rice pest research unit was established.

After retirement from COPR, Peter moved to Cardiff, despite great interest from other universities. He joined the staff of the newly developed School of Pure and Applied Biology as Director of the, sadly short lived, Cleppa Park Field Research Station, near Newport. There he encouraged a wide array of research projects on pest control in both European and tropical countries. This culminated in the large scale EU funded collaborative programme (ECLAIR) on Olive Pest Management in Mediterranean countries, including Greece, Italy and Spain as well as UK (1991 – 1994 inclusive). A year before the end of that programme in 1993, Peter formally retired his position in Cardiff. Although he and his wife Aileen subsequently left Cardiff for south-east England, he retained an

active interest in the university through his continuing Hon Professorial Fellowship.

Personal interactions

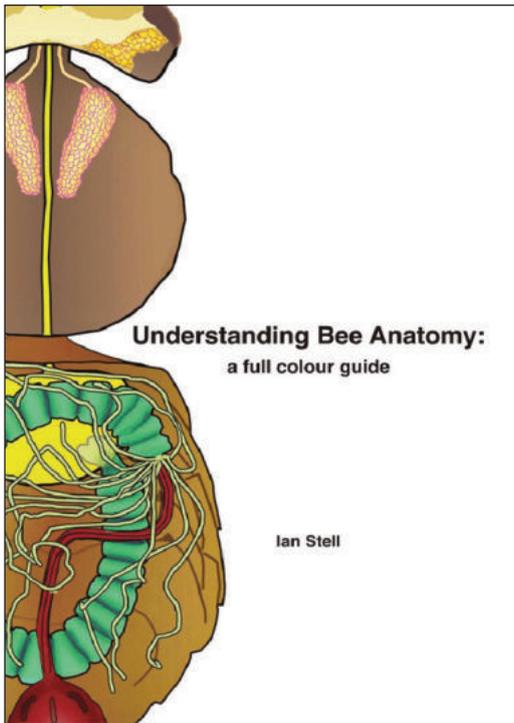
Peter's personality and style of management are well summarised in the following quote from the COPR annual report on the occasion of his retirement as Director in 1983 - "From 1960 onwards, Dr Haskell imposed his own inimitable and indelible stamp upon the direction of locust research and control. With the formation of COPR, his energetic style of leadership and scientific grasp of national and international pest problems in developing countries facilitated and ensured the smooth transition from an internationally known and respected specialised centre to one in which the existing expertise was mobilised to tackle a far wider range of work. Thus the new centre became, in its turn, acknowledged in the broader sphere of plant protection and vector control." Few scientists have been so successful and remarkably broad in their interests as Peter Haskell. All of his ex-colleagues and students always comment on his willingness to take a real interest in their problems. Not only did he tolerate an internal cartoon version of life at COPR in which he figured as "PHATMAN", but actively encouraged it. He always had time for a word with colleagues at all levels in the hierarchy. This is well summarised in a quote from a recent message from Dr Joyce Magor, a colleague during the ALRC and COPR years commenting on "his ability to meet juniors on equal terms always taking time and showing great interest in them and their work — Peter managed to keep the family feel of the original ALRC of around 25 people alive whilst numbers grew from 60 – 70 when he took over to nearly 150 when he retired." Experiences in Cardiff were exactly the same. He is greatly missed around the world.

Acknowledgements. I am greatly indebted to colleagues around the world for sending me their comments and thoughts. Particularly I must thank Dr Joyce Magor and colleagues who have trawled through the documentation from ALRC and COPR, and also Dr David Padgham for permission to use a drawing from his PHATMAN cartoons.

Book Reviews

Understanding Bee Anatomy: a full colour guide

Ian Michael Stell, 2012, £28.00



In *Understanding Bee Anatomy: a full colour guide*, Dr Ian Stell describes honeybee anatomy and physiology in thirteen scientifically accurate and beautifully presented chapters. Stell begins with the developmental stages of honeybees (from egg to imago) in chapter one, then through chapters two to eleven, describes honeybee worker anatomy and physiological systems. Here he details whole body segments, wings and flight structures and the circulatory, respiratory, digestive and neurological systems. Some important differences in Queen Bee anatomy are illustrated in chapter twelve and drone anatomy in chapter thirteen. The anatomical detail is explained clearly with more than six hundred high-quality images. These include some highly impressive scanning electron micrographs (SEM), macro-images, high-power stained sections for details of tissues and descriptive schematic diagrams.

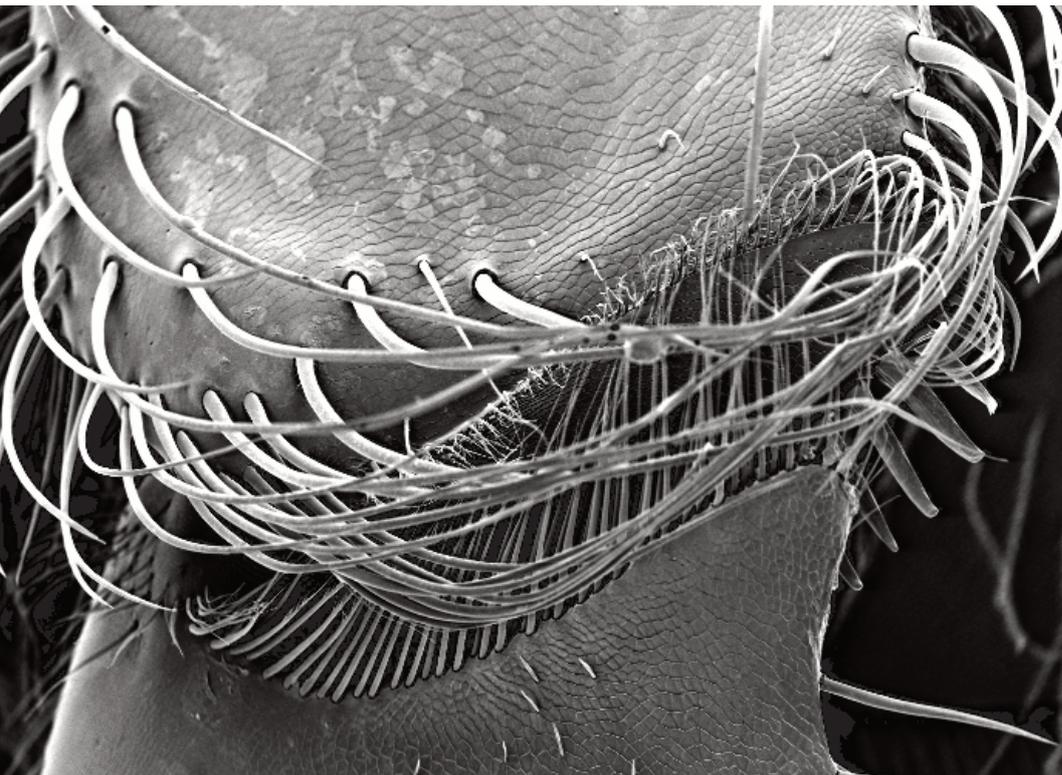
Dr Stell's easy to follow style enables the reader to gain a better understanding of how honeybee structure and function are interrelated. For example on page 136, the reader can quickly and easily visually link the schematic diagram (Fig. 6.72), macro-image (Fig. 6.73), SEM (Fig. 6.74) and read the text describing the structure and function of the corbiculum. An extended example is in chapter eleven where, prior to moving on to describing Queen and drone differences, the chapter concludes with a sub-section on the neurosecretory system which includes images and text to show how a honeybee's anatomy and physiology can influence sociality.

While the index could have been a little more comprehensive to help the reader find information (and is incorrectly titled, 'CONTENTS'), the book will be a great complement to current texts such as Dade's

"Anatomy and Dissection of the Honeybee" and Goodman's "Form and Function in the Honeybee". This is principally because it gives the greatest detail of tissue and cellular level anatomy with its corresponding physiology.

This book will be helpful for those preparing for the British Beekeepers Association bee biology module and for entomologists wanting to study bees in more detail. It will also be great to have handy on one's shelf because some of the images are so stunning that it will also appeal to the general reader.

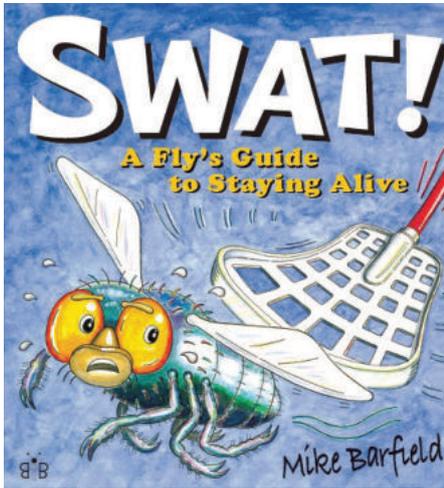
Dr Mark K Greco PhD
(Eng-Bath), PhD (Bio-UWS)
Research Scientist,
Department of Biology and
Biochemistry
University of Bath, UK



Swat!: A Fly's Guide to Staying Alive

Author: Mike Barfield

Publisher: Brambleby Books



Though it may not be usual to see a children's publication featured in *Antenna*, I couldn't resist the opportunity to review this latest offering from Mike Barfield. Though I wouldn't necessarily recommend it for immediate addition to the RES library, I'm a great believer in encouraging an entomological interest in the young, especially when this combines facts with fun to generate optimum uptake. 'SWAT!: A Fly's Guide to Staying Alive' admirably achieves this aim by basing itself on the many and varied threats posed to its main character, Buzzter the housefly.

Buzzter's journey begins when he emerges into adulthood from a bin and has his first narrow escape from a fly-swat. Buzzter then finds himself at the 'School of Fly Survival' where Professor Hector Halfbottle introduces him to the many threats faced by a fly; threats that even Buzzter's hero Superfly can't avoid. These include "leafy and lethal" plants and numerous predators from archer fish and frogs to lizards, birds and various spiders. Predatory insects are also included with a line-up featuring other Diptera, as well as digger wasps, pond skaters, dragonflies and mantids. Humans also make an appearance with a range of anti-fly measures covered and justification for their use given by noting the role that flies can play in disease spread. Devoted Dipterists will be pleased to know that

the redeeming features of houseflies follow immediately thereafter, with their role as both decomposers and food for higher trophic levels noted. It would have been nice to see a page or two on the major beneficial groups in the Order here, to highlight that some flies provide valuable services such as pollination and pest control, though this is at least partially addressed by the inclusion of predatory Diptera within Buzzters "killer cousins".

In a refreshing break from the norm SWAT! is presented using a combination of formats that should appeal to the younger audience. A comic-book style predominates throughout, with clever use of annotated drawings and text boxes to deliver key facts and figures. Humour is regularly used to good effect with colourful, fun and engaging illustrations on every page. Another nice touch is the inclusion of a 'bin-dex' and 'buzz-words' at the end, introducing the concept of indexes and glossaries to young readers. On the inside of the back page a link is provided to the author's own website where additional SWAT!-related activities can be accessed.

In short, for those who may be trying to prompt an entomological interest in their own progeny, or those of others, this book is a fun and informative addition to your armoury. Indeed, strategically deployed alongside other useful weaponry such as the plastic insect collection, butterfly net, collecting jar with built in magnifying glass and DVD compilation featuring *Ants*, *A Bug's Life* and *Bee Movie*, it may yet help to convince George Jr. that there's more to life than dinosaurs!

Dr. Dave George, Co-Editor of *Antenna*

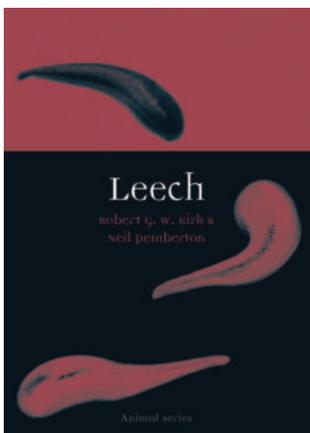
Leech

Robert G. W. Kirk & Neil Pemberton

Reaktion books

ISBN 9781780230337

£9.95



Leeches are not normally considered to be within the scope of entomology but any entomologist who has conducted field work in the tropics will be only too aware of these Annelids. While field workers often regard them as a mere nuisance this book will reveal leeches as a curious and fascinating element of our faunas. "Leech" explores the biology of these annelids and examines our cultural relationship with them across history, revealing many of our attitudes to the leech as a metaphor for many of our human failings. Chapter one examines the history of their taxonomy and their natural history. Chapter two then explores their medical applications from medieval times to the present. Subsequent chapters deal with leeches as money makers both literal and metaphorical, their use to predict the weather, mechanical leech simulators and their role in tales of terror both on and off the silver screen. "Leech" concludes with a look at their role in modern performance art. Copiously illustrated it also features a time line of leeches in human history.

Here is a book that takes a subject that we thought we understood and reveals a spectrum of new perspectives from which to view an old protagonist. Friend or foe, angel or demon, "Leech" explores the paradox of man's relationship with these creatures and asks the reader

to reevaluate. It is another excellent addition to Reaktion's Animal Series, which has become essential reading for any biologist who wishes to examine their biological muse in a wider, social and historical context.

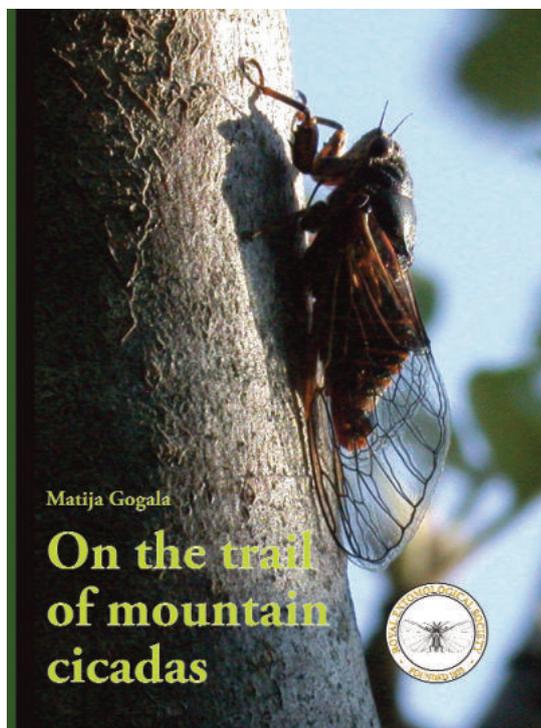
Peter Smithers

“On the Trail of Mountain Cicadas”

by Prof Matija Gogala

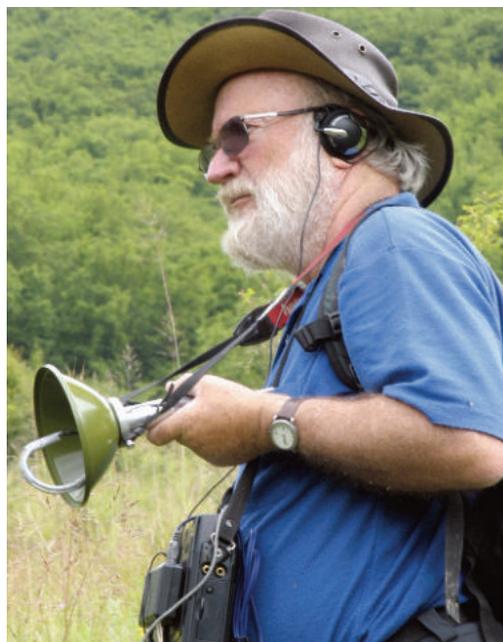
English edition, published by the Slovenian Academy of Sciences and Arts, Ljubljana,
and the Royal Entomological Society, 2013

Price: £25.00



Cicadas are an iconic group of insects, abundant through the warmer parts of the world and well known for the very loud calls produced by adult males. Any Mediterranean holiday during the summer months will be accompanied, maybe even disturbed, by these very loud serenades. Only one species has been recorded from the UK, the mountain cicada, *Cicadetta montana* (Scopoli), known in England as the New Forest cicada. Although a relatively large insect, with a body length 16 to 20 mm, it is much smaller than most of its allies in southern Europe and is now very rare and possibly even extinct in the New Forest. The species was originally described from what is now Slovenia!

For the past ten years or so, my old friend and colleague, Matija Gogala (see photo), has spent much of his time in extensive field research on *C. montana* over wide areas of south and central Europe, including his home country of Slovenia. During his earlier years Matija pioneered the study of low intensity acoustic vibrational signals in various families of Heteroptera when he perfected a number of special recording techniques for such calls. Modern digital technology has made it not only possible, but relatively easy to record and analyse insect sounds in the field. The calls of *C. montana* are of such a high frequency that they are inaudible, that is ultrasonic, to most older observers. Consequently, special equipment is needed to detect, record and analyse them, such as the well-known bat-



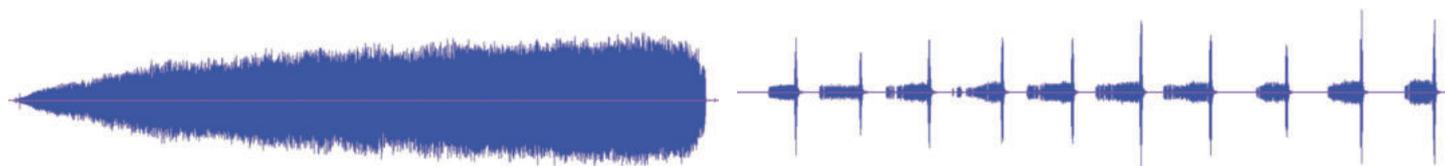
detectors developed to record and identify the ultrasonic calls of bats, our mostly nocturnal flying mammals.

This beautifully illustrated book is the first English language edition after the original edition in the Slovenian language was published in 2011 by the Slovenian Academy, Ljubljana. The new, revised edition is published again by the Slovenian Academy, but in collaboration with the Royal Entomological Society, and will make the information more widely available to the English speaking world. The author has managed to combine an easily readable style with scientific precision and authority. The book is beautifully illustrated and is personalised by illustrations and descriptions of the roles of many of the entomologists who have contributed to the remarkable story.

The morphological species *C. montana* (on the book's cover) has now been shown across Europe to consist of at least 13 different biological species by the work described here. Most of these are not obviously distinguishable as yet in adult morphology. The best criterion for identifying them is from the structure of the male calls which may be analysed in detail from oscillograms (below). Many of these species are shown to be sympatric and to show no signs of interbreeding by detailed field observation.

This book is beautifully produced and in addition to giving an account of the recent fieldwork on *C. montana* also includes a general introduction to the family Cicadidae and the Hemiptera. Some of the marvellous habitats in southern Europe where much of the research was done are also described and illustrated. This is a great example of how important high quality field work still is in entomology.

Mike Claridge



Odonata, Hemiptera, Hymenoptera and other insects of the Seychelles Islands.

Edited by Justin Gerlach

400 pages, 325 B/W line drawings, 20 B/W photos, 4 colour plates, 24 × 16 cm. Soft-cover.

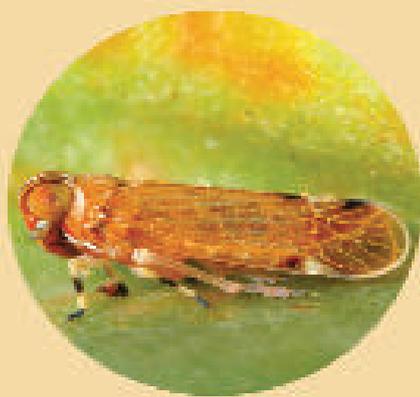
Siri Scientific Press, 2013; in English.

ISBN 978-0-9567795-1-9

Obtainable from Siri Scientific Press <books@siriscientificpress.co.uk>; cost £66.00 (plus p/p). Further details online at: <<http://www.siriscientificpress.co.uk>>.

Odonata, Hemiptera, Hymenoptera and other insects of the Seychelles islands

Edited by Justin Gerlach



Siri Scientific Press

It is my pleasure to introduce a new book of the monographic series devoted to the Seychelles insect fauna to fellow-entomologists. It is the final volume of the large series produced by different publishers, of which the three latest ones were published by Siri Scientific Press: the volume on Arachnida & Myriapoda, the one on Crustacea & various groups of invertebrates and the latest book reviewed here. The reviewed book is a comprehensive synopsis of the following 14 insect orders: Protura, Collembola, Diplura, Microcoryphia, Zygentoma, Ephemeroptera, Odonata, Hemiptera Thysanoptera, Psocodea (Psocoptera and Phthiraptera), Neuroptera, Siphonaptera, Trichoptera and Hymenoptera. In total, the volume contains information on 945 species. The volume was prepared by 17 expert authors from 11 countries. Most contributors' names and addresses are given on p. 4, except for B. and C. Wain (the chapter on Odonata; pp. 50–63). As in the earlier published volumes, the new book starts with an abstract, a list of contributors, a brief introduction, a brief discussion of the comparative diversity of the included insect groups on the various islands and an identification key to the orders included in this volume (pp. 4–12). In the main part, different orders were obviously given different attention and space, ranging from a single page on the fleas (one introduced species) to 113 pages on the Hymenoptera (266 recorded species). Some chapters contain illustrated identification keys to genera and species (e.g., the chapter on Hemiptera; pp. 67–161), others only annotated checklists (e.g., Collembola; pp. 16–19). Some chapters (e.g., the Trichoptera; pp. 212–229) contain illustrated taxonomic descriptions of all the recorded species. Pages 343–369 contain a table of red-listed indigenous and endemic species according to the IUCN Red list criteria. Unfortunately, there is no cumulative account of

how many red-listed species of various categories occur on the Seychelles and/or individual islands, and what is to be done in order to protect them or their habitats. The volume ends with an index to taxa treated (pp. 370–394) and four plates of colour photos (Hemiptera and Hymenoptera only). Overall, this volume has made a very good impression on me, and I wish to congratulate the authors, editor and publisher for such fine work. The book constitutes a reliable source of taxonomic information on these 14 insect orders of the Seychelles and indeed will be a very useful reference volume in the library of any natural history museum or university.

Dmitri V. Logunov
Curator of Arthropods
The Manchester Museum

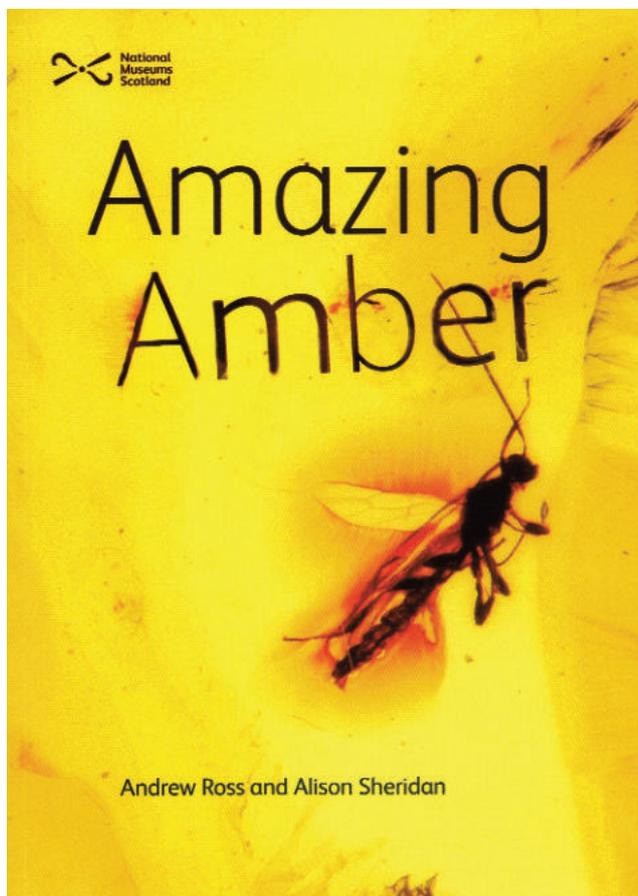
Amazing Amber

Ross, A., Sheridan, A. 2013.

64 pp. National Museums of Scotland, Edinburgh.

ISBN: 9781905267798

Paperback, £7.99p, available from bookshops or www.nms.ac.uk/books



World-wide interest in amber has not abated since Crichton-Spielberg's *Jurassic Park*, and many new and fascinating discoveries have been and continue to be made. This is the first amber booklet from Scotland uncovering the richness of the collections in the national museums ('RSM') and accompanies a current exhibition (running until 8th Sept., 2013).

After an introduction to the world's amber, amber finds in Scotland are revealed commencing in prehistoric times (fifth millennium Before Present) and continuing into historic times, ending with eighteenth-century Scottish folklore when amber was used to ward off evil (Sassenachs, I wonder?). This is followed by amber carving and jewellery (including plastic!) and we learn about faking- which is where insects come in. In fact, identifying amberised insects can help reveal art forgeries and a selection of insect inclusions are discussed, especially in Burmese (Myanmar), Mexican and Dominican ambers as well as others, including the familiar Baltic amber found in Europe. Many of the insects have not been published previously and new family records illustrated include a cecidomyiid fly from Chinese Fushun amber (p. 46, which should not be confused with Tibetan amber); also new (but not explained in captions) are a mirid bug from Burmese amber (p. 50) and a rhagionid fly, diplatyid earwig plus tropiduchid planthopper in Mexican amber, as well as the first true damselfly and geophilomorph centipede from the same deposit (pp. 55-56). Finally, we return to Crichton and was there ever any dinosaur DNA found in fossil mosquitoes? The answer is no, the sensitive lab equipment in some leading laboratories at the end of the last century only picking up contamination (and hopeful enthusiasm, I might add).

The paperback is beautifully illustrated, text easy to follow, and short in its selection but broad in its scope, crossing traditional boundaries in natural and human history, so it's a good read whether you're an entomologist or an artist. It is up-to-date in an interesting field and ideal if you want more than a pamphlet or souvenir guide, but less than a technical tome. It's a good excuse to visit Edinburgh too.

Ed A. Jarzembowski
(Nanjing; Visiting Professor, Chinese Academy of Sciences)

Film Review

Flight of the Butterflies

IMAX movie. SK Films, Toronto 2012, 44 minutes. Director: Mike Slee. Executive producers: Jonathan Barker (CEO of SK Films) and Wendy MacKeigan.



The Monarch has iconic status. An image of an adult *Danaus plexippus*, once called the “black-veined brown”, is almost synonymous with “butterfly” – either in its true orange and black livery, or falsely coloured blue, purple, green, what-have-you, on greetings cards, advertisements and wrappings, from book jackets and chocolate boxes to face tissues and toilet paper, the world over. The image of the Monarch is literally everywhere.

The reason lies in its abundance and dramatic migratory behaviour in North America. The autumnal mass-clustering of Monarchs at particular places along the coast of California has been the subject of curiosity, mystery and delight for more than a century—and was woven, albeit with considerable ‘poetic licence’, into one of the greatest of all 20th Century American novels, John Steinbeck’s *Sweet Thursday*.

On the eastern side of North America the scientific quest to understand the migration of the Monarch began early (e.g. D’Urban, 1857), notably through the pioneering work of Charles Valentine Riley (1871, 1878). The endeavours that Riley initiated to unlock the mysteries of Monarch biology, now forever associated with the names of Fred Urquhart (1911–2002) and Lincoln Brower (see Fink & Vane-Wright, 2007), have also become part of American literature – in a wonderful novel which, by giving thought to the current plight of the Monarch migration phenomenon (Lichtman, 2013), addresses the issue of climate change (Kingsolver, 2012).

Flight of the Butterflies tells two dramatic stories in parallel – one entomological, the other human. The entomological story is surely familiar to the readers of this journal, resolving the problem first addressed by C.V. Riley almost 150 years ago. Every spring many millions of male and female Monarchs leave their overwintering mountain “homes” in the Transverse Neovolcanic Belt of central Mexico and head north, into the heartlands of eastern and mid-western USA. There they mate and the females seek out the numerous milkweeds on which their caterpillars rapidly develop. But as the season progresses the milkweeds die back, and the new generation moves further north, to give rise to a summer generation of Monarchs. By early fall, the area of northern USA and southern Canada around the Great Lakes has a population of up to a billion or more Monarchs – the sons and daughters, and grand- and great-grand- sons and daughters of the butterflies that originally left Mexico. As day-length continues to decrease, the Monarchs alter their behaviour, cluster in bands of thousands, and start the great journey south – eventually to locate the tiny areas of Mexican forest at 10,000 feet where they have never been before, where many will die, but huge numbers will hope to survive and restart the whole cycle again, the following spring (Brower, 1995).

The human story centres on University of Toronto zoologist Fred Urquhart, and how he became enthralled by Monarch migration. As a young boy growing up in Toronto in the 1920s, “Fred wondered where all the Monarch butterflies were flying to, each fall.” As he grew older, Urquhart became possessed by his desire to discover where the Monarchs actually went.

“I had the idea that sticking tags on butterflies might work, but no one back then had ever tagged insects.” Eventually he found a good combination of glue and paper. Having got the technology, he set to work with his devoted wife Norah, and a huge team of volunteers. “By the 1960s, we had over four thousand helpers” – forerunners of the current Monarch Watch, and even the whole ‘citizen science’ movement. Step by step Urquhart built up a picture of the Monarch migration routes. Tens of thousands of Monarchs were bred and tagged, and others wild caught, of which a small fraction were recovered far away from their release sites. There were many dead-ends and frustrations – but the project also brought much joy and happiness to the Urquharts.

Starting in 1937, it actually took them almost 40 years to find the ultimate destination. In 1976 Fred and Norah Urquhart were able to reveal to the world the incredible Mexican mass over-wintering colonies (Urquhart & Urquhart, 1976; Urquhart, 1976; a good account of the Urquharts’ quest can be found at <http://www.flightofthebutterflies.com/discovery-story/>). [As

an aside, one wonders if such an epic study could ever be funded in today's culture of "performance indicators" and demand for near-instant results?]

Very nice to see in the film, there is a second human story-line, about the key role played in Mexico by two very special volunteers, Ken Brugger and his then young wife Catalina or "Cathy" Aguado (now Catalina Trail). Travelling through many parts of Mexico in search of the Monarchs, they were the ones who located the first mass overwintering Monarch site known to science, at Cerro Pélon, Michoacán State, 2nd January 1975 – some 4000 km from southern Canada (Brower, 1995; Maeckle, 2010). Exalted, the Urquharts – by then Fred was well over 60 – made the trip to Mexico and, with the Bruggers, clambered up to 10,000 feet to see this amazing phenomenon for themselves. Within five minutes of arrival, Fred found a tagged butterfly, giving instant proof that the massed butterflies really had arrived there from the north! This remarkable moment was captured by a *National Geographic* photographer. In 1998 Fred and Norah Urquhart were awarded the Order of Canada. It credited them with "one of the greatest natural history discoveries of our time."

Film production started in 2007, helped by a 3 million dollar NSF grant. The Monarchs in Mexico were filmed during 2011 and 2012. A major problem to be solved was not only getting the massive IMAX cameras up to the overwintering sites but, having got them there, deploying them successfully in the uneven and densely wooded terrain. Snee considered using cables, balloons and even helicopters, but ultimately opted for a 70-foot crane. To access the protected areas where the butterflies occur, the team worked with local officials and conservationists to get the necessary permissions. In addition to the stunning on-location IMAX 3-D cinematography, there is plenty of other technological wizardry included, not only to demonstrate how the individual butterflies make their long flights, but also to give the best-yet visual representation of metamorphosis, offering a convincing impression of seeing through a transparent pupa to witness the later stages of the transformation taking place – literally before your eyes. This sequence should be available to every university course where entomology is still taught.

Arguably the film is a little 'light' on the plight of the great Monarch phenomenon – due to a toxic cocktail of illegal logging, wholesale diversion of mountain-top water for agriculture, climate change, and the use of GM crops in the USA. But some of the film's box-office receipts will go to help fund butterfly conservation. Moreover, while true to both main stories, the film is entertainment, not a proselytising documentary. In the process it relates the Urquhart story with great affection – perhaps with a touch too much sentimentality for some – but I personally found the warmth provided a good balance to the otherwise overwhelming presence of the Monarchs themselves. And I mean 'presence' almost literally, because some of the 3D overwintering sequences, with many hundreds of the butterflies flitting hither and yon through the sun-dappled oyamels, or many thousands of 'spooked' Monarchs literally bursting – shouting one might almost say – from the tree-tops, is as close to actually being there as you could ever imagine.

See this film if you possibly can. See it more than once. No entomologist should miss this remarkable movie.

R.I. Vane-Wright

Where to see *Flight of the Butterflies*

The film had its world premiere on September 24, 2012, at the National Museum of Natural History, Washington D.C., and hosted by the Mexican Tourism Board and Mexican Embassy. Since October 2012 the film has been shown at many 3D-IMAX cinemas throughout North America. Following private showings in the UK in May and June this year, the film has been shown daily from 1st July at the Rheged Centre, Penrith. There are plans to screen the film in Birmingham's Think Tank, the Glasgow Science Centre, and the National Media Museum in Bradford. From September the film will be screened the British Film Industry's IMAX at Waterloo, London. The link <http://www.flightofthebutterflies.com/theatres-reviews/> can be used to see where the film is likely to showing, worldwide.

References

- Brower, L.P. (1995). Understanding and misunderstanding the migration of the monarch butterfly (Nymphalidae) in North America: 1857–1995. *Journal of the Lepidopterists' Society* 49: 304–385.
- D'Urban, W.S.M. (1857). Description of four species of Canadian butterflies, continued. *Canadian Naturalist & Geologist*, Montreal 2(5): 345–355.
- Fink, L.S. & Vane-Wright, R.I. (2007). Lincoln Brower's European Tour. *Antenna* 31(4): 203–207.
- Kingsolver, B. (2012). *Flight Behaviour*. Faber and Faber, London.
- Lichtman, F. (2013). Monitoring the Monarchs [in conversation with L.P. Brower]. Available at <http://www.npr.org/2013/04/12/177029257/monitoring-the-monarchs> (accessed 29th June 2013).
- Maeckle, M. (2012). Founder of the Monarch Butterfly Roosting Sites in Mexico Lives a Quiet Life in Austin, Texas. Available at <http://texasbutterflyranch.com/2012/07/10/founder-of-the-monarch-butterfly-roosting-sites-in-mexico-lives-a-quiet-life-in-austin-texas/> (accessed 29th June 2013).
- Riley, C.V. (1871). Two of our common butterflies. *Report on the Noxious, Beneficial, and other Insects, of the State of Missouri*, Jefferson City (3): 142–175.
- Riley, C.V. (1878). On migratory butterflies. *Journal of Proceedings of the Academy of Science of St. Louis, Mo.* 3: cclxxiii–cclxxiv.
- Urquhart, F.A. (1976). Found at last: the Monarch's winter home. *National Geographic* 150(2): 161–173.
- Urquhart, F.A. & Urquhart, N.R. (1976). The overwintering site of the eastern population of the Monarch butterfly (*Danaus p. plexippus*; Danaidae) in southern Mexico. *Journal of the Lepidopterists' Society* 30(3): 153–158.

Announcements

PRESS RELEASE

from the COLOSS Network



COLOSS,
Institute of Bee Health,
Vetsuisse Faculty,
University of Bern,
Schwarzenburgstrasse 161
3003 Bern, Switzerland.
www.coloss.org

Losses of honey bee colonies over the 2012/13 winter

Preliminary results from an international study

The honey bee research network COLOSS¹ has today announced the preliminary results of an international study to investigate winter colony losses. Data were collected from 19 countries from Europe, Israel and Algeria. In total, more than 15,000 beekeepers provided overwintering mortality and other data of their colonies. Collectively, they managed more than 280,000 colonies. A preliminary analysis of the data shows that the mortality rate over the 2012-13 winter varied between countries, ranging from 6% in Israel to 37% in Ireland, and there were also marked regional differences within some countries. These figures compare with losses over the same period of 31% and 34% recently reported from the USA² and the UK³ respectively.

The protocol used to collect this COLOSS data has been internationally standardized to allow comparisons and joint analysis of the data. A more detailed analysis of risk factors calculated from the whole dataset, as well as further colony loss data from other countries will be published in the peer-reviewed *Journal of Apicultural Research*⁴ later in the year. The data show that Poland and Finland have each year experienced losses of about 17%. Countries in south eastern Europe (Slovakia, Bosnia Herzegovina, Croatia) have had average losses of less than 10%, but in 2012 losses were slightly higher. In central Europe (Germany, Switzerland, Austria) losses rose to above 20% in 2012 but went back to around 15% in 2013. In the neighbouring Netherlands, losses were above 20% for five years, but decreased in 2013 to a level comparable with Germany and Switzerland. Interestingly, we now see losses rising to substantially higher levels in northern countries (Sweden, Denmark, Norway, Ireland, UK) whose losses were around the 15% in the previous years.

Co-ordinator of the COLOSS Monitoring and Diagnosis Working Group Dr Romée van der Zee from the Dutch Centre for Bee Research says: *"We have observed an interesting pattern in honey bee colony losses over the last 3 years. These results emphasise that losses in many countries remain greater than beekeepers consider are acceptable. We believe that many factors including the weather are responsible for these losses, which show patterns over the years which are not bound to administrative borders"*. [Ends]



FOR FURTHER INFORMATION PLEASE CONTACT

Romee van der Zee. Tel: +31 5155 21107 / +31 6155 25784 Email: romee.van.der.zee@beemonitoring.org

NOTES FOR EDITORS:-

1. COLOSS is a network formerly funded by the European Union COST Programme (Action FA0803) and currently by the Ricola Foundation – Nature & Culture, which aims to explain and prevent massive honey bee colony losses. The network does not directly support science, but aims to coordinate international research activities across Europe and worldwide, promoting cooperative approaches and a research programme with a strong focus on the transfer of science into beekeeping practice. COLOSS has more than 300 members drawn from 62 countries worldwide. It is chaired by Prof. Peter Neumann of the University of Bern, Switzerland. Website <http://www.coloss.org/>

2. Information on US honey bee colony losses over the 2012-3 winter from the Bee Informed Partnership is available at:-

<http://beeinformed.org/2013/05/winter-loss-survey-2012-2013/>

3. Information on UK honey bee colony losses over the 2012-3 winter from the British Beekeeper's Association is available at:-

http://www.bbka.org.uk/files/pressreleases/bbka_release_winter_survival_survey_13_june_2013_1371062171.pdf

4. The peer-reviewed scientific journal the *Journal of Apicultural Research* has been published by the International Bee research Association since 1962. It includes original research articles, theoretical papers, scientific notes and comments, together with authoritative reviews on scientific aspects of the biology, ecology, natural history, conservation and culture of all types of bee.

<http://www.ibra.org.uk/categories/jar>



COLOSS, Institute of Bee Health, Vetsuisse Faculty, University of Bern, Schwarzenburgstrasse 161, 3003 Bern, Switzerland. Tel: +41 (0) 31 323 8227 Email: coloss.network@gmail.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.

Offers to convene meetings on an entomological topic are very welcome and can be discussed with the Honorary Secretary.

MEETINGS OF THE ROYAL ENTOMOLOGICAL SOCIETY 2013

Oct 10 RES sponsored Wallace 100 lecture

Venue: Natural History Museum

Dr Tom Fayle (previous Alfred Russel Wallace prize-winner) will speak on "*Wallace's legacy to biogeography and conservation biology*"

Oct 16 Climate Change Special Interest Group

Venue: Rothamsted Research, Harpenden

Convenors: Dr Richard Harrington (richard.harrington@rothamsted.ac.uk)
Dr Howard Bell

Offers of talks in all areas relating to the impacts of climate change on insects are welcomed, for example: invasive species, insect-borne diseases, pest management, ecosystem services, biodiversity, conservation and population dynamics.

Oct 23 Joint Aquatic Insect / Insects and Sustainable Agriculture Special Interest Groups

Venue: Newcastle University

Convenors: Ms Jenni Stockan (jenni.stockan@hutton.ac.uk),
Mr Craig McAdam (craig.macadam@buglife.org.uk)
Dr John Holland (jholland@gwct.org.uk)

Confirmed speakers:

**Prof Steve Ormerod (Cardiff University),
Dr Chris Extence (Environment Agency),
Steve Hewitt (Cardiff Museum),
Dr Lorna Cole (SRUC)**

Oct Irish Regional Meeting

24-25 (Thursday 24th - Untangling the web - where are we with the Marsh Fritillary? Friday 25th - Hovering on the edge - threatened species evaluation in Ireland)

Venue: Dublin Botanic Gardens, Glasnevin

Convenors: Drs Eugenie Regan
Brian Nelson
Archie Murchie

Speakers to include:

**Jeremy Thomas, President of the RES
Constanti Stefanescu, Catalan Butterfly Monitoring Scheme
Chris van Swaay, Butterfly Conservation Europe**

Nov 6 Orthoptera Special Interest Group

Venue: Natural History Museum, London from 13:30-20:00

Convenor: Bjorn Beckmann (orthoptera@ceh.ac.uk)

The 34th annual Orthopterists' meeting will be held on Wednesday 6th November 2013 from 1:30-8:00pm in the Natural History Museum, London. Talks, posters and other contributions are welcomed on grasshoppers, crickets

and related groups (cockroaches, earwigs, stick insects, mantids). Everyone is very welcome to attend, whether to present research or just to listen and meet fellow Orthopterists. Please email orthoptera@ceh.ac.uk if you would like to attend, present something or have a suggestion for a speaker. A draft programme will be published in due course.

Nov 14 South-East Regional and East Malling Centenary Meeting

Venue: East Malling Research, Kent

Convenor: Mr John Badmin (jbadmin@btinternet.com)

Prof. Jerry Cross (jerry.cross@emr.ac.uk)

Pests and natural enemies in fruit crops: a review celebrating 100 years at East Malling Research

Provisional programme includes:

Michael Solomon: Historical review of entomological research at East Malling

Jerry Cross & Michelle Fountain: Spotted Wing Drosophila.

David Hall: Advances in chemical ecology of fruit pests: EMR-NRI collaboration.

Guest speaker: Dr Herman Helsen, Netherlands. Earwigs in orchards.

Nov 22 Joint meeting of RES SW Region and the Peninsular Invertebrate Forum. Small is Beautiful.

Felicity Crotty, Aberystwyth University, Food webs in the soil, who's eating who.

Jane Pickard, Schumacher College, Water mites down under. Tales of Australian Hydracarine.

Nigel Marley, Plymouth University, The secret life of water bears. Everything you wanted to know about Tardigrades but never thought to ask.

6.00pm Devonport Lec theatre, Plymouth University.

Convenor: Peter Smithers psmithers@plymouth.ac.uk

Dec 5 Northern Regional Meeting joint with Medical Veterinary Entomology Special Interest Group

Topic: "Insect Pest Management"

Venue: Northumbria University, Newcastle upon Tyne

Convenors: Dr David George (david.george@northumbria.ac.uk)

Prof. Steve Torr

2014

Jun

23-29 National Insect Week

Aug 2-8 European Congress of Entomology

Venue: University of York, Heslington, York

Confirmed plenary speakers:

Janet Hemingway, Liverpool School of Tropical Medicine, UK

Bruno Lemaitre, Ecole Polytechnique Federale, Switzerland

Nancy Moran, Yale University, USA

Vojtech Novotny, Czech Academy of Sciences, Czech Republic

John Pickett, Rothamsted Research, UK

Chris Thomas, University of York, UK

Each session will comprise one keynote presentation (30 mins) followed by eight invited or contributed talks (15 mins each). The keynote speaker will receive a 50% reduction in registration fees only. To encourage international participation the committee encourages applications where joint organisers are based in different countries from one another.

2015

Sept 2-4 Ento' 15 Annual Science Meeting and International Symposium

Insect Ecosystem Services

Venue: Trinity College Dublin

Convenors: Drs Jane Stout

Olaf Schmidt

Archie K. Murchie

Eugenie Regan

Stephen Jess

Brian Nelson

Diary of other Meetings

2013

Oct 05 Introduction to Spiders 2013

Saturday one-day course - Expert Lawrence Bee introduces these amazing, diverse and numerous invertebrates. These day courses will involve indoor and outdoor sessions; tea and biscuits provided - but bring a packed lunch. BOOKING ESSENTIAL as places are limited to 8 people: £25 charge.

Venue: Withymead Nature Reserve, Bridle Way, Goring-on-Thames, Oxfordshire, RG8 OHS, UK.

Contact: Dorothy Reich: email: info@withymead.org: Tel: +44 (0)1491 872265

Oct 08 Aberdeen Entomological Club BeeWatch - Rene Van der Vaal, University of Aberdeen

Venue: The James Hutton Institute, Aberdeen

Contact: jenni.stockan@hutton.ac.uk

Oct 12 AES Annual Exhibition and Trade Fair 2013

The annual AES Annual Exhibition and Trade Fair is the entomology show to attend. The show takes place at Kempton Park Racecourse near London and exhibitors and traders pack two floors of exhibition space. The exhibition is open to members of the public and not just members of the AES. Should you wish to join the AES then you can do so on the day but you don't have to be a member to attend. Tickets can be bought on the gate. Traders include those selling books, equipment, livestock, specimens and food plants. In addition, the show is attended by most of the major invertebrate societies and organisations within the UK.

Venue: Kempton Park Racecourse, Sunbury-on-Thames, TW16 5AQ, UK.

Contact: Wayne Jarvis exhibition@amentsoc.org

Nov 05 Aberdeen Entomological Club. Collecting beetles; a practical guide - Gabor Pozsgai, James Hutton Institute

Venue: The James Hutton Institute, Aberdeen. **Contact:** jenni.stockan@hutton.ac.uk

Nov

08-12 Global Conference on Entomology 2013

The major objective of the conference is to showcase recent advances in entomological research and development in the insect world. The skills and knowledge of entomologists are needed worldwide helping farmers to produce crops and livestock more efficiently through sound pest management strategies, fighting to save endangered species and fragile ecosystems, and preventing insects from spreading agents that cause serious diseases.

Venue: Kuching, Sarawak, Malaysia. **Contact:** Dr V Sivaram info@gce2013.com

Dec 10 Aberdeen Entomological Club. Breeding behaviour of the Ghost Moth and Ghost Swift - Nick Picozzi, Butterfly Conservation

Venue: The James Hutton Institute, Aberdeen. **Contact:** jenni.stockan@hutton.ac.uk

2014

Jan 14 Aberdeen Entomological Club. Ticks - issues and changes - Lucy Gilbert, James Hutton Institute

Venue: The James Hutton Institute, Aberdeen. **Contact:** jenni.stockan@hutton.ac.uk

Feb 11 Aberdeen Entomological Club. Protection of invertebrates - the law, protected sites and protective policies - Alistair Watson, British Arachnological Society

Venue: The James Hutton Institute, Aberdeen. **Contact:** jenni.stockan@hutton.ac.uk

Mar 11 Aberdeen Entomological Club. Tales from the riverbank; riparian beetles and land use change - Jenni Stockan, James Hutton Institute

Venue: The James Hutton Institute, Aberdeen. **Contact:** jenni.stockan@hutton.ac.uk

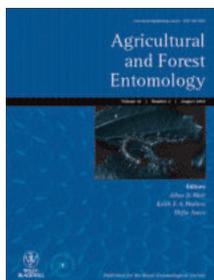
July

13-18 XVII Congress for the International Union for the Study of Social Insects.

The purpose of the Union is to promote and encourage the study of social insects and other social organisms in the broadest sense. Both research and the dissemination of knowledge about social insects and other social organisms through publications, educational programs, and activities are encouraged. The Union further pursues these objectives via the organization of Congresses and Symposia, publication of the journal *Insectes Sociaux*, and recognition of distinguished service with awards.

Venue: Cairns Convention Centre, Cairns, Australia. **Contact:** IUSSI2014 Secretariat info@iussi2014.com

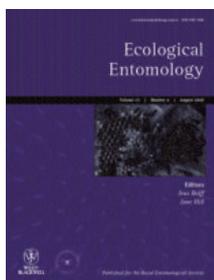
Publications of the Royal Entomological Society



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.

2014 print or online prices: UK £707, Euroland €900, USA \$1,307, Rest of World \$1,523

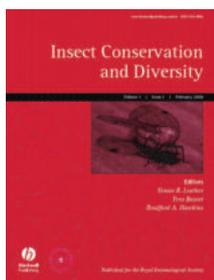
2014 print and online prices: UK £813, Euroland €1,035, USA \$1,503, Rest of World \$1,752



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.

2014 print or online prices: (with Insect Conservation and Diversity) UK £1,157, Euroland €900, USA \$2,145, Rest of World \$2,501

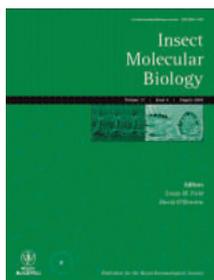
2014 print and online prices: UK £1,340, Euroland €1,035, USA \$2,467, Rest of World \$2,873



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.

2014 print or online prices: UK £707, Euroland €900, USA \$1,307, Rest of World \$1,523

2014 print and online prices: UK £813, Euroland €1,035, USA \$1,503, Rest of World \$1,752



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.

2014 print or online prices: UK £1,178, Euroland €1,496, USA \$2,177, Rest of World \$2,538

2014 print and online prices: UK £1,354, Euroland €1,722, USA \$2,504, Rest of World \$2,920

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 arthropods of medical and veterinary importance.

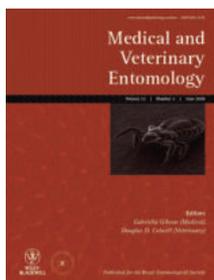
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Physiological Entomology is designed primarily to serve the interests of experimentalists who work on the behaviour of insects and other arthropods. It thus has a bias towards physiological and experimental approaches, but retains the Royal Entomological Society's traditional interest in the general physiology of arthropods.

2014 print or online prices: UK £646, Euroland €796, USA \$1,156, Rest of World \$1,349

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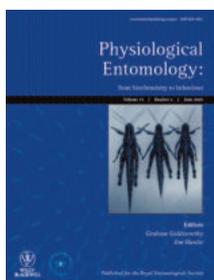


Systematic Entomology encourages the submission of taxonomic papers that contain information of interest to a wider audience, e.g. papers bearing on the theoretical, genetic, agricultural, medical and biodiversity issues. Emphasis is also placed on the selection of comprehensive, revisionary or integrated systematics studies of broader biological or zoogeographical relevance.

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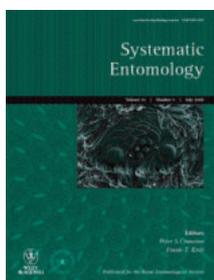
Subscriptions and correspondence concerning back numbers, off-prints and advertising for the seven principal journals of the Society should be sent to the publishers, Wiley-Blackwell Publishing Ltd, 9600 Garsington Road, Oxford OX4 2DQ. (customerservices@blackwellpublishing.com)

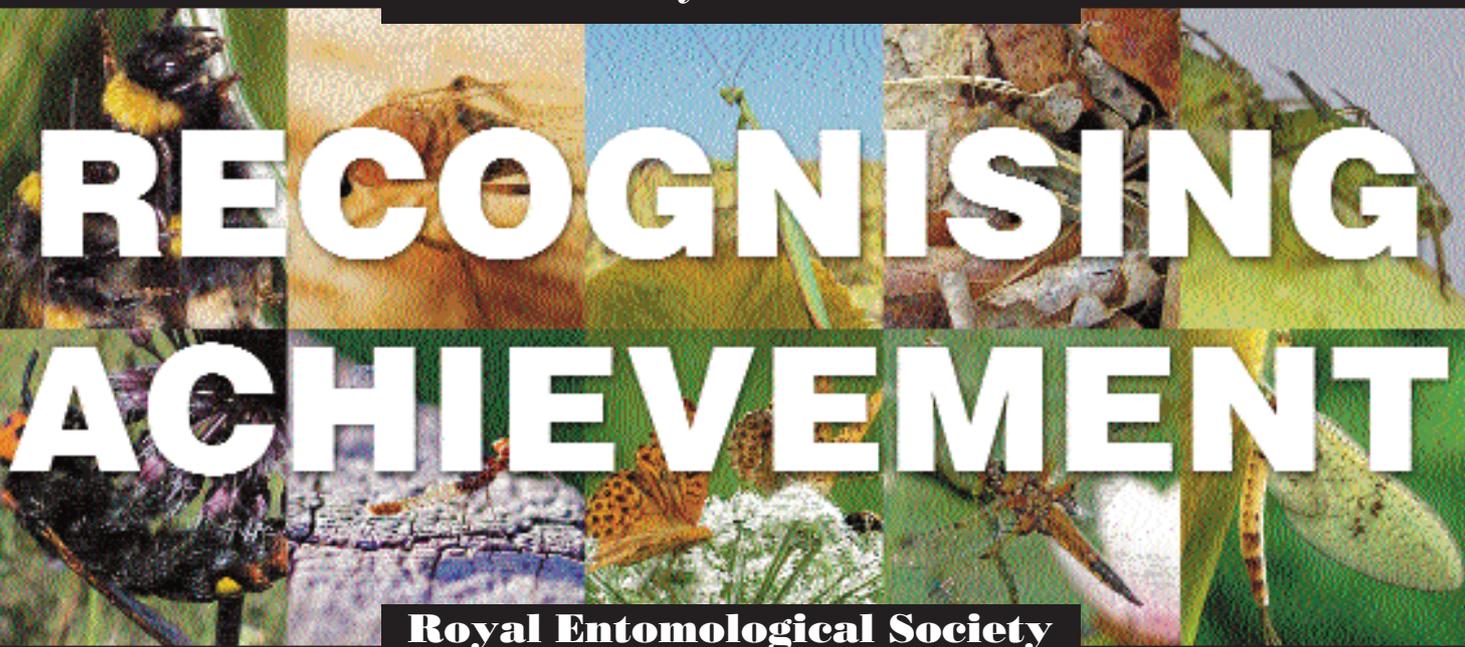


Antenna (Bulletin of the Society). Free to Members/Fellows. Published quarterly at an annual subscription rate of £40 (Europe), £42 (outside Europe), \$70 (United States). This journal contains entomological news, comments, reports, reviews and notice of forthcoming meetings and other events. While emphasising 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.





**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



Royal Entomological Society
www.royensoc.co.uk

The Mansion House, Chiswell Green Lane, St. Albans, Herts AL2 3NS, UK
Tel: +44 (0)1727 899387 • Fax: +44 (0)1727 894797
E-mail: info@royensoc.co.uk