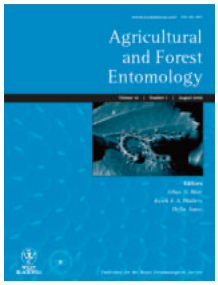
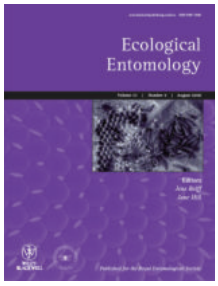
Bulletin of the Royal Entomological Society Volume 40 (3) 2016

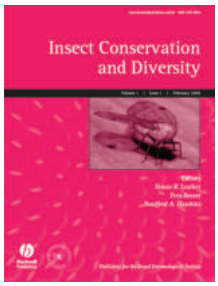
antenna

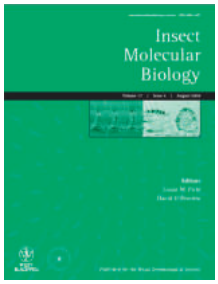
DIGITAL ENTOMOLOGY

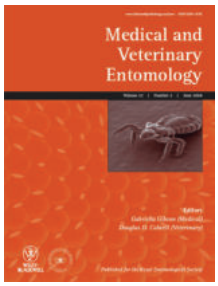
ENTOMOLOGY FOR ALL

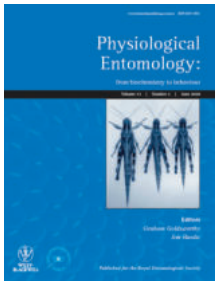


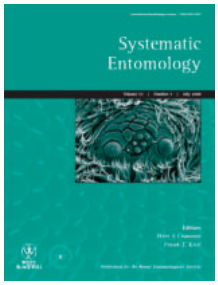












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Antenna (Bulletin of the Society). Free to Members/Fellows. Published quarterly at an annual subscription rate of £50 (Europe), £55 (outside Europe), $90 (United States). This journal contains entomological news, comments, reports, reviews and notice 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.

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Marsh Fritillary courtesy of Ray Cannon

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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)
David R. George
(Stockbridge Technology Centre)

Editoral Assistant:
Jennifer Banfield-Zanin

Consulting Editor:
Prof Jim Hardie

Assistant Editors:
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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

Welcome to the third edition of *Antenna* for 2016. Entomology often gains the attention of the media over the summer months and this summer is no exception. Grave warnings were offered regarding the imminent arrival of a plague of Diamondback moths that would decimate the *brassica* crops across the UK, and then in contrast there was the news of the recent establishment of a colony of the Large Heath butterfly in Lancashire. Such wildly opposing views of insects from the same order can easily confuse non-entomologists, which is why initiatives such as National Insect Week (NIW) and the conference for young people, 'EntoSci', are vitally important. The success of both of these initiatives is reported in this issue.

This edition has a distinctly lepidopteran flavour with Ray Cannon's reflection of digital photography and the internet as a vital tool for 21st century lepidopterists, plus a report from the recent meeting of the *Heliconius* research group in Sheffield.

Peter Cranston reports on his vacation to Madagascar, where entomology crept in despite his best efforts to concentrate on other things. Here, wild collected silk caught his attention and it transpires that there is a thriving local industry on Madagascar.

The theme continues with reviews of two new books; *The Butterflies of Sri Lanka* and *Insects of Fiji* (which features many butterflies).

Other book reviews are of the recent *Catalogue of the Caddisflies of Ireland*, an account of the fauna of Manchester's nature reserve at Alderney Edge, an introduction to the insects in and around Australian houses, an ecological account of Australian insects and a slightly eccentric account of the Hymenoptera in *The Sting of the Wild*.

We also have a report of the Verrall Lecture by Max Barclay, in which he proposed that museum collections are the last great frontiers of exploration.

The other theme in this issue is communication, getting the message out that insects are useful, even essential, to our wellbeing. NIW and EntoSci speak for themselves but it is encouraging to see an increasing number of books such as *Insects of Fiji* and *Miniature Lives* that introduce insects to a much wider non-scientific audience. *The Sting of the Wild* will certainly pique the curiosity of many with its accounts of the author's hymenopteran encounters and a table offering a pain index for most of the Apocrita.

In the spirit of the old maxim that a picture can speak a thousand words, I would like to draw your attention to two entomological exhibitions that are running until the autumn. The first is Maria Merian's butterfly paintings, which are on show at the Queen's Gallery, Buckingham Palace. This displays a series of paintings that Merian was commissioned to produce for a wealthy patron. They are based on the images in her famous book *Metamorphosis Insectorum Surinamensium* and have been painted on sheets of vellum. The exhibition also displays books and journals that refer to this work in order to put the display in a historical context. The exhibition website is appended below.

The other exhibition, Microsculpture, is in stark contrast and is a display of stunning photographs by Levon Biss which is on display at the Oxford Museum of Natural History. These photographs are on a gigantic scale with some being three metres by two. These are images of such detail that it is hard to believe. Website appended below.

These exhibitions are a rare chance to compare the beginning of scientific illustration with the current technological state-of-the-art. Any entomologist worth their salt has to see at least one of these.

Maria Merian
https://www.royalcollection.org.uk/collection/themes/exhibitions/maria-merians-butterflies/the-queens-gallery-buckingham-palace

Microsculpture
http://microsculpture.net

The *Antenna* team hope that this edition will enhance your summer evenings and may possibly provide a few interesting days out.

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

Help for Solomon Islands insect database

Dear Members of RES,

This letter is a plea for help for entomological and other volunteers to assist with an insect and other invertebrates database project I am assembling in Solomon Islands.

Solomon Islands has had professional entomologists working here for more than 100 years. During that time several thousand identifications of insects and other fauna have been made by experts at the Commonwealth Institute of Entomology (CIE, and under several other names) and the BM(NH). Manuscript copies of these records were stored at Dodo Creek Research Station, Honiara, but were destroyed along with the laboratory during the ethnic tensions of the early 2000s. More recently we have managed to fund the copying of every Solomon Islands identification report that could be found in the CIE and BM(NH) archives. These were delivered as PDFs and I have spent the past year transferring them using OCR and a lot of patience into an Excel spreadsheet. There are 18 orders of insects on individual worksheets and 11 worksheets for other organisms (mostly in small numbers). See Table 1 below for details.

I am currently trying to clean up the files but am in dire need of help. For example, insect nomenclature has changed, families and orders have changed, and of course there have been many synonym changes, e.g. many *Papilio* are now *Graphium*. Also, the OCR process has introduced errors in spelling, e.g. by inserting 1 for l and l for i.

I am looking for volunteers who are willing/able to help edit the lists for errors of nomenclature and spelling. I stress the word volunteers as no funds are available or are likely to become available for the work. To make the work more practical I would be happy for individuals to specify just one or two orders they are most familiar with. Or perhaps members could point me at an internet site that might help with modern family and genus names, synonyms etc. I would be happy to send over the Excel file for people to look at and assess the amount of work involved. The total file is only 503 Kb.

We already have two databases of plant pest and disease information assembled from published literature and recent surveys. My intention is to ultimately amalgamate all these lists into a total list of names of insects and other fauna. This will match the plant lists being assembled by others. All lists will then be available for conservation, plant protection and biosecurity work, research and other studies. I am sure members of RES will appreciate the value such data has.

Insects	No. of records	Other fauna	No. of records
Diptera	1,113	Acarina.	48
Coleoptera	2,231	Nematoda	8
Hymenoptera	664	Scorpions	3
Lepidoptera	897	Mollusca	2
Hemiptera (Homoptera and Heteroptera)	1,392	Pseudoscorpiones	3
Dermaptera	29	Cestoda	1
Orthoptera.	103	Lacertilia	3
Anoplura	12	Amphibia	1
Siphonaptera	2	Chelifera	9
Thysanoptera	23	Amblypigi	4
Collembola	6	Araneae	14
Isoptera	79		
Odonata	53		
Diplopoda	5		
Neuroptera	6		
Psocoptera	3		
Strepsiptera	3		
Dyctyoptera	2		

Interested members are invited to contact me direct at Scapanes@gmail.com

Many thanks, kind regards

Bob Macfarlane
C/o Biosecurity Solomon Islands
Ministry of Agriculture and Livestock
PO G13
HONIARA
Solomon Islands

+677 7750402
www.biosecurity.gov.sb

Figure 1. A group of Pale Jezebels (*Delias sanaca perspicua*) drinking or puddling? Northern Thailand.

Butterflying in the digital age!

Raymond J C Cannon

16-18 Princess Street
Scarborough YO11 1QR

I feel blessed to be living in the digital age where it is possible to capture images of living insects, and share them with fellow enthusiasts around the world, in a way that would have amazed and fascinated entomologists from the past. Whilst it has long been possible to watch and study butterflies using binoculars, the advent of excellent and relatively cheap digital cameras and macro lenses has made it possible to capture images of them much more easily than in the past. The advantage of taking a picture is that it allows you to examine it much more closely after the event, and in many circumstances this reveals things which you might not have been aware of at the time of pressing the shutter. It also allows people to build up a digital collection of species, and to enjoy all the pleasure of examining an individual via a photograph, without causing it any harm. In these days of increasing threats to butterfly numbers, this is, I think, an important consideration. Photographers can also travel and 'collect' images of beautiful species from around the world, without having to worry about obtaining a collecting permit. Additionally, I would even argue that there are some things that photographs can contribute towards our knowledge of a species that neither an examination of their morphology, nor a print out of their DNA, can provide. That is, capturing the behaviour of a living organism in its natural environment.

Many thousands – perhaps millions – of amateur entomologists are now building and sharing their digital

collections of images with like-minded enthusiasts online. There are now so many excellent websites it is almost impossible to document them all. Whilst standards vary, the very best sites contain a wealth of superb images and information on life stages, host plants, behaviour and so on. It is now possible to join groups and societies on social media sites and to share information and images in a way that has never been possible until very recently. The quality of images available at the touch of a button via, for example, Google Images or Flickr or Instagram or Facebook, is extraordinary. The range of articles – available free online – from societies and groups around the world is incredible. All of this information is at our fingertips and free! It is possible for amateurs to share photographs and interact with specialists to contribute towards helping to understand some outstanding research questions: like the meaning of butterfly eyespots, observations on insect camouflage, the effects of markings in different situations, examples of larval/adult resemblances, just to name a few. Perhaps of greatest value is that photography enables people to become more familiar with, and to have a better understanding and appreciation of insects. Butterflies are of course the most charismatic group and the standard bearers of insect conservation (beetles must run a close second!) and it is them that I describe here.

When butterflies are 'puddling' or 'mud-puddling' it is often a good opportunity to get some nice photos. Butterflies – particularly in the tropics – exhibit this puddling behaviour when feeding on a wide range of substrates, including: moist ground, mud, animal excrement, rotting fruits, carrion, dung, bird droppings, sweat, tears and so on. Most of the individuals seen puddling are young males. What they are doing is making up for the chemicals or nutrients they lack as a result of their diet as larvae. Puddling is a way of imbibing the salts and micronutrients they need when they become adults and start mating (Molleman, 2010).

Female butterflies lose a huge amount of their body salt as a result of egg laying. The male is providing her (via his spermatophore) with a so-called 'nuptial gift' of nutrients which he has obtained via puddling. Providing the female with resources for her to use for making eggs can be seen as the male's contribution towards the process of reproduction, a sort of division of labour between the sexes: he spends time and energy obtaining and then passing on to her what she needs to produce their fertilised eggs. The quality of the nutrients in the spermatophore which the male provides to the female may, therefore, improve her fertility and give their offspring the best chance in life (i.e. increase their fitness).

Figure 2. Common Nawab (*Polyura athamas*) absorbing nitrogen by puddling on dead fish.

A living butterfly is a highly dynamic creature, capable of amazing aerobatics and complex movement. I never cease to be amazed at how fast some species can fly! Of course it is well known that poisonous insects tend to be slow, leisurely flyers. It has been mooted that the slow and regular flight of unpalatable butterflies might be an adaptation to increase the conspicuousness of their warning coloration (Chai & Srygley, 1990).

It is not easy to photograph insects in flight using a hand-held camera, but it is fun to try and it sometimes works if you use a fast shutter speed and focus on the ponderous poisonous ones.

Many people will have seen two butterflies come together and chase each other round and round or up and up, before spinning off on their own trajectory once more. I naively used to think such behaviour was a romantic interlude, perhaps the male chasing the female; but such spiralling flights, or 'spinning wheels' as they have been

Figure 3. Glassy Tiger (*Parantica aglea*) photographed in flight.

Figure 4. The Great Eggfly (*Hypolimnas bolina jacintha*) male.

Figure 5. Thai Cruiser (*Vindula erota erota*) males.

Figure 6. Thai Cruiser (*Vindula erota erota*) male depositing something with his abdomen

called by lepidopterists, are little shadow boxing matches between males, sparring with each other in non-contact aerial combat to secure ownership of territories where they can attract mates. It is fascinating to learn that in some butterflies – like the Great Eggfly – size is less important than age in winning such contests (Kemp, 2000). The older males, which were also more likely to be resident in the disputed area, were much more likely to win; i.e. seeing off their younger challengers. This is even more remarkable, given that the older males tended to be smaller than their younger counterparts (Kemp, 2002). The body mass and wing areas of the butterflies in this study – The Great Eggfly, *Hypolimnas bolina* (L.) - decreased with age. Amusingly, it was suggested that the older butterflies might have been more persistent in their contests, because they were old, and somehow *knew* that their opportunities for survival and reproduction were declining rapidly.

Some readers may have attempted to photograph butterflies and found to their dismay that they just keep on flying, never seeming to rest! I have chased some for ages, waiting for them to land and be still, so I can take a photograph. In my experience, some butterflies slowly get used to one's presence and seem to tolerate you gradually getting closer. Unlike the effect of catching and handling, which unsurprisingly tends to make them warier and more elusive of being caught again (Mallett *et al.*, 1987), photographing them seems to habituate them. I could be imagining it, and some species remain almost impossible to photograph; they just do not stop and settle, or if they do so, it is long after I have given up following them around with my camera! Some seem like swifts: constantly on the wing. What are they looking for? Some obvious nectar sources are ignored; odd bits of vegetation are inspected, but on they go, up and down, without stopping, searching for what, an egg laying site? A mate? Who knows! But what is amazing is how much energy they have to just keep on flying. Or are they just such efficient fliers that all they need is a sip of nectar or a puddle now and then?

Photographs can sometimes reveal interesting behaviour. I photographed a whole sequence of two male Thai Cruiser butterflies, *Vindula erota erota* Fabricius, 1793, interacting with each other. The two males were closely associating with each other, and when I came to look at the images closely, it was apparent that they were not only absorbing liquids using their proboscises, but also secreting small amounts of liquid from the end of their abdomens (Link 2). Quite what is going on, I don't know. It is possible that were 'recycling' something that had already been voided from the anus – the proboscis is reflexed backwards, perhaps to absorb the exudate – a behaviour which Professor Vane-Wright reported that he had seen before in skippers and swallowtails (*pers. comm.*).

A large number of butterflies are killed and eaten before they get a chance to mate and reproduce. One way they can avoid being predated is to divert the lethal pecks of predatory birds towards body parts that can be sacrificed in the interests of survival. Obtaining direct evidence for the protective utility of eyespots is difficult, but the deflective function of marginal eyespots has been demonstrated and shown to work well under low light conditions – such as at dawn and dusk – when birds are most active (Olofsson *et al.*, 2010).

Photographs of butterflies often show evidence of extensive damage to

Figure 7. Fluffy Tit (*Zeltus amasa amasa*) worn and damaged.

the wings. Whilst such evidence of 'beak marks' – damage caused by a would be predator – is only circumstantial, it is a good indication of the fact that it is a regular occurrence in nature. Once pecked, as in Figure 7, the eyespot may be lost, so the butterfly is presumably more vulnerable to subsequent attacks.

Another feature which has become obvious to me as I have taken more and more photographs of butterflies, is that they are seemingly able to fly about and carry out their lives, despite sustaining considerable damage to their wings. I once photographed a papilionid – the Red Helen (*Papilio helenus*) – which was happily nectaring and flying from flower to flower with only half a right fore-wing and a completely missing right hindwing. Some of this damage may be simple 'wear and tear' as well as predation damage. Compare these two photographs, Figures 8 and 9. The first, a highly worn and presumably 'old' butterfly – male Clipper, *Parthenos sylvia apicalis*. The second, a much fresher specimen of the same species – but nevertheless, still sporting a beak mark on the left hind wing – which only became apparent to me after I photographed it and looked at the image on my computer. Yet both individual butterflies were gaily flying around and resting to feed on flowers, indistinguishable from each other to the casual observer.

Take a photograph of a flower, examine it closely – or enlarge it on a computer screen – and you will invariably find an insect lurking somewhere in the picture. This is not altogether surprising given that two-thirds of flowers are pollinated by insects. To achieve this, flowers have evolved many ways to bribe, cajole, or trick insects into carrying out this function. A variety of different insects – e.g. bees, wasps, ants, butterflies, beetles and so on – may visit a given flower. Some may be feeding on nectar (butterflies and moths); some might be defending their sap-sucking aphids (ants); some might just be sheltering or hiding in the petals; and some may be eating the plant; but the pollinator species which is best for the plant is the one that helps it to reproduce successfully. These are the insects that the flower will evolve to attract. But not all flowers are specialists in this regard; some may be visited by a variety of pollinating bees and butterflies during the day, and by moths during the night. Butterflies are often of minor importance as pollinators, but for some species of plants they are vital and the only pollinators in some cases.

One of the greatest pleasures of photographing living insects, is that you capture an image of a living creature, behaving naturally and displaying its natural colours. Although, it could be argued that having a large mammal chase it around might alter its behaviour somewhat. Nevertheless, by contrast, a museum specimen is a mere husk, a lifeless relic of the living creature. Some colours remain just as vibrant after death, such as those caused by physical effects, but others can fade as the coloured pigments decay.

A good example of this is provided by the Dusky Diadem [*Ethope himachala* (Moore, 1857)]. One of the most striking things about seeing this butterfly in the field is its lovely blue eyes.

Butterflies have very good eye-sight and are thought to see in colour (Stavenga, 2002). They are so brightly coloured and patterned – iridescent in many species – they must be able to see in colour, although exactly how they perceive the world, and each other, is not possible to know for sure. It is difficult to say why a given species of butterfly has eyes of a certain colour; it may be related to a number of different factors. The so-called screening pigments in the pigment cells are said to generally determine eye colour in insects. In butterflies however, there is

Figure 8. Clipper (*Parthenos sylvia apicalis*) male, highly worn and damaged.

Figure 9. Clipper (*Parthenos sylvia apicalis*) male, with small beak mark.

Figure 10. Painted lady (*Vanessa cardui*) on *Aesculus californica*.

Figure 11. Marsh Fritillary (*Euphydryas aurinia*) butterfly on Knapweed flower.

Figure 12. Dusky Diadem, *Ethope himachala*. Arunachul Pradesh, India.

Figure 13. Blue eyes of Dusky Diadem, *Ethope himachala*, Arunachul Pradesh, India.

also a structure called a tapetum – composed of highly folded tracheoles – which acts as a sort of reflection filter, improving the sensitivity of the eye and determining the colour, or 'eye shine' (Stavenga, 2002). So in nymphalid butterflies such as this, the blue eye colour is not due to the blue reflecting visual pigments (opsins) in the eyes, but instead is caused by the colour of the light reflected by this structure which is at the back of the eye.

The Dusky Diadem was one of many Indian butterflies first described by the Victorian entomologist Fredric Moore (Moore, 1857). He worked for the British East India Company as an Assistant Curator, located in London at the East India Museum (housed in an extension to the East India House). Moore was largely responsible for a large, 10-volume work on the butterflies of the Indian region called *Lepidoptera Indica* (Moore, 1857). In the preface to these volumes, he described the work as being produced by "contributions … from numerous friends and correspondents who held or are now holding positions in the Civil and Military service in various parts of India". In other words, he did not collect the butterflies himself, but rather described and catalogued the specimens sent in by a host of people scattered across British India at the time.

The two sexes can be compared on Plate 54 of Volume 1 of *Lepidoptera Indica* (Moore, 1857). The volume has been digitized by the Internet Archive with funding from the University of Illinois Urbana-Champaign (Link 3). It is worth looking at for the plates alone, most of which were illustrated by Fredric Moore's son, F. C. Moore, who was clearly a highly talented artist. The Moore's must have loved their butterflies, but I find it a bit sad that they did not see many of them flying around in the wild – I assume this was the case as there is no mention of them visiting India – and they based their vast study on pinned specimens sent back from India. This may explain why there was no mention of this butterfly's blue eyes! There are also no blue eyes shown in the illustrations; just brown eyes which was presumably the colour of the faded specimens. No-one had digital cameras either in 1857.

In the Common Earl (*Tanaecia julii*), both sexes have lovely green eyes and a green proboscis to match.

The Courtesan (*Euripus nyctelius*) on the other hand has beautiful yellow eyes. I don't know what function the yellow colour has, if any, but it offers a beautiful contrast to the black, white and brown colours of the rest of the butterfly. It was first named by Edward Doubleday Esq, in 1845, and originally called *Diadema nyctelius*. Reading the 1845 Volume 16(1) of the 'Annals and magazine of natural history' which is available via the Biodiversity Heritage Library (Link 2) makes me think that he also did not have the advantage of seeing a live specimen, because there is no mention of the yellow eyes.

The proboscis is an extraordinary organ. Despite being tightly curled whilst not in use, the feeding tube can be unfurled – or uncurled – with amazing speed and it is surprising how such a long and delicate instrument can be manipulated with such precision. Although seemingly highly delicate, it must in fact be very strong and flexible, since butterflies can probe different nectar sources with surprising speed and 'dexterity'; accurately plunging the tip of the proboscis into tiny little florets, or nectar cups, then rapidly recurling it again whilst taking off to visit another flower or inflorescence; the final recurling often taking place in flight.

Figure 14. The Courtesan (*Euripus nyctelius*) male.

Figure 15 a and b. Thai Cruiser (*Vindula erota erota*) female with proboscis inserted into cup-shaped nectar gland

I will finish with a note on identification. I find I can identify almost all of the butterfly species I photograph around the world online now. It helps to have a good text book – like the excellent Butterflies of Thailand (Ek-Amnuay & Komaradat, 2012) – or one of the many photographic guide books to the area in question, like the John Beaufoy Publishing's Naturalist's Guides, to focus one's search and look for possibilities or probably species. But, no doubt to the horror of genuine taxonomists, the final confirmation can usually be done by feeding the putative species name into Google Images, and comparing your photograph of the unknown butterfly with the ones shown online. It's not infallible – and it is important to remember that no one is 'correcting' mislabelled identifications on the Internet – but with perseverance, a degree of caution and thorough cross-checking, it is usually possible to arrive at a correct identification. If you get it wrong and post it on Facebook, someone will usually come along and correct it anyway. It's a sort of Wiki-identification process. What would the old time collectors and butterfly admirers of yesteryear have made of it? I think they would have embraced the internet and the digital camera; I can even imagine Darwin, Wallace and Bates going around with their mobile phones snapping away. Well, maybe not.

Links

Link 1. http://www.biodiversitylibrary.org/item/19483#page/206/mode/1up

Link 2. http://rcannon992.com/2016/ 01/31/a-tale-of-two-butterflies/

Link 3. https://archive.org/stream/lepidopteraindic01moor#page/n3/mode/2up

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Madagascan 'wild' silk

Text by Peter S. Cranston

Illustrations by Peter Sheridan

Sericulture is the ancient and well-established manufacture of a natural product (silk, la soie (Fr.)) processed from cocoons of moths cultivated for high value fabrics. To a close approximation all modern silk derives from the domesticated silkworm, *Bombyx mori* (Bombycidae), reared on mulberry (*Morus* spp.). This moth is no longer found in the wild and all aspects of production are human-assisted. Silk fabrics actually provide a very small proportion of global fabric production, comprising less than 0.2% (International Sericulture Commission, 2013-16), with the market dominated by China and India where 98% of all silk is produced. African, including Madagascan (Malagasy), silk production is modest even among the remaining few producer countries, yet in some areas it is a locally important source of income. Native silk moth production is mentioned at most as a footnote to *B. mori* sericulture in entomological textbooks including Gullan & Cranston (2014).

Earlier this year I travelled through central Madagascar on a 'national parks' trip, largely to watch birds, lemurs and chameleons (in that order), and with culture and entomology as asides only. However, as we progressed it became evident that natural silk production in this country may be a sustainable and conservation-sensitive means of poverty alleviation. Combined with a fascinating historical background, the sociolological implications continue to the present day.

My first silk encounter was in Antsirabe, a large town lying in the central highlands at an elevation of 1500 m., some 500 km south of the capital Antananarivo on the sole north-south asphalt road. In a typically children-dominated encounter, there was a sign advertising '*La Soie Sauvage*' – Malagasy people have French as their second (educated) language. My rusty French eventually helped me very much, but early on I had forgotten that '*sauvage*' meant 'wild', not necessarily 'savage', silk. Our tour guide Didier Ramilison had organised a demonstration of silk production in what was essentially a backyard artisanal enterprise. All stages were performed with power only from human muscles (foot pedals) and fine motor skills. We saw cocoons being heated in an alkaline liquid (Figs. 1A, B), fired by fuel derived from the plentiful eucalypt plantations, silk spinning and weaving on a loom (Figs 1C-E). As our group watched the show, a tale emerged, mostly in Malagasy incorporating French for concepts new to the traditional Indonesian-based language, and simultaneously translated to current French with some English. The enterprise usually used cultivated *B. mori* cocoons for their silk, via contracts to local producers growing mulberries, to meet demand for this 'whiter' silk for some customers. However, what we were seeing was the artisanal production of a native silk from indigenous gatherers, collected from native trees, to produce a less refined final product that naturally was a pleasant shade of beige (Fig. 1F, 4). We gleaned that 'la soie sauvage' was sought for particular uses, notably in making the traditional shrouds in which the deceased, especially if wealthy and of high status, were wrapped prior to burial ceremonies. More of this later.

My interest was piqued by the 'sauvage' silkworms: after all, this was the trivially mentioned 'and other African moths' from which silk could be produced commercially. Traveling south through the highlands, introduced pines and eucalypts had dominated, but some savannah-like areas had clumps of native trees, although no forest. These trees, with vernacular name *tapia*, scientifically are *Uapaca bojeri* Baill., once treated as Euphorbiaceae, but the lack of toxic sap and spines has had them removed to the Phyllanthaceae. In appropriate

Figure 1. A-E. Stages in silk spinning and weaving, F. Final undyed native silk fabric. Antsirabe, Madagascar.

Figure 2. Immature stages of "*landibe*", *Borocera cajani* (Vinson), Isalo National Park, Madagascar. A-B, larvae (caterpillars), C. evacuated pupal cocoon; on 'tapia', *Uapaca bojeri* Baill., (Phyllanthaceae).

areas these tapia trees can dominate, giving rise to the ecosystem-defining tapia woodlands. Close-up, to a naïve observer they look like cork oaks because of the thick insulating bark, and this is key – the trees are fire resistant. The grasslands in which they grow are burnt annually to force the tough *Imperator* grasses to generate fresh growth for the all-important zebu cattle (= male wealth). This tree and a few other species are the preferred hosts for the moths that provide the cocoons for wild silk. In Isola National Park, as we climbed upwards through sandstone bluffs into the tapia 'forest', distraction was provided by ring-tailed lemurs rising from their overnight repose in caves for fossa (an endemic cat-like carnivore) avoidance. Despite warning from our local guide Naina that it was not the season for the moths, almost the first tapia tree examined had a 10 cm long multicoloured larva actively feeding in full view (Fig. 2A). This was the penultimate (of five) larval instars of *Borocera cajani* (Vinson) (confused previously with more lowland, coastal *B. madagascarensis* (Boisduval)). These lasiocampid moths, known as "*landibe*" in the local vernacular, are the major source of wild-collected silk. The final instar is more cryptically coloured and can reach a length of over 12 cm. The species is endemic to Madagascar, has high sexual dimorphism with the female adult up to three times the size of the male, and with high variability in colour and patterning. Oviposition is not assisted by humans although some suggestions for intervention are being made by charities associated with alleviation of rural poverty. Soon we found larvae showing colour variation (Fig. 2B) and some empty cocoons (Fig. 2C). Major differences between the cocoons and those of *B. mori* are evident: the silken cocoon is off-white to brownish, impregnated with spines and hairs ('dirty') and, above all, when harvested after the adult has emerged, has larval and pupal cuticle within the cocoon. This explained what we had heard earlier in Antsirabe, that handling of 'soie sauvage' is much more difficult, including the need for special cleaning and other preparation, and with fibre length shortened by the emergence of the adult creating an exit hole. Add to this the dispersed nature of the 'crop' scattered amongst many hectares of forest, and the lack of local processing facilities makes one wonder how this can be an economic harvest.

Although it is suggested that wild silk has been in decline, it still amounts to a national crop of some 40–50 tonnes per year. Some indications are positive

Figure 3. A. Giraffe weevils (*Trachelophorus giraffa*) on *Melostoma* leaf, B. phasmatid, *Achrioptera gracilis*, on dead branches of 'tapia'.

for the future. In drier regions of the country with only one crop of rice possible per year, there is substantial labour down-time and men head to cities to seek cash employment. Cocoon collection is dominated by women, and payment for cocoons from wild harvest in impoverished rural areas generates cash that may cover school fees, for example. Misuse of tapia for firewood or charcoal, even felling for cocoon harvest and other unsustainable uses is said to have reduced the availability of trees for local harvest of cocoons, but conservation and replanting projects do exist. According to Naina, our local guide in Isola National Park, people from the nearby commune of Ranohira can obtain a free permit to collect cocoons, with the proviso that they damage no trees and collect only post-emergence cocoons. While it is a decent hike from the commune and hard work harvesting the cocoons, surely this is a sustainable and sensible use of a local resource. Community 'ownership' and management of natural resources such as silk, and tourist access under local guidance to 'non-National Park' areas seem to work well to augment local income and enhance conservation in areas that I saw in rainforest, highland and arid areas.

Above all, what is the demand for this difficult-to-handle 'sauvage' silk that encourages the producers in Antsirabe to travel each year over 1000 km return to and from Isalo on a bad road to this southernmost Tapia forest? The answer lies in funerary customs (Famadihana, the turning of the bones) involving the burial and reburial of the dead, in an ancestor worship ceremonial uncannily reminiscent of those of the Tana Toraja in south Sulawesi. In traditions that long predate the arrival of 'Chinese' silkworms (in c. 1830), funerary shrouds of native silk have been *de rigueur* for wrapping the recently deceased corpse and again for subsequent exhumations.

I still can't get my head around the sustainability of acquisition of zebu (Asian humped cattle) as a sign of wealth, much sought after by males by working otherwise in menial jobs. The herds, which graze widely across fire-managed grasslands, are not 'redeemed' until a death, at which time they are slaughtered to pay for the first burial and subsequent re-burial ceremonies, including much feasting, the purchase and wrapping of the corpse and bones

Figure 4. Penny Gullan, modelling her shroud of native silk.

in expensive natural silk and in the construction and maintenance of impressive tombs. Fortunately, wealthy Malagasy have used native silk for fashion and the demonstration of the wealth of the living. Now tourists are the new wealthy purchasers, and there are encouraging signs that awareness of native silks is catching on as a fashionable 'new' insect-derived product with a 'story', as I have recounted above. But there is more to it: the sustainable collection of cocoons may provide little more than pin-money, but several charities recently have recognised that the 'lost skill' of preparing, dyeing, spinning and hand-looming of fabrics from wild silks can be revived and provide real jobs in a rural economy. Furthermore, colours as seen in the fabric in Fig. 1E, come from natural dyes from native plants such as *Labourdonnaisia madagascariensis* Pierre ex Baill.. This is known in the vernacular as 'nato', a species of Sapotaceae whose bark gives a characteristic red (not a cochineal) and provides good reason to conserve such resources.

Since returning I found that David Attenborough had fronted a project to support this cultural revival via a recent BBC television series (in the UK). Links to some charities and some videos are provided below. However, a word of caution – your partner may be less than impressed with a funerary shroud, so presentation as a soft, light, native silk shawl or scarf may be more acceptable (Fig. 4).

Although I travelled with entomology as a low priority, I became aware of many giraffe weevils (*Trachelophorus giraffa*) actively interacting on native *Melastoma* leaves (Fig. 3A) and dozens of species of stick insects were everywhere, all near invisible as was this 25 cm long *Achrioptera gracilis* (Fig. 3B). The heavy-weight Madagascan hissing cockroaches (*Gromphadorhina portentosa*) were seen around rotting timber and in leaf litter, and the insect-collecting tongues of chameleons clean up by day and night. The weirdest plants abound - baobabs are but one example of the many 'bottle plants/trees' - and xerophytes and succulents dominate. I won't mention the 100+ species of birds and 14 lemurs that I saw. All biologists should visit, but do avoid the wine.

We thank Didier Ramilison of Wild Madagascar, who masterfully guided a group of eight around Madagascar on behalf of Australia-based International Park Tours. Randrianantenaina Charles Edmond (Naina) led us into the sandstone country of Isola and discussed the harvest of silkworms and its local sustainability. Gavin Svenson kindly provided a provisional identification of the phasmid from photographs.

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Society News

EntoSci16 – a conference for future and budding entomologists

Professor Simon Leather

This year, 2016, saw a first for entomology, a conference for 14-18 year olds dedicated to insects and other invertebrates hosted at Harper Adams University on April 13th 2016. And it all happened because of Twitter. Some of you may remember my account of how, after being strongly encouraged (some might say being nagged at) by one of my PhD students, Fran Sconce, I joined the Twitterati (Leather, 2015). Shortly afterwards I met another new Tweeter, @Minibeastmayhem (Sally-Ann Spence in real life) who approached me with an idea that she had been trying to get off the ground for a number of years – an entomology conference for children. This sounded like a great idea to me and I was extremely surprised to hear that she had been told by various entomologists that it wouldn't work. After a bit of 'to and fro' on Twitter we met up for Sunday lunch at her farm near Swindon, and hammered out a basic plan of action and a mission statement. "*To excite and educate both the pupils and their teachers about entomology. To clarify the careers presently available within entomology and other invertebrate professions. To explain the route to study entomology from secondary school subjects to courses in higher education. To inspire pupils to consider a future in entomology and related sciences.*" I think all of us in entomology would agree that this should be our *raison d'etre*.

Sally-Ann had already done a lot of the preliminary work in approaching potential presenters and over the next couple of months we came up with a few more. When I approached my Head of Department and the Vice-Chancellor at Harper Adams University, they were both very supportive and it was agreed that the university would foot the bill for the publicity and the catering. We then approached a number of organisations for financial support and/or for stuff to put in the conference goodie bags. I was very surprised and disappointed, to discover that some organisations that very publicly claim to support invertebrates and education, such as the RSPB and London Zoo, either didn't read our letters or only pay lip-service to the majority of the animal kingdom. Undeterred we persevered, and with very generous support from the Royal Entomological Society , both financially and in the person of their Director of Outreach, Luke Tilley, were able to put together a very exciting package of events and presenters. And very importantly, because of the generosity of our sponsors, everything was free for the delegates. Two members of the Harper Adams marketing team, Laura Coulthard and Helen Foster did a great job of contacting schools directly and also ran a Facebook campaign. Sally-Ann was also indefatigable in publicising the event and I used my Twitter account as well. As a result of our combined efforts, almost 300 students and their accompanying adults (science teachers, careers teachers and some parents) turned up on the day, and to think that at one stage we were worried that no-one would be interested!

To ensure smooth running and to meet health and safety rules we divided the conference into five zones, Bugs & Beetles, Maggots & Murder, Entomophagy, Discover Arthropods and Careers & Soapbox Scientists. The delegates were all issued with colour-coded conference lanyards (provided by the RES) and put into the care of PhD, MSc and BSc students to guide them to the various zones and to keep things running to time.

George McGavin (our Patron) and Erica McAlister from the Natural History Museum (London) got the conference off to a great start with two very entertaining plenary talks about the wonders of entomology and flies respectively. After that it was on to the zones.

Graham and Janice Smith were kept very busy with their Discovering Arthropods room, the students really enjoyed handling and cuddling the insects and other invertebrates. Stefan Gates (the Gastronaut) gave a dazzling and interactive display of entomophagy, and seemed to have no trouble at all in convincing the delegates to tuck into tasty insect snacks. Amoret Whitaker from the University of Winchester introduced the students to forensic entomology which included them processing a 'maggot-infested crime scene' and current and past MSc Entomology students in the Careers & Soapbox Scientists hall, along with the Field Studies Council, RHS Wisley, and other

ENTOSCI16
The Entomology conference for Schools and colleges

Harper Adams University

Wednesday 13 April 2016

Time	Activity			Location	
09.00-10.00	Arrival and registration			Weston building foyer	
10.00-11.00	Welcome/keynote (George McGavin), Speeches (Erica, Sally-Ann, Simon)			Weston Lecture Theatre	
Groups	**Blue group**	**Red group**	**Green group**	**Yellow group**	**Purple group**
11.10-11.55	Zone1: Bugs & Beetles (Weston LT)	Zone 2: Maggots & Murders (Labs S21)	Zone 3: Entomophagy with the Gastronaut (RFA LT)	Zone 4: Discover Arthropods (Weston WG3)	Zone 5: Careers & Soapbox Scientists (RFA Conf Space)
12.00-12.45	Zone 5: Careers & Soapbox Scientists (RFA Conf Space)	Zone1: Bugs & Beetles (Weston LT)	Zone 2: Maggots & Murders (Labs S21)	Zone 3: Entomophagy with the Gastronaut (RFA LT)	Zone 4: Discover Arthropods (Weston WG3)
12.45-13.45	Lunch			Delegates: QMH? Speakers/Facilitators: Weston seminar room WG4	
13.50-14.35	Zone 4: Discover Arthropods (Weston WG3)	Zone 5: Careers & Soapbox Scientists (RFA Conf Space)	Zone1: Bugs & Beetles (Weston LT)	Zone 2: Maggots & Murders (Labs S21)	Zone 3: Entomophagy with the Gastronaut (RFA LT)
14.40-15.25	Zone 3: Entomophagy with the Gastronaut (RFA LT)	Zone 4: Discover Arthropods (Weston WG3)	Zone 5: Careers & Soapbox Scientists (RFA Conf Space)	Zone1: Bugs & Beetles (Weston LT)	Zone 2: Maggots & Murders (Labs S21)
15.25-15.40	Break			Delegates: Weston Speakers/Facilitators: Weston seminar room WG4	
15.45-16.30	Zone 2: Maggots & Murders (Labs S21)	Zone 3: Entomophagy with the Gastronaut (RFA LT)	Zone 4: Discover Arthropods (Weston WG3)	Zone 5: Careers & Soapbox Scientists (RFA Conf Space)	Zone1: Bugs & Beetles (Weston LT)
16.35-17.00	Closing speeches			Weston Lecture Theatre	
17.00	Coaches depart				

exhibitors provided a very interactive session. To add to the conference air, the students even had the chance to buy books from Brambleby Books and have the chance to chat with former RES President, Hugh Loxdale. In the main lecture theatre, Max Barclay, Erica McAlister, George McGavin, Andy Salisbury, Darren Mann and Richard Comont were subjected to a barrage of questions ranging from how much they earned, to their favourite insects and their most dangerous insect encounter, some much easier to answer than others.

As an added bonus, BBC Breakfast came and did live filming, which meant that for the organisers and presenters and some hastily-drafted in students, the day was even longer as we had to put in an appearance at 0645. I think the student delegates felt it was worth the effort though, if only to be able to say that they had been on TV. The BBC had also done some filming the day before, two hours to be exact which turned into a whole three minutes of screen time. All in all, the day was a real buzz. Of course the real stars were the insects and other invertebrates which managed to generate real enthusiasm amongst the delegates and their accompanying teachers. It was wonderful to see how many of the students responded so favourably to the insects, many of whom at first, were reluctant to get close-up and personal with them. I really, truly believe, that we will be seeing many of the delegates becoming professional entomologists.

I leave you with a few images to give you the flavour of the day.

Early morning preparation.

And we're off to a great start.

And it just kept getting better

And better!

Some of the team, Luke Tilley, Sally-Ann Spence, Graham Smith, Tim Cockerill, George McGavin and me.

And finally, as well as thanking the Royal Entomological Society for their financial support a really huge thank you must go to Laura Coulthard and Helen Foster, from the Harper Adams Marketing and Communications Department, who put their hearts and souls into making sure that the event ran smoothly. We couldn't have done it without them.

And who knows, perhaps we will do it all again next year – we certainly seem to have been a hit in the USA as well as in the UK.

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National Insect Week

The week the UK celebrated insects and entomology

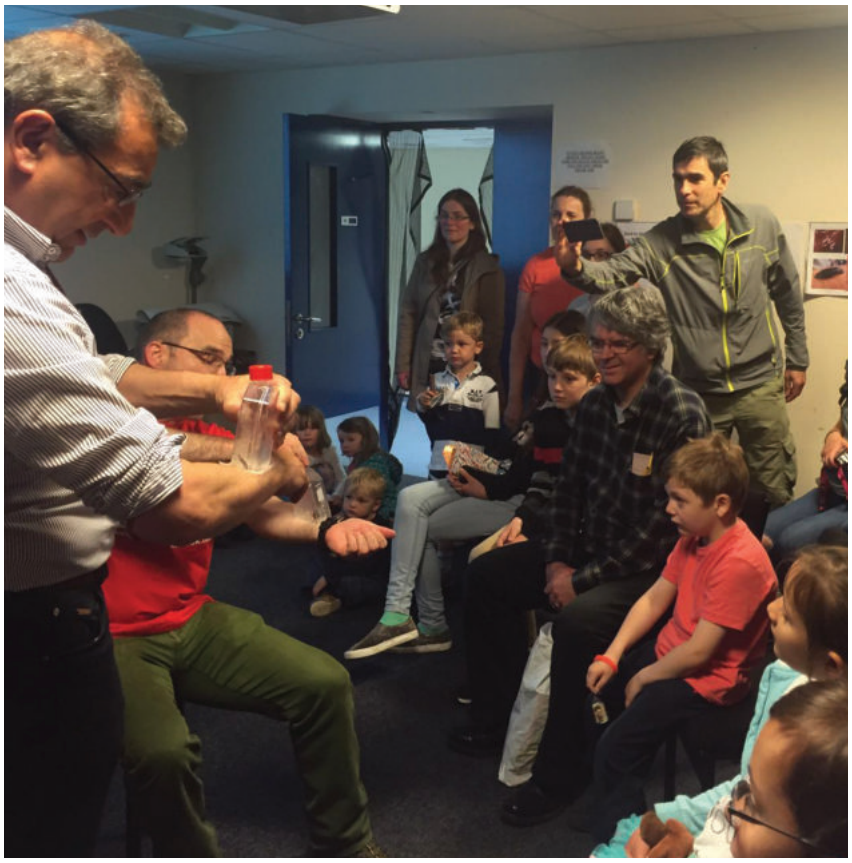
Dr Luke Tilley
RES Director of Outreach and Development

The seventh NIW campaign organised by the Royal Entomological Society Insect Week (NIW) returned in the UK this summer from 20-26 June. National Insect Week is an initiative that aims to promote public awareness of insects, entomology and entomologists. Over 540 events were registered as part of National Insect Week 2016, and with the loosening of the 7-day guidelines to include more event organisers in the 'buzz' another 50 events took place on the Saturdays and Sundays before and after the publicised week. The events were supported by media activity and the initiative's website (www.nationalinsectweek.co.uk) in order to reach as many people as possible, of all ages and experience. Events were held all over the UK, from pollinator awareness activities in the Highlands of Scotland to bioblitzes and a moth trapping day in Cornwall. Dragonfly identification took place in the fens of Norfolk and an exciting new research centre and visitor attraction (Dr Beynon's Bug Farm) was officially launched in Pembrokeshire, Wales.

This year's campaign was supported by hundreds of event organisers, schools and over 60 official partners. During NIW2016 the focus was once again on the "little things that run the world". This 'strapline' was taken from the important 1987 E.O. Wilson paper[1] and chosen to offer a glimpse of the importance of insects and entomology around the world. The continuation of the "little things…" general theme in 2016 allowed the campaign to include supporters and partners from many sectors of entomology.

NIW Events Map (c) Google Maps

A very collaborative ribbon-cutting at Dr Beynon's Bug Farm (c) Bug Farm



Dr John Baird and Dr Jerry Sternberg allowing people to 'Meet the Bloodsuckers' at the University of Aberdeen, introducing hematophagous insects and vector-borne disease (c) University of Aberdeen.

NATIONAL insect WEEK 20 to 26 JUNE 2016

LITTLE THINGS THAT RUN THE WORLD

The Launch

The official launch event was held at the B.U.G.S. Exhibit (Biodiversity Underpinning Global Survival), ZSL London Zoo, London on Monday 20 June. Invited supporters and the press were welcomed by B.U.G.S. Team Leader, Dave Clarke and the 2016 campaign was officially launched with speeches from the RES President, Prof Michael Hassell FRES and the Earl of Selborne, RES Vice-Patron. Lord Selborne spoke of the value of long-term insect monitoring in understanding the natural world, entomological research in agriculture and horticulture, and the importance of educating younger people about insects. Guests were treated to a new and exciting exhibition, Insects in Depth by scientific artist Alan Shaw,

Children finding grasshoppers at the offical launch of Dr Beynon's Bug Farm, Pembrokeshire, Wales (c) Bug Farm.

featuring three-dimensional S.E.M. images of some fascinating insects. Attendees were provided with 3D glasses to get up close and personal with the *little things that run the world*. This unique display made its world public debut at the NIW2016 official launch and will be in place at the B.U.G.S. Exhibit until the end of September.

Thirty children from Hawley Infant School, London joined after the speeches and were shown some amazing insects by Jess French (BBC presenter of 'Minibeast Adventure with Jess'), Dr Rosy Key, Dr Tim Cockerill and Dr Roger Key. Very wet conditions on the launch day meant that the school insect hunt became an indoor session with insects brought in by the group leaders. Spirits, particularly those of the children, were not dampened and the sun came out that afternoon and the rest of the week remained warm and dry for most areas of the UK.

The National Insect Week 2016 Photography Competition was launched at the launch on 20th June

BBC presenter Jess French discovers a bumblebee colony with pupils from Hawley Infants School (c) ZSL.

Earl of Selborne GBE, DL, FRS, (Chair of Science and Technology Committee (Lords) and RES Vice-Patron) officially launches NIW2016 at ZSL London Zoo (c) ZSL.

Children marvel at Insects in Depth (c) ZSL.

with two prize categories, for under and over 18's. Previous competitions have attracted some stunning entries, which can be viewed in the galleries on the NIW website, where competition rules can also be found (www.nationalinsectweek.co.uk/photography). Fellows and members are encouraged to enter the insect photograph of which they are most proud to the competition using the NIW website. The competition closes to entries on 31st October 2016.

During the Week and Beyond

Hundreds of events took place for NIW2016. They attracted people of all ages and were almost as diverse as the insect groups on which they focused. Wherever possible, event organisers were encouraged to highlight the importance of insects, the entomologists that study them and the research that underpins our understanding of them. Each organiser was provided with an event pack from the RES, which included ID guides provided by the Field Studies Council, posters, magnifying cards, t-shirts, stationery, and other goodies to help promote the event and the overall NIW campaign.

The campaign was supported by an intensive online and media campaign. There were hundreds of local and regional newspaper articles about insects and the campaign, and several items in national newspapers, on television and on the radio.

The NIW website continued to feature videos and learning resources for NIW2016. Dr Chris Jeffs interviewed a number of people that have a particular interest in entomology for a series of podcasts. There were also blogs about entomology and 'Bug of the Day' artwork by Paul Manning, all produced to support the campaign and provide visitors to the website with fun content about insects and entomology. The newest animated video, "What is an entomologist?" proved to be particularly popular. All of the online features are still available on the NIW website and you can find all of the videos and podcasts on the RES YouTube channel.

Prof Adam Hart talks to Dr Adam Rutherford for Inside Science, BBC Radio 4.

The first issue of Instar, the new online magazine for young entomologists, was published for NIW2016 and can be found on the NIW Homepage (www.nationalinsectweek.co.uk). Instar includes articles about entomology, starter activities and poetry for ages 7 and above. The aim is to provide entertaining things for 'larval'

Instar Magazine for young entomologists. Available on the NIW website

Podcast - Entomologist and author Richard 'Bugman' Jones tells us how his dinner-party behaviour inspired his new book 'House Guests, House Pests' (available on YouTube)

What is an entomologist? animated video.

For those using social media, the campaign on Twitter and Facebook continues to strengthen the NIW initiative. Supporters were invited to tweet and post about insects and the events using #NIW2016 and #littlethingsthatruntheworld. Prof Simon Leather was the guest tweeter on @realscientists for the week and NIW2016 featured on @biotweeps. Both of these Twitter accounts feature a different scientist or organisation every week.

There were several competitions and giveaways that took place or opened to celebrate NIW2016, and three were organised directly by the RES:

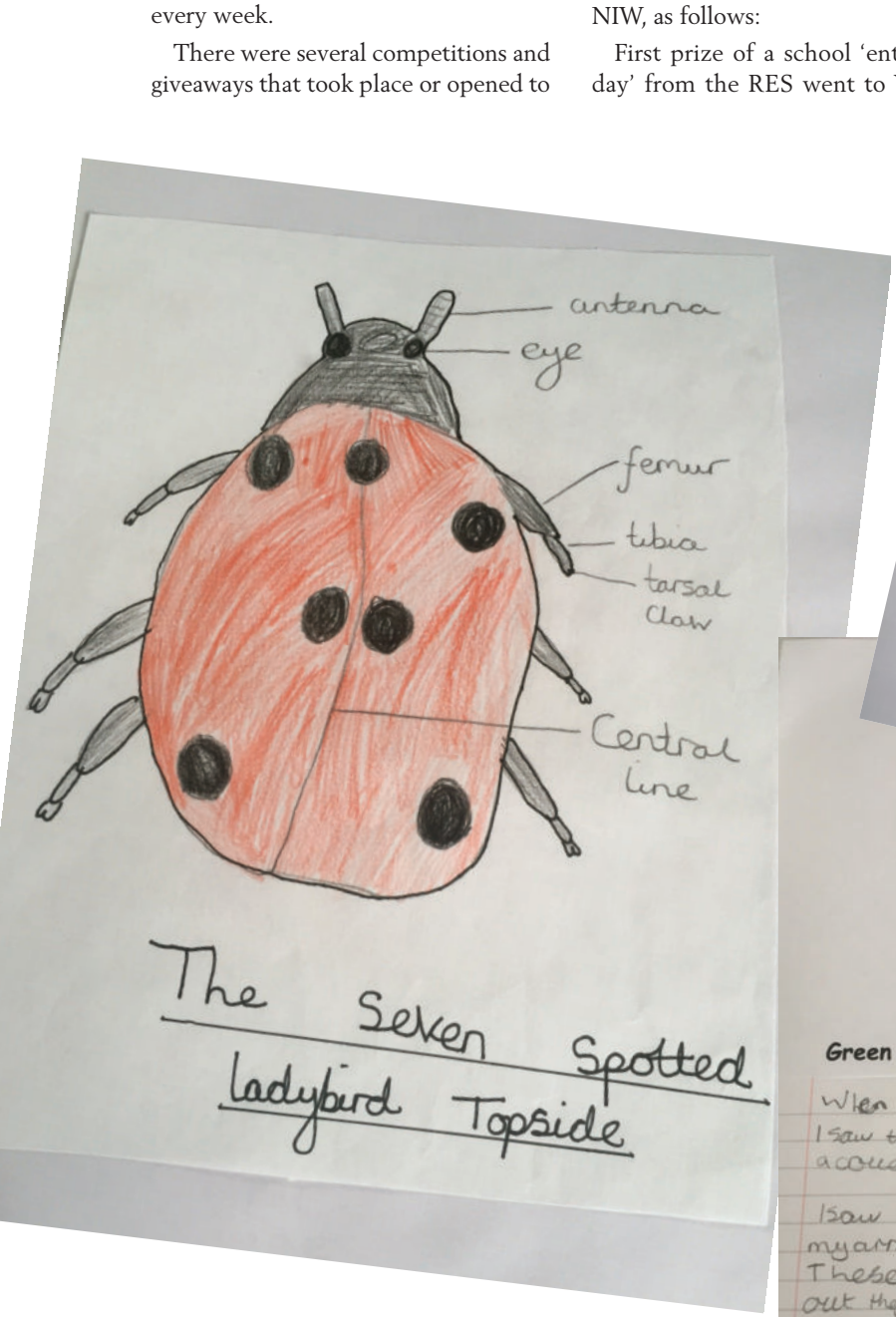
The Great Bug Hunt – in conjunction with the Association of Science Education (ASE), this classroom project encouraged children to submit workbooks on British invertebrates. Over 800 entries were received and the entries were grouped by school class and judged by representatives from the ASE and RES. The winning schools and classes were announced shortly after NIW, as follows:

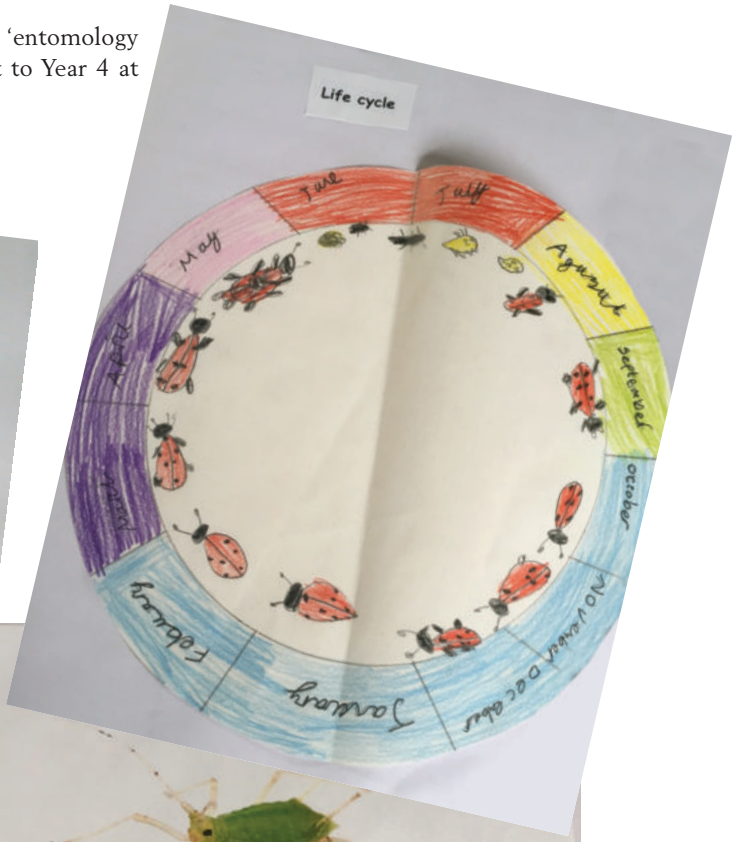
First prize of a school 'entomology day' from the RES went to Year 4 at Wickham Market Primary School, Suffolk. Winners from each age category received certificates and lots of entomological goodies:

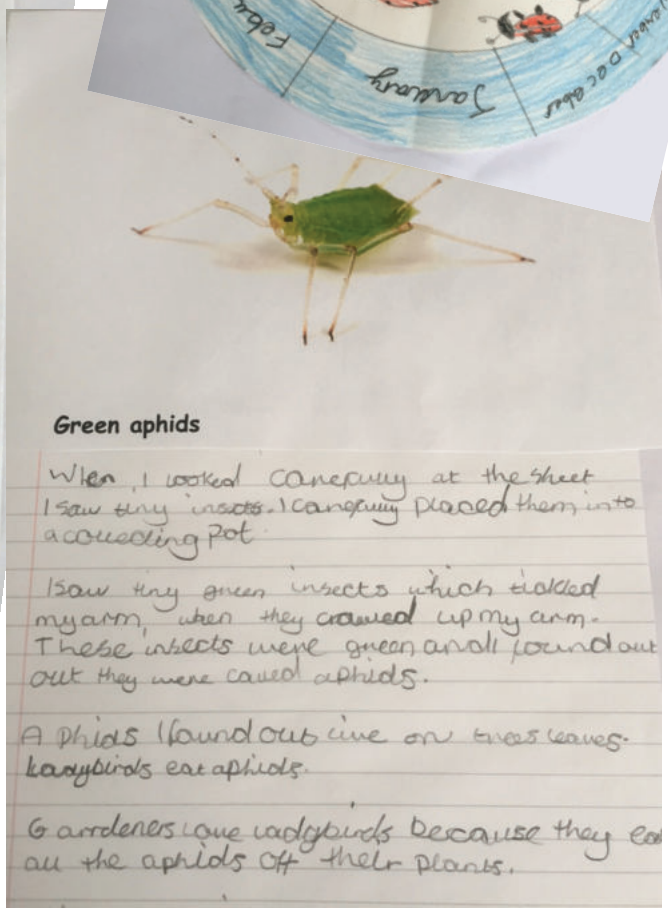
Years 1 and 2 (ages 5-7) - St James CofE, Weybridge, Surrey

Years 3 and 4 (ages 7-9)- Swaffield Primary School, Wandsworth, London

Years 5 and 6 (ages 9-11) Manor Farm Junior School, Hazlemere, Buckinghamshire.







A Great Bug Hunt winning entry from Wickham Market Primary School.

Author M.G. Leonard talks to children about beetles and her successful book *Beetle Boy* © Dr Beynons Bug Farm.

#NIW2016 Twitter giveaway – Any person or organisation that tweeted a photograph from an event during the Week and used #NIW2016 was entered into a prize draw to win 'Insect Flats' (mountable insect homes provided by Neudorff UK Ltd). A grand prize of an 'Insect Hotel' (large insect home provided by Neudorff UK Ltd) was awarded to the most imaginative photograph from an event, judged by the NIW Team and Neudorff representatives.

The next National Insect Week will take place **18–24 June 2018**. Please put it in your diaries and contact the NIW Team (info@nationalinsectweek) if you would like to organise an event or discuss anything about the next NIW. You can find out much more on the website (**www.nationalinsectweek.co.uk**) or on Twitter (@insectweek) and Facebook (/nationalinsectweek)

There are so many dedicated people and organisations to thank for making National Insect Week 2016 such a success. Special thanks must go to the official partner organisations and event organisers, colleagues at the RES, Dave Clarke and his colleagues at ZSL London Zoo for an excellent launch event. Thank you to the trustees of the Royal Entomological Society and the RES Outreach and Development Committee members for their advice and support. Several individuals deserve particular thanks: Lord Selborne for his continued support of the RES and the NIW initiative, Francisca Sconce for her work on the website and social media, Dr Chris Jeffs for content and television, Prof Simon Leather for having a busy week on @realscientists, Jess French for her support at the Launch and other NIW events, Author M.G. Leonard for her support at events and on television, Prof Adam Hart for his media and science communication work, Paul Manning for artwork and all the members and fellows of the RES that helped with everything from identification enquiries to minibeast hunts.

Reference

1 – Wilson, EO (1987) The Little Things That Run the World (The Importance and Conservation of Invertebrates) *Conservation Biology, 1:4*

The Verrall Lecture 2016

Collections – the Last Great Frontiers of Exploration

Maxwell Barclay

This year the lecture was held in the Ondaatje Theatre of the Royal Geographical Society. This change of venue was due to the refurbishment of the lecture theatre in the Natural History Museum (NHM). After some convivial minglings over tea, Dr Andrew Polaszek opened proceedings by welcoming the audience on behalf of the NHM and the Royal Entomological Society. Max's talk was then introduced by Prof. Richard Fortey. Richard is most known for his work on trilobites but confessed an affinity with entomologists as, although based at the other end of the NHM, they at least worked in the same phylum (the arthropods). He said that the best systematicists have a burning passion for their subject and told the story of former NHM Head of Entomology Quentin Wheeler, who named several slime-mould beetles after George W. Bush, Dick Cheney and Donald Rumsfeld. This was not, as some thought, a derogatory action but rather, from a taxonomist and Republican American, one of the highest praise. Richard said that museums never throw anything away. What might appear as a dry, shrivelled specimen could hold important information. A case in point was old dry specimens whose storage preserved DNA, compared to apparently better preserved formalin-pickled specimens, where the DNA was much harder to recover. Richard finished his introduction by saying that museum collections are the conscience of the biological world: they tell us what we have and also perhaps what we have lost.

Max opened his talk by dedicating it to George Verrall, a Dipterist who was also a Conservative MP (a parallel perhaps between taxonomists and right-wing politics), and also the founder of the Verrall Lecture and supper. In starting a theme that Max returned to throughout his talk, he pondered our notion of value and worth. The philanthropist who endowed the Ondaatje Theatre had also recently 'saved' a Van Dyke painting 'for the Nation'. Max suggested that saving biodiversity was

Prof. Richard Fortey (seated), left to right, Prof. John Pickett (then RES President), Dr Andrew Polaszek (Natural History Musem) and the Verrall lecturer Max Barclay (also from the NHM).

Prof. Richard Fortey introducing the Verrall lecture by way of some trilobites.

different from 'saving' artworks, because what was at stake was not which country would house something, but whether it would be available at all, or would be destroyed and lost to all human knowledge for all time. The NHM houses some 10 million beetle specimens. Each specimen has been collected by somebody, labelled and identified by somebody and cared for by somebody, representing lifetimes of dedication. As an example, Max mentioned Luigi Magnano, who though a tailor by trade was the world expert on *Otiorhynchus* weevils. After his death in 2009, the NHM acquired his collection including 45,000 weevils and 1,208 type specimens, which he had assembled over a lifetime. In looking at this question of worth and how we value biodiversity, Max referred to the legend of the Sibylline Books. The Sibylline Books were books of ancient prophesies. The nine books were offered by the Sibyl to the King of Rome but he declined due to the cost. The Prophetess burned three books, and offered the remaining six to the King at the same price, which he again refused. She then burned three more and repeated her offer. The King then purchased the three surviving books at the original price for which he could have had all nine, had he acted sooner. As a society, where biodiversity is concerned, are we still at the refusing and burning stage?

There are parallels between the Natural History Museum and the Royal Geographical Society: just as maps are schematic representations of what is known about the physical world, so natural history collections are representations of what is known about the living world. Often the same people have contributed: at the RGS one is surrounded by images of intrepid explorers, and many of them were also collectors. Joseph Banks was the first naturalist to set foot in Australia and Hawaii, accompanying Captain Cook. Portraits and busts include explorers David Livingstone, Wilfred Thesiger, Richard Burton, John Speke and Henry Stanley. All of them collected beetles which are now in the Natural History Museum. Livingstone's specimens were only found last year, in the private collection of a lawyer, E.Y. Western. As they were common species, they were probably overlooked by the entomologists of the time as of little biological significance, but the historical provenance of the Livingstone connection adds another dimension. Max drew attention to a less famous Victorian explorer called Mary Kingsley, who was remarkable at that time for being a lone woman explorer in West Africa. She found a few beetles, including a longhorn beetle, subsequently named *Pseudictator kingsleyae*, which is the only member of its genus and only individual of its species ever found. Darwin of course was famously a beetle collector. He could be quite passionate and even threatened to throw a local collector down the stairs at Cambridge for providing beetles to a rival entomologist, Cardale Babington. It would seem though, that later in life tempers calmed and Darwin sent 'Beagle' water beetles to Babington. Some of these specimens are still missing and Max contends that they are probably in a regional UK museum waiting to be rediscovered. Max also observed that Darwin beetles are still being described. The staphylinid beetle, *Darwinilus sedarisi*, was collected by Darwin on the Beagle voyage but not described as a new species until 2014, 180 years after it was collected.

The perception of museums can be of warehouses like at the end of 'Raiders of the Lost Ark', where specimens are wheeled in, labelled and left. However, Max refutes this, saying that museum curation is an active and long-term endeavour. A museum may not have the expertise to deal with a particular family at a particular time. In fact, taxonomists are so thin on the ground that expertise on a given group may not exist worldwide in a given generation. This is why some specimens may 'wait' to be described, but we should still archive them. Max said that he collects specimens of taxa that he is not expert in, and lays them down in the certainty that one day, some future entomologist will thank this 'long-dead coleopterist for collecting, preserving and labelling this exciting new species from a long-vanished forest'. Max said that he once corrected a manuscript that contained the phrase 'languishing in the Natural History Museum' for paratypes of a new species of British *Quedius* staphylinid. The particular specimens referred to had actually been sent out to several other museums and in totality had probably been on several continents in the past few years, before British coleopterist Derek Lott finally took the step of describing them – hardly 'languishing'. That collections are dynamic places, generators of knowledge, still needs to be impressed on the general public, and some decision makers as well.

Alfred Russel Wallace was an avid professional collector. His influential eight-year period in the Malay Archipelago, during which time he formulated the theories of biogeography and natural selection, was funded in part from insurance from the loss of South American specimens in a tragic ship-board fire. Unlike Darwin, Wallace was not independently wealthy and was an early recycler. Max showed an insect label written by Wallace on the back of a fragment cut from an old letter, which mentions 'Burlington House', the seat of the Linnean Society. Tantalisingly, this could possibly be a

letter from Darwin to Wallace, outlining the arrangements for their joint paper to the Linnean Society. Wallace, like most entomologists, assiduously labelled his specimens, and other entomologists have revisited some of his sites to resample insect biodiversity there. A recent acquisition by the Natural History Museum, the Milan Krajcik collection, comprises cetoniine flower chafers from many of the same islands that Wallace collected on more than 100 years previously. What is curious is that there have been changes in species prevalence, and the species found by contemporary researchers are often not the same as those found on the same islands by Wallace. Max coined the term the 'onion effect', that the layers of forest on an island, at different altitudes and reliefs, are like the layers of an onion, each supporting its own fauna. As each layer of the onion is peeled off and discarded (by deforestation and land use change, from the coast inward), subsequent generations have access to different layers, so encounter different species. The 'forests of Borneo' studied by Wallace are not the same forests as the forests of Borneo today, and do not have the same inhabitants. We only know this because we have the continuous record of natural history collections, and because in the case of the Malay Archipelago, one individual dedicated eight years of his life to recording and archiving the fauna of those forests in the 1860s.

In concluding, Max commented that natural history collections are distillations of biodiversity, archived and available for current and future study, and full of potential scientific discoveries. Professor John Pickett, President of the Royal Entomological Society, chaired a number of interesting questions put to Max. Many of these dealt with the impact of taxonomy on conservation and /or the future of taxonomists. Max conceded that sometimes he feels that he is inevitably archiving something that is likely to be lost, but that this is a reason for urgency, not despair. If that loss cannot be prevented it is better that we know what we had, than for it to vanish without trace. John presented Max with an engraved tankard as a token of our appreciation and thanked him for a fascinating talk that was also a plea for action. Max's final words were a light-hearted reference to the two instructions given to humanity in the Bible: 'go forth, increase and multiply' and 'give a name to every creature'. We're doing a pretty good job of the first one, but what about the second? That task is being left entirely to taxonomists.

A. K. Murchie (Hon. Secretary)

Maxwell Barclay delivering the 2016 Verrall lecture on "Collections - the Last Great Frontiers of Exploration".

Max's reaction on being asked the impossible question of what was his favourite beetle.

Heliconius Meeting

13-14th June, 2016, Sheffield

Melanie Brien

Following last year's meeting in Panama, the 11th Heliconius meeting was held at the University of Sheffield in June, organised by Nicola Nadeau and her team. 53 scientists working on, or just interested in, this butterfly study system came together for two days of talks and workshops covering a broad range of topics including genomics, behaviour and speciation. Participants represented 16 different research organisations from seven countries.

John Davey, from Chris Jiggins' group at the University of Cambridge, opened the conference presenting his work about chromosome inversions and looking for rearrangements in *Heliconius melpomene* and *H. cydno* genomes. Other work from this lab involved looking at patterns of divergence and duplications across genomes.

Mathieu Joron's group joined us from CNRS, Montpellier, via Skype. Their research looked at mimicry among prey with unequal defences and supergene evolution. Monica Arias (MNHN Paris) spoke of the development of a computer game to explore the evolution of mimetic colour patterns by using humans as surrogate predators. The 'Hungry Birds' game can be found at Heliconius.org.

Another captivating talk came from Erika de Castro (University of Copenhagen), who discussed cyanogenic glucosides and their uses in defence, nuptial gifts, and transport and storage of nitrogen. She reported how the toxicity of *Heliconius* larvae depends on the chemical profile of its food plant.

An evening poster session displayed work on the roles of wing patterns and flight ecology as reproductive barriers, and a project investigating the effects of different logging techniques in the Amazon on the diversity and abundance of butterflies.

As the planned barbecue was rained off in true British style, to finish the day we were kept entertained by a quiz with Sheffield-themed prizes.

A *Heliconius erato demophoon* from Panama feeding on a flower in one of our insectaries. Photo by Melanie Brien

The second day began with a workshop by Sujai Kumar (working with Mark Blaxter at the University of Edinburgh) on using Lepbase (lepbase.org), a website which holds lepidopteran genome assemblies, with tools for browsing, searching, and comparing.

Next, we heard about an exciting infrastructure project in Colombia. Mauricio Linares, from Universidad del Rosario in Bogotá, introduced his plans for the Jose Celestino Mutis field station, which will be a great resource for the *Heliconius* community.

While many of the talks focussed on the *Heliconius* system, we also heard about a variety of other species. There were two invited talks from groups working on other ecological genomics systems in Sheffield: Victor Soria-Carrasco discussed the genomics of speciation in *Timema* stick insects, while Anja Westram spoke about ecotype divergence in *Littorina* snails.

Stephen Montgomery's talk 'Brains over beauty' covered adaptation in brain structure during ecological speciation. A subspecies of *Heliconius erato* found at low altitudes was reported to have higher visual investment compared to a sister species found at higher altitudes, which had higher olfactory investment. We also learned about pollen-feeding behaviour from Gilbert Smith (University of California Irvine). This behaviour is thought to be found only in *Heliconius* and can increase fecundity and longevity by up to 6 months.

The high quality of all the student talks made the decision of best talk very difficult. It was awarded to Bruna Cama from the University of York for her interesting talk on pheromone composition in two sister species of *Heliconius*. Second place went to Paul Jay from Montpellier for his work showing that the introgression of an inversion kick-started the evolution of a supergene.

Marianne Elias, from Paris, closed the conference talking about another group of mimetic butterflies, the Ithomiini. She will be starting some fascinating work on the evolution, structure and function of transparent butterfly wings, and we hope to hear more about it at next year's meeting.

The meeting provided a captivating overview of the huge range of research being carried out on *Heliconius* butterflies. We would like to thank all of the participants, and the Genetics Society and Royal Entomological Society for their support.

HONORARY FELLOWS OF THE SOCIETY (HON. F.R.E.S.)

as at June 2016

1974	
Professor C D Michener	USA
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 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
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
Dr G R Port	UK
2010	
Professor C P Haines	UK
Professor J A Pickett	UK
Professor J Hemingway	UK
Professor P S Cranston	Australia
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 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
2014	
Professor C Wiklund	Sweden
Professor P R Ehrlich	USA
Professor B H lldobler	USA
Dr R M Pyle	USA
Dr A J A Stewart	UK
Dr R Harrington	UK
Dr G McGavin	UK
2015	
Professor W S Leal	USA
Professor Z R Khan	Kenya
Dr A D Watt	UK
Professor P J Eggleston	UK
Professor S R Leather	UK
2016	
Professor J K Hill	UK
Professor H D Loxdale	UK
Prof. Dame L Partridge	UK
Professor P G Mulder	USA
Sir Paul M Nurse	UK

SCHEDULE OF NEW FELLOWS AND MEMBERS

as at 4th May 2016

New Honorary Fellows
None

New Fellows (1st Announcement)
Dr P D Kamala Jayanthi
Dr M G Sanalkumar
O'Hara Professor Nora Jessie Besansky
Professor Emeritus Bernard David Roitberg
Dr Stylianos Chatzimanolis
Dr Daniel Martín-Vega

Upgrade to Fellowship (1st Announcement)
Dr Dino Peter McMahon
Mr Mark Anthony Yeates

New Fellows (2nd Announcement and Election)
Dr Michelle T Fountain
Mr John Anthony Lloyd
Dr Ramiro Morales-Hojas
Professor Abid Farid

Upgrade to Fellowship (2nd Announcement and Election)
Professor Dr Seetharaman Suresh
Mr Paul Lee
Dr Christopher David Williams
Dr Bilal Saeed Khan

New Members Admitted

Mr Roy Kevin Woodward
Mr Simon May
Dr Jacob Bishop
Mr Andrew Martin William King
Dr Ranajit Das
Dr T O Sasidharan
Mr Paul Andrew Cawsey
Mrs Elizabeth Claire Ripper

New Student Members Admitted

Mr Jonathan Pattrick
Mrs Nwamaka Oluchukwu Akpodiete
Mr Benjamin Bertram Phillips
Mr Nicholas John Howe
Mr Adam Bent
Mr Théo Antonin Baptiste Léger
Miss Rebecca Di Donato
Mr Robin Jan Southon
Mrs Felicity Edwards
Mr Benjamin John Clunie
Mr Carlos Martinez-Ruiz

Re-Instatements to Fellowship
None

Re-Instatements to Membership
None

Re-Instatements to Student Membership
None

Deaths
Mr E G Gange, 1981, Salisbury
Mr P G Clinch, 1989, New Zealand
Mr K G Goodyear, 1961, Dorset

SCHEDULE OF NEW FELLOWS AND MEMBERS

as at 8th June 2016

New Honorary Fellows
None

New Fellows (1st Announcement)
Dr Alex Eapen
Professor Andrew William Taylor-Robinson

Upgrade to Fellowship (1st Announcement)
None

New Fellows (2nd Announcement and Election)
Dr P D Kamala Jayanthi
Dr M G Sanalkumar
O'hara Professor Nora Jessie Besansky
Professor Emeritus Bernard David Roitberg
Dr Stylianos Chatzimanolis
Dr Daniel Martín-Vega

Upgrade to Fellowship (2nd Announcement and Election)
Dr Dino Peter Mcmahon
Mr Mark Anthony Yeates

New Members Admitted
Mr Christopher Douglas Moore
Dr Tonya Allen Lander
Dr James Robert Bell
Mr Alexander Greenslade
Mr Andrew David King

New Student Members Admitted
Mr Samuel Telling
Miss Adriana Adoldi
Miss Nancy Naanogot Dawam

Re-Instatements to Fellowship
None

Re-Instatements to Membership
None

Re-Instatements to Student Membership
None

Deaths
Miss J E Harker, 1950, Cambridge
Professor I Hanski (Hon.Fellow), 2012, Finland

OBITUARY

Barry Philip Moore

1925 – 2015

Barry Moore, a Fellow of the Royal Entomological Society since 1946, and an internationally-recognised insect chemist as well as taxonomist died at the age of 90 on 21st November 2015 in Bermagui, NSW, Australia, after a long career at the then Division of Entomology of the Commonwealth Scientific and Industrial Research Organisation (CSIRO). Although a former colleague and personal friend of Barry, I was not directly familiar with much of his taxonomic and chemistry research, so this obituary is based largely on information provided by colleagues – all of whom are acknowledged at the end of this notice.

Barry was born and grew up in southern England, completing his schooling as an evacuee during World War II. Although he had developed a childhood interest in entomology, he decided to pursue a career in chemistry and studied this subject for both a BSc and PhD at the University of Sheffield. As a Department of Scientific and Industrial Research (DSIR) scholar, he gained the opportunity to complete a second doctorate (1947-50) at Oxford University supervised by Sir Robert Robinson, then President of the Royal Society and the leading UK organic chemist of the day. Barry's studies were in alkaloid chemistry which helped provide a sound basis for his significant contributions to the chemistry of insect defence systems throughout his research career.

Following his Oxford D.Phil, Barry undertook post-doctoral studies on alkaloid chemistry at the Canadian National Research Council in Ottowa, and then returned to the UK in 1951 to take up a position at the DSIR Pest Infestation Laboratory (PIL) at Slough where he undertook pioneering research with Paul Hewlett on the structure and activity of synergists for insecticides with special reference to pyrethrins. Although much of his work was as a chemist, Barry continued his interests in beetle taxonomy and biology throughout this time, including work on spider beetles (Ptinidae).

In 1958, Barry first came to Australia to work in the Australia-wide Phytochemical Survey at the CSIRO Chemical Research Laboratories at Fishermans Bend in Sydney, which was where he met his future wife, Honor, working as a botanist in the Survey. Two years later in 1960, Barry moved to Canberra to the CSIRO Division of Entomology to establish a programme on insect chemical communication, which I had the privilege of joining many years later in 1969.

Barry's pioneering studies included the first-ever chemical characterisation of trail pheromones in termites which was published in *Nature* in 1966. This work provided a strong foundation for the later work of his CSIRO colleague Mike Lacey together with researchers elsewhere in the world to identify other trail and sex pheromones of termites.

Of equal international significance was his research over many decades on the chemistry of 'warning odours' – mostly pyrazines - of numerous aposematic insects, and how this varied amongst mimics across the range from Mullerian to Batesian extremes. He was a world authority in this area and his papers published over several decades with his CSIRO co-worker – W.V. ('Vance') Brown –

remain widely cited. Barry collaborated quite extensively with Dame Miriam Rothschild who had a well-known and well-documented passion for understanding the defensive chemical armoury of insects - and their collaborative studies were on the Monarch butterfly as well as several Arctiid and Zygaenid moths. This collaboration also meant being invited to stay at Dame Miriam's estate at Ashton Wold near Peterborough, and Barry recounted (Mike Lacey *pers com*) that on his first night he was startled to find under his pillow a gift bottle of fine single-malt whisky!

Much of this research on the characterisation of minute quantities of volatiles produced by insects became possible through Barry's pioneering use of micro-ozonolysis and other techniques including a splitting device of his own design by which various odour volatiles emerging from a gas chromatograph could be monitored and characterised simultaneously in real time with a coupled mass spectrometer. In addition to the work on Lepidoptera referred to earlier, Barry also studied defensive chemicals in many beetle groups including carabids, lycids, buprestids and cerambycids. His expertise in both chemistry and taxonomy enabled him to undertake pioneering work on insect chemotaxonomy - based initially on carabids.

Barry took early retirement from CSIRO in 1985 in order to concentrate more fully on his taxonomic work, especially on the Carabidae of the Australian Pacific region. During the course of this research, he assembled a very large amount of material – now housed in the CSIRO's Australian National Insect Collection (ANIC). With the death in 1983 of the leading carabid specialist for the Asian-Pacific region, Philip J Darlington Jr, Curator of Insects at the Harvard Museum of Comparative Zoology, Barry was a natural successor to take over this role - which he did with great distinction. His surveys took him to most parts of the region and included working with the Royal Entomological Project Wallace in Sulawesi in 1985. His many taxonomic publications on Carabidae, including major revisions of the Pterostichine and Trechine tribes, date back to the early 1960s and include papers in the then *Transactions of the Royal Entomological Society of London*. He also undertook extensive work on classification of carabid larvae, and, as with all of his taxonomic research, did all his own illustrations. His beetle interests also extended to stag beetles and both before and after his retirement, he published a number of papers on new species from Australia and the USA.

Cave-dwelling insects also remained a long-term interest and over several decades Barry joined various speleological expeditions, mostly in Australia but also in New Caledonia. His taxonomic work on cave-dwelling carabids included examination of specimens found in past expeditions, and led to him, for example, discovering a new genus *Speagonum* and three new species from the British speleological expedition to Papua New Guinea in 1975 (described in the *International Journal of Speleology*).

Barry considered it important that guides to beetle identification should be more widely available to Australian naturalists, and he produced a semi-popular series of linked publications in the *Australian Entomologist* on the beetles of south-eastern Australia; all of these were beautifully illustrated with his own scraper board drawings. His artistic skills also came to the fore in the illustrations for his book published in 1978 entitled *Life on Forty Acres* which described the seasonal patterns of plant and animal life on a block of Australian bush near Canberra that he lived on from 1970 onwards - and named, perhaps not entirely surprisingly: *Calosoma*. I recall that for his chapter on the effect of bush fires on plants and animals, he came out to the small farm that I owned to study the impact of the devastating 1975 fires on the property. Following his retirement, Barry purchased an area of tropical rainforest in northern Queensland where he lived for part of each year and which he described as his second "field station" for research on Coleoptera.

Barry was a founder member of the Australian Entomological Society and a former Vice-President and Chairman of the Society's Executive. He was also a long-time member of the Entomological Society of Queensland, and that Society will publish a special memorial issue of its journal *Australian Entomologist* in 2017 to highlight his many contributions to entomological science, supplemented with papers on the taxonomy of Australian Coleoptera from all those interested in contributing.

In his personal life, Barry was married as noted earlier, but his wife, Honor, died tragically in a car accident not long after they decided to live out in the countryside at *Calosoma*. He remained very close to his step-children and was also a devoted grandparent, and no doubt was able to instil a passion for nature in them as he did in many other ways for those of us who enjoyed knowing him as a friend and professional colleague.

Acknowledgments. It would not have been possible to compile this obituary without the extensive information provided by the following colleagues: Geoff Monteith (Queensland Museum) personally and through his obituary notice in *Myrmecia* Vol. 52. May 2016); Mike Lacey (Honorary Fellow, CSIRO) through emails, and Tom Bellas (ex-CSIRO) who provided a copy of a 1985 retirement tribute from Barry Longtaff (ex-CSIRO) in the *News Bulletin* November 1985 Australian Entomological Society. The photograph, forwarded by Geoff Monteith, was taken by Esther Brooks.

George Rothschild

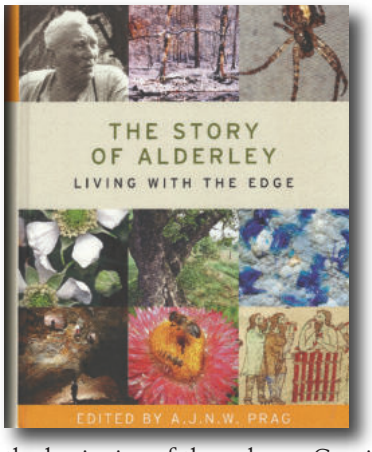
Emeritus Professor,
Natural Resources Institute (NRI)

University of Greenwich
– Medway Campus

Book Reviews

The Story of Alderley: Living with the Edge

Edited by A.J.N.W. Prag (2016),
ISBN: 978-0-7190-9171-1
Manchester University Press, Manchester
984pp, £50.00 (hard back)



As a child growing up in Manchester, the mention of Alderley Edge always invoked images of mysticism and magic, particularly as the Weirdstone of Brisingamen, a children's fantasy novel set in an around Alderley Edge, was one of the books we read at primary school. Hence, it was with some degree of pleasure that I accepted the offer to review this work, but there was also a considerable degree of trepidation, given its incredible breadth of coverage. I had known about the existence of this project since its inception two decades ago, as a result of working at the Manchester Museum for a brief period shortly after the initial funding had been obtained and seeing the list of contributing authors is somewhat akin to a reunion of old colleagues and friends. The volume covers a huge number of topics grouped under several themes: Introduction, Geology and Geography, Natural History, Human History (archaeology and social). In this review, I will concentrate on the Insects and Other Invertebrates chapter (pages 220–299) and the associated Appendices 13.1 (pages 821–873) and 13.2 (page 874) written by Dmitri V. Logunov (DVL) and Roger L.H. Dennis (RLHD).

At the outset, I should mention that this is not an identification guide, although there are 39 associated colour photographs of invertebrates in the collection of plates towards the beginning of the volume. Consider this number against the total number of invertebrates recorded from the site (1,732 species), represented mainly by Lepidoptera (616 species), Coleoptera (363 species), Diptera (216 species), Araneae (137 species), Hemiptera (134 species) and Hymenoptera (128 species). Despite these considerable numbers, as will become evident from this review, an identification guide would be premature as the fauna is still very poorly known and this is noted frequently for the relevant groups throughout the chapter.

The chapter is subdivided as follows: Introduction (DVL), True Bugs (Hemiptera) and smaller orders of insect (DVL), Lepidoptera – micromoths and macromoths (DVL), Lepidoptera – butterflies (RLHD), True Flies (Diptera) (DVL), Wasps, ants, bees and allies (Hymenoptera) (DVL), Beetles (Coleoptera) (DVL), Invertebrates other than insects (DVL). Most of these sections are rather uniform, contextualizing the species richness with regard to the total UK fauna and the global fauna, before discussing topics such as useful identification resources, rather common species that are not formally recorded from Alderley and interesting elements of the behaviour and ecology of various different species that have been recorded. For example, the observation of two peacock butterflies diving into the same rabbit run for shelter during a rain storm. Both common names and Latin names are used throughout and given the lack of illustrations most readers will need a good insect field guide to use in conjunction with this volume. Suggested works are included in the six pages of references at the end of the chapter. The butterfly section by RLHD is rather different and considers amongst other things, changes over time (e.g. the significant decline of the common blue) as demonstrated by various surveys in different biotopes and how the butterfly resources can be managed in the future.

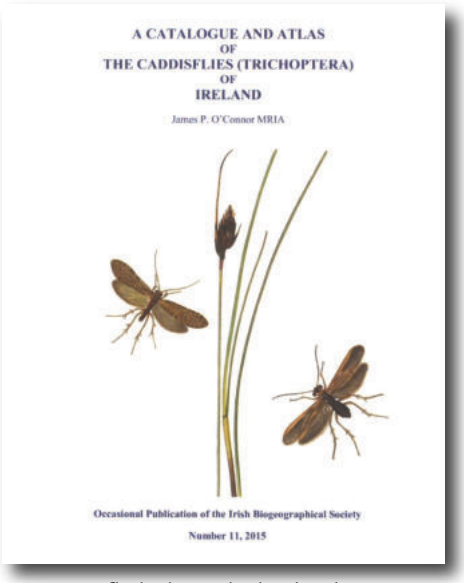
To give you an idea of the gap in our knowledge, the authors propose that only around one-third of the fauna is known. There are currently no records of whiteflies or scale insects (Homoptera), bristletails (Thysanura), thrips (Thysanoptera), leaf-miners (Diptera: Agromyzidae) and certain spider families that can be expected to occur (e.g. Mimetidae and Oonopidae). Even the violet ground beetle *Carabus violaceus* is absent from the current list. There has been just a single species of springtail (Collembola) recorded, one species of gall midge (Cecidomyiidae). Other groups notably underrepresented include barklice (Psocoptera) and true lice (Phthiraptera). Despite the lack of many common species that may be expected to occur, there are also some unusual records, such as the hemipterans: *Kleidocerys ericae* and *Cymus claviculus*, which are uncommon in northern England, the cuckoo bee *Nomada lathburiana*, which is rare and at risk of extinction in the UK and the two spiders *Entelecara congenera* and *Crustulina guttata*, which represent the northernmost records of these species in the UK.

There can be no doubt that this is a comprehensive synthesis of what is known of the Alderley Edge invertebrate fauna. The extensive checklists are the first to be compiled for this locality. This work provides a baseline for future research and highlights areas that are likely to be extremely productive in terms of new records. If you don't want to collect, then just go and observe. As the authors note, plenty of the species recorded are known only by their name, with very little (if any) information known about their general biology, feeding or mating habits. There are calls throughout the chapter to take up the challenge of adding to our knowledge of various aspects of this fauna and I encourage you to do so. Reading this book certainly got my bug net twitching!

Dr David Penney
Faculty of Life Sciences, University of Manchester, UK

A Catalogue and Atlas of the Caddisflies (Trichoptera) of Ireland

by James P. O'Connor
The Irish Biogeographical Society Number 11 2015
£25.00
ISBN 9780955080685



The first impression of this book is its size. With nearly 460 pages and weighing close to a kilogram this book takes up 3 centimetres of shelf space. It represents a lifetime's dedication to the study and recording of caddisflies in Ireland and is based on somewhere in the region of 20,000 distributional records of caddisflies, many of which have been made by the author himself.

The book is split in to three sections. It opens with an extended introduction which includes a fascinating account of the history of caddsifly recording and study in Ireland, including short biographies of entomologists who have worked on the Irish Trichoptera over the years such as James Halbert and JJFX King.

The bulk of the detail in this volume is contained in the catalogue. This section includes accounts for each of the 149 caddis species known from Ireland, with information on their known Irish and European distribution, Irish counties where they've been recorded, published Irish records and the location of voucher specimens in museum collections. More general autecological information such as flight periods is also included.

Also included within the catalogue is more detailed information on species of particular interest in Ireland such as *Limnephilus pati*, *Hydatophylax infumatus* and *Erotesis baltica*. A further welcome addition is information on the separation of larvae of the *Hydropsyche*.

As you flick through this book it is tempting to think that the records contained within it are simply a list of sites where the species have been found, however they also include little snippets of information of where on the site the species was found, habitat preferences and other observations made by the author. One minor annoyance when using the catalogue is that in the text the records are given using Irish grid references, yet the distribution maps have been produced using latitude and longitude coordinates, making cross-reference between the two difficult.

The final section of the book is the atlas which replicates the Irish distribution maps for each species included in the catalogue, albeit at a larger size to fill the page.

The author makes reference to the difficulties of incorporating data from datasets hosted by the National Biodiversity Data Centre (NDBC) due to issues with verification of the information contained within the records. It would be good to rectify this situation by making the records included in this publication publicly available through the NDBC, thereby establishing this dataset as the definitive source of distributional information on the Irish caddisfly fauna. This would also alleviate the issues around different coordinate systems described above.

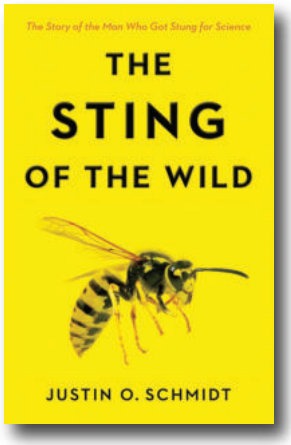
In summary, this publication provides the most up to date information on the distribution of Irish caddisflies. It should be an essential reference for anyone wanting to study this important group of aquatic insects.

Craig Mcadam
(Buglife)

The Sting of the Wild

The story of the man who got stung for science

Justin O. Schmidt
Johns Hopkins University Press, hardback
£16
ISBN 9781421419282



When I first came across the Schmidt sting pain index, my first thought was not that it was a bonkers idea, nor was it the realisation that US entomologists were as eccentric as the British; no, it was: "Damn, I wish I'd done that". I've been stung enough times to be stoic about my pain, and I try to admire the welt or swelling with an objective scientific curiosity, but Schmidt's dedication and enthusiasm for self-torture is another order of magnitude more impressive.

Not that he has deliberately set about being stung, that would be silly. Instead he has taken the time and effort to formally record, and quantify each pain opportunity as it has come along. And as he has spent a life-time studying the aculeates, opportunities came thick and fast, ever since that first, from a bumblebee, when he was five years old.

Stings, though, are not there for the purposes of one-to-one personal combat, nor for the subsequent tales of individual bravado, tabloid shock or forensic medical reportage. They have evolved in response to the sociality of the Hymenoptera, and this is the constant theme on which Schmidt weaves his tale.

The how and why of stinging (the first 5 chapters), sets the scene with the basics of stinger anatomy, warnings, aggression, nest dynamics, and the biochemical warfare of toxicity, before Schmidt takes a taxonomically-guided tour through the different groups where pain is freely on offer.

As with all good story telling, the plot starts easy and happily with sweat bees and fire ants — a 1 on the pain scale, like being tickled with sparks or the static from a thick pile carpet. I soon realise, with slight embarrassment, that my own pain analysis stops with social wasps and honeybees — a jarring and sudden burn, score 2, but soon diminished. The mild demure nature of the British stinging fauna is suddenly revealed in all its parochial and impoverished modesty. At the heavier end of the pain spectrum there are reports of cow killers (velvet ants, *Dasymutilla*, a solid 3) tarantula hawks (pompylids, *Pepsis*, an eye-watering 4), and bullet ants (*Paraponera*, top-whack 4), where we cringe at the descriptions of searing flesh, uncontrollable shaking and the urge to just lie down and scream.

The book is not a simple catalogue of sting sensations and agony adjectives; at every turn the narrative brings us back to a series of biological questions. Why should some insects sting more than others? What is the purpose of insect stings? What is going on in the blood and nerves of the stung? We might not know know all of the answers, but the finding out is fascinating. Schmidt writes with an easy and enthusiastic warmth, divided evenly between a keenness for his insect subjects, and an affection for his friends and colleagues who, wittingly or unwittingly, become embroiled in the wealth of personal anecdote that runs through the book.

Richard Jones

Miniature Lives

Identifying Insects in your Homes and Gardens

Michelle Gleeson
CSIRO
Au $ 39.95
ISBN 9781486301379

In her introduction, Michelle Gleeson describes this book as a launch pad for a journey of discovery and this is exactly what it is. Miniature Lives introduced the diverse and often complex world of the insects to a readership that has little or no scientific background. Miniature Lives is a book aimed at Australians who wants to know more about the insects that they encounter in and around their home.

It allows the reader to identify any given insect to the level of order and then provides an introduction to that order along with a list of recommended books and web sites to allow the reader to learn more of the group.

The book offers three approaches to the identification of the orders:

- A dichotomous key based on the morphology of the insect.
- A habitat based based section that lists the common insects found in each of these.
- A guide to the feeding signs, nests and other structures that insects produce.

The key is copiously illustrated with annotated line drawings that enhance and explain the text.

Each couplet is accompanied by a series of addenda that point out pitfalls or offer further explanation of difficult features and also highlight similar insects that might cause confusion.

The second section focuses on 15 habitats found in and around human habitation, which include; kitchens, living rooms, compost heaps, in water, around lights and in the vegetable patch. It then offers a list of the common insect that can be found in each of these. Where these are common and widespread they are identified to species, otherwise they are left at the family level.

The third section entitled Clever Clues, divides insect signs and structures into four groups;

- Markings on leaves or bark.
- Lumps and bumps on plants.
- Nests or hideouts.
- Cocoons, cases and eggs.

A brief introduction to the common culprits is provided for each of these.

The remaining half of the book offers a series of chapters that provide an account of each of the insect orders that are common in Australia. Each of these start with a summary box that offers an outline of the key features of the order plus any sub orders. The chapter then deals with each of the principal groups within the order. As an example the Hymenoptera chapter divided the order into Bees, Wasps, Ants and Sawflies. Each of these has sections on diet and habitat, life cycle and defence. There is also a section titled Goodie or Baddie plus a list of fascinating facts and a short list of book and websites for further reading. Each section also has a box of look a likes entitled "Don't confuse with".

The book closes with a very brief chapter on non-insect arthropods, an excellent glossary, a pronunciation guide and a list of references. It also contains a vast collection of photographs which illustrate and enhance the text. Each of the order chapters provide an index to the relevant photographs that are scattered through the book.

Gleeson's light style makes the text extremely readable and is dotted with humour, for example in her introduction to the Hemiptera she states " the fact is that true bugs suck - literally!" (of course this is not strictly true as most Hemiptera rely on the positive pressure in the phloem of the plant on which they are feeding to force food into them). This accessible style combined with the wealth of information that is packed into this volume make it an ideal introduction to entomology for readers with no or little science background.

Miniature lives is a fun, informative and attractive volume that is bound to stimulate many of its readers to take a keener interest in the insects that they encounter in and around their homes.

Peter Smithers

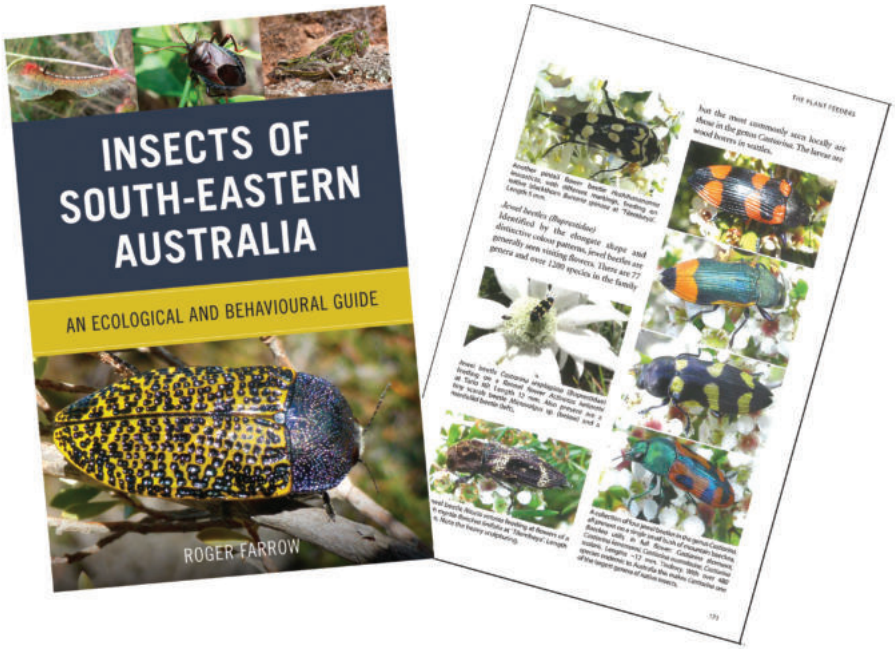
Insects of South-Eastern Australia.
An Ecological and Behavioural Guide

A remarkable new field guide to Australian insects (and their host plants and habitats)

Roger Farrow (2016)

280 pp., colour photographs

CSIRO Publishing, Melbourne, Australia.



Cover and included page (p. 173) from *Insects of South-Eastern Australia. An Ecological and Behavioural Guide*.

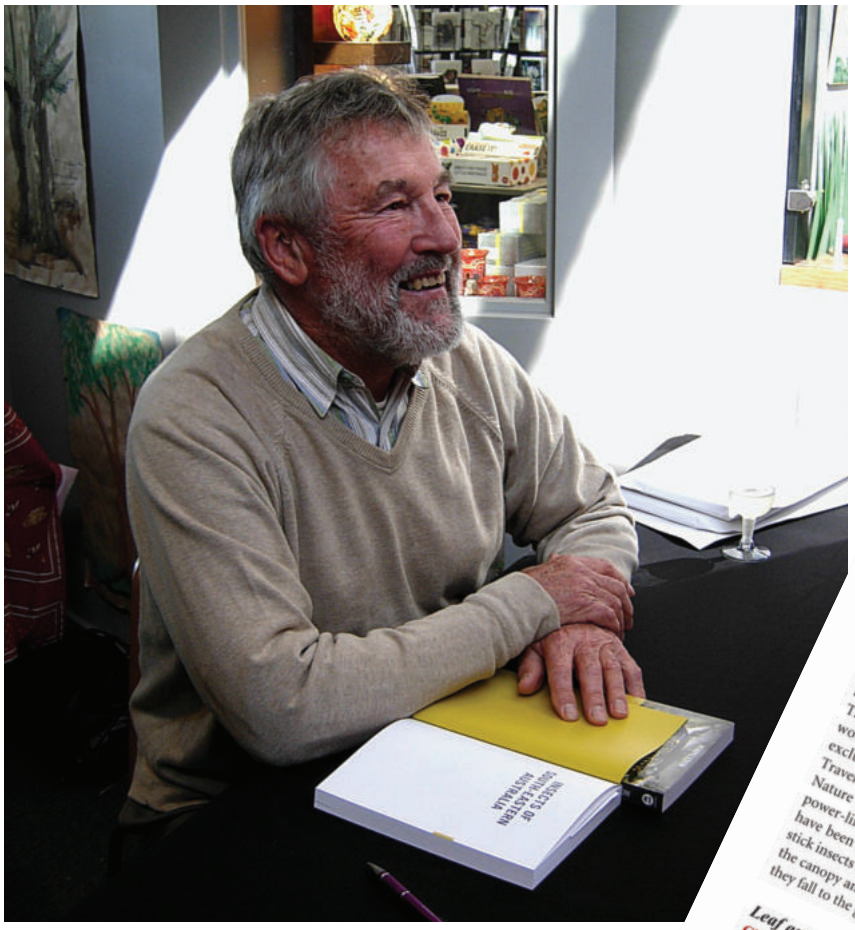
On the face of it, a botanical garden may seem an unusual place to launch an entomological book. However the co-evolution and current interactions between insects and plants are well known, increasingly studied globally, and reveal some fascinating scientific and biodiversity issues. A major player in the field over the past 50 years has been Roger Farrow, who has now produced a wonderful book summarizing and illustrating his mostly post-retirement observations of insects. At a launch in the Australian National Botanic Gardens (ANBG), the audience was told of Roger's background in natural history, especially insects, before the signing of copies for enthusiastic friends, colleagues and collaborators at a reception sponsored by the publishers, CSIRO Publishing.

The development of Roger's natural history interests commenced with childhood exposure to the natural world in southern England, in what was then a lightly-managed Romney Marsh. Interest in beetles prevailed until the discovery of the daunting numbers of species led him to switch to the more-manageable Orthoptera. This continued through to tertiary education, and then employment in the UK public service at the Anti-Locust Research Centre, which became the Centre for Overseas Pest Research (COPR). Linked to the Colonial Office with a remit to assist tropical agriculture, Roger's fieldwork was based largely in Mali where serious outbreaks of the migratory locust threatened the agricultural production of surrounding countries[1]. All the while Roger's interests in natural history burgeoned, adding a continuing fascination for arid parts of the world, and in the flourishing Malian musical culture.

London was less interesting after Mali and a position offered by the expanding CSIRO Division of Entomology in Australia lured him away in 1971. I can vouch for this as I assisted in cross-pinning Roger's extensive personal collection for shipment to Canberra ('pin money'?). Down-under, Roger extended his locust studies to still highly-cited work on insect migration, and to research into insect-plant interactions, including the resistance of eucalypts and acacias to insect herbivores. With this came the opportunity to indulge and extend his interest in trees and indeed all plants, especially the Australian natives, and the herbivorous insects that fed upon them. However, by the mid-90's CSIRO saw no future in labour- and time-intensive ecological and whole organismal work and molecular biology was to answer the pressing questions. Ironically, it took 25 years to discover the genetics of the 'mosaic' resistance to herbivory shown by a single mature *Eucalyptus* tree[2]. This was unravelled 'across the road' in the Australian National University, not at CSIRO where Roger's colleagues had discovered the phenomenon[3].

Since his retirement as one of Australia's top insect ecologists in 1996, Roger's well-developed photographic skills, nature hikes with the Australian Native Plant Society and Friends of Grasslands (often as leader), plus increased time at his bush block ('Tilembeya', mentioned often in this book) provided the foundations for this new guide. Lavishly illustrated by nearly all his own photographs taken in the field in life, a compendious documentation of insects 'going about their business' is both a work of love and a serious contribution to entomological science. The content of this book reflects the author's enthusiasm and professional experience in observing insect ecology and behaviour, as the subtitle states. Furthermore, it is meticulous in validating all identifications (based on photographs provided to a long list of experts, worldwide) and ensuring that the contemporary classification followed in a current textbook[5].

There are some unusual approaches to the organization of the guide. First, characteristic feeding preferences (such as plant feeders, predators, parasites and decomposers) and regional major habitats for south-eastern Australian 'tablelands and ranges' are used initially to guide identification. This is followed by an introduction to the insects of the region, including their



Author Roger Farrow signing at the book launch, Canberra, May 2016. Photograph by Penny Gullan.

environment, classification, life history, feeding strategies and behaviour. I think this works rather well with citizen scientists and non-specialist entomologists alike benefiting by NOT having to make a taxonomic identification before heading for associated natural history information. And there is plenty of the latter, including concise but highly informative legends to each and every photograph. For example, a legend (from p. 67) packed with information reads "A distasteful grasshopper, *Monistria concinna*, (Orthoptera: Pyrgomorphidae). Length 30mm. This species exhibits warning colouration and emits distasteful, pungent, defensive droplets from between the body segments when disturbed. It feeds on very aromatic shrubs such as Alpine Mint Bush, *Prostanthera cuneata*, which are rarely consumed by other insects, but the specific chemical basis for its distastefulness is unknown. Old Boboyan Road NNP". Note the species-level identification of the host plant, as done throughout the text, and warranting a separate index.

The plant feeders

Eucalypt feeders

Eucalypts are the dominant plant group of much of the Australian landscape, so it is not surprising that they support the largest diversity of plant-feeding insects. The best places to observe a high abundance and diversity of eucalypt-feeding insects are in open grassy woodlands where there is a high proportion of regrowth of young trees. The regrowth often occurs in areas where woodland is regenerating, following exclusion of cattle and sheep (e.g. in Travelling Stock Reserves and newly created Nature Reserves) and also along road and power-line easements where mature trees have been removed. Some insects, such as stick insects and katydids, often feed high in the canopy and are rarely seen except when they fall to the ground.

Leaf and shoot feeders

Chewers

Eucalypt leaves are often heavily attacked by chewing insects, especially new growth. Seven principal groups of insects chew eucalypt foliage: (1) adult Christmas beetles and smaller scarabs in the family Scarabaeidae; (2) adults and larvae of leaf beetles in the family Chrysomelidae; (3) adults and larvae of weevils in the families Curculionidae, Brentidae and Attelabidae; (4) larvae of moths belonging to a wide range of families in the order Lepidoptera; (5) larvae of sawflies in the family Pergidae; (6) stick insects in the order Phasmatodea and (7) some grasshoppers, katydids and bush crickets in the families Acrididae and Tettigoniidae, respectively. The distinction between the different groups of caterpillar-like larvae is as follows: (1) leaf beetle larvae have three pairs of forelegs and are rarely covered in hairs or bristles and are defended by chemicals such as cyanide (HCN); (2) eucalypt weevils have slug-like larvae; three pairs of thoracic legs, several pairs of abdominal prolegs (although a few are slug-like) and most are well defended by long hairs, bristles and chemicals, or are camouflaged; and (4) sawfly larvae (often called 'spitfires' because of their habit of regurgitating stored eucalyptus oils) are similar to beetle larvae but possess abdominal claspers.

Adult beetles (Coleoptera)

Scarab beetles (Scarabaeidae). This is one of the largest beetle families, with over 2240 described species, and is divided into several distinct subfamilies. The adults are stout beetles with lamellate antennae, powerful legs and claws, and a shovel-shaped head adapted for pushing into the soil. In most subfamilies, a large shield or clypeus on the front of the head conceals the mouthparts. Most larvae are decomposers living in decaying or fresh plant material in the soil or in compost and dung, while the adults feed on leaves, at flowers or not at all.

Christmas beetles (Rutelinae, *Anoplognathus* spp.). Adult beetles emerge from the ground in mid-summer and fly to the nearest eucalypt tree to feed and mate but they occasionally aggregate on other kinds of trees and shrubs. They differ from

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A second distinctive strategy is the provision of tangential but pertinent information in the form of boxes, concerning the following topics: Attraction to light', 'Nocturnal activity', 'Sound production', 'Camouflage', 'Defences: warning colouration, odorous and bitter chemicals and defensive behaviour or bluffing', 'Mimicry', 'Migration', 'Aggregations and swarming behaviour', 'Insect outbreaks and plagues', 'Other predators, parasites and diseases', 'Ant attendance' and 'Rare and endangered insect species and their conservation', 'Introduced insects' and 'Attracting native insects to your garden' The text of all of these boxes are complemented by local exemplars – a nicely didactic touch.

All-in-all, coverage is impressive, and the organization is admirable with separated indices to common and scientific names of arthropods and host plants, a glossary and guidance to additional reading and resources. It can be used as a guide in the field, a source of insights into the breadth of entomology and as a browsable book for the pleasure of the photographs and accompanying text. This will be a welcome addition to the resources needed by 'citizen scientists' for burgeoning recording schemes.

THE PLANT FEEDERS

All their larvae (curl grubs) live in the soil and some species are significant pasture and lawn pests, feeding on the roots of grasses. There are ~1400 described species in this subfamily.

Leaf beetles (Chrysomelidae). This is another large family of beetles, comprising ~3000 described species in 70 genera and many more undescribed species. As their name suggests, they feed on the leaves of a wide range of plant species although eucalypts arguably support the highest diversity with ~250 species recorded from this host genus. They are divided into several distinct subfamilies, three of which are found on eucalypts.

Eucalypt leaf beetles (Chrysomelinae). The beetles in this subfamily are represented by a diverse array of colourful species in several different genera. They are characterised by their ovate body and hooded shape to the thorax, which curves around the head. The colours fade after death. All stages except pupae are present on the host trees and there are several generations a year. Pupation occurs in litter on the soil surface. Adults generally overwinter under loose bark. Most feeding occurs on the new growth in spring and summer and adults cause a characteristic scalloping along the leaf edges (p. xx). Larvae and adults of species such as *Paropsis atomaria* can cause extensive defoliation to young eucalypts. Adults often drop to the ground when disturbed, although all are active fliers between trees. Most species are not highly host-specific and can be found on a range of eucalypt species in an area of woodland or forest, although most congregate on juvenile trees with young leaves.

Smaller eucalypt leaf beetles. Most are in the genus *Paropsisterna*, many of which

Paropsisterna aurea on a snow gum leaf *E. pauciflora* at Porcupine Track, KNP. Length 5 mm. Note the elytral 'skirt' protecting the legs.

Paropsisterna agricola on a juvenile broad-leaved peppermint leaf *Eucalyptus dives* at Ironpot TSR. Length 6 mm.

Paropsisterna m-fuscum on an apple box stem at 'Tilembeya'. Length 5 mm. This is one of the few host-specific species, which is confined to the very waxy (glaucous) juvenile leaves of species such as apple box *Eucalyptus bridgesiana*, candlebark *E. rubida* and eurabbie *E. bicostata* that other species of eucalypt leaf beetle cannot grip easily.

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INSECTS OF SOUTH-EASTERN AUSTRALIA

Paropsisterna nobilitata at Sawpit Creek, KNP: one of the most colourful species. Length 6 mm. This beetle has emerged from hibernation on a tree trunk.

Paropsisterna intacta on a juvenile leaf of candlebark at Wadbilliga NP. Length 6 mm.

Paropsisterna octosignata on a juvenile stem of Blakely's red gum at Mulligans Flat NR. Length 7 mm.

Paropsisterna sp. on a juvenile broad-leaved peppermint leaf at 'Jojare'. Length 5 mm.

Paropsisterna lignea complex on a snow gum leaf at Porcupine Track, KNP. Length 6 mm.

Paropsisterna sp. at Friday Flat, KNP. Length 6 mm.

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All insects depicted in images in the book were identified, as far as can accurately be done, by relevant taxonomic experts, but in Australia we are still in a discovery phase and some images may represent undescribed species that are poorly or not represented in collections, such as a wingless grassland stick insect photographed in a local nature reserve but never seen since. Although ongoing debate concerns validity of non-vouchered records[6,7] (identified, or even described as new to science from photographs alone of live insects) this should be tempered by the author's valid desire to capture only with a camera, and let live.

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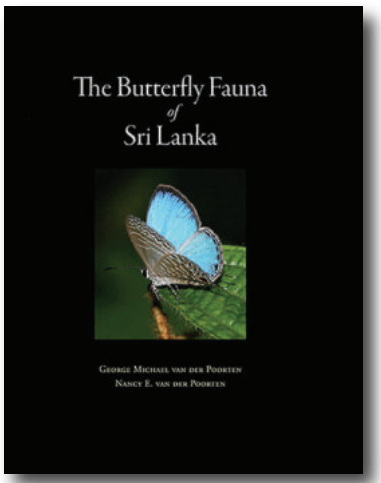
Peter Cranston

The butterfly fauna of Sri Lanka

by George and Nancy Van der Poorten
Lepodon Books, Canada
418pp., price from £45
ISBN 978-1-77136-189-7



This is a substantial book in every sense. Chapter One is a lively introduction to the island of Sri Lanka and its 247 butterfly species (including 31 endemic). Early focus on the islands' fauna was on collecting and identification, but in the last decade and a half, a revival of interest has encompassed rearing the early stages in Sri Lanka (many previous accounts of early stages referred only to India) and maintaining systematic records. As a direct result, this book contains a wealth of new data. There are fascinating accounts of the origin of the fauna, regional studies of butterflies, threats to the fauna, topography and climate, all brought up to date. Maps chronicle a varied topography, vegetation and climatic zones, all illustrated lavishly – if by rather small photographs.

In Chapter two – life of the butterfly – centres of diversity and composition of the fauna are tabulated, and well-illustrated sections on early stages, their structures, predators and behaviour must surely rank among the most informative and easily readable accounts of any recent butterfly book. They have a fresh feel, rather than the "same old same old" we have perhaps become accustomed to. Chapter three deals with conservation: past frustrations and future aspirations.

A short introduction to the species' accounts comprises Chapter four, and the bulk of the book – Chapters five to ten – occupy the next 300 pages. Each species is treated similarly: description; similar species; status, distribution (in Sri Lanka) and habitat; adult behaviour; and immature stages. Where required, there are additional sections on conservation issues (sometimes lengthy: e.g. p. 245, a pragmatic treatment of *Symphaedra nais*), and practical keys where appropriate, adapted to requirements for particular groups: for example, a series of couplets relates to three potentially difficult *Mycalesis* species, with illustrations for comparison (p. 281, Fig. 7-86), whereas separation of five species of *Eurema* (p. 315, Figs 9-12) and five species of *Jamides* (p. 123, Fig. 6-26) is clearly achieved by arrows highlighting diagnostic features. Having said that, the *Jamides* diagnoses may have been slightly better accomplished using set specimens, which would show the whole of each forewing underside. A whole page is devoted to a key to four species of *Euploea* (p. 228, Fig. 7-28) and a double page spread (pp. 134-5) provides an illustrated key to species of *Nacaduba*, *Prosotas*, *Petrelaea* and *Ionolyce*. The overall impression is of a professional approach by authors who are intimately familiar with their subject and know what users of books really need and want to know. They have succeeded admirably.

Books that show only photographs of butterflies in their "natural" setting may be inadequate for identification purposes in comparison to set specimens but, with few exceptions, the authors overcome this beautifully by including as many "natural" pictures as are necessary to show the upper and under surfaces of both sexes of each species (e.g. p. 55, Fig. 5-13: *Gangara lebadea*), in addition to some unusual – sometimes spectacular – pictures of the species in flight (e.g. p. 46, Fig. 5-5[a]: a male *Bibasis sena* taking flight; p. 288, Fig. 8-4[a]: *Graphium antiphates*). There is even a "roadkill" opportunity to illustrate the upper surface of *Jamides bochus* (p. 125, Fig. 6-28[a])!

Towards the end of the book, several appendices complete this book in some style. Appendix A comprises an annotated species list with the full scientific name, common name, status (i.e. endemic or not), and zone where the species is most likely to be encountered. Appendix B is an annotated list of publications on Sri Lankan butterflies; Appendix C lists larval host-plants (by plant, in alphabetical sequence); Appendix D lists reported nectar sources for adult butterflies, and Appendix E provides historical accounts of dispersal and migration. And just when you think you've seen it all, Appendix F provides a magnificent kaleidoscope of photographs of eggs, larvae and pupae of butterflies (as available, sorted by family) over 30 pages. These really are rather spectacular, each presented in a similar scale and situation to facilitate comparison and provide a fair opportunity to identify an "unknown" larva or pupa found in the field. Many pages accommodate 50+ pictures each. The book concludes with a glossary, references, photographic credits and index.

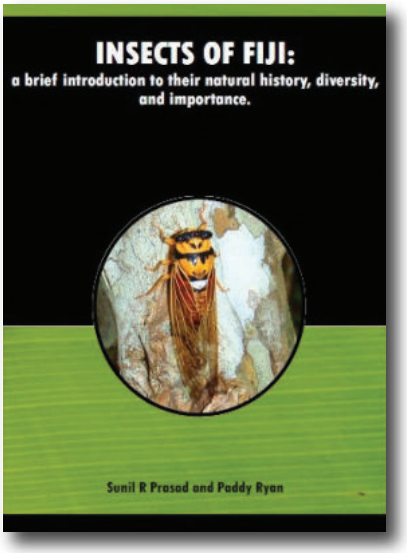
Photographs throughout the book are outstanding, and occasionally take the reader by surprise. For example, a photograph of *Tajuria cippus* (p. 29, Fig. 2-40[f]) taken from directly above, provide a view of hindwing tails and anal lobes as seen by a potential predator, quite different to the more usual side view placed next to it. The content is well written and scholarly; text is succinct and relevant. The book is a significant improvement on any of the few books dealing specifically with butterfly fauna of the island in recent years.

Distribution outside Sri Lanka may be regarded as a minor omission by some, but this is readily available elsewhere. Sri Lanka and southern India are at the western end of the distribution of many familiar species that extend eastwards throughout much of the Oriental Region as far as Australia and the Pacific Islands. This solid, yet delightful book deserves a place on the shelf of every lepidopterist, and of anyone with a general interest in natural history.

John Tennent

Insects of Fiji:
a brief introduction to their natural history, diversity, and importance

Sunil R. Prasad and Paddy Ryan
Price $30.00
ISBN 978-982-361-006-1
Available from The National Trust of Fiji website



This book is a wonderful introduction to the common and colourful insects that can be found across the island of Fiji.

The opening chapters provide an introduction to insects, including morphology, life cycles, evolution and their importance to humans. This is followed by a discussion of the techniques for their collection and preservation.

The main section of the book covers the common orders that can be encountered. These comprise; Blattodea, Diptera, Coleoptera, Dermaptera, Hemiptera, Hymenoptera, Lepidoptera, Mantodea, Phasmatodea, Odonata, & Orthoptera. For each of these the major sub orders are outlined and described.

The final chapter deals with the conservation of insects on Fiji, outlining the current threats and challenges. The book terminates with a list of interesting entomological facts and a list of references for those who wish to read a little further.

This is a book that is aimed at members of the public that have a casual interest in the natural world but would like to learn a little more about the insects that they encounter.

It is written in plain english with a minimum of technical terms and brims with enthusiasm. The introductory sections are concise but laden with facts that are conveyed in a very readable style. Each of the orders have sections covering the diversity of the group, their ecological role, collection methods and an overview of the Fijian fauna. These are illustrated with a series of colour photographs that aid in the identification of the group.

The Insects of Fiji will raise the profile of the vast number of insects that can be encountered on Pacific Islands and its easy going style is bound to kindle an interest in those who have not considered insects worth looking at before. It should be popular with tourists and will be essential reading for local schools. Books like this one are essential tools in the battle to raise a wider awareness of the natural world and using insects as a tool to introduce the complexities on natural systems has been proven to work extremely well in schools across the world. In my experience the mention of a bug hunt in any classroom generates an intense ripple of excitement.

The Insects of Fiji is an excellent and extremely accessible introduction to entomology which should stimulate many of its readers to take a more serious interest in the insect world.

Peter Smithers

Diary

Details of the Meetings programme can be viewed on the Society 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 typically 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.

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

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

2016

Sep 6 – 8 **Ento' 16 Annual Science Meeting**
Venue: Harper Adams University College, Shropshire
Convenor: Prof. Simon Leather

Nov 2 **Climate Change SIG Meeting**
Venue: The Mansion House, Chiswell Green Lane, St Albans, Herts, AL2 3NS
Convenors: Keith Walters (keith.walters@imperial.ac.uk); Richard Harrington (richard.harrington@rothamsted.ac.uk)

Nov 16 **Orthoptera SIG**
Venue: Natural History Museum, London

Nov 18 **SW Regional Meeting**
Venue: Plymouth University, Devonport Lecture Theatre, 6.30pm
Convenor: Peter Smithers (psmithers@plymouth.ac.uk)
Speakers: John Thorpe-Dixon, Plymouth University - "*Biogeography of Water Beetles in the Western Ghats, India*"
Richard Fox, Head of Recording, Butterfly Conservation - "*The Secret Lives of Butterflies*"
Despite hundreds of years of study, fascinating discoveries continue to be made about the lives of even our most familiar butterflies. This talk will present three case studies from the recent scientific literature that reveal surprising aspects of butterfly ecology and behaviour.
Dr Rosalind Shaw, University of Exeter – "*Biodiversity and ecosystem services: beneficial invertebrates in crops*"
Beneficial invertebrates provide numerous ecosystem services, but the relationships between biodiversity and ecosystem services can vary depending on the service of interest and the communities that provide it. We investigated the impact of large-scale variation in the invertebrate biodiversity associated with grasslands on the provision of ecosystem services in farmland.
For more information contact Peter Smithers (psmithers@plymouth.ac.uk).

2017

Feb 22 **Northern Meeting and Meeting of the Post-Harvest SIG**
"Pre- and Post-harvest insect pest management"
Venue: Stockbridge Technology Centre, Cawood, YO8 3TZ
Convenors: David George (david.george@stc-nyorks.co.uk), Jennifer Banfield-Zanin, Maureen Wakefield (maureen.wakefield@fera.co.uk), Steven Belmain (s.r.belmain@gre.ac.uk)

May 11 **Insect Genomics SIG**
Venue: Rothamsted Research, Harpenden, U.K.
Convenors: Ramiro Morales-Hojas, Martin Williamson

Sep 12 – 14 **Ento' 17 Annual Science Meeting and International Symposium**
Entomological Networks: Ecology, Behaviour and Evolution
Venue: Newcastle University
Convenors: Gordon Port, Darren Evans, Geraldine Wright, James Gilbert

Other Meetings

2016

Sep 25 – 30 **XXV International Congress of Entomology**
"Entomology without Borders"
Venue: Orange County Convention Centre, Orlando, Florida USA
For further details, please visit: http://ice2016orlando.org/

Nov 12 **BENHS Annual exhibition and Annual Dinner**
Venue: Conway Hall, 25 Red Lion Square, London WC1R 4RL
For further details please visit: http://www.benhs.org.uk/events/

2017

Mar 25 **BENHS AGM.**
Venue: Oxford University Museum of Natural History, Parks Road, Oxford, OX1 3PW
For further details please visit: http://www.benhs.org.uk/events/

2018

Jul 2-6 **European Congress of Entomology**
Venue: Expo Convention Centre, Naples, Italy

author guidelines

We are always looking for new material for *Antenna* – please see below if you think you have anything for publication

AIMS AND SCOPE

As the Bulletin of the Royal Entomological Society (RES), *Antenna* publishes a broad range of articles of relevance to its readership. Articles submitted to *Antenna* may be of specific or general interest in any field related to entomology. Submissions are not limited to entomological research and may, for example, include work on the history of entomology, biographies of entomologists, reviews of entomological institutions/methodologies, and the relationship between entomology and other disciplines (e.g. art and/or design).

Antenna also publishes Letters to the Editor, Meeting Reports, Book Reviews, Society News, Obituaries and other items that may be of interest to its Readership (e.g. selected Press Releases). *Antenna* further includes details of upcoming entomological meetings in its Diary Section and features information and reports on RES activities including National Insect Week, Insect Festival and National, Regional and Special Interest Group meetings. Details of RES Awards and recipients are also covered, as is notification of new Members (MemRES), Fellows (FRES) and Honorary Fellows (HonFRES).

READERSHIP

Antenna is distributed quarterly to all Members and Fellows of the RES, as well as other independent subscribers.

INSTRUCTIONS FOR AUTHORS

Standard articles are normally 2,000-6,000 words in length, though shorter/longer submissions may be considered with prior approval from the Editorial Team. The length of other submitted copy (e.g. Letters to the Editor and meeting reports) may be shorter, but should not normally exceed 2,000 words. The use of full colour, high quality images is encouraged with all submissions. As a guide, 4-8 images (including figures) are typically included with a standard article. Image resolution should be at least 300 dpi. It is the responsibility of authors to ensure that any necessary image permissions are obtained.

Authors are not required to conform to any set style when submitting to *Antenna*. Our only requirement is that submissions are consistent within themselves in terms of format and style, including that used in any reference list.

PAGE CHARGES

There is no charge for publication in *Antenna*. All articles, including images, are published free-of-charge in full colour, with publication costs being met by the RES for the benefit of its membership.

REVIEW AND PUBLICATION PROCESS

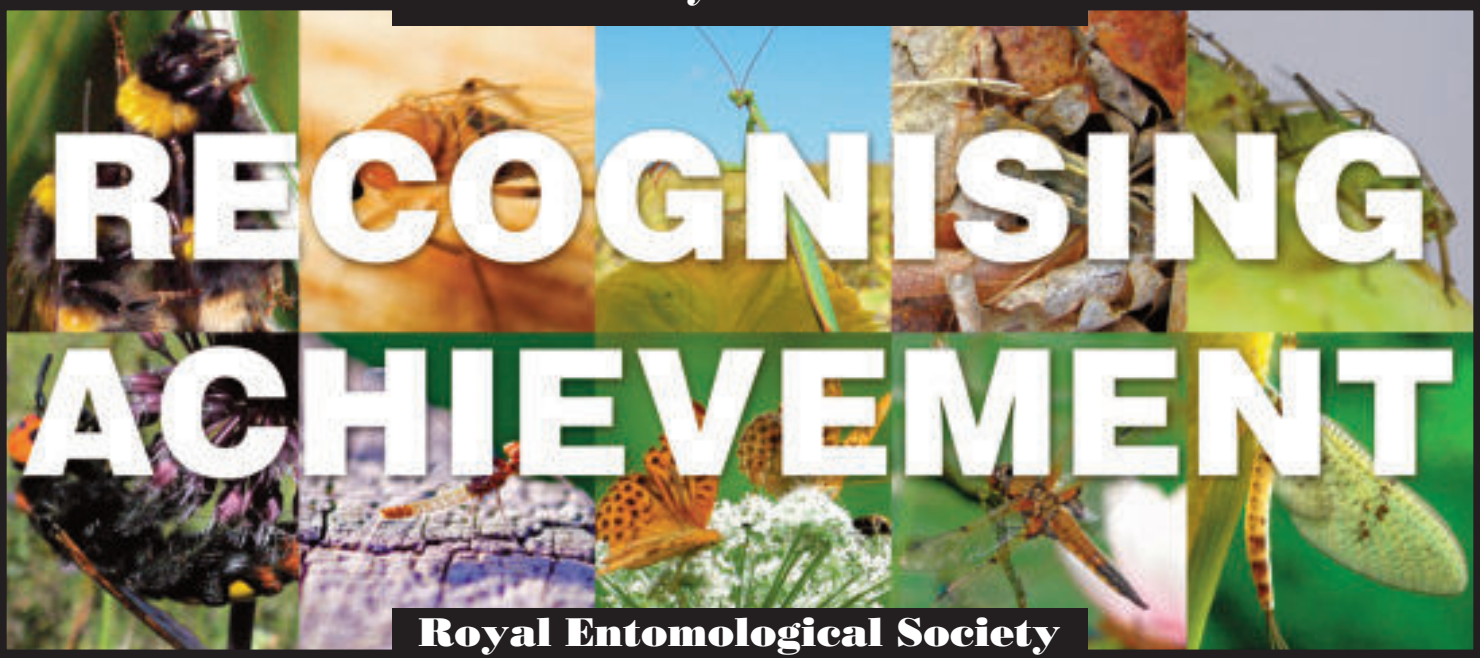
All submissions are reviewed and, where necessary, edited 'in-house' by the *Antenna* Editorial Board, though specialist external review may be sought in some cases (e.g. for submissions that fall outside the Editorial Boards expertise). Receipt of submissions will be provided by email, with submitting authors of accepted articles being offered the opportunity to approve final pdf proofs prior to publication. Where appropriate, authors will be requested to revise manuscripts to meet publication standards.

SUBMISSION PROCESS

All submissions should be sent electronically to 'antenna@royensoc.co.uk', preferably in MS Word format with images sent as separate files (see above). Image captions and figure headings should be included either with the text, or as a separate file.

EDITORIAL BOARD

www.royensoc.co.uk



Royal Entomological Society
– Society Awards –

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

THE ROYAL ENTOMOLOGICAL SOCIETY STUDENT AWARDS

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

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

RES JOURNAL AWARDS SCHEME

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

Prize: £600 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: £800 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