

antenna



INSECTS ON THE MENU

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

CONTENTS

- 2 Editorial
- 3 Article – Insects, food of the future
- 9 Article – Ento: Introducing Edible Insects into the Western Diet
- 16 Article – PROteINSECT
- 18 Article – Entomophagy, a Journey from Novelty to Necessity
- 21 Article – BugsCEP, an entomological database twenty-five years on
- 29 Article – Confessions of a Verrall Supper Organiser, 1972-2012
- 32 Article – Moths Count and the National Recording Scheme: an update
- 35 Article – Botanical Entomologists
- 39 Article – Insects in Line. Michael Darby. Facing up to Beetles
- 41 Society News
- 53 Meeting Reports
- 63 Obituary – Professor John Cloudsley-Thompson
- 66 Book Reviews
- 70 Announcement
- 72 Diary



COVER PICTURE

Insect stir-fry, photograph courtesy of Bugsinthepicture

antenna

Bulletin of the Royal Entomological Society

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

Editors:

Peter Smithers
(University of Plymouth)

and

David R. George
(Northumbria University)

Editorial Assistant:
Jennifer Banfield-Zanin

Consulting Editor:
Prof Jim Hardie

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

Business Manager: Registrar

COPY DATES

For *Antenna* 38 (2) – 1st April 2014 (DG)

For *Antenna* 38 (3) – 1st July 2014 (PS)

Diary Copy date:

five days before *Antenna* copy date above.

Any facts or opinions expressed in this bulletin are the sole responsibility of the contributors. The Royal Entomological Society and the Editors cannot be held responsible for any injury or loss sustained in reliance thereon.

The Royal Entomological Society

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

The Royal Entomological Society is a scientific society founded in 1833 and incorporated by Royal Charter in 1885 for the improvement and diffusion of entomological science exclusively.

Officers 2012/2013

President: Prof J. A. Thomas OBE (F)

Honorary Treasurer: Prof H. D. Loxdale (F)

Honorary Secretary: Dr A. K. Murchie (F)

Honorary Editorial Officer: Prof L. M. Field (F)

Vice Presidents: Prof M. F. Claridge, Dr C. Thomas

Members of Council:

Prof S. R. Leather (F), Mr D. Allen (M),
Dr R. O. Clements (Hon. F), Dr K. Reinhardt (F),
Mrs J. P. North (F), Mr P. Smithers (Hon. F),
Mr C. P. Farrell (Hon. F)

Chairs of Standing Committees:

Prof H. D. Loxdale – Finance Committee

Dr A. K. Murchie – Meetings Committee

Prof L. M. Field – Publications Committee

Dr G. Port – Membership Committee

Dr A. J. A. Stewart – Insect Conservation

Dr R. O. Clements – Library Committee

Registrar:

Mr W.H.F. Blakemore E-mail: bill@royensoc.co.uk

Director of Science:

Prof R.J. Hardie E-mail: jim@royensoc.co.uk

Director of Outreach:

Dr L.A.N. Tilley E-mail: luke@royensoc.co.uk

Regional Honorary Secretaries:

Dr D. George (North), Dr J. Stockan (Scotland),
Mr P. Smithers (West), Dr G. J. Masters (East England),
Mr J. S. Badmin (South East),
Dr A. Murchie (Northern Ireland)

Library: Mrs Valerie McAtear, Librarian (lib@royensoc.co.uk)

The Library is open to Fellows and Members from 9.00am to 4.30pm Monday to Thursday and 9.00am to 3.30pm on Friday. The Library is not open on Saturdays and Sundays or public holidays, and such other times as may be notified in *Antenna*.

Subscription Rates 2013

The following are the subscription rates due on 1st March 2013: Fellows £54; Members £48; Students £25; Fellows and Members over 65 £32. The journals of the Society are available to individual Fellows and Members at preferential rates via the Subscriptions Department at The Mansion House. *Antenna* is supplied free of charge to Fellows and Members not in subscription arrears. **Cancellation of Journal subscriptions must be notified to Subscriptions Department before the 31st October in the year preceding cancellation.**

Printed by Cravitz Printing Company Limited
1 Tower Hill, Brentwood, Essex CM14 4TA
email: cravitzprinting@btconnect.com

EDITORIAL



Welcome to the first edition of 2014, here at *Antenna* we hope that the coming year will be both prosperous and entomologically rewarding for all our readers. With a new year come new ideas and challenges, so in this issue we re-examine a concept that for many years has been considered a peripheral issue by entomologists. It is one which has recently gained a much higher profile due to the publication of the UN report “Edible Insects” which was published last May. This has catapulted the topic of entomophagy back into the mainstream of scientific debate.

So here at the start of 2014 we offer a snapshot of where we are in this rapidly expanding field. We have an overview of the topic from Arnold van Huis (editor of the UN report), an interview with and an article from Ento, the UK company that is introducing designer insect meals to UK diners. The team at

PROteINSECT explore the role that insects may play in feeding our livestock, and I offer a personal perspective of the various ways in which we have presented insect snacks and meals to UK audiences. It is clear from the rapidly growing interest in this area that insects are being seriously considered as an addition to western diets and the many reasons for this are eloquently explained in the articles in this issue.

One issue that continually crops up when the topic of insects in our diets is debated is the potential conflict between entomophagy and conservation. In the tropics the main bulk of insects consumed are harvested from the wild and, while this may be a sustainable practice for such local communities, it could not be a viable model for the supply of western consumers. The challenge that we now face is how to develop insect farms to supply this emerging market. The UK already has a number of insect farms that supply vast numbers of insects to the pet trade as food for reptiles and as food for garden birds. If this fledgling industry were to expand it could begin to supply food for human consumption. There are many issues to address; we will have to draft new legislation to ensure the highest standards of hygiene and good farming practice are maintained. New culture methods also need to be explored, such as the processing of many of our current waste streams to produce a standard, hazard-free product that can then be fed to farmed insects. This, plus economies of scale, would help to produce a cheaper and more readily available product. If these goals can be achieved we could have a sustainable industry that supplies a high quality but affordable alternative food.

Another consideration is the possibility that the consumption of insects may imply a negative attitude to them. If we are eating insects on a regular basis, will this impact on public attitudes to insect conservation? As entomologists, we currently portray insects as vital players in the maintenance of natural systems, the ecosystem services that they provide are vital to the smooth running of the biosphere. So within this perspective, insects as food for humans are just an extension of their role in nature as food for many other groups of organisms. I personally believe that there will be no conflict between entomophagy and insect conservation; they are different sides of the same coin.

This *Antenna* also includes the usual wide range of articles and society news. We have an article from John Badmin on UK botanists who also studied insects, a short history of the Verrall supper from Helmut van Emden, an update on the national moth recording scheme from Butterfly Conservation and an introduction to the BugsCEP entomological database. There are also short reports from Ento 13 and the National Insect Festival, plus an interview with Michael Darby, the artist whose exhibition added an entomological aesthetic to last year’s Insect Festival in York.

We hope you enjoy both this edition of *Antenna* and the coming year.

Peter Smithers

Guidelines for submitting photographs

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

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

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

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

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

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



300dpi



72dpi



Insects, food of the future



Prof Dr Ir Arnold van Huis

Laboratory of Entomology
Wageningen University
P.O. Box 8031
6700 EH Wageningen
The Netherlands

Interest in the practice of eating insects (entomophagy) has only recently received increasing attention in the western world. This is remarkable considering that insects are common food in the tropics but they have never been considered as a serious alternative to our chicken, pork or beef, partly due to the erroneous perception that it is practiced by people in extreme poverty who eat insects out of necessity.

The interest by the western world in alternative protein sources is triggered by what has been called 'the meat crisis' (D'Silva and Webster, 2010). Faced with a growing world population and increasingly demanding consumers, there is a shift to diets with more animal products and fat; this is mostly occurring in the developing world due to rising incomes and urbanization. This will result in an increase in the demand for meat of 75% by 2050 compared to 2005/07 demands (Alexandratos and Bruinsma, 2012). But how can this demand be satisfied, as 70% of all agricultural land is already dedicated to livestock production? The

meat crisis has highlighted the negative side effects of livestock production, such as land degradation, high greenhouse gas and ammonia emissions, deforestation and water pollution (Steinfeld et al., 2006). The meat-based food system requires vast quantities of energy, land and water, far more than a plant-based diet. Increasing productivity, reducing waste, eating more sustainable diets and eating less meat have all been proposed as alternatives (Herrero, 2013). Novel protein sources such as insects, algae, duckweed, and rapeseed have also been suggested (van Huis et al., 2013).

Why would the consumption of insects be more sustainable than conventional meat? First, insects are efficient converters of feed to body weight, primarily because they are cold-blooded. The house cricket only needs 1.7 kg of feed to produce 1 kg of body weight. This compared to 2.5 for chicken, 5 for pigs and 10 for cattle (van Huis, 2013). When considering the edible portion the advantages become even more pronounced



FAO workshop on Edible insects, Chiang Mai 2008

(photo Arnold van Huis)

against only 40-55% for the other livestock species. In addition, edible insect species like crickets, locusts and mealworms produce considerably less methane and nitrous oxide, which are very powerful greenhouse gases (Ooninx et al., 2010). These edible insects were also compared to conventional livestock, which is responsible for two thirds of all ammonia produced globally and contributes to acidification and nitrification of the environment and eutrophication of waterways. That does not mean that all edible insects do not produce harmful gases, as termites produce 4% of all methane (Hackstein & Stumm, 1994), but termites have not been considered for farming. For one edible insect species (mealworms) a life cycle analysis has been conducted. Such an analysis takes all factors into account that contribute to the end product, e.g. the fertilizer to produce the feed, the tractor transporting the fertilizer, irrigation system to water the crops, etc. This study showed that per kg protein, mealworms require much less land area than cattle (Ooninx & de Boer, 2012).

Entomophagy is mainly confined to tropical regions. The explanation could be that insects in temperate zones are not available throughout the year as they are in diapause or quiescence during the cold winter season. Insects in temperate zones are of smaller size, which is probably related to respiration; the oxygen diffusion through the respiratory tracheal system will be lower than in tropical zones. They also occur less clumped than in the tropics, e.g. caterpillars and locusts are often heavily clustered which facilitates harvesting. Moreover, in the western world the reputation of insects as food is dubious, with strong associations with dirt and disease. People are often not aware of the beneficial aspects of insects. Besides producing honey and silk, insects also provide vital ecological services such as pollination, decomposition, recycling, and biological control of pests through parasitoids and predators. Less than 0.5% of the one million known insect species are harmful to plants, livestock, pets or humans (van Lenteren, 2006).

In the tropics insects are predominantly harvested from nature, making it by definition a rural activity.

More than 1,900 insect species are known to be consumed around the world (Jongema, 2013). The most important groups are beetle larvae (31%), followed by caterpillars (18%), wasps, bees and ants (15%), crickets, grasshoppers and locusts (13%), true bugs (11%), and termites, dragonflies, flies and others (12%). Other arthropod groups such as spiders are also eaten. Some species are semi-domesticated which means that certain measures are taken to make the harvesting more predictable (Van Itterbeek & van Huis, 2012). For example, palm trees may be cut deliberately, in order to trigger palm weevils (*Rhynchophorus* spp.; Col.: Curculionidae) to oviposit on the trunk. After a certain time the larvae are then harvested. These larvae are considered an absolute delicacy in many parts of the world. In Central Africa the collection of arboreal, foliage consuming caterpillars is facilitated by manipulating host tree distribution and abundance, shifting cultivation, fire regimes, host tree preservation, and manually introducing caterpillars to a designated area.

The question is whether insects can be harvested from nature in a



The bamboo caterpillars (photo Arnold van Huis)

sustainable manner. For example in Thailand, instead of cutting down whole clumps of bamboo to harvest the bamboo caterpillar, it has now been suggested to harvest the insect from only the infested internode (Hanboonsong et al., 2013). Also, in Mexico about 14 edible insect species are overexploited because of increased demand (Ramos-Elorduy, 2006). For example, instead of harvesting Dolichoderinae ants of the genus *Liometopum* (called “escamoles”) by trained people, who retrieve the insects while leaving the nest intact, non-qualified independent workers, who try to make a living, collect as much as possible, depleting the resource such that it cannot be exploited in future seasons. The group of aquatic insects collectively called “Axayacatl” (Hemiptera-Corixidae) of which the eggs “ahuahutle” are cultivated for food, are threatened because of habitat degradation (drying out and pollution of water bodies).

To promote insects as food, insects need to be farmed, and insects reared in this way are often known as ‘mini-livestock’. In the tropics, edible insects are farmed in Thailand. About 20,000 medium and large-scale enterprises in this country produce 7,500 tonnes of crickets per year; currently, the palm weevil is also reared by using simple techniques (Hanboonsong et al., 2013). In the western world, the demand for insects as food will remain limited. A number of companies produce insects as pet-food (mainly for reptiles). However, conditions now seem to be favourable for insect products to enter the market as animal and fish feed, mainly because the current feedstock ingredients of fish-meal, fish oil, soy and cereals, are becoming increasingly expensive. Fish-meal and fish oil is processed from pelagic fish, which are a by-product of the marine fishing industry, but they are now becoming scarce because of over-exploitation. The world fish production in aquaculture has expanded by almost 12 times in the last three decades (1980–2010), at an average annual rate of 8.8% providing more than 40% of all fish consumed (FAO, 2012). This industry uses large amounts of fish-meal and fish oil, and prices are predicted to increase by more than 50% in the next decade. Several fly species such as the Black Soldier Fly and the House Fly are interesting alternatives, and a number of



Insects on sale at Tlat Dong Makkhai market near Vientiane Laos (photos Arnold van Huis)

companies from different parts of the world are involved or have pilots in mass producing these insects. These will also support the development of the mass rearing of insects as human food.

Concerning the nutritional value of insects, it is difficult to draw a general conclusion of all edible insect species. Often a comparison with conventional meat is made. However, insects cannot be considered as meat. The muscles are not isolated from insects and they are eaten as a whole (only wings and legs maybe removed) or the proteins are isolated from the whole insect.

The nutritional value does not only depend on the insect species, even within one species it can differ because of life stage (larvae of adult), the insects' diet, environmental factors and the way in which the insects are prepared. Concerning the last point for example, for both the beetle larvae *Rhynchophorus phoenicis* and *Oryctes monoceros*, the lipid and cholesterol contents were significantly lower in smoke-dried samples compared to the raw samples (Edijala et al., 2009). Rumpold and Schlüter (2013) reviewed the nutritional value of a large number of insect species and concluded that, "most edible insect species are satisfactory in providing energy and protein, meet amino acid requirements for humans. They are high in monounsaturated and/or polyunsaturated fatty acids, and rich in several micronutrients such as copper, iron, magnesium, manganese, phosphorous, selenium, and zinc as well as riboflavin, pantothenic acid, biotin, and in some cases folic acid" (Rumpold & Schlüter, 2013).

The mineral content, with particular regard to iron and zinc, is of specific interest. Crickets, caterpillars and palm weevils for example have shown high iron content, and considering that one billion people are anaemic, in particular pregnant women and pre-school children, the eating of these insects could help to alleviate these problems (Christensen et al., 2006). Micronutrient deficiency is an important cause of growth stunting in the Democratic Republic of Congo (DRC). A cereal made from dried caterpillars and other locally available ingredients (ground corn, palm oil, sugar and salt) had appropriate macro- and micronutrient contents for complementary feeding, and was acceptable to mothers and infants (Bauserman et al., 2013).

The risks involved in the eating of insects has been covered by several authors (van der Spiegel et al., 2013; Belluco et al., 2013). Potential problems are of an allergenic, microbial, parasitic and chemical nature. A distinction should be made when insects are collected from nature or when they are farmed. When collected in agroecosystems, it may be difficult to know whether the plants, from which the insects have been collected, were sprayed with insecticides. For that reason insects collected from forest-ecosystems are generally considered safe. In principle, the history of eating insects shows that the practice is safe. There are some specific cases of problems mentioned in the literature, mostly related to a failure to maintain hygienic conditions. In general, cooking the insect before consumption is always recommended. In reared systems, the diet provided should be certified clean, particularly when organic waste streams are considered as feed. Also, the hygienic conditions, under which insects are being collected, transported, conserved and processed are important. Any food can potentially be allergenic, and shellfish, such as shrimps, are widely known to be able to induce allergic reactions in susceptible individuals. The protein tropomyosin represents an important cross-sensitizing allergen, responsible for the immunological relationship between crustaceans and house dust mites. Based on cross-reactivity studies, house dust mites and crustacean allergic patients may react to food containing the Yellow mealworm *Tenebrio molitor* (Verhoeckx et al., 2014).

A major barrier to the growth of the edible insect sector, particularly in the western world, is the lack of legislation, standards, labelling and other regulatory instruments governing the production, use and trade of insects in food chains (Halloran, 2013). This is mainly because until recently nobody considered insects as food or feed. The legislation deals with meat from animals and because insects are also animals, insects are part of the same legislation. An overview of the legislation relevant for insects as food is provided in Halloran (2013). Insects for human consumption in the European Union (EU) may fall under 'Novel food', as insects have not been used for human consumption to a significant degree in the EU before 15 May 1997. Due to the history and common

practice of entomophagy in many countries outside Europe, insect-based foodstuffs would most likely be considered as "traditional food from a third country" (Belluco et al., 2013). Then, "history of safe food use" will need to be demonstrated showing "that the safety of the food in question is confirmed with compositional data and proof of historical and current use in the normal diet of a large part of the population of a country". If this cannot be demonstrated a complete risk assessment will need to be performed (Belluco et al., 2013).

How to convince consumers to include insects in their diet is a question that is valid for both western and non-western countries. It does not automatically follow that when a group of insect species are eaten in a specific tropical country that the population will automatically include other edible insect species in their diets. The acceptance of food depends not only on a rational dimension of evaluating taste and odour, it also has emotional and cultural dimensions (Looy et al., 2013). The famous gastronome, Jean Anthelme Brillat-Savarin, wrote in "*Physiologie du Gout*" (The physiology of taste) in 1825: "Dis-moi ce que tu manges, je te dirai ce que tu es": "Tell me what you eat and I will tell you what you are". With "We are what we eat", people do not want to become associated with insects. Stressing the advantages of sustainability of entomophagy compared to a conventional meat-based diet will not be enough. Food safety needs to be assured by adhering to the guidelines laid down in the Hazard Analysis Critical Control Point system (HACCP). This is a process control system that identifies where food safety hazards may occur in a food production process and puts into place stringent controls to prevent the hazards from occurring. For the catering industry it is important to have role models such as the world famous top cooks Rene Redzepi from the Noma restaurant in Copenhagen and Alex Atala of the restaurant D.O.M. in São Paulo, who both have insects on the menu. The former secretary general of the United Nations, Kofi Annan considered the eating of insects a matter of educating the public (van Huis et al., 2014). Despite this support it will take some time to convert the western view from one of edible insects as "starvation food" to the notion that it can be "an exquisite and delicious dish."

References

- Alexandratos, N. & Bruinsma, J., 2012. World agriculture towards 2030/2050: The 2012 Revision. Global Perspective Studies Team, ESA Working Paper No. 12-03. Agricultural Development Economics Division. Food and Agriculture Organization of the United Nations.
- Bauserman, M., Lokangaka, A., Kodondi, K.-K., Gado, J., Viera, A.J., Bentley, M.E., Engmann, C., Tshetu, A. & Bose, C., 2013. Caterpillar cereal as potential complementary feeding product for infants and young children: nutritional content and acceptability. *Maternal & Child Nutrition*, 7 pp.
- Belluco, S., Losasso, C., Maggioletti, M., Alonzi, C.C., Paoletti, M.G. & Ricci, A., 2013. Edible Insects in a Food Safety and Nutritional Perspective: A Critical Review. *Comprehensive Reviews in Food Science and Food Safety*, 12, 296-313.
- Christensen, D.L., Orech, F.O., Mungai, M.N., Larsen, T., Friis, H. & Aagaard-Hansen, J., 2006. Entomophagy among the Luos of Kenya: a potential mineral source? *International Journal of Food Sciences and Nutrition*, 57, 198-203.
- D'Silva, J. & Webster, J. (Eds), 2010. The Meat Crisis: Developing More Sustainable Production and Consumption. London, Earthscan. 305 pp.
- Edijala, J.K., Egbogbo, O. & Anigboro, A.A., 2009. Proximate composition and cholesterol concentrations of *Rhynchophorus phoenicis* and *Oryctes monoceros* larvae subjected to different heat treatments. *African Journal of Biotechnology*, 8, 2346-2348.
- FAO, 2012. The state of world fisheries and aquaculture. *FAO Fisheries and Aquaculture Department, Food and Agriculture Organization of the United Nations, Rome*.
- Halloran, A., 2013. Discussion paper: Regulatory frameworks influencing insects as food and feed (preliminary draft 18/12/2013). FAO, Rome.
- Hackstein, J. H. & Stumm, C. K., 1994. Methane production in terrestrial arthropods. *Proceedings of the National Academy of Sciences of the United States of America*, 91, 5441-5445.
- Hanboonsong, Y., Jamjanya, T. & Durst, P.B., 2013. Six-legged livestock: edible insect farming, collection and marketing in Thailand. *Food and Agriculture Organization of the United Nations, Regional Office for Asia and the Pacific, Bangkok*.
- Herrero, M., 2013. Feeding the planet: key challenges. In: *Energy and Protein Metabolism and Nutrition in Sustainable Animal Production* (Eds.: James W. Oltjen, Ermias Kebreab and Hélène Lapierre): pp. 27-34. 4th International Symposium on Energy and Protein Metabolism and Nutrition Sacramento, California, USA 9-12 September 2013, EAAP Publication No. 134, Wageningen Academic Publishers.
- Jongema, Y., 2013. <http://www.wageningenur.nl/en/Expertise-Services/Chair-groups/Plant-Sciences/Laboratory-of-Entomology/Edible-insects/Worldwide-species-list.htm>
- Looy, H., Dunkel F.V. & Wood J.R., 2014. How then shall we eat? Insect-eating attitudes and sustainable foodways. *Agriculture and Human Values*, 31, 131-141.
- Oonincx, D.G.A.B. & de Boer, I.J.M., 2012. Environmental impact of the production of mealworms as a protein source for humans – A life cycle assessment. *PLoS ONE*, 7, e51145.
- Oonincx, D.G.A.B., van Itterbeeck, J., Heetkamp, M.J.W., van den Brand, H., van Loon, J.J.A. & van Huis, A., 2010. An exploration on greenhouse gas and ammonia production by insect species suitable for animal or human consumption. *PLoS ONE*, 5, e14445.
- Ramos-Elorduy, J., 2006. Threatened edible insects in Hidalgo, Mexico and some measures to preserve them. *Journal of Ethnobiology and Ethnomedicine*, 2, 51 (online journal).
- Rumpold, B.A. & Schlüter, O.K., 2013. Nutritional composition and safety aspects of edible insects. *Molecular Nutrition & Food Research*, 57, 802-823.
- Steinfeld, H., Gerber, P., Wassenaar, T., Castel, V., Rosales, M. & de Haan, C. (Eds), 2006. Livestock's long shadow. Environmental issues and options. Food and Agriculture Organization of the United Nations, Rome, Italy, 319 pp.
- van der Spiegel, M., Noordam, M.Y. & van der Fels-Klerx, H.J., 2013. Safety of novel protein sources (insects, microalgae, seaweed, duckweed, and rapeseed) and Legislative Aspects For Their Application In Food And Feed Production. *Comprehensive Reviews in Food Science and Food Safety*, 12, 662-678.
- van Huis, A. (2013) Potential of insects as food and feed in assuring food security. *Annual Review of Entomology*, 58, 563–583.
- van Huis, A., van Gurp, H. & Dicke, M. 2014. The Insect Cookbook: Food for a Sustainable Planet. Columbia University Press, New York. 216 pp.
- van Huis, A., Van Itterbeeck, J., Klunder, H, Mertens, E., Halloran, A., Muir, G. & Vantomme, P., 2013. Edible insects: Future prospects for food and feed security. FAO Forestry Paper, 171. Rome, Food and Agriculture Organization of the United Nations, Rome, and Wageningen University and Research Centre, the Netherlands. 187 pp.
- Van Itterbeeck, J. & van Huis, A., 2012. Environmental manipulation for edible insect procurement: a historical perspective. *Journal of Ethnobiology and Ethnomedicine*, 8, 1-19.
- Van Lenteren, J.C., 2006. Ecosystem services to biological control of pests: why are they ignored? *Proceedings of the Netherlands Entomological Society Meeting*, 17, 103-111.
- Verhoeckx, K.C.M., van Broekhoven, S., den Hartog-Jager, C.F., Gaspari, M., de Jong, G.A.H., Wichers, H.J., van Hoffen, E., Houben, G.F. & Knulst, A.C., 2014. House dust mite (Derp 10) and shellfish allergic patients may be at risk when consuming food containing mealworm proteins. *Food and Chemical Toxicology*, 65, 364–373.



Ento, a taste of the future

Peter Smithers

Walking around the statue of Eros in Piccadilly Circus I was swept along by the waves of uncertain tourists who hesitantly explored the statue's steps while Londoners ploughed through the crowds, striding head down to their next appointment. I had arranged to meet the Ento team here and when we had made the arrangement it seemed foolproof. However, now that I was here I wondered if we would ever make contact amid the hectic throng as I had already circumnavigated the statue half a dozen times. A phone call and much arm waving later we manage to locate each other and move to the relative peace of a nearby restaurant.

I had made contact with Ento at an event run by UCL at the Dana Center in South Kensington a few weeks earlier, and eager to find out more about their project we had arranged to meet next time I was in London.

The Ento team had met as students on the Masters in Innovation Design Engineering at the Royal College of Art, so I was keen to discover how a group of design students had decided to explore the concept of insects in western diets.

The key was innovation, they had to find something new to design and had come across the Ted talk by Arnold van Huis on Insects as Food. This seemed like a real challenge so they began to explore what was known and what was on offer. The London restaurant Archipelago was one of only two UK restaurants that had insect dishes on their menu, so it seemed an obvious place to start. Here the insects were added to the dish as a garnish of whole insects and, in their own words, "it was quite shocking, we really struggled to eat them", but once they had overcome this barrier the insects tasted great. This was a major problem, so the project became how to present insects in a way that would be acceptable to western diners.

Trialing presentation styles from whole insects to insect pate then led to the distinctive Ento brand, which is presented in the accompanying article.

One of the major problems that Ento face is that of supply, as currently none of the UK insect farms supply insects for human consumption. One reason for this is the lack of a market for them, and the other is the absence of any legislation or health and safety directives to define good practice in this sector. These are huge challenges which are currently being explored by the Food Standards Agency. The other supply problem is cost, as the current live insect markets are set up to deliver small numbers of individuals, while a potential culinary market would need very large quantities of insects to supply restaurants and shops. The price of farmed insects would also have to come down in order to make meals that featured insects affordable.

The transition from the Royal College of Art to the wider world has led to compromises for Ento. Each member of the team also work as professional designers while they develop the entomophagy business in their spare time. Despite all the challenges that they face, Ento brims with energy and enthusiasm. They may have begun as an academic exercise, but it has evolved into an enterprise that is destined to bring a new and exciting culinary experience to UK diners.



Ento: Introducing Edible Insects into the Western Diet

**Jacky Chung
and
Julene Aguirre-Bielschowsky**

Introduction

Ento is a London-based food company established in 2012, which is aiming to introduce edible insects to the western diet as an enjoyable, everyday alternative source of protein. We intend to achieve this through a series of delicious products and eating experiences that have been designed to gently challenge the cultural taboo and steadily build mainstream acceptance.

Ento was founded by Aran Dasan, Jacky Chung, Jonathan Fraser and Julene Aguirre-Bielschowsky. The multidisciplinary team came together while doing their Masters in Innovation Design Engineering at Imperial College London and the Royal College of Art. With diverse backgrounds in design and

engineering, the team was motivated by a collective interest in sustainability and food. This led to our desire to tackle the growing problem of global food security, and we set out to achieve this through an innovation and design strategy-driven approach.

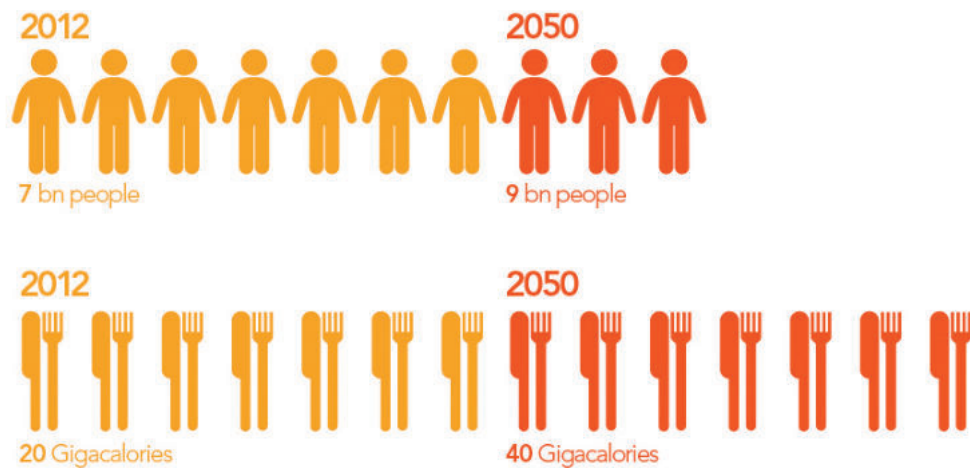
Global food security will be a growing concern in the future. The world's population is predicted to increase from today's seven billion people to nine billion by 2050. However, the growth in food demand will accelerate, and is set to double from approximately 20 to 40 gigacalories per day within the same time period, with much of this due to the economic growth of developing nations, promoting an increasing appetite for meat.

Modern day industrial meat production is a resource-hungry practice. It consumes roughly a third of all crops produced and requires 70% of agricultural land. It also accounts for around 20% of greenhouse gas emissions, through production, transport and animal digestive gas.

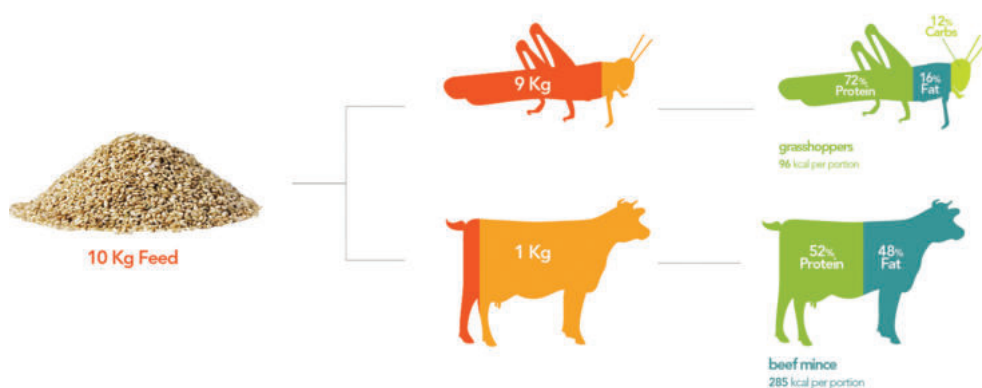
It is against this backdrop that edible insects offer an exciting alternative. They are extremely efficient at turning feed into meat compared to traditional livestock, and are also an excellent, low-fat source of protein. They can be farmed at a very high density, which means that their embodied energy is low – a tenth that of beef cattle. Their relative size also allows for more flexibility on where they can be farmed, making urban farming a possibility, which reduces food miles and can potentially activate unused urban land.

We first developed an interest in the idea of edible insects as a potential future solution to global food security after coming across an inspiring piece of research conducted at Wageningen University, which describes the incredible nutritional and environmental possibilities of insects as a future food. Given these benefits, it was therefore unsurprising to see why the UN, EU and Dutch government have such an invested interest in investigating their future potential, which has most recently been documented extensively in the FAO's (Food and Agricultural Organization of the United Nations) report on Edible Insects: Future prospects for food and feed security. Though while it was apparent that there were many people taking this issue very seriously, much of the research to date has mainly been focused on the supply side.

Currently, there is a major cultural taboo against eating insects. In an initial survey that we conducted on different people, most would imagine them to be dirty, gooey and unsafe. These negative preconceptions that most people have are also reflected in the types of edible insect products available in the market today, which are generally designed to play on the novelty aspect of eating insects, such as chocolate covered mealworms. While such products may serve a purpose in enabling people to try edible insects for the first time, they do not represent them as a real, everyday consumable food; rather as a snack that you would only try on a one-off for its novelty aspect. Given the



2050 Population and Food Demand Projections.



Energy and Nutrition Comparison: Grasshopper vs. Beef.

incredible nutritional and sustainable benefits of edible insects, we felt that there was a clear opportunity to address the challenge of acceptance, and enable people to begin viewing insects as a serious source of protein and ingredient that they can enjoy as an everyday part of their diet.

Ento Strategy and Process

The Ento approach to gradually increase acceptability of edible insects in the west can be illustrated through our strategic roadmap. The strategy was the outcome of our research to understand people's perceptions towards eating insects, the elements that make up a food culture and the visual language of our food and brand.

Each stage of the roadmap was paired with particular types of consumers and their motivations, and these change with the natural growth of the food business. We start by focusing on the adventurous eater, who is always looking to try something new for the sake of it, the crazier the better. These consumers can be found in festivals and markets or one-off events; in situations where many people are looking for surprising experiences to try new things. Ento currently operates within this area.

We believe that these early adopters would help us build up enough hype and resources to open a restaurant, where we would focus on creating a new experience around eating insects. This will provide a controlled environment within which we can explore different tastes, food typologies and eating experiences. It will also attract the likes of adventurous eaters and the foodies – who are food enthusiasts that are always on the look out for new eating experiences.

As people become more accustomed to the idea of eating insects, the novelty hype will gradually subside, allowing us to focus on the more sustainable, ethical and nutritional value of edible insects. At this point we would introduce a range of supermarket products that would initially be ready-made meals and pre-packaged foods designed to support consumers in preparing insects at home. These would then evolve over time to become normal everyday ingredients, which can be achieved when people truly begin to view edible insects as a normal part of their diet.

This strategy was the outcome of various strands of research and experiments, which can broadly be categorized within the following areas.



Ento Product Roadmap to Acceptance.

Food culture

In order for people to truly accept something new, it has to be embedded in a context that they can access. This means that we have to generate a culture surrounding insects as food, which could be used to ease their introduction to society. A cultural context is something that would be created gradually over time, but it is critical in enabling people to differentiate insects from being a type of animal to a food.

To identify the elements of a food culture, we studied other foods to understand how they are introduced and the factors that can establish their recognizable food format. For example, what differentiates our perception of a sandwich from two slices of bread with filling? While this simple concept has now evolved into a multiplicity of different ingredient combinations, it will always possess a consistent format that will allow you to recognize the food as a sandwich.

Another valuable example of food introduction and culture that we were inspired from was that of sushi in the UK. Thirty years ago, tourist guides warned British tourists about the strange and off-putting Japanese habit of eating raw fish, now you can even

buy it at leading British supermarkets. We found restaurants such as Yo!Sushi played a pivotal role in raising the profile of sushi in the UK as a fun and exciting new food during its early introduction. Since then it has opened up the way to alternatives such as Wasabi and Itsu, which are eateries that specialise in sushi lunches, with a strong promotion of its nutritional and health benefits. We drew on such insights to develop an insect food culture, which was fed into the development of the Ento strategy.

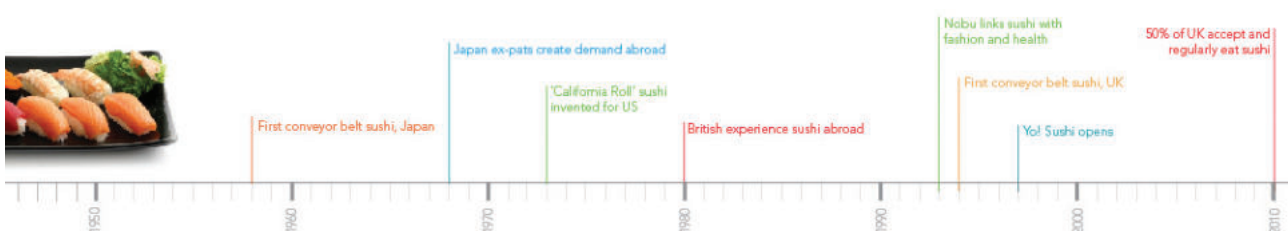
Consumer perceptions

In order to challenge the current cultural taboo of eating insects, we designed an experiment to try to understand other people's perceptions towards insect eating. We created a range of insect dishes that varied from abstract to very apparent, and asked the test subjects what they would or would not try while gauging their body language.

Unsurprisingly, most of the interviewees were more accepting of abstract dishes such as the bug flour biscuit. However, this abstraction effect was found to be far more powerful than we expected, and persisted until the insect parts became very apparent. Through this

experiment we discovered that even a minimal barrier layer of breadcrumbs was enough for many people to find the food appetizing, quoting from one interviewee, "I don't mind knowing they are insects, it's more the seeing." Part of this is due to our traditional cultural connection with our animal food products. For example, in the UK, people are accustomed to seeing their meat on supermarket shelves presented in an abstract form of different 'cuts' in clinical plastic packaging. There are few meat products in the supermarket shelves where you might see the full animal. Due to this some of the test subjects found that when they saw the very apparent whole insects, not only did they find this unappetizing, they also found it difficult to discern whether or not the insect was alive or not, and some were concerned that the insect might suddenly move.

The power of abstraction was a critical insight to how people may begin to try and accept edible insect foods. However, the experiment also identified a host of negative perceptions that we needed to address if people are to accept edible insects, and we found these to be strongly linked to our research findings of food culture and introductions.



Ento Product Roadmap to Acceptance.



Ento Events Catering and Food Development (left). Perception Experiment: Accepted Levels of Abstraction (right).



Ento Pop-up restaurant.

(Photographer: Vivek Vadoliya)



Ento Visual Identity.

Visual language

The context and experience that accompanies a food plays a critical role in its acceptance. In order to counter the negative preconceptions that people typically have towards eating insects, we tried to create a visual identity that could deliver a positive message. We wanted to create a visual language that was natural, playful, and futuristic: natural to convey a sense of purity and transparency; playful to make insects more approachable; and futuristic to identify insects as contemporary, forward-looking food. Using this language, we created our brand “Ento”. While being short for entomophagy, the similarity to the word bento (Japanese for lunchbox) gives the brand an Asian subtext. By using these visual cues, we wanted to encourage people to approach our edible insect foods with positive imagery such as a grasshopper in a green field on a warm spring day, rather than a fly that has gotten in their soup.

Food Design

The core values that underlie our brand are also inherent to how we design our foods. This is best represented in the Ento cubes, our first and original product that embodies our core values and acts as a benchmark to new dishes that we develop. The cube shape was derived from our understanding of consumer perceptions and food cultures; we wanted to create a culturally relevant food with a strong identity that can build trust and familiarity. A cube geometry is not often associated with natural foods, but in the case of edible insects this helps to create a sense of human control and cleanliness. Knowing that the insect foods have been carefully prepared and

processed helps suggest to consumers that the food is safe. The geometric shape also redefines insects as a new food typology, which reinforces their position as a future food.

Fundamentally, the Ento cubes aim to redefine insects as a type of food, rather than as a type of animal. This differentiation is already apparent in other meat products, for example, there is a clear distinction between a pig in a farm, and a cut of pork that is packaged and chilled on a supermarket shelf. Achieving this cultural context around edible insects can make it easier for people to accept them as a regular part of their diet.

Ento Development

Since Ento’s conception in 2012, we have been progressing steadily towards our future vision of mainstream acceptance. We have had the opportunity to host and cater a number of exciting events that has allowed us to stay on track in terms of our strategic goals. We have been able to continue developing and creating new insect foods with the support of a number of awards and collaboration with various partners.

The developments of our insect foods are carried out through close collaborations with experienced chefs. Since 2012, we have worked with a number of different chefs whom we share our knowledge of insects with, and in return they offer us their unique interpretations of insect foods. We are currently working closely with our professional chef partner Xenia Von Oswald to develop our next line of insect dishes, while also exploring their possibilities as a future ingredient. Each new recipe is typically tested at the

various events that we cater for, and this has been a very effective means for receiving direct feedback on our foods from a diverse audience.

Our most recent major food event was a three-day pop-up restaurant, which was hosted in southeast London and supported by Grey Goose Vodka. For this summer event, we curated a four-course menu that was designed to gently ease consumers into their first experience of eating insects. We worked with a team of professional chefs to develop each dish, and designed the interior space of the pop-up restaurant to give our customers a clean and controlled environment to experience our foods. The event was very successful and attracted much press attention. It was also clear that there is currently much demand for such an insect dining experience, as our event was sold out for all three nights. Interestingly, we found that many of the attendees were a combination of adventurous and foodie customer types – which enabled us to reaffirm our position in our strategic roadmap.

Most importantly, we were pleased to learn that many of our customers found themselves able to overcome their initial fears of eating insects over the course of the meal. Since the success of our first pop-up restaurant, we have been pursuing our near term goals using the insights gathered from such events to further refine our existing foods and develop new recipes. Through different events and opportunities, we are determined to make our foods more accessible to early adopters.

There are still many challenges that lie ahead to raise the profile of edible insects. One of the biggest challenges currently lies in finding a reliable and local source of insects that are farmed for human consumption. The Netherlands is already making great progress in this area, having established farms that produce insects suitable for humans, along with active collaborations between academics from Wageningen University and local producers. However, in the rest of Europe, there are still many regulatory and supply challenges. However we believe these can be overcome by increasing the collaborative efforts between academics, product developers and suppliers. This collaboration will be critical for the continued development of our food products and the industry’s future growth.

The Ento website can be found at <http://www.eat-ento.co.uk>



Creating a New Cultural Context.

References

Image: 2050 Population and Food Demand Projections Source: http://www.fao.org/fileadmin/templates/wsfs/docs/Issues_papers/HLEF2050_Global_Agriculture.pdf

Image: Energy and Nutrition Comparison: Grasshopper vs. Beef. Source: Beef nutrition data: http://www.nutritionvalue.org/USDA_Commodity%2C_raw%2C_frozen%2C_bulk%252Fcoarse_ground%2C_ground%2C_beef_nutritional_value.html

Insect nutrition data: The Food Insects Newsletter, July 1996 (Vol. 9, No. 2, ed. by Florence V. Dunkel, Montana State University) and Bugs In the System, by May Berenbaum



The PROteINSECT consortium at a recent meeting at the Guangdong Entomological Institute in China

PROteINSECT



Elaine Fitches
Coordinator of PROteINSECT,



Rosie Pryor
Dissemination for PROteINSECT,
Minerva UK Ltd.

PROteINSECT is a new EU-funded project investigating how insects can contribute to the growing demand for protein in animal feed. The project is being coordinated by the Food and Environment Research Agency (Fera) in the UK, but also involves partners from Europe, Africa and China, including feed industry multinationals, farmers, and research centres.

At present, the demand for animal feed protein is mostly met through soya and fishmeal. However, the expanding global population, combined with a rise in per-capita meat consumption, has highlighted a need to introduce more sustainable sources of protein. Insects represent an excellent alternative and in many countries outside of Europe, they have long been recognised as a valuable source of protein for both human consumption and animal feed. Although there is growing interest in the potential of insects as human food, Westernised eating habits mean that, in the short-term at least, insects are likely to make their greatest contribution to food security as an ingredient in animal feed.

PROteINSECT is concentrating on the inclusion of protein derived from insects in feed for poultry, pigs and

several species of fish since these animals already consume insects as part of their natural diet. Specifically, larvae of the black soldier fly (*Hermetia illuscens*) and the house fly (*Musca domestica*) are being investigated. These species can be quickly and successfully reared on a range of organic waste materials, such as chicken and pig manure, and are capable of reducing the volume of this waste by up to 60% in the process (Miller et al., 1975; Sheppard, 1983).

The project focuses on five main areas, the first of which is the development and optimisation of sustainable insect production methods. A variety of waste substrates are being evaluated in order to identify those that are most appropriate for rearing flies, over a range of geographic locations. In addition to animal manures, waste products from food and beverage processing are being investigated. The material remaining after fly development is also being analysed for potential downstream applications including use as a fertiliser or substrate for biogas generation.

Following insect production, PROteINSECT is also investigating protein processing technologies.



Maggots produced at a chicken farm in China. Inset: chicken feeding on maggots.

Methods for the extraction and refinement of insect protein will be reviewed and those that show the most promise will be scaled up to pilot scale. Next, poultry, pig, and fish feeding trials will be conducted using both crude and refined insect protein extracts. Multiple factors will be monitored including feed intake, daily growth rate of animals and feed conversion ratio. This data will enable a comprehensive assessment to be made as to whether insects are a suitable source of protein for animal nutrition.

One of the principle aims of this project is to evaluate the quality and safety of insect extracts. There is little published data currently available on these issues. Whole insects, insect protein extracts, and meat and fish derived from insect-fed animals will be examined for protein content and amino acid composition as well as chemical, microbiological and allergenic safety. Furthermore, non-protein by-products of insect processing, such as vitamins, minerals, fats, and chitin will be identified and their potential value assessed.

Previous studies have suggested that insect production is likely to be more environmentally friendly than the farming of traditional livestock. It has

been demonstrated that insects produce lower greenhouse gas and ammonia emissions than cattle and pigs (Oonincx et al., 2010). PROteINSECT is undertaking a complete life cycle analysis to evaluate the environmental, social, and economic impact of the production and use of insect-based animal feed, in order to compare it with conventional feed production. The collection of raw materials, the production and processing of insects, and the distribution and use of the end products will all be considered. This will enable policy and technical recommendations to be made for the establishment of environmentally and economically efficient fly-rearing systems.

Finally, PROteINSECT is working hard to encourage a positive and receptive platform in Europe for the use of insects in animal feed in the short term and for direct consumption by humans in the longer term. This is being achieved by engaging and informing both consumers and key stakeholder groups, which include feed producers, farmers and regulators to name a few. Insect protein is currently not permitted in animal feed under EU law, with the exception of feed intended for fish or shellfish. However,

PROteINSECT intends to develop and present a 'white paper' to the European Parliament in the hope that it will lead to the introduction of clear and permissive legislation supporting the use of insect protein in feed and food.

The successful adoption of insect production technologies on a global scale is heavily dependent on the transfer of knowledge from countries that have a wealth of expertise not currently present in Europe. Advances have already been made in the rearing of insects for animal feed in PROteINSECT's partner countries: China, Ghana, and Mali. The exchange of information between countries on insect rearing, processing technologies, and quality and safety is fundamental to this project. The PROteINSECT team benefited greatly from a recent trip to China that included tours of maggot production facilities managed by the Guangdong Entomological Institute and Huazhong Agricultural University.

The public's opinion on the use of insect protein in animal feed is very important to PROteINSECT. If you would like to share your views, a short survey is available to complete on the project's website: www.proteinsect.eu.

References

- Miller, B.F. et al. (1974) Digestion of poultry manure by *Musca domestica*. *British Poultry Sci.*, 15: 231-234.
- Oonincx D.G.A.B. et al. (2010) An exploration on greenhouse gas and ammonia production by insect species suitable for animal or human consumption. *PLoS ONE.*, 5(12):e14445.
- Sheppard, D.C. (1983) House fly and lesser house fly control utilizing the black soldier fly in manure management systems for caged laying hens. *Environ. Entomol.*, 12: 1439-1442.



Entomophagy, a Journey from Novelty to Necessity

Insects as food for humans is a curiosity which has been reported in the pages of *Antenna* for some time. Green (1998) & Latham (1999) documented the use of insects in Namibia and the Congo. These articles both explored the role that insects play in the diets of developing countries, highlighting its decline and the subsequent nutritional repercussions. It was a tropical curiosity which could not possibly be relevant in western Europe, where the consumption of insects has been regarded as a desperate measure or an interesting novelty at best.

Back in 2002, Plymouth University ran an exhibition in the City Museum that explored the public perception of 'Bugs'; as both microbes and as minibeasts. The entomological side of the exhibition presented a series of panels that outlined what the world might look like without certain groups of invertebrates such as ants, woodlice and dung beetles. These were accompanied by a rogues gallery of insect portraits, SEM images of invertebrate faces and a series of public talks on invertebrates. We were looking for a way to attract the public when I read that Liverpool Museum had hosted an afternoon at which a range of dried insects were offered to visitors as a tasty snack. The staff reported that it had been incredibly popular and that they had run out of insects very quickly as so many people were keen to try them. Here, I thought, was a great way to grab the public's attention and raise the profile of our entomological exhibition. Insect eating would also be one of the talks we would offer as part of our public lecture series. We ran "Insects as Food" as an opening lecture accompanied by a tasting session, and it transpired to be so popular that we had to repeat it the following weekend by public demand. Eating insects, it appeared, was a very hot topic.

Researching the talk I was struck by the wide range of insects eaten around the world and the relish with which people anticipate these, often seasonal, harvests. Most papers and articles left me with an impression of the exotic nature of tropical diets and the

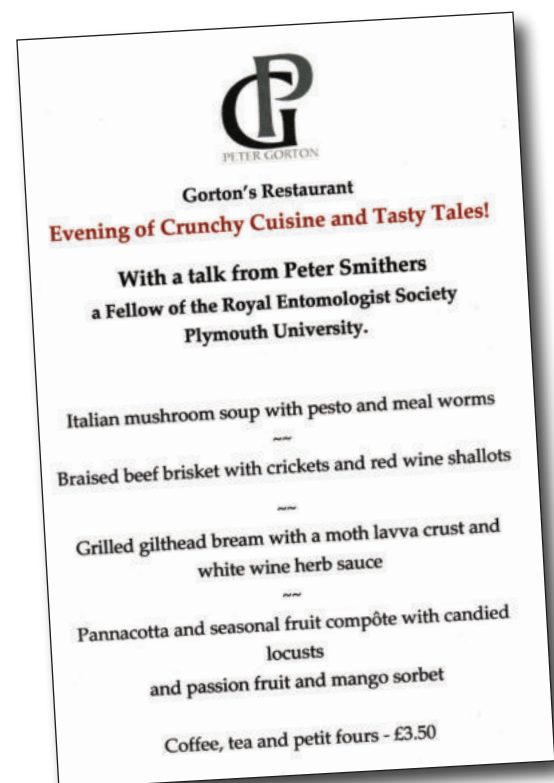
essential role that insects played in supplementing the required intake of proteins and minerals. Gene Defoliart's review (Defoliart, 1999) highlighted another perspective; that as emerging nations prosper they aspire to western life styles and when they look at our diets, insects are absent. So there is a tendency to reject insects as primitive and un-western, which then leaves a nutritional gap in their diets; a fact that is borne out in a more recent *Antenna* article where entomophagy was seen to be in decline in the African state of Benin (Verspoor *et al.*, 2013). Gene felt we in the west should adopt insect proteins in our diets and demonstrate that a move to western life styles could also include insects, which would allow emerging nations to maintain access to these essential protein supplements. This then became the theme of my entomophagy lectures; we were no longer dealing with a curiosity, we had a social perspective to shift.

When the BBC launched its landmark series dealing with invertebrates, "Life in the



Peter Smithers

School of Biological Sciences
Plymouth University



invertebrates, “Life in the Undergrowth”, the University and City Museum decided to mark the occasion with an exhibition and a series of lectures. The exhibition was called “Investigating Insects” and dealt with local entomologists past and present. The public lectures were going to be on the weekend before the launch of the series and we managed to persuade Mike Salisbury (producer of the series) to send the producer of the first programme to Plymouth to give a talk on how the series was made and to show some clips. This would be followed by my “Insects as Food” talk, and a range of insect snacks would then be served in the cafe adjacent to the lecture hall. On the day the lecture hall was packed, with many people resorting to sitting on the lecture theatre steps. Following the talks the insect snacks were in great demand as the queue of eager entomophagists ran out of the cafe across the foyer of the Lecture theatre, out of the main door and into the courtyard outside.

Following this success, we have run entomophagy events for local schools and the Children’s University, local natural history groups and even the Rotary club. We have also run sessions at the local Cafe Scientifique (science based discussions with an introductory talk designed for a public audience), which is run in a bar that has a resident Thai chef. Here we offered diners a portion of crickets stirred in or as a side dish with their chosen curry and noodles. The orthopteran side dishes had sold out by the end of the discussion.

At the Plymouth Insect Film Festivals, local Michelin star chef Peter Gorton has previously cooked up a range of interesting dishes, including cricket and mango risotto, followed by a dark and white chocolate cake with crickets poking through the top, all of which was consumed with great delight by an eager audience.

I have since worked with other chefs to produce insect snacks, feeding local schools in Yorkshire for National Insect Week where Lionel Strubb produced a cricket stir-fry and a truly wonderful crab and cricket terrine. We then fed adults at the Cheltenham Science Festival where Conrad Black served crickets in a pesto and bayleaf parcel, which was battered and deep fried; these went as fast as he could produce them.

The publication of the UN report on edible insect use in SE Asia, “Humans Bite Back” in 2008 explored the way that SE Asia utilized insect protein. This raised the prospect that we might not be just looking at persuading emerging nations to continue to consume insects, but may well be embracing the practice here in the west as an essential extension of our diet.

The more recent UN report simply entitled “Edible Insects”, which was published last May (Van Huis *et al.*, 2013), follows this theme and presents entomophagy as an essential part of the solution to feeding the world’s growing population. This report suggests that insects could provide a more efficient and sustainable protein source for human populations in developed as well as developing nations, and as animal feeds.

Coincidentally, the day after this was published I was addressing an event organized by University College London that explored insects in human diets. It was here that I met the London based company Ento who presented their roadmap from insect canapés at festivals to a series of entomophagous restaurants (see article in this issue).

Spurred on by the UN report, Peter Gorton and I organized an entomological dinner at his restaurant in Tavistock. Peter put together a four course meal comprising:

- Italian mushroom soup with pesto and mealworms

- Braised beef brisket with crickets and red wine shallots
- Grilled bream with a waxmoth larvae crust
- Pannacotta and seasonal fruit compote with candied locusts

On the evening the restaurant was packed with eager diners, and I gave a short talk on various aspects of insects in human diets between courses. The meal was a great success with a great deal of media interest and many requests for a repeat performance.

Following the UCL event at the Dana Center, I was asked to speak at one of the Royal Geographical Society’s 20th Century Challenges events. This was entitled “Feeding the Nine Billion”. This event was chaired by Jay Rainer (novelist and TV food critic) and featured talks from myself on insects as a future food, Tim Wheeler who discussed agricultural technologies and their future role in feeding a growing population, and Edd Colbert who examined the use of food waste as animal feed.

There was an audience of approximately 400 people who fired a barrage of questions at the speakers in the discussion that followed. Videos of the talks are available on the RGS website.

Following this event there has been a steady flow of requests for talks on this subject, so it appears that there is an increasing interest in insects as a part of western diets. The 21st century has seen a transition in western attitudes from that of exotic novelty at the beginning of the millennium to the present serious discussion of whether insect protein can play a significant role in feeding a growing world population. So watch the pages of *Antenna* for future developments and keep an eye on the menus in your local restaurants for the appearance of some innovative cuisine.

References

- DeFoliart G.R. 1999. Insects as Food: Why the Western Attitude is Important. *Annual Review of Entomology* 44 21-50.
- Durst P. B., Johnson D. V., Leslie R. N. and Shono K. 2010. Forest Insects as Food, *Humans Bite Back*. Food & Agriculture Organization of the United Nations, paper No 2010/02
- Feeding the 9 Billion. Royal Geographical Society. <http://www.21stcenturychallenges.org/challenges/food-matters/>
- Green V. S. 1998. The Bushmen as Entomologists. *Antenna* 22 (1) 4-8.
- Latham P. 1999. Edible Caterpillars of the Bas Congo Region of the Democratic republic of the Congo. *Antenna* 23 (3) 134-139.
- van Huis A., Van Itterbeeck. J., Klunder. H., Mertens. E., Halloran. A., Muir. G., and Vantomme. P. 2013. Edible Insects. Future Prospects for Food and Feed Security. Food & Agriculture Organization of the United Nations, Forestry paper 171.
- Verspoor R., Riggi. L., Veronesi. M., and MacFarland. C. 2013. Bugs for Life 2013: Exploring the practices, perceptions & possibilities of edible Insects in Northern Benin. *Antenna* 37(2) 63-66.

BugsCEP, an entomological database twenty-five years on

P. I. Buckland¹

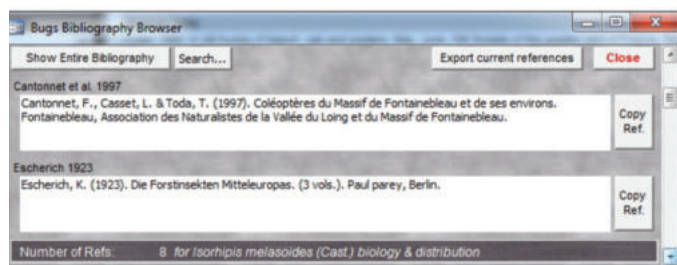
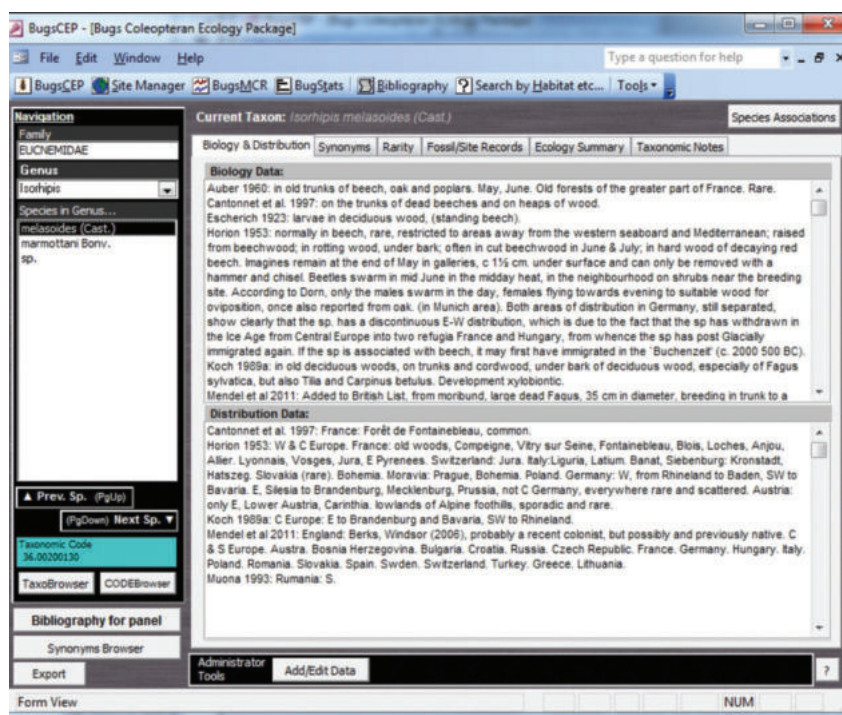
and

P. C. Buckland²

¹ Environmental Archaeology Lab,
Dept. of Historical,
Philosophical & Religious Studies,
Umeå University, Umeå, SE-90187,
Sweden
Email: phil.buckland@umu.se

² 20 Den Bank Close,
Sheffield, S10 5PA
Email: paul.buckland@bugscep.com

Figure 1. The primary species information screen of BugsCEP (top), here showing biology and distribution data for *Isorhipis melasoides* (Laporte de Castelnau) (as *Isorhipis melasoides* (Cast.)), can be browsed one taxon at a time, in taxonomic order. Tabs underneath the current taxon name allow different information panels to be brought forth, such as those for synonyms and an overview of the fossil record. Clicking the Bibliography button on the left opens a list of the full references for the information shown (bottom). The toolbar across the top of the window provides access to more advanced analysis and searching tools, including climate and habitat reconstruction as well as the facility to query by habitat, rarity and more.



Introduction

Several recent papers in a range of entomological and biogeographical journals (e.g. Abellán *et al.*, 2010; Foster & Carr, 2008) have drawn attention to the importance of the Quaternary insect fossil record, both in terms of species distribution and conservation. Papers on the recent discovery of a population of the eucnemid *Isorhipis melasoides* (Laporte) at Windsor (Mendel *et al.*, 2011) and the record of the weevil *Cossonus linearis* (Fabricius) north of its previously known modern range in Leicestershire (Drane, 2012) both refer to fossil records from Postglacial (Holocene) sediments, albeit incompletely. The limited discussion of the fossil record reflects, in part, the difficulty of access to the relevant papers. Whilst the first fossil record of

the former occurs in a note in *Nature* (Buckland & Kenward, 1973), its more full discussion is in an obscure monograph (Buckland, 1979), recently made more accessible as a download (<http://epapers.bham.ac.uk/26/> or <http://www.thmcf.org/publd.htm>); other finds, from the Baker Site in Somerset (Girling, 1980), West Heath Spa in Hampstead, not far from Windsor (Girling, 1989), and Misterton Carr in north Nottinghamshire (Osborne, 1978) are less easily tracked. With help from Keith Alexander, Tony Drane (*ibid.*) was able to track one fossil record of *C. linearis*, Peter Osborne's (1974) early Holocene find from Lea Marston in Warwickshire, but another is missed, that of Mark Robinson (1993) from mid-Holocene sediments at Mingies Ditch in

Oxfordshire. Both papers on the modern fauna include consideration as to whether the species are native, having arrived at some point in the Holocene (Postglacial to optimists), or are recent introductions, a point again raised by Howard Mendel and Joanne Hatton (2012) in their discussion of the addition of *Gastrallus laevigatus* (Olivier) to the British list; this has no fossil record although its congener *G. immarginatus* (Müller) extended at least as far north as Thorne Moors, S. Yorkshire three thousand years ago (Buckland, 1979). The new checklist of the British beetle fauna (Buckland & Buckland in Duff, 2012) includes a list of all species no longer considered native to the British Isles, but recorded as Quaternary fossils. This essentially covers the last 2.6 million years, and

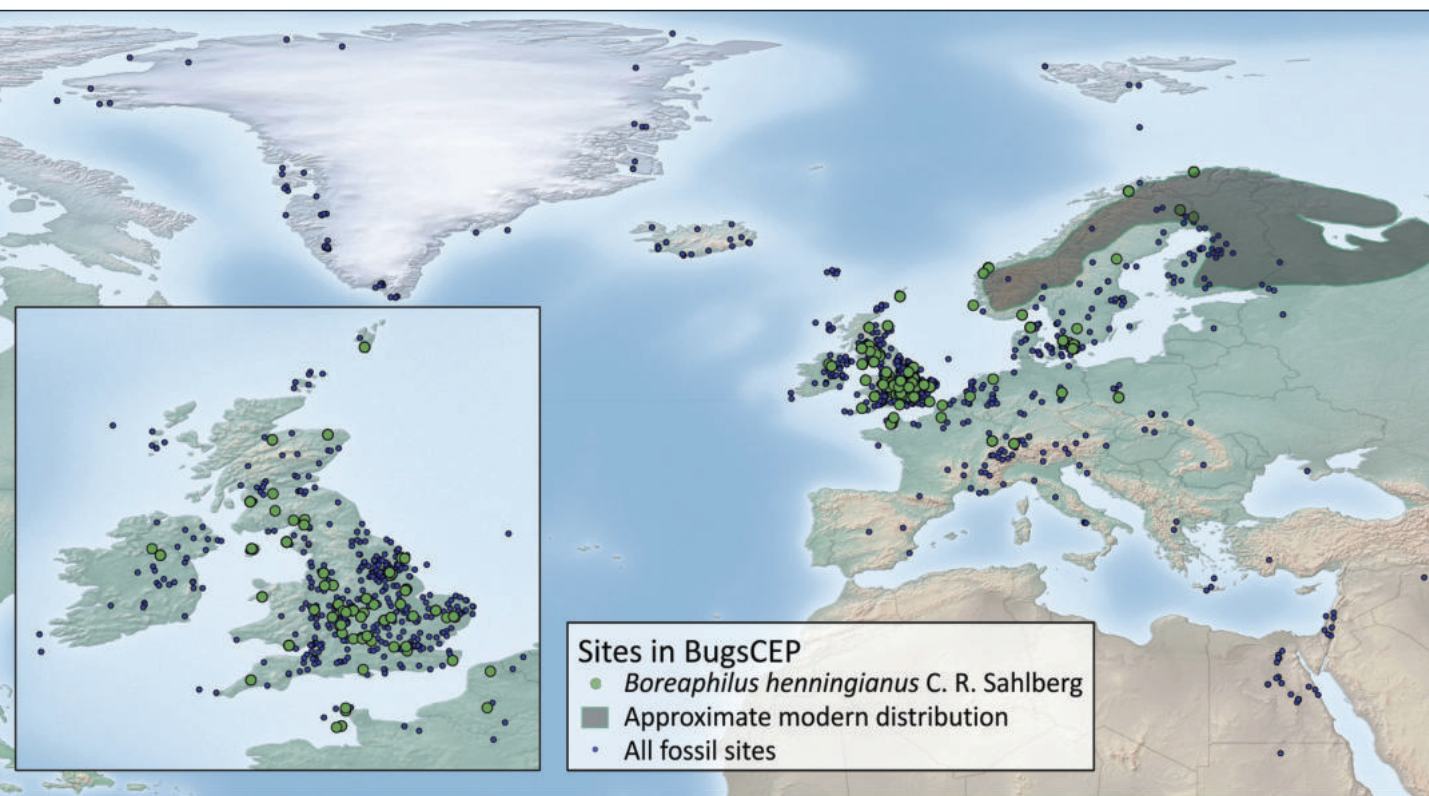


Figure 2. Map showing all European sites with fossil data currently stored in the BugsCEP database (small circles) and the fossil distribution of *Boreaphilus henningianus* C. R. Sahlberg (large circles) plotted against approximate modern distribution. Points extracted from the BugsCEP master dataset using the Strategic Environmental Archaeology Database (SEAD; <http://www.sead.se>; Buckland *et al.*, 2010). Base map made with Natural Earth @ naturalearthdata.com.

includes an indication as to whether the finds belong to the present interglacial, a previous one, the Lateglacial, when the first of many extant taxa established themselves on what must have been the *tabula rasa* of the British Isles (*sensu* Morris, 2012), the last glacial or a previous one. The Checklist has insufficient space to include localities and the user is referred to the BugsCEP database (www.bugscep.com; Buckland & Buckland, 2006), which is freely downloadable, for further information and sources (Figure 1). These records may also be browsed on a map using the SEAD (Strategic Environmental Archaeology Database) online interface at www.sead.se (Figure 2). This article provides an outline of the Bugs database in its present form, BugsCEP, and its genesis.

The Bugs Coleopteran Ecology Package (BugsCEP)

The problems of linking neontology (the study of the extant biota) with palaeontology (the study of fossils), or more specifically entomology with

Quaternary entomology, were apparent more than twenty years ago, when Jon Sadler and others (1992) devised a database in now long-defunct Dbase3© to link fossil records with information on modern ecology and distribution. The program has gone through several iterations to keep up with changing computer technology and provide greater functionality for a growing user base, the current version having been transmogrified into Access© by the senior author of this short paper (Buckland & Buckland, 2006; Figure 1). The initial problem was that of articulating the data around a checklist. From the beginning in the 1980s, it was intended that the database would encompass European fossil records as well as British ones, and it was fortunate that the Central European Coleoptera checklist compiled by Lucht (1987) also employed a specific numbering system which was both robust and able to accommodate additional taxa. This allowed numerals before the point to be used for Family or other higher taxon, and digits after the point to be divided, three for genus and three for species within genus, with

a fourth digit to allow additional species or other categories to be interspersed. Thus, *I. melasoides*, by way of example, has the unique code 36.0020013, whilst identifications to the species pair *Pterostichus nigrita/rhaeticus* (Paykull/Heer) (the minor reorganisation of trivial names and authors here reflects the way the data are stored in the database) is 01.0510192 and the non-European *P. magus* Mannerheim, known from the Lateglacial at Farmoor in Oxfordshire (Briggs *et al.*, 1985), is 01.0510575. This system allows for convenient browsing and outputs in taxonomic order. All information relating to a taxon, culled from a wide range of sources, reflecting both the nature of the fossil record and the esoteric interests of the compilers, is linked to this unique identifier, along with source and bibliography for each individual reference (Figure 2). Whilst Lucht and his team were clearly far-sighted in their provision of a numbered list in 1987, even by the time of Böhme's (2005) revision, it was beginning to creak, and the completion of the *Palaeartic Catalogue* (Löbl & Smetana,

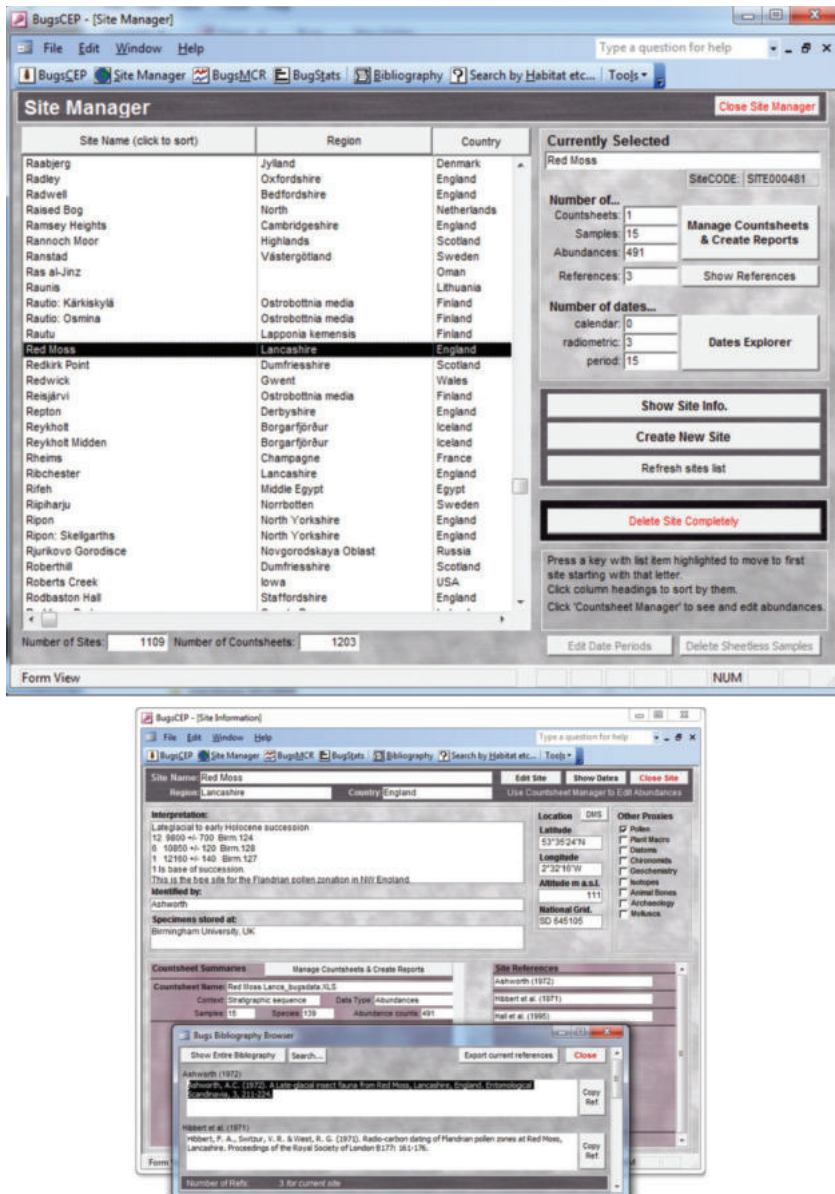


Figure 3. (Top) BugsCEP site manager showing part of the list of 1150 sites stored in the database at the time of writing. Summary information is shown to the right for the currently selected site (Red Moss in Lancashire). Clicking the [Show Site Info.] button opens a screen showing more detailed information and references for the site (bottom). The beetle list comes from Ashworth (1973)

2003-13) has rendered the system even more in need of revision, although this in itself might be the source of some contention. The glaring errors in the latter (Marshall for Marsham for example) have been corrected in the Bugs checklist but taxa have not been re-ordered as per the current usage in, for example, Duff (2012), where species are listed in alphabetic rather than morphotaxonomic order. The provision of a database for Eva Panagiotakopulu's fossil research in Egypt (Panagiotakopulu, 2001; Buckland *et al.*, 2004) needed significant numerical gymnastics to achieve a numbered list in taxonomic order whilst retaining those taxa

occurring in Central Europe with the same identifier. Although the version of the software currently under development using the SEAD system circumvents such problems by providing for parallel check-lists, resolving international differences is no easy task and requires constant attention.

Fossils and taxonomies

From these problems it is evident that a major re-organisation of taxa within BugsCEP is necessary, but that this is dependant upon a numbered checklist encompassing the Palaearctic fauna. This is a major short-coming of the new Catalogue (Löbl *et al.*, 2003 *et*

seq.), which is not provided with unique numerical identifiers for each taxon. Similarly, the present trend towards ordering species within genus alphabetically rather than in an order which at least places morphologically most similar adjacent is seen as a retrograde step, notwithstanding the absence of supporting phylogenetic studies for some genera. Pope (in Kloet & Hincks, 1977), perhaps an early victim to that current trend to dumb everything down, threw out the entomological baby with the bathwater, abandoning generations of careful morphological study (for a contrary discussion, see the late Derek Lott (2012) in Duff (2012)). Such an approach becomes particularly problematic where a species has been found to consist of two or more morphologically similar species. As many groups, particularly amongst the Aleocharinae, as fossils, these may be indistinguishable above the molecular level, and identification is to group. For example, *Latridius minutus* (Linnaeus) 'grp' (group) of many archaeological assemblages (e.g. Kenward, 2002) includes *L. minutus*, *L. pseudominutus* (Strand) (= *assimilis* Mannerheim of Johnson, 2012a) and *L. anthracinus* Mannerheim (= *porcatus* Herbst (*ibid.*)), although given the diagnostic sclerite (in this case the metasternum - Tozer, 1972) species identification is possible in some fossils. Biogeographically, this is significant since only *L. pseudominutus* appears to make it on the Norse ships to medieval Greenland (Buckland *et al.*, 2009), whilst the Icelandic checklist (Ólafsson, 1991) lists *L. minutus* and *L. anthracinus*, and Tozer (in Buckland *et al.*, 1991) notes *L. anthracinus* from a recently abandoned barn in southeast Iceland. In identification work it is very useful to know what is similar and what are the possibilities; morphologically similar species may be alphabetically far apart and it is no longer easy to indicate what 'grp' includes. As a further example, *Anotylus sculpturatus* (Gravenhorst) in BugsCEP also includes *A. mutator* (Lohse) in all fossil records since they can only be separated on male terminal abdominal segments (Lott, 2009); there are many other examples. Advances in database design allow such problems to be solved, but the intuitive and practical importance of a taxonomically meaningful ordering system should not be forgotten.

That taxonomy is not entirely moribund is apparent from the number of changes in the British checklist, not so much from new discoveries, (which at least shows that good, old-fashioned natural history is not dead), but from the revision of old finds (most recently, e.g. Johnson, 2012b; Levey, 2012). BugsCEP attempts to keep up with these on a Europe-wide basis by including synonyms, with sources, and these are available on the second page tab of its species information screen (Figure 1), which lists synonyms, again with sources, on a Europe-wide basis. This list is far from complete, however, and inevitably requires constant revision. In terms of the fossil record, some changes require reference back to the original specimens, many of which have unfortunately decayed due to storage in 70% alcohol (the late Russell Coope (2012) recently recommended reducing the concentration to 30%). Foster (2000) draws attention to the fact that *Stictotarsus* (= *Boreonectes* of Angus 2010) *multilineatus* (Falkenström) is the most frequently identified water beetle in the Lateglacial sequence at Gransmoor in East Yorkshire (Walker *et al.*, 1993), where it is listed under the synonym *S. griseostriatus* (De Geer) (= of Brit. auctt.). Other British and German fossil records (e.g. Walkling & Coope, 1996), which utilised the Gorham Collection in Birmingham as the primary comparative collection, undoubtedly perpetuate this error, and the lists in BugsCEP have been amended accordingly, but it is probable that the true *S. griseostriatus* is present in fossil assemblages since its modern Scandinavian (Nilsson & Holmen, 1995) and Alpine distribution (Angus, 2010) would suggest it. Geoffrey Lemdahl's Swedish records (e.g. Lemdahl, 1988) and Philippe Ponel's French ones (e.g. Ponel, 1995) have therefore been accepted. There are no doubt other corrections necessary, but BugsCEP does not attempt to duplicate in full the various checklists; neither is the whole of the European checklist entered since the research has concentrated on making sure as much of the Quaternary fossil insect record (Figure 3), including groups other than Coleoptera, backed up by relevant habitat and distribution data as is accessible, has been entered. Future versions will include more comprehensive taxonomic lists to enable linking with external biodiversity databases such as the

Global Biodiversity Information Facility (GBIF, 2012; see caveat below). In the longer term, it is hoped to include the extensive work carried out on Quaternary sediments east of the Urals and across Siberia and the Russian Arctic, although an independent database has been constructed for the latter (Kuzmina, 2013). Integration of the data would be helped considerably by the provision of a numbered Palaearctic Catalogue. In the meantime, we have attempted to pull together a worldwide bibliography of Quaternary entomology, based on that originally compiled by Buckland and Coope (1991) and this is available for download with periodic updates from the BugsCEP website (<http://www.bugscep.com/qbib.html>).

Habitat data and ecological summaries

The provision of habitat and distribution data in BugsCEP is inevitably somewhat quixotic. Initially restricted to the Coleoptera, in the more recent versions the fossil record of all Quaternary insects has been added, although the input of ecological and biogeographic data for these lags far behind that of the beetles. Chironomidae have currently been omitted as they are generally handled differently from the larger fossils. This caveat notwithstanding, the database contains records of >150,000 fossil occurrences (representing over 600,000 observations) including virtually all of the European fossil record (Figure 2). In the British Isles, this involves species lists from the large number of reports in the 'grey literature,' which has become an inevitable part of archaeological publication. The need for 'quality control' and efficient data management has meant that data entry has been limited to one of us (PCB), although sourcing of data has ranged very widely. The need to collate records of woodland species as part of a Natural England project examining natural grazing in the wildwood (Hodder *et al.*, 2005), added to previous work on the nature of the pre-clearance forested landscape (e.g. Buckland & Dinnin, 1993), led to a bias in habitat data towards dead wood habitats. In terms of research objectives, it was also relevant that the bulk of extirpations (extinctions) from the British fauna and major retractions in continental range involve the forest (cf. Whitehouse, 2006; Olsson & Lemdahl, 2009). Much of the data from classic

sources, such as Palm's (1959) epitaph for the Swedish *Urwald* beetle fauna, have been freely translated, abstracted and entered. This bias in data entry has been partially re-balanced by the use of Koch's collation of Central European habitat and distribution lists in the supplementary volumes to *Die Käfer Mitteleuropas* (Koch, 1989a; 1989b; 1992), and British sources, including the recent Royal Entomological Society handbooks (e.g. Lott, 2009). BugsCEP uses a combination of broad scale references such as Koch along with more specific and often local sources. Often, these may disagree in terms of their descriptions of the preferred habitat of a species, and the authors leave it to the judgement of users with respect to the appropriate use of the data in their research. Examination of the database entries, for example for the anobiid *Gastrallus immarginatus* and the weevils *Rhyncholus ater* (L.) and *Dryophthorus corticalis* (Paykull), not infrequent Quaternary fossils, provides good examples where rare records from the edge of ranges provides habitat data which is more restricted than Continental sources would indicate. In terms of the fossil record, this issue is perhaps more important to consider when using broad habitat classification systems for describing environmental change, such as that used by Koch (*op. cit.*) or the more compact system built into BugsCEP, which, by their very nature generalise.

Distribution data and modelling climate change

Distribution data are more difficult to process than habitat, where apparent contradictions in hosts may be assessed by using a range of Continental and British sources. Despite a rather bizarre attempt to apply archaeological frequency statistics to assemblages (Bray *et al.*, 2006), it is apparent that it is the fluctuating edge and not the core of an insect's distribution which provides the climate signal. This may be derived by collating distribution maps and collecting data, and although these will inevitably always be incomplete, they are sufficient to convert into climate envelopes which can then be overlapped to produce a Mutual Climatic Range (MCR) (Atkinson *et al.*, 1986) enabling an assessment of past climate. It is a tribute to the mental agility of the late Russell Coope that he would look at a fossil beetle assemblage and suggest a

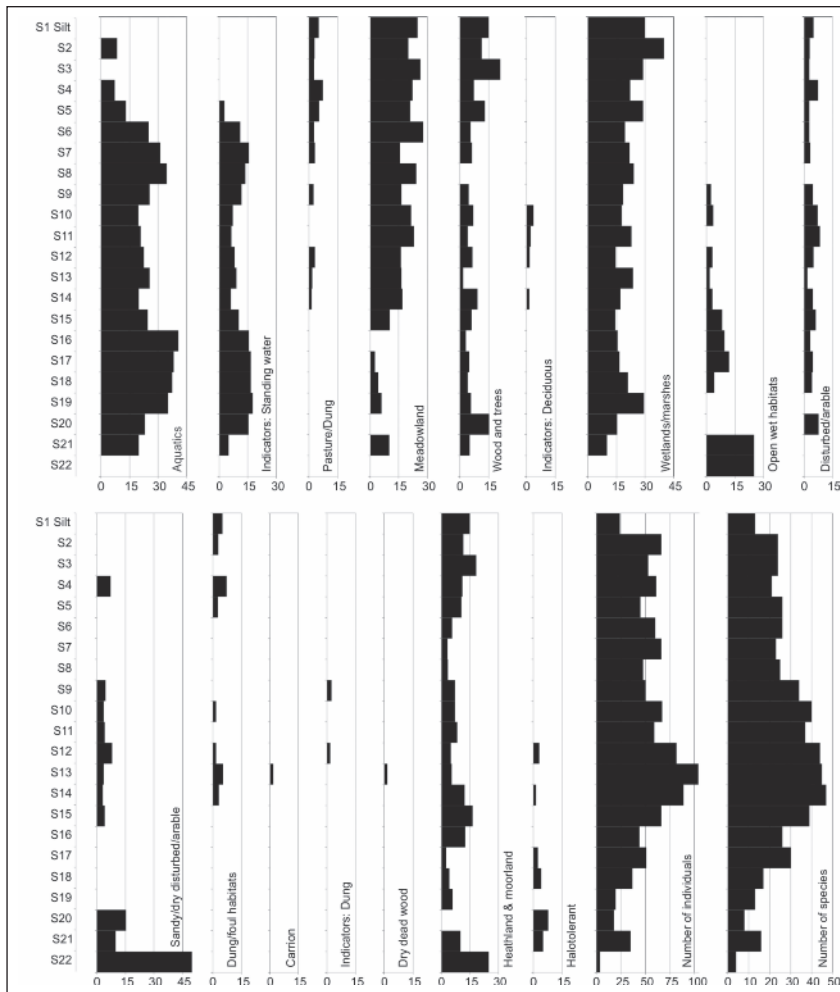


Figure 4. Broad habitat classification of the Lateglacial (~ 13500- 10000 bp) succession at Glen Ballyre, Isle of Man, using BugsCEP Ecocodes. Bars represent the proportional representation of each habitat group in each sample, excluding stenotopic indicator groups which are outside of the total sum (see Buckland, 2007 for methodology). The sequence shows the silting up of a pond and the development of terrestrial vegetation as indicated by the beetle fauna. Unpublished data from Russell Coope in Joachim (1978).

which would invariably lie within that obtained by the program. BugsCEP incorporates the envelopes developed in the now disbanded Birmingham Quaternary Entomology Laboratory, laboriously digitalised largely by Margaret Joachim (1978) and Dave Perry (1986), but these cover only a small part of the European fauna, restricted almost entirely to carabids, staphylinids and dung beetles, species less influenced by host distribution than many phytophages, and also relatively well known in terms of distribution. This, however, is another element of the program which is starting to creak, with diachronous maps covering two hundred years of collection in the face of a warming climate, and partly based upon distribution maps which often in Europe took little note of altitude or local circumstance, proximity of glaciers, particular substrate preferences, continuity of habitat, etc.

One advantage of utilising British distribution is the number of species which reach either their northern or southern limits therein, and for lowland Britain and Ireland at least, relief is fairly subdued such that relatively minor fluctuations in climate may lead to major changes in distribution patterns. After the drowning of Doggerland in the mid-seventh millennium BC (Gaffney *et al.*, 2009) and the creation of the British Isles, local extinction was forever, with most later introductions reflecting accidental transport by dispersing and trading humans. The assisted passage took many species on across the Atlantic to islands where survival depended on the artificially warmed environments created by farmers and their stock (e.g. Buckland *et al.*, 1995). In order to separate natural from synanthropic distribution, BugsCEP is in the process of collating this data before effective new maps and MCR envelopes can be created based

upon national distribution maps (e.g. Roy *et al.*, 2011). The next stage will be to refine both maps and program to create more robust and effective models of past climates and landscapes. Ideally, one would like to use data from international biodiversity mapping projects such as GBIF, but as yet these data are of far too poor resolution to be of use when compiling detailed climate reference data. In many cases, primarily as a result of museum data entry backlogs, the compiled international point source distribution data for the fossil record in BugsCEP is more extensive than the modern data for the same species (e.g. Buckland & Eriksson, 2014). Naturally this situation will improve with time and one of the objectives of the BugsCEP project from the very beginning was to promote a greater degree of interaction between the various researchers, from climate modellers and Quaternary scientists to field entomologists and taxonomists. As well as providing essential habitat and distributional data, BugsCEP will also include Red Data Book status for species across a range of countries, although currently only UK data have been entered. The entry of data from the Swedish Species Information Centre (Artdatabanken, 2012) will be undertaken within the scope of the SEAD project and subsequently ported over to BugsCEP.

Quantitative habitat reconstruction as a research tool

In a paper on an earlier version of BugsCEP, Buckland and others (1997) suggested that an expert system might be built by utilising the accumulated knowledge gained from previous landscape and climate reconstructions by looking statistically for which previously studied fauna had the closest resemblance to that under examination. This was simply an extension of the use of similarity coefficients used widely in ecology (e.g. Southwood & Henderson, 2000) and it has, among its problems, divorcing the fossils from what they are, the remains of extant animals with particular habitat and climate requirements. The simple modified Sørensen Correlation Coefficient has been built into BugsCEP, as much for those working with modern faunas as fossil assemblages where there are attendant problems of the nature of the associations. Spreadsheets can be

exported in Excel© format for more sophisticated methods but there is always the danger of animals becoming ciphers and ecology being ignored in favour of apparent associations thrown up by technique. Most recently, this has been seen in Smith's (2013) attempts to define archaeological cess pit assemblages on the basis of statistical associations, although he successfully moderates his results by consideration of the other lines of palaeoecological evidence from his sites. Much of the research on Quaternary insect assemblages has concerned change through time, as indicated by the variations in faunal composition through a vertical sequence of samples through a naturally accumulating sequence (most recently, see Coope, 2012). Such data are amenable to interpretation through a simple bar chart, although because of the diversity of many fossil assemblages, some combination of species into a limited number of habitat groupings has to be attempted (Figure 4). Both Harry Kenward (e.g. Carrott & Kenward, 2001) and Mark Robinson (1983) have approached this problem from differing viewpoints, the former looking at the varying aspects of immediate anthropogenic environments and the latter examining pastoral to arable ratios. The classification employed in BugsCEP to construct bar charts of changing environments (Figure 4), with 17 classes ranging from Aquatics to Ectoparasites, attempts to ascribe all species to primary habitats, which means that some eurytopic species occur in several groups. Five additional indicator groups are used to provide for the detailed habitat information available through stenotopic species. A more extended system employing a classification based on that of Koch (1989a; 1989b; 1992) was found to be impractical for such reconstructions, although many of the data have been entered in the hope that they may prove useful for more detailed studies.

The tool allows summary bar charts of habitat frequency in the fossil record to be produced rapidly and despite the taphonomic problems of interpreting fossil insect assemblages the results are promising. Figure 4 summarises data from Coope and Joachim's work on the Lateglacial site at Glen Ballyre on the Isle of Man (data from Joachim, 1978), standardizing results across the sum of habitats to enable comparison between samples. A recent piece of work on a

peat succession of the 4th to the 1st millennia BC at Thorne Moors, South Yorkshire, which covers the transition from pine dominated forest to raised mire (Buckland, in prep.) clearly shows the development of the wetland environment. It is, however, less successful in defining the woodland or the nature of the ombrotrophic mire, something which becomes more evident by close examination of individual habitat data.

As well as species' lists with their attendant dates and stratigraphic data, accessible either via site name (Figure 3) or through the individual species' entries (Figure 2), a partial series of keys by the late Peter Skidmore also forms part of the database, as well as a comments box for additional identification notes and a note of the size range of each species. These are drawn from various sources and provide more an aide to memory than final identification, which, like the abstracted and summarized habitat and distribution data, requires consultation of the primary published source for any detailed conclusion on a particular species. Species association is also an important aspect of ecological research and these are also being progressively entered. This aspect is intended as much to help in the identification of enigmatic or unfamiliar fossils in an assemblage as to obtaining the likely co-occurrence of taxa in modern assemblages.

Conclusion

The BugsCEP project has a number of long term goals, including the establishment of a permanent and publicly accessible online archive for Quaternary and archaeo-entomological data through the SEAD project (Buckland *et al.*, 2010), and the continued provision of analysis tools to aid the integration of modern ecology and studies of the past. At the time of writing (December 2013), BugsCEP contains over 60,000 records of referenced information on the ecology and distribution of >10,500 taxa, where possible at the species level; species lists for over 1,150 sites from both the Quaternary fossil record and archaeological contexts, together with supporting comments, references and dating evidence. It has to be stressed, however, that no matter how extensive the database, it is not intended to replace the original published sources, which remain the primary archive of the research. As we have already stressed in numerous papers, palaeoenvironmental

reconstructions cannot be made without detailed knowledge of the ecology of the individual taxa used to infer past conditions. This applies just as much to the individual tree or ants' nest as it does to a woodland or grassland. By collating these data, the knowledge of experts and providing easy access to powerful aggregation facilities and interpretation guides, BugsCEP not only speeds up the analysis process, but opens the field for more geographically and chronologically comprehensive studies of biodiversity. Palaeoentomology, by necessity of the paucity of the evidence, must use a combination of indicator species and broad generalisations. It should, however, never be considered in isolation from other proxy data sources, such as pollen, plant macrofossils, stratigraphic and geoarchaeological methods, which in combination can help build more complete, or perhaps probable, reconstructions of the past. Finally, we would stress the fact that a database can never be complete and that we have omitted sources which many would regard as essential. We would greatly appreciate additions, corrections, and more than anything else critical new users.

Acknowledgements

Initiated by Jon Sadler and colleagues, the BugsCEP project is a long standing team effort that would be nothing without its data contributors and users. A full list of contributors can be found in the software's bibliography and a list of papers referring to or using BugsCEP can be found at <http://www.bugscep.com/publications.html>. Roger Engelmark should also be thanked as supervisor under the PhD process which resulted in the current version. The database would be considerably less useful were it not for the discussions the authors have had with entomologists including Keith Alexander, Robert Angus, Garth Foster and the late Peter Skidmore and Quaternary entomologists, such as Geoffrey Lemdahl and Eva Panagiotakopulu, who understand the intricacies of their subjects more than most. A more comprehensive list of acknowledgements for the software and database can be found on the website at http://www.bugscep.com/help/help_more.html#credits. Finally none of this work would have been possible without the inspiration of the late Russell Coope to whom this paper is dedicated.

References

- ABELLÁN, P., BENETTI, C. J., ANGUS, R. B. & RIBERA, I. 2010. A review of Quaternary range shifts in European aquatic Coleoptera. *Global Ecology and Biogeography*, **20**: 87-100.
- ANGUS, R. B. 2010. *Boreonectes* sp. N., a new genus for the *Stictotarsus griseostriatus* (De Geer) group of sibling species (Coleoptera: Dytiscidae), with additional karyosystematic data on the group. *Comparative Cytogenetics*, **4**: 123-131.
- ARTDATABANKEN 2012. The Swedish Species Information Centre. Available at: <http://www.slu.se/en/collaborative-centres-and-projects/artdatabanken/> (accessed 8 October 2012).
- ASHWORTH, A. C. 1972. A Late-glacial insect fauna from Red Moss, Lancashire, England. *Entomological Scandinavia*, **3**, 211-224.
- ATKINSON, T.C., BRIFFA, K.R., COOPE, G.R., JOACHIM, J.M. & PERRY, D.W. 1986. Climatic calibration of coleopteran data. In B.E. Berglund (ed.) *Handbook of Holocene Palaeoecology and Palaeohydrology*, 851-858. Chichester: J. Wiley & Son.
- BÖHME, J. 2005. *Die Käfer Mitteleuropas. K. Katalog (Faunistische Übersicht) (2nd ed.)*. Munich, Spektrum Academic.
- BRAY, P.J., BLOCKLEY, S.P.E., COOPE, G.R., DADSWELL, L.F., ELIAS, S.A., LOWE, J.J. & POLLARD, A.M. 2006. Refining mutual climatic range (MCR) quantitative estimates of palaeotemperature using ubiquity analysis. *Quaternary Science Reviews*, **25**: 1865-1876.
- BRIGGS, D.J., COOPE, G.R. & GILBERTSON, D.D. 1985. *The Chronology and Environmental Framework of Early Man in the Upper Thames Valley*. Oxford: British Archaeological Reports, **137**.
- BUCKLAND, P.C. 1979. *Thorne Moors: a palaeoecological study of a Bronze Age site. A contribution to the history of the British insect fauna*. Birmingham: Dept. of Geography, University of Birmingham Occ. Paper **8**. <<http://epapers.bham.ac.uk/26/>>.
- BUCKLAND P.C. (in prep.) Late Holocene Insect Faunas from the Tween Bridge Moor Windfarm Site. In J. Rackham et al. (in prep.) *Palaeoecological Research at Tween Bridge Moor, S Yorkshire*. The Environmental Archaeology Consultancy.
- BUCKLAND, P. C., ASHWORTH, A. C. & SCHWERT, D. 1995. By-passing Ellis Island. Insect immigration to North America. In R. Butlin & N. Roberts (eds.) *Ecological relations in historical times*, 226-244. Oxford: Institute of British Geographers, Blackwell.
- BUCKLAND, P.C. & COOPE, G.R. 1991. *A Bibliography and Literature Review of Quaternary Entomology*. Sheffield: J. Collis Publications.
- BUCKLAND, P.C. & DINNIN, M.J. 1993. Holocene woodlands: the fossil insect evidence. In K. Kirby & C.M. Drake (eds.) *Dead wood matters: the ecology and conservation of saproxylic invertebrates in Britain*, 6-20. Peterborough: English Nature Science **7**.
- BUCKLAND, P. C., DUGMORE, A. & SADLER, J. P. 1991. Faunal Change or taphonomic problem? A Comparison of modern and fossil insect faunas from south-east Iceland. In, *Environmental Change in Iceland Past and Present*. Maizels, J. K. & Caseldine, C. Dordrecht, Kluwer: 127-146.
- BUCKLAND, P.C. & KENWARD, H.K. 1973. Thorne Moor: a palaeoecological study of a Bronze Age site. *Nature* (London), **241**: 405-406.
- BUCKLAND, P.I. 2007. The Development and Implementation of Software for Palaeoenvironmental and Palaeoclimatological Research: The Bugs Coleopteran Ecology Package (BugsCEP). PhD thesis, Environmental Archaeology Lab. Department of Archaeology & Sámi Studies. University of Umeå, Sweden. *Archaeology and Environment* **23**, 236 pp + CD. URL: <http://www.diva-portal.org/umu/abstract.xsql?dbid=1105>
- BUCKLAND, P.I. & BUCKLAND, P.C. 2006. *Bugs Coleopteran Ecology Package (Versions: BugsCEP v7.56; Bugsdata v7.11; BugsMCR v2.0; BugStats v1.2) [Downloaded/CDROM: DATE]* www.bugscep.com.
- BUCKLAND, P.I. & BUCKLAND, P.C. 2012. Species found as fossils in Quaternary sediments. In A. G. Duff (ed.) *Checklist of beetles of the British Isles* (2nd ed.), 127-130. Iver: Pemberley Books.
- BUCKLAND, P.I., BUCKLAND, P.C., PANAGIOTAKOPULU, E. & SADLER, J.P. 2004. A Database for Egyptian entomology. *Journal of Egyptian Entomology*, **81**.
- BUCKLAND, P.I. & ERIKSSON, E.J. 2014. Strategic Environmental Archaeology Database (SEAD). In: Smith, C. (Ed.) *Encyclopedia of Global Archaeology*, Springer Science+Business Media New York.
- BUCKLAND, P.I., ERIKSSON, E.J., LINDERHOLM, J., VIKLUND, K., ENGELMARK, R., PALM, F., SVENSSON, P., BUCKLAND, P.C., PANAGIOTAKOPULU, E. & OLOFSSON, J. 2010. Integrating Human Dimensions of Arctic Palaeoenvironmental Science: SEAD - The Strategic Environmental Archaeology Database. *Journal of Archaeological Science*, **38**: 345-351.
- BUCKLAND, P.I., YUAN ZHUO, D. & BUCKLAND, P.C. 1997. Towards an expert system in palaeoentomology. In A.C. Ashworth, P.C. Buckland & J.P. Sadler (eds.) *Studies in Quaternary Entomology - An Inordinate Fondness for Insects*. *Quaternary Proceedings*, **5**: 67-78.
- CARROTT, J. & KENWARD, H. 2001. Species associations among insect remains from urban archaeological deposits and their significance in reconstructing the past human environment. *Journal of Archaeological Science*, **28**: 887-905.
- COOPE, G.R. 2012. The insect remains. In F. Coward, W.A. Boismier & C. Gamble, *Neanderthals among mammoths: excavations at Lynford Quarry, Norfolk*, 75-94. London: English Heritage.
- DRANE, A.B. 2012. *Cossonus linearis* (Fabricius) new to Leicestershire: a recent immigrant or a long-established species in the British fauna? *The Coleopterist*, **21**: 91-93.
- DUFF, A.G. (Ed.) 2012. *Checklist of beetles of the British Isles (2nd ed.)*. Iver: Pemberley Books.
- ELIAS, S.A. 2010. *Advances in Quaternary Entomology. Developments in Quaternary Science* **12**. Amsterdam: Elsevier.
- FOSTER, G. 2000. *A review of the scarce and threatened Coleoptera of Great Britain. Part 3. Water Beetles*. Peterborough: UK Joint Nature Conservation Committee.
- FOSTER, G. N. & CARR, R. 2008. The status of *Bidessus unistriatus* (Goeze) in England, with records of *B. grossepunctatus* Vorbringer, 1907, a species present in England in the Bronze Age (Dytiscidae). *The Coleopterist*, **17**, 191-203.
- GAFFNEY, V., FITCH, S. & SMITH, D. 2009. *Europe's lost world, the rediscovery of Doggerland*. York, Council for British Archaeology.
- GBIF 2012. The Global Biodiversity Information Facility. Available at: <http://www.gbif.org/> (accessed 5 October 2012).
- GIRLING, M.A. 1980. The fossil insect assemblage from the Baker Site. *Somerset Levels Papers*, **6**: 36-42.
- GIRLING, M.A. 1989. Mesolithic and later landscapes interpreted from the insect assemblages of West Heath Spa, Hampstead. In D. Collins & D. Lorimer (eds.) *Excavations at the Mesolithic Site on West Heath, Hampstead 1976-1981*, 72-89. Oxford: British Archaeological Reports **217**.

- HODDER, K.H., BULLOCK, J.M., BUCKLAND, P.C. & KIRBY, K.J. 2005. *Large herbivores in the wildwood and modern naturalistic grazing systems*. Peterborough: English Nature.
- JOACHIM, M. 1978. *Late-glacial Coleopteran assemblages from the west coast of the Isle of Man*. Unpubl. Ph.D. thesis, University of Birmingham.
- JOHNSON, C. 2012a. Latrididae. In Duff, A. G. (Ed.) *Checklist of beetles of the British Isles (2nd ed.)*, 79-81. Iver: Pemberley Books.
- JOHNSON, C. 2012b. *Brachygluta klimschii* Holdhaus, 1902 (Staphylinidae: Pselaphinae) in England. *The Coleopterist*, **21**: 103.
- KENWARD, H.K. 2002. *Assessment of insects and other invertebrate remains from Viborg Sønderø, Denmark*. Reports from the Environmental Archaeology Unit, York, 2002/14.
- KLOET, G.S. & HINCKS, W.D. 1977. *A Checklist of British Insects.3.Coleoptera and Stepsiptera (2nd ed.)* (rev. R.D. Pope). London: Royal Entomological Society of London.
- KOCH, K. 1989a & b; 1992. *Ökologie 1-3. Die Käfer Mitteleuropas*. Krefeld: Goecke & Evers.
- KUZMINA, S. 2013. New approach to the Quaternary studies: QINSIB - The database of Siberian fossil insects. *Quaternary International*. <http://dx.doi.org/10.1016/j.quaint.2013.08.029>.
- LEVEY, B. 2012. *Trachys subglaber* Rey, 1891 (Buprestidae) an unrecognised British species. *The Coleopterist*, **21**: 67-72.
- LEMDAHL, G. 1988. *Palaeoclimatic and Palaeoecological Studies based on Subfossil Insects from the Late Weichselian Sediments in Southern Sweden*. Lundqua Thesis, **22**.
- LÖBL, I. & SMETANA, A., (Eds.) 2003-2013. *Catalogue of Palaearctic Coleoptera. 1-8. Archostemata - Myxophaga - Adephaga*. Stenstrup: Apollo Books.
- LOTT, D.A. 2009. The Staphylinidae (rove beetles) of Britain and Ireland. Part 5: Scaphidiinae, Piestinae, Oxytelinae. *Handbooks for the identification of British insects 12 (5)* Shrewsbury: Field Studies Council & Royal Entomological Society, 1-99.
- LOTT, D.A. 2012. Introduction. In Duff, A. G. (Ed.) *Checklist of beetles of the British Isles (2nd ed.)*, 3-6. Iver: Pemberley Books.
- LUCHT, W.H. (Ed.) 1987. *Die Käfer Mitteleuropas K. Katalog*. Krefeld: Goecke & Evers.
- MENDEL, H. & HATTON, J. 2012. *Gastrallus laevigatus* (Olivier) (Anobiidae): a British species. *The Coleopterist*, **21**: 73-76.
- MENDEL, H., JEFFREY, P. & PLEDGER, M. J. 2011. *Isorhipis melasoides* (Laporte, 1835) (Eucnemidae) breeding and probably established in the British Isles. *The Coleopterist*, **20**: 41-43.
- NILSSON, A.N. & HOLMEN, M. 1995. The aquatic Adephaga (Coleoptera) of Fennoscandia and Denmark. II. Dytiscidae. *Fauna Entomologica Scandinavica 32*. Leiden: E.J.Brill.
- ÓLAFSSON, E. 1991. *Íslenskt skordýratal*. Reykjavik: Náttúrufræðistofnun Íslands.
- OLSSON, F. & LEMDAHL, G. 2009. A continuous Holocene beetle record from the site Stavsåkra, southern Sweden: implications for the last 10 600 years of forest and land use history. *Journal of Quaternary Science*, **24**: 612-626.
- OSBORNE, P.J. 1974. An insect assemblage of Early Flandrian Age from Lea Marston, Warwickshire and its bearing on the contemporary climate and ecology. *Quaternary Research*, **4**: 471-486.
- OSBORNE, P.J. 1978. Insect evidence for the effect of man on the lowland landscape. In S. Limbrey & J.G. Evans (eds.) *The Effects of Man on the Landscape: the Lowland Zone*, 32-34. London: Council for British Archaeology Research Report **21**.
- PALM, T. 1959. Die Holz und Rindenkäfer der sud- und mittelschwedischen Laubbaume. *Opuscula Entomologica Suppl.* **16**.
- PANAGIOTAKOPULU, E. 2001. New records for ancient pests: archaeoentomology in Egypt. *Journal of Archaeological Science*, **28**: 1235-1246.
- PERRY, D.W. 1986. *The analysis of sub-fossil insect assemblages: a numerical approach*. Unpubl. Ph.D. thesis, University of Birmingham.
- PONEL, P. 1995. Rissian, Eemian and Wiirmian Coleoptera assemblages from La Grande Pile (Vosges, France). *Palaeogeography, Palaeoclimatology, Palaeoecology*, **114**: 1-41
- ROBINSON, M.A. 1983. Arable/Pastoral ratios from insects. In M. Jones (ed.) *Integrating the Subsistence Economy*, 19-47. Oxford: British Archaeological Reports **S181**.
- ROBINSON, M. 1993. The scientific evidence. In T.G. Allen & M.A. Robinson (eds.) *The prehistoric landscape and Iron Age enclosed settlement at Mingies Ditch, Hardwich-with-Yelford Oxon*. Oxford Archaeological Unit, Thames Valley Landscapes. The Windrush Valley 2, 101-141. London: Council for British Archaeology Research Report.
- ROY, H., BROWN, P., FROST, R. & POLAND, R. 2011. *Ladybirds (Coccinellidae) of Britain and Ireland*. Shrewsbury, Field Studies Council.
- SADLER, J.P., BUCKLAND, P.C. & RAINS, M. 1992. BUGS: an entomological database. *Antenna* **16**: 158-166.
- SMITH, D. 2012. Defining an indicator package to allow identification of 'cesspits' in the archaeological record. *Journal of Archaeological Science*, **40**: 526-543.
- SOUTHWOOD, T.R.E. & HENDERSON, P.A. 2000. *Ecological Methods (3rd ed.)* Oxford: Blackwell Science.
- TOZER, E.N. 1973. On the British species of *Lathridius* Herbst (Col., Lathridiidae). *Entomologist's Monthly Magazine*, **108**: 193-199.
- WALKER, M.J.C., COOPE, G.R. & LOWE, J.J. 1993. The Devensian (Weichselian) Lateglacial palaeoenvironmental record from Gransmoor, East Yorkshire, England. *Quaternary Science Reviews*, **12**: 659-680.
- WHITEHOUSE, N.J. 2006. What can forest managers learn from research on fossil insects? Linking forest ecological history, biodiversity and management. In S.J. Grove & J.L. Hanula (eds.) *Insect biodiversity and dead wood: proceedings of a symposium for the 22nd International Congress of Entomology*, 30-41. General Technical Report SRS-93. U.S. Dept. of Agriculture Forestry Service, Southern Research Station, Asheville, N Carolina.

Confessions of a Verrall Supper Organiser, 1972-2012

Helmut van Emden



The author, obviously having bought a drink for someone else.

My predecessor Norman Riley, who had been Keeper of Entomology at the Natural History Museum, was 86 when he decided to hand over the baton. So, he asked me to become the Verrall member of the Entomological Club, that eight-member dining club that has existed since 1826 (seven years before the Royal Entomological Society was founded), and who run the Verrall Supper for the benefit of UK entomologists.

For those not familiar with it, the Verrall Supper is an annual meeting and dinner in London (currently held on the first Wednesday in March) for members of the Verrall Association of Entomologists, open by invitation to all with an interest in Entomology. The members of the Association pay an annual subscription of an optional amount, and the funds so accumulated pay for the event at no extra cost to those members who are able to attend. Members may also nominate other entomologists for an invitation.

Why did Norman Riley come to me? Having already been retired for a quarter of a century, he really knew very few entomologists much younger than himself. However, not only had my father worked on the Diptera floor of the Museum, but both our family and the Rileys lived in Wimbledon. My brother and I had often been left at the Rileys when my parents had gone out for the evening. Norman Riley had therefore known me since I was in short trousers, and also knew me as an entomologist who regularly attended his Verrall Suppers. For him, I (then aged 38) was the obvious choice.

In 1972 personal computers were pretty rare, and everything like addressing envelopes and recording subscriptions was done manually. Invitation letters and tickets had to be typed out afresh each year and the copy taken to a commercial letterpress printer, who then produced proofs for checking before the final printing. Just typing and then checking the names of current members for the invitation letter was a major exercise. I therefore used some of the Verrall income to pay my touch-typing technician, Liz Wild, to do the secretarial work. In August 1972, I collected the files from Norman Riley, and Liz and I set about customising a system to suit our requirements.

Then, in September, it happened! I received a letter from the University of California at Berkeley inviting me to



The Centenary cake bearing 100 candles presented by the Imperial College.

spend seven months there as a Visiting Assistant Professor from January to July 1973. Most people, I think, would accept that this offer was too tempting to resist – it certainly was for me! I was therefore in the bizarre position of abandoning the first Verrall Supper under my stewardship. Fortunately, my then Reading colleague Julian Vincent agreed to substitute for me and organise the 1973 event together with Liz. It all worked out OK, my conscience is relieved to report.

Verrall Suppers when I took over were different from today in several ways. Firstly it was only five years earlier that women entomologists were eligible to attend, and so the punters were still predominantly male; none would even dream of showing up in anything other than a smart lounge suit and tie. Quite a lot of insect store-boxes would be carried around and their contents shown to other members, and this networking before the meal was carried out on both floors of the Imperial College Senior Common Room – each with its own bar and linked by a private staircase. Instead of the caterer offering the organiser menus, as happens now, I had to devise a menu from a price list of individual items (e.g. a portion of peas), with additional charges for silver service and room hire. I then had to increase the total by VAT and then add a compulsory 15% gratuity before I could check we could afford that particular menu – if not, it was back to the drawing board!

When I took over, numbers were rather similar to what they are today, but with increasing job opportunities in the early 1980s for entomologists and more Entomology postgraduates at many universities, numbers built up rapidly and peaked at about 350. Groups wishing to sit together would crowd at the door to the dining room

as early as 20 minutes before the meal, and when the doors were opened there was a stampede to grab seats – so much so that I began to get letters from elderly members who felt it too dangerous for them to attend; hence the introduction of the seat booking system now familiar to Verrallers.

The meal started with a grace in Latin intoned by the staphylinid guru the Rev. Anthony Harbottle, one of Her Majesty's chaplains at Windsor. Presumably of the same view as the late Professor J.B.S. Haldane that God must be "inordinately fond of beetles", he was quite relaxed about attending the Supper when the first Wednesday in March clashed with Ash Wednesday. Not so with some of the other Reverend entomologists at that time. I would receive letters one year complaining about the clash, with appreciative letters the following year that the clash had been avoided. Then high dudgeon a few years later – "I see you've booked the Verrall for Ash Wednesday again". They seemed not to understand that actually it was not the first Wednesday in March that moved its date from year to year! Other correspondence I received mainly involved complaints about the menu, usually taking the form "There must be lots of other people who don't like... fish, mushrooms, lamb, Brussels sprouts, prawns, guinea fowl, cheese etc..."; it could be anything.

The wine and port for the toasts after the meal were included in the costing (plus VAT and gratuity, of course). At the Centenary Dinner in 1987 the Club decided to treat those attending to the after-dinner port, and was astonished by the size of the bill. It was therefore decided to scrap port in future to bring the cost of the event down for everybody. At a later date, as costs continued to rise, members agreed that the wine should also be deleted

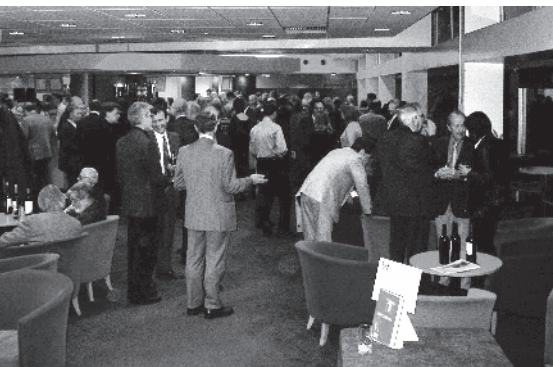
from the costing, and instead a cash wine bar was provided on the evening.

The Centenary Dinner was certainly rather special, and the Club set up a little exhibition about the Verrall together with a set of pencil portraits of the then Club members, drawn by the artist Gillian van Emden. At the dinner, Imperial College sprang the surprise of presenting us with a huge decorated Centenary cake bearing 100 candles – a nice touch that was much appreciated.

In early 1994 I received a phone call from Imperial College. "We are changing the system. In the past we have paid the bar staff out of the profits, but we are now going to add the cost to your bill". They were surprised that I was happy to go along with this; apparently other customers had complained volubly. I explained I had no problems about paying the staff out of the bar profits instead of them; in fact I thought I would do quite well out of this new arrangement. Apparently I had misunderstood their proposal, which included Imperial College retaining the bar profits as well as sending me the bill for the staff! I put my faith in entomologists and said, "Please look at the bar profits over the last five years, then ring me back and convince me your proposal is reasonable". It's a credit to Verrallers that, when Imperial College rang back, they agreed their proposal was 'unreasonable' and had withdrawn it for our event!

The Verrall in 2000 proved a bit of a disaster. Building work meant that much of the area for networking before the meal was boarded off, and all the seating had been removed. The remaining reception area became unpleasantly overcrowded, and things were made even worse by a failure of the water supply in the building. The caterers valiantly brought the water they needed in buckets from elsewhere, and security staff would appear every half hour or so to escort separate crocodiles of men and women needing to use a toilet to other buildings in different directions!

When it became apparent that the building work was on-going through 2001, we had to find another venue, and we tried Baden-Powell House on the corner of Queen's Gate and Cromwell Road as it was large enough and also conveniently in South Kensington. One, and perhaps the only, nice feature of this experiment was that



Networking after the refurbishments at Imperial College.

the dining room was not set out with a few long tables as at Imperial College, but with a large number of circular tables each seating 12. This meant that the number of people who could join in the same conversation was doubled, and that any newcomers not forming part of a group automatically became included. By contrast, the bar provision was woeful, to put it charitably! B-P House clearly had no idea how much bar area 180 entomologists required or how much they were expecting to drink – this in spite of my giving strong hints in advance. The bar was tiny and in a narrow dark corner, and huge queues soon formed. Moreover, the one small keg of draught beer was exhausted almost immediately. I was sitting at the reception desk, and soon became aware of a trickle of folk leaving the building. Their intended destination became only too apparent a quarter of an hour later when they returned. They were laden with carrier bags from Waitrose in Gloucester Road, full of the alcohol supplies individual groups had decided they needed for the rest of the evening. This showed how totally unsatisfactory the bar provision



The dining area.

had proven, and of course it was also infringing the licensing laws. It also reflects the level of monitoring of the event by B-P House managers, that none of them even noticed.

Since the Imperial College premises were still a building site, I felt it necessary to try and resolve the B-P House problems and sought a meeting with the managers there on no less than three occasions. Each time I turned up by prior arrangement, the person I needed to see was not in the building, but fortunately this took so much time that the refurbishments at Imperial College had been completed, and we could book a return there for 2002.

The new first floor Senior Common Room at Imperial College was a great improvement. It provided a large sitting-out area with comfortable chairs, integrated toilet facilities, a circular bar with provision for several serving points and a large dining area. All now went well until 2009. That year I turned up as usual at 4 pm to set up, and found major changes. The bar had disappeared, and a small coffee bar in the corner was to be used instead. The whole non-dining area was filled with new and huge settees and armchairs, which had to be nudged closer together merely to enable my entrance desk to be set up. Once the Verrallers arrived, the small amount of floor space remaining between the settees soon filled up to overcrowding. At one point, I needed to get to what passed for the bar to help out the staff there with change, and it proved to be an exercise in 'free running' across the furniture! I eventually did make it to the bar, only to find the limited space for service there had resulted in a huge queue – some people had waited over 45 minutes for a drink, while others had given up! The meal was fortunately rather good, which improved the atmosphere somewhat. The caterer had produced amazingly excellent and succulent steaks, so good in fact that some who had ordered special meals removed their 'special meal' cards; as a result the steaks ran out with just one person still to be served. The caterers were kind enough to sweeten his alternative menu of fish with a free bottle of wine.

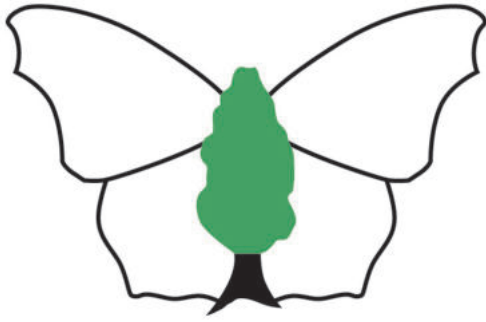
Following the 2009 debacle, I called a meeting with the Imperial College caterers and senior Conference Office management after sending them a list of the issues that needed to be resolved. As they also had issues with us

(particularly over special meals and extra people) it is fair to say that a 'full and frank discussion' took place. I think the last three years show that both sides have now benefited from this.

Running a supper for an unknown number of people and with an unknown income has been 'interesting'. By tradition, the amount of the annual subscription is optional. Thus the income is certainly unknown, but most years it all seems to come out in the black. In the early 1970s I was regularly sent some cheques more than 10 times the actual cost per head! Those days are long gone, but the subscriptions of entomologists unable to attend, as well as some extra paid by others, still enable us to accommodate reduced subscriptions from students and colleagues who have fallen on hard times. Many thanks for that. As far as numbers are concerned, the College does require me to give final figures by a deadline. Does that mean that the figure I have by then is the final one? It certainly doesn't! Requests for places continue to come in after that, including for new invitations, and even on the night new faces appear, some (often new invitees) waving the card at me which clearly states in large capital letters, "THIS IS AN INVITATION ONLY; IT DOES NOT ADMIT TO THE MEETING". However, experience enables me to guess the number of extra places I can safely order, and there are always some "no-shows" on the night. Again, it all somehow seems to work out in the end, and as far as I know everyone who has gone into the dining area over the years has had a meal.

Not everyone does go into the dining area when the meal is served. A number of entomologists, realising we trusting types do not check tickets at the door, enjoy the networking and bar before the meal without making any contribution to the cost of hiring the room. When dinner is served they quietly leave the building, believing (till they read this) that no one has noticed.

The black and white illustrations for this article are reproduced from Gilbert, P. (2005). *The Entomological Club and Verrall Supper: A History (1826-2004)*. The Entomological Club, London, v + 81 pp.



Butterfly Conservation

Saving butterflies, moths and our environment

Moths Count and the National Moth Recording Scheme: an update



Introduction

The National Moth Recording Scheme (NMRS) was established in 2007 as part of Butterfly Conservation's Moths Count project. The project is a partnership of many organisations and individuals, and was primarily funded by the Heritage Lottery Fund (HLF) for the first four years. Butterfly Conservation is committed to the long-term continuation of the Moths Count project, despite the short-term nature of Lottery funding. The ongoing financial support from partners such as the Royal Entomological Society and statutory agencies has been vital in enabling us to honour this commitment. The aims of Moths Count are to raise positive awareness of moths and moth recording among the general public and to set up an ongoing recording scheme for the 900 or so macro-moths found in the UK.

Public engagement

We continue to promote moths to members of the public via our simple online 'citizen science' survey Migrant Watch (www.butterfly-conservation.org) which encourages people to submit sightings of Humming-bird Hawk-moths (and Painted Lady butterflies). We organise Moth Night,

the annual celebration of moths and moth recording, in partnership with Atropos. Moth Night will be running again from the 3 - 5 July 2014 and this year's theme is Woodland Moths. As usual, you do not have to stick to the official theme and if you prefer to target your own sites, habitats or species this is completely fine. All we do ask is that data are submitted via the online system (www.mothnight.info). We moved to online-only data submission back in 2012 to ensure the sustainability of Moth Night through a much more streamlined and efficient approach to data management. This system, which also provides 'live' feedback to participants, has proved very successful with over 35,000 records submitted for last year's Moth Night. To find details about field events in your area please visit the Moth Night website (www.mothnight.info), or if you are running an event please submit the details to the website.

National Moth Recording Scheme

Now in its seventh year, the NMRS has amassed over 16.1 million moth records from the UK, Channel Islands and Isle of Man. The Moths Count team wish to thank the moth recording community as a whole and especially

**Dr Zoë Randle
Les Hill
and Richard Fox**

Butterfly Conservation,
Manor Yard,
East Lulworth

● 2000 onwards
○ Pre 2000



Figure 1. NMRS provisional distribution map showing the distribution of Silver Y *Autographa gamma* at 10km resolution in the UK, Isle of Man and Channel Islands. Photograph courtesy of Robert Thompson.

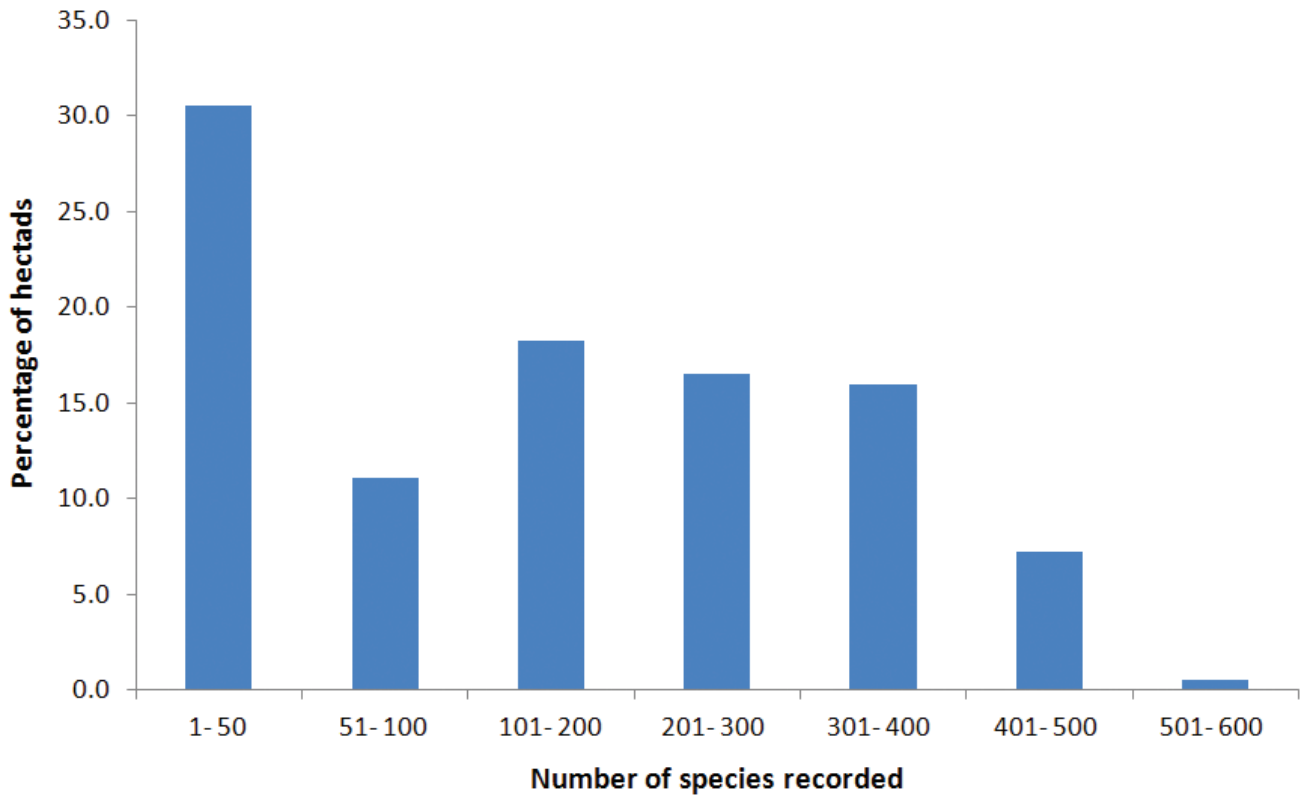


Figure 2. Numbers of macro-moth species recorded in hectads across the UK, Channel Islands and Isle of Man.

- 1991 to 2012
- 1968 to 1990

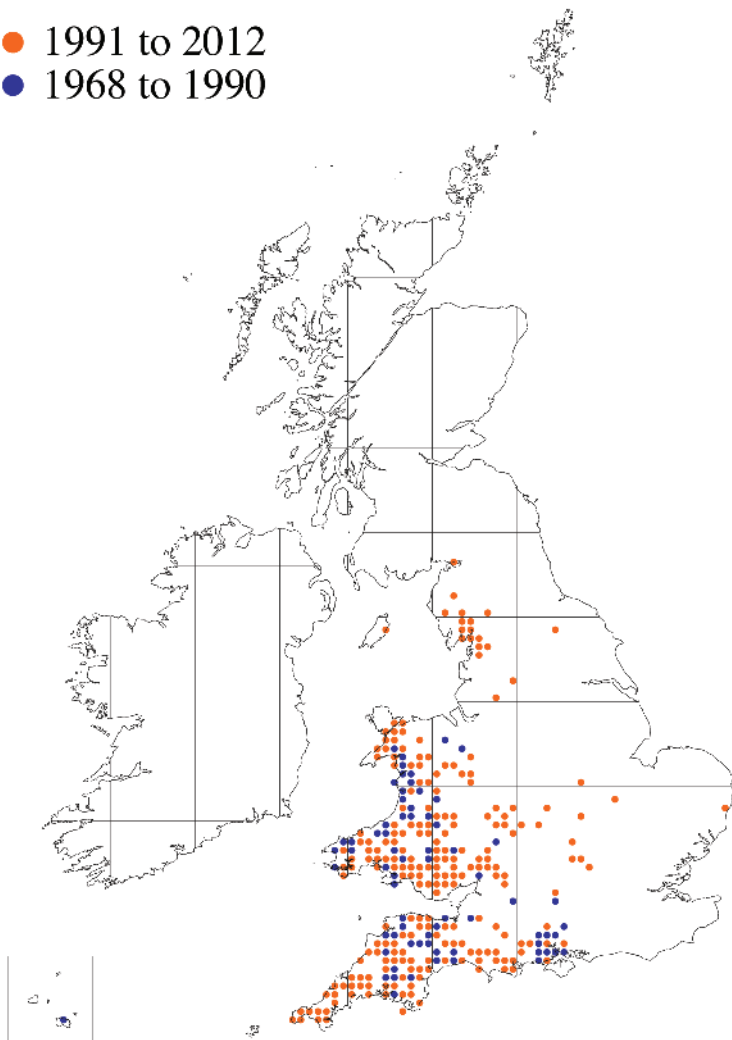


Figure 3. NMRS provisional distribution map showing the distribution of Devon Carpet *Lampropteryx otregiata* at 10km resolution in the UK, Isle of Man and Channel Islands. Photograph courtesy of Dave Green.

the network of County Moth Recorders (CMRs), Record Collators and Local Record Centres who have submitted their local datasets to the NMRS. We ask all County Moth Recorders to refresh their datasets with the NMRS by the end of March each year in order for us to update our database and online distribution maps (www.mothscount.org). These maps provide valuable feedback to the moth recording community. To ensure your records enter the NMRS please submit them to your County Moth Recorder, details can be found on the Moths Count website (www.mothscount.org).

Geographical coverage of moth records in the NMRS is relatively comprehensive. At hectad (10 km x 10 km square) resolution 97.9% of the UK, Channel Islands and Isle of Man have been recorded at some point in time; records from recent years (2000 onwards) cover 96.4% of hectads and historical records (pre 2000) cover 86%. There is clearly a need to improve historical coverage to enable accurate assessments of species range changes at a local and national level. Undoubtedly there will be historical records on cards, in note books and diaries etc that need

computerising but CMRs won't necessarily have access to them or the time to undertake such a task; however, other volunteers may be able to assist. There is also a need to target under-recorded squares; CMRs and / or the NMRS team can help identify these for moth recorders to visit.

To date, 880 macro-moth species have been recorded in the NMRS. Unsurprisingly, the most widespread is Large Yellow Underwing, *Noctua pronuba* (L.), which has been recorded

in 2,404 (79%) hectads. The database contains 379,965 records for this species, 76% of which are recent and the remaining 24% are historical. The second most widespread moth is Silver Y, *Autographa gamma* (L.), occupying 78% (2,382) of hectads (figure 1). In the NMRS there are 231,599 records for this species, over two-thirds of which are recent. The peak year for Silver-Y was 2006 when 12% of the total number of records were submitted; this was a good year for migrants in general.



People gathered around a moth trap. Photograph courtesy of Dave Green.

Botanical Entomologists

It is not often that we entomologists can claim to have an internationally-recognised botanist amongst our membership. **Dr Ian Denholm**, former Head of the Plant and Invertebrate Ecology Department, Rothamsted Research, UK, was elected President of the Botanical Society of the British Isles in June 2013. Ian, a former Vice President of this Society, is better known to us for his pioneering studies on the evolution of insecticide-resistance in houseflies, aphids, whiteflies, spider mites, and other agricultural pests, and for developing strategies for their control carried out over three decades of research at Rothamsted. He has been involved in many international initiatives in pest and resistance management in the USA, Australia, India, Pakistan and China. As Head of PIE (which subsumed Rothamsted's Entomology Dept in 2001), he also supported the development of world-leading research on pollination biology and insect migration as well as the continuity of the Rothamsted Insect Survey, whose long-term studies of the spatio-temporal dynamics of the UK's moths and insect aerial plankton are proving so vital to our overall assessment of Britain's wildlife in general.

But come weekends and holidays, Ian can invariably be seen driving his car or boarding a plane to some remote spot, such as the outer isles of Scotland or Ireland in order to study plants, sometimes accompanied by former fellow Rothamstedite Richard Bateman. Ian's special passion is for orchids, particularly those in the taxonomically-critical genus *Dactylorhiza*. In the 1970s, identification of *Dactylorhiza* marsh orchids in Britain and mainland Europe had descended into near chaos due to confusion over species boundaries and with names of dubious value being applied to almost any population which showed apparently distinct differences in flower or leaf shape, colour or blotchiness. Ian and Richard widened their study of the group to encompass more than 50

morphological characters rather than the usual three or four, studying populations scattered across Britain and Ireland, including all of the most controversial taxa. The results of multivariate analyses of diploid and tetraploid marsh-orchids (as well as the relatively more straightforward spotted-orchids) were published in a series of widely-cited papers (eg. Bateman and Denholm, 1983 & 1985) that attracted responses ranging from strong support to outright hostility, again reflecting entrenched views regarding the systematics and correct taxonomic treatment of such a challenging genus. However, one of the key benefits of such a comprehensive study was to caution against over-reliance for taxonomic purposes on relatively trivial (and possibly even monogenic) traits such as the intensity of vegetative anthocyanins), which show continuous variation often along geographical or ecological clines. Ian and Richard have recently been expanding their morphometric databases and combining these with molecular DNA studies to produce a synthesis and strengthen conclusions based on morphological data alone (eg. Bateman & Denholm, 2012). Not surprisingly, they are now the botanical experts to whom the society's members and the wider botanical community turn to for advice for correct identification of plants in this genus and of British orchids in general.

The BSBI has nearly 3,000 members, and the Presidency is a demanding role. Ian has presided over the final stages of a name change to 'The Botanical Society of Britain and Ireland' (which is a more explicit statement of its geographical coverage, but notice the same initials!) and a change in status to 'a company limited by guarantee' (as befits an organisation of its size). He has helped push through initiatives for restructuring the society, with the formation of separate Boards of Trustees and Council (to coordinate science and strategy), and an expansion



John Badmin

Kent & Medway
Biological Records Centre,
Faversham, Kent.



Ian Denholm on the summit of Ben Lawers, Scotland – the best place for montane plants in Britain.

in the number of paid staff. BSBI has always been heavily involved in government-funded research to monitor the changing status of the British flora and receives grants close to £150,000 per annum for various projects. These have to be carefully managed by Officers of the Society, and the data submitted to BSBI's new bespoke Vascular Plant database as well as the National Biodiversity Gateway. Current projects include a new Plant Surveillance Scheme in conjunction with the Centre of Ecology and Hydrology and Plantlife, sponsored by JNCC and Defra, and a Red Data List of Vascular Plants in England scheduled for publication in 2014. Past data have been used to produce magnificent publications such as the *New Atlas of the British & Irish Flora* (Preston *et al.*, 2002) weighing in at a mighty 4.5kg! A new Atlas is provisionally scheduled for 2020. Sadly, by comparison we have only one equivalent book on British insects.

Ian is currently part-time Senior Lecturer in Environmental Sciences at the University of Hertfordshire, contributing to undergraduate and Masters Courses on Habitat Management, Biological Conservation and Crop Protection. He retains a Visiting Scientist role at Rothamsted, and continues an interest in pesticide resistance management and the broader challenges of producing food

for a growing population while safeguarding the environment.

Of course entomologists have always appreciated the wonders of plants – their diversity of form and colour: the sheer size of trees, the beauty of flowers. They are an integral part of most studies of insects: even if in some cases we are investigating the use of insects for their ultimate demise. In recent times we have sadly lost the company of several entomologists who have shown a more than passing interest in plants. Eric Philp,



Eric Philp shaking hands with Maidstone Museum's latest model.

coleopterist and heteropterist, wrote not one, but two county Floras; Paul Sokoloff utilised his botanical skills in discovering new and rare UK micromoths, and Bernard Verdcourt, in a complete reversal, was a botanist with a great interest in insects. Brief accounts of their lives are given below. Note: all had mentors to whom they were eternally grateful.

Eric Philp FRES, former President of the British Entomological and Natural History Society (2000) and Keeper of Natural History at Maidstone Museum, Kent died on 8th January 2013 aged 82. He will be greatly missed by all field naturalists; entomologists and botanists alike. He was a field biologist par excellence, with expertise on the identification of most groups of British arthropods and vascular plants, as well as being a practised bird ringer and mammal recorder. His extremely broad knowledge of British wildlife is best exemplified by his position as third in the all-time pan-species recorder rankings, having identified 6,878 taxa in UK, most from his county of Kent. Deep down though, Eric would claim to be a coleopterist.

Eric lived most of his life in Kent. After national service, Eric worked locally often visiting Maidstone Museum to learn more about the region's wildlife. Here he soon fell under the influence of Tony Tynan, Keeper of Natural History, Alan Grove, Maidstone Museum Curator and Dr A. Morel Massee, chief entomologist at

nearby East Malling Research Station. It was Dr Masee who sparked Eric's lifelong interest in Coleoptera and Heteroptera.

Eric joined his local museum as a technical assistant rising to become Keeper of Natural History in 1958. He was a prime mover in establishing the Kent Field Club, the county's natural history society. Here he met John Felton (RES Vice President), Malcolm Chalmers-Hunt, Dr Masee (RES Vice-President), Colonel Duffield, John Sankey, Dr E. Scott, David McClintock and Francis Rose. Two youngsters who subsequently joined the junior section were (Professors) Clive Stace and David Streever. The Field Club can boast that it has had more authors who have written British Floras (5) than any other county society, and that's not including the many revisions and reprintings of 'Stace', our current bible!

Eric had firm ideas about what a museum was for, and that it should be a centre for reference collections, records and an identification service for whatever was brought in by the public. He subsequently set up the Kent Biological Archives at the museum in 1971, the first centralised database for storing the county's wildlife records. This was a hard copy system, comprising sets of individual species cards arranged by taxa group and a folder for each tetrad (2 x 2km square), where details of all the known records of plant and animal species from sites within each tetrad (e.g. a wood or SSSI) were stored, together with relevant correspondence. The known distribution of each species in the county was summarised in tetrad map form, a massive undertaking in the days before computerised databases. All 10 filing cabinets have now been delivered to the Kent & Medway Biological Records Centre so the records can be added to the computerised database when time allows: possibly a million more records.

During his time at the museum Eric strived to improve the quality of the collections, particularly those of the Insecta which suffered extensive damage during a fire in 1979. The herbarium was completely modernised and a huge amount of new material was incorporated largely as a result of field work undertaken for the new Atlases. Eric also made a special effort to ensure that specimens of difficult taxa such as *Rubus*, *Taraxacum* and *Hieracium* from Kent localities were

well represented. As a result the herbarium now houses a very comprehensive collection of Kent plant material that is consulted regularly by botanists from across the South-East of England. Naturally Eric was heavily committed to conservation and was a leading organiser in the founding of the Kent Trust for Nature Conservation (now the Kent Wildlife Trust) with 40,000 members today.

His publications included the *Atlas of the Kent Flora* (1982), *The Butterflies of Kent* (1993), the *Provisional Atlas of the Amphibians and Reptiles of Kent* (1998), the *Provisional Kent Mammal Atlas* (2002) and *A New Atlas of the Kent Flora* (2010). He is the only entomologist to have published two county plant atlases, a feat that will surely not be surpassed for a long time to come.

He is commemorated in the plant world, first by an oak tree on his grave and secondly by a hybrid dock *Rumex x philpii*, a cross between *R. patens* (Patience Dock) and *R. conglomeratus* (Clustered Dock) discovered by Eric near Snodland, Kent in 1978.

Paul Sokoloff FRES died on 26th November 2012 at the age of 66 after a short unexpected illness. He was a respected field entomologist with an encyclopaedic knowledge of the British Lepidoptera fauna, particularly the micros. Paul was expert at finding microlepidopteran leafmines and blotches and in order to assist in their identification became an expert botanist at identifying hostplants at the same time. Having an eye for unusual or rare plants in the field is of course halfway to finding unusual species of insects. Paul was always busy. He contributed to nearly all of the entomological societies and publications in a number of roles but mainly as editor, and he frequently worked for several at the same time.

Much of Paul's work was dedicated to supporting the British Entomological and Natural History Society. After various stints on Council, including Editorship Paul was invited to become President in 1984. His Presidential address 'An Introduction to the Gelechiidae' was a well-received paper that shed much light on this overlooked family. The twelve British species in the genera *Teleiodes* and *Teleiopsis* were covered and the adults of these genera were illustrated in the

Proceedings by, in Paul's words, "...magnificent colour paintings" by Eric Bradford. At the time there was little literature covering the British Gelechiidae and the address was the first of an occasional series on this family published in the Society's proceedings.

Paul was a longstanding member of the Kent Field Club (Natural History Society of Kent) and used to lead the occasional lepidopterists' field meeting. Jan Hendey, KFC bryophyte recorder and fellow lecturer at Bromley College remembers Paul's earlier days. 'As a teenager Paul took a job as a technician at Burroughs Wellcome Laboratories in Beckenham. With most of their technicians, he came on a part-time day release course to Bromley College of Technology. He was a first class student and over a number of years progressed through our courses to gain an MIBiol. During this time, he took a vacancy which arose in our department for a technician. At last, every instrument in the department worked properly as Paul serviced them and found out how they worked. We were an expanding Department of Life Sciences and he applied successfully for a lecturing post. Again he progressed through the ranks until he became a Principal Lecturer and Deputy Head of Department.

I occasionally overheard his lectures in cell biology as my office was nearby. I thought, "lucky students", as his well-known wit often provoked much laughter. They must have found it easy



Paul Sokoloff.

remember how the cleaners were wary of doing his office, as often they found a tank containing some creature with too many legs; a large black scorpion really scared them. Being in early, I had to offer 'reassurance'.

Paul served on the Council of the Amateur Entomologist's Society from 1975 until his untimely death. He was Honorary Secretary and then President of the Society from 1981-1982, an honour he greatly appreciated. For many years he compiled the Index to the Society's journal and assisted with other editorial duties. He even managed to find time to write two volumes of *The Amateur Entomologist Series: No.16, Practical Hints for collecting Microlepidoptera* (1980) and *No. 19, Breeding the British and European Hawkmoths* (1984). He was invited to be editor of the *Entomologist's Record and Journal of Variation*, a position he held from 1985-1995.

Paul's late climb up the educational ladder meant that he was particularly interested in providing others with the opportunity to undertake further education studies either as part of their business training or in evening classes so that they had the opportunity of progressing as he had. His interests led him to join BTec as an Adviser in 1986, a company providing GCSE and A level examination papers and National and Higher National Diplomas for the whole of the UK. He was Director and Policy adviser of Edexcel (formerly Btec) by the time he retired in 2006. This role involved him in extensive negotiations on educational policy and exam and course structures with ministers and civil servants. One day by pure chance I was lucky enough to listen to Paul on the BBC Radio 4's Today Programme (the most important News programme in the UK) having to explain to a certain John Humphries the reasons why a set of national examination papers had unfortunately gone astray (not for the first time) and how Edexcel had resolved the situation. Many a politician and even a recent former head of the BBC, as we know, have succumbed to John's intense interrogations, but Paul's polite, succinct replies left Humphs speechless: 5 - 0 to Paul. I must admit I went around with a big smile on my face for the rest of the day, Humphs had lost!! – and that is how I wish to remember Paul – with a big smile on his face.

Bernard Verdcourt, who died in 2011, aged 86, was a botanist at the Royal Botanic Gardens, Kew. He made important contributions to two distinct fields of East African natural history: he was an acknowledged expert on African plants, and on non-marine molluscs. He was responsible for almost one-third of the monumental *Flora of Tropical East Africa* that deals with 12,500 species. At the same time his extensive researches on molluscs resulted in '*A revised List of the Non-marine Molluscs of East Africa*' in 2006, a multitude of species descriptions, and around 380 malacological publications introducing over 200 new names. His malacological output was such that his colleagues found it difficult to believe it was the product of what time remained outside his career as a botanist.

He had always been very interested in insects and contributed over 200 short papers to various entomological journals from the age of 19 onwards. He collected *Meligethes* beetles extensively in East Africa, obtaining numerous new species, also many new species of Neuroptera. Several were named after him including *Meligethes verdcourtii* (Col. Nitidulidae) which was described by A. M. Easton as 'dedicated to the finder who has collected so energetically...' Another new species described in the same paper was named *Meligethes lornae* in honour of his wife, Lorna, who often accompanied him on field excursions.

The grandson of a Belgian hatter, Bernard Verdcourt was born in Luton, Bedfordshire on 20 January 1925 and attended Luton Grammar School. Here his enthusiasm for botany was fostered by John Dony, county recorder for plants, while local hymenopterist, Victor Chambers, encouraged a lifelong interest in entomology.

In 1943 he was called up and trained as a radar operator at Reading University and subsequently graduated with a degree in Radio Engineering, Physics and Chemistry. He worked briefly as a mycologist and microscopist before, in 1948, joining the East African Agriculture and Forestry Research Association.

His regular work, of naming thousands of plant specimens for various government departments, visiting research workers and the general public led to him acquiring an unrivalled knowledge of the East African flora and its literature. Somehow he managed to find time to



Bernard Verdcourt

conduct his own botanical research and gained an external PhD from Reading University in 1955.

After serving from 1958 to 1964 as Botanist-in-Charge of the East African Herbarium, he returned to England in 1964 and worked at Kew, first as Principal Research Fellow and latterly as a Principal Scientific Officer. Bernard officially retired in 1987 but this made little impact on his botanical research output. He continued working on the *Flora of Tropical East Africa*, *Flora Zambesiaca* and a *Revised Flora of Ceylon*. As a spritely 80 year old he was still working four days a week at Kew, publishing prolifically.

He published more than 1,200 papers and books on botany, malacology and entomology, but said he had done scarcely anything of real merit – "just a mass of descriptive material, useful, requiring judgement and knowledge but scarcely any intelligence". Others believed differently: he was elected President of the British Conchological Society in 1969, awarded the Kew Gold Medal in 1986, and honoured by the Linnean Society of London with their Gold Medal in 2000.

With thanks to Richard Polhill (Kew) and Colin Hart (BENHS) and Geoffrey Kitchener (BSBI) for help in compiling the obituaries.



Insects in Line

Michael Darby. Facing up to Beetles

Peter Smithers
Plymouth University

deputy director of the V&A, he is a man who spent most of his life immersed in icons of our culture's taste and style; The decorative arts by day but always beetles once off duty. He would occasionally steal away from the V&A to indulge in some lunchtime entomology. "I would meet with Peter Hammond at the Natural History Museum next door. We often sat on the roof of the NHM and talked beetles while Peter smoked a cigarette".

Inspired by his school natural history society, he had developed an interest in beetles and amassed a large collection. Keen to add to our knowledge of the UK beetle fauna he took advice from his fellow beetle collector Alex Williams and decided to focus on a different family each year. Realizing few people had any knowledge of the tiny featherwing beetles, the Ptiliidae, he decided to focus on these as his first family. He quickly realized how extraordinary this group was and never made the intended annual switch to another family.

Michael and I had exchanged many emails and phone calls over the previous six months all in connection with his artwork rather than his beetles. Following a series of articles in *Antenna* about insect artists Michael had contacted me regarding his exhibition of beetle images, which was then on show in Salisbury library. Entitled "Facing up to Beetles", it offered a range of beetles viewed head on so the viewer was face to face with coleopterans, a



Michael Darby at his desk.

Lost amongst the sinuous green lanes of Wiltshire, I wonder if I will have to resort to that phone call my patiently waiting host warned me I would have to make. "Most people fail to find us and have to call to be guided in", he had said in his text. The sat-nav was ominously silent as we passed yet another turning and I am reaching for the phone when the house appears as if by magic. Michael Darby steps through the ancient front door of his 17th century farmhouse, his frame much larger than the door's medieval dimensions. He extends a hand and a friendly smile, "you made it".

Michael Darby is a coleopterist with a passion for awakening an interest in beetles in non-entomologists. Ex

dramatic juxtaposition that intrigued me. As we were looking for an insect-related art exhibition to run in parallel with the 2013 Insect Festival in York this seemed a heaven-sent opportunity. Michael kindly agreed to loan us his images and installed them in Victor J's Art Bar, a small independent cafe in York's busy city centre. Thus the citizens of York were treated to a new experience of getting up close and personal with a number of very large beetles. The York exhibition featured only nine of the twenty-five images Michael had produced due to the space available. The exhibition had proven to be a great success, attracting many visitors and regulars who enthusiastically left comments such as "Authentically terrifying", "This opened

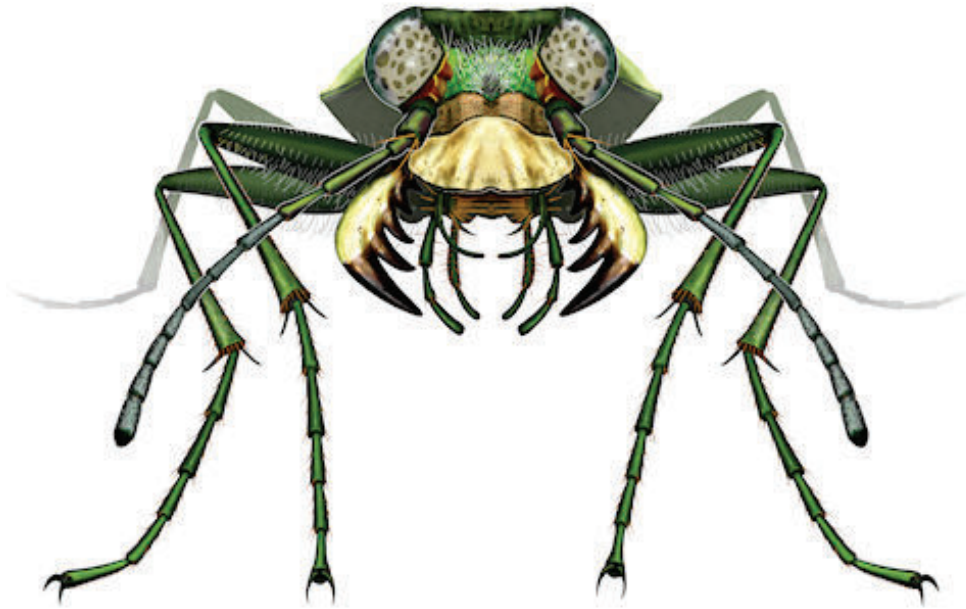
my eyes even wider” and “Magnificent magnifications a magical perspective”.

On our way to his study we pass through several rooms lined with bookshelves, other libraries lead off of these hinting at a labyrinth of information, books old, new and in between abound. A narrow staircase leading us to the study takes us past the beetle paintings, the smaller pictures are stacked in corners while the larger frames are lounging against the walls, faces of curious beauty blurred by their protective film of bubble wrap.

In Michael’s study he reveals the process he uses to create these stunning images. “It’s a bit of a cheat”, he had informed me during our last phone conversation, so I was intrigued.

Images of a beetle’s face are captured by a camera attached to his microscope. These are transferred to his computer and loaded into Corel Paintshop Pro. Here Michael draws around the various parts of the beetle saving them as separate layers in the new image. Texture and detail are copied and pasted into appropriate sections of the image and replicated to fill the space using Corel Draw. This simple but painstaking process produces some of the most dramatic images of beetles I have encountered. The images are extremely high-resolution files that enable these faces to be produced at a scale way beyond the beetle’s original dimensions. “The pictures are just the hook to draw non-entomologists in, I really want them to read the accompanying text and learn how important beetles are”. The many text panels deal with topics such as beetle diversity, their ecological roles and their history.

Michael has combined simplicity, dedication and careful observation to produce an exhibition that is dramatic, beautiful, challenging and informative. As a way to engage the public with insects, this is a formula that has proved extremely successful and we hope it will inspire other artists to offer the public the opportunity to experience close encounters with other groups of insects.



Society News

RES Scholars

Ceri Watkins

Insects are among the oldest, most abundant, most successful and best adapted inhabitants on this planet. Without them the world would cease to function as we know it; the decay of organic matter would slow, food chains would break down, the soil would become more compact and less fertile and pollination would be greatly reduced. The insects should be among our most revered assets, yet this is not so. Many are simply not noticed, some are dismissed, others actively despised for destroying crops and threatening lives and livelihood. Perhaps worse, though, are those that are feared, not for some injurious crime against man but due to a lack of understanding and a sense of disconnection with the natural environment.



Insects are fascinating. They inhabit all environments, no location is too inhospitable. The arctic beetle *Pytho americanus* uses cryoprotectants in both adult and larval stages to protect tissue while freezing and thawing occurs. At the other end of the scale is *Stenocara gracilipes*, the Namibian desert beetle

that survives by collecting dew on hydrophilic bumps on its elytra. Apart from amazing physiological adaptations, complex life histories abound. For instance, complete metamorphosis - little else so radically alters morphology. Consider also the social insects which form sophisticated self-regulating colonies with intricate pheromone communication systems and division of labour. Some insects mimic others, perhaps for a protective or other advantage, and in our own way, humans take advantage too. Think the Eastgate Centre in Harare with an air conditioning system modelled on a termite mound or ant colony optimisation theory, a revolutionary way of solving supply chain problems. Intra- and interspecific interactions are so finely tuned we are only just beginning to understand a minute proportion of this taxa. Whichever way you look at it, the insects have it all and much observation and research is required to unravel the many, as yet untold, mysteries. This understanding is a fundamental requirement to preserve and promote diversity, address the issues of insects as vectors of human, plant and animal disease and generally advance our own society by the application of novel insect inspired technology. For such schemes to be realised, information needs to be disseminated far and wide, both inside and outside academia. Slowly, bit by bit, negative attitudes can be changed, myths and fears dispelled and replaced with sense of inherent value for the insects and what can be learnt from them.

Why do I want to study entomology? So that I can be in a position to confidently and knowledgeably help others to appreciate how truly remarkable the insects are and inspire them to learn more. Receiving a Royal Entomological Society scholarship has enabled me to study MSc Entomology full time at Harper Adams University and take that all important professional step on the road to entomological discovery. It's a journey that will last a lifetime and I am extremely grateful for the opportunity to get started.

Natalie Kay

Why entomology and what the Royal Entomological Society Scholarship means to me

Just over half of all named species on Earth are insects and there are estimated to be millions more species yet to be described. Such diversity alone has fascinated me for years and presents an amazing opportunity for a career in research. Insects also play extremely important roles in ecosystems from pollination services and natural control agents to nutrient cycling. Without them, worldwide natural systems could not function. Therefore, understanding and assessing how these systems work and how to conserve them has become very important to me, particularly as we face issues of climate change, food shortages and habitat loss.



Throughout this Masters, I hope to build on the knowledge and experience that I gained during my bachelors degree in Zoology at the University of Reading, where my interest in insects grew to such an extent that I was awarded the Steve Hopkins Memorial Prize for the best Invertebrate Zoologist in my class. This was awarded partly due to my dissertation on the coexistence of *Acacia*-ants within *Acacia erioloba* in Namibia where I was

also able to join a general entomological project and develop many useful skills, from trapping to identification and mounting. My interest continues to grow as I sort insects as a volunteer at the Natural History Museum as well as research and write about various insect species for the ARKive website.

I am looking forward to improving my taxonomic knowledge of insects as I enjoy learning about how species are related to one another and what drives evolutionary change. Taxonomy is so important, as without knowing what species we are dealing with we cannot begin to address problems such as conservation or pest management. I'm also keen to practice and improve my identification skills as this is an essential skill for a future career and I enjoy the challenge. I'm particularly interested in insect ecology as understanding how species interact with each other and their environment is crucial when conducting the majority of research. I also thoroughly enjoy the practical side of entomology in terms of collection, mounting and curation and will have ample opportunity to develop these skills throughout this course at Harper Adams University.

I'm extremely grateful to have received this scholarship from the Royal Entomological Society as it has enabled me to study for the only Entomology Masters in the country and provided me with the next step towards a career as an entomologist. Without this scholarship, it would have been extremely difficult to afford to study this year but I am now in a position to study full time and focus on making the most of the academic year. I can also now afford to buy books and entomological equipment to aid learning during the course of this Masters and beyond.

Mary Sumner

As a child, I spent countless hours at the bottom of the garden, looking under plants to examine the woodlice and running from the Devil's Coachmen. After years of keeping caterpillars, snail farms, and getting too close to ant nests, I was distracted by engines and dreams of being a vet. It wasn't until I was in Trinidad on a University expedition and saw my first tailless whip-scorpion that I realised I still loved the creepy-crawlies as I had



when I was a child. It should have been obvious – for my third year essay topic I chose the evolution of flight in insects, and the reason I applied for the Trinidad expedition originally was because there was an opportunity for studying the asymmetric mantis, *Tithrone roseipennis* (which I still find fascinating).

When I came back to Glasgow I found myself in the archives of the Zoology Museum, where I was in amongst the Asilidae; getting to know them a little from descriptions nestled amongst the keys and staging the trays of specimens. I loved every moment of it: reading about the flies; inspecting them under the dissecting microscope; finding legs after they exploded off when removed from the cork and gluing them back together with a pin and very shaky hands. It was also a motivational glimpse into the daily life of the archives: It was thrilling to see so much interest and activity around insects, and it strengthened my resolve to be a part of the community. This was bolstered by my participation in some of the many courses held by Buglife where I met enthusiasts from the local community (with much greater knowledge than myself), some of whom I even saw again in the archives.

I'm very excited about learning more about the world of insects and their kin, partly through the dazzling range of structures and habitats as well as the huge importance the entomological clades have on the rest of the ecological systems of nature. It's my belief that the best way for sustainable conservation is a bottom-up understanding of natural processes, which seems to be underestimated by the larger conservation community. This perspective looks to be beginning to change, and I'm eager at the prospect at being able to participate

even in some small way.

The modules of most interest to me are Biology and Taxonomy, Diversity and Evolution and Ecological Entomology. I am very interested in the breadth of the diversity shown by invertebrates, and their specialisations to the environment and to their interactions with the environment, adapting to and creating niches. I find the particular and intricate designs that have arisen within the field fascinating, while the problems that arise from the low numbers of preserved specimens throughout the ages makes for interesting and constantly evolving stances on how features developed and were utilised in their intermediate stages. Currently I have no particular area of specialisation in the field of Entomology, having been similarly enthused by all the groups I have spent any time studying or working with, and I hope that these courses would help me choose an area to specialise in, and thus help to structure my future career path from here onwards.

I had been working since shortly after I graduated from Glasgow University to try and build up enough funds to finance a Masters degree, all the while having a student loan from my undergrad that was automatically taking repayments, just not enough to cover the interest! The scholarship has given me a fantastic chance to get more involved in the experience of my Masters, taking off the stress of having to budget and giving me the chance to widen my knowledge and hopefully help out in conserving and cataloguing the insect collections here and being more active in the university community.

One of the most exciting aspects of this course is the fact that so much is new to me, and even after the year is over there are so many other questions to answer: How extensive are the behavioural syndromes seen in funnel web spiders throughout the arthropods? In Trinidad I saw a bright white, cave-dwelling amblypygid – is it distinct from the aboveground black individuals? Why and how *did* insects develop flight? Are there better ways we can use insects as biological controls on farmland, or to regulate pest insects to help feed the planet? There are many, many things I do not know about this area, and this course will help me understand them, or put me in a position closer to answering the rest.

Ento '13



This year's meeting took place in the ancient university town of St Andrews and was organized by David Shuker, Leigh Simonds and Graham Stone. At the opening of the Principal's wine reception, the Principal of the University, Professor Louise Richardson described the university as being defined by both its history and its isolation. Travelling from Devon I had a very real appreciation of the latter and a short stroll around the town definitely confirmed the former. St Andrews possesses a rugged austere charm, it is a town that has endured both time and the elements and has been a seat of learning since the 14th century. Coincidentally Ento'13 had arrived in St Andrews in the midst of their 600th anniversary of the founding of the university, thus adding to the celebrations; celebrations which, due to some uncertainty regarding the founding date, had already lasted for three years.

The conference was a meeting of two halves, with the international symposium taking place each morning and the national meeting breaking into

two parallel sessions each afternoon. The Symposium was a celebration of the publication of Thornhill & Alcock's classic text, *The Evolution of Insect Mating Systems*, which had been published thirty years previously. The sessions explored the advances made since then and provided a current perspective of our understanding of the many aspects of insect sexual behaviour. The talks presented in these sessions are to be summarized as chapters in an RES symposium volume entitled *The Evolution of Insect Mating Systems*, edited by David Shuker and Leigh Simmonds, and which will be available next year.

The theme of sexual selection also spilled into the national meeting with two of the afternoon sessions continuing the sexual selection theme and another dealing with nuptial gifts. This latter session was an excellent summary of our current knowledge.

The remaining three sessions focused on insect genomics, beneficial insects and a general session.

The Antenna team were, as always, tracking down the pheromones of a

good article and managed to persuade a number of presenters to convert their talks into articles; so, a fair proportion of this conference is destined to appear in print over the next year.

While all of the talks were of an incredibly high standard two did stand out as exceptional. Michael Jennions' lucid and entertaining outline of the incredible complexities of the evolution of mating strategies was a tour de force of science communication. His engaging talk presented the complexities of sex ratio determination as a set of simple graphics, which were delivered with humour and style. Then, to demonstrate the hard science behind it, he dropped a set of formidable formulae into the final slide just to let us know what we had been spared.

The other was Simon Leather's description of how he was drawn into the twittersphere. His amusing account of his journey from an indifference to social media to using Twitter to raise the profile of the conference left many older members of the audience with the impression that they were possibly

missing a trick if they were not engaging.

In addition to the scientific sessions Walter Leal gave a presentation on the upcoming ICE meeting in Florida, which is predicted to be one of the largest entomological gatherings so far. Gordon Port gave a summary of the membership survey and put out a call for ideas regarding extra services that the Society could offer.

The Ento meetings are always a chance to socialise, network and catch up with old friends. Ento'13 was no exception, with many delegates staying late in the bar to discuss ideas, future plans and form new friendships.

As always, the Ento meeting was not all work and this year there were two entertainment events. During the President's wine reception there was a performance of the new one act mini opera "Miriam", which offers a portrait of the late Miriam Rothschild using extracts from her own writings. This was a piece for a single voice and bass clarinet and was performed by Francis Lynch and Karen Whimhurst who are part of Electric Voice Theatre. In this performance the ghost of Miriam walked amongst the delegates explaining her passion for fleas and the natural world in both words and song, while the deep resonant tones of Karen Whimhurst's bass clarinet supplied a musical backdrop of both classical and jazz inspired rhythms. The piece appeared to be well received and will go on to be performed at Tring, the Edinburgh Botanic Gardens and Plymouth University.

The other entertainment was the traditional ceilidh following the conference dinner. This was held in the Lower College Halls, which are situated in one of the medieval quads in the older part of the university campus. The excellent dinner was followed by a short speech from the Society's president Jeremy Thomas. In this he offered a vote of thanks to the conference organisers and the RES team. He then presented two prizes, the Wallace Award to Richard Merrill for his work on mimetic butterflies and the other to Ciaran Pollard, winner of this year's student essay competition. A large number of fellows then signed the Society's obligations book, maintaining a tradition that goes all the way back to Darwin and Wallace.

Following the dinner, the company adjourned to the Upper Hall where a



band featuring a mandolin, harp and accordion awaited to draw the company onto the floor and dance the night away. Even the last surviving professor of entomology in the UK, was seen whirling elegantly amongst the dancers. The evening was a great success, despite several complaints the next morning of sore toes resulting from a lack of synchronization with various dance partners. Dance partner selection it seems may be as tricky and complex as selecting a mate.

Peter Smithers

Top: Ciaran Pollard receives his prize for best student essay.

Right: Frances Lynch and Karen Whimhurst performing Miriam.

Below: Richard Merrell receives the Wallace Award.



ENTO 13 Conference report

A workers perspective

**Emily R. Burdfield-Steel, Rebecca A. Boulton,
Nicki Cook, Liam R. Dougherty, Darren J. Parker**

We ask the team of local volunteers (or "Workers") to give us their impressions of the ENTO13 experience.

What was the experience like?

Liam: It was excellent: the talks were great and I met loads of interesting, friendly people. Helping out with the running of things was fun even though it was pretty hectic at times and I think we managed to avert any major disasters. It was a great insight into the work needed behind the scenes for these conferences, though of course the real organisers did all the hard work!

Becky: I wasn't really sure what to expect, but I had a great time. It was very different from my typical work schedule and I really enjoyed running around and helping people upload talks and such. It was actually a great way to get introduced to some famous scientists without that initial awkward startup conversation!

What were your favourite talks and why?

Becky: So many to choose from! I particularly enjoyed Rhonda Snook (University of Sheffield) and Nina Wedell (University of Exeter), who talked about the evolution of polyandry and the role of selfish genetic elements in insect mating systems. What they study is so interesting (and very relevant to me) and they presented so enthusiastically you couldn't fail to be engaged! It also really got me thinking about my own research from a perspective I hadn't considered before.

Liam: I really enjoyed Valentina Zizzari's (VU University, Amsterdam), talk on sperm competition in springtails; it was a great combination of an unusual phenotype (dissociated sperm transfer), good experiments and some fun videos of males eating their rival's sperm.

Darren: I enjoyed Boris Baer's plenary (University of Western Australia) as it answered several questions concerning the evolution of polyandry in social insect. In particular showing that queens face a trade-off in the number of matings she should accept: a greater number leads to less parasitism in the hive, however the more she mates the more likely she is to become fatally immuno-compromised.

Another favourite of mine was Darryl Gwynne's (University of Toronto) talk which gave us an overview of work he and others have across many species of non-model insects, emphasising the how understanding the natural history of understudied organisms can allow us to test evolutionary predictions.

What was the social aspect like?

Emily: The whole conference felt very social and friendly. The signing of the Obligation Book by the new Fellows deserves a mention, and of course the operetta on Miriam Rothschild was definitely a break from conference tradition!

Liam: The ceilidh was excellent, everyone really got involved which was good to see. There were also plenty of interesting discussions in some of St Andrews finest pubs!

What did you learn?

Nicky: The Thornhill and Alcock theme opened the floor for a lot of really interesting talks in the field of sexual selection which helped fill in a more than a few gaps in my knowledge! Also - entomologists are very friendly people!

Becky: I learned a lot about quite specific things, from how to engage the public about entomology through twitter (from Simon Leather (Harper Adams University)) to how males of *Drosophila littoralis* avoid mating with inbred females. But I think most of what I got from the conference was ideas for the future, and how many questions there are still to answer with regards to insect mating systems. It was also a really inspiring conference and seeing talks by such influential people really got me motivated and excited about all the directions I could take my own work!

Insect Festival 2013

Yorkshire Museum Gardens and Hospitium, York

Sunday 7 July 2013

Dr Luke Tilley, Dr Gordon Port, Julie North and Peter Smithers

Outreach

The Royal Entomological Society



For the third consecutive Insect Festival, the day dawned bright, sunny and warm – what brilliant luck!

The team and supporters had arrived in York the day before for the “Evening of Entomology” event, taking place in the Museum’s Tempest Anderson Hall. This new initiative for the Insect Festival included an engaging presentation from Dr James Miller (American Museum of Entomology), recipient of the prestigious J. O. Westwood Medal. Dr Miller demonstrated his fascination for tropical noctuid moths and their evolution. A couple of entertaining short animated films followed, which seemed to be well received by the very mixed audience, and the evening was rounded off by an entomological question time. A panel of Fellows, Peter Mayhew (York), Thomas Simonsen (NHM), Jim Miller (AMNH), Roger

Key and Peter Smithers took questions from the floor and also answered questions pre-submitted via email and twitter. A thoroughly enjoyable evening for all who attended – backed up by very positive feedback on the day of the Festival from some of the attendees.

As this was the third Insect Festival, everyone had a good idea what to expect. On hindsight, the team seemed to work together instinctively - there was no plan discussed beforehand on who should do what but the setting up of the Hospitium, the marquees and other paraphernalia was completed remarkably quickly. Contractors were on site for 7am to set up the marquees and unload tables, chairs and poster boards. They were gone by 8.30 am. The first exhibitors started arriving at 7.30 am (according to their designated unloading slots), to find their stands in the Hospitium

ready and equipped with table-cloths and welcome packs.

Volunteers arrived for a 9 am briefing and went to work immediately to help wherever required. With the exception of one ‘no show’, all exhibitors and outdoor activity stands were ready by 9.45 am, allowing time for a photo call for the IF team and volunteers.

Visitors started arriving before the opening at 10 am, and soon there was a steady stream coming through the doors on what turned out to be a glorious summer’s day. The nature of this event makes it difficult to conduct a head count, but a conservative estimate of 1,500 to 2,000 people visited the Insect Festival this year.

This year there were even more outdoor activities in the marquees on the lawns of the Museum Gardens, with new support from the British



Arachnological Society, National Bee Unit and OPAL Tree Health Survey. Popular activities from 2009/11 returned, such as the mini-beast hunts led by Roger Key, Graham Banwell and postgraduate volunteers (nearly 200 participants throughout the day). Outside, children had the opportunity to build an insect to take home with them, have their faces (arms and hands) painted, look at a photographic display of an entire bee colony, and learn about British spiders, the insects in British trees and insect ecosystem services. The winning National Insect Week photography competition entries were displayed outside, alongside the Schools' Art Competition. The art competition was a great success and helped attract school children (and their families) to the event. There were prizes presented to the top three pictures in four age categories; 850 entries were received in total over the months before the Festival. All twelve winners came to the event to collect their prize and enjoy the exhibits.

Adding to the ten stands in the marquees outside were 25 exhibits, spread over the two floors of the Hospitium. Many previous exhibitors returned, some for the third time, such as the Thorne and Hatfield Moors Conservation Trust, the Yorkshire Naturalist's Union, Brambleby Books and Butterfly Conservation, with a

good contingent from research organisations, such as Fera, the Institute for Animal Health, Pirbright and Derby University (Crime Scene Insects). New exhibits included the Friends of Rawcliffe Meadows, who joined forces with Buglife to demonstrate how they are working together to save the rare and stunningly beautiful tansy beetle. Atropos Books (field guides and reference books) and Nurturing Nature (innovative insect nest boxes) both made their debut, as did Amy Mae ceramics, who produced intriguing sculptural pieces inspired by the 3-dimensional forms of bumblebee nests. Amy joined as part of the underlying theme of the Festival "Insects in Art".

As part of the "Insects in Art" theme, there was an exhibition of paintings of beetle faces by Michael Darby entitled, 'Facing up to Beetles'. This took place in Victor J's art bar in the centre of York. The exhibition brought the audience face-to-face with some of the UK's most charismatic and colourful Coleoptera. The large scale of the paintings (some being six feet by three feet) allowed the viewers to gain an insect's eye view of these magnificent creatures. The paintings were accompanied by text panels that provided information on beetle diversity, their ecological roles and conservation. The exhibition ran for a week before and after the festival. The

exhibition generated a huge amount of interest, with many customers returning to view the paintings with friends and family.

Peter Smithers was a new recruit to the Insect Festival team and was tasked with developing the Insects in Art for the Festival – there are plans to build on this for the next time, either as a running theme or to widen the interest within the Festival.

Sterling support was received from the RES President, Jeremy Thomas, who not only presented the Westwood Medal during the "Evening of Entomology" but also gave out prizes to the winning entries of the Schools Art Competition, and made a point of speaking to every exhibitor during the course of the day. This was very much appreciated and will have given a very welcoming impression to those participating on behalf of the Society. Welcome support was also received from RES Hon. Treasurer, Hugh Loxdale – his enthusiasm and ability to talk to visitors of all ages was evident on the day and was a valuable contribution. As always, the RES HQ staff cannot be thanked enough for their continued support for during the months leading up to the Festival, the preparation behind the scenes and running of the event on the day. It cannot be stressed enough how important their role is to the success of

this event. Knowing that so many 'behind the scenes' jobs are covered, without having to ask, is hugely reassuring – it wouldn't work without them. Sixteen keen volunteers helped with activities and as stewards.

This Insect Festival was another extremely successful event that was well attended throughout the day, confirming it has been the right decision to keep it as a Sunday event. This is clearly a 'family day', and even the Wimbledon Final did not seem to have a negative impact on numbers in the afternoon. A slight dip in numbers outside after lunch was not seen inside, where both floors were still in full flow with animated visitors. The £1 admission fee for adults (free to children under 16) does not seem to affect numbers attending.

Overall, this event is gaining momentum and wider recognition. Media interest continues to grow, with slots on BBC Radio Leeds and York in the days before the Festival. The quality of participants is extremely high but the friendly and welcoming atmosphere is retained. There is now an established breadth of exhibits that offers something for all ages and levels of entomological expertise. There is a clear opportunity for networking as well, with many of the exhibitors expressing their gratitude for having so many key organisations under one roof. The atmosphere of the day continues to be one of collaboration between all involved, with the communal aim of engaging the public with insects and the work of entomologists.



The Wallace Award

This award is made annually for postgraduate work leading to a PhD degree, with no age limit.

University supervisors are now invited to nominate postgraduate students who have been awarded their PhD during the academic year October 2013 - September 2014, and whose work they considered to be exceptional. The assessment will be based on the candidate's thesis (which must be in English), plus a one-page submission from the candidate explaining in layman's language how his or her work has made a significant contribution to entomology.

Nominations should be sent to the Registrar, on a form which is downloadable from the Society's website. The deadline for submissions for this year's Wallace Award is 1st October 2014. Applications should be routed through heads of department. Please do not send any theses or supporting documents until asked to do so by the Registrar.

Comparative assessment of the candidate's work will be done by a panel of Fellows of the Society, and the result will be announced in April 2015. The winner of the Wallace Award will receive a certificate plus a cash sum of £800, and one year's free membership of the Society.

The winner's university department will also receive a certificate. The winner will be invited to give a presentation of their work at an appropriate meeting of the Society.

Wallace award winner 2011/12 – Dr Richard Merrill

***Heliconius* wing-patterns – a key to understanding speciation**



H. cydno courting



Dr Richard Merrill

The diversity of living forms – and particularly that of insects – is a perpetual source of wonder. For many years it was thought that differences between species had to evolve in isolation, because populations in contact would continue to interbreed, thus preventing the emergence of the particular genetic associations that characterise species. Gradually it has come to be accepted that adaptation to different ecological niches must in itself be able to provide a sufficient driving force for speciation. The big problem is, how to devise experiments that demonstrate unambiguously that such ecological speciation – speciation in the face of gene flow – can occur, and is occurring.

The winner of this year's Wallace Award is Richard Merrill, who is with Chris Jiggins' group at Cambridge

University working on the genetics of *Heliconius*. This genus is of course well-known for Müllerian mimicry, where unrelated species converge in their warning patterns, forming "mimicry rings" that provide a more effective advertisement of their unpalatability to predators than could any single species acting alone. What is significant, however, is that more closely-related *Heliconius* species – those that might still be occasionally hybridising – tend to belong to different mimicry rings. Their wing patterns differ so much that any hybrids between them with intermediate patterns would appear to be at a considerable disadvantage, as they would not be recognised as distasteful by predators. This has long been surmised, but there has been no hard evidence. Now Richard has demonstrated, working in Panama with



Heliconius melpomene and *H. cydno* (top row, left to right) and their distantly related co-mimics *H. erato* and *H. sapho* (bottom row).

artificial butterflies designed to match the natural butterflies with respect to bird vision, that there is indeed selection against the colour patterns of hybrids between closely-related *Heliconius* species.

This in itself is a major contribution, but Richard's research has gone a lot further than this. What makes *Heliconius* an ideal model for such studies is that their wing colour patterns are known to function also in mate recognition. Selection for divergent colour patterns can only lead to speciation if it is accompanied by the corresponding mating preferences, which means that there needs to be genetic linkage between features of the wing pattern involved in divergent selection and those involved in choice of mates, to prevent the association from being broken down by hybridisation. Richard compared pairs of species to see how the strength of mate preferences differed according to their degree of divergence. He then examined mate preferences among progeny of crosses between two *Heliconius* sister species that are sympatric across much of Central and northern South America, *H. cydno* and *H. melpomene*. The colour pattern differences between these two butterflies are largely controlled by a few genes, clustered on just two of the 21 chromosomes. In behavioural experiments with hybrid males, Richard demonstrated that variation at one of these sites, which controls the presence of a red forewing band, is a major determinant of whether the male attempts to mate with *H. cydno* or *H. melpomene* females. So, male hybrids that inherit a *H. melpomene* allele for a red forewing band show a stronger

preference for females with the same red band pattern, when compared to their brothers that have the alternative white band allele. Genes controlling female preferences seem to be associated with patterning genes on a second chromosome, providing further evidence that "speciation genes" in these butterflies are clustered together in the genome. He also found evidence of the existence of genetic associations between colour pattern loci and alleles affecting hybrid sterility and host-plant use. This all leads towards the conclusion that linkage between traits

that contribute to reproductive and ecological isolation is a general phenomenon in *Heliconius*, and has an underlying adaptive basis.

Thus, Richard has made major advances towards unravelling the complex genetic architecture of a system that, by impeding recombination, can facilitate speciation in the face of gene flow. His work has contributed some major new knowledge and insights, in a field that is basic to our understanding of insect biodiversity.



Heliconius melpomene and *H. cydno* mating.

Council Matters

Council Matters June 2013

The Registrar reported that following agreement from Mr Brian Marsh (of the Marsh Christian Trust), Dr Tom Oliver had won the Marsh Award for an Early Career Entomologist and Mr Peter Harvey was to receive the Marsh Award for Insect Conservation.

Professor Reynolds provided Council with a written and verbal update on progress with the European Congress of Entomology (ECE), which the Society is hosting and that will be held in York from Sunday 3rd August to Friday 8th August 2014. Plenary lectures had been secured from high profile entomologists from around the world. The scientific programme was taking shape but a more diverse range of topics was required. Prof. Reynolds felt that there were some areas that were insufficiently covered. Several Council members offered to provide contacts, which may be useful in bridging gaps. Arrangements for a social programme were also being developed. It was felt by Council that the ECE should take full advantage of the many historical aspects of the City of York and environs, and that this would appeal especially to overseas delegates.

Professor Reynolds graciously agreed to draft an article on Alfred Russel Wallace for *Antenna*. Wallace had been President of the Society from 1870 to 1871, and 2013 was the centenary of his death. The article will appear in the winter edition of *Antenna*.

Prof. Mordue explained that she was keen to progress plans with updating the Society's Bye-Laws. A working party on this topic had been meeting on an *ad-hoc* basis but significant progress had been made. In considering the Bye-Laws, however, there were

straightforward changes (e.g. of address) but also some more fundamental issues, that required significant thought and ultimately agreement of Council.

Council agreed to continue financial support for the National Moth Recording scheme, for the next three years.

Prof. Thomas, as President of the Society, expressed much thanks and appreciation to the retiring Trustees: Dr R.A. Farley-Brown, Prof. J. Rolff and Prof. A.J. Mordue.

Council Matters October 2013

The Honorary Secretary provided Council with an overview of Ento'13, which was held in St Andrews University 4th to 6th September 2013. There were approximately 140 delegates over the three-day meeting. The format was as usual with Symposium speakers in the morning and the national meeting in the afternoon. The topic of the Symposium was: Thirty years of Thornhill & Alcock: the Evolution of Insect Mating Systems. Some delegates commented that they enjoyed the structure of the meeting as many of the national meeting sessions also revolved around insect mating. Council debated the merits of the national meeting aligning closely with the Symposium topic. In the end it was felt that this was a decision for the local convenors and in the case of Ento'13 seemed to work well. The President expressed his satisfaction at the quality of the scientific presentations, which he felt were universally excellent. The Honorary Secretary, Honorary Editorial Officer and Registrar commented on some logistical issues which had arisen

during the conference organisation and suggested that guidelines be issued to future convenors. Finally, the President mentioned the large amount of interest generated by the Society's Obligation Book, which had been available at the conference dinner.

Ms North provided a written overview of the Insect Festival 2013 and, at the President's behest, led Council through it commenting on various aspects of the organisation of the Festival. Council agreed wholeheartedly that the Festival is gaining momentum and wider recognition, and that the aim of 'engaging the public with insects and the work of entomologists' is being thoroughly met. The President congratulated Ms North and the Festival team for this important outreach event. Ms North accepted the invitation to coordinate the 2015 Insect Festival.

Council reviewed a written report on the European Congress of Entomology, provided by Prof. Reynolds as Chair of the organising committee. Dr Klaus Reinhardt has joined the organising committee and agreed to act as 'programme master' and session organiser. Council considered that Dr Reinhardt would be a valuable addition to the committee having strong links with the Society and being based in Germany he would add a broader European perspective.

The Registrar advised that sub-committee guidelines were due for revision and that these should be circulated, and the sub-committees asked for comment.

The President advised that Prof. M. Claridge, Dr C. Thomas and Ms J. North had agreed to serve as his Vice Presidents for this session of the Council.

THE WIGGLESWORTH MEMORIAL LECTURE AND MEDAL AWARD 2016

To be received at:

The 25th International Congress of
Entomology in Orlando, Florida, USA
25-30 September 2016

The Royal Entomological Society, on behalf of the Wigglesworth Fund, is pleased to announce that the period for submitting nominations in respect of the Award is now open and will remain open until 31 August 2014.

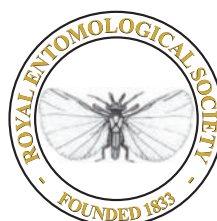
Nominators' attention is drawn to the following statement from the Fund's terms of reference:

"The Award is made in recognition of the great contribution of Sir Vincent Wigglesworth to Insect Biology and the example that he set in the performance of his work. Nominees shall be persons who will be regarded by the Royal Entomological Society's Trustees as having made a significant and eminent contribution to Entomological Research. The nominee's contribution will be work of an outstanding nature that best reflects Sir Vincent Wigglesworth's standards of personal involvement in all aspects of research."

Nominators will please submit a comprehensive C.V. of their nominee, which shall include a list of publications and a formal statement by the nominator indicating the importance and relevance of the nominee's work and how that work adheres to the principles outlined in the above statement. Additional letters of support for a particular nominee may be attached and, indeed, are encouraged.

The person selected as the 2016 Lecturer will have their costs for attending the I.C.E., to give the Lecture and receive the Medal, met from the Fund.

Nominations should be submitted
c/o the Registrar,
The Royal Entomological Society,
The Mansion House, Chiswell Green Lane,
St Albans, Herts, U.K., AL2 3NS



www.royensoc.co.uk



2004 Award
Winner,
Kenneth George
Davey



2008 Award
Winner,
James William
Truman



2012 Award
Winner,
Steve Simpson

THE
WIGGLESWORTH
AWARD

for outstanding services to
the Science of Entomology

Meeting Reports

APHIDOPHAGA 12 : a splendid meeting in an attractive setting

Helmut van Emden

e-mail: h.f.vanemden@reading.ac.uk

The 12th international symposium on the biology and ecology of the natural enemies of aphids (APHIDOPHAGA 12) was held on 9-13 September 2013 in Belgrade, Serbia. This series of meetings, now held every three years, was founded in 1965 by Dr Ivo Hodek of the now Czech Republic. Just two of those who attended that meeting in Prague, Professor Tony Dixon of the University of East Anglia and myself, were also in Belgrade. The Steering Committee, headed by Dr J-P. Michaud of Kansas State University, do a great job in selecting offered papers and structuring the programme to maintain a high scientific standard; APHIDOPHAGA meetings are always so worthwhile. With such a relatively narrow remit, every contribution has the potential to be of interest to all at the meeting.

A very helpful idea of the local organisers was to leave the logistics of the meeting in the hands of IMPALA, a local travel agency. This meant that, with just one form and one payment, it was possible to deal with flights, transfers to and from the airport, accommodation, registration, bookings for social events and even abstract submission. This worked efficiently and smoothly, and organisers of other meetings could do worse than follow the Belgrade example.

The Hotel Palace in the centre of the city was where most of the scientific sessions took place and from where coaches departed for the social events. Although modestly priced in comparison with several other hotels on offer, a quick "Google" for client reviews identified very high ratings for food quality and friendliness of staff. This surely made it a "no brainer", and I therefore made a rapid booking with the travel agent for myself and my wife.

With our home so close to Heathrow and a daily direct flight at lunchtime, our journey was simplicity itself; at Belgrade the driver to take us to the

hotel was waiting for us in the arrivals hall. So we reached the Palace Hotel at about 5 pm, in plenty of time to be ready for the coach at 8 pm to take us to the 5 ha university botanic garden for a Welcome Reception with cocktails and canapés by the light of flaming torches; very atmospheric! After a few short speeches, we had the opportunity of a conducted tour of the Japanese Garden. It was now pitch dark and so we heard quite a lot about what we might see if we returned in daylight!

The symposium proper opened the next morning in the impressive Great Hall of the Serbian Academy of Sciences and Arts, just a five minute walk away from the hotel and on Knez Mihailova, the "Bond Street" of Belgrade. The opening ceremony began with speeches by dignitaries from the Academy and the University of Belgrade as well as a welcome from Prof. Ivica Radovic, Deputy Minister of Education, Science and Technological Development, himself an entomologist. The Chairman of the local organising committee, Dr Željko Tomanovic also expressed his welcome and gave us the statistics – there were some 60+ participants from 25 countries presenting about 30 oral papers and 30 posters. This attendance was rather less than the 100 or so at previous recent APHIDOPHAGA meetings; it was obvious that budget restrictions in universities and research stations were really biting. Then came a moment I shall always treasure. I had already been told that the whole meeting was to be "dedicated" to me as had also been announced in the printed programme. Now at the opening ceremony Dr Michaud made a very complimentary speech about my research etc., and I was called from my seat and presented with a huge commemorative certificate (Fig. 1). The first scientific session then began with papers under the heading of "Community Structure", and this then continued at the Hotel Palace after



Fig. 1. "Van" (on the right) receives his giant "dedication" certificate from Dr J-P. Michaud (Aphidophaga photo).

lunch there, surprisingly also included in the registration fee. The session comprised seven presentations, several on coccinellid densities at the landscape level and movement between crops.

My wife Gillian had been registered at the reduced rate for an "accompanying person". However, she was the only one in that category, and it was understandably unreasonable for us to expect a daily alternative programme specifically for her. Fortunately, as a zoologist who has herself taught entomology at university level, she was happy simply to join in the sessions with everyone else.

After the evening meal, we gathered outside the hotel for a guided tour (in English) of the Knez Mihailova and the Belgrade Fortress, a defensive structure frequently modified over the centuries from its Roman origins and set in a



Fig. 2 Illuminations at the Belgrade Fortress.

large park on a hill overlooking the confluence of the two rivers of Belgrade, the Danube and the Sava. This, like the welcome reception the night before, took place in darkness, but there was a fair amount of “son et lumière” to help (Fig. 2).

The sessions on Tuesday were devoted to 13 presentations on coccinellid ecology. Several papers stressed paternal effects and competition, but there was also a report of a volatile sex pheromone in *Harmonia* and a paper on the identification of prey items in frass. The programme ended with a poster session from 16:00-18:00.

In the evening, dinner was provided as part of a river cruise along the Sava and into the Danube. A coach took us

to the boat, in the cabin of which long tables were set out for the meal. The boat left its moorings once the meal was more or less finished, so it was then possible to leave the cabin and enjoy the illuminations along the river. Very impressive was a huge bridge suspended by many glittering cables from a single upright support and of course also the promontory with the illuminated Fortress now seen from below. I noticed that networking about aphidophagous insects was so enthralling for a large proportion of the participants that they saw none of this and stayed at the tables in the illuminated cabin for the entire trip. You can be too serious!

A feature of APHIDOPHAGA is that, after two days of scientific

sessions, everyone has a day off “work” with a coach excursion to local places of interest and to see more of the environment in general. Our first stop was at Zasavica, a nature reserve of forests, meadows, swamps and the banks of a tributary of the Sava river. Here we were welcomed with a plum brandy, and then told about the rarer animals and plants in the reserve with a large panel of photographs as a visual aid (Fig. 3). The reserve’s resident biologist spoke in Serbian, but unfamiliarity with the language was no obstacle to the transmission of his passion and enthusiasm. The more measured English version from his colleague, paragraph by paragraph, lost a lot in the translation. We then boarded a river boat and cruised gently between the reeded banks for about half an hour; sadly the weather was dull and rather dark and the wildlife kept their heads down.

The coach then took us into the hills to the quaint city of Sremski Karlovci, the spiritual, cultural and educational centre of Serbia for over 200 years and 57 km from Belgrade. There a guide met the coach to explain the significance and history of the major baroque buildings. In Belgrade we had been surprised at the abundance of graffiti on buildings everywhere, even in the most elegant parts of the city. In Sremski Karlovci, graffiti was also much in evidence, though I was surprised to find my visit had been anticipated (Fig. 4)! We spent some time in the Catholic church. Here the priest, who spoke little English and came from Austria began his spiel in German, which our guide then tried to translate into English till she realised that it would be much easier for both of them if he switched to Serbian.

We then followed our guide on what proved to be quite a long walk to a winery on the edge of the town. Here there was also a sales outlet for honey and a “bee museum”. Thus our visit to the winery began with a lecture in the museum about bees; if the speaker had been warned that we were likely to be a more informed group of visitors than most, he had clearly forgotten it.

Next we descended into the cool and low lighting of the cave where the wine barrels were stored to hear about the vinification processes involved. We then moved to another building where a splendid lunch was served as a suitable backdrop for tasting a range of wines from the winery. Each long table



Fig. 3 At the Zasavica nature reserve.



Fig. 4 Graffiti on a building at Sremski Karlovci.

was amply provided with spittoons, but I believe they may have remained empty. For most of the meal we were entertained by a delightful and lively quartet of musicians (Fig. 5); their sheer enjoyment in making music was contagious. The meal ended with a dessert wine and a honey tasting, and we then had the opportunity to make purchases. I bought two bottles of the wine I had most enjoyed, and my wife added a jar of honey. By now it was quite late, and time to return to Belgrade after a most enjoyable day – one during which we had seen the local agricultural cropping systems as we travelled and also had plenty of opportunity to develop new friendships.

Parasitoids were the subject of

Thursday morning, and among the ten presentations was my own. Most presentations included some consideration of specificity. Others considered endosymbiont-conferred resistance to parasitoids and the concept of parasitism thresholds for effective biological control in different landscapes. The sessions finished at 13:00, and were followed by a second period for viewing the posters.

That evening the Conference Dinner took place, and the room we were using for our sessions had been transformed into an elegant dining room. The food was served as a buffet and it was superb; moreover the local wine flowed freely. As in the winery, a small group of (only a little less exuberant) musicians played in the background.



Fig. 5 The exuberant musicians at the winery in Sremski Karlovci.

Then the dancers came on! They had obviously been told that I was the “guest of honour”, and so it was to the table I was sitting at that they presented the best view. The dancing was fantastic, with lots of colour and energy (Fig. 6). There were many props and costume changes; I’ll never forget it. By now it was getting late and, being “larks” rather than “owls”, my wife Gill and I decided to call it a day (night?) and depart. Consternation! I was entreated to stay, as apparently I had one function still to perform. A conference cake was brought in under escort with due ceremony and accompanied by candles (Fig. 7); it had apparently been decreed that I (surrounded by cameras flashing away) should cut the first slice. I felt quite a celebrity.

Friday was the final morning, with just five presentations related to practical implementation and Pest Management. The emphasis was on classical biological control, but not entirely – in this session entomopathogens as natural enemies of aphids also featured. Then it was the final lunch and reluctant “goodbyes”.

You’ll have noticed that this report has stressed the social interactions rather than details of the scientific programme, since it would be rather relentlessly mind-numbing to try and go through all the oral presentations and posters. However, I am only too willing to include in this report an offer to forward on request the programme and abstracts from the meeting. Every participant will have left influenced by different presentations; I can only speak for myself. For me and my own research experience and interests, the most useful presentations (in no particular order) were:

- Transferring facultative endosymbionts, that protect the aphid host from parasitisation, from *Myzus persicae* genotypes with such symbionts to those without by micro-injection (Vorburger, Switzerland);
- The concept of “thermal windows” to explain the replacement in the subtropics and tropics of aphids by coccids (Dixon, UK);
- “Optimistic” and “pessimistic” coccinellids of the same species in terms of different numbers of larval instars (Michaud, USA)
- How small variations in how rm is calculated can yield unrealistic



Fig. 6 Serbian dancers at the Conference Dinner.

population doubling times (Soares, Azores)

- Why the rearing of potential biological agents in quarantine can fail to perpetuate properties such as diapause, essential for success after release (Brodeur, Canada).

Some general comments on the scientific programme:

There were a lot of presentations on floral diversity outside the crop in relation to conservation or impact of coccinellids. Lots of data can be collected which then defy statistical validation – I assume that computer retrieval is still so historically limited

that researchers do not realise that “we’ve been there before!”

Secondly, where were our colleagues working on syrphids, aphidophagous midges and aphid pathogens? OK, these taxa were mentioned in passing, but only the pathogens were central to any presentations (just two!). The result is that APHIDOPHAGA meetings overemphasise coccinellids and parasitoids, so would those working on syrphids and pathogens please note that APHIDOPHAGA 13 will be held in Munich in 2016. Please do try to be there; they are cracking meetings. I can guarantee you will not regret it and your input really is needed! Please feel

free to contact me for more information.

Thirdly, surely it is nothing short of crazy that in Belgrade the entire UK contingent was two Emeritus Professors. What kind of message about UK research does this portray? If the subject is up your street, was your absence at the Belgrade meeting because of the cost, or were you not aware of APHIDOPHAGA 12 (in spite of the Antenna meetings diary)? If nothing else, I can arrange for you to be

added to the e-mail list for future circulars – no subsequent obligation.

Those who did attend had a really terrific time – but only because of the work behind the scenes of the local Serbian organising and the international steering committees. Respectively the buck stopped with Željko Tomanovic and J-P. Michaud. Both they and their committee colleagues deserve our sincere thanks for their work over many months and congratulations for arranging such a successful meeting. I have been the local organiser for eight scientific conferences at Reading, so I know only too well the amount of work involved and how little feedback one receives afterwards. It can be discouraging.

A final little cameo. All my years of international travel often involved bringing back two bottles of local wine I had enjoyed. These I wrapped in newsprint and the washing to ensure safe transit in my suitcase. Foolishly in Belgrade, forgetting the 100 ml limit for liquids, I put my two bottles of Serbian wine in my cabin luggage, plus a third bottle of a special Greek wine that my good friend Nickolas Kavallieratos had given me at the meeting as a present. At the departure gate at Belgrade airport, as my cabin luggage emerged from the X-ray scanner, the security staff opened my bag and slowly, deliberately picked out my three bottles one by one and dropped them into an adjacent wheelie rubbish bin. I practically died on the spot!

Enter Nickolas, but only there because his flight to Athens had been delayed for an hour and was now boarding from the other gate in the same departure lounge as we were. He saw my predicament and, like a knight on a white charger, intervened. As he has collaborative research in Serbia, he spoke the language well enough to wade in with all fists flying! Nick was particularly annoyed that the security staff would no doubt later retrieve his wine from the wheelie bin and share it out between themselves! Apparently I was a major international figure, and the wine had been a present to me from the organisers of the conference. The concourse manager was summoned, as the only person senior enough to bend the rules. This worked, and I was allowed to re-pack the wine into my flight bag on the understanding that I would hand it to



Fig. 7. The arrival of the conference cake (detail in inset).

You said ... We did

Dr Gordon Port

gordon.port@newcastle.ac.uk

The Membership Questionnaire results and comments have been sorted and reviewed by appropriate committees of the RES for their response and action. Below are the responses from the Meetings Committee and the Library Committee. These responses do not always fall neatly into the “You said ... We did” format, usually because more explanation is required, but bear with us. Responses from further committees will follow in later issues of Antenna.

Response from Meetings Committee to the Membership Survey

Over the past six months the Meetings Committee has been giving thought to your responses in the Membership Questionnaire concerning the nature, type and timing of the Society’s meetings. We would like to put our thoughts to you and would welcome further comments and of course volunteers to help instigate the changes envisaged.

Firstly a brief background to some of the changes that have already occurred over the past decade. While our headquarters was in London, the regular monthly meetings at Queen’s Gate had proved a problem from the point of view of numbers attending. Some meetings were so poorly attended that it became an embarrassment to have an eminent speaker as our evening guest. Recognising the problem, the Meetings Committee promoted the idea of the Special Interest Groups (SIGs) running most of the monthly meetings, which were expanded from just an evening lecture to a full day of speakers with a ‘key’ speaker delivering the evening lecture. Judging by the increased attendance this idea was well received by the membership, and had the added bonus of giving our post-graduates a chance to present their research in a friendly and constructive atmosphere. It also provided the chance for researchers from specific aspects of entomology to exchange ideas and develop new ‘partnerships’. Since our move to Mansion House at Chiswell Green the regular monthly meetings have ceased, but the role of the SIGs has remained and they are still a key factor in the meetings of the Society.

You Said . . . meetings are regarded as an important aspect of the Society and that their number should be increased, and they should be spread as broadly as possible around the UK.

We Did . . . The Meetings Committee completely agrees and has set in motion changes, which should meet these requests, as described below:

Our Headquarters no longer provides the venue for monthly meetings and the SIG Convenors have been encouraged to arrange meetings at an appropriate venue anywhere in the UK. The Meetings Committee tries to arrange approximately one SIG per month, although other events are sometimes substituted for these meetings. The number of meetings held by each SIG is very much the choice of the Convenor, although the SIG Co-ordinator usually recommends a meeting every eighteen months. This is because

there is a good deal of work required in convening a meeting (even with the considerable help from HQ) and we are very grateful to the Convenors for all their work. We would also welcome an increase in the number of SIGs, and the Co-ordinator would be delighted to discuss the setting up of new groups with any volunteer willing to act as a SIG Convenor. The Committee would also love to hear from anyone willing to help current SIG Convenors with the running of meetings or who can offer appropriate venues, which would increase the spread of the Society’s meetings around the UK.

You Said . . . more ‘general’ meetings, including field days, around the country are needed.

We Did . . . We do recognise the great value of meetings in the regions, which enable members of the Society to travel to the venue more easily and again provide an excellent chance for the interchange of information and ideas. This move for more regional meetings seems especially important as the number of ‘professional entomologists’ (still the bulk of our membership) has been greatly reduced due to government action, and those remaining have become far more dispersed around the country. As you know, the Society has divided the UK into regions with an Honorary Regional Secretary appointed for each and it is under their guidance that ‘regional activities’ are arranged. We are grateful for their participation in finding topics, venues and speakers for these meetings and all the work this entails. We would be very happy to support an increase in these regional activities, especially the introduction of seasonal field meetings, but for this to happen we need more participation by members in the regions to shoulder some of the work involved.

We hope that members will feel that we are responding in a positive fashion to your requests in the replies to the questionnaire. It was also heartening to see that a number of people volunteered to help with the changes requested in the questionnaire. So, if you feel that you could help with the areas specifically associated with the responsibilities for the Meetings Committee or the Membership Committee, please contact the chairman of these committees:- Dr Archie Murchie (Archie.Murchie@afbini.gov.uk) and Dr Gordon Port (Gordon.Port@newcastle.ac.uk) respectively.

Response from Library Committee to the Membership Survey

1) Positive comments

Twenty-three respondents rated the Library as the best thing about the Society and was a major reason for joining. Many members said that the Library staff were very helpful. The Committee were pleased to hear this.

2) Lack of response

One respondent said he / she had had no response whatsoever to a request. Our apologies, but did he /she use correct email address? We acknowledge that there have been some problems with our server, which are now resolved.

3) Location, location, location

You Said . . . the Library (i.e. Mansion House) is difficult to reach by public transport (22 respondents)

We Did . . . The increasing use of on-line facilities makes it easier for members to access the Library without the need to travel at all. Many members find the new location easier to reach – especially by road. Members travelling by public transport from the south or within London may not know that it is not necessary to go via Kings Cross – use Farringdon instead (trains for St Albans stop there). This will be easier still when Cross-Rail is completed in three years time as there will be an interchange at Farringdon.

4) Better on-line access

You Said . . . you wanted better on-line access to the Library (4 respondents).

We Did . . . We are improving this all the time, as fast as resources allow.

5) More journals

You Said . . . you wanted a greater range of journals (2 respondents).

We Did . . . The range has been increased markedly recently now that we subscribe to Bio-One

6) Notify book disposals

You Said . . . advertise when we are disposing of books (1 respondent).

We Did . . . We can't recall ever disposing of books, except in one instance many years ago under exceptional circumstances.

If you feel you have matters to discuss with the Library Committee please contact the chairman Dr Bob Clements (clements01491@btinternet.com).

SAVE THE DAY!



NATIONAL
insect
WEEK

23
— to —
29
JUNE
2014

LITTLE THINGS
THAT RUN THE WORLD

The Other “Entomology 2013”

The 61st Annual Meeting of the Entomological Society of America
Austin, Texas, 10th-13th November

Richard Harrington

Rothamsted Research



Texas State Capitol, close to the meeting venue.



Austin Convention Center.



The Linnean Games.



A stall at the exhibition.

The last ESA meeting I went to was in 1999, so I can't really be accused of overdoing it in that regard. I confess, though, to engineering an invitation to this one, partly to catch up, partly because I love Austin and have family members there. I'm glad I went. I usually prefer small, specialist meetings, but this was up there amongst the best of the mega-meetings I've been to.

The 3,470 attendance broke ESA records. With a total membership of around 6,800, around half must have been present, the equivalent of 800 or so turning up to one of our meetings. The enormous Austin Convention Centre was more than up to the task and there was never any feeling of

overcrowding. All the talks and posters were at the Centre, together with a massive exhibition hall. At any one time there were up to 30 parallel sessions. The best plan was to pick the session which, overall, looked the most interesting and stick with it, rather than trying to flit. There were five main types of symposium. Programme Symposia were directly aligned to the main theme of the meeting “Science Impacting a Connected World”. Section Symposia were organised by the themed sections of the ESA (roughly equivalent to our SIGs, or perhaps our journal topics). Member Symposia were proposed by individual ESA members and a Programme Committee chose which would go

ahead. Student Competition TMP (Ten Minute Paper) and Open TMP sessions allowed anybody to submit a paper. A very well laid out 256 page programme booklet occupied me for a good part of the flight in planning my campaign, and there was a Mobile App for those who are into such things.

The opening plenary on the Sunday evening comprised a welcome and address from ESA President Rob Wiedenmann (University of Arkansas), a report from ESA's Chief Executive, David Gammel, the presentation of a whole raft of Society Awards, and the Annual Founders' Memorial Lecture which, each year, honours one of the World's great departed entomologists. This year, Dr Anurag Agrawal (Cornell)



Presidents and representatives of National Entomological Societies.

honoured our very own Dame Miriam Rothschild, outlining her achievements in the fields of insect sequestration of plant defence compounds, mimicry, fleas, seat-belt design *etc.*, and providing anecdotes to which I and others could have added.

On Monday morning I chose a Student TMP session and am pleased I did. Two talks stood out to me, one from Paul Chisholm (Washington State University) showed that Pea aphids carrying Pea enation mosaic virus do better on plants that had previously been fed on by a range of insect herbivores, whereas non-viruliferous aphids did better on plants which had not been subjected to herbivory. Laura Ingwell (University of Idaho) showed that Bird cherry-oat aphids carrying Barley yellow dwarf virus were attracted preferentially (over a short range) to virus-free plants, whereas non-viruliferous aphids preferred plants carrying virus. Plant volatiles were involved and clearly this system aids virus transmission. Following the Presidents' lunch, on which more below, I took off to Zilker Botanic Garden in the afternoon for a spot of

butterflying, returning in the evening to honour my invitation to three "mixers". These are socials organised in nearby hotels by individual or groups of universities, and I greatly enjoyed my time with the good folk of Kentucky *et al.*, Northwest, and Minnesota.

On Tuesday morning I opted for a session on trapping methods, which turned out to comprise some well-known contraptions and some interesting variations, coupled with stories of derring-do from Indiana Jones wannabes. I emerged well pumped for giving my own two talks in the afternoon in a Section Symposium on "Climate Change and Arthropod Pest Dynamics", organised by Bill Hutchison (University of Minnesota) and Rob Venette (US Forest Service). On Wednesday I opted for an excellent Programme Symposium on "Impacts of Climate Change on Biodiversity and Biological Control".

As always, it's the fringe activities and the contacts made that make these meetings so valuable. There were many opportunities to socialise. In addition to the mixers, there was a photography workshop, an art exhibition, "lunch and

learn" sessions covering a wide range of topics, sunrise yoga (I skipped that) and the 30th anniversary Linnean Games, a student entomology quiz won by UC Riverside, from which I departed feeling extremely thick. I have long wanted to try something similar in the UK.

I was privileged at the meeting to represent our Society on behalf of the President. This ticket got me into the splendid Board of Governors' Reception and the Presidents' Lunch. The latter was attended by the Presidents (or their representatives) from various national entomological societies and included discussion of an initiative from ESA President Elect (Frank Zalom, UC Davis) related to collaboration between Societies, particularly as regards increasing the profile of the role of entomologists in solving some of the World's grand challenges. I hope that we will hear much more of this, and get involved, in the coming years.

My thanks to Bill Hutchison, University of Minnesota, for funding the visit, and to the Entomological Society of America for truly

The Masters are coming: Harper visits the Royal Entomological Society's HQ

Jen Banfield-Zanin

Figs 1 & 2. Rare volumes were displayed for the students' perusal. Photo courtesy of Simon Leather.



On a balmy, early-December morning, some twenty-odd MSc students and several PhD candidates, escorted by Prof. Simon Leather and Dr. Tom Pope, left Harper Adams University bright and early to brave the perils of the M1 and M6 to pay a visit to the Royal Entomological Society's headquarters in St Albans. Their company was comprised of this year's Entomology and Integrated Pest Management courses, though I am reliably informed that a Conservation & Forest Protection student was also to be found in the number. I myself was tempted along by the offer of a free lunch (once a student, always a student...) and the opportunity to catch up with RES stalwarts.

The visit presented an opportunity for the students to get to know the Society, and familiarise themselves with an important hub of Entomology in the U.K. Upon arrival the visitors were revived with cups of tea and coffee, before being shepherded into the Meeting Room for a presentation.

The RES' current Director of Science, Prof. Jim Hardie, outlined the

history of the Society, from its 'official' founding in 1833 and modest beginnings in a room above a pub, the granting of a Royal Charter, through years spent in South Kensington before the Mansion House was purchased. Students were regaled with stories of erudite past Fellows, such as Charles Darwin and Alfred Russel Wallace (subject of several articles in *Antenna* vol. 37(4)). Among these stories, the inception of the Society Badge by William Kirby, who selected the Strepsipteran *Stylops melittae* (then known as *Stylops kirbyi*) in a 'subtle' attempt at stamping authority through the ages, elicited a few chuckles around the room.

Jim also highlighted the role the Society can play in assisting the students, outlining the various Awards and Grants supported by the Society and diligently singling out this year's RES Scholarship students. He also brought attention to the Society's many publications, ranging from scientific journals, through identification keys and much simpler field guides. The extensive

entomological library housed in the Mansion House and the services rendered therein (having used them myself, I can certainly vouch for them!) were also topics discussed.

The floor was then handed to Dr Luke Tilley, Director of Outreach, who expounded on the importance of science communication, and the ways in which the Society promotes Entomology and entomological information. National Insect Week (NIW) and the Insect Festival were described to the students, along with some of the past events held during 2012's NIW. Hopefully, some of them may have been inspired, and we may yet get to see some events held at Harper Adams during NIW 2014! A shameless bit of plugging: the next NIW will run for the week between the 23rd and 29th June 2014 (<http://www.royensoc.co.uk/events/niw.htm>), and anyone with ideas or who wants to help out should get in touch.

Students were ushered into the library, where several rare and beautifully illustrated volumes were displayed (Figures 1 & 2). These included Moses Harris' 1840 tome, *The Aurelian, A Natural History of English Moths and Butterflies*, John Obadiah Westwood's *The Cabinet of Oriental*



Fig.3. The Book of Obligation's page bearing Princess Victoria's signature, illustrated by J. O. Westwood. Photo taken during Ento'13.



Fig.4. One of the two *The Entomologist* illustrations held by the Society. Seen on Society mugs. Photo courtesy of Fran Sconce.

Entomology; being a selection of some of the rarer and more beautiful species of insects natives of India and the adjacent Islands (1848), and the eldest piece, dated 1682, was Johannes Godartius' *Of Insects, Done into English, and Methodized, with the Addition of Notes.*

Perhaps most notable, or at least certainly a personal favourite, was the Society's Book of Obligation (formally, *The Obligation Book of The Royal Entomological Society*), signed by all Fellows of the Society. The book is beautifully illustrated by J.O. Westwood, and was signed by the then Princess Victoria in 1835 (Figure 3). The book also sports the signatures of Her Majesty Queen Elizabeth II, Darwin and, surely somewhere though we were unable to find it, Wallace. Suffice to say that current Fellows' signatures share exceptional company. The students were provided with gloves, so that they could leaf through all the tomes themselves, and I would like to thank the librarian, Val McAtear for pulling out not only these volumes, but also digging out the illustrations held by the Society of *The Entomologist* (Figure 4), famously displayed on the Society mugs.

Students were then released into the 'wild' and allowed to explore the rest of the library (Figure 5), the Mansion House itself as well as the grounds as they waited for lunch – a delicious buffet offering assorted sandwiches, finger food, mince pies and wine, all of which were well enjoyed. Some of students found themselves lunching in

the Council Room, where they may have cast a glance at Wallace's writing slope. The visitors were also all given the opportunity to sign up for Membership with the Society... a popular endeavour, if the popularity of Simon's autograph and the running about of Kirsty and Elena was anything to go by!

Well-fed and watered, the intrepid explorers filed back onto their bus upon its return, to brave the M1 and M6 once again. I can only hope that their visit will be the start of a long and fruitful relationship between

themselves and the Society. The next lot will be along next year!

I would also like to take this opportunity to thank, on behalf of all us visitors, the Society staff for their efforts and for making us all feel welcome.

Acknowledgments

I would like to thank Simon Leather and Fran Sconce for providing some of the photographs, and Val McAtear for sending me the list of books placed out for the students.



Fig. 5. Some of the students wandering around the library. Photo courtesy of Simon Leather.

OBITUARY



Professor John L Cloudsley-Thompson

“One of the best real Natural Historians”

“The last Titan of the Sahara Desert”

Professor J L Cloudsley-Thompson MA, PhD, DSc, HonDSc, CBiol, FSB, HonFLS, HonFBNA, HonFBHS, FWAAS, FRES, FZS, Emeritus Professor of Zoology University of London

On hearing John had died, BNA President Professor David Bellamy said “Sad news, one of the best real Natural Historians has passed on”.

Sadly, our distinguished Vice President John Cloudsley-Thompson died on 4th October 2013 at the age of 92. He was a former British Naturalists' Association Chairman (1974-83), and a very worthy recipient of the Association's highest honour for outstanding services to our understanding of natural history, the Peter Scott Memorial Award in 1993. To mark John's 90th birthday in 2011, the BNA presented John with a special Fellowship Honoris Causa certificate “in recognition of his outstanding lifetime contribution to the understanding of Natural History”.

It was a particular pleasure for me as the present chairman to be able to present this to John with his wife Anne beside him. Anne died just 8 months later, aged 96 (during the presentation, Anne joked with me that John at 90

was her ‘toy-boy’!) John was a dynamic and enthusiastic field naturalist throughout his life, renowned throughout the world as *“The Desert Naturalist”*, and Anne had shared numerous field trips with John (including a trans-Saharan crossing). When John was Professor of Zoology at the University of Khartoum from 1960-71, Anne formed a Physiotherapy Department at Omdurman Hospital. They complimented each other well, John as a naturalist, Anne as an artist. John and Anne had three sons.

John was born in May 1921 at Murree in India (now Pakistan), was educated at Marlborough and Cambridge, and had a very active war, being by his 21st birthday a Tank Commander stationed at Beni Yusef. It was during his time in North Africa that his lifetime passion for desert wildlife began, when between actions crews adopted local wild species, including species of Solifugae which they dubbed ‘Jerrylanders’ (Camel

Spiders, wind Scorpions and allies). John had bartered for a baby fox with “over-ripe bananas and half a piaster” and his crew amused themselves training it, and it became ‘completely tame’. She ‘scrounged extra bully beef from other tank crews’. One day she strayed into the engine compartment, “and the whole squadron was held up until she had been extricated!”

John's Crusader tank was knocked out during a battle, and his crew were all injured or killed. John had a severe injury to his leg. His leg had paralysis (which remained with him), so he was made a gunnery instructor at Sandhurst, until he ‘wangled’ a medical upgrade so he was able to return to tanks for the Normandy landings. Subsequently, John's Cromwell tank was hit during the intense battle of Villers Bocage.

After the war, John continued his studies at Cambridge, where he came across a copy of the British (then BENA) Naturalists' Association's

journal/magazine 'Country-side'. John joined the Association and began to write articles for 'Country-side' including about desert wildlife, and his fascination with desert wildlife has remained with him throughout his life, as has his significant support for the BNA (when John was Chairman of the Association he took me on as editor of 'Country-side', beginning my own involvement with the BNA).

In 1945 he had his observations on the behaviour of the common centipede published in *Nature*. At Cambridge he achieved his MA and PhD.

From 1950 to 1960 he became a lecturer in zoology at Kings College, London. He was awarded a DSc by the University of London. In 1960 he returned to live in the arid African landscape as Professor of Zoology at the University of Khartoum and Keeper of the Sudan Natural History Museum. He undertook many expeditions continuing his researches as the best known of desert naturalists. He was awarded an Hon DSc from Khartoum.

When John began his desert studies he was a pioneer, for little field research had been carried out in deserts especially over a long period. His research caused others to follow and develop desert ecology.

John became Professor of Zoology at Birkbeck College, University of London from 1972-86, subsequently Emeritus. He was visiting Professor or Fellow at a number of institutions around the world such as Arizona State University & Kuwait University. He really was

truly international in outlook.

He became President of the British Arachnological Society (1982-5), British Society for Chronobiology (1985-7) and British Herpetological Society (1991-96).

John is the author of many publications and was author of over 50 books, particularly on the desert environment and the adaptations used by its wildlife, of species like spiders and scorpions. He especially observed the effect of temperature, water and diurnal rhythms in desert species. His many titles include 'The Diversity of Desert Life', 'Spiders & Scorpions', 'The Desert', 'Sahara Desert', 'Insects & History', 'Camels', 'Biological Clocks, their Function in Nature', 'Microecology', 'Rhythmic Activity in Animal Physiology & Behaviour', 'The Temperature & Water Relations of Reptiles'. John published his last major biological book in 2005 when he was 84, 'Ecology & Behaviour of Mesozoic Reptiles', and the following year he brought out his book of memoirs of armoured warfare during 1939-45 called 'Sharpshooter'. He edited the book series "Adaption of Desert Organisms" and was founder/editor (helped by Anne) of the *Journal of Arid Environments*. He collaborated with others, like Wilson Lourenco with whom he produced over 45 papers in 20 years on scorpion biology after he retired from Birkbeck. Lourenco noted that John brought 'refreshing enthusiasm to each new subject'.

His achievements in his fields of study have been recognised by a number of awards including the BNA's

Peter Scott Memorial Award, Royal African Society Medal, JH Grundy Memorial Medal (Royal Army Medical College).

When John reached his 80th birthday his ex-students, colleagues and friends published as a celebration "Ecology of Desert Environments: A Festschrift for J P Cloudsley-Thompson" consisting of 28 articles edited by Ishwar Prakash. One of the writers called John 'the last Titan of the Sahara Desert'.

In 2011 when John reached 90 'Euscorpius' the first publication focussed entirely on scorpion research produced a special edition "Scorpions 2011: John L Cloudsley-Thompson 90th Birthday Commemorative Volume". As John was approaching his birthday in 2011 he wrote to me that he wanted to attend BNA events but that he became 'rather wobbly & feeble after heart failure in 2008 (when he was 87) so he didn't get out so much'. However, it didn't dampen his enthusiasm at all.

John's active interests went beyond deserts, and he produced publications on bees, wasps, woodlice, seals & sea lions, and others. He collaborated with BNA's former editor of 'Country-side', Dr David Applin on biological periodicities. John wrote the BNA's popular "Guide to Woodlands" which was published in 1985, which is when John became a Vice President of BNA following nine years as Chairman.

John was a pioneering desert species specialist, a great naturalist and a delight to know.

A Tribute to John Leonard Cloudsley-Thompson

Euology delivered in 2013

How can I get 92 years of a packed life into a few minutes – sufficient to pay tribute to this remarkable man? I don't know, but I will try!

John Leonard Cloudsley was born in May 1921 in India, though his family soon moved back to the UK. He was educated at Marlborough College, where learning was still by rote, and where fags and corporal punishment were still the norm, the latter for the most trivial misdemeanours.

John showed his innate sense of justice and his independent thought early on. He hated learning by rote, and when he became head of house,

refused to employ corporal punishment, hating this demeaning treatment of younger boys by older ones, despite pressure from his housemaster.

John left Marlborough at the end of the summer term 1939, and went up to Cambridge at the beginning of the Lent term 1940, so he was in London during the first few frenetic weeks of the Second World War. His father was medical officer of health in Lambeth, so John helped out at the town hall, recruiting stretcher bearers and first aiders, ready for the anticipated blitz. But things calmed down, so John went

up to Cambridge as planned. However, after Dunkirk in June 1941, he decided not to return but to find some way of helping in the war effort. Officer Cadet training at school stood him in good stead to join the army, but he was too young! He was also too young as well for ARP warden duties – the age for that was 30! So he volunteered for farm work – he was old enough for that!

Ultimately, later that year, and still only 19, he was called up and went first to Tidworth with the 53rd training Regiment, and then to Sandhurst for four months. Once commissioned, he



was recruited into the County of London Yeomanry and then into a tank regiment – the 7th armoured division.

In October 1941 he arrived in Egypt, and moved straight into the desert, and was part of the 2nd Libyan Campaign.

In May 1942, after his 21st birthday, John was engaged in the so-called Knightsbridge tank battle – fighting against Rommel and his panzer divisions (lots of information about this is available on the internet).

He was seriously injured in his lower leg, and was hospitalised first in Egypt, then in S. Africa before being shipped home. He arrived in Liverpool in December 1942. After recuperating, he went back to Sandhurst to train young soldiers. I can't help thinking that for many young men, such a serious injury as the one John sustained would have meant the end of the army for them – and a pension for the rest of their lives. Not so John! His experiences from Egypt no doubt brought much respect from these new recruits, and brought reality and honesty into his teaching.

He also married at this time, Anne, who was his companion and friend, and mother to their three sons, until she died in 2012.

In June 1944 John was back on active service, taking part in the D-Day landings at Bayeux. He and his tank crew were forced to bale out when their tank was destroyed at Villers-Bocage – and miraculously, John led them through enemy lines and back to an English unit. Once into another tank, they took part in the Caen offensive, a drawn out and bloody

battle.

But in November 1944, with peace in Europe on the horizon, John, with the rank of Captain, resigned his commission and returned to the UK.

There followed Academia – Pembroke College, MA, PhD, then a lectureship in Zoology at King's College, 1950-60.

An exciting opportunity came in 1960 – Professor of Zoology in Khartoum University, where John, with Anne, stayed from 1960-71. This was a golden era! His wartime experiences in Egypt had opened up the desert and that continent to him, and this post gave great opportunity to explore the mysterious East and its deserts in a big way.

During those 11 years, the family travelled all around searching out new areas. Christmases were magical – the boys home from school, the old land rover packed up, they would set off into some new, exciting part, discovering how the people lived, but also the suqs, the music, the atmosphere, the mystery... and the fascinating history. All this might require an extra week or two, but these were 'borrowed' from the next term, and it was all worthwhile.

We have heard from Tim's tribute to his father, of John's love for and empathy with the Sudanese people, his encouragement of students, and their desire to Sudanize the University. Without that rapport with the people and culture of Sudan the story might have been very different.

In 1971, the family returned to the UK, where John was appointed Professor of Zoology at Birkbeck University, from 1972 until his retirement in 1986.

This was another golden era, though very different from that in Sudan. The buzz of London, its busy-ness, its excitement, the theatres and concerts, the libraries and Zoological Societies, the many learned Institutions, where discoveries could be discussed and new knowledge be disseminated... and there were constant invitations too, to lecture or deliver papers at different universities - Arizona State University in 1967, Kuwait 1978 and 1988, Namibia 1989, Malaya 1969, and Bahrain 1986 to name but a few. And there was writing too – John wrote between 40 and 50 books, as well as many, many articles for various learned journals. He was writing and drawing until early this year.

On all of his travels, Anne would go with him, trading in the 1st class air ticket provided for John for two economy class tickets!

Here was a man who had a zest for life and a zeal for exploring the world he lived in, including its smallest inhabitants; a man who received many awards for his work and for his contribution of so much new information and understanding.

And yet he was also a man who had experienced so much loss – loss of school friends, army friends and colleagues, who had died in that ghastly war. He had experienced personal injury, fear, cold, hunger, illness, lack of sleep; it must have affected him. And there was no recognition of post traumatic stress syndrome or its treatment in 1945. It was, rather, two weeks leave, a demob suit, then back to work!

Perhaps John found peace and tranquility in examining, watching and marvelling over the tiny creatures in our universe. He loved music too, especially opera and particularly Verdi.

There's no doubt too that he and Anne were a couple that did life together, living in the mutual society, help and comfort that the marriage service prescribes.

Today we remember John, give thanks for his life and his contribution to Zoology, for his leadership and courage during WW2, for his guiding/mentoring so many hundreds of students who have passed through

Book Reviews

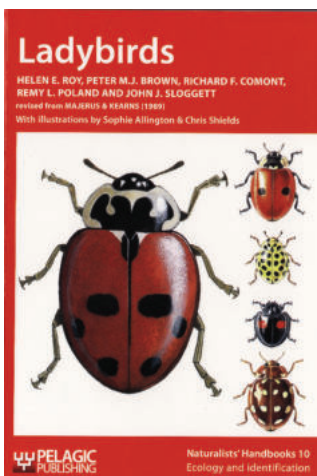
Ladybirds

Helen E Roy, Peter M J Brown, Richard F Comcont, Remy L Poland & John J Sloggett.

Naturalists Handbook No 10. Pelagic Publishing. ISBN 978 1 907807 07 7

£19.99

The Naturalist handbook series has become well established as an excellent introduction to a range of discrete invertebrate taxonomic groups or the faunas of particular habitats.



Ladybirds is a comprehensive rewrite of the earlier work. It is produced by the team that spearhead ladybird research in the UK, and continues to raise the bar of this much loved series. The book contains an initial section that provides an introduction to what we currently know of the biology of UK ladybirds. This is followed by a well-illustrated key to both adult and larval ladybirds and a final section dealing with the collection, rearing and curation of this group.

The initial section has chapters dealing with Life history, Ladybirds and their environment, Natural enemies, Variation, Population and evolutionary biology and distribution, and the introduction also discusses the effects of climate change on UK populations.

The book is lucidly written and possesses an excellent innovative glossary, which is distributed throughout the margins of each chapter adjacent to the introduction of the term. There is also a set of invaluable tables which display the habitat preferences, distribution, preferred food, parasites and pattern variations of the UK species.

The keys are simple to use and copiously illustrated, providing access to the UK fauna for beginners and experienced entomologists alike. There is a field key to the ladybirds and a lab-based key to the larger group of the Coccinellidae. The book is fully referenced and has

a comprehensive index. If you don't work in this field Ladybirds is full of surprises and will provide a new perspective on a familiar member of the UK fauna.

If you have only a vague interest in this group, this is the one book you must have on your shelf. It is an essential component of any sixth form or university library and a must for any field naturalist.

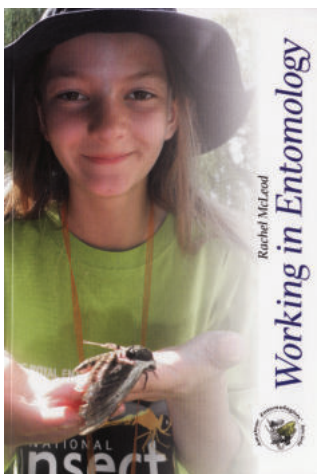
Peter Smithers

Working in Entomology

Rachel McLeod

Amateur Entomologists' Society. ISBN 978 0 9571491 2 0

£10.48



This is a truly inspirational book that should encourage a new generation of entomologists to take up their nets and pooters and forge a lifetime interest in insects. The book is impeccably endorsed with an impassioned introduction from Simon Leather and a foreword from Sir David Attenborough. Rachel has gathered together interviews with seven UK entomologists and has asked them all the same set of questions. These include; What is your favorite place to collect insects, How did you get involved in entomology, What can my generation do, and Are you scared of any arthropods?

She has interviewed; George McGavin, the late Mike Majerus, Oliver St John, Martin Hall, Seirian Summer, Chris Haines, Virginia Cheesman and has also given her own answers to these questions. This collection of interviews offers a unique insight into the way that the next generation perceives the entomological world of today. Rachel's enthusiasm spills across every page, she is perceptive and sometimes challenging but her love of Entomology is the principal theme of the book.

This is a book that should be in schools across the UK and is a vital read for any entomologist who interacts with young people. Rachel is to be congratulated on an excellent piece of entomological journalism, and we look forward to future publications. I am sure that Simon Leather has already booked her a place on his MSc in Entomology.

Peter Smithers

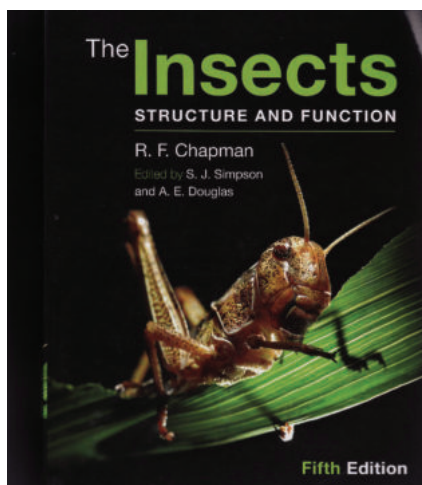
The Insects. Structure and Function

R F Chapman. Edited by S J Simpson & A E Douglas

Cambridge University Press

ISBN 978 0 521 11389 2

£44.99



Chapman's *The Insects* has been the acknowledged first port of call for anyone who had a query regarding the physiology of insects. A compendium of authoritative information, it has been the bible of insect function for entomologists from students to professors since 1969. In this new edition each chapter has been revised and updated by an acknowledged leader in their field, providing a synthesis of our current knowledge in that area of research. The list of chapter editors is a role call of international expertise and it is good to see that so many RES Fellows have contributed to this valuable book.

Each chapter now ends with a summary, a list of recommended reading and references. Another new feature is a prologue that introduces an outline of each of the orders that comprise the class Insecta. The biblical length of the book means that few people will sit down and read it cover to cover, but it is a mine of useful and fascinating information in which one can dip and extract the current perspective. This fifth edition is a major revision that brings this book up to date and will ensure that it remains the premier reference in this field.

Peter Smithers

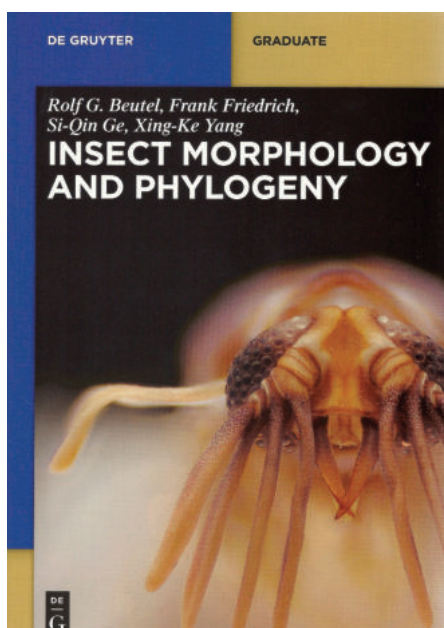
Insect Morphology & Phylogeny

by Rolf G. Beutel, Frank Friedrich, Si-Qin Ge & Xing-Ke Yang

Print ISBN: 9783110262636

Softcover 516 pages, January 2014 (De Gruyter); also available in electronic format

US\$126.00, €89.95



I would like to introduce readers to a new book that tries to cover two broad subject areas and cater to two different audiences: professional entomologists (as a reference work) and undergraduate students (as a textbook, although the subtitle "A textbook for students of entomology" does not appear until the title page). Catering to both these audiences is not easy and requires striking a very careful balance. In some cases I feel this has been achieved whereas in others it has not.

The book consists of the following major headings: Morphology (pp. 1–103), Reproduction, development and immature stages (pp. 104–116), Glossary (pp. 117–142), Traditional and modern techniques in insect morphology (pp. 143–161), Phylogenetic reconstruction based on morphology (pp. 164–173), The orders of Hexapoda (pp. 174–479), Literature (pp. 480–507) and Taxonomic index (pp. 508–516).

In my opinion, the book is more morphology oriented than it is phylogeny oriented. There is excellent coverage of both basic and aspects of advanced morphology (e.g. musculature), with terms explained in the glossary printed in bold. There is a useful section on traditional and modern techniques used in insect morphology, including new technologies such as micro-computed tomography. However, the authors did not differentiate between micro-CT and synchrotron scanning (which are quite different things) despite including a figure of the latter. I also feel they failed to take advantage of the potential 'wow

factors' these new techniques are bringing to the study of insects; for example, revealing the transitional internal development within a butterfly chrysalis (e.g. Lowe et al., 2013). Certainly, additional and stunning images could have been included with regard to these new technologies.

At first sight, it would appear that little of the book is devoted to phylogeny as this chapter is only nine pages long. However, the aim here is to set the scene for the systematic discussions that follow in the section, 'The Orders of Hexapoda'. Nonetheless, in order to be more useful to both groups of readers I would have expected a general cladogram depicting how all the insect

orders are currently considered to be related. Furthermore, specifically for undergraduates, there should have been some worked examples using data matrices to show how cladograms are constructed, and to illustrate mono-, para- and polyphyletic groups, sister taxa etc. There is also no mention of the supertree approach as is increasingly applied in phylogenetics, including to insects (e.g. Davis et al., 2010).

Even in 'The Orders of Hexapoda' section it is not at first apparent where the phylogenetic contributions are to be found. In this section the following subheadings for each extant insect order are used: Diversity and Distribution, Autapomorphies, Taxonomy, Diagnosis, Morphology, Biology, Reproduction and Development, Fossil Record, Economic Importance. The text is rather devoid of cladograms illustrating the relationships that are discussed under the subheading Taxonomy, and hence would probably have been better expressed as Taxonomy and Systematics. I was very pleased to see sections covering autapomorphies and a diagnosis for each order, although the latter would have been better placed immediately after the former rather than being separated by the Taxonomy section. The numbers of known extant species are provided for each order, but in most cases it is unclear from where these have been derived. In some instances there are considerable discrepancies with other values cited elsewhere in the literature. For example, the authors cite beetle diversity as 31,500 species fewer than that proposed by Slipinski et al. (2011).

As a palaeontologist I was also very happy to see a Fossil Record section, but was disappointed that this was based mainly on Grimaldi & Engel (2005), which despite being an excellent volume is now almost a decade old. There have been significant advances in palaeoentomology since this work was published, and although some are included several important papers are not cited, e.g. for Ephemeroptera, Plecoptera, Embioptera, Phasmatodea and Phthiraptera to name a few. There is also no mention of some of the strictly fossil insect orders. Some are referred to in the text, but it would have been useful to have at least listed these in an appendix, but preferably in a chapter devoted to the immense diversity of the insect fossil record, in order that new students can gain an insight into this important branch of entomology, which has the potential to provide useful insights into phylogenetic questions regarding the modern taxa.

The volume concludes with an extensive reference section and a taxonomic index, with entries limited to family level and above. There is no subject index and so I expect some readers, especially students, will find this rather frustrating. The text reads well and is well illustrated throughout with clear line illustrations, photographs and SEM micrographs. However, there are rather a lot of typos and consistency errors. These are particularly prevalent in the references, where it is easy to find mistakes on every page. The overall physical quality of production of the volume is good.

Despite the above relatively minor quibbles this volume has made a very good impression on me. It is certainly a work I will refer to (and hence I consider it more than just a textbook). Would I recommend it as a textbook for undergraduate student entomology courses? Not necessarily as a stand alone resource, but I would certainly put it on my reading list of recommended works.

References cited

- Davis, R.B., Baldauf, S.L. & Mayhew, P.J. 2010. Many hexapod groups originated earlier and withstood extinction events better than previously realized: inferences from supertrees. *Proceedings of the Royal Society B*, 277, 1597–1606.
- Grimaldi, D.A. & Engel, M.S. 2005. *Evolution of the Insects*. Cambridge University Press, New York.
- Lowe, T., Garwood, R.J., Simonsen, T.J., Bradley, R.S. & Withers, P.J. 2013. Metamorphosis revealed: time-lapse three-dimensional imaging inside a living chrysalis. *Journal of the Royal Society Interface*. Doi: 10.1098/rsif.2013.0304
- Slipinski, S.A., Leschen, R.A.B. & Lawrence, J.F. 2011. Order Coleoptera Linnaeus, 1758. In: Zhang, Z.-Q. (Ed.) *Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness*. *Zootaxa*, 3148, 203–208.

David Penney

Hymenoptera and Conservation

By T. R. New. 2012.

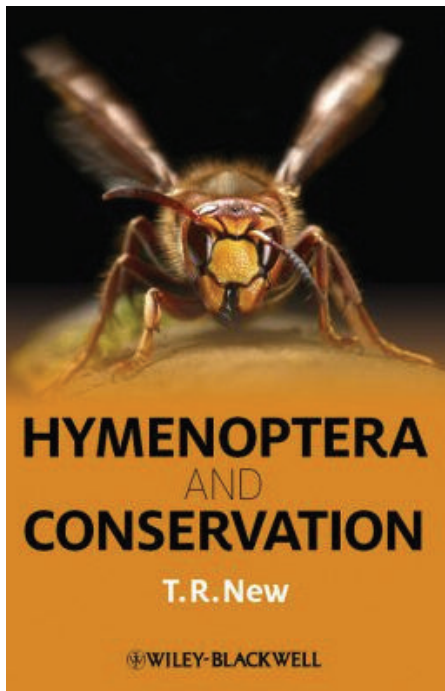
230 pages. Hard-cover

Published by Wiley-Blackwell, UK

ISBN 978-0-470-67180-1 Price £60

This is another book in Professor New's growing collection of conservation-focused tomes. The book comprises 10 chapters. The first introduces Hymenoptera and their Conservation, explaining their classification and diversity, their importance for conservation and the implications of social life for conservation. From the off, it is clear that the book attempts a global perspective, with lots of coverage of Parasitica as well as bees and ants, and a big emphasis on the impacts of species that have been artificially or accidentally introduced to new parts of the world. 150,000 species of Hymenoptera have been formally described, yet as many as a million species are predicted, with DNA studies showing that many traditional 'species' are in fact species complexes (the author cites the example of *Apanteles leucostigma*, which had been divided into 36 microspecies at the time of writing).

Chapters 2 and 3 concentrate on the use of Hymenoptera in biological control, highlighting the dilemma of accurate screening of host specificity and what can happen when introduced parasites decide to go off-piste and attack non-target, sometimes very restricted, indigenous hosts e.g. in Hawaii. The importance of high quality taxonomy is emphasised.



Bees are focused upon in a couple of chapters. The first of these explores the impacts on native bees of introducing bees such as honeybee *Apis mellifera* or mass-reared *Bombus terrestris* to new parts of the world. The impacts are still not well-understood, though direct competition, transfer of disease, and hybridisation between introduced races and indigenous races are noted. A second chapter explores pollinator declines, and points out that this is not strictly the same as a decline in bees *per se*, but explains that a decline in bee diversity can be an issue in floristically diverse landscapes where many wildflower species rely on a restricted number of bee species for pollination. Within a section describing threats to pollinators, pathogens and parasites and the impacts of pesticides are explored, though I felt that a lot more could have been said about the impacts of habitat fragmentation/deterioration and agricultural intensification.

The impacts of alien social wasps and ants is subject to another chapter. The social wasps *Vespula vulgaris* and *V. germanica* now occur far beyond their natural ranges, whilst the yellow-legged (asian) hornet *Vespa velutina* is currently spreading across Europe and threatening the honeybee industry. Such species can often thrive in new areas, exerting substantial predatory pressure on other invertebrates and they can be difficult to eradicate. 'Tramp ants' include some of the most serious invasive aliens - five ant species were included in a recent list of the top 100 worst invasive alien species. This is impressive given that only 17 terrestrial invertebrates made the list. The author states that 30-40 ant species have become established widely beyond their natural ranges and many are having serious impacts. The difficulties in avoiding accidental introduction of social wasps and ants is noted.

The remainder of the book explores the conservation of Hymenoptera, discussing species-focused and biotope/habitat-focused activities and furnishing a series of species case histories. The importance of good quality national datasets in showing both distribution/regional rarity of individual species plus indicating changes in the status of those species is emphasised. Britain's Bee, Wasp and Ant Recording Society (BWARS) is flagged up as a fine exemplar. Such data helps to underpin the red listing of more threatened species, but again, the importance of good taxonomy is stressed. Unfortunately, with so many Hymenoptera species globally, often poorly understood taxonomy and little data on the distribution and statuses of most species, it is likely that many endangered species are being ignored. Where conservation is attempted, there is a growing recognition that landscape-scale activity is often required, notably for bumblebees, or that certain levels of human disturbance or intervention are required to conserve certain Hymenoptera species or promote diverse Hymenoptera assemblages.

The discussion of practical conservation is perhaps the weakest section of the book, and fails to mention the critical role that formal land-use planning (through national and local planning systems) and associated site designation can play in Hymenoptera conservation. Within England, for example, the notification of statutory Sites of Special Scientific Interest is an important mechanism for protecting sites with important aculeate assemblages. The notification of Highgate Common in Staffordshire and Red Lodge in Suffolk were both influenced by the presence of rare aculeates. Non-statutory wildlife sites (e.g. Local Wildlife Sites, NGO reserves and other private nature reserves) are also important. Unfortunately, all this goes unmentioned, as does the role of local biodiversity action planning, which attempts to deliver local action on the ground for BAP Priority Species. The growing collaboration between quarrying companies and organisations such as Buglife and RSPB (with aculeate conservation as a major concern), is also overlooked. This is perhaps an example of where the adoption of an evidence-based approach to writing a book such as this fails to account for much of the unpublished or less academic activity that contributes to active invertebrate conservation. Likewise, the role of the simple amateur county recorder could have done with more emphasis, as such people are often best placed to ascertain the issues affecting Hymenoptera locally and to ensure this gets translated into proper screening of planning applications, nature reserve management and local biodiversity action planning.

Overall, this is a well-researched and thought-provoking book, a useful resource for students and researchers. But it is not a practical manual for Hymenoptera conservation, and is heavy reading for conservation managers who need short, sharp pointers for what to do on the ground or advice on how to interpret a list of Hymenoptera on the sites they manage.

Steven Falk



PRESS RELEASE

[Immediate 2/12/13]

The biology of other *Apis* honey bees

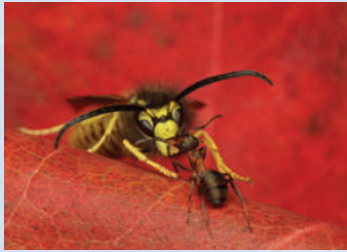
The western honey bee *Apis mellifera* is probably the world's most studied insect, but beekeepers and bees scientists in the west sometimes forget that its close relatives in the genus *Apis* may be of significant economic importance. Published today in the *Journal of Apicultural Research* are five new papers which increase our understanding of these neglected species.

One paper studied the degree of inbreeding in the giant honey bee *Apis dorsata*, which is a major pollinator in the rainforests of Peninsular Malaysia, but unfortunately is threatened by frequent harvesting of its combs by honey hunters. The results, using DNA microsatellite markers showed that the queens of different nests were not closely related, and that the colonies had enough time to produce honey before they were harvested. Another paper studied the gut flora of *Apis dorsata* in Malaysia to determine whether colonies contained bacteria which might be of potential interest as probiotics.

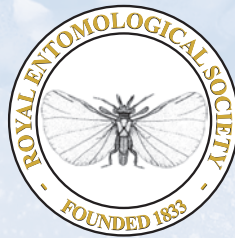
A study in northern Thailand investigated the bee plants exploited by three honey bee species, the Eastern hive bee *Apis cerana*, *Apis dorsata* and the dwarf honey bee *A. florea*. The authors analysed pollen grains from the bees, and found that the most abundant pollen source was from *Mimosa pudica*, an interesting touch-sensitive plant often grown as a garden curiosity in the west, but which is considered as an invasive weed in other areas.

Finally, two studies looked at pests and diseases of the Eastern hive bee *Apis cerana*. One investigated pseudoscorpions, which are small relatives of spiders, which have previously been suggested as a possible biological control for the parasitic mite varroa. Pseudoscorpions were observed in *Apis cerana* colonies in Nepal, but it was concluded that they seem to prey on dead honey bees and larvae rather than on the mites. The other studied the gut parasite *Nosema ceranae*, which has already been detected in adults of managed *A. cerana*, managed non-native *Apis mellifera* and in wild *Apis florea* and *Apis dorsata* populations in the north of Thailand. As a comparison, a number of unmanaged (wild and feral) colonies of several species of honey bees in Northeast Thailand were sampled, and it was found that *Nosema* infection is not widespread, possibly because they possess some degree of resistance to the disease.

IBRA Science Director and *JAR* Senior Editor Norman Carreck says: "*These other honey bees such as the eastern hive bee Apis cerana, the giant bees such as Apis dorsata, and the dwarf bees such as Apis florea have interesting behaviours which contrast with the other species, and studies of their biology may lead to improved understanding and management of our own Apis mellifera*".



RES MARSH AWARD FOR EARLY CAREER ENTOMOLOGIST



RES MARSH AWARD FOR EARLY CAREER ENTOMOLOGIST

Marsh Award for Early Career Entomologist recognises an individual who has made an early career contribution to Entomological Science, with a single or on-going impact to the field. It commends their dedication to the field, hard work and creativity.

Award Criteria

For an early career contribution to Entomological Science that is judged to be outstanding or exemplary with single or ongoing impact on the science. The Award is 'open' and not restricted to any particular discipline or specialised area of entomological science.

Prize

£1000 and Certificate.

Eligibility

Any person whose work, or contribution, meets the Criteria. There are no geographic restrictions.

Cycle

Annual; nominations accepted until 31st December in any year, winner announced early in following year.

Adjudication

By a panel consisting of, the President, two senior Fellows and the Chairman or representative of the Marsh Christian Trust.

Entry

By letter of nomination from a Fellow of the Society, or, a person of standing in the field of entomological science. Additional letters of support welcome. The nomination should give as full a profile of the nominee as is possible with special emphasis on relevance to the Award Criteria. All entries to:

The Registrar, Royal Entomological Society, The Mansion House, Chiswell Green Lane, St Albans AL2 3NS

It is a condition of entry that the winner of the Award shall attend the annual Ento (or other nominated) meeting to receive it, at the Society's expense.

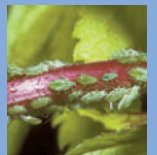
Further information

Websites www.marshchristiantrust.org/Early_Career_Entomologist
www.royensoc.co.uk/awards/Marsh_award.htm

2013 WINNER: MR TOM OLIVER

Centre for Ecology & Hydrology, is the second recipient of this award

Tom is a researcher in the Biological Records Centre in the Centre for Ecology and Hydrology. Much of his research focuses on butterfly ecology and landscape structure. He is also a keen entomologist promoting biological recording through several outreach projects. His PhD considered ant-aphid interactions at Silwood Park, Imperial College. He is now rediscovering his aphid roots by modelling pests and natural enemies in agricultural landscapes. On a new project, he is also working closely with collaborators to understand how people perceive and value biodiversity. His research has focused on several areas, but the consistent thread has been using insects as model systems to inform conservation, climate change adaptation and ultimately understanding their value for human wellbeing!



Tom's research focuses on analysis of ecological datasets to inform the management of landscapes for biodiversity and ecosystem services. He is also interested in bridging the gap between theory and application, by providing tools to help decision makers and integrating biodiversity conservation into mainstream economics.



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

Mar 26 **Scottish Regional meeting** (forensic entomology, tour and supper)

Venue: Perth Museum, 78 George Street, Perth from 4-7 pm

Convenor: Jenni Stockan

The speaker will be Ms Amoret Whitaker (NHM) talking about Forensic Entomology. The talk will take place 5-6pm with tours of the collections and light refreshments available before and after the talk.

Apr 29 **Post-harvest Entomology Special Interest Group**

Venue: Food & Environment Research Agency, Sand-Hutton, York

Convenor: Prof. Rick Hodges

June 4 **RES AGM**

Venue: The Mansion House, St Albans

Jun **National Insect Week**

23-29 **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)

2015

Sept **Ento' 15 Annual Science Meeting and International Symposium**

2-4 **Insect Ecosystem Services**

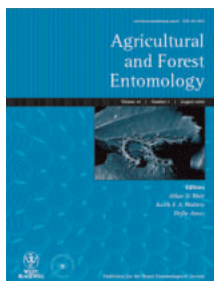
Venue: Trinity College Dublin

Convenors: Drs Jane Stout, Olaf Schmidt, Archie K. Murchie, Eugenie Regan, Stephen Jess, Brian Nelson

Speakers confirmed to date:

Sarah Beynon (Pembrokeshire); Tom Bolger (Dublin); Dave Goulson (Sussex); Alexandra-Maria Klein (Freiburg, Germany); Simon Leather (Harper-Adams); Sarina Macfadyen (CSIRO, Australia); Jane Memmott (Bristol); Charles Midega (ICIPE, Kenya)

Publications of the Royal Entomological Society



Agricultural and Forest Entomology provides a multi-disciplinary and international forum in which researchers can present their work on all aspects of agricultural and forest entomology to other researchers, policy makers and professionals.

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

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



Ecological Entomology publishes top-quality original research on the ecology of terrestrial and aquatic insects and related invertebrate taxa. Our aim is to publish papers that will be of considerable interest to the wide community of ecologists.

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

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



Insect Conservation and Diversity explicitly associates the two concepts of insect diversity and insect conservation for the benefit of invertebrate conservation. The journal places an emphasis on wild arthropods and specific relations between arthropod conservation and diversity.

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

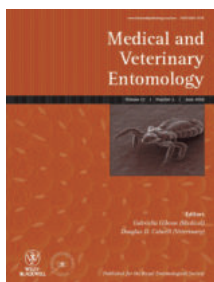
2014 print and online prices: UK £813, Euroland €1,035, USA \$1,503, Rest of World \$1,752



Insect Molecular Biology has been dedicated to providing researchers with the opportunity to publish high quality original research on topics broadly related to insect molecular biology since 1992. *IMB* is particularly interested in publishing research in insect genomics/genes and proteomics/proteins.

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

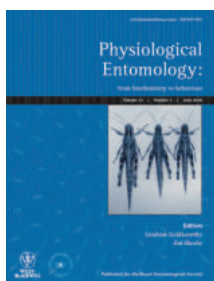
2014 print and online prices: UK £1,354, Euroland €1,722, USA \$2,504, Rest of World \$2,920



Medical and Veterinary Entomology is the leading periodical in its field. The Journal covers all aspects of the biology and control of insects, ticks, mites and other arthropods of medical and veterinary importance.

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



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

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

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

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

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

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

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

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:

Bruno Lemaitre
Ecole Polytechnique Federale, Lausanne,
Switzerland

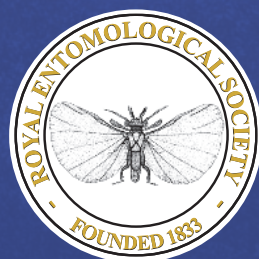
Nancy Moran
University of Texas at Austin, USA

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

Organising Committee contact:
ece2014@royensoc.co.uk

Further information, registration, abstract
and accommodation booking forms
available on:

www.ece2014.com



Xth European Congress of Entomology

ECE 2014

York, United Kingdom

Hosted by the Royal Entomological Society