Bulletin of the Royal Entomological Society Volume 38 (2) 2014

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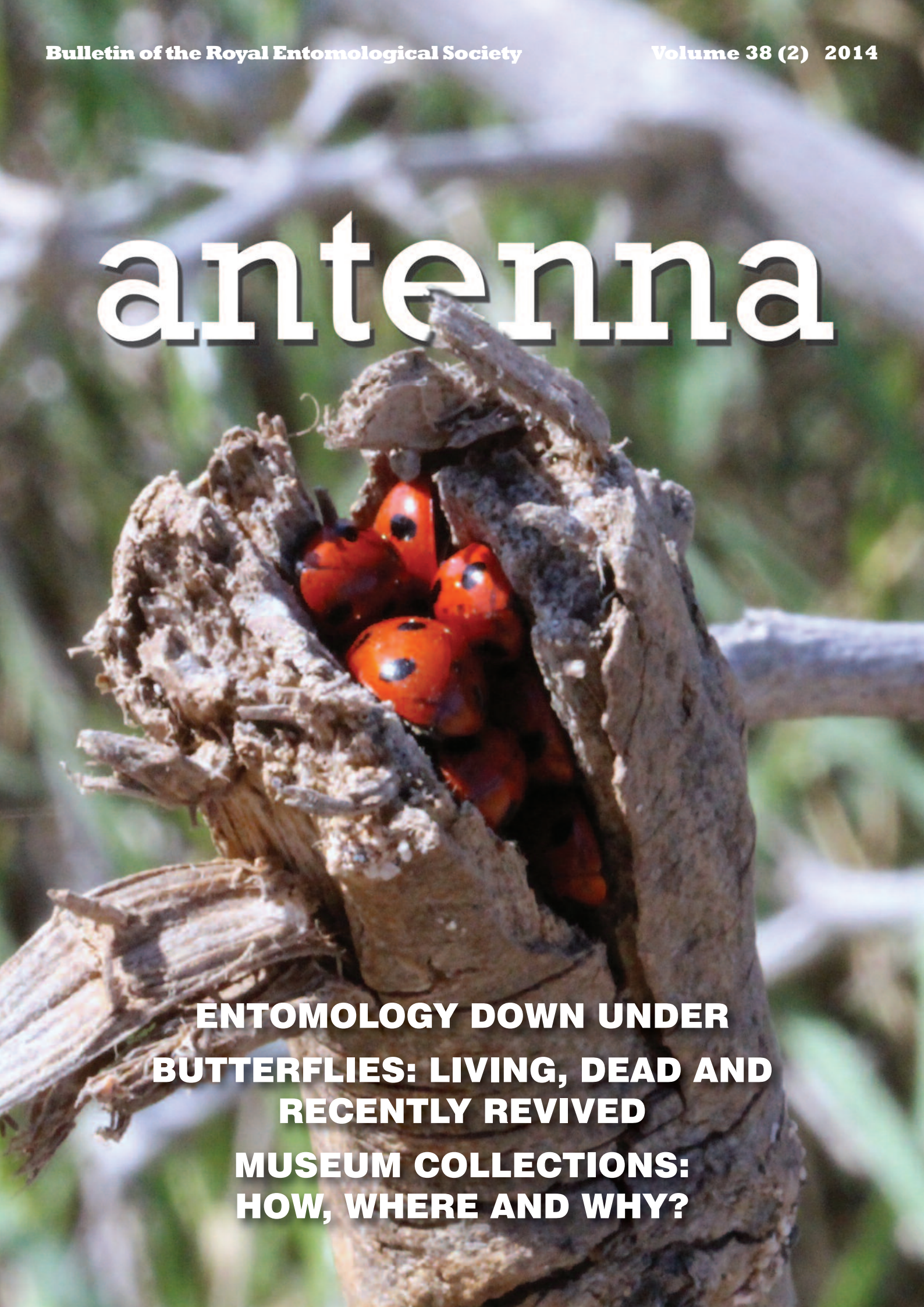

ENTOMOLOGY DOWN UNDER

BUTTERFLIES: LIVING, DEAD AND RECENTLY REVIVED

MUSEUM COLLECTIONS: HOW, WHERE AND WHY?

meetings of the society

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

2014

June 4
RES AGM
Venue: The Mansion House, St Albans

Jun 23-29
National Insect Week

Aug 3-8
European Congress of Entomology
Venue: University of York

Sep 3
Aphid Special Interest Group
Venue: Harper Adams University
Convenor: Simon Leather

Oct 14
Behaviour Special Interest Group
Venue: Rothamsted Research, Harpenden
Convenor: Jason Chapman and James Bell

Nov 5
Orthopterists' Special Interest Group
Venue: Natural History Museum
Convenor: Björn Beckmann

Nov 21
SW Regional Meeting
And now for something completely different... Exploring the fringes of entomology
Venue: Plymouth University
Convenor: Peter Smithers

2015

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

2016

Sep 5-8
Ento'16
Venue: Harper Adams University College, Shropshire
Convenor: Simon Leather

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

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COVER PICTURE

Coccinella septempunctata Linnaeus, 1758, the common 7-spot ladybird.
Photograph: John Tennent

Note from photographer: "My colleague Peter Russell and I saw several aggregations of these ladybirds in the crevices of dead twigs on an Acacia bush growing on a sand dune between the ocean and salt pans on the Cape Verde Island of Maio in November 2013. The temperature was 40˚C, and this was the only one of a dozen Acacia bushes harbouring the ladybirds."

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EDITORIAL

Hello and welcome to the second issue of *Antenna* vol. 38. Whilst on a break from writing this editorial I was pleased to spot my first *Bombus* spp. of the year (I should perhaps note that it's still early April, I live in the centre of Newcastle-upon-Tyne, and I'm currently 'lab-based'). With any luck insects of all shapes and sizes will be on the wing and abundant by the time this issue goes to print. As I'll be returning to fieldwork later this year, I'm also hopeful that the summer of 2014 will go some way towards compensating for the recent spring smog and winter wash-out that subjected so much of the UK to significant and prolonged flooding.

In this issue we feature several articles that focus or touch upon common themes, climate included. In an article by William Hentley that focuses on entomology 'down-under', a wealth of work to investigate insect responses to climate change is reported. Our front cover, with an image captured by John Tennent, demonstrates how 7-spots cope with higher temperatures, aggregating together (presumably in response to pheromone-driven cues) in a dead acacia stump to escape 40°C heat on Cape Verde Island. The importance of museum collections as a resource to inform on past insect distributions, for example when studying recent responses to changing climate, is covered in an article by Richard Kelly, and work to evaluate present-day insect populations in understudied yet important habitats is the focus of Scott Forbes's article on the butterflies of Semuliki National Park. Reviews of the work and contributions of past entomologists are provided by both John and Anita Hollier (on François-Jules Pictet) and Richard Baker (on Malcolm Barcant), linking again with entomological collections and with butterflies reoccurring as the focus in the latter of these contributions. Continuing upon lepidopteran lines, and with a shared focus on entomological collections, Katherine Child and Zoë Simmons provide an update on the recently reopened Oxford University Museum of Natural History and work that has been underway there to digitally catalogue and improve access to the institutions' butterfly and moth type collections. The role of museums in providing public and scientific access to entomological material also features in Richard Kelly's article, this being the first in a planned series of contributions from Richard on insect collections throughout the UK.

This issue also features the usual correspondence, Society News, obituaries, book reviews and announcements. These include multiple responses to John Firth's call for species suggestions (see Issue 37:4) and reports on this year's Verrall Lecture and Supper, Postgraduate Forum and the 2013 Irish Regional Meeting. The latter of these reports contains author abstracts from the meeting, with *Antenna* also being selected to provide a similar summary of papers delivered at the forthcoming European Congress of Entomology in York. These will be delivered to our readers as one-page 'summary articles' in a Special Issue of *Antenna* that will also feature additional ECE-based material to mark and commemorate the event. Peter, Jen and I are all scheduled to attend the ECE and so hope to see many of you there. If you've just presented a particularly interesting paper, you can expect at least one of us to track you down and 'gently encourage' a submission! This issue's Society News also includes a short but important note from Gordon Port on the recently approved use of the suffix Mem.R.E.S for (full) members of the Society.

Finally, I would like to thank all of you that responded so enthusiatically to our previous call for suggested improvements to, or content for, future issues of *Antenna*. Feedback received was universally useful and all thoughts and suggestions have been taken into account when formulating our vision for the years ahead. More to come on this in future issues.

Dave George

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

Oops, I got it wrong (or so it seems!)

There was a considerable response to my suggestion in the last issue of *Antenna* (37/4) that the photographs (printed again here for those who may not have seen them originally) were of a Satyrid, possibly *Erebia*.

There was a spread of opinion as to its identity, but all were united in the view that it was not a Satyrid!!

I'm very grateful to all who took the trouble to contact me, either directly, or via the Editorial team, and I have been greatly enlightened by their views and suggestions.

Almost all were of the view that it was an extremely melanic small Nymphalid, although Emilio Balletto suggested *Hamearis lucina*. Mark Young suggested a 'small Fritillary', and Owen Lewis and Martin Ebejer narrowed it down to Melitaea, while Tony Irwin suggested *Mellicta varia* or *athalia*.

Most people however, suggested an aberrant form of *Mellicta athalia* including; Chris Luckens, Ken Willmott, Tony Pickles, and Art Shapiro. Mike Percival and Willy dePrins went to considerable trouble to point me toward Figures 60 & 67 on Plate 44 in Vol 4 of Verity's famous book, which I reproduce here:

I am extremely grateful to Paola Tozzi and her assistant Raphaela in the Zoology library at the University of Florence for allowing me access to it.

Figures 60 & 67 on the extreme right are labelled by Verity as '*forma cymothoe* (Bert)' but are of two separate specimens from different localities.

Roger Payne referred me to some excellent pictures, also labelled '*ab cymothoe*', Marc Heath (marcheathwildlife photography.zenfolio.com) on www. ukbutterflies.com, which I reproduce here by kind permission, and I am grateful to Peter Eeles for putting us in contact.

Mike Percival and John Tennent both suggested that the specimens I photographed near Arezzo were also *ab cymothoe* and I agree that there is some resemblance although I think that the Arezzo examples are more extreme aberrations, though on the same general theme. I rather agree with Jim Reid that they represent a new and unnamed aberration for which the name *ab stercoratae* might be appropriate, after the little valley where I found them.

In summary, I have no doubt that all those correspondents who suggested that 'my' butterfly was an aberrant *Mellicta athalia* were absolutely correct, but it disturbs me slightly that so much of the identification is based on the argument that 'A' looks like a picture of 'B' shown by 'X' who said it was *Mellicta athalia ab...*, and that much of the original identification was based on the circumstantial evidence of a few individuals found flying amongst a large population of normal individuals of a readily identifiable species. I rather agree with Karl Bailey who suggested that a more definite identification could be achieved by breeding from the aberrants and seeing what turns up, as it were! Unfortunately such an exercise is quite beyond my competence and inclination!

To be fair Martin Ebejer attempted a little more rigour by pointing out that the chequered fringes, the banded antennae and the cream post-discal band are not features found in *Erebia*, but I would just point out that they are all found in some members of the genus, and I also thought that my photo showed at least some suggestion of the swollen veins at the base of the forewing.

The really rigorous evidence however, was provided by the aforementioned Karl Bailey, who told me that he has consistently produced these aberrants in captive populations of *M. athalia* by temperature stressing the pupa, whether high or low, I am not entirely sure. Unfortunately, he has not so far been able to provide me with pictures of the resulting aberrations. I gather that he has published extensively on this matter and I tried to read one of his papers, but found it a bit impenetrable (sorry Karl – this says more about me than about you!). Nevertheless I bow to his extensive expertise on this matter.

So, the winner is. . . *Mellicta athalia celadussa ab cymothoe* (*stercoratae?*)

John Firth
Cortona, Italy, March 2014

In response to John Firth, *Antenna* 37(4) pp. 198-200

Sir,

My copy of *Antenna* dropped on the mat this morning with some fine photographs of European butterflies taken by J. Firth in central Italy. The final two pictures, which the author thought to be a satyrine, possibly of the genus *Erebia*, or even a new species, depict an extreme aberration of one of the common *Melitaea* butterflies (Nymphalidae), probably *M. athalia*. Nice pictures though!

John Tennent

Sir,

With regard to the images on page 200 of *Antenna* 37(4), I would suggest to John that these may represent a (slightly aberrant) female of *Melitaea varia* Meyer-Dür, 1851. This species is known from the central Appenines in Umbria and may well extend into eastern Tuscany at elevations above 1200m. The underside markings on the forewing are aberrant discally by elongation, but the hind wing looks fairly typical. I have not seen images of females from Italy, but some of this sex from Alpine France and Switzerland are dark above with

very reduced orange patterning. See page 507 of Tshikolovets, 2011, Butterflies of Europe and the Mediterranean Area.

An alternative is *Melitaea athalia*, especially if the photo was taken at a location significantly lower than 1200m. If it is from higher elevation then further determination would probably need a specimen, dissecting kit and a microscope rather than a photo.

Regards, Alan Cassidy MRES

Dear Mr Firth,

I was interested to read your paper in the last *Antenna* (Vol 37(4)). You ask for ideas on the species illustrated in figures 7 & 8. This is not an *Erebia* as you suggest, but a melanic aberration of a fritillary. These aberrations occur in many fritillaries and in the most extreme cases the species is sometimes not immediately apparent. It is thus helpful to know what species it was flying with.

I think your photos are of *ab. cymothoe* Bertolini of the Heath Fritillary *Mellicta athalia* Rottemburg. This aberration is illustrated on plate 31 in Aberrations of British Butterflies by A.D.A. Russwurm (1978) and earlier on plate 5 in Varieties of British Butterflies by F.W. Frohawk (1936), under the name *ab. navarina* Selys-Long, an earlier name for this aberration.

Ab. cymothoe certainly occurs in Italy as Verity has photos of two specimens in his Le Farfalle Diurne D'Italia, vol.4, (1950), tavola 44, figures 60 & 67.

I hope that this is helpful.

Yours, Mike Perceval

Merfield, Goodall and chimpanzee tools

Prof. Loxdale's recent and illuminating article on Frederick Merfield makes several contentious assertions regarding his standing in primatology. Each of these points needs some clarification or correction.

For example, he asks, "But is it *actually* true that Jane Goodall was the first to observe chimpanzees fashioning tools…?" He goes on to state, "So I would boldly assert that it was Fred Merfield, rather than Jane Goodall, who was in fact the first to observe and record the use of tools by chimpanzees." (Presumably, he means chimpanzees in nature, as published accounts of tool-using captive chimpanzees appeared much earlier.)

Goodall (1964) was the first to publish findings on wild chimpanzees *making* and using tools, in her case, as noted by Loxdale, for acquiring subterranean termites (*Macrotermes* spp.) by 'fishing' them out of their mounds. However, previous published accounts of wild chimpanzees *using* tools appeared earlier (e.g. Savage & Wyman, 1844; Beatty, 1951). None of these previous reports (including Merfield's) mentioned raw materials being *modified* to produce tools. (This distinction between making *versus* using is important: Many creatures, including ants and wasps, use found objects as tools, but many fewer taxa make them, Shumaker *et al.*, 2011.) Thus, Goodall's position as the first to report tool manufacture seems secure.

Prof. Loxdale goes on to lament that "Nevertheless, he [Merfield] seems to have been largely overlooked for this discovery." On the contrary, Goodall has always cited Merfield's report, starting with her initial article in 1964, as well as in her *magnum opus*, *The Chimpanzees of Gombe* (1986, Cambridge University Press). Similarly, reviews of animal, and especially primate, technology continue to cite Merfield (e.g., McGrew, 1992; Shumaker *et al.*, 2011). Thus, Merfield has not been overlooked.

So, why has Merfield not achieved comparable fame? Perhaps because he published only an anecdote, that is, a one-off, minimal description. Goodall, on the other hand, published a series of quantitative, detailed analyses of chimpanzee tool use, based on decades of careful observation. (This distinction is not trivial: Sarringhaus *et al.*, 2005, showed that while many anecdotes turn out to be prescient, others never recur.) Thus, Goodall has been rightly recognised as the authority, scientifically.

Finally, in case anyone wonders about Merfield's report of chimpanzees using tools to extract honey from the underground hives of bees (presumably Meloponini) being replicated, the answer is yes. First reported by Goodall (1970)!

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William C. McGrew

Reply from Hugh Loxdale

Professor McGrew is undoubtedly right in some of the things he says, but I would like to point out that my article was essentially about the Merfields (Fred, Hilda and children) and their life and times in the Cameroons and interest in insects, with many specimens sent back to the UK, including to the NHM (then British Museum (Natural History)) in London. I am of course an entomologist not a primatologist/anthropologist, and whether the tools the chimps used in the Fred Merfield observation were fashioned or not (I presume the Professor means stripped of accompanying foliage to make a long, flexible probe) I cannot say, but the fact remains that Jane Goodall, born in 1934, was only a small infant when Merfield made his observations in, I presume, *circa* 1936 or thereabouts. And there I rest my case. My comments are not meant to be a put-down of Jane Goodall; I am sure she, a Dame and all, is famous enough to withstand any such comments. But I do feel Merfield should get more claim to fame than he has received so far. That is all I wished to state… briefly. He may be known in the scientific circles that Prof. McGrew moves in and it may be true that he (Merfield) is cited by Goodall in her book *The Chimpanzees of Gombe*, but Merfield has undoubtedly been eclipsed by her! His pioneering observation still has merit and whilst he was not studying chimps (or even gorillas) in a long-term scientific way, he did observe something in the wild that had hitherto been largely unreported to the scientific community at that time, and was indeed very important. It is also worth noting that there were very few such intelligent naturalists/zoologists wandering around the forests of West and Central Africa, let alone trained anthropologists, in the time period we are speaking of (i.e. the early 20th C.)… and even today, as we know, such forests are potentially very dangerous places, both in terms of dangerous wildlife and more especially dangerous human beings, e.g. guerrillas in the Congo.

Climate change and bugs down under

William Hentley

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We hit the big 400 mark last year, with ambient concentrations of atmospheric carbon dioxide reaching the unprecedented figure of 400 parts per million – a 40% increase on pre-industrial levels. The latest IPCC report confirmed current projections and reduced uncertainty. So what does this mean for insects? My recent trip Down Under to New Zealand and Australia opened my eyes to the scope of experimental work being undertaken in this area, ranging from insects that nibble on the roots to those that munch away in the tree top canopies.

I kicked off my visit by speaking at a symposium on Insects and Climate Change organised by Dr Scott Johnson and Professor James Cook, both at the University of Western Sydney. This one day symposium was held in Auckland as part of EcoTas 2013 (the joint meeting of the Ecological Societies of Australia and New Zealand), and offered fresh insights into how global climate change might affect insects. After a very successful conference I headed to the south island visiting the New Zealand Biotron at the Bio-Protection research centre, part of Lincoln University. The New Zealand Biotron facility consists of six controlled environment chambers. Each chamber has two levels, a growth chamber on top and a rhizotron below (Fig. 1). This allows researchers to independently control the temperature above- and below ground. Stuart Larsen, who oversees the facility, and his colleagues have developed a camera probe that allows you to see within each of the rhizotrons, exposing the secret life of roots. At the moment there hasn't been any entomological research undertaken in the New Zealand Biotron, but researchers at Lincoln and Sydney, led by Michael Rostas, hope to test whether climate change above ground decouples interactions between root herbivores and their natural enemies. This will hopefully open the door for more entomological research in this amazing facility.

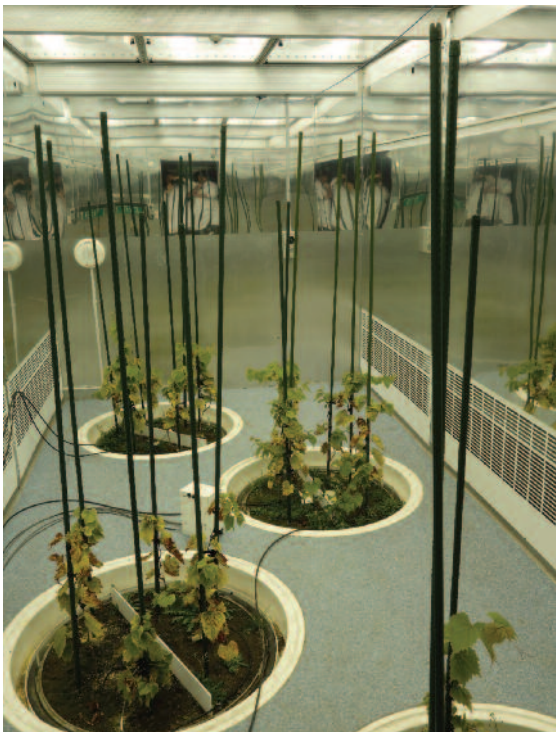

Figure 1. The New Zealand Biotron, controlled environment growth chamber above and independently controlled rhizotron below.

Figure 2. Invertebrate collections prepared by Sharleen Knox, Monique Laing and Justine Peel.

New entomologists

Moving over the ditch to Australia I visited the University of Western Sydney (UWS) Hawkesbury Institute for the Environment. I found training in entomology alive and well at UWS, with the current unit coordinated by Scott Johnson being one of the most popular; intake is expected to reach over 100 undergraduates next year. In particular, students prepare an invertebrate collection which accounts for a quarter of their overall mark. 'Students really get into this aspect of the unit', Johnson commented, 'and while some of the skills associated with preparing such collections might seem old fashioned, it genuinely helps students understand and learn about different taxa'. Some of the collections were fascinating (Fig. 2), and the undergraduates were clearly enthusiastic. Sharleen Knox remarked how '… It was an excellent way to learn the orders of invertebrates (which was invaluable at exam time), gave me a greater understanding of how museum collections are put together and an appreciation of the beauty and differences of our local invertebrates'. Monique Laing, another budding entomologist, said 'We encounter insects and invertebrates every day of our lives, but I never imagined how much diversity there would be…It gave me the opportunity to study a range of organisms and relate it to how important they are to the world'.

EucFACE

From the very small insects in the collections to the towering *Eucalyptus* trees in the newly-built Free Air Carbon dioxide Enrichment facility. FACE is usually created using vertical pipes arranged in a circle. The diameter of this circle can vary from 1m to 30m. Using an array of CO_2 sensors and complex control equipment, CO_2 is injected into the centre of the rings through the individual pipes until the required CO_2 concentration is reached. Despite seeing photographs of these facilities, nothing can prepare you for the scale of each of the rings. With each of the six rings being 25m in diameter and 28m tall, this installation is very impressive (Fig. 3). Turned on in spring 2012, there have already been some effects of CO_2 enrichment on the plant life; but what does this mean for the insect life?

Current research projects include tri-trophic interactions in the forest understory, including a PhD project undertaken by Sarah Facey. 'I anticipate that under elevated CO_2, some herbivorous insects may become less abundant as a result of declining food quality. This could have knock-on

Figure 3. High up in the canopy in one of the EucFACE rings with Scott Johnson.

Figure 4. An example of some of the chewing herbivory taking place in the tree tops in the elevated CO_2 FACE rings.

effects for animals, which feed on herbivorous insects, including spiders and other natural enemies. Future climates could therefore see altered herbivore and predator species compositions compared with what we have today', Facey explained.

Twenty metres higher than Sarah in the understory, Andrew Gherlenda, another PhD student is investigating how elevated CO_2 affects leaf chewing beetles. The 43-metre high cranes visible in Fig. 3 are not for maintenance; they allow scientists to get up close and personal with insects living in the canopy (Fig. 4). Describing his findings so far, Andrew explained '[in elevated CO_2] we've seen an increase in developmental time and leaf consumption by the eucalypt leaf beetle (*Chrysophtharta m-fuscum*) while its pupal weight decreased'. Andrew offered an explanation for this, stating 'changes in insect responses were mediated by changes in leaf chemistry which decreased leaf quality at elevated CO_2'.

This FACE facility is in the early stage of its life, there are many questions that can be answered using this set up. David Ellsworth, chief scientist responsible for the facility said "It's time for these long-term CO_2 experiments to address whether mature natural ecosystems show CO_2 fertilisation, or other climate factors like drought and low nutrients 'wash-out' the CO_2 effect".

Whole tree chambers

Nestled within the same forest as the FACE facility, you could be mistaken for thinking alien space ships had landed, but these are in fact 'whole tree chambers' that allows the environment around individual trees to be manipulated (Fig. 5), providing carbon dioxide CO_2 concentrations and temperatures anticipated in climates of the future. The tree chambers can accommodate growing trees up to 10-m tall while simultaneously monitoring the exchange of CO_2 and water

Figure 5. Below, the whole tree chambers; Right, me checking for insect herbivory inside one of the whole tree chambers.

Figure 6. The rain shelters of the new DRI-GRASS facility.

vapour. Kirk Barnett, a recent recruit from Missouri, is studying the effects of elevated temperature and drought on plant chemistry and its effects on an iconic defoliator of eucalypts, the Christmas beetle, as part of his PhD project. 'The whole-tree chamber facility enables multidisciplinary studies of climate change impacts on forest trees at scales ranging from leaf-level chemistry to integrated tree growth and function, including plant-insect interactions in a changing climate,' said Prof. Mark Tjoelker, chief scientist.

Rain-exclusion experiments

In the world's driest continent, it came as no surprise to see that researchers were investigating the responses of insects to altered precipitation patterns, both in arboreal and grassland systems. The new DRI-GRASS facility (Drought and Root-herbivore Impacts on GRASSlands) explicitly involves root-feeding herbivores. 'Grasslands account for significant amounts of carbon sequestration', explained Johnson, 'yet we don't know how twin stresses of root damage and drought might affect this'.

These are exciting times for entomological research Down Under, but what does this mean for the UK? The soil and ecosystem may be very different from other parts of the world, but many of the processes underlying ecosystem functioning are the same. Plants, for example, have common responses to CO_2, nitrogen and phosphorus, regardless of where they are in the world. Therefore, the questions being answered by this research Down Under can have important implications for entomological research elsewhere. Much of the work that takes place Down Under is linked to Europe and the USA by the extensive list of collaborators. Without their expertise, many of the experiments, or even design of the facilities, would not have been possible. It was great to see entomology featuring so prominently in these research programmes – good onya!

Butterflies of Semuliki National Park, Uganda

Scott Forbes
The Open University
hkxpat@gmail.com

The Afrotropical region and equatorial belt geography

Semuliki National Park, a lowland rainforest in western Uganda, will become the focus of my attention for the next four years of doctorate study on its butterfly composition and conservation. It is a little-known and isolated pocket of protected tropical rainforest within Uganda's National Park network managed by the Uganda Wildlife Authority (UWA). Considerably more famous for its birdlife, with over 400 species (Chege et al., 2002), than its insect fauna, I realised on a trip there in 2011 that here was the perfect location to undertake Afrotropical butterfly research. It is located within the biogeographic Afrotropical region (Crosskey and White, 1977), a region defined to include Africa south of the Sahara, including Madagascar and Southern Arabia. This region has approximately 4,000 butterfly species; roughly 20% of the world's total, and is second only in species number to the Neotropical region, which has approximately 8,000 species. The butterflies of this biome show remarkable regional species-level endemism with around 98% of Afrotropical species and approximately 76% of the genera not occurring outside the region (Carcasson, 1964).

The park is also confined within the narrow African equatorial belt which extends from the Atlantic at Basse Casamance in Senegal to western Tanzania and western Kenya. This belt of forest is only interrupted by the Dahomey Gap, a broad band of Guinean forest-savannah mosaic that extends to the coasts of Togo, Benin and Ghana. All the lowland rainforests of Africa are restricted within this narrow equatorial belt. These lowland forests are richer in biomass and plant species than any other vegetation type in Africa and subsequently provide one of the richest habitats for butterflies. They contain the greatest diversity of butterfly species, though not necessarily abundance. This diversity gradually reduces with altitude.

Salient characteristics of Semuliki National Park

Semuliki National Park has an area of 219 km^2 and is part of the Central African Congo Basin forest system of the Democratic Republic of Congo (DRC), being separated from the Ituri forest of the DRC only by the Semliki River. It is separated from the rest of East Africa by the Rwenzori Mountain range and with it being located within the Albertine Rift (Fig. 1), the western arm of the Great Rift Valley, it is included within the Eastern Afromontane biodiversity hotspot (Myers et al., 2000).

Figure 1. Albertine Rift Valley.
Map courtesy of the PAWAR project / Woods Hole Research Center.

Figure 2. Semliki River.

Semuliki National Park is a closed canopy, moist semi-deciduous forest, with an altitude ranging from 670 m to 760 m and is the only lowland forest in Uganda. There has been no accurate historical meteorological data taken for the Park, but average temperature is around 30^0 C and average rainfall around 1,500 mm/year. With a Central African influence on its fauna and flora the park is comprised predominantly of Uganda ironwood, *Cynometra alexandrii*, with other common trees including the Wild Oil Palm, *Elaeis guineensis*, and a number of different fig tree species, including *Ficus vogeliana*, which provide an excellent food resource for my targeted butterfly communities. There are small areas of bamboo swamp near the Semliki River dominated by *Mitragyna stipulosa* and a small area of grassland covering approximately 75 ha enclosed within the forest. Areas of the park have poor drainage and in the rainy seasons, between March-May and Sept.-Dec., these can experience extensive flooding.

The park is bordered to the south by the main Fort Portal to Bundibugyo road and to the north by the Semliki River (Fig. 2), which runs north for approximately 140 km from the northern end of Lake Edward in the DRC, eventually draining into Lake Albert in Uganda. The river also effectively divides Semuliki National Park from the Ituri forest in the DRC. Long ago an inquisitive colonial administrator was making his way through the forest and came across an as yet unnamed river. An old lady from the local Bakonzo tribe happened to be passing with a wicker basket half full of fish strapped around her head, so he stopped her and asked her in Swahili what the river was called. The old lady, not understanding Swahili, assumed that this was yet another plundering adversary who was actually wanting to know what was in her basket, and not wanting to tell him that she had fish replied in her Lukonzo language 'semuliki, semuliki' translating as 'nothing, nothing'. So the ignominious name was duly noted and wrongly transcribed by the administrator as 'Semliki' and has been retained. This word in both guises is also used for The Semliki Wildlife Reserve which borders Lake Albert and also for the Semuliki National Park (the correct spelling).

Afrotropical research and historical studies on Lepidoptera at Semuliki

Research on African Lepidoptera and their conservation is urgently needed with the present pressures for multiple land use on protected land and the possible effects of climate change. Although it is situated within one of the most biodiversity rich regions of Africa in The Albertine Rift, this region also has a very high human population density. Logistically, working with Lepidoptera in Africa also produces its own personal challenges. The scarcity of resources for field-based research, a small local research community, together with climate difficulties makes any research proposition a stimulating challenge.

Research in Semuliki has been restricted in the last few decades due to instability within the region, a lack of general security and an incredibly bad access road from the nearest town, Fort Portal, 60 km away. The last large scale biological survey was a Uganda Forest Department, now National Forest Authority, census of its fauna and flora in 1996 (Howard and Davenport, 1996). Since 1996 small scale research had amounted to a trickle of studies, mostly by ornithologists. An excellent new road, recently built by the Chinese, now allows access to the Park Headquarters from Fort Portal in less than 45 minutes, with the road continuing on to the border of the DRC.

Unlike other East African countries, such as Kenya (Larsen, 1991) or Tanzania (Kielland, 1990), there is no country guide to Uganda's butterflies. As Semuliki has its faunistic influence from Central Africa the excellent but now rare 'Papillons du Zaire' by Lucien Berger has proved my most useful aid for field identification and is still also a highly accurate source of information. The story behind this publication, commissioned by the then President of Zaire, Mobutu Sese Seko, is a fascinating historical anecdote. Apparently, the majority of the copies of this book that were published ended up being stored at the Mobutu palace deep in the jungle at Gbadolite as gifts for visiting dignitaries. A few copies were distributed to Mr Berger for his personal use and to provide for friends. On Mobutu being expelled from the country in 1997 his palatial residence was ransacked and the remaining books that he had stored were destroyed. Only a few copies remain and the price of a copy reflects the scarcity and quality of the book.

The Lepidoptera data from the 1996 census showed Semuliki to be the most butterfly rich park in Uganda, containing 309 species from a country with a total of approximately 1,300 species (Davenport, 2001). My first period of research was primarily interested in any changes in the butterfly biodiversity of the park since 1996 and the patterns of community biology making up that biodiversity. I focused on the frugivorous species of the family Nymphalidae (the brushfoots), primarily because they are easily caught in traps which have been baited with fermented banana. This allowed quantification of species richness and evenness and over the longer term would allow monitoring of trends in species diversity and community structure with a focus on understanding resource availability and seasonality. Subsequently, the introduction of a long-term collaborative monitoring programme with UWA, investigating the spatial and temporal variation of communities, would allow a greater understanding of the park's ecosystem and therefore enable an influence on future management actions, especially with respect to the butterfly communities present in Semuliki.

Semuliki habitat

There are no roads into the park and so the entrances to the Park's trails have to be accessed by foot. There are two main trails in the park (Red Monkey trail, named after one of the common primates found in the park, and the Kirumya trail named after a nearby river). About 10 km apart, both trails eventually lead to the Semliki River around 14 km west of the park boundary road. There is a marked difference in the forest structure around these trails with Red Monkey containing classic dense closed canopy ironwood forest with an open understorey. The forest around the Kirumya trail has quite extensive sections that had been allocated to the surrounding local communities for cultivation during Idi Amin's era. With further encroachment of the Park continuing during Amin's period and beyond, all settlers were evicted from the Park in the early 1990's before it was granted National Park status in 1993. In this section of the park you can find abandoned fruit orchards and coffee or cocoa plantations and the secondary forest understorey can be fairly impenetrable, except with the use of a machete. Community resource use of the park is now allocated to a period of one day per week, when the women of the surrounding communities can enter the forest for the collection of deadwood. The Batwa, the original inhabitants of the forest, are allowed unrestricted access to the forest, although they are not allowed to live there. Fishermen are allocated permits to catch fish in the Semliki River.

The two accessible trails are ideal transects, allowing for sample replication in the park but at different locations, thus taking into account the park's spatial habitat heterogeneity. I have employed the traditional method of trap type used in the tropics, this being the hanging of cylindrical van Someren fruit-baited traps (Fig. 3) at various height elevations (forest floor to canopy), using fermented bananas as bait. These traps attracted the frugivorous butterflies from the family Nymphalidae, especially the large Afrotropical genera *Bebearia*, *Euphaedra* and *Bicyclus*. There were also rarer catches of *Cymothoe*, *Charaxes* and *Euriphene* species.

Figure 3. van Someren Trap example.

Capturing, photographing and identifying specimens

The canopy traps were positioned with the assistance of one of the Batwa from the local communities. I hired the local Batwa King, named Joffra (Fig. 4), whose climbing skills were impressive. He climbed seven trees in one day positioning the canopy traps at a distance of between 20-25m above the ground. The heights of the canopy traps were accurately measured using a rangefinder. In the forest I am also assisted by two armed rangers from UWA who accompany me at all times, providing welcome security in the unlikely event of buffalo or elephant meetings. These are not unusual, and during the initial phase of my first period of research I was charged by a buffalo in a small grassland area. Elephant tracks are regularly seen on the trails while chimpanzees are

Figure 4. Joffra, Batwa King with Justice.

Figure 5. Handling *Charaxes fulvescens.*

Figure 6. *Charaxes pollux* feeding after handling

Figure 7. *Bicyclus* feeding on banana bait after handling

It is not uncommon during the early dry season period when species abundance is greatest to have over 100 butterflies caught in the traps at one time. All butterflies in the traps which are not readily identified in the field are photographed. For photographing, the butterfly is held gently by the thorax (Fig. 5) which immobilises it and allows time to take the necessary images of both its dorsal and ventral surface. All the Nymphalidae caught in the traps are robust enough to tolerate this handling and appear unaffected by the experience. After handling and photographing a *Charaxes* for example (Fig. 6), I can place it on my arm or hand and it will immediately start probing its proboscis for my perspiration. The smaller *Bicyclus* specimens on release onto banana bait will begin feeding immediately once placed on the bait (Fig. 7). This system cannot be used for the butterflies from the family Pieridae or Lycaenidae found at Semuliki as I have found even the lightest of handling can cause distress. The scales can be easily damaged while handling and so any species from these families caught in a hand net are placed in a small pot and photographed. Pierids and Lycaenids, although found in the forest, are rarely caught in traps. Pierids are, however, commonly seen at mud puddles on forest tracks.

Initial data analysis suggests that there is a peaking of abundance and diversity at the end of the wet season and beginning of the dry season. At the end of the dry season there is a large decrease in both species diversity and abundance with some very common species found at the beginning of the dry season, for example *Bebearia laetitiodes*, disappearing almost completely. This change in temporal abundance and diversity in African equatorial tropical forests is common and can also be found in the Atlantic Forests of Brazil (J. Carreira, pers comm). Trapping data has yielded an estimated 344 species which is close to the original 1996 census of 309 species. However, the more varied sampling methods and extended period of trapping used during my research have identified more than 80 new species records additional to the 1996 census.

Some of the more commonly trapped species

The majority of trap captures are from the Nymphalidae subfamilies, Limenitidinae and Satyrinae. Nymphalidae butterflies are identified as having only four functional legs instead of the usual six, with a reduced pair of forelegs. The higher systematics of the Nymphalidae family is still a matter of some conjecture between various authors, and the subfamily Limenitidinae has been described as an 'unnatural assemblage' by Harvey (1991). A more recent attempt to reclassify the Nymphalidae family by Freitas (1999) has considered six distinct groups based on characteristics of both adult and larval morphology. However, this is again being superseded by ongoing molecular work on the Nymphalidae family by Wahlberg (2003). Details of current work and information can be found on the website of his 'Nymphalidae Systematics Group'.

The colourful African genus *Euphaedra* Hubner 1819 is the second most species-rich in Africa after the genus *Acraea*, currently with more than 200 recognised species and numerous subspecies (Hecq, 1999). It is the largest entirely endemic genus found in Africa although interestingly the larval food plants, *Sapindaceae* and *Anacardiaceae*, are not exclusively Afrotropical (Ackery, 1988). *Euphaedra*, along with the genus *Bebearia*, are characteristically common on forest floors of good condition.

The genus is characterised by a forewing dorsal subapical band and a characteristic ventral basal wing pattern shape and colour (Figs. 8 and 9), with the majority of species having a white, cream or orange subapical band and a diffuse basal pattern of various shades and colours. The dorsal pattern is tremendously variable, but the ventral

Figure 8 (left). *Euphaedra alacris*; Figure 9 (right). *Euphaedra hollandi*.

Figure 10. *Aletis helcita*.

Figure 11 (left). *Bebearia barce*; Figure 12 (right). *Catuna crithea*.

pattern of the hind wing is generally species specific, with the common features being a selection of differing black spots and stripes, sometimes with a splash of pink.

The genus was revised by Hecq (1976) and divided into eight well-defined sub-genera based on morphological and anatomical characteristics. Hecq considers that there are no intermediate species. They are exclusively frugivorous, being particularly attracted to rotting forest floor fruits (in Semuliki this is provided by the numerous figs that drop to the forest floor) and are therefore easily drawn to the forest traps. There can be particular difficulty in distinguishing between species of the red *eleus* group which all mimic the unpalatable day flying moth *Aletis helcita* (Fig. 10). Hecq (1997) considers that there are 12 species in the *eleus* group which are distinguished by very slight differences in the white subapical band on the forewing. There are possibly three species of the red *eleus* group present in Semuliki; *Euphaedra eleus*, *Euphaedra alacris* and *Euphaedra rattrayi*. Compared to the 1996 data my current research has added eight or possibly nine new recorded species to this location, with a new total of 14 species of *Euphaedra*.

Another common genus found in the traps from the subfamily Limenitidinae is *Bebearia* Hemming (1960), an Afrotropical genus which comprises 95 species. Again the taxonomy of this group is complex and was last updated and summarised by Hecq (2000). This genus is taxonomically close to the genera *Euphaedra* and *Euriphene* and the traditional method of separating *Euphaedra* and *Bebearia* is by the colour of the labial palps; grey in *Bebearia* and orange in *Euphaedra*. Other major defining characteristics separating the two genera are that *Bebearia* show strong sexual dimorphism and the subapical forewing band shape is generally thinner (Fig. 11). While in *Euphaedra*, sexual dimorphism is not as marked and is only evident through secondary charactersitics such as wing margins.

One of the commoner species of *Bebearia* found in the traps, together with *Bebearia laetitiodes* and *Bebearia brunhilda*, is *Bebearia cocalia*. It has been described as part of a complex – the *mardania* complex which comprises five species (Holmes, 2006), with each species being separable on one aspect of the angle of the apical band on the forewing, wing venation or female genitalia. Females of many *Bebearia* and *Euriphene* species mimic *Catuna crithea* (Fig. 12), also a species from the Nymphalidae subfamily Limenitidinae. *Catuna crithea* does not actually appear to be distasteful to predators, but the mottled brown and white wing pattern may provide the advantage of camouflage in the shadowy mottled light of closed canopy forest floors (Larsen, 2005). Four further *Bebearia* species have been recorded since the 1996 census.

Another genus that contributes greatly to the trapping figures is *Bicyclus* Kirby (1871), the bush browns, a large endemic African genus, from the subfamily Satyrinae (Fig.13). This genus, which is again currently under revision, was monographed 40 years ago by Condamin (1973). Unfortunately all the images in the book are in black and white, but the distribution of each species is described and it is currently the only detailed resource of its kind. There are 21 species that have been described from Semuliki, however the taxonomy for this genus is still far from complete and one species found in Semuliki, *Bicyclus mesogena*, is two or possibly even three species (O. Brattstrom, pers comm). Females of certain species of *Bicyclus* can be impossible to distinguish and are really only roughly identified by their size and the presence of males in the same vicinity. Some *Bicyclus* species, however, can be identified by their modified wing scales, called hair pencils, or androconial spots which excrete pheromones to attract females or repel other males. This genus is characterised by undergoing marked seasonal polyphenism of the size of the eyespot markings on the wings. The dorsal wing eyespots appear to be involved in mate signalling, while the ventral characters may play a role in predator avoidance (Oliver, 2009). One species, *Bicyclus anyana* (not found at Semuliki), is extensively studied as a model for the study of wing pattern development and genetics (Beldade and Brakefield, 2002).

The Afrotropical genus *Cymothoe* Hubner (1819), the gliders, from the subfamily Limenitidinae also contributes a number of different species, but with very low numbers. Usually *Cymothoe* species are caught in traps as singles and very rarely will there be more than one individual for each *Cymothoe* species in a trap. We have image data for 12 species so far, either through trapping or through

Figure 13. *Bicyclus alboplagus*.

Figure 14 (left). *Cymothoe cyclades* female and Figure 15 (right) *Cymothoe cyclades* male.

conventional collecting with a net. This genera exhibits strong sexual dimorphism (Figs. 14 and 15) and all *Cymothoe*, with the exception of *Cymothoe caenis*, are restricted to primary forests. The females of *Cymothoe caenis* which are found at Semuliki are infraspecifically variable and up to 20 forms have been described (Ackery and Vane-Wright, 1995; Berger, 1981). West of the Niger Delta in Nigeria, *Cymothoe caenis* females are monomorphic and this has led to the proposal of a recent change in its taxonomy by Van Velzen et al. (2009) to describe this species of *Cymothoe caenis* as being a distinct species, *Cymothoe druryi*.

Finally, the Nymphalidae subfamily *Charaxinae* is predominantly represented by the genus *Charaxes* Ochsenheimer (1816), which comprises over 183 species in Africa and approximately 250 subspecies (Henning, 1989). These are well represented in the traps, but usually as single specimens. *Charaxes fulvescens* is the most common species trapped. Few *Charaxes* species are found in open or savannah country, with the majority of species being found in or near large tracts of forest. This preference for unbroken strands of evergreen forest allows some species to be considered as excellent bioindicators of forest health. Adult *Charaxes* feed on decomposing animal or plant matter and also animal scats. They are extremely robust butterflies and very fast flyers. They are frequently caught in both understorey and canopy traps. The census of 1996 listed 27 species and the current research has added a further five species to this number: *catachrous*, *viola*, *hadrianus*, *epijasius* and *anticlea*. Semuliki National Park can therefore claim to contain over 15% of all *Charaxes* species found in Africa.

The future

The lowland forests of Africa have suffered considerably through habitat destruction, degradation and human land use pressures. This will undoubtedly have an effect on butterfly species diversity found within these forests. Semuliki National Park is effectively managed and management is proactive in terms of conservation measures. The future for this relatively small tract of forest appears to be positive.

Further research will consider vertical stratification and effect on composition within the park, with trapping also occurring deeper into the forest away from the trail network. A long-term monitoring programme investigating seasonal trends in spatial and temporal abundance and diversity is a collaborative project that is continuing with the UWA. Another collaborative effort with Makerere University in Kampala is permitting the digitisation of the 20,000-30,000 butterfly specimens presently being housed in the University's museum. Specimens will be photographed and their data collated and uploaded for dissemination onto the internet. My own research work in Semuliki is also aiming to encourage local Ugandan undergraduate students to participate in small scale entomological research projects, by providing field equipment, appropriate field literature and technical expertise.

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Semuliki Team: L to R. Joffra, Justice, Martha and Scott Forbes

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Malcolm Barcant (1913-1986) and the butterflies of Trinidad and Tobago

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Abstract

Malcolm Barcant was born in Trinidad and was a resident amateur lepidopterist there for around 60 years, but left the island in 1974 to spend the rest of his life in Florida. His book, *Butterflies of Trinidad and Tobago*, published in 1970, is still the main source of reference. He was an avid collector, amassing a very large collection which has been preserved and is now housed and displayed at Angostura Ltd., manufacturers of rum and Angostura bitters, near Port of Spain. It is regarded as one of the most important collections in the Caribbean and 2014 marks the celebration of the 40th anniversary of the Angostura Barcant butterfly collection. Barcant also bred butterflies in captivity, carried out breeding experiments and wrote scientific papers. He added 13 new species to the Trinidad list and was involved in descriptions of others new to science.

Introduction

Many resident and visiting naturalists have collected butterflies in Trinidad and Tobago and these islands are a particularly rich and rewarding place for lepidopterists. Apart from visitors, some of the early naturalists and members of the Trinidad and Tobago Field Naturalists Club were collectors and cataloguers in the 1890s and early 1900s, but some Trinidadian collections at the Natural History Museum in London date back to earlier decades. Amongst the more familiar collectors are Robert Dick (died in 1943), Sir Norman Lamont (1869-1949), Margaret Fountaine (1862-1940), William James Kaye (1875-1967) as well as Malcolm Barcant (1913-1986). Kaye, having first visited the island in 1898, published extensive work on Trinidad's butterflies until 1940. Matthew Cock has done extensive work during the last 30 years on butterflies, especially skippers (Hesperiidae) (see Lamas, 2013), and moths from Trinidad and Tobago. Tikasingh's (2003) paper refers to other collectors, collections and lists, and provides an extensive bibliography. More recently, Homer (1966) described a butterfly collecting trip to Trinidad and meeting Malcolm Barcant, an account which includes some of the difficulties and problems faced while on this trip. De Worms visited Trinidad and Tobago in 1968, and with the help of Malcolm Barcant, collected, identified and listed the butterflies seen and caught in Trinidad (de Worms, 1969). Lamas has a checklist of certain groups (2004) and an annotated bibliography of Neotropical butterflies (2013). A major problem about some early collections is that they lack a detailed provenance, 'Trinidad' being insufficient for serious scientific work or in a case mentioned by Tikasingh (2003), where the name given on the label was St George's, without any reference to Trinidad.

Butterfly populations depend mainly on climate and a country's geographical position for their numbers. As a result, "Trinidad in proportion to its size, is perhaps the richest place on earth for butterflies" (Barcant, 1970). The reasons for the richness are many – sunshine, high temperatures and humidity, luxuriant flowering growth and, in the case of Trinidad, nearness to South America. Tobago has a sparse population of butterflies compared with those found in Trinidad (Barcant, 1982; and see note 1).

Brief biography

Malcolm Barcant was born in Trinidad in 1913 and died from a heart attack in Florida in 1986, to where he had emigrated and become an American citizen in the 1970s. He was educated at St Mary's College in Port of Spain and in England at Ealing Priory School (now St Benedict's School), London, and attended the Imperial College of Tropical Agriculture from where he graduated with a Diploma in

Figure 1. Malcolm Barcant - from the family album

Agriculture, although agriculture was not to be his career. He became a chartered accountant in Trinidad eventually working for his own company. His other 'career' was as an amateur lepidopterist for which he became famous throughout the world. He married Madeleine Germaine 'Jimmie' Seheult (1911-2013) in 1940 (note 2) and they had three children.

Barcant began collecting butterflies in Trinidad when he was eight years of age and later visited other Caribbean countries looking for butterflies, as well as Columbia, Venezuela, Ecuador, Mexico, Panama and Brazil. Trinidad, however, was his home and it was there where his main collecting took place. After acquiring a car in 1946 he was able to travel much further afield in the pursuit of his hobby.

He recalls interestingly in his book (p.179) one collecting trip in May 1927 when he was only 14 years of age. It was to a local area in the Fondes Amandes valley in St Anns, Port of Spain, which is vividly remembered by his son Roger (pers. comm. Roger Barcant) who often went with him on collecting trips there as a young boy in the 1950s:

"The rainy season had just come and although early in the year butterflies were abundant. The catch had been a good one. The day was one in which every minute was filled with expectancy, a rarity was likely at every turn in the road…. I was then young in the game and had never seen *protesilaus* [*Graphium protesilaus* The Northern White Page] in flight before. But today I knew immediately what they were as they made a hasty disturbed exit up the road and out of sight. Instinctively I followed slowly expecting nothing. Ten minutes and two hundred yards later the two White Pages were sitting a foot apart drinking water from moist sand on the road… An approach with caution from behind was essential. It seemed like hours before I got to a striking distance to net the two in one downward stroke but one was caught, the other escaping to rise twenty feet in a crazy, fast disturbed flight. I put the killed Papilio, a perfect specimen, on the wet sand to look for the other. In seconds he dived to earth and with quivering wings settled quickly on his dead brother as if in silent sympathy. This second easy capture together with a boxful of other rarities brought to a close a most memorable day of collecting in Trinidad"

When Barcant decided to leave Trinidad, Angostura Ltd. (note 3) stepped in, bought the collection and first exhibited the butterflies in 1975 as part of the company's 150th anniversary celebrations. The formal opening ceremony was performed by Eric Williams, the first Prime Minister, and Ian Lambie, chairman of the Exhibition Committee, said in his opening remarks that "Our country in proportion to its size, is perhaps the richest country in the world for butterflies". The two islands are currently estimated to have over 750 species, a substantial increase on Barcant's (1970) figure (note 4). Some Latin names have changed since 1970 and Lamas's (2004) catalogue updates the taxonomy. Roegner (2003) is right to point out that habitat destruction, following urbanization, development, and other human threats, as well as climate change, have had a serious effect on total numbers since the 1970s. Cock (2005), however, expressing a personal opinion, believes that few, if any, indigenous species (excluding vagrants and migrants) have become extinct in the last 100 years or so.

In 1976, the first year of the Republic, Malcolm Barcant was awarded the Chaconia Medal, Gold class, for "long and meritorious services" to lepidopterology in Trinidad. He had discovered 13 new species and two new to science, the latter being named after him, *Heliconius hecale barcanti* (note 5) and *Pachythone barcanti* (note 6). He also wrote the standard work, *Butterflies of Trinidad and Tobago*, published by Collins in 1970.

The collection

Malcolm Barcant started collecting butterflies in his garden at home and the Gorgeous Yellow and the Jaune d'Abricot were amongst his first captures, but when the family moved to a new home, it was found that his entire collection had been virtually destroyed by other insects. The collecting began again and this time the Riker mounting method was used (note 7) to prevent attack by both insects and

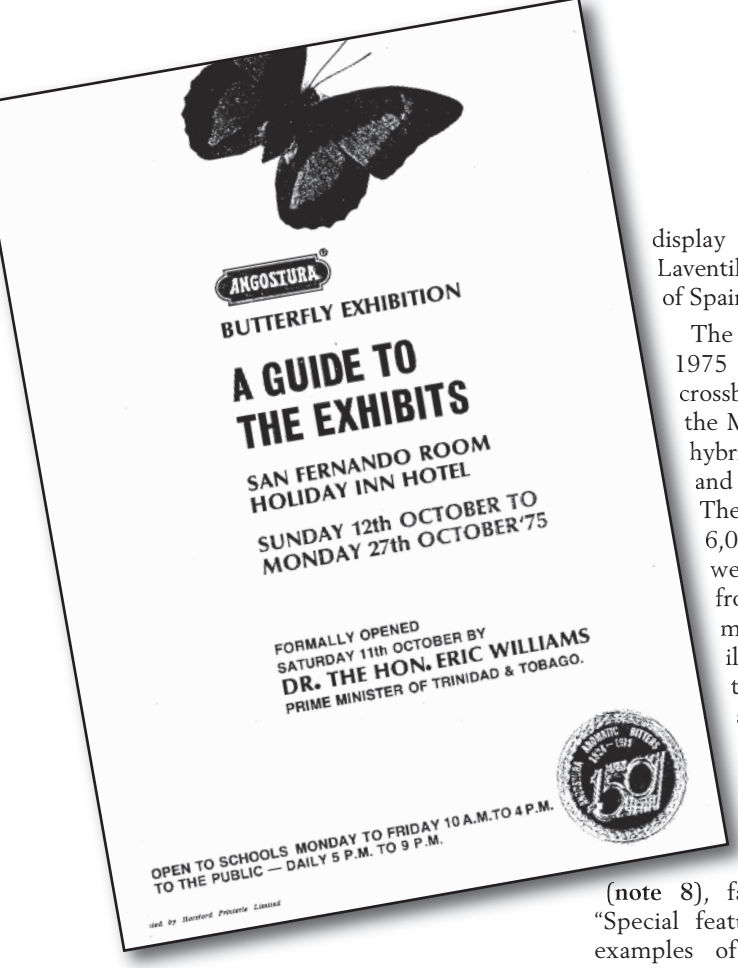

Figure 2. The programme of 1975 exhibition.

fungi. He soon realized that different butterflies flew at different times of day, so he collected at different times, sometimes three times a day in school holidays. In the later years his emphasis became more on collecting new or rare species and replacing specimens in the collection which were old or damaged. Record cards were maintained showing the name and number of the species and each specimen had a label giving date and place caught.

Angostura Ltd. acquired the collection in 1974. It would appear that Roegner (2003) is wrong in stating that "He endeavored to take his famous butterfly collection with him but was prohibited from doing so by the government". According to Angostura, Barcant was reluctant to take the collection with him, believing it would be more beneficial to the people of Trinidad and Tobago. In his words, "The collection belongs to all the people of Trinidad for educational purposes. Who knows, it might motivate someone to see the beauty in nature, and that reason is enough to leave it with the people" (pers. comm.. Ronda Betancourt, Angostura, to author 2 December 2013). An arrangement was made, through a friend Thomas Gatcliffe, one of the Directors of Angostura Company at the time, to purchase and house the collection. The collection at present is in a purpose built room, made to accommodate and display it, at Angostura Ltd., Laventille, two miles east of Port of Spain.

The original exhibition in 1975 included "Foreign and crossbreds exhibits" featuring the Morpho cross breeds and hybrids bred from 1965-1968 and "Special feature items". The collection numbers over 6,000 specimens, from what were said to be 623 species from Trinidad. They are made up of 14 families, illustrating the diversity of the island's butterflies, and include 72 species from the Nymphalidae (note 4), 110 species from the Metal Marks, family Riodinidae, and 230 species of Skippers (**note 8**), family Hesperidae. The "Special features" exhibits included examples of life histories, books, collecting equipment, articles and the postage stamp issue from 1972. The exhibition was described by Carr (1975) in a local newspaper as a "rare and valuable collection" and "among the finest in the world".

Barcant (1970) added at least one other collection to supplement his own. The collection of Robert Dick, who died in 1943, went to his nephew Percy Rodriguez and when he died in 1961, Barcant acquired the collection. It is not known if other collections or specimens were obtained by exchange, purchase or donation.

Barcant's other work on butterflies

It is important to appreciate that Barcant was not just a collector of butterflies. He carried out breeding experiments (Barcant, 1981), wrote scientific papers (Barcant, 1982), popular works (Barcant, 1975) and the standard book on the butterflies of the two islands. He knew about what makes a new species and recognized the small differences in structure, colour and form. He added new species to the Trinidad list and two new to science (Barcant, 1982; Tite, 1968). He corresponded with specialists at the Carnegie Museum, Pittsburgh, USA and the Natural History Museum at Tring in Hertfordshire, part of the British Museum (Natural History) as it was then known, and sent material there for identification and description. On describing a new species from Trinidad, Tite (1968) wrote, "Full acknowledgement is here made to Mr. Malcolm Barcant… the discoverer of this interesting addition to the fauna of the island; who not only brought the insect to notice, but generously presented two males (including the holotype) to the British Museum (Natural History)". In his younger days Barcant was also an active member of the Trinidad and Tobago Field

Figure 3. The butterfly display at Angostura Ltd. Courtesy of Ronda Betancourt, Angostura Ltd. for help and permission.

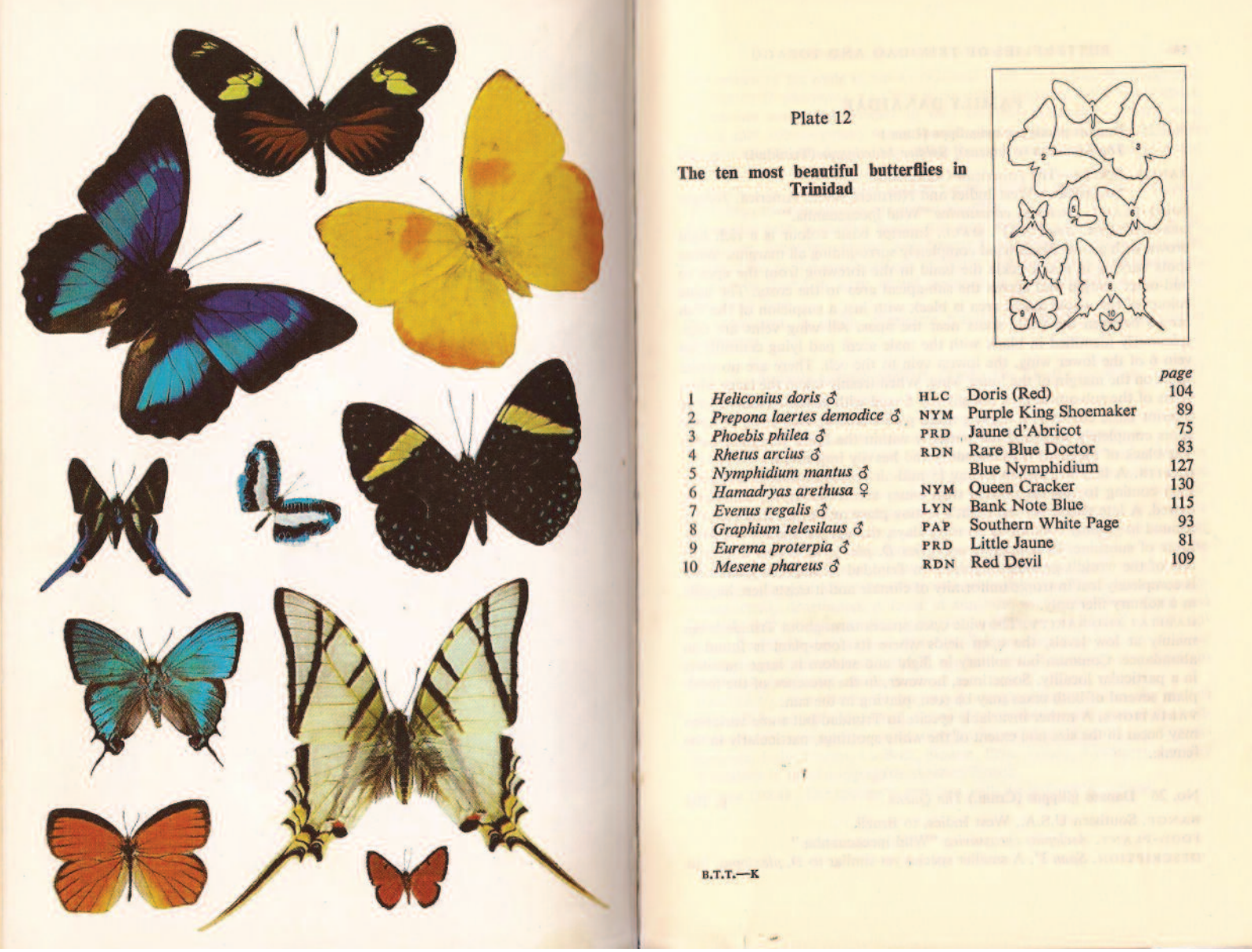

Plate 12

The ten most beautiful butterflies in Trinidad

				page
1	*Heliconius doris* ♂	HLC	Doris (Red)	104
2	*Prepona laertes demodice* ♂	NYM	Purple King Shoemaker	89
3	*Phoebis philea* ♂	PRD	Jaune d'Abricot	75
4	*Rhetus arcius* ♂	RDN	Rare Blue Doctor	83
5	*Nymphidium mantus* ♂		Blue Nymphidium	127
6	*Hamadryas arethusa* ♀	NYM	Queen Cracker	130
7	*Evenus regalis* ♂	LYN	Bank Note Blue	115
8	*Graphium telesilaus* ♂	PAP	Southern White Page	93
9	*Eurema proterpia* ♂	PRD	Little Jaune	81
10	*Mesene phareus* ♂	RDN	Red Devil	109

B.T.T.—K

Figure 4. Plate 12 from Barcant's (1970) book. Help from Imogen Plouviez, Permissions Department, Harper Collins, is acknowledged.

Naturalists' Club, gaining and sharing his knowledge with the other dedicated amateur naturalists of Trinidad.

The successful breeding of the Emperor butterfly, *Morpho peleides insularis*, in captivity and subsequent cross breeding experiments are described by Barcant (1981). These are of particular interest and probably mark his greatest scientific achievement. Living males of *M. achillaena*, from Rio de Janeiro, Brazil were shipped to Trinidad and crossed with females of *M. peleides* from Trinidad and gave good fertility to the F4 generation indicating that they were the same species. The appearance of melanic forms of *M. peleides* during the breeding experiments led him to speculate on the genetic and environmental basis of this melanism, as well as on speciation and geographical distribution.

Apart from his collection, Barcant's most lasting legacy is his book *Butterflies of Trinidad and Tobago* published in 1970 and now out of print. It was compiled over a ten year period from the notes he had maintained over the years. The book is not a conventional one in the academic sense and is written mainly for laypeople and amateurs without detailed taxonomy and with long scientific descriptions being avoided. There is even a chapter on "Answers to popular questions". The book is comprehensively illustrated with coloured plates of good quality, but lacks an index. Barcant bases his book not on systematics but on habits and habitats and groups the butterflies under such headings as "Butterflies of the home garden, the shade dwellers, the tree settlers and forest dwellers". This gave rise to some criticism.

Figure 5. The postage stamps.

Quesnel (1973), in his review, questioned that the author "rejects a straightforward taxonomic classification" and was critical of the use of the term 'rarity' by the author, whom he believed was referring to the collection rather than to the field. However, the book was written for the non-specialist and therefore some of these criticisms are unjustified in this author's opinion. Cock (2005) and S.N.A.J (1971 – probably Jacobs) wrote positive reviews and, on the whole, the book was well received and has been well used by travelling naturalists.

On the 18th February 1972, a set of stamps was issued by the postal service showing six butterflies from Trinidad and Tobago. Malcolm Barcant was involved as a consultant and helped to choose the species and their floral backgrounds (note 9). The species illustrated on the stamps were chosen for their beauty, rarity and general appeal and are all indigenous to Trinidad. They are arranged with a background of an appropriate plant, since many butterflies are very specific about their food plant (Owen, 1971). The stamps are made up of the following values and names - 3c Morpho hybrid (Barcant), 5c Purple Mort Bleu (*Eryphanis polyxena*, 6c Jaune d' Abricot (*Phoebis philea*), 10c Purple King Shoemaker (*Prepona laertes demodice*), 20c Southern White Page (*Graphium telesilaus*), 30c Little Jaune (*Eurema proterpia*) with their common and Latin names presented.

Conclusion and assessment

Malcolm Barcant made an enormous contribution to the study of butterflies, especially in Trinidad and Tobago, and was an important collector in the Caribbean. He also maintained and bred butterflies in captivity and carried out breeding experiments. His collection has been preserved and is of significant scientific and educational value, particularly for the schools in Trinidad. The collection and exhibition itself draw attention to the need for the conservation and protection of butterflies and together form an important contribution to the natural history of Trinidad and Tobago. Important collections such as this one need to be preserved and displayed and their records kept.

Acknowledgements

Without the generous help and enthusiasm of Malcolm's son Roger Barcant, who was kind enough to lend me several items, this article would not have been written. Ronda Betancourt from Angostura Ltd. also helped to clarify certain points and provided pictures of the present display. Matthew Cock was kind enough to read through a draft and make several useful comments and corrections. I am also pleased to acknowledge the help of Angostura Ltd.

Notes

1. Barcant (1970) includes the Tobago species in his check list, but the 123 species comes from the work of a British collector, W. S. Sheldon, in the 1930s and the same figure is included in the 'Butterflies of Tobago' Internet source given below.
2. Born in Port of Spain in 1911, 'Jimmie' died on May 21 2013, aged 101, in Lakeland Florida.
3. Angostura Ltd. manufactures rum and the well known Angostura bitters and has been in Trinidad for nearly 200 years, celebrating its 150th anniversary in 1975.
4. The number of species quoted by different authors varies somewhat. A reviewer of the book (SNAJ) says 617 species and the same figure is quoted by Barcant in his book. Numbers have increased since that time. The current estimate is much greater, thought to be around 750, largely due to our increased knowledge of the Hesperiidae. Also the classification has changed somewhat – the Morphidae, Satyridae, Heliconiidae, Brassolidae, Libytheidae and Ithomiidae are all now subsumed in Nymphalidae as subfamilies or tribes – Cock to author 18 December 2013.
5. Now considered a subspecies from Venezuela, named after Barcant because he was the first to illustrate it, based on a vagrant specimen now in the Angostura-Barcant collection - Cock to author 18 December 2013.
6. This is now considered to be a synonym of *Pachythone erebia* Bates – Cock to author 18 December 2013.
7. The pin is extracted after setting and the specimens are placed on cotton wool against glass in shallow drawers.
8. This was the number included in the 623 species recognized from Trinidad. Barcant had far fewer species of Skipper in his collection - Cock to author 18 December 2013.
9. This information is taken from the Trinidad Philatelic Society Bulletin number 101, September – October 1976: 1-3, and is based on Barcant's account.

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Butterflies of Tobago. Wikipedia en.wikipedia.org/wiki/List_of_butterflies_of_Tobago

There are several photo galleries such as that of Tom Murray www.pbase.com/tmurray74/trinidad_tobago_butterflies

François-Jules Pictet and the Neuroptera

John Hollier
Museum of Natural History, Geneva

Anita Hollier
CERN, Geneva

François-Jules Pictet (1809-1872) of Geneva was an early specialist of the Neuroptera. The Neuroptera as conceived by Linnaeus was, by our standards, a very heterogeneous entity including hemimetabolous and holometabolous insects which are now arranged in various orders from the Ephemeroptera to the Neuroptera (*sensu stricto*). Pictet was influential to our understanding of these groups and is regarded as the "father" of the Ephemeroptera (Peters *et al.*, 1980) and Plecoptera (Aubert, 1946). His work was far ahead of its time and included studies of larval as well as adult morphology, ecology and habitat requirements. Although he was limited by the optical instruments available at the time, his work still seems remarkably modern compared with that of his contemporaries.

François-Jules Pictet de la Rive (it was customary in Geneva to add the wife's maiden name to that of her husband, to help differentiate the numerous members of the oligarchic leading families) was born into one of the oldest and best connected families in Switzerland (Candaux, 1974). His father, Jean-Pierre Pictet Baraban (1777-1857), had studied Philosophy and Law at the Geneva Academy, and Science in Paris with another well-known Genevan, the botanist Augustin-Pyramus de Candolle (1778-1841). Candolle held the chair of Botany and Zoology at the Geneva Academy from 1816 until 1834 and laid the foundations of the code of botanical nomenclature used today. Assistant Professor of Experimental Physics at the Geneva Academy, Jean-Pierre Pictet was also active in politics and a member of the local learned and cultural societies.

Encouraged by his father, the young Jules (as he was known) did well at the Geneva College and also studied privately with Jean Humbert (1792-1851), an expert on oriental languages (Soret, 1872). He entered the Geneva Academy in 1823, first studying the humanities for three years and taking a degree in Letters, then science for three more, taking a degree in Science. He followed that by a year of law. He particularly shone at science and became an intimate friend of Candolle, the friend and colleague of his father. While still a student, Pictet was active in adding to and curating the collections of the *Musée Academique*, precursor of the Geneva Natural History Museum. He also accompanied his father on the Alpine explorations that resulted in a joint publication on the Mt Blanc massif (Pictet & Pictet, 1829).

Figure 1. The young Pictet.

In 1830, Pictet went to Paris to study under Cuvier at the Jardin des Plants (precursor to the Paris Natural History Museum). Here he was in contact with some of the greatest naturalists of his day; as well as Georges Cuvier (1769-1832) the staff included Etienne Geoffroy Saint-Hilaire (1772-1884), André Duméril (1774-1860), Henri de Blainville (1777-1850), Marie-Jean-Pierre Flourens (1794-1867) and Pierre André Latreille (1762-1833). Pictet was particularly influenced by Latreille's assistant (and later successor as Professor of Entomology) Victor Andouin (1797-1841), who had

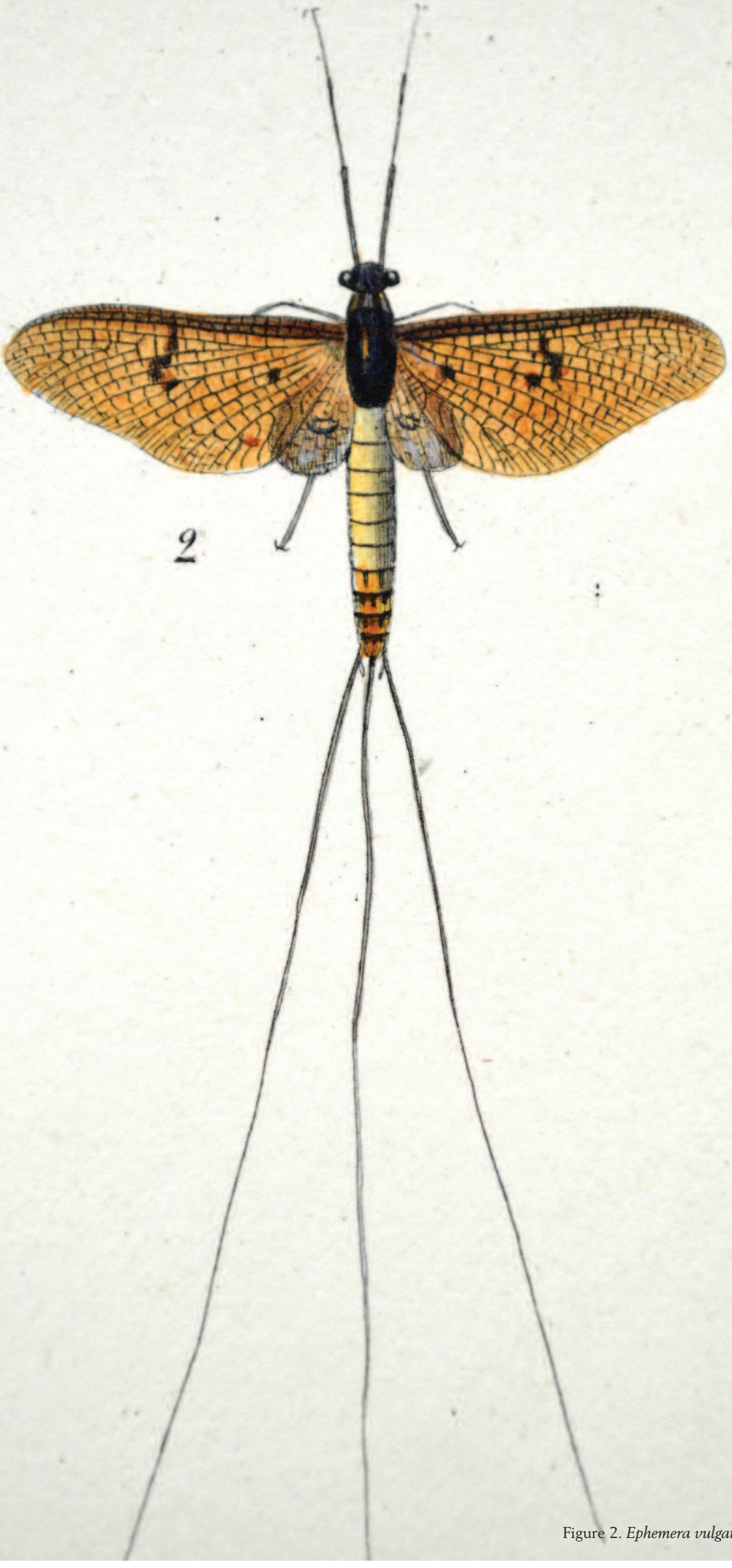


Figure 2. *Ephemera vulgata* (from Pictet, 1845).

co-founded the journal *Annales des Sciences* in 1824 and would be a founding member of the Entomological Society of France in 1832. It was Andouin who suggested that he work on the Neuroptera. As well as the lectures and practical work at the Jardin des Plantes, Pictet read voraciously, attended salons and theatres, and wrote accounts of all he had seen, including the 1830 July Revolution, to his family in Geneva.

For the next few years Pictet divided his time between Geneva, where he began teaching at the Academy as a demonstrator, and Paris where he continued his research at the Jardin des Plantes. Although the larvae of a few spectacular neuropteran species like the antlions were known, virtually nothing of the morphology or ecology of the immature stages of most groups had been studied, and it was here that Pictet focused his efforts. Sampling in many rivers, streams, lakes and ponds around Geneva, Pictet collected the larvae of caddis flies and other aquatic groups to describe and rear where possible. In general, only late instar larvae could be reared and Pictet's nomenclature and descriptions make it difficult to tell which species is meant in some cases (Aubert, 1947). Nevertheless, Pictet was breaking new ground.

In his first paper on the subject (Pictet, 1832) he describes the nymphs of five stoneflies then placed in the genus *Nemoura* Latreille, one of which he described as a new species. He made some comparisons with mayfly nymphs, showing that they were similar but distinct. Amazingly, this was the first demonstration that stonefly nymphs were aquatic (which had previously been surmised) and hemimetabolous (which had not). His next paper (Pictet, 1833) dealt with stoneflies then placed in the genus *Perla* Geoffroy, describing seven nymphs and four new species. Here he noted the similarities between *Perla* and *Nemoura* and placed them together as a distinct family. He definitively separated them from the holometabolous caddis flies and lacewings. Both of these papers were read to the Geneva Société de Physique et de l'histore naturelle, which elected him to full membership in 1832.

Pictet's main concern during this period was with the caddis flies, which were the subject of his first large scale monograph (Pictet, 1834). In this work

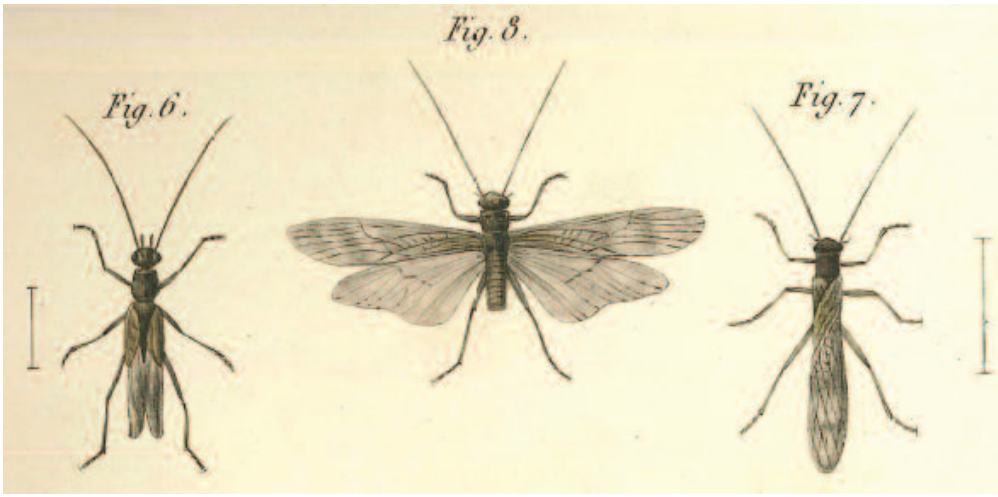


Figure 3. *Nemoura trifasciata* (from Pictet, 1832).

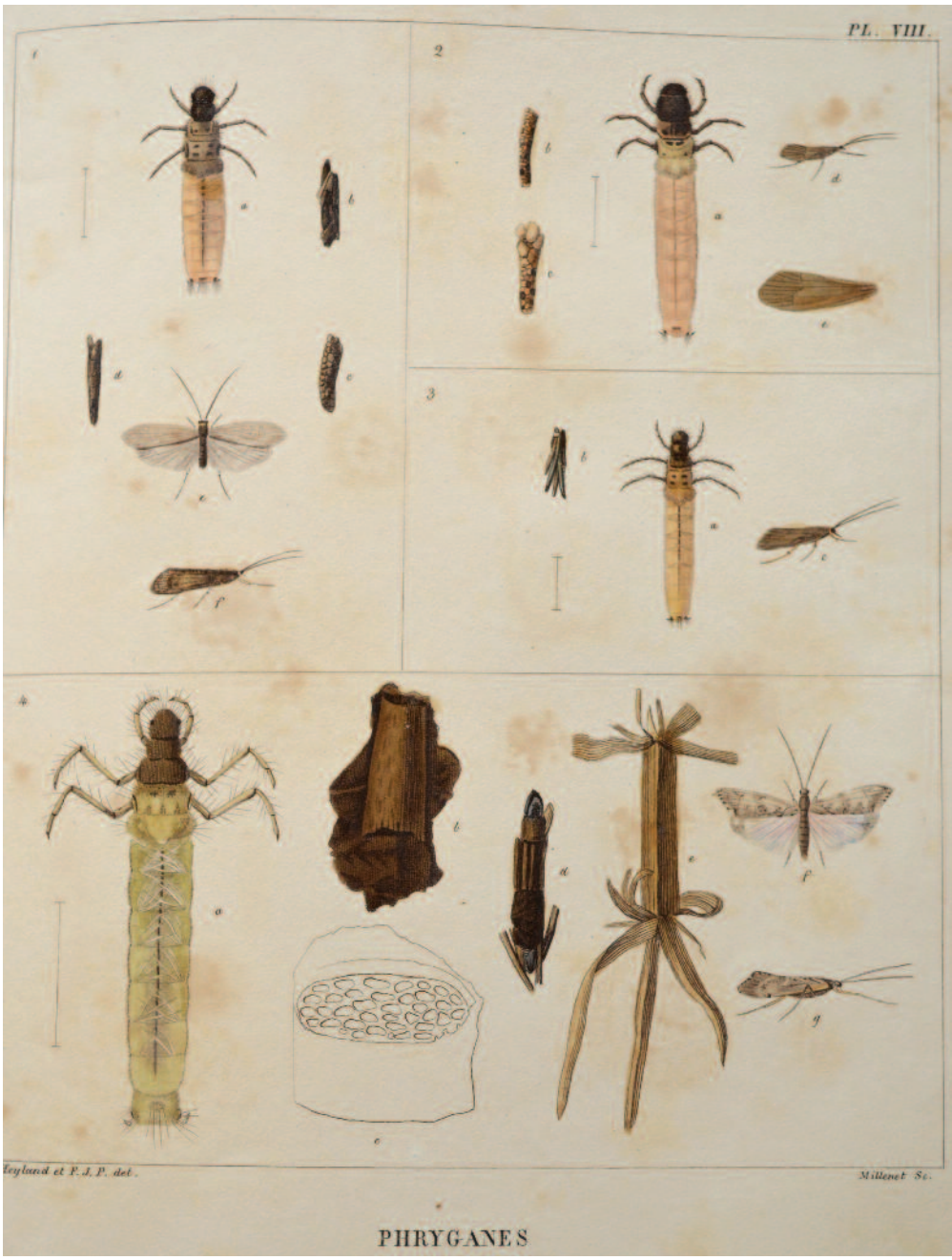


Figure 4. Phryganes (from Pictet, 1834)

Figure 5. Phryganes (from Pictet, 1834).

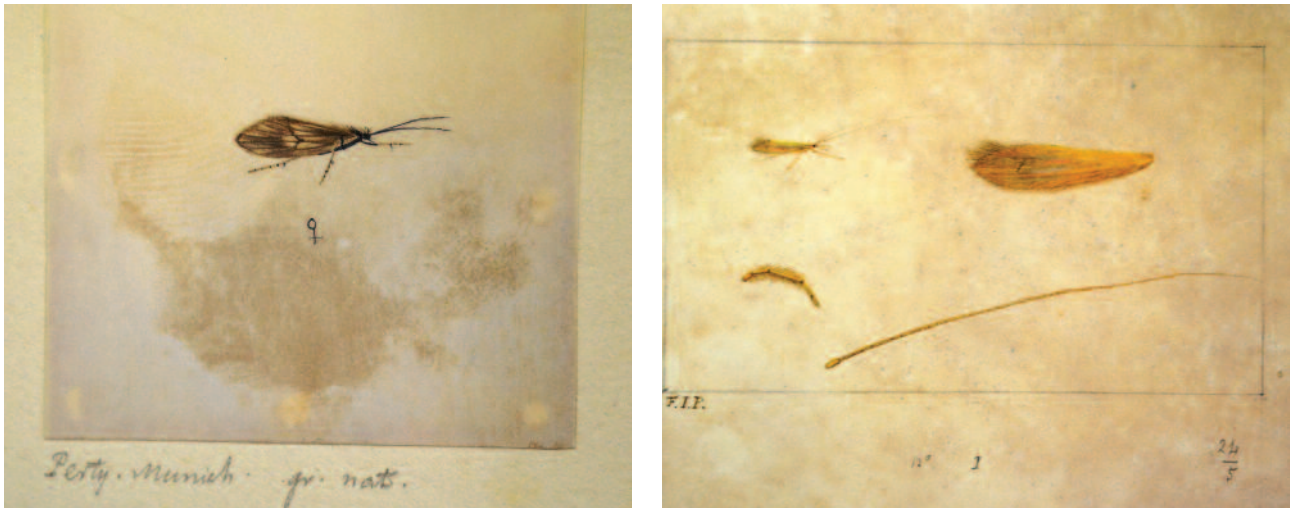


Figure 6. Original paintings made by Pictet.

he pioneered use of the morphology and ecology of the caddis larvae to help him define the genera into which he divided his species. His rearing experiments allowed him to associate the larvae and adults of 52 species, and the monograph included the description of 91 new species. The monograph was accompanied by 20 hand coloured plates, and, rather strangely, the habitus illustrations of the adults were printed life-size. Amongst the treasures of the Museum are some of the original drawings made by Pictet for this monograph, which are watercoloured and also painted life-sized. This monograph Pictet submitted for the Prix Davy, which was duly awarded to him. The money for the prize had been donated by Lady Davy in recognition of the help she had received from Candolle in arranging the funeral and interment of her husband, the great British scientist and inventor Humphry Davy in Geneva, where he succumbed to his final illness in 1829. There is a certain poetic justice in the awarding of the prize because one of Davy's last works was a book about fly fishing (Davy, 1828), with illustrations of caddis and artificial flies. The Trichoptera type specimens in the Museum have been listed by Botosaneanu & Schmid (1973).

In 1834 Pictet married Eléonore de la Rive, a member of another of the most important Geneva families, and related through her mother to both the Saussure and the Necker families. The following year, 1835, there was a reorganisation of the teaching at the Academy, and the chair of Botany and Zoology that Augustin-Pyramus de Candolle had occupied was divided, with Candolle's son Alphonse Pyrame taking the chair in Botany, and Pictet that in Zoology. Pictet also taught other courses including physics. He was soon recognised as a talented lecturer and inspiring teacher (Soret, 1872).

In 1836 Pictet published an account of the alderfly genus *Sialis*, describing the morphology of the larva and its development, showing that it is holometabolous and adding a second species (Pictet, 1836a). In this paper he divides the Neuroptera into six natural groups that are remarkably similar to the current system of orders, although

Figure 7. Hydropsyches (from Pictet, 1834).

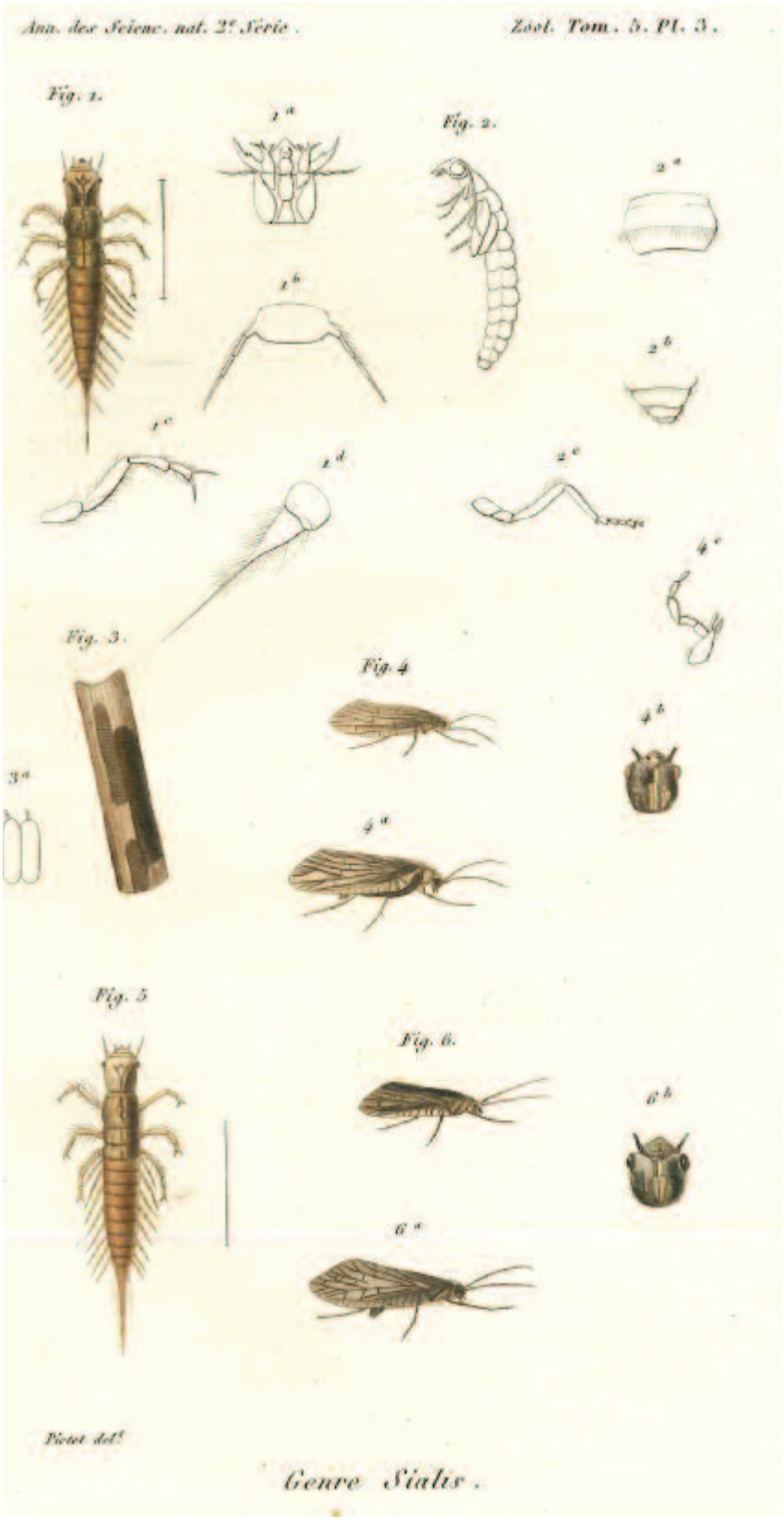


Figure 8. *Sialis*(from Pictet, 1836a).

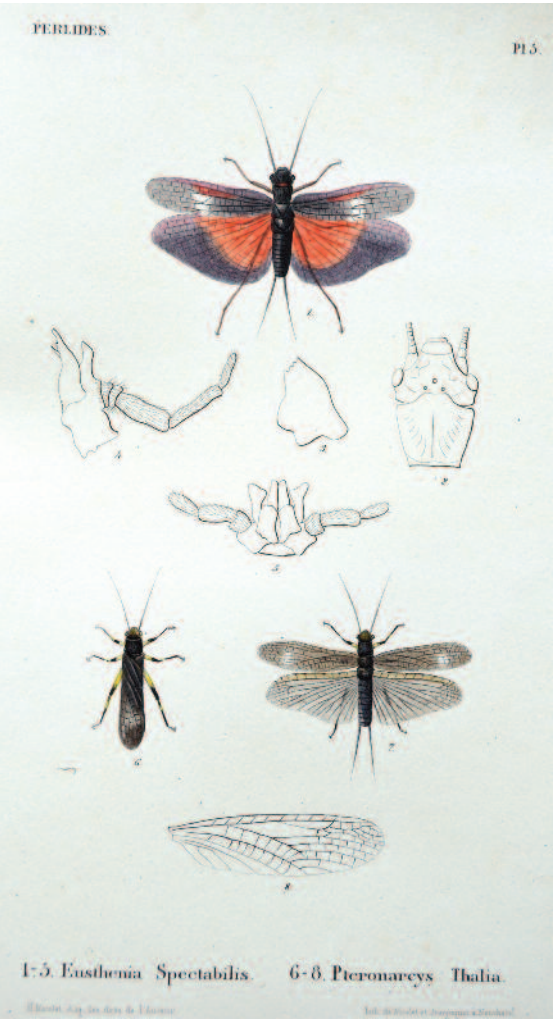
he erroneously places the Nemopteridae with the Mecoptera and leaves the Megaloptera and the Raphidioptera with the Neuroptera. In the same year he returned to the stoneflies of the Geneva region, describing 11 more species and giving precise localities with ecological information (Pictet, 1836b). On a more exotic note, he wrote two papers about specimens sent to him from Bahia in Brazil by Jacques Blanchet (1807-1879), one describing a species of hanging fly (Bittacidae) and two caddis flies, and the other discussing some larval cases and larvae of caddis flies (Pictet, 1836c & d). The specimens in the Museum are discussed by Hollier (2007).

In 1841 Pictet published a monographic revision of the stoneflies in two volumes, the second containing 53 plates, many of which were hand coloured. As well as discussing the anatomy and function of both nymphs and adults, he also created several genera and laid the basis for the current systematics of the order (Aubert, 1946), again using the form and ecology of the nymphs to divide his species. Once again, the plates have the peculiarity that the habitus drawings of the adults were printed life-size. The monograph included the description of 57 new species, but the identity of some of the smaller species remains unclear (Aubert, 1947). The type specimens of Pictet's Plecoptera have been catalogued by Zwick (1971).

The first monographic treatment of the mayflies was published by Pictet in two volumes, the text in 1843 (Pictet, 1843a) and the 47 plates in 1845. Once again, the anatomy and ecological adaptations of nymphs and adults are discussed, and nymphal morphology played an important role in defining the genera. Pictet described 31 new species and pointed out the large differences in some species in the appearance of the subimago and imago, and between the sexes. Although it was principally based on the fauna of the Geneva area, this work nevertheless forms the basis of the current systematics of the order. He also published one paper on dragonflies (Pictet, 1843b), but did not work on their systematics.

At this point in his career, Pictet abandoned entomology and dedicated his research to palaeontology. There was some overlap and Pictet studied the Baltic amber Neuroptera fauna, but it would appear that his contribution was made in the early 1840s (see Pictet, 1846), even though the work appeared much later (Pictet-Baraban & Hagen, 1856). His reason for abandoning the Neuroptera is unclear. It has been suggested that the death of Andouin may have played a role (Peters *et al.* 1980) but the political upheaval in Geneva leading up to the 1846 Revolution was probably more important. Although politically conservative, Pictet not only retained his chair after the Radicals of James

Figure 9 (above). *Perla bipunctata* (from Pictet, 1841); Figure 10 (below). Perlides (from Pictet, 1841).



Fazy took power and rewrote the constitution, but also acted as Rector of the Academy during this troubled period. Once order had been restored the number of lecturers in the biological sciences was increased and Pictet concentrated on palaeontology, publishing his ground-breaking paleontological textbook and numerous monographs (see Soret, 1872). Pictet was also active in cantonal and national politics, taking a conservative but pragmatic view of the development of the federal constitution of Switzerland.

His teaching and example meant that entomology flourished in Geneva. The most important contribution was made by Henri de Saussure (1829-1905) who had been inspired as a student at the Academy to study Vespid Hymenoptera and who went on to become an authority on the Orthoptera (Hollier & Hollier, 2013). Another of Pictet's students, Aloïs Humbert (1829-1887), became the first curator of the natural history collections of the Museum and collaborated with Saussure on Myriapoda as well as with Pictet on palaeontology. Pictet's son Albert-Edouard (1835-1879) published on the Neuroptera (*s.l.*) of Spain following an expedition there with Rudolf Meyer-Dür (1812-1885), while another son, Alphonse (1838-1902), published on the Orthoptera, mainly in collaboration with Saussure.

Pictet's entomological collection did not go directly to the Museum, but was used, and added to, by his son Albert-Edouard. On the death of Albert-Edouard their joint collection was given to the Museum by his son Camille (1864-1893), himself a distinguished expert of Coelenterates and contributor to the Geneva Museum. These specimens were then given Museum labels (see Hollier, 2007) which make it difficult to tell which specimens had been used by Pictet for his descriptions and which were added to the collection later (Aubert, 1946, Zwick, 1971, Botosaneanu & Schmid, 1973). Many specimens were probably lent or given to other entomologists, such as Herman Hagen (1817-1893) who continued the Baltic amber study started by Pictet (published as Pictet-Baraban & Hagen, 1854), and whose collection is now in Museum of Comparative Zoology in Cambridge, Massachusetts. Zwick (1971) found syntypes of several of Pictet's stonefly species in the Berlin Natural History Museum, although it is not clear how they got there. Pictet's entomological collections remain

the Natural History Museum as a separate entity. Largely as a result of his scientific work and tireless advocacy, the collections were rehoused in a purpose-built Museum as part of the new complex of buildings designed to accommodate the University (as the Academy became known in 1872). Although he died just before it opened, Pictet is still recognised as the godfather of the Museum.

Figure 11. *Beatis* (from Pictet, 1845).

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A tour of insect collections in the UK: First stop – The Cole Museum of Zoology

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There is a common argument in the heritage sector regarding the fundamental point of a museum collection. Are they there for the preservation of objects or are they there for the exhibition of objects to the public? I would argue the latter; of course a large part of a museum's job is to preserve objects for future generations, but there wouldn't seem much point to this unless people can access and learn from them. The number of insect specimens in museum collections globally is vast with estimates of up to 724 million, not including those that have yet to be properly identified and catalogued (Nishida, 2006). But how much of this immense collection is available for the public, or for that matter for the scientific community to access?

That is where I come in. As a keen entomologist-in-training making my way in the world of natural history curation, the editors of Antenna have kindly offered me a regular slot to explore the insect collections of the UK and to share my findings with their readers. Many museums in the countres of the UK have insect collections, some are small and hidden away whilst others are vast and held within museums that have the space and the funds to exhibit them (for example: Natural History Museum, London – estimated 30 million insect specimens). They all have a role to play in public engagement with insects and so the purpose of this series of articles is to take a tour of insect collections in the UK, large and small, and to shed light on their extent and potential.

As well as exploring these collections I will be meeting the people behind the scenes, interviewing the curators and other staff involved with museum


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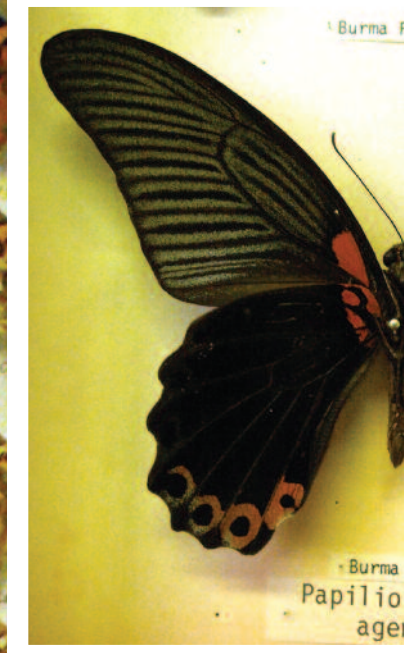
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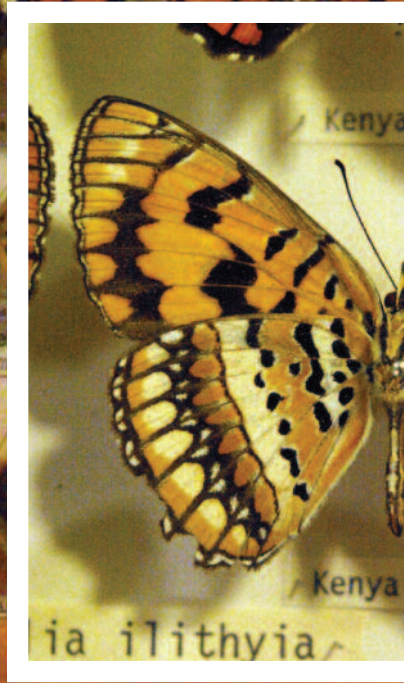
Burma April 84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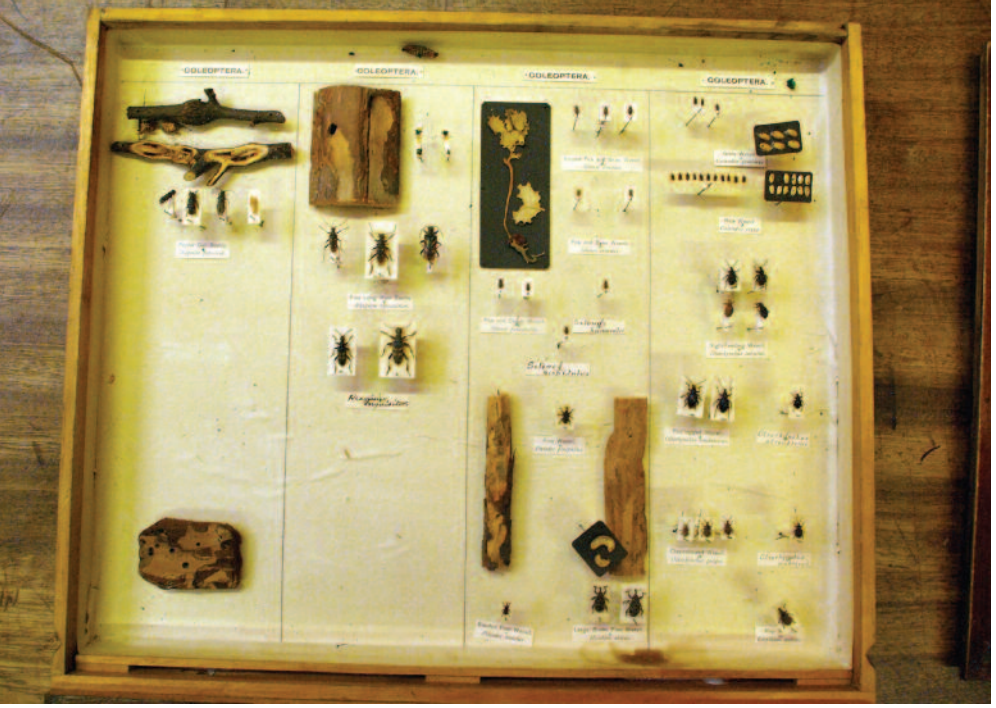


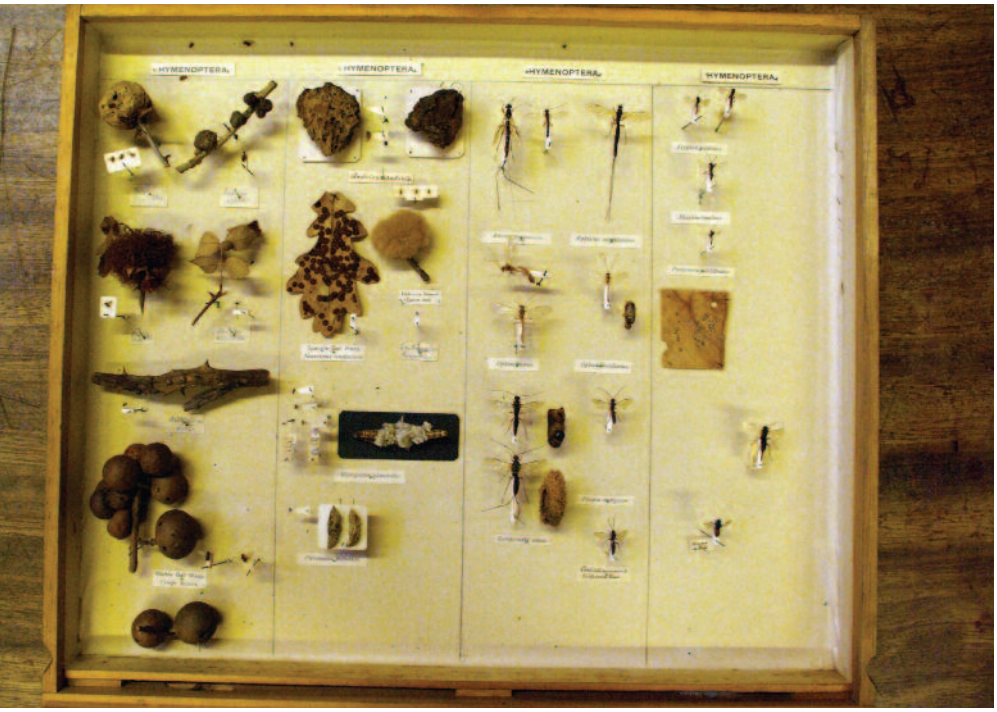


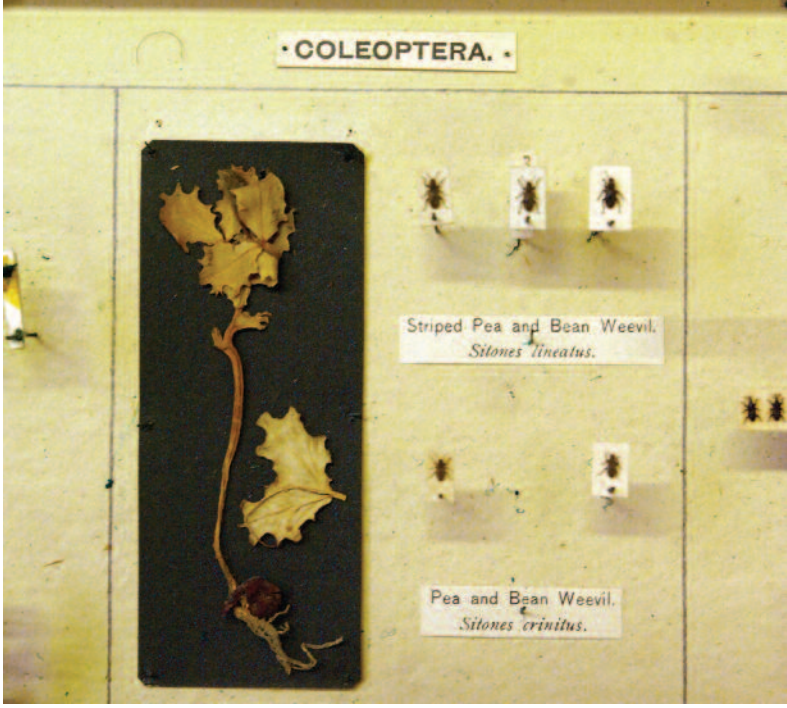
Figure 2 (previous pages): The Wise Collection of tropical butterflies at The Cole Museum. There are around 60 trays of specimens from all over the world. The examples shown are only a few of the wonderful specimens in the collection.

Figure 3 (left): The Bastin Collection shows specimens of economic importance.

insect specimens. The larger museums may have specific curators for specific groups of animals, but smaller museums may have only a single individual who cares for all collections and requires a broad range of knowledge on the natural world. I will begin this first article with a look at how insect collections can be utilised by the scientific community for research purposes and how they can engage with people to increase public interest.

Insect collections for the scientific community

Natural history museums are important scientific and cultural centres of knowledge that allow people to observe the natural world. They provide an arena, within which current ideas can be displayed alongside objects and specimens to tell stories that people would otherwise not hear. The collection of the natural world allows a record of things that have past so that we may make inferences on the present, and predict things to come. The research potential of the vast global collections we have already amassed is substantial and specimens can inform on topics such as biodiversity, species distribution and evolution. Brooke (2000) wrote a pertinent article in TREE about why museums matter and although the article concentrates primarily on avian specimens the principles discussed are evident throughout natural history heritage. In short, the article reports how changes in biodiversity or distribution over time can be illuminated with museum collections. Living insects provide an excellent tool for studying the natural world. Their small size, large numbers and incredible diversity allow for studies that could not be carried out on larger organisms. It is also true that, as a collection within a museum, insects can represent a key tool in scientific investigations as well as beautiful specimens to observe *per se*. Engagement with insects in a museum setting is thus beneficial to experts who may use them as a resource for their research, or to public



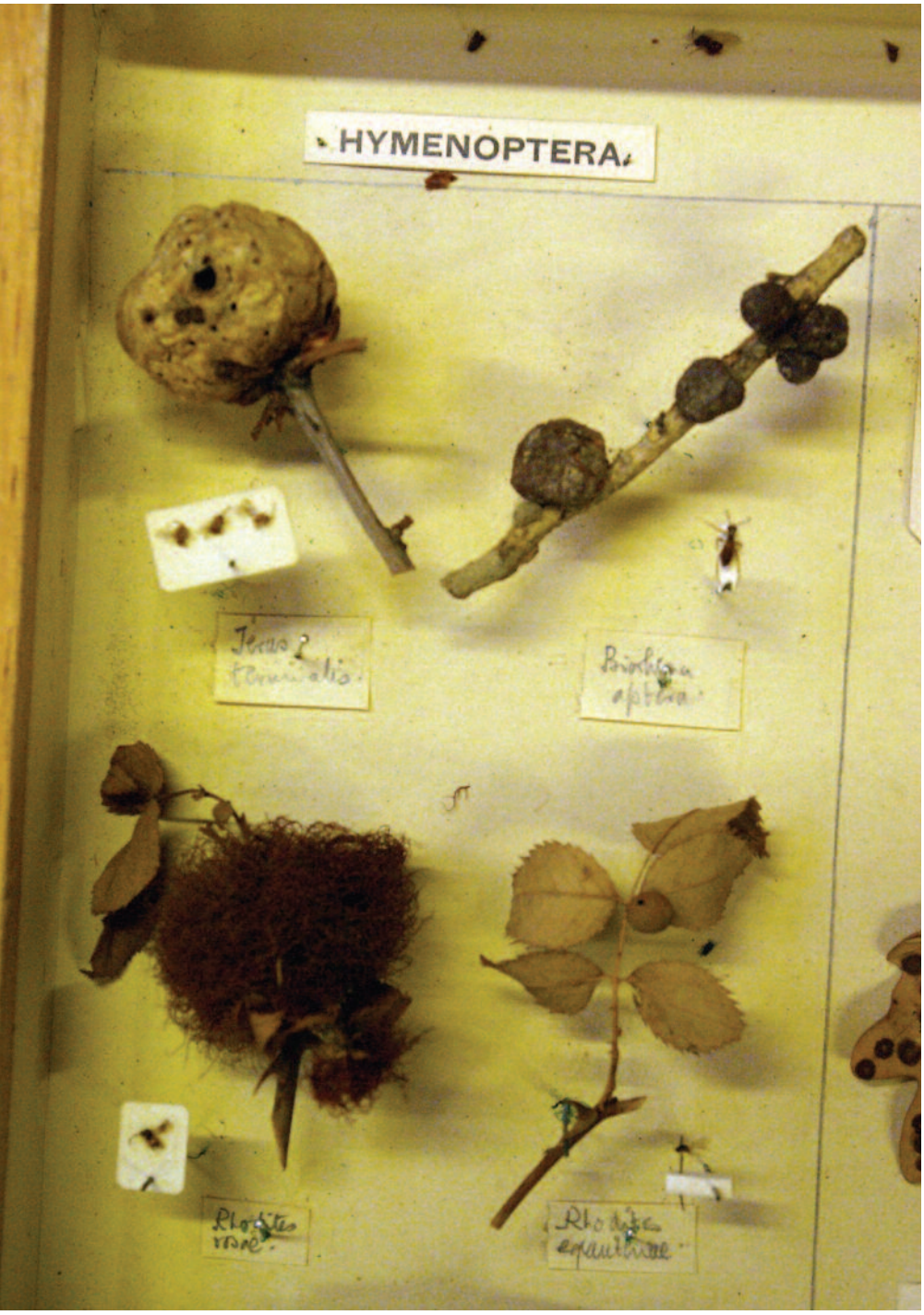


Figure 4 (and next page): The interesting way in which the specimens are displayed gives the viewer a closer look at the insect's way of life.

education and interest. A quick internet search for biological studies involving museum collections brings up several bodies of work that are worthy of note. One study in Rome considered patterns in insect extinction through urbanization, using a long-term data set attained from museum collections to inform on conservation management strategies (Fattorini, 2011). Another study used museum collections to investigate the diversity of freshwater insects in Madagascar (Vuataz *et al.*, 2013). By using museum collections of insects this study was able to avoid (often expensive) field sampling. Live specimens caught in the field are still important, but these two studies ably demonstrate that insect collections can also be used to inform on topical issues.

The very nature of museum collections lend to their usefulness in scientific research. Collections are usually well documented, organised and specimens are often identified to species level. This allows researchers more time to ponder on the processes they are analysing, and less time staring down a microscope trying to figure out whether that really is an indentation on the hind tibia or not. Currently there are several cross-institutional and international online projects to attempt to centralise the information held by different museums into an easily accessible catalogue. The Global Biodiversity Information Facility (GBIF) and European Natural History Network (Synthesys) are two such initiatives. GBIF currently holds records for over 433 million specimens, almost 35 million of which are insects (GBIF, 2013). Synthesys is an EU wide

initiative to bring together information in natural history catalogues into one fully accessible system (Synthesis, 2013). The main aim of these projects is to allow access to information for researchers and the public that was previously 'hidden' away in institute specific databases.

Museum collections, as with any other data, are not infallible and as with any source of information there are inherent issues to be overcome before data can be robustly used. Graham *et al.* (2004) wrote a review of museum based informatics and considered how collections can be applied to biodiversity analysis. The authors explained in the review that there are problems with inaccuracies in identifications. This is especially true with older collections where the names of the specimens may have changed since their initial collection. My own experience working on insect collections in museums confirms that this is indeed a significant issue. Furthermore, many specimens may only have common names in their descriptions, this also being restrictive to their potential 'value' (at least as a research resource). It is also true, however, that it takes less time to check for inaccuracies than to start from scratch identifying each specimen. Graham *et al.* (2004) also report that bias in the locations of sampling must be corrected for. Again, from my own experience working with insect collections, I can fully support that specific collectors tend to source specimens from their 'home range', or from an otherwise defined area of interest. Though this is hardly surprising, especially from the perspective of an amateur collector, this bias may nevertheless impede on the usefulness of collections for scientific research. It could be argued, however, that as long as the specimens form a representative sample of the area under study then problems will be limited.

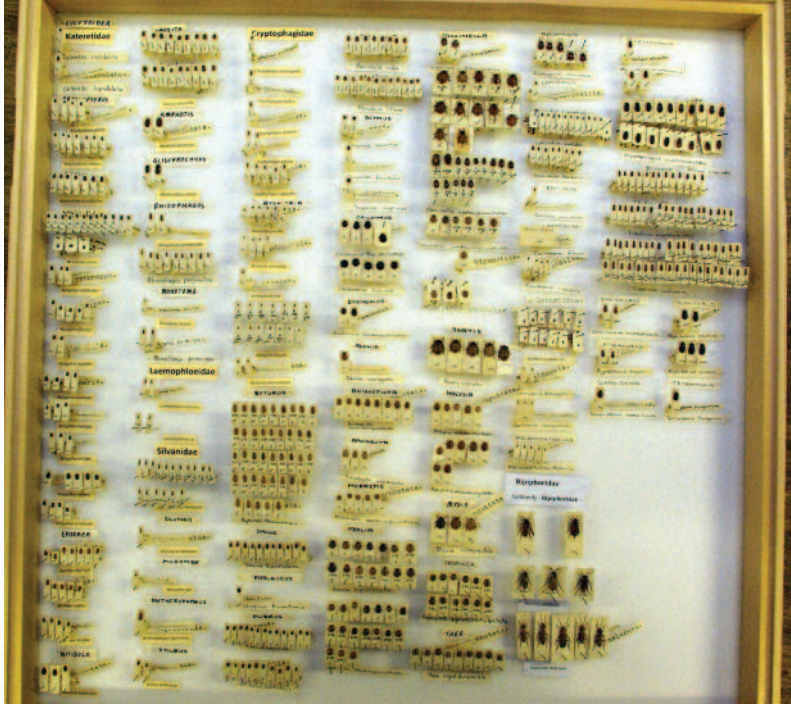
Insect collections and public engagement

Insects are astounding creatures that are arguably the most important animal group on the planet (although I'm no doubt preaching to the converted here!) As entomologists we know how beautiful and interesting insects are, but unfortunately not everyone has the same impression of them. Museums can often represent the only educational contact members of the public have with insects outside of nature documentaries. For many, museum collections also offer a rare portrayal of insects in a positive light, in a setting where they are not being swatted from food, or attempting to use us to obtain a blood-meal. This opportunity to educate people on the positive attributes of insects should be fully exploited; one of the reasons for this series of articles is to look at whether museums are doing this already, or whether they could do more. How many insects are on display? How accessible are they? Are there related workshops and events available? These are all important questions when considering how much people can take away from a visit to a museum and the insects held within it.

First stop: The Cole Museum of Zoology, Reading

It seems fitting that the first stop on our tour of entomological collections is in the same location as the First European Congress of Entomology, which took place at the University of Reading in 1978. The University has a lively and diverse School of Biological Sciences and a BSc in Zoology which has run since the beginning of the 20th Century. Reading has a focus on taxonomy and species identification, and is one of the few universities in the country to offer specific entomological training at undergraduate level. The


Carabidae


Cryptophagidae
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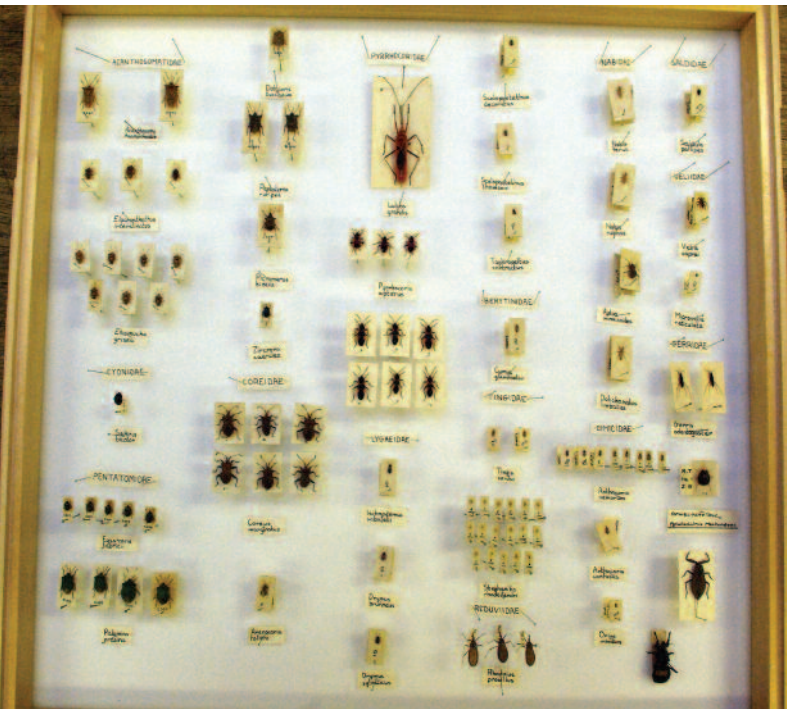
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NABIDAE
SALDIDAE
CYDNIDAE
COREIDAE
PENTATOMIDAE
REDUVIIDAE

Figure 5 (previous page): Collection of pinned insects mostly collected in the surrounding area often by members of university staff.

is a relatively small but nationally important museum, curated by Dr Amanda Callaghan who looks after all of the specimens with the help of volunteers. This is a museum I am quite familiar with having volunteered here myself for the past few years.

The Cole Museum is one of three museums at the University, the others being the Museum of English Rural Life and the Ure Museum of Greek Archaeology, and can be found on the main Whiteknights campus. The museum has an impressive collection of zoological specimens, most of which were collected by Professor Francis Cole between 1906 and 1939. It also holds a fascinating collection of historical medical books that were bought by the university from Professor Cole's private collection after his death in 1959. In 1939 the journal *Nature* stated that the collection was unrivalled by contemporaries at the time and a former keeper of zoology at the British Museum (Natural History) referred to it as the gem among British museums of comparative anatomy (Franklin, 1960). The same could be said today given that the Cole's collections, unlike many of its kind and age, are still intact and remain one of the most important collections of the comparative anatomy of animals in the UK.

Working at the then University College of Reading, Professor Cole was able to amass a collection with methods not always available to other collectors. He would actively involve students at the university college by asking that they donate any interesting specimens found during research field trips. Although active collection mostly ceased after 1939, student involvement in the museum is still strong today. Volunteers are welcome to help with the daunting task of 'collections management' and meet once a week to work on the collections. Volunteering with the insect collections for the past few years, the team I am personally involved with has been organising the specimens and digitising their catalogue.

Members of the public are welcome to visit the museum, which is open Monday to Friday 9:30am to 4:30pm, but the primary purpose of the collection, as Dr Callaghan points out, is as a teaching resource for the university. The Zoology degree at the university has its roots in the work of the first Professor of Zoology at Reading, Professor Cole, and has gone from strength to strength, now offering one of the most balanced degrees in Zoology available in the UK. The Cole collections are used by module convenors in the practical elements of teaching, and there is even a third year exam based on animal specimens from the Cole collections.

Curator: Dr Amanda Callaghan

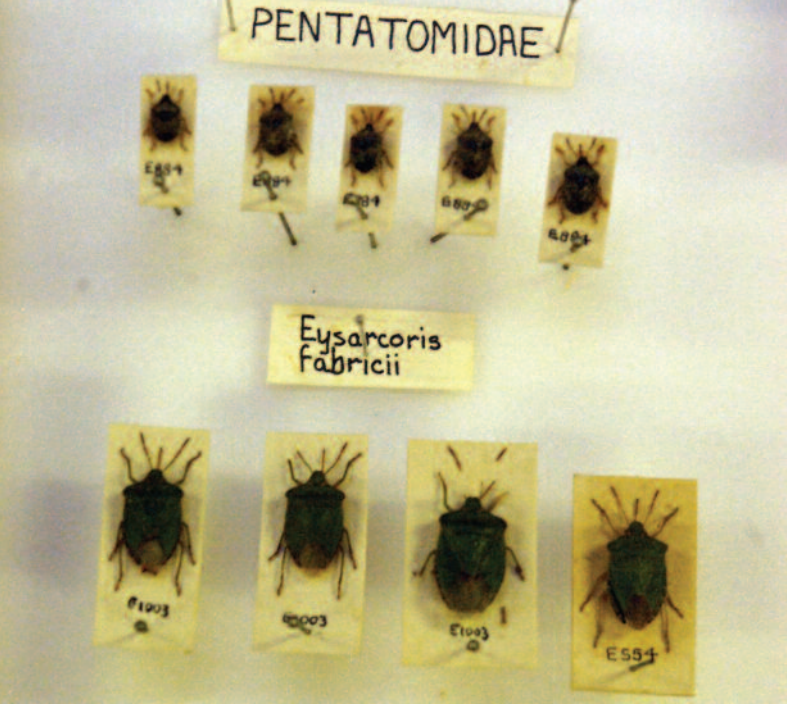
As with Professor Cole before her, Dr Callaghan is an academic at the university and works with the Cole Museum out of a passion for natural history. During our chat Amanda explains that museum curation was not something she had thought about during her early career, but it was her keen interest in natural history and taxonomy that led her to the role when called upon by her predecessor. Although warned that getting too involved with the university level management side of the museum would not be in her best interest, she explains that this became a necessary part of the job if the museum was to persist. Amanda explains about the difficulties a small museum like the Cole faces when it comes to funding. Especially in today's economic climate it becomes all the more important for museums to remain ahead of their game and to be as up-to-date and accessible as possible.

When asked what it is that makes the Cole Museum stand out Amanda explains that as far as she knows it is the only zoological collection that was formed at the beginning of the 20th century that is still intact. There are museums that are older, but those from the same period of time as the Cole have closed. The museum therefore allows a look at the natural history collections of the time, and indeed the collectors of the time, like few other places. The collections were originally based on comparative anatomy, this being Professor Cole's area of expertise, and are still very much in the same condition as when they were collected. Dr Callaghan's interests lie more with taxonomy and ordering the natural world to make it more understandable and accessible, so the collections are now presented with taxonomy in mind.

Insect collections at the Cole Museum

There are an impressive number of insect specimens at the Cole Museum spread over four collections. The Wise Collection of tropical butterflies is notable by any measure and includes many beautiful specimens from all over the world, including Burma, Kenya, Ghana and Sierra Leone (figure 2). Several trays of these are on display in the main area of the museum and form half of the overall insect display. The Bastin Collection was amassed by Harold Bastin before the First World War and mainly consists of economically important insects, particularly those from the Lepidoptera, Diptera, Neuroptera, Coleoptera and Plecoptera (figure 3). The trays are housed in the cabinet they were donated in and are accessible to students and to the public who wish to take a look. Bastin's insects are not simply pinned into trays, but instead have been displayed in a more informative manner, including larvae and pupal cases where possible. Certain specimens are even pinned in such a way that their habitats are illustrated (figure 4). Impressively, some of the caterpillars have been 'blown' and mounted dry. The labels on the outside of the drawers have been applied with modern day taxonomy, but inside the drawers the original labels remain, giving an impression of the change in taxonomy since the collection was originally put together.

The main teaching collection is not on display in the museum and is used only for delivering university modules. These specimens are usually collected during field trips or dissertation projects and are used during undergraduate and postgraduate entomological identification classes. Many of my own specimens from my final year project on the coleopteran family Scraptiidae have ended up in this collection. Then there is the largest of the collections, consisting of pinned insects collected over the past 80 years. Coleoptera and Hymenoptera feature greatly in the collection, but there are also specimens from Trichoptera, Hemiptera, Lepidoptera, Diptera, Orthoptera and Mantodea (figure 5). They have mostly been sampled in or around the Berkshire area, often by members of staff at the university. Some of the more spectacular specimens have been picked out to give a flavour of the collection's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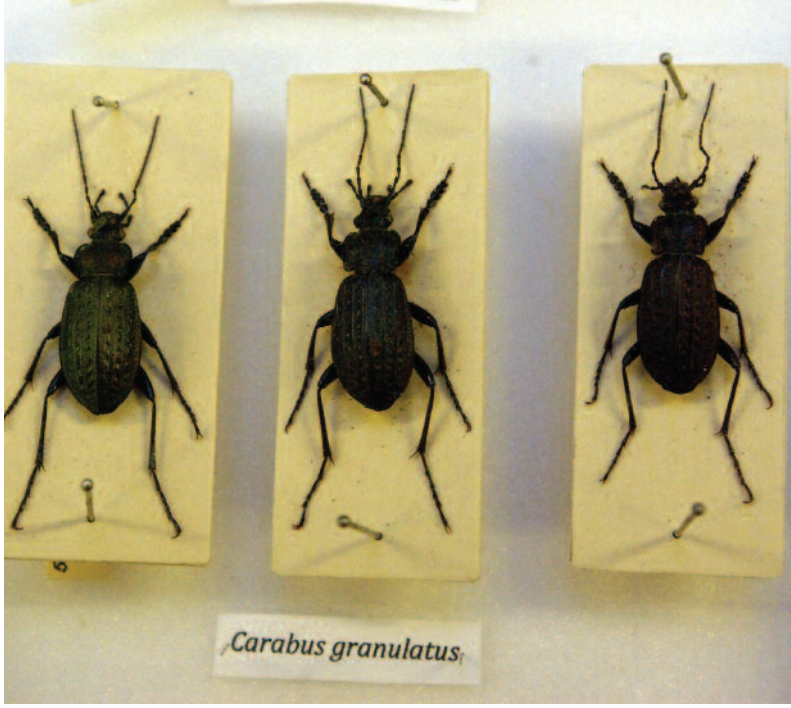
Eysarcoris fabricii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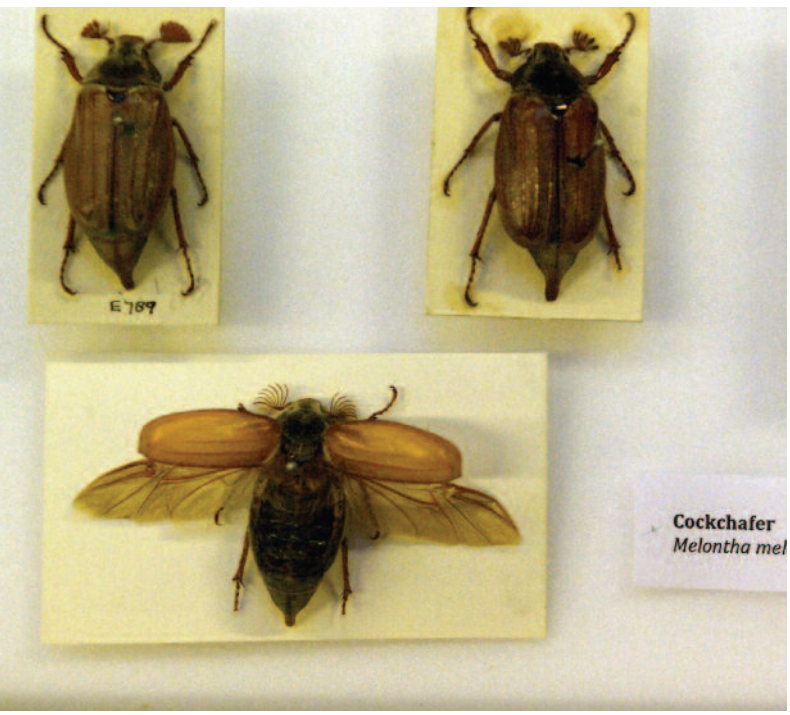
Cockchafer
Melontha mel


Glyphotaelius Steph:
126 pellucidus (Retz.).

Figure 6 (previous page): Some of the more spectacular specimens from the pinned collection, including a rather amazing looking mole cricket and some very colourful grasshoppers.

When asked about the reaction to the insect collections from students and the public Amanda explains that the latter tended to respond to the spider specimens more than anything else; indeed Amanda hadn't heard any specific responses about the insect collections. Regarding the students, Amanda explains that there is a perception, even among zoology students, that insects are boring. I would agree that this seems to be the case with some of my peers, many of whom are dismissive of invertebrates on the whole. The main reason for this could be a lack of exposure, and Amanda tells me that throughout her years of teaching she has noticed that students will often arrive with a negative or apathetic view of insects, but after exposure to their diversity and beauty will leave the university wanting to pursue a career involving at least some aspects of entomology. This seems to support that it is access to the resource that allows the true benefit of insect collections to be realised. Without access to insect collections, and without exposure to them in an interesting and educational light, the majority of people will retain their negative opinions towards this group.

Within the Cole accessibility of the collections to the public is impressive for such a small museum with very few staff. Students are also greatly encouraged to use the collections as part of their study. There are no workshops or events *per se*, but tours are offered by student volunteers and are quite an enjoyable way to experience the museum. There are several insect displays including specimens caught by students on the campus and the tropical butterflies are positioned in a way that attracts the eye as walking through the museum. The Bastin Collection is fully accessible, though the main body of tropical butterflies and other pinned insects are not. This is largely explained by the fact that the pinned insects are still being organised and there are plans to display them once the collection is ready.

The Cole Museum has provided us with the ideal starting point for our tour of insect collections in the UK. This small but important museum is involved with teaching the next generation of zoologists and fills an important role in the community, allowing access to its collections to anyone who is interested. But can it do more to engage the public with the collections and more specifically the insect collections? In the next article I will be exploring the collections of the UK further. Comparisons can, and indeed will, be drawn between institutes to highlight ways in which museums can improve their access to the public. It should always be remembered though that each museum is special in its own right and comparisons should not be made to discredit the work of any one museum based on that of another. This series of articles is meant only to advise the sector from the perspective of a fresh pair of eyes, and to highlight the collections and their 'delivery' in different museums. And of course to take a look at lots of interesting insects!

If you are the curator of an insect collection and would like to be represented in an article in this series please do get in touch on my Twitter account and I will be happy to arrange a visit. If you haven't discovered the exciting world of Twitter yet (I only did so recently) then my email address is also provided above.

Further Reading

The Cole Museum

www.reading.ac.uk/colemuseum/

The Cole Library:

http://www.reading.ac.uk/special-collections/collections/sc-cole.aspx

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Photographing Oxford's Lepidoptera type collection

Katherine Child & Zoë Simmons

Life Collections,
Hope Entomological Collections,
Oxford University Museum
of Natural History
Parks Road, OXFORD, OX1 3PW

http://www.oum.ox.ac.uk/

If you step into the main court of the newly reopened Oxford University Museum of Natural History (OUMNH) at the moment, you will find yourself overlooked by striking large scale images of sixteen Lepidoptera specimens from the Hope Entomological Collections (HEC). The insects in the 'Light Touch' exhibition have been chosen to celebrate the plethora of colour, delicate shapes and intricate patterning found within this insect order and they form the core of the 'Re-emergence' theme for the museums' reopening.

In December 2012, the museum was closed to the public for 14 months so that essential repairs to the original Victorian glass roof could be undertaken, it opened its doors once more on February 12th of this year. Prior to this, at the first sign of rain you would have seen staff hastily distributing yellow buckets around the museum's galleries, ready to catch the inevitable streams of water that would drip from the roof. The difficulties of working with 150 year old glass meant that the main gallery space of the museum had to be closed to the public and four layers of scaffolding were erected and boarded. During the period of closure each of the roof tiles was removed, cleaned, replaced and resealed, so that the museum is now much brighter and watertight for the first time since its original opening in1860.

The photographs which help celebrate the museum's long awaited re-opening are not only of some of the Hope collection's most beautiful butterflies and moths but also some of its most historically important. The images are, appropriately, suspended high up from the balcony and have

Figure 1. A view of the museum's south balcony with images from the 'Light Touch' exhibition.

been printed onto fabric banners, which tie in well with the gothic architecture of their surroundings (Figure 1). The majority were not taken specifically for the exhibition, but were part of a large-scale project to photograph the museum's Lepidoptera type specimens.

The museum houses somewhere in the region of 3,500 to 4,000 Lepidoptera types. Because of their historic and scientific significance (as well as the delicate nature of these insects), it is not always practical to put them in the post. By photographing each one we can provide a valuable alternative to mailing them, as well as opening up access to the collections for any researchers around the world who are interested in studying these specimens.

The insects in the exhibition hail from countries around the globe, with representatives from Europe, Africa, Asia, North, South and Central America. The collectors and authors associated with them include such notable names as Alfred Russel Wallace, Geoffrey Douglas Hale Carpenter (Hope Professor from 1933-48), John Obadiah Westwood (Hope Curator from 1857-1893) and Francis Walker, who was a prolific author and named countless species held within the Hope collections. There are a few non-types in the exhibition as well – specimens such as *Antigonis felderi* (Figure 2) which were included simply because they are so visually stunning.

An electronic catalogue of the butterfly and moth types had already been completed when the imaging project, funded by Museums and Libraries Association Designation Development Fund, began in June 2010. It was my job to undertake the imaging of the specimens and for each of the insects I took dorsal and ventral photographs, as well as photographs of all of the historic labels associated with them. The project was finally completed in February 2013 – 7,517 photographs later!

Figure 2. *Antigonis felderi* Bates 1864, one of the 'Light Touch' exhibition's non-type specimens.

Shape and colour play an important role when identifying Lepidoptera, so it was imperative to capture the colour as accurately as possible. This was a particular challenge given that the colour of the subject matter often changed depending on the angle it was viewed at when under direct light. Many moths and butterflies can look quite brown or black when viewed from directly above, but when tilted at a certain angle will display a fantastic iridescent sheen of blue, purple, green, pink, silver or gold. Similarly some of the very small moths in the collection look quite unpromising to the naked eye and it is not until they are placed under a microscope that tiny flecks of gold or silver or extremely fine patterning becomes apparent.

Maintaining as near to accurate colour as physically possible in the images was an on-going process. The camera I used for most of the types and their labels was a Nikon D50 SLR. It took a while to find the best settings for the colour temperature, saturation, contrast and so on, and it turned out that what worked perfectly for one specimen was not necessarily the case for the next, even with consistent lighting. Computer monitors needed regular calibration, and the camera's settings often needing tweaking as work progressed – it was frequently a case of trial and error (particularly in the initial stages).

The majority of the images will have had some degree of processing after they were taken. Photoshop has many useful tricks for altering individual or all colours in a photograph, and in this way it is possible to get them a little nearer to the colour of the original subject, if this has not been achieved first time.

As to the question of capturing a specimen's iridescence… often tilting the light box would give reasonable results, or adding extra light from the side, or even photographing the insect without any extra lighting, just using the available light in the room and a slower shutter speed.

When photographing the smaller moths, I was able to take advantage of the museum's photo-micrography system, which comprises a Leica camera mounted on top of a microscope and software which allows you to take multiple images throughout the depth of a specimen. Another program – Helicon Focus – then selects all the in focus parts of each photograph and combines them to make one complete, in focus image, giving you much greater depth of field than you would be able to achieve without this multiple image stacking. The system's pretty straight forward to use, and it's really good fun, especially with smaller insects.

As I worked my way through all of the types in the collection, I gradually became familiar with the names of the authors and collectors associated with the specimens, as well as some of the particular shapes and colours of the labels used by different entomologists. Westwood's diamond shaped labels with an underlined W at the top and Alfred Russel Wallace's small circular labels being among the most distinctive. Though the handwriting on some of the older labels was often tricky to read, it was always fascinating taking them off the pin and seeing what information was given. Often a description of the habitat or climate in which the creature was caught was given in spidery hand writing. Occasionally the labels even contained drawings or diagrams showing parts of the insect.

Some of the more memorable labels include the description of how the type specimen of the moth *Aegeria ferox* (Meyrick 1929) was caught in the summer of 1927:

'I saw this flying slowly and heavily among herbage and caught it as an Ichneumon, taking it from net very gingerly in fingers for fear of getting stung! Later saw another and was again impressed by the mimicry. Amar, near Gulu.' (Figure 3).

Figure 3. The finished plate for the type of *Aegeria ferox*, the labels describing details of how the specimen was caught.

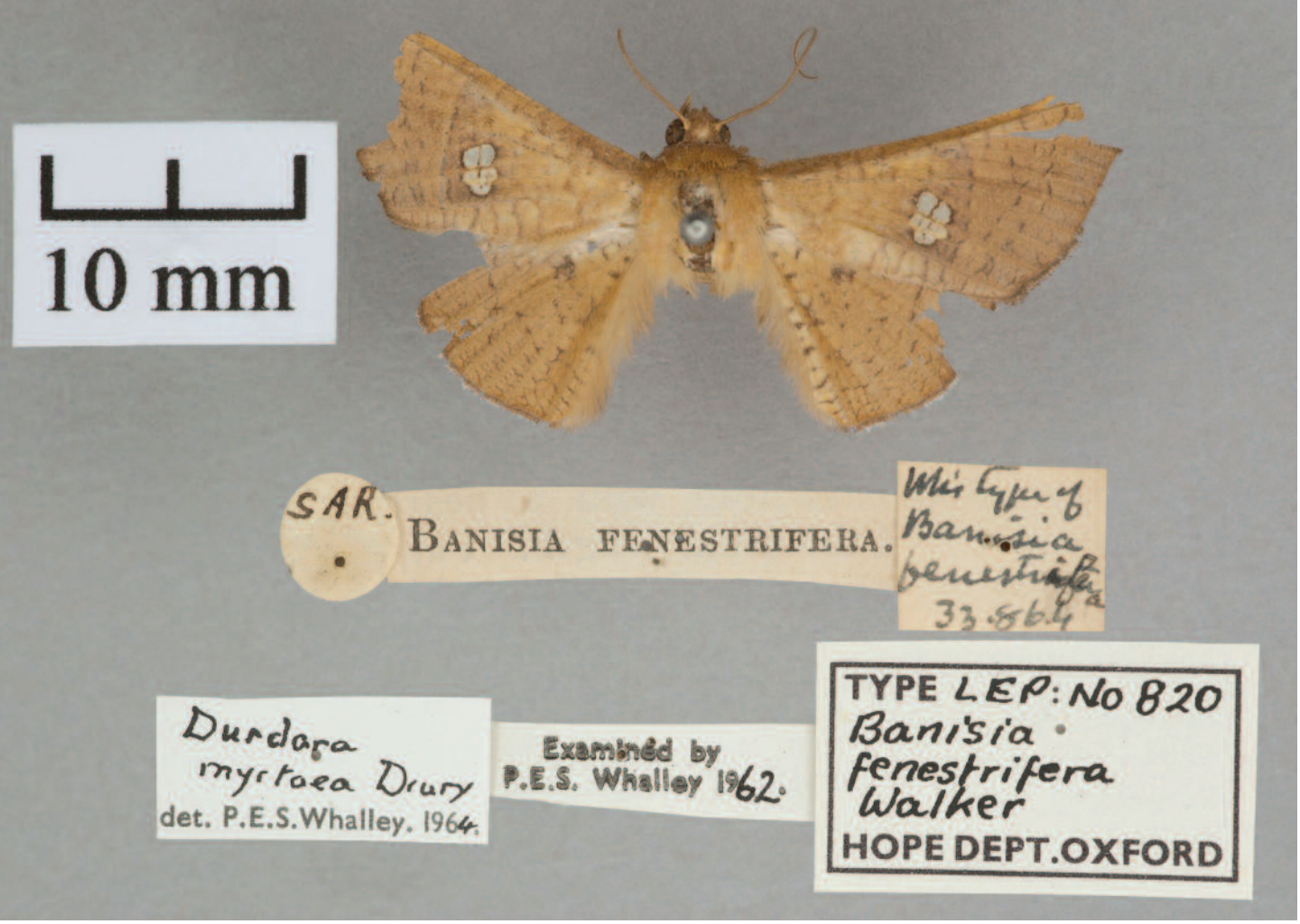

Figure 4. The type of *Banisia fenestrifera* clearly demonstrating the reason for its Latin name, 'windowed creature'.

Figure 5. The type of *Eusemia dentatrix*, with possible tooth shapes decorating its wings?

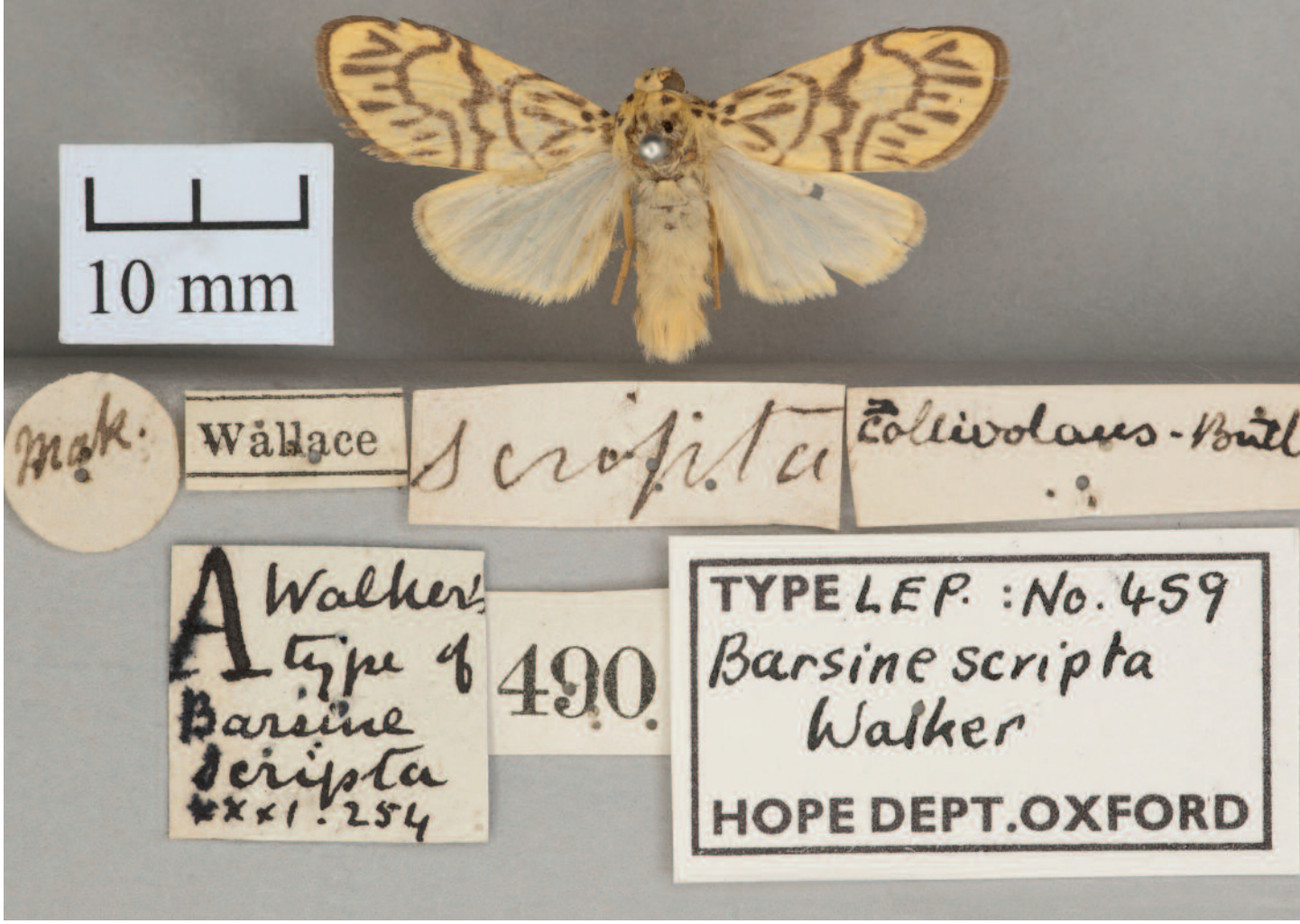

Figure 6. The aptly named *Barsine scripta* (*scripta* meaning written).

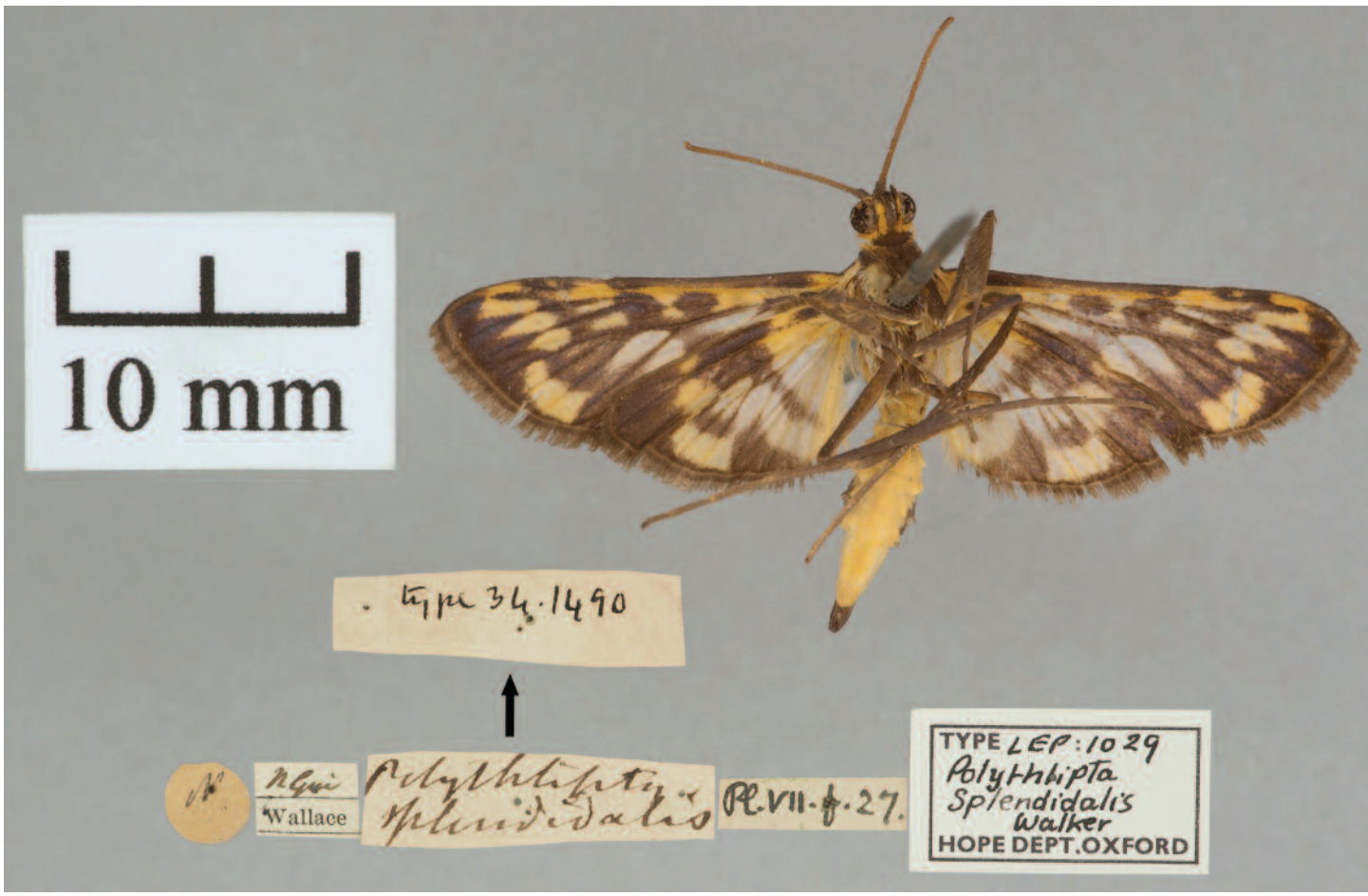

Figure 7. *Polythlipta splendidalis*, 'Splendid wings', still looks worthy of its name 149 years after this type specimen was caught.

Figure 8. *Pseudopompilia mimica*, the type specimen of this cleaver wasp mimicking moth.

The Ichneumon referred to is a parasitic wasp, and this seems to have influenced the naming of the species: *ferox* is Latin for fierce. Another label written in 1912 for the type *Tortrix callopista* (Durrant 1914) which measures less than a centimetre when its wings are outstretched, simply gives the number 625 and states:

'Very tiny but of much importance. Em. Jan 27th.'

Other labels give information such as: 'In swamp' or 'very dry country' or more specifically: 'Flying around house among flowers at Bwaidoga … 10am, sunshine'. Often labels were made from recycled documents or envelopes, some of which still have penny red stamps on their backs.

Not coming from an entomological background, often the full scientific or historical significance of the labels passes me by, but one thing I really enjoyed about the Lepidoptera project was looking at the species names. Even with little or no knowledge of Latin, many of these names are close enough to the English for their meanings to be clear, or else to be intriguing. It is always pleasing to find a name which plainly describes the specimen. Many were descriptive of colour, such as: *Horaga amethystus*, (amethyst), *Pithea ferruginea*, (rusty), *Hyblaea flavipicta*, (yellow painted), *Speiredonia prunicolora*, (plum colour), *Zebronia pyrrhalis*, (flame coloured stripes), just to name a few examples.

Others describe a particular feature such as the aptly named *Banisia fenestrifera*. *Fenestri* is Latin for windows and *fera* for beast or creature and this specimen comes complete with a small four paned transparent window in either wing (Figure 4). Similarly, *Eusemia dentatrix* (Figure 5) which, with a little imagination, could be described as having four pairs of pulled teeth decorating its deep black wings. Then there is *Edeta icarusalis*, (Icarus wings), with its swirling molten waxy patterning; *Opsirhina parallelina*, decorated by two distinct sets of parallel lines; *Hierochthonia featheri*, a soft green feathery looking moth; *Cyclosia noctipennis*, (night wings), which is a deep velvety black dotted with bright white or pale blue points of colour; *Lyclene vagilinea*, (roaming lines) – as the name sugests; the unfortunately named *Macaria pustularia*, whose patterning is actually very pretty; *Botys conglobatalis* with similarly attractive globules of colour; and *Hypoprepia ziczac*, and *Barsine scripta* (Figure 6) with their wonderfully scribbled-on looking wings.

Some were more vague in their descriptions, such as: *Polythlipta splendidalis*, (splendid wings), (Figure 7); *Asteroscopus nodosus*, (complicated); *Dysphania magnifica*, (from which the Spanish word for magnificent is derived); *Sacada decora*, (beautiful); *Poecilosoma gaudens* (delights).

Then there were names which seemed to describe something about the specimen's behaviour or nature, such as *Pseudopompilia mimica* (Figure 8), a moth which cleverly mimics pompilid wasps; *Synemon notha* with *notha* being Latin for 'fake' and this particular moth having clubbed antenna that resemble those of a butterfly; *Prodenia reclusa* and *Ephyra privata* are both small brown moths which I imagine to be shy; similarly *Aclonophlebia inconspicua* and *Lasiocampa inobtrusa*; then there is *Ceaena inquieta* meaning restless or 'unquiet' and *Bethura minax*, *minax* being Latin for menacing, though it is unclear quite why this small brown soft looking moth should have been named so.

There were also those names which I presume relate to the difficulties and subsequent resolutions which arose when describing the species: *Erosia conflictaria*; *Cosmophila inconclusa*; *Leptosoma confusum*; *Acontia indecisa*; *Boarmia contraria*; *Homoptera intractabilis*; *Nadagara indeterminata*; *Fisera perplexata*; *Eupithecia inexplicata* and reassuringly, *Ophisma correctata* and *Cotuza confirmata*.

Many species names relate to a specific locality, others such as *Pintia insularis* and *Chaerocampa insularis*, (coming from Singapore and Seram respectively) make reference more generally to their island locations, (*insularis* is Latin for islands).

With others the guess work becomes trickier: Does *Egnasia parsimonalis* refer to the way the specimen changed hands perhaps?; *Teracolus interruptus* may have to do with the abrupt change in the colour of its wings from cream to a bright vermillion at the tips; *Leptosoma absurdum* and *Sesquialtera ridicula* are disappointingly both quite modest in appearance… Other uncertainties include: *Botys inhonestalis*; *Agrotis interferens*; *Ephyra contentaria*; *Pseudomya desperata*; *Erosia indignaria*; *Acidalia destituta* and *Scoparia stupidalis*.

The majority of the species names I came across run along descriptive themes, but with the more unusual or unlikely names such as those above, it is fun to imagine the stories which might lie behind them.

The type photography project was first and foremost a practical way of bringing these important insects to those researchers or scientists who need them. The current exhibition furthers that by bringing some of the more decorative and interesting insects, which would normally be tucked away safely in their drawers, out into the newly shining light of main court for all to enjoy.

All of the type images will be online and made accessible through the museum's website in the very near future: http://www.oum.ox.ac.uk/

Society News

Mem.R.E.S.

Following discussion at the Membership Committee and Council it has been agreed that Members of the Royal Entomological Society may use the suffix 'Mem.R.E.S.' after their name. Student members may use the suffix when they have completed their degrees and have become full members of the society.

Gordon Port on behalf of the Membership Committee

Student Essay Competition

Once again the judges faced the difficult task of selecting three winners from the many excellent submitted essays and for the first time since the competition began the judges failed to reach an immediate consensus as to who the winners were. There was a healthy debate, but after much re-reading a decision was made and the following essays were selected.

The Judges would like to congratulate all of the entrants on the fascinating range of articles that was submitted this year and to encourage those who did not gain a prize to try again next year.

Congratulations go to the three winning entries that appear below.

1st PRIZE

The Lessons of the Lepidopteran

Galen Cobb

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One day, Bobby the Blue Jay was flying over a meadow, when he saw fluttering below him a large orange butterfly. Oh boy, he thought, a nice tasty treat before I fly home! So he swooped down to take a bite. Just as he was about to clamp his beak down, he heard a voice call out.

"You don't want to do that," warned the butterfly. "My name is Mrs. Monarch and my bright orange stripes are telling you that I'm poisonous. You'll get awfully sick if you try to eat me. I'm what they call aposematic. Let my colours be a warning to you!"

Disappointed, Bobby flew away wary of this colourful foe.

Monarch butterfly, *Danaus plexippus*

A monarch's bright colors and ornate patterning act as warning signals to its predators to stay away. They are highly distasteful and toxic to many predators, including birds.[1] In a study in which scientists fed a blue jay a monarch, the bird promptly threw up and refused to eat any monarchs later presented to it.[2] Poisonous organisms that exhibit bright colouration are called aposematic. Bright colouration helps predators more easily learn to avoid dangerous prey.[3]

Bobby searched the meadow more carefully, when he saw an antenna waving from a leaf. Then, he spotted the butterfly's eye. Perfect, he thought, this grey-blue coloured butterfly shouldn't be poisonous. He flew straight at the butterfly, aiming his beak at its head. To his surprise, just as he bit down, the butterfly he crushed flew away.

Above him a bunch of crows cawed and hawed. "That Eastern Tailed-Blue Butterfly really fooled you! You weren't going for its head. You ate the back of its hind wings."

Sure enough when Bobby opened his beak, he saw two torn pieces of wing fall out. He could now see that what he thought were antennae were two thin tails on the end of the wing and the eyes he thought he had seen were dark eye-like spots on the back of the light coloured wing.

Frustrated, he flew off into the forest back towards his evening perch.

Eastern Tailed-Blue butterfly, *Cupido comyntas*

The Eastern Tailed-Blue butterfly and related species, most notably ones known as the Hairstreaks, have these antenna-like tail projections on their wings. Eye-spots on the rear edge of their wings are also common. Some species can move these backside appendages as if they were real antennae.[4] Scientists believe that these features are meant to confuse predators. Predators will attack the wings of the butterfly, mistaking it for the butterfly's nutritious head. In some cases, the predator gets fatigued from the unsuccessful attacks and gives up entirely.[5]

The sun was setting and the forest lighting was dim. As Bobby swooped by a tree, he saw a flash of red and black striped wings. One last chance, he thought. But just as suddenly as the colourful wings appeared, they disappeared.

"I could have sworn that moth was right here." He looked around in wonderment. He went to perch on a tree. Just as he landed, from the trunk the flash of colour emerged again. Quickly, he followed it and just as he was going to catch it, the moth once again vanished! Bobby was very confused. He saw his friend, Nigel the Nighthawk.

"Nigel, what's happening? Every time I try to catch one of these red and black striped moths, it disappears."

"My old friend, you are not alone. These moths continually confuse me. Their top set of wings blends so perfectly with bark of these trees and when they move that flash of their colourful underwings is so startling I can hardly think before they land and disappear again."

Underwing moths, genus *Catocala*

The *Catacola* have a sharp contrast between their upper and lower wings. The upper wings are intricately patterned with browns, grays, and blacks. Behaviourally, they fold their lower wings under these patterned upper wings, so the upper wings act as camouflage shields while they are perched. The lower, or under, wings have brilliant patterning of red and black stripes. If a predator comes too close, the underwing moths will quickly open their wings exposing this colour and fly away. Scientists believe that this unexpected flash of colour startles the predator.[7,8] While the predator is disoriented, the moth is able to fly to another perch and once again blend with its surroundings. Predators have shown an ability to adjust over time to the colours and patterns.[8]

"Between the poisons and trickery, I give up on these butterflies and moths," declared Bobby. So he swooped down and searched in the leaf debris until he found a fat earthworm.

"Finally, a meal without complications." Bobby chomped down and flew off to his perch to enjoy his wingless snack.

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2nd Prize

Worlds within worlds, within a changing world

Sarah Luke

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"What are we doing today?" my Malaysian research assistant, Ling, asks.

"Cuci batu" – washing rocks, I reply. "The stream's really dirty", I joke. "We must make sure all the rocks are clean".

We place our Surber sampler – a metal frame and net combination for catching aquatic invertebrates – over the rocks and pebbles on the stream bed, and start to disturb the rocks, gently cleaning and scrubbing each stone in turn. As we 'wash' the rocks, insect larvae clutching their surfaces are dislodged and swept into the net.

I continue to joke as we complete the survey. "Would your family laugh if they knew you were washing rocks?"

"Yeah – scientists are 'gila'!" he replies. "Crazy!"

But then we hoist the sampler out of the stream and see a net teeming with life – a whole world within a world of a rainforest stream in Borneo. We tip the net out into a white tray and excitedly look to see what we've caught. These big ones are dragonfly nymphs – can you see their terrifying jaws? Those ones have gills all down their bodies – they're Ephemeroptera. These are like mosquito larvae, says Ling. Yes, they're a type of Diptera – 'true flies'. We pick out anything that's moving with dropper pipettes and put it into alcohol to kill and preserve it for later identification.

We repeat this across multiple points in a stream to make sure we have a good sample of the whole insect community, and we repeat it across multiple streams each surrounded by different land use to look for differences between streams. I'm interested in the effects of rainforest logging and conversion of forest to oil palm plantations on stream ecosystems in Malaysian Borneo. Rates of logging in the region are high because of the valuable timber industry and also to clear land to grow oil palm – the tree which produces the palm oil that is increasingly used in processed foods, cosmetics and biofuels around the world. This land use change is an important part of the economic development of Malaysia, but also causes significant impacts on natural ecosystems and the amazing biodiversity of the region. Logging and oil palm plantations can damage streams through inputs of sediment and pollutants, reducing shading and decreasing the amount of leaves and wood that fall into the stream. However, we know very little about how this affects the insects living in these streams, and the functions they perform, and what conservation steps can be taken to try to reduce the bad impacts.

Once our collections are done I bring the insect specimens back to the UK for identification. It's important for us to identify what we have found so that we can assess the 'health' of the streams and look for significant changes caused by logging and oil palm. How many insects we've caught, how many different species and the identity of these species – whether they're ones you only find in forest, or only in Borneo, or ones that feed on a particular thing or will happily

eat anything, or perhaps one that can withstand pollution or ones that really can't – are all important things to know. But unfortunately insect larvae are too small to be able to identify them live or without magnification. We need to see them under a microscope to appreciate the detail of these organisms and the fascinating differences between them that separate first one order from another, and then when we get a bit further, different families, genera and finally species from each other. A world of intricately different species, within different groups, is brought to life under the microscope.

I work with undergraduate students doing their research projects, and using keys, books and scientific papers, we try to puzzle it out. First we identify the larvae to order: big or small eyes, tails or no tails, gills on its body? No? Well does is have a large plate-like jaw? How about long thin pointy jaws? And when we're happy with this we dig deeper and into the world of families – the next most detailed taxonomic level.

"The mayfly gills are so delicate. You can see what look like blood vessels."

"I've got a hairy armpit Plecoptera here!" We look at a stonefly nymph whose gills grow in tufts from the top of its legs.

Unfortunately the taxonomy of many of these Malaysian insect larvae is not yet well known enough for us to be able to identify everything to species, but even identifying them to family level will tell us important things about these streams and how they are being affected by the changing world around them. We hope we can learn some more about them, try and find some ways to help protect them, and crucially, get people excited about a hidden world.

3rd Prize

Sweet dreams and the Vitruvian Fly

Mariana De Niz

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Any character that has earned a place in the works of Joseph Conrad, David Livingstone, Patrick Manson, and – why not – *Jumanji*, is worth at least its own essay. The character? Possibly the most intimidating presence of the tropical world: the *tsetse* fly.

The first time I heard about the *tsetse* fly some decades ago, was indeed through Chris Van Allsburg's *Jumanji*, where aside from monsoons, monkey troops and rhino stampedes, the most memorable characters were huge *tsetse* flies capable of inducing sleep! Naturally, aside from Van Allsburg's imagination, the *tsetse* fly has for centuries captivated academics and writers, and many forms of human knowledge and skill in an attempt to control human sleeping sickness, and nagana. In memoirs recovered from the African colonial period, tsetse flies were often referred to as '*owners*' of entire valleys and lands between the Sahara and the Kalahari. Owners… It is difficult to picture, and indeed a humbling idea, that of an insect pre-dating humans by millions of years, dictating the spread of man-made settlements and in fact defining economy, health and, for many, lifespan.

While the trypanosomes are intriguing creatures themselves, the tsetse flies are more than the delivery-personnel for the parasite. With a unique anatomy ranging from a scary proboscis to peculiar reproduction methods, eye optics, aerodynamics and wing geometry, this fly is one of a kind. Despite countless extraordinary characteristics, I will dedicate my story to two of the features that would make tsetse flies my nominee for the *Time* insect of the year, if such a tradition existed.

When I first looked at a tsetse fly under the microscope, I felt as adventurous as Steve Irwin taming crocodiles: the only thought in my mind when I saw the proboscis was whether the fly was adequately anaesthesized! The proboscis of all hematophagous insects, is a scary device: imagine mouthparts and mandibles packaged into tubes, stuck into your skin for blood sucking. Not very pleasant! But even among insects, there are mouthparts…and mouthparts. It is less scary to think of my or your teeth in a tubular version, as opposed to those of a shark. In the case of the tsetse fly, not only is the proboscis much longer; it is an actual piercing machine, armed with teeth and rasps at the tip, able to destroy subcutaneous capillaries and of producing miniature pools of blood that are suctioned by a 'pump' in the diaphragm. The denticles at the tip help cut into the skin and actually anchor the proboscis during feeding... The closest equivalent I can think of in our size-scale is the fearsome eel's mouth with its raptorial pharyngeal jaw. Needless to say, it is a painful bite!

The trypanosome puts the importance of the proboscis at a new level: the proboscis harbours the infective metacyclics, and injects them together with saliva into the hosts during blood feed…Time to sleep! In fact, the parasite itself is believed to worsen the already intimidating feeding process! In order to form pools of blood and feed on them, the fly must inject anti-coagulant factors and inhibit the host's haemostatic reactions. Apparently, the parasite hampers the anti-haemostatic potential of the saliva, forcing the fly to feed for longer – do more bites – to increase the chances of parasite transmission. More bites!?

The second feature that makes these flies quite peculiar, lies more in the field of optics. The fly seems to have an exotic colour taste. The eyes show a preference for pthalogen blue, due to increased spectral sensitivity in the 400-500nm-wavelength range in specific cell types. Black and UV-reflecting white, on the other hand, stimulate the encounter, luring tsetse flies to landing sites. No one knows why, but current hypotheses include the association of the colours with suitable hosts, and the association of black and blue with daytime shadows that the fly may relate to resting places. Having discovered such peculiar taste, humans have developed ingenious designs for tsetse traps that combine the colours in cloths of various shapes that simulate movement. Impregnate these bi-colour cloths with artificial odours specific to each fly species, and voila! You'll have a fly magnet… While travelling through tsetse fly-inhabited zones in Uganda and becoming aware of the traps around me, I questioned my bias towards black and blue in my clothing… oh well, apparently, they dislike yellow!

Certainly fascinating creatures, tsetse flies have played a major role in the composition of the current African landscape and health along the 'tsetse-belt'. Among the various descriptions and analyses of this insect, I found one that conveyed a rather straightforward message defining our struggle with them, which I found memorable. *"Most tsetse flies are physically very tough. Houseflies are easily killed with a fly-swatter but it takes a great deal of effort to crush a tsetse fly."*

SCHEDULE OF NEW FELLOWS AND MEMBERS

as at 5th March 2014

New Honorary Fellows
None

New Fellows (1st Announcement)
Mr Andrew Frederic Edwyn Neild
Dr Emilio Guerrieri
Dr Charles Vincent
Dr Richard Montague Merrill
Professor Malcolm Burrows

Upgrade to Fellowship (1st Announcement)
None

New Fellows (2nd Announcement and Election)
Dr Richard Michael Smith
Professor Locke Rowe (as at 4.12.13)

Upgrade to Fellowship (2nd Announcement and Election)
Mr T M D Ranjith De Alwis (as at 4.12.13)

New Members Admitted
Dr Johanna Lindahl (as at 4.12.13)
Mr Corin Pratt
Miss Kelleigh Greene (as at 4.12.13)
Dr Ivan Hiltpold (as at 4.12.13)
Dr Olaf Schmidt
Dr Nicholas Peter Swift

New Student Members Admitted

Miss Fevziye Hasan (as at 4.12.13)
Miss Ceri Marie Watkins
Miss Alice May Gribble
Mr Jack Lee
Miss Eleanor Passingham
Miss Sarah Anne-Leigh Scriven
Miss Ruth Wade
Ms Myrsini Eirini Natsopoulou
Ms Alix Dawn Blockley
Mr William Garrood
Mr Geoff Stanley
Mr Alan R Davis
Miss Mary Sumner
Mr David Swan
Miss Sue Shemilt
Miss Katrina Dainton
Ms Ashley Lyons
Mr James Wilson
Miss Charlotte Miller

Re-Instatements to Fellowship
Mr Peter Michael Hammond

Re-Instatements to Membership
Dr Faye Messervy
Dr Jo-Anne Nina Sewlal

Re-Instatements to Student Membership
None

Deaths
Mr R S George, 1951, Bournemouth
Professor H Z Levinson, 1975, Germany
Miss R M Badcock, 1956, Powys
Dr J C Taylor, 1959, Australia
Mr M J Sharp, 1978, Whitsable

Meeting Reports

The Dublin Botanic Gardens hosted the State of Insect Conservation in Ireland meeting.

Meeting report: The State of Insect Conservation in Ireland

Archie Murchie

In late October 2013, the Botanic Gardens in Dublin hosted a meeting on the 'State of Insect Conservation in Ireland', which was well attended by around 90 entomologists from across Ireland, Britain and Europe. The two day meeting was sponsored by the National Parks and Wildlife Service (NPWS), organised by the Royal Entomological Society and supported by the Agri-Food & Biosciences Institute, Belfast and the National Biodiversity Data Centre, Waterford.

The meeting was opened by Dr Ciarán O'Keeffe (Director NPWS), with plenary speakers Prof. Jeremy Thomas (RES President / University of Oxford) and Dr Chris van Swaay (Butterfly Conservation Europe). The first day was titled 'Untangling the web – where are we with the Marsh Fritillary' and the second day 'Hovering on the edge – threatened species evaluation in Ireland'. As part of the conference, there was also a special public lecture on the Painted Lady by Dr Constanti Stefanescu (Granollers Museum of Natural Sciences).

Although the topic of this meeting was insect conservation, much of the discussion related to land-use management in Ireland, and in particular the role of agriculture, fisheries and forestry in habitat maintenance. Although the usual threats to wildlife of intensification of agriculture were highlighted, so too were the dangers posed by abandonment and lack of management. It would seem that agriculture is an integral part of insect conservation and in maintaining the Irish fauna. This is crucial if Ireland as a whole is to meet European targets for preserving biodiversity.

This was a most enjoyable meeting with detailed accounts of hands-on, practical conservation, an excellent venue and good craic. One or two pints of the black stuff may also have been consumed.

(L to R): Dr Eugenie Regan (UNEP-WCMC, Cambridge), Dr Brian Nelson (NPWS), Prof. Jeremy Thomas (RES President / University of Oxford), Dr Archie Murchie (AFBI), Dr Ciarán O'Keeffe (Director NPWS)

Abstracts

Professor Jeremy Thomas

(Royal Entomological Society/Oxford University)

Lessons for Conservation from Recording Change in Insect Populations

Rigorous recording schemes to measure change in insect populations have existed for approaching 50 years in the UK, and have developed greatly in Ireland and other European countries in recent decades. Their aims range from sampling macro-invertebrates in order to assess the quality of European freshwaters for human health, and – more importantly for this meeting - to informing conservationists of changes in species' status. For conservation, two complementary approaches have been invaluable: mapping schemes that record distributional changes and monitoring schemes (e.g. Rothamsted Insect Survey, UK Butterfly Monitoring Scheme) that generate time-series of population changes on fixed sites. To date, the longest running and largest-scale insect recording schemes across Europe involve Butterflies and macro-moths, but recent work suggests that other insect taxa have experienced similar or amplified declines.

In addition to the basic tasks of informing conservationists of what is happening to native insect species, where they occur, and providing a base-line against which local conservation initiatives can be assessed, terrestrial recording schemes are providing a wide range of benefits, ranging from raising public (and political) interest and involvement in insects to many insights into the structure and dynamics of species' populations. Examples of the latter include understanding the migratory patterns of mobile species; an aid to identifying the main different drivers of change in different species; predicting the impacts of future land-use and climate changes; and insights into the existence, or not, of regionally adapted races of species, as well as their plasticity in the face of environmental change.

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The conservation status of the Marsh Fritillary in Ireland 2013

The Article 17 report on the status of priority species and habitats in Ireland was completed in 2013. The report covered the 6 year period 2007-2012 and the assessments were made with reference to the previous reporting period of 2000-2006. The overall conservation status of the Marsh Fritillary was assessed as Unfavourable. This is due to an assessment of a declining population and that the threats and pressures identified as operating currently are not likely to reduce over the next cycle. Range and habitat for the species were both considered Favourable. The species has been found throughout Ireland although the range is concentrated in the centre and west. In the eastern coastal counties from Waterford to Louth the species has always been restricted but the recent find of the species on North Bull Island within Dublin City shows that even here there are areas that can support the species. It is more widespread in Wicklow than previously appreciated.

Population in Marsh Fritillary is very difficult to measure. Counts of the adults or webs are prone to large variation and without a long time series, trends can be difficult to determine. Limited data from the Irish Butterfly monitoring scheme indicates a decline and the expert opinion of the Red List assessment was that the population has declined by perhaps 30%. More data is needed on site occupancy in Ireland which is considered the best surrogate for population. Are sites diminishing in number or are they becoming smaller and more isolated?

Questions that have come about from the surveys for NPWS include the following. Is the species more mobile in Ireland than elsewhere in its range and is this mobility preventing the declines and isolation of populations seen elsewhere? How significant is grazing in maintaining sites? Is land abandonment a significant factor in some areas creating temporarily suitable habitat? How do we explain the inconsistencies of occurrence on windswept heaths in Donegal with apparent need for shelter? Why is the species not all over the Burren? Is grazing holding it back? Is the boom and bust population a product of declining habitat and food resource? Why do we not see many parasites and if these are not significant what controls the population? Answers to many of these questions may be impossible to find, but some are essential to maintaining this our only Annex II insect species a widespread feature in the Irish countryside.

The President and Dr Brian Nelson enjoying the conviviality of a Dublin hostelry

Kyle Hunter

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The conservation status of the Marsh Fritillary in Northern Ireland 2013

2012/13 saw the 3rd round of European Reporting under Article 17 of the EU Habitats Directive. Marsh Fritillary was selected as a pilot to test the reporting tool and mechanism with the report being completed mid-2012. Three main status areas were reported on including Range, Population and Habitat with pressures and threats identified. Data was mined from NIEA Art 11 and ASSI surveillance programmes and from the Centre for Environmental Data and Recording (CEDaR); this was used to inform expert opinion and draw conclusions. Evidence from outside NIEA was often inaccurate and lacked consistency in survey approach; this presented a risk to the quality of the output. Knowledge gaps, recommendations for future work and surveillance were identified through the reporting process with the aim to provide statistically robust, fit for purpose data to facilitate accurate reporting in 6 years time.

Georgina Thurgate

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The conservation status of the Marsh Fritillary in Northern Ireland 2013

To help fill this knowledge gap, NIEA funded CEDaR to carry out Marsh Fritillary surveys in Counties Fermanagh and Tyrone. In 2012 a survey was carried out to assess the distribution of Marsh Fritillary colonies, the number of larval webs and the quality of suitable habitat. The survey focused on 7 large target areas outside of the designated site network, which were identified by NIEA as the most likely to hold Marsh Fritillary habitat. Using a variety of NIEA datasets and CEDaR records, as well as rapid field assessments, the target areas were reduced to approximately 300ha for detailed survey. The results of the survey were undoubtedly impacted by the adverse weather conditions experienced in 2012, but nevertheless 118 larval webs were found at 15 of the 41 survey sites. Another survey is currently being conducted in 21 Areas of Special Scientific Interest in Counties Fermanagh and Tyrone.

Will Woodrow

(Woodrow Sustainable Solutions Ltd, Sligo)

Notes and lessons learnt from Marsh Fritillary population and habitat surveys in north and west Ireland

Surveys of marsh fritillary populations were undertaken in different parts of North and West Ireland in 2011, 2012 and 2013. These surveys have all been aimed at improving our understanding of the distribution, population ecology and needs of the species. They have allowed for population monitoring of sites, the testing and development of a habitat assessment approach as well as rapid assessment approaches for large, previously unsurveyed areas.

During this time detailed population surveys have been undertaken in successive years for the first time on some sites, providing insight into how the species uses sites over time and raising speculation on how it responds to environmental pressures. Populations at different sites were observed to change in both numbers and in the spatial use of the site during two years of survey in 2011 and 2012. Habitat condition remained largely the same for most sites during the two years with the exception of noted deterioration at one or two sites, highlighting how easily such sites can be damaged by management change.

A number of parameters were recorded at web locations and the association of webs with areas of structured vegetation in general and with individual features, such as tussocks, in particular, was notable. It is considered that such features are likely to have a role to play in the ecology of different stages of the species but may also be indicative of more established sites rather than ones that have been subject to recent management change.

Surveys in 2013 concentrated on habitat assessments and rapid surveys of large areas of potentially suitable habitat in order to gain a picture of the area of potentially suitable habitat, and hopefully to find new colonies in two border counties. Experience from earlier survey seasons allowed for confidence in the potential for rapid survey approach to locate populations of marsh fritillaries. New colonies were found during the 2013 surveys, a number of which were located on small, disparate or impacted sites. Large areas of suitable habitat were found and mapped in 2013. Many of these areas had no marsh fritillaries recorded in 2013 despite the species being recorded in the wider locality, or in some cases at the site, in previous years.

Three years of surveying for marsh fritillaries has helped to better understand the species in terms of ecology and distribution. It has also raised further questions relating to the population dynamics of the species in the wider landscape and has highlighted the need for conservation of suitable habitat for the species throughout its range.

Faith Wilson

(Ecological Consultant, Wicklow)

The Marsh Fritillary survey of south and east Ireland 2012

Faith Wilson, Ken Bond, Patrick Crushell, Peter Foss & Christian Osthoff

Marsh Fritillary (*Euphydryas aurinia*) is the only insect species in Ireland listed under Annex II of the EU Habitats Directive. As part of our national monitoring obligations, NPWS commissioned a survey of Marsh Fritillary sites in S and E Ireland in 2012. 32 sites were surveyed in the field and a search for larval webs was conducted. Habitat condition was assessed over the entire site and at the location of each larval web. Breeding was confirmed at 16 of the 32 sites surveyed. Within these sites larval webs were recorded at 20 of the 46 sub-sites surveyed. In general webs were mostly found in sub-sites which were deemed to be in good condition. Of the 46 sub-sites surveyed, 35 sub-sites were found to be in good condition, with nine sub-sites being suitable but under grazed and one sub-site deemed unsuitable. The most common habitats with Marsh Fritillary was wet grassland, followed by cutover bog (PB4) and rich fen and flush (PF1). Other habitats used by breeding Marsh Fritillary included dry calcareous and neutral grassland (GS1), dry meadows and grassy verges (GS2) and dry humid acid grassland (GS3) – 2, 3 and one sub-site respectively. Only one coastal site with dune slacks (CD5) was surveyed. Dry calcareous heath (HH2) was present at two sub-sites.

In terms of habitat management 11 sub-sites were grazed by cattle, deer were the principal grazer at 4 of the Wicklow sites, seven sub-sites were grazed by horses and 22 sub-sites had no grazing at all. The vast majority of webs were located amongst structured vegetation (97%), with no evidence of grazing (93%) and an absence of low invading scrub (85%). 85 % of webs were recorded from locations where the abundance of *Succisa* exceeds 10 individuals / m².

Several of the sites had previous records of larval webs and there appears to have been a decline in breeding populations of Marsh Fritillary at these sites. The species is in urgent need of a national species action management plan supported by an agri-environment scheme, which would support and incentivise landowners with breeding Marsh Fritillary on their lands to implement an appropriate grazing regime.

Dave Allen

(Allen & Mellon Environmental Ltd, Belfast)

Don't forget the bycatch – adding value to Marsh Fritillary surveys

When undertaking marsh fritillary larval web surveys the surveyor spends a great deal of time staring at the ground. Inevitably non-target species will be seen and rather than dismissing them natural curiosity led the author to try and

identify some of the more seemingly obvious invertebrates. Many are easy to identify and have turned out to have apparently local distributions or are even true rarities such as the attractive ground beetle *Lebia cruxminor*. Recording the bycatch does not impact in any negative way on the primary task of recording marsh fritillary larval webs. After over five years work it is now possible to define an expected invertebrate assemblage associated with typical Irish marsh fritillary habitat. It is hoped that increased awareness of this suite of species will result in increased recording and an increased knowledge of these species in Ireland.

Nigel Bourn

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Landscape scale conservation for the Marsh Fritillary: case studies from the UK

Ecological theory, from island biogeography to metapopulations have encouraged conservationists to think beyond single site safeguard to operating at a landscape scale. Here we describe how recent advances in metapopulation theory have influenced the work of Butterfly Conservation.

Butterfly Conservation staff are involved in over 70 'landscape scale' projects, which for the purpose of this paper can be defined as 'the coordinated conservation and management of habitats for a range of species across a large natural area, often made up of a network of sites'. Here I describe three case studies of our work to conserve the Marsh Fritillary *Euphydryas aurinia*. In all cases recent declines have been high but targeted conservation effort across the landscapes has begun to yield positive results. Two case studies will illustrate work undertaken by Butterfly Conservation with our conservation partners in the south west of Britain, the 'Two Moors threatened butterflies project' and the 'Dorset marsh fritillary project', while a third will look at the situation in Scotland. The key lessons learned from over 10 years of experience will be explored and are of relevance across other highly intensified agricultural systems.

Neil Ravenscroft

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Habitat Associations in the Burren and Scotland: Chalk and Cheese?

Surveys of Marsh Fritillary *Euphydryas aurinia* populations were undertaken during 2012 in two distinct parts of its NW European range – the Burren, SW Ireland, and on the Isle of Islay, western Scotland. Both populations were highly restricted in 2012. The populations of the Burren and Islay occur in seemingly very different environments: the former on thin soils over limestone and the latter largely on acidic peats and other wet soils. Despite this, they share many features, including extensive landscapes with abundant habitat that is far more widespread than *E. aurinia*, and similar web microhabitats.

Recent work on Islay suggests that sites that remain occupied during population contractions have complex vegetation and improved edaphic conditions compared with abandoned sites. These features were also characteristic of web locations in the Burren. The foodplant *Succisa pratensis* is not always more abundant at these higher quality sites, but appears healthier and often shows features associated with younger populations. Vegetation is usually short and grazed heavily, but livestock in extensive grazing systems concentrate on these areas – high quality sites also exist in the absence of livestock. I believe that intrinsic site character is the principal component of habitat quality and precedes general vegetation composition and management, but it is difficult to tease apart the relative importance to *E. aurinia* of the variety of factors operating in these habitats without studying their impacts on its biology. Current work on Islay is examining caterpillar biology and foodplant condition during the acute spring feeding period in relation to the persistence of *E. aurinia*. The rate of site turnover is high on Islay and the population is expanding currently and will probably peak again around 2016.

The 'Flash Speakers' await their turn for a mini-presentation

Andy Bleasdale

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Agri-environment in Ireland. How do we get to where we need to be?

Ireland has obligations under the Habitats and Birds Directives to ensure that Natura 2000 sites are protected and appropriately managed. As most of the lands of the State are managed through farming, agricultural policy, programmes, schemes and measures are central to the conservation of farmland biodiversity. Article 8 of the Habitats Directive envisages funding being targeted towards the cost of managing Natura 2000 sites. The EU Commission takes the view that funds are made available through, and should be sourced from, the existing financing instruments. Improved targeting of future financial supports under the Rural Development Programme for Ireland 2014-2020 is critical if farmland biodiversity is to be protected in designated areas and in the wider countryside in High Nature Value (HNV) farmland.

The Prioritised Action Framework, which Ireland submitted in 2013, provides a focus on realistic priorities for Natura 2000 over the next programming period. This is further elaborated for biodiversity in the wider countryside in the National Biodiversity Plan 2011-2016, which mirrors the targets of the EU Biodiversity Strategy to 2020. This prioritisation will allow Ireland to plan in a strategic way to meet the main biodiversity challenges of the years ahead.

The biodiversity challenges for Ireland in the upcoming programming period include restoration goals, cessation of turf cutting, grazing regulation in the uplands, addressing species declines, closure of ECJ cases etc. Over the last fifteen

years, Ireland has had four separate adverse findings against it in regard to failures to meet the requirements of the Nature Directives.

In the next period, Ireland must ensure better targeting and spending of monies, improve monitoring, reporting and delivery of agri-environmental schemes and structures, address policy anomalies and perverse incentives and ensure better integration and balance between direct supports and agri-environment supports.

Chris van Swaay

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Red Listing and Monitoring of Butterflies at a European scale

The main goal of IUCN Red Lists is to provide information and analyses on the status, trends and threats to species. In 2010 the European Red List of Butterflies showed that of the 435 butterfly species in Europe, 40 were considered threatened or extinct. A third of the species is in decrease, with nowadays the strongest declines in Eastern Europe. The main threats are agricultural intensification and abandonment.

Where Red Lists are only updated once every ten years or more, indicators can provide annual updates of changes in butterfly diversity by using Butterfly Monitoring Schemes. I show two types of indicators: a species-trend indicator (the European Grassland Butterfly Indicator) and a community-change indicator (the European Butterfly Climate Change Indicator). The Grassland Butterfly Indicator shows that the populations of characteristic grassland butterflies have declined by 50% since 1990. Because of the changing climate, butterfly communities have shifted more than 100km north in 20 years, much more than birds, but much less than the temperature. The Irish Butterfly Monitoring Scheme is doing very well and is an important addition to the European trends. With all the other schemes it is possible to keep track of changes in butterflies in Europe.

Brian Nelson

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Overview and Application of Irish Invertebrate and Insect Red Lists to Date

Red Lists of Irish insects have been produced since 2006 with the List of Irish Bees. A new series of Red Lists commenced in 2009 and insects and invertebrates understandably given the number of species have been a significant focus of the process. There are certain requirements that need to be in place before a red list assessment can be undertaken and these include a verified and comprehensive database and expertise in the Irish fauna. There have been five invertebrate red lists completed to date covering four taxonomic and one ecological group. This still only represents about 3.5% of the Irish invertebrate fauna. Some of the projected red lists do include some species rich groups including the Larger Moths (750) species) and ground beetles (165 species). The applicability of the red lists are just being developed. Their use in site assessment should be much more common than it is and NPWS should use it as a criterion for NHA declaration. Some of the red listed species may be considered for Schedule 5 of the Wildlife Act if it can be demonstrated that the species would benefit from this level of protection.

Úna Fitzpatrick

(NBDC, Waterford)

Red Lists: the Next Steps

A Red List assesses the extinction risk from Ireland. However, the IUCN point out that conservation priorities cannot be based solely or primarily on extinction risk. The relationship between species identified as threatened with extinction through the Red List process and those that should be recognised as national conservation priorities will be discussed. Moving on from a Red List, through to identification of conservation priority species and the ultimate conservation of these species within the landscape throws up a number of significant national data needs. Three of these needs will be discussed with suggestions on how they might be addressed.

Richard O'Callaghan

(NPWS, Dublin)

Freshwater Pearl Mussel Conservation in Ireland

The Freshwater Pearl Mussels, *Margaritifera margaritifera* and *Margaritifera durrovensis* are two of Ireland's most endangered invertebrates. Freshwater pearl mussels have been in decline throughout their European range for much of the past century, with the key driver of this decline arising from changes of land use intensity and associated drainage, resulting in increases in the levels of sediment and nutrient delivered to rivers from the surrounding catchment area. These increases in sediment and nutrients levels in these naturally oligotrophic rivers have impacted mussel habitat, in particular on juvenile habitat by clogging gravels, impairing oxygen exchange to juvenile gravels and increased algal growth. In response to the threat to the freshwater pearl mussels, Ireland has designated 27 Special Areas of Conservation (SACs) and has prepared Sub-basin Management Plans (SBMP) for each of these Natura 2000 populations. The SBMPs adopted a catchment based model to address point sources (e.g. quarries and municipal waste treatment systems) and diffuse sources (e.g. agriculture and forestry) of sediment and nutrient pressures. This paper aims provide an update of the species conservation status in Ireland and will also outline current conservation approaches that are being used to support the conservation and restoration of freshwater pearl mussel populations and their habitat.

Garth Foster

(Balfour-Browne Club, UK)

Freshwater Habitat Assessment Arising from the Red List

Many naturalists, especially birdwatchers, keep lists of the species they have seen in a year or in a particular place. Water bodies, being better defined than many terrestrial habitats, make listing their faunas feel purposeful too. This listing is an end in itself for many, but apart from personal satisfaction and to aid recollection, what purpose can it achieve? It is hard to see how it increases knowledge about the species or promotes the group. A better objective would be to produce as complete a site list as possible, a standardised inventory, which can then be interpreted and evaluated against other lists. The forthcoming Manual of Irish Water Beetles will be a water beetle equivalent of a botanical habitat manual, providing information on the species that would be expected

Prof. Garth Foster and one of the locals.

on the sampling methodology, description of the habitats and accounts for the most important species and assemblages of Irish water beetles. It derives its content from the Water Beetles of Ireland recording initiative and the Red List of Irish Water Beetles.

Eugenie Regan

(UNEP-WCMC, Cambridge)

Mind the Gap: gap analysis of protected areas for red listed species

Eugenie Regan and Marcos Moreno

This paper aims to determine the extent to which threatened Irish freshwater invertebrates are protected by existing conservation areas networks, i.e. do currently known sites for these species fall within Natura 2000 or other protected areas? If some species are not protected, which species are they and what habitats do they occur in?

We looked at known Irish sites for water beetle, freshwater mollusc, mayfly, and dragonfly species with threat categories of critically endangered, endangered and vulnerable. The results show that existing protected areas in the Republic of Ireland and Northern Ireland provide a reasonable representation of the regionally threatened species of water beetle, freshwater mollusc, dragonfly and mayfly. However, some species are inadequately represented, in particular those associated with streams. Streams, therefore, appear to be a major gap in our network of protected sites. This study is one of the first assessments to objectively look at the overlap of the Natura 2000 network with areas of freshwater biodiversity.

Rachel Hamill

(CEDaR, Belfast)

An introduction to the invertebrate communities of golf courses and upland wildfire areas throughout Northern Ireland.

Through the TCV/HLF Natural Talent Apprenticeship scheme over the course of the last year I have been undertaking research into the biodiversity of golf courses. The emphasis being on the study of ground beetles, spiders and Lepidoptera communities. I used the standard methodology of pitfall trapping with twenty traps in four different transects on each of the seven courses. The field season ran from April to September, so I am still in the process of sorting and identifying specimens. To date, I have recorded eleven species of Carabidae. To catch the Lepidoptera I used a combination of mercury vapour and heath traps. To date, I have recorded five species that have been listed as Northern Ireland Priority Species. Following on from a moth leaf mining course I completed in September 2013 I found a *Callisto denticulella* (Thunberg, 1794) mine on an apple leaf which is a new record for Northern Ireland. The results from this project will provide a starting point for future research into golf courses and the habitats they currently or possibly could provide to support Northern Ireland's biodiversity, particularly with reference to priority species. I have also been involved in the invertebrate section of Dr Ruth Kelly's (QUB) research into the impact of wildfires on upland habitats. The same methodology was used as on the golf courses. We placed twenty pitfall traps in four transects across each of the six study sites. Two transects were in burnt areas and two were in unburnt. This approach has facilitated the study of species that colonise areas post-fire. An overview of each project and current key findings will be discussed.

John Breen

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The Hairy Wood Ant Formica lugubris *in Ireland - can it be saved?*

The Irish population of the Hairy Wood Ant, *Formica lugubris*, is genetically distinct from those in England; it is an ancient colonization and not a human introduction. This iconic woodland keystone species has large conspicuous nests, which are easy to locate during the active season. The colonies are host to myrmecophiles – mainly beetles (Coleoptera, Staphylinidae) – which are not found away from the nests. The species is classified as Near Threatened on the IUCN global red list and its distribution in Ireland has been in serious decline, especially in recent decades. Nests are now confined to five localities: two adjoining Coillte properties in Tipperary, one Coillte property in Galway, Killarney National Park and one privately-owned cut-over bog in Tipperary. The genetics study also showed that the Irish population of this species has just one queen per nest and one nest per colony; this has implications for the conservation of the species in Ireland as the effective population size is now very low. Honeydew collected from aphids (*Cinara* spp.) on suitable "aphid trees" is the major food item of adult workers. Conservation of the species in Ireland will require the implementation of carefully considered measures in high priority areas where the species is still found. This will include reduced coupe size at felling, and continuous-cover management, to limit the extent of clear-felling, the planting of suitable tree species which support the target aphid species (*Cinara* spp.): Scots pine, but not Lodgepole pine, spruces (both Norway and Sitka), and larches (European and Japanese). The aim will be to develop a mosaic of patches of mixed-aged trees which is more likely to encourage the development of new nests. Hopefully the answer to the question in the title is Yes.

Dave Allen

(Allen & Mellon Environmental Ltd, Belfast)

Hunting Leprechauns: the Search for the White Prominent

The White Prominent *Leucodonta bicoloria* (D. & S.) was first discovered in Ireland in 1858 and last seen in 1938, some eighty years later, somewhere in the Killarney area of County Kerry. Over the next seventy years many lepidopterists

searched in vain for this beautiful and enigmatic species. Others doubted or came to doubt its very existence in Ireland or Britain, suspecting fraud, some even gave lectures on the subject! In 2008 a five man team assembled by Allen and Mellon headed to the Caragh Lake catchment of County Kerry. This area was selected for a number of reasons; few recent records of lepidoptera, suitable old birch trees and most importantly the 1912 records of Canon Foster from County Down, a Lepidopterist of impeccable reputation. Most previous efforts had centred on Killarney National Park. On the night of 7th-8th June 2008 light traps were operated on Robert's Island, in the grounds of a private hotel on the shores of Caragh Lake. Early in the morning of the 8th a male white prominent was discovered close to a Robinson trap by Mark Telfer. A total of seven males were captured over two nights, all in the same small area. In June 2009 a wider search of the Caragh Lake catchment found nearly 100 individuals at a scatter of sites encompassing an area of over 20 square kilometres. The catch included two females which laid fertile eggs allowing a detailed study of the larval stage. A second visit in late July that year discovered a single caterpillar as well as adults still on the wing, a month beyond the recorded flight season. The various stages of the project were made possible with grant aid from the Heritage Council.

Will Woodrow

(Woodrow Sustainable Solutions Ltd, Sligo)

Recent findings on the Irish Annulet Odontognophos dumetata *and implications for its conservation*

The Irish population of the Irish Annulet *Odontognophos dumetata* moth was first recorded in 1991. Research following this discovery considered it to be a subspecies of this southern and Mediterranean species and most similar to the subspecies occurring in the Spanish part of the range. The subspecies has been subject to some study since its discovery in Ireland (e.g., Martin 1997), leading to a consideration that it is mainly found where its foodplant Purging Buckthorn *Rhamnus cathartica* occurs in association with limestone pavement and winter flooding. The known range in Ireland falls entirely within the eastern Burren, and largely within the two SACs and the Burren National Park. The conservation management of the Burren National Park and SACs requires decisions to be made on issues such as scrub clearance for habitat management and a survey was contracted by NPWS to provide understanding of the distribution and needs of the species in order to facilitate balanced management decisions.

In 2012 and 2013, Irish Annulet adult and larval surveys were undertaken within the known range. The surveys were designed to provide an enhanced understanding of the ecology of the species, and particularly the extent to which factors such as scrub height, habitat type, proximity to water and presence of limestone pavement and grykes are important. Adult surveys in 2012, together with an analysis of historic records provided a confirmation on known range of the species and general habitat inhabited. Larval surveys in 2013 allowed for the collection of data relating to purging buckthorn bushes where Irish Annulet caterpillars were recorded or notably absent.

Results showed a strong affiliation with purging buckthorn bushes below 1.5 metres, and affiliation with isolated bushes on limestone pavement. Caterpillars were largely absent from areas of dense or higher scrub spreading onto grassland habitat, even when this was in fairly close proximity to limestone pavement. In such situations, caterpillars of other species, such as the Tissue moth were often present in large numbers. In some areas of apparently suitable habitat in close proximity to the core population, no adults or caterpillars were recorded. The results will assist in decisions on conservation management of the area but also raise further questions relating to why the species appears to have such a limited range in the locality.

Eugenie Regan

(United Nations Environment Programme World Conservation Monitoring Centre, Cambridge)

Butterfly monitoring – from the national and international perspective

The Irish Butterfly Monitoring Scheme was established in 2007 and although the scheme has been running for less than ten years, it has clearly shown the importance of data gathered by citizen scientists in understanding the changes in our insect fauna. Butterfly monitoring is not new. A similar scheme has been running in the UK for over 35 years and in the Netherlands for over 20 years. In fact, there are now national butterfly monitoring schemes in nine European countries as well as North America, South Africa and Australia. There is now an opportunity to have a global view of how butterflies are faring and to build a network of butterfly monitoring schemes around the world.

Inga Reich

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Kerry Slug recent research findings

Inga Reich, Rory Mc Donnell, Cindy Smith, Mike Gormally

The distribution of the Kerry Slug *Geomalacus maculosus*, a species protected under EU and Irish law, was believed to be limited to northern Iberia and to south-west Ireland. In July 2010, the species was found in a commercial conifer plantation in Connemara, about 200 km north of its previously known Irish range. A subsequent survey found no populations between the two Irish distribution areas, suggesting that the slug was most likely introduced to Connemara by forestry. In an attempt to trace the source location of the Connemara population and to generally assess the extent of genetic variation within Irish populations, partial sequences of the mitochondrial 16SrDNA and COI genes were compared from 36 *G. maculosus* specimens sampled from 12 locations throughout Ireland. Results show, that for both markers only a single haplotype is present in Ireland. The same markers were used for 42 specimens sampled from seven locations in northern Spain and three locations in northern Portugal. In this region, 23 haplotypes were found for COI and 22 for 16SrDNA and these clustered into several regional clades. The reduced genetic diversity of Irish populations compared to Spain and Portugal suggest the presence of a genetic bottleneck probably due to founder effects. Capture-mark-recapture experiments carried out in the plantation show, that *G. maculosus* occurs with densities of up to 23 individuals per m^2 and that there is a strong positive correlation between capture success and temperature. No significant difference could be found in the mean number of sympatric slug species *Lehmannia marginata* captured at a site where *G. maculosus* is present and at a site where the Kerry Slug is absent.

Postgraduate Forum 2014

Louise Mair

The RES postgraduate forum was held this year at the University of York, with over 30 delegates attending over the two days. There was an exciting programme consisting of four guest speakers, ten oral presentations from students and eight poster presentations.

The forum opened with a presentation from Professor Chris Thomas, an ecologist at the University of York. Chris discussed the impacts of climate change on butterflies in Britain, illustrating how the research that his group carries out has identified effects of microclimates and adaptations in host-plant use, which have resulted in complex species' responses to climate change. There was a broad range of backgrounds amongst the invited speakers, with a second presentation coming from Dr Larrisa Collins, a senior entomologist at FERA. Larissa provided a great insight into life as an applied entomologist, detailing how her work has a widespread impact in areas such as tackling pest outbreaks. This was contrasted with the work of Vicky Kindemba, who is a conservation delivery manager for the charity BugLife. Vicky spoke about the practical conservation and public education programmes that BugLife carries out, and provided an insight into the challenges and pleasures of working in the charity sector.

As always, student talks covered a diverse range of subjects, making for a very interesting programme. The first student presentation was delivered by Victor Brugman, whose research investigates the human and avian biting behaviour of mosquitoes in UK farms, and who fielded a pressing question for field entomologists; are some people really more attractive to mosquitoes than others? Duncan Procter presented his field work results demonstrating a clear link between afforestation and the spread of a wood ant in Yorkshire. James Rainford's research investigates the diversification of insects and involves some very large and complex phylogenetic trees. Sarah Scriven was the final speaker on the first day, presenting results of her enviable field work studying tropical butterfly behaviour at forest-palm oil plantation boundaries.

The poster session was held at the end of the first day. Buoyed by some free wine, there were interesting posters from Jamie Alison, Yi-Huei Chen, Yee Man Theodora Cho, Esam Elghadi, Joe Roberts, Charlotte Rowley, Lucinda Scriven and James Wilson. The session was followed by the traditional après-forum drinks and dinner, which as always was great chance to socialise and of course discuss research.

The fourth and final guest speaker, Luke Tilley, talked to attendees on the second day. Luke offered useful information on the Royal Entomological Society and what it can do for graduate students, in particular with regards to funding opportunities to support student research. Amongst the student speakers, William Hentley introduced a change of format with his presentation on the obstacles he faced during his PhD and how he overcame them, imparting wisdom for early stage PhD students. Ants were on the menu again with a talk from Sam Ellis on resource distribution in complex social insect societies. James Hourston discussed whether AM fungi enhance the 'alarm signal' emitted by infested plants to natural enemies. Eleanor Heyworth explained how she has been studying competition between endosymbiotic bacteria using aphid haemolymph transfers. Francisca Sconce presented fieldwork results quantifying the relationship between Collembola diversity and land management strategies. Student talks were rounded off by Ruth Wade, whose research investigates how predicted changes in precipitation are likely to impact tri-trophic interactions in a barley ecosystem.

The forum was concluded with a series of handshakes as the prize-winners were congratulated. First prize for poster presentations went to Jamie Alison, with Lucinda Scriven as the runner up, while Eleanor Heyworth won the oral presentation prize and James Hourston was the runner up. The overall standard of presentations was excellent, and the forum was a very enjoyable couple of days. Thanks to everyone who attended, especially to those who gave oral or poster presentations, to our guest speakers, and to Cathleen Thomas and Rod Blackshaw for judging the talks and posters. Many thanks also to Kirsty Whiteford and Dr Luke Tilley for providing help and support during the organisation of the forum.

The Verrall Supper 2014

S. R. Leather

Last year with a certain degree of trepidation I organised The Verrall Supper for the first time on my own! Those of you interested in knowing how my first year went can find an account in Leather (2013). I had added to the stress quotient by making a number of changes to the event, first by changing the venue from Imperial College to the Rembrandt Hotel, just opposite the Victoria & Albert Museum, second by changing the ticketing system, thirdly by altering the seating allocation method and introducing round tables and finally by changing the dress requirement from lounge suits to smart casual (before I became a member of the Entomological Club, I had already started to subvert this rule, not actually owning a suit of my own anyway). I am told that the evening was a great success; I was too stressed to really notice but certainly the emails that I received after the event put my mind at ease.

This year I introduced yet another change, email invitations and renewals. Last year we collected as many email addresses as possible, well Clive Farrell actually did the collecting, but it was a

joint decision. Despite a few 'undeliverables' the email booking system worked remarkably well and 185 entomologists ranging in age from 21 to well over 80 turned up at the Rembrandt Hotel on March 5th where they were greeted by the ever-dependable Clive Farrell and one of my ex-PhD students, Dr Jennifer Banfield-Zanin, whom had met me earlier in the day to discuss some papers we are writing and found herself co-opted to collect money from those members without cheque books. I should point out that people pay a subscription to join the Verrall Association of Entomologists, not to pay for the dinner. The dinner, which comes with wine (another new innovation), is part of the membership package. The subscription is traditionally not fixed, rather, an amount is suggested, with the expectation that most will pay it and that a significant number will generously exceed it and thus enable the less well-off to attend without undue hardship. This is a tradition that I fully support, although I fear that not enough of the newer well-salaried members are aware of this. This year we had 46 female members including Marion Gratwick, who was one of the first ever women to attend. My aim next year is to try to get to an even sex ratio. It was nice to see so many of my ex-students, PhD and MSc, plus lots of Tweeters.

I leave you with assorted scenes of revelry and intrigue!

I hope that this fairly random assortment of pictures gives you some flavour of the evening and also highlights the fact that the Verrall Supper is no longer entirely populated by old grey-bearded entomologists, although of course there are still some of us left!

Leather, S.R. (2013) The Verrall Supper 2013 - New organiser – New venue. Antenna, 37, 138-139

Ward Cooper and Professor Mike Claridge – discussing a future book deal?

Ashleigh Whiffin and Craig Perl – two of the first Harper Adams University MSc Entomology graduates. I can never resist a chance to get in a plug for the course and I should also mention that Craig and Ashleigh were also part-funded for their course by the Royal Entomological Society Scholarship scheme.

Charles Godfray & Keith Bland – Keith taking advantage of the relaxed dress code!

Everyone facing the camera at this table is an ex-student of mine!

None of these are ex-students of mine! Also proof that not all entomologists are male or old.

Chatting about Collembola? Flic Crotty & Fran Sconce with Carly Benefer.

Gia Aradottir (Rothamsted Research) and Tilly Collins (Imperial College) – Tilly was my first Giant Willow Aphid PhD student and then was co-supervisor of Gia who was my most recent Giant Willow Aphid PhD student. And we still don't know where it goes in the winter!

Helen Roy, Gordon Port and John Whittaker

Part of Top Table; Van, Gill van Emden, Chris Lyal, Richard Lane and Mike Siva-Jothy

Top Table again - The Verrall Secretary is conspicuous by his absence – he must be taking photos!

James Logan from the London School of Hygiene and Tropical Medicine and team.

Entomologists at the bar!

Happy Diners – including Hugh Loxdale and Helen Roy

2014 Verrall Lecture

Archie K. Murchie

The 2014 Verrall lecture was delivered by Prof Greg Hurst from the University of Liverpool on the topic of the '*Extended genome: the impact of microbial symbionts on insect ecology and evolution*'. Dr Andy Polaszek welcomed the audience on behalf of the Natural History Museum and the Society, explaining that as the Flett lecture theatre had been booked in advance we were in the pleasant but compact surroundings of the Sir Neil Chalmers seminar room.

Prof Hurst explained that he would be talking about the esoteric subject (to some) of bugs inside bugs. That is, the importance of inheritable microbes on insect function and diversification. The basic experiment to investigate this is to feed antibiotics to insects (usually tetracycline hydrochloride in honey water). A whole range of things can happen next: tsetse flies go sterile or die; aphids become susceptible to fungal diseases; rove beetles lose their toxicity to predators; vectors can become more or less efficient at transmitting diseases; males of the species can suddenly appear where there were no males before. So symbionts are inheritable traits that can be beneficial or detrimental to the host. The relationships between microbes and insects have been ongoing for millions of years and therefore are highly entwined, in some cases resulting in clear co-cladogenesis. So how many insect species host how many bacteria? Greg reckoned certainly all phloem and obligate blood feeders. In addition, it is not only bacteria; there are inherited fungi, viruses and even a mealy bug. He showed a slide of an ant holding its symbiotic mealy bug, only this was encased in amber dating from about 20 million years ago. It is clear that something works. Symbionts have many abilities. They can digest cellulose, produce toxins, and act as bioreactors. They can even be deployed outside the host, e.g. fungal gardening by ants. Symbionts can also be used for pest or vector control. In Australia,

Prof. Greg Hurst presenting the 2014 Verrall lecture.

entomologists have manipulated *Wolbachia* symbionts of *Aedes* mosquitoes with the aim of reducing transmission of dengue. In effect, this is a form of modifying genetics without genetic modification.

The second part of Greg's talk focussed on the 'World's most beautiful butterfly' *Hypolimnas bolina* and its male-killing bacteria. Greg explained that symbionts have Dr Jekyll and Mr Hyde characteristics. The Mr Hyde part is that they kill males. Transmission is heritable but horizontal transmission is rare. For example, *Wolbachia* are transmitted inside the ova during oogenesis. Males therefore represent a dead-end for the symbiont. Therefore, symbiont infection can kill males, produce feminisation of males or induce parthenogenesis. All of which alters the sex-ratio of the host population, with subsequent ecological and evolutionary effects. Greg referred to the work of 'the two Emilys' (Emily Dyson and Emily Hornett), who mapped the sex ratio and *Wolbachia* infections of *H. bolina* in the islands of south-east Asia (Samoa, Borneo, the Philippines and French Polynesia). By looking back to historical records and museum specimens, what they found was that a 'male-killer' *Wolbachia* had spread through the islands at various dates in the past, as demonstrated by the appearance of largely female populations. However, they also found more recent examples in the Philippines of a host factor that 'rescues males': a dominant suppressor gene that allows males, but retains *Wolbachia*. The selection pressure to produce males is intense and between 2001 and 2005 this genetic change swept through the islands of Samoa, radically swinging the sex ratio back to unity and thus providing one of the strongest examples of rapid natural selection.

Greg finished up this fascinating talk by pondering on advice that he had previously given to research students, which was to work on something widespread... don't get wrapped up in a small, obscure field. However on reflection, he wondered if this was entirely good advice as sometimes it was the rare 'one off' situations that might reveal how unusual (but very important) transitions occurred, such as those observed in insect sex determination systems.

The President gave a vote of thanks to Prof. Hurst and opened the floor to a raft of questions, which no doubt inspired discussions long into the Verrall Supper. We would like to thank Greg for an excellent Verrall lecture that cast light on the interdependence and genetic jostling between insects and microbes. Our sincere apologies to those in the overflow room who lost sound. Unfortunately, the technical difficulties meant it was 'not alright on the night'. We are delighted to announce that the Flett has been pre-booked for the Verrall lecture for the next three years!

Left: Prof. Jeremy Thomas, Prof. Greg Hurst and Dr Andy Polaszek after the Verrall lecture at the Natural History Museum.

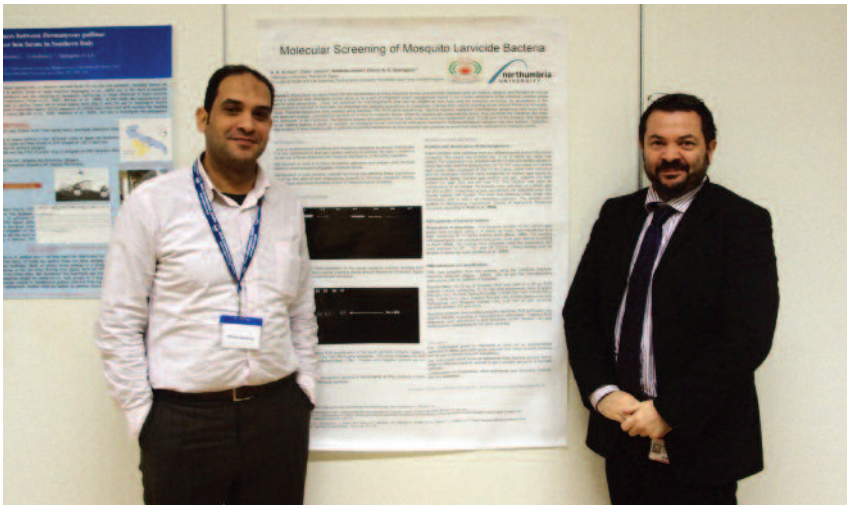
Below: Prof. Greg Hurst and the President take some questions.

Antendees getting into the Chritmas spirit.

Report on the RES 2013 Northern Meeting and Meeting of The Medical and Veterinary Entomology Special Interest Group. Thurs 5th December 2013, Northumbria University, UK

David George

The well-known phrase 'it's grim up north' certainly applied to the weather when entomologists gathered in Newcastle upon Tyne for the RES 2013 Northern Meeting and Meeting of The Medical and Veterinary Entomology SIG. Northumbria University hosted the meeting, their first for a RES gathering, with parts of the campus only re-opening shortly beforehand after being closed due to storm damage to buildings. The meeting was co-organised by Dr David George (Northumbria and RES Hon. Sec. for the North) and Prof Steve Torr (Liverpool School of Tropical Medicine and RES Med. Vet. Ento. SIG Co-ordinator), with Dr Gordon Port



Dr Ahmed Rashed Abdelnabi (left) and Prof Olivier Sparagano (right).

(Newcastle University) assisting with session chairing duties.

The theme of the meeting was 'Insect Pest Management', with two sessions planned before lunch on agricultural and medical pests, and an afternoon session on veterinary pests. As it turned out talks in the agricultural and veterinary sessions needed to be switched due to travel delays, with Dr Bob Finn's offering on 'Cytochrome P450s: the key to the acaricide resistance lock?' being included in the first session, and Andy Evan's presentation on 'Pest management below ground through confusion and diversion' being moved to a slot after lunch. Thanks to Bob for agreeing to the last minute timetabling change, and Andy for persevering with his delay-stricken trip down from Scotland.

In all eight platform presentations were delivered throughout the day, along with a 'Welcome and overview of research at Northumbria', provided by Prof Olivier Sparagano (Northumbria University) to open the meeting. Prof. Steve Lindsay (Durham University) kindly agreed to serve as Keynote Speaker, delivering his excellent presentation titled 'Can we reduce malaria by improving housing?' during the Medical Pest Management session. This session also included a memorable invited talk from Prof. Paul Reiter (Institut Pasteur, France), the meeting's International Speaker, on the subject of 'Dengue Control: Why did Gorgas Succeed. And why have we failed!' Other talks covered a broad body of research, from flowering field margins to dust mites, with details of all presentations and speakers provided below. Several interesting and engaging posters were also displayed over lunch.

The organisers would like to thank all those that attended the meeting, and especially those that presented their work, for making it an interesting and informative event. Though numbers attending were less than hoped, the small but enthusiastic nature of the group made for an enjoyable and friendly atmosphere. Thanks also to Dr Luke Tilley (RES) for manning the registration desk, and the RES for funding the meeting and supporting travel for the Keynote and International Speakers.

Presentations delivered at the RES 2013 Northern Meeting and Meeting of The Medical and Veterinary Entomology Special Interest Group

Welcome and overview of research at Northumbria

Prof. Olivier Sparagano, Associate Dean for Research and Innovation in the Faculty of Health and Life Sciences, Northumbria University, UK.

Session One: Agricultural Pest Management

Chair: Dr. Gordon Port, Newcastle University, UK

Flowering field margins for combined ecosystem service provision

Dr. David George, Northumbria University, UK

Pest management below ground through confusion and diversion

Dr. Andy Evans and Dr. Craig Rogers, SRUC, UK

Session Two: Medical Pest Management

Chair: Prof. Steve Torr, Liverpool School of Tropical Medicine, UK

KEYNOTE SPEAKER: Prof. Steve Lindsay, Durham University, UK

Can we reduce malaria by improving housing?

Integrated Vector Management: Collateral effects of insecticide-treated nets for malaria control on other vector borne diseases

Anne Wilson, Durham University, UK

Child Car Seats: a habitat for dust mites and reservoir for harmful allergens?

David Clarke, Dr. Mike Gormally, Dr. Miriam Byrne, National University of Ireland, Ireland

INTERNATIONAL SPEAKER: Prof. Paul Reiter, Institut Pasteur, France

DENGUE CONTROL: Why did Gorgas succeed. And why have we failed!

Session Three: Veterinary Pest Management

Chair: Dr. David George, Northumbria University, UK

Cytochrome P450s: the key to the acaricide resistance lock?

Dr. Robert Finn, Northumbria University, UK

Effects of 'tiny targets' on trypanosomiasis in livestock in NW Uganda

Lucas Cunningham, Liverpool School of Tropical Medicine, UK

The poultry red mite, *Dermanyssus gallinae*: A pest of emerging significance?

Dr. David George, Dr. Robert Finn, Kirsty Graham, Prof. Olivier Sparagano, Northumbria University, UK

OBITUARY

In Memory

Michael Locke

(1929-2013)

Michael Locke, who died on 20 October 2013 in London, Ontario, was among the most influential insect scientists of his generation whose work illuminated insect development and cell biology. Gifted with extraordinary intelligence, restless curiosity, and quiet determination, he was able to spot crucial lacunae in our knowledge of how insects function, to identify with great precision the appropriate questions, and, using a variety of tools, provide answers that were unfailingly provocative.

Born in 1929, Locke attended Drayton Manor Grammar School in Ealing, London, England, and, after obligatory National Service in the RAF, took up a state scholarship to Cambridge, obtaining a double first in the Natural Sciences Tripos, an early recognition of his talent. He joined the growing group of students of V.B. Wigglesworth on the top floor of the Zoology Department, obtaining his PhD in 1956. He later earned a DSc for his additional work.

The three papers from his doctoral work, published in the *Quarterly Journal of Microscopical Science* in 1958, had a fresh look at the structure and development of insect tracheae. He used electron microscopy (EM) to demonstrate that tracheoles exhibit the same taenidial structure as the rest of the tracheal system and demonstrated convincingly that the taenidia arose simply as a result of physical forces generated during development. More importantly, he identified and explored an apparent paradox: although the normal developmental pattern resulted in a series of branching tubes in each segment in which the total cross sectional area after each branching remained approximately constant (an observation first made by the Danish physiologist Krogh), the system was also capable of considerable plasticity. A series of simple surgical approaches outlined the dimensions of this plasticity and hinted at the existence of both tissue gradients and blood-borne factors. These papers are still attracting citations more than half a century after publication, a clear indication of their influence.

Michael, perhaps surprisingly, took up a position at the University of the West Indies in Jamaica. Among the consequences was his adoption of the skipper butterfly *Calpodes ethlius* as an experimental model. Easily reared, the larvae are transparent, permitting the observation of events in living specimens. He used this model to explore a paradox in the secretion of the wax layer of the cuticle. The current dogma held that this layer reached the cuticle via pore canals, but often the melting point exceeded 60°C. A paper in *Nature* showed that final synthesis of the wax occurred after secretion. Note that while the solution to the paradox was important, so also was the identification, and clear statement, of the problem.

While in the West Indies, he also took up the question of segmental developmental gradients that had been

raised by his analysis of tracheal growth. In two extraordinary papers, completed while on leave in Cambridge, he used clever transplantation of *Rhodnius* cuticle and underlying epidermis to explore the effect on cuticular pattern of rotating the transplants. While the concept of developmental gradients had been in the air for many years, these papers were the first to provide an unequivocal demonstration of their existence, and launched a renewal of interest. The papers continue to attract citations.

These early papers exemplify Locke's approach that characterized all of his work. First, identify the paradox or problem, and provide a clear analysis leading to an experimental approach to solve or at least further clarify the problem. All of this is written in unfailingly clear, simple, easily comprehended prose. Indeed, these papers could easily be used in teaching about how to write in science.

During a six month leave in Cambridge, Locke used the EM to explore the question of wax secretion in *Calpodes*. This marked the beginning of his use of the EM as the primary (although not exclusive) tool for his research. He was still to some degree a novice, however, and he spent the summer of 1960 in the Rockefeller Institute (now University) with Keith Porter exploring the ultrastructure of insect cuticles, particularly pore canals. By the time that the paper (which still attracts citations) appeared in 1961, Michael had been recruited by Howard Schneiderman to the faculty of the Department of Biology to join a large group of developmental biologists at Western Reserve University (later Case Western) in Cleveland. Others in the group were also former students of VBW: Tony Watson, John Edwards, Peter Lawrence, Michael Berridge. This period was enormously productive and a flood of papers appeared, mostly concerned with the tracheal system or the epidermis and cuticle. It would be a mistake, however, to regard these as simply descriptive biology. In each case, the observations were directed toward a specific problem in the cellular dynamics of the insect system. At least one of these publications, on cuticulin, was designated as a "citation classic".

During this period, a new interest in the movement of protein within and between tissues developed, exemplified by a series of five papers using the fat body of *Calpodes* (including one in *Science* and another in *Nature*) with his student, Janet Collins.

In 1971, Michael was attracted to the University of Western Ontario to be chair of the Department of Zoology. It was perhaps an odd appointment, given his commitment to research, but he remained as chair for 14 years with external reviews every 5 years. During all of this time, he continued his personal research programme, working personally at the bench, providing leadership by example. Given a granting system that rewards professors as managers, directing the research of others, it is a remarkable achievement. His interests in the cell biology of epidermal cells and fat body were undiminished, and papers on a wide variety of problems emerged. Of particular note are those on the beads of the Golgi complex, and the exploration of ferritin. The Golgi beads were at first challenged, informally and amusingly, by those who regarded insects as "lower" organisms and hence not particularly relevant to "real" (mammalian) cells. Michael extended the reach of his research and showed that they were observable in mouse testes.

As always, however, he remained close to the organism. An example is the remarkable discovery of the tracheal lung in *Calpodes*, stemming from his recognition that, although every cell in an insect received a direct supply of oxygen via the tracheal system, there was one exception: the blood cells. Generations of insect scientists had failed to recognise this problem. Michael did, and the transparent *Calpodes* was the ideal organism to answer the question. I suspect that I was not the only scientist to feel a little foolish for having missed that anomaly. Curiously, others have not taken up this interesting and important question. Although *Calpodes* has a specialised tracheal structure, that is not the case in all insects. The fundamental question, identified by Michael, remains: how do blood cells get their oxygen?

Michael was frequently at his best as a synthesizer of a field. Those papers, often invited, are not simply the recitation of his research, but develop new insights. The paper "What every epidermal cell knows" in the Festschrift for Wigglesworth marking his formal "retirement" in 1967 is still relevant, as is his contribution to the remarkable volume he developed with David Smith to celebrate Wigglesworth's 80th birthday 13 years later. For several years in the 60s, he served as editor of the annual Symposium of the Society of Developmental Biology and Growth (now the Society of Developmental Biology).

Like most academic scientists, he leaves the legacy not only of a body of papers (about 200 in all) and several books, as author or editor, but also a legacy of students. Among his doctoral students from the time in Cleveland were Joan Lai Fook (faculty at University of Toronto), Susan Bonner-Weir (faculty at Harvard), Joseph Kunkel (faculty at the University of Massachusetts), and Eugenia Wang (faculty at the University of Louisville). At Western, his doctoral students included Reddy Palli (faculty at the University of Kentucky), Jan Ryerse (faculty at St Louis University), Helen Nichol (faculty at the University of Saskatchewan), David Brodie (pharmaceutical industry), Tim Brac (Brac Scientific Consulting), Oana Marcu (SETI Institute), and Alan Tuck (faculty in Medicine, Western). Among the post docs at Cleveland were Michael (now Sir Michael) Berridge and Peter Lawrence, both of whom returned to Cambridge, and at Western, David Carter (UC Riverside), Cheryl Ketola (Fanshawe College) and Rob Dean (faculty, Western).

Various honours recognized his achievements: Fellow of the Royal Society of Canada, Fellow of the Entomological Society of Canada and of the Entomological Society of America, Honorary Fellow of the Royal Entomological Society, Killam Fellowship. The award by the RES of the Wigglesworth Medal and Lectureship at the International Congress of Entomology in Brazil gave him great pleasure, since Wigglesworth was his inspiration.

I think it is important that I should say something about Michael, Cambridge and Wigglesworth. Being a student in that environment was clearly a defining experience in Michael's life, as it was in mine. Certainly it changed my life. VBW was required to take on students as a condition of the Quick Professorship that he occupied. Once he was satisfied that you had selected and defined a worthwhile problem, you were left to get on with it, leaving Wigglesworth free to get on with his research, his consuming interest. This

single-minded commitment to, and personal involvement in, research at the bench impressed Michael and he tried, successfully in my view, to emulate that behavior within the constraints of a very different academic environment in North America. For students of Wigglesworth, the dissertation was YOURS, the papers were YOURS. There were no committees to satisfy, no course work required, and Wigglesworth refused to read the dissertation or drafts of the papers. But that did not imply indifference. Because I had the privilege of returning to the group as a Fellow, and because I visited VBW at least once per year until the late 80s, I was able to observe him more closely. He was certainly aware of what the students were doing, and while he would never intervene directly, he might ask about progress, implying perhaps that you had better get on with it. He also followed the progress of former students. VBW had a strong preference for students from Canada, a strategic move designed to strengthen insect science in Canada, and he took a great interest in what he referred to as his Canadian mafia. He was thus pleased that Michael had taken on the job at Western and often asked about his progress. Incidentally, Michael was the second Wigglesworthian to serve as chair of Zoology at Western. A.W.A. Brown, who was chair during my time at Western, had worked his way across the Atlantic in a cattle boat to work with VBW in the late 30s while he was still at the London School of Hygiene and Tropical Medicine.

And that brings me to Michael the man. He was, as already noted, blindingly bright, unswervingly principled and above all, rational. He set very high standards for himself (and others!): good enough was not in his vocabulary. At the same time, he was also entirely self-contained: extrovert is not a characteristic that leaps to mind. All of that sounds cold and humourless, and first encounters could be daunting or even terrifying.

He was in fact a man capable of great generosity and kindness, particularly for the young. Evidence of that can be found in the acknowledgments of his help by many authors from what might be regarded as competing labs. He was generous about recognising the contributions of others to his thinking and about authorship: his long-time assistant at Western was a co-author on many of his papers.

Although he served as chair for 14 years, he regarded most "administrators" in universities as superfluous, and he frequently turned his devastating sense of humour in their direction, often in the form of a carefully crafted bit of writing. I wish that I had retained one piece, written when he was dealing with bowel cancer. He compared the administrative process in universities to the fascination of the aged with their own digestive process: "a far too careful inspection of the product combined with an excessive use of paper". He even managed to insert a bit of invective in his address for the Wigglesworth Medal, published in the *Journal of Insect Physiology*.

Michael married Audrey in 1953, before beginning his doctoral work. They had four children. In 1980, Michael married his former student, the formidable Janet Collins, who left a position in Biology at Dalhousie to join him in London. She entered law school at Western, qualified as a lawyer, and served on the Board of Governors at Western.

He was, for a supposedly entirely logical predictable man, capable of great surprises. On one occasion, he took me after dinner to the basement where he revealed the equipment he used in lapidary. He explained that since he no longer had the time to cut sections, he found that he needed something to do with his hands. (I note that VBW produced soapstone carvings, often of *Rhodnius*). As in his science, lapidary was done at a level of perfection matched only by the best professionals. Michael was incapable of superficiality. The lapidary led him to an interest in objects fashioned from bone, and eventually ivory and horn. He developed so much expertise that he was consulted about antiquities made from these materials. Typically, his examination of bone identified some questions about the details of the accepted structure, and a paper in the *Journal of Morphology* resulted. Similarly, he investigated the structure of ivory from a wide variety of animals. That study also resulted in a paper in the *Journal of Morphology* that included characteristic sketches that clarified the apparent complexity. A book on bone, ivory and horn appeared at the end of 2013, after his death.

He and Janet shared an interest in gardening, and the garden at the back of their home in London was a perfection, whether it was dominated by flowers or, as happened suddenly, converted to a vegetable garden, including a miniature swamp, fed by run-off from the roof.

It has been, by any measure, an extraordinary life that has enriched our science, and the lives of many students. For me personally, I have often remarked that I have led a life full of good fortune and great privilege. That life has been enhanced by the privilege of having Michael Locke as a friend.

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PRESS RELEASE

from COLOSS

COLOSS,
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University of Bern,
Schwarzenburgstrasse 161
3003 Bern, Switzerland.
www.coloss.org

[Immediate: 13/2/14]

Scientists meet to develop plans to help honey bees.

At meetings held in Graz, Austria, international scientists from the honey bee research association COLOSS met to discuss two key areas of work that will aid our understanding of honey bees and the factors that affect their wellbeing. These are the monitoring of beekeepers' colony losses, and an innovative Citizen Science project to explore the diversity of food sources available to bees.

A total of 35 scientists representing 18 different countries attended the meeting, which was supported by COLOSS, University of Graz, the Dean of the Faculty of Science and the Austrian Research Association. They discussed the development of the ongoing project to monitor international honey bee colony losses. A major achievement of COLOSS has been the development of a standardised questionnaire for beekeepers, details of which have already been published in the ground breaking COLOSS *BEEBOOK*, the definitive guide to carrying out research involving honey bees. A jointly authored publication on colony losses over the winter of 2012-2013 which is to appear shortly was welcomed by the participants of the meeting. One possible factor that has been identified from analysis of these results is a link between high colony losses and bees situated in intensive agricultural areas with a low diversity of food sources.

Pollen is the only source of food protein for honey bee colonies and is needed to feed brood, for the development of adult bees and the build-up long lived winter bees. Little information is currently available about the diversity of food sources in different areas. One means to study the biodiversity of pollen available to honey bees, however, is through utilising the beekeepers themselves as Citizen Scientists (C.S.). As part of the new COLOSS C.S.I. Pollen project, beekeepers will be invited to participate by fitting pollen traps to several of their hives and estimating the diversity by counting the numbers of colours present in the sample. National coordinators from 16 countries agreed to conduct a common investigation in 2014 and 2015 using techniques trialled in pilot studies during 2013.

To coincide with the meetings, the new COLOSS website http://www.coloss.org/ has been launched today.

COLOSS President Prof. Peter Neumann said: *"The COLOSS association is a dynamic international initiative, and I welcome these new developments which will aid our understanding of the factors which have contributed to the worldwide crisis with our bees and hence the pollination of food crops".*

[Ends]

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PRESS RELEASE

[embargoed until 00:01 GMT on 26/2/14]

Understanding honey bee colony losses

Four papers published today in the *Journal of Apicultural Research* describe the results of surveys of beekeepers in 22 countries worldwide. Two present information on losses of honey bee colonies from the 2012-13 winter gathered from a total of more than 22,000 beekeepers together owning nearly 1 million colonies.

The first paper[1] reports colony losses from the USA for the 2012-13 winter. These losses were much higher than reported for the previous year (22.5%), but at approximately 30%, they are exactly average for losses since the recent surveys began in 2006-7. The difference between the last two years highlights the differences in the weather experienced. Amateur beekeepers tended to blame losses on factors which should be within their control, such as starvation, or weak colonies going into winter, whilst commercial beekeepers tended to blame factors outside their control such as pesticides and queen problems. The parasitic mite Varroa was a key factor reported, but the symptoms of "Colony Collapse Disorder" were low down the list of reported causes.

Meanwhile, the second paper[2] reports the results from standardised questionnaires developed by members of the COLOSS research association from 19 mainly European countries. For the first time, the authors have attempted to model the influence of various factors on the losses, with some striking results. Significant factors identified with colony losses were the age of queen bees in colonies going into winter, the treatment of varroa, and access by foraging honey bees to agricultural crops such as oilseed rape and maize. This could support the current concerns about pesticides widely used on these crops, but there is also growing evidence that the decline for bees in areas of intensive agriculture may be because mass flowering crops provide food for only part of the year in a landscape otherwise devoid of bee forage, and also that these crops may provide poor quality food for bees. The third paper[3] documents for the first time colony losses in Luxembourg from 2010-2012. Although a small country, the losses reported seem to fit in well with what is known of losses in neighbouring countries.

Finally, in contrast to these results from the northern hemisphere, the last paper[4] reports data from South Africa. Whilst these losses (29.6%) are comparable with those reported elsewhere, the causes seem to be different. The main cause reported by the South African beekeepers is the Cape honey bee, which acts as a social parasite in colonies of the more common savannah honey bee. The authors emphasise that the causes of colony loss experienced in the northern hemisphere, although present in South Africa, appear to be less threatening there, and uniquely African factors seem to be more significant.

IBRA Science Director and *JAR* Senior Editor Norman Carreck says: *"We are now eight years into the story of increased honey bee colony losses, and these new papers increase our confidence that we are beginning to understand the causes"*

[Ends]

Book Review

The Cicadas of Thailand, Volume 2. Taxonomy and Sonic Ethology

by Michel Boulard

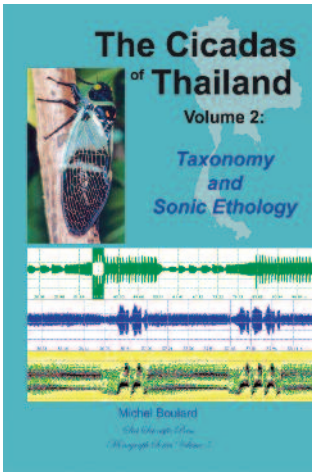
436 pages, 384 B/W photos, line drawings and sonograms (soundtracks available online),
97 colour plates with 400 photos, 24.5 × 17 cm. Hard-cover.

Siri Scientific Press, 2013; in English.

ISBN 978-0-9567795-9-5

Obtainable from Siri Scientific Press <books@siriscientificpress.co.uk>; cost £120.00 (plus p/p).

Further details online at: <http://www.siriscientificpress.co.uk>.



It is my pleasure to introduce a new comprehensive and very impressive book devoted to the cicadas of Thailand to the readers of Antenna. It is the fifth volume of the continuing monograph series produced by Siri Scientific Press under the general editorship of David Penney. The book represents a 436 page volume from the leading world expert on Cicadomorpha, resulting from 13 years of his work on the taxonomy and behavioural ecology of cicadas in Thailand. It is a sequel to the preceding book by the same author devoted to general characteristics of Thai cicadas published by White Lotus Publishers (Bangkok) in 2007. The reviewed book starts with two Prefaces (in English and French, pp. 5–6), a list of Contents (p. 7), followed unexpectedly by Lists of all the figures included in the volume (384 in total; pp. 8–10), colour plates (97 in total; pp. 10–11) and audio tracks (109 in total; p. 11). The main part of the book (pp. 14–335) consists of three Chapters, Conclusions, Endnotes to the chapters, References and two Appendices.

Chapter 1 (pp. 14–16) provides a brief description of the studied region, including the provinces of Thailand visited by the author (22 field trips between March 2000 and December 2011), technical details on how sound recording was done and a very brief morphological characteristic of cicadas. Unfortunately, there is no information on a depository (or depositories) of the studied material; one can only suspect that the studied collections are mainly preserved in the Muséum National d'Histoire Naturelle in Paris as mentioned for the types of newly described species (see below). Chapter 2 (pp. 17–20) provides a simplified classification of Thai cicadas based, as the author noted in the previous chapter (p. 15), on "a conventional schema that is accessible to all". No reference to this schema has been provided and thus it is unclear whether it is a personal author's view, which seems to be the case, or a conventionally accepted opinion. The studied species are classified in two subfamilies, Cicadinae (tymbal cover present) and Cicadettinae (tymbal cover absent), with three tribes in each; one tribe (Cryptotympanini) is designated with a new taxonomic status. The subfamily Cicadinae is also subdivided in 15 subtribes, of which two (Aolina and Balintina) are erected as new. In my opinion, it would be useful if this Chapter also included an identification key, at least to subtribes, and comparative illustrations of the characters discussed to make it indeed accessible to all. Chapter 3 (pp. 20–316) is the main section of the book containing detailed accounts of 42 genera, 6 tribes, 15 subtribes and 143 species studied, of which 78 species were discovered and described by the author (a very impressive score indeed!). Every (sub)tribe and genus are provided with taxonomic diagnoses, plus synonymy lists for the genera. Each species account consists of the following subsections: synonymy list, distribution in Thailand, brief morphological description, main measurements of both sexes and ethological notes. The latter are particularly comprehensive, giving lots of original information about the species' biology and particularly its sonic communication; acoustic identity cards of all species are illustrated and described in detail. The value of all this information for new generations of cicada students can hardly be underestimated, especially as the soundtracks of 109 species can be freely accessed via the site of Siri Scientific Press, online at: http://www.siriscientificpress.co.uk/Pages/ThaiCicadaSoundtracks.aspx. Taxonomic accounts of newly described species are more detailed and additionally include the information on the depository of the type specimens, etymology for the new name and separate morphological descriptions of male holotypes and female allotypes; both sexes are photographed, but only male genitalia are illustrated. A total of eight new species from three genera are described in this work: *Abroma* (1 species), *Huechys* (1) and *Pomponia* (5). The Conclusion section (pp. 317–318) summarises the previous content of the volume and the state of the knowledge of cicada fauna of Thailand. Unfortunately, there is no comparison of this fauna with those of neighbouring regions and no estimate on how many unrecorded cicada species are likely to occur in Thailand. The reference list (pp. 322–331) includes 233 works, of which 55 were published by the author. Appendix 1 (pp. 332–334) contains a taxonomic list of all taxa included in this volume. Appendix 2 lists all *Errata and corrigenda* recorded for volume 1, the previous book by the same author. A taxonomic index (pp. 336–339) and a set of 97 colour plates, with 400 eco-photos of cicadas taken in their natural settings, conclude this impressive book.

Overall, this volume has made a very good impression on me, particularly with regard to its comprehensiveness, and I wish to congratulate the author and publisher for such fine work. Despite the book containing taxonomic, ecological and ethological information on cicadas of Thailand only, there is no doubt that it will be useful for anyone studying cicadas of the entire SE Asia. It is indeed a useful reference volume to have both in a private library and in the library of any natural history museum or university.

Dmitri V. Logunov
Curator of Arthropods, The Manchester Museum

Diary

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

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

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

MEETINGS OF THE ROYAL ENTOMOLOGICAL SOCIETY

2014

Jun 4 **RES AGM**
Venue: The Mansion House, St Albans

Jun 23-29 **National Insect Week**
Lots happening, please check out…
www.nationalinsectweek.co.uk

Aug 3-8 **European Congress of Entomology** (www.ece2014.com)
Venue: University of York, Heslington, York
Chair of the Organising Committee: Prof. Stuart Reynolds (ece2014@royensoc.co.uk)
Confirmed plenary speakers:
Janet Hemingway, Liverpool School of Tropical Medicine, UK
Bruno Lemaitre, Ecole Polytechnique Federale, Switzerland
Nancy Moran, Yale University, USA
Vojtech Novotny, Czech Academy of Sciences, Czech Republic
John Pickett, Rothamsted Research, UK
Chris Thomas, University of York, UK

The 10th European Congress of Entomology will be held in the University of York from Sunday 3rd (opening ceremony) to Friday 8th August. There are currently 48 sessions being organised on all aspects of entomology. Please look at the website (www.ece2014.com), which has up-to-date information.

Sep 3 **Aphid Special Interest Group**
Venue: Harper Adams University
Convenor: Prof. Simon Leather (simonleather@harper-adams.ac.uk)

Oct 14 **Behaviour Special Interest Group**
Venue: Rothamsted Research, Harpenden
Convenor: Dr Jason Chapman (jason.chapman@rothamsted.ac.uk) and Dr James Bell (james.bell@rothamsted.ac.uk)

We shall be holding an Insect Behaviour SIG with the theme of "sensory biology" at Rothamsted, and we welcome submission of oral or poster presentations for this meeting. We have some agreed speakers already (tentative titles are below), but there are still plenty of slots for interested speakers. To submit an oral or poster presentation for this one-day meeting, please email the convenors.

Dr Gabriella Gibson, Natural Resources Institute, University of Greenwich "Auditory communication in mosquitoes"
Prof Daniel Robert, School of Biological Sciences, University of Bristol "Hearing and the electro-reception senses in insects"
Prof Gareth Jones, School of Biological Sciences, University of Bristol "Sky wars: moths v bats"

Nov 5 **Orthopterists' Special Interest Group**
Venue: Natural History Museum, from 1.30 – 8.00 pm
Convenor: Dr Björn Beckmann (orthoptera@ceh.ac.uk)

Everyone is very welcome to attend the annual Orthopterists' meetings, whether to present research or just to listen and meet others. Talks, posters and other contributions are welcomed on grasshoppers, crickets and related groups (cockroaches, earwigs, stick insects, mantids). Both initial observations and ideas, as well as completed research can be presented.

A draft programme will be posted online and circulated in the autumn. To date we are expecting a talk by Mike Edwards on the conservation and current status of the Field Cricket (*Gryllus campestris*) in Britain. Suggestions for further speakers are welcome, e.g. students working on Orthoptera.

Cost
Either a full price of £14.00 to include a cold buffet with wine at about 6:00 pm, and tea and biscuits during the afternoon
Or a reduced price of £4.00 to include tea and biscuits only, if you are not staying for the buffet.

Registration
Please register by sending an email to orthoptera@ceh.ac.uk, or by post to Björn Beckmann, Centre for Ecology & Hydrology, Wallingford OX10 8BB, providing the following details:
your first name, surname, and institution if applicable (for name badge)
title of talk or poster, if you would like to present something
indicate whether you will be staying for the buffet or not, and any special dietary requirements

Nov 21 **South-West Regional Meeting**
And now for something completely different... Exploring the fringes of entomology
Venue: Plymouth University
Convenor: Mr Peter Smithers (psmithers@plymouth.co.uk)

2015

Mar 4 **Verrall lecture**
Venue: The Flett lecture theatre, NHM
Convenor: Dr Archie K. Murchie

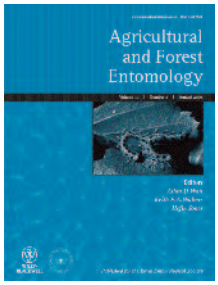
Jun 3 **RES AGM**
Venue: The Mansion House, St Albans

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

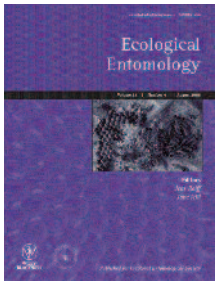
Speakers confirmed to date:
Janne Bengtsson (Uppsala, Sweden)
Sarah Beynon (Pembrokeshire)
Jerry Cross (East Malling)
Tom Bolger (Dublin)
Dave Goulson (Sussex)
Alexandra-Maria Klein (Freiburg, Germany)
Simon Leather (Harper-Adams)
Craig Macadam (Buglife, Stirling)
Sarina Macfadyen (CSIRO, Australia)
Jane Memmott (Bristol)
Charles Midega (ICIPE, Kenya)
Michael D. Ulyshen (USDA – Forest Service, USA)

2016

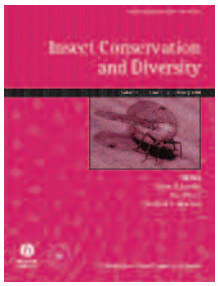
Sep 5-8 **Ento'16**
Venue: Harper Adams University College, Shropshire
Convenor: Prof. Simon Leather



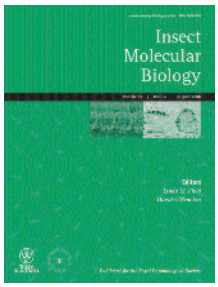
Publications of the Royal Entomological Society



Agricultural and Forest Entomology provides a multi-disciplinary and international forum in which researchers can present their work on all aspects of agricultural and forest entomology to other researchers, policy makers and professionals.
2014 print or online prices: UK £707, Euroland €900, USA $1,307, Rest of World $1,523
2014 print and online prices: UK £813, Euroland €1,035, USA $1,503, Rest of World $1,752

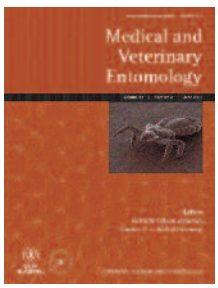


Ecological Entomology publishes top-quality original research on the ecology of terrestrial and aquatic insects and related invertebrate taxa. Our aim is to publish papers that will be of considerable interest to the wide community of ecologists.
2014 print or online prices: (with Insect Conservation and Diversity) UK £1,157, Euroland €900, USA $2,145, Rest of World $2,501
2014 print and online prices: UK £1,340, Euroland €1,035, USA $2,467, Rest of World $2,873

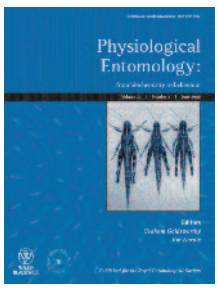


Insect Conservation and Diversity explicitly associates the two concepts of insect diversity and insect conservation for the benefit of invertebrate conservation. The journal places an emphasis on wild arthropods and specific relations between arthropod conservation and diversity.
2014 print or online prices: UK £707, Euroland €900, USA $1,307, Rest of World $1,523
2014 print and online prices: UK £813, Euroland €1,035, USA $1,503, Rest of World $1,752

Insect Molecular Biology has been dedicated to providing researchers with the opportunity to publish high quality original research on topics broadly related to insect molecular biology since 1992. *IMB* is particularly interested in publishing research in insect genomics/genes and proteomics/proteins.
2014 print or online prices: UK £1,178, Euroland €1,496, USA $2,177, Rest of World $2,538
2014 print and online prices: UK £1,354, Euroland €1,722, USA $2,504, Rest of World $2,920



Medical and Veterinary Entomology is the leading periodical in its field. The Journal covers all aspects of the biology and control of insects, ticks, mites and other artropods of medical and veterinary importance.
2014 print or online prices: UK £678, Euroland €864, USA $1,255, Rest of World $1,465
2014 print and online prices: UK £780, Euroland €994, USA $1,445, Rest of World $1,685



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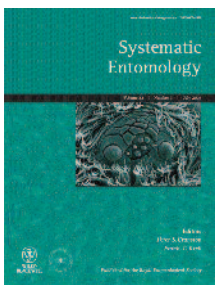
2014 print or online prices: UK £646, Euroland €796, USA $1,156, Rest of World $1,349
2014 print and online prices: UK £717, Euroland €915, USA $1,330, Rest of World $1,551



Systematic Entomology encourages the submission of taxonomic papers that contain information of interest to a wider audience, e.g. papers bearing on the theoretical, genetic, agricultural, medical and biodiversity issues. Emphasis is also placed on the selection of comprehensive, revisionary or integrated systematics studies of broader biological or zoogeographical relevance.
2014 print or online prices: UK £1,113, Euroland €1,416, USA $2,059, Rest of World $2,403
2014 print and online prices: UK £1,279, Euroland €1,629, USA $2,368, Rest of World $2,764

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

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

ECE 2014

Xth European Congress of Entomology

3-8 August 2014

University of York, York, UK

The main topic of the congress is: Entomology information: science – society, and the topics will include all important issues of basic and applied entomology.

Plenary speakers will include:

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Ecole Polytechnique Federale, Lausanne, Switzerland

Nancy Moran
University of Texas at Austin, USA

Vojtech Novotny
Czech Academy of Sciences, Ceske Budejovice, Czech Republic

Organising Committee contact:
ece2014@royensoc.co.uk

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ROYAL ENTOMOLOGICAL SOCIETY - FOUNDED 1833 -

Xth European Congress of Entomology
ECE 2014
York, United Kingdom
Hosted by the Royal Entomological Society