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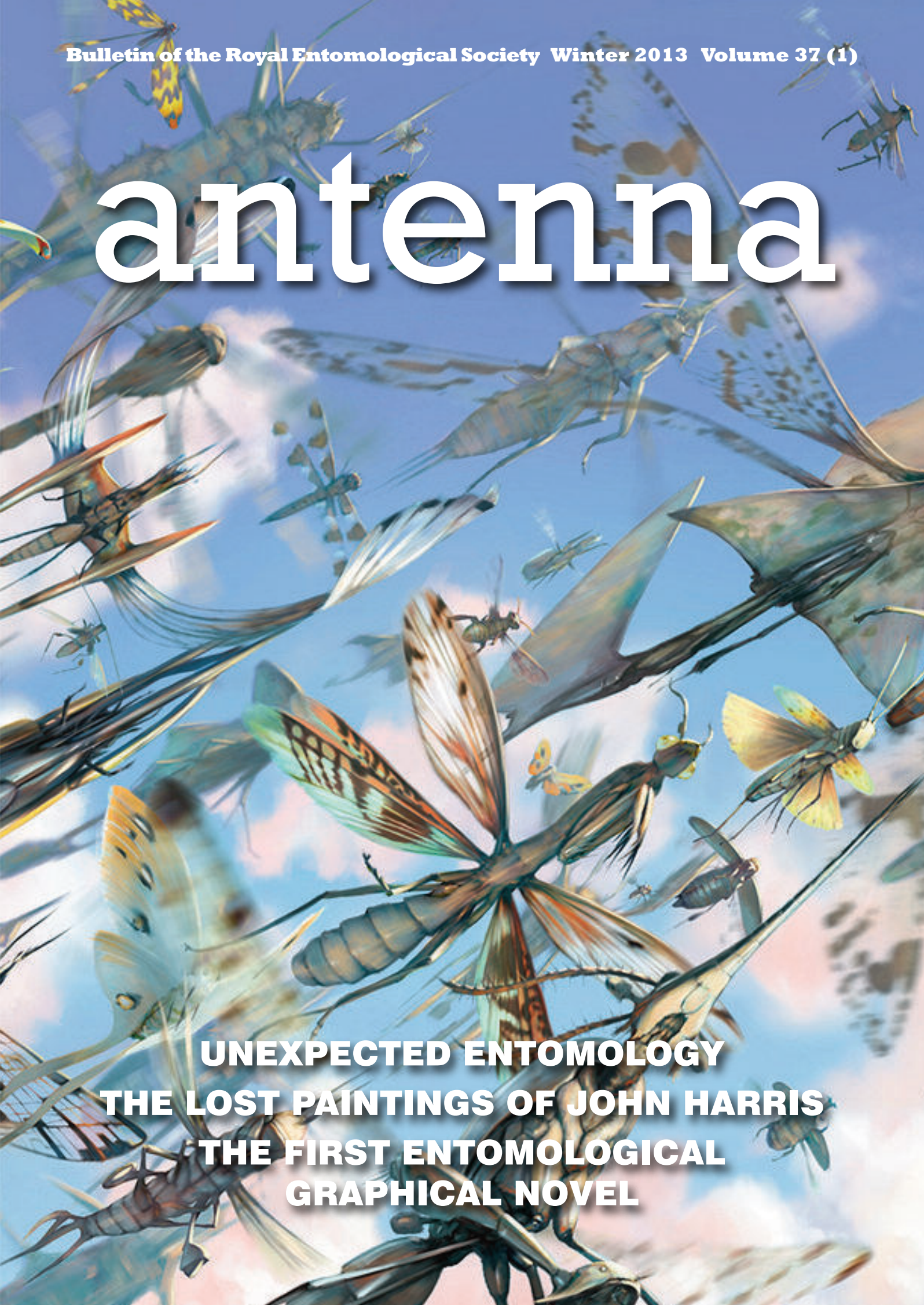

UNEXPECTED ENTOMOLOGY

THE LOST PAINTINGS OF JOHN HARRIS

THE FIRST ENTOMOLOGICAL GRAPHICAL NOVEL

meetings of the society

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

2013

Mar 6	**Verrall Lecture by Professor Michael T. Siva-Jothy** Venue: Flett Lecture Hall, Natural History Museum *Bed Bugs: An emergent problem and an excellent model*
April 12	**Insect Parasitoid Special Interest Group** Venue: University of York, Heslington, York Convenor: Peter Mayhew
June 5	**Society Annual General Meeting**
July 7	**2013 Insect Festival** Venue: Yorkshire Museum & Gardens, York
Sep 4-6	**Ento'13 National Meeting and International Symposium** *The Evolution of Insect Mating System: 30 Years of Thornhill and Alcock* Venue: University of St. Andrews Convenors: David Shuker, Leigh Simmons, Graham Stone
Sep 11	**Aphid Special Interest Group** Venue: Christ Church, Priory Terrace, Leamington Spa Convenor: Rosemary Collier
Oct 16	**Climate Change Special Interest Group** Venue: Rothamsted Research, Harpenden Convenors: Richard Harrington, Howard Bell
Nov 14	**South-East Regional and East Malling Centenary Meeting** Venue: East Malling Research, Kent Convenors: John Badmin, Jerry Cross

2014

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

2015

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

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

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COVER PICTURE

Image from the graphic novel Salsa Invertebraxa. Reproduced with the permission of the artist and author Paul Phippen.

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Bulletin of the Royal Entomological Society

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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.**

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EDITORIAL

In The Days of The Comet

Welcome to the first edition of the new year. A year in which not one, but two comets will appear and cruise across our skies. A year of celestial influence which has opened with the publication of a paper reporting that African dung beetles use the Milky Way to navigate on moonless nights (Dacke et al. 2013). Comets are traditionally portents of doom, change and the unexpected. While we have no entomological doom on the horizon, these predictions of the unexpected do ring true in the pages of this *Antenna*, as we report the publication of the first ever (as far as I know) graphic novel whose cast consist entirely of invertebrates. Salsa Invertebraxa has arrived as a riotous carnival of entomology. We also have the unexpected discovery of a set of paintings by John Harris, the son of Moses Harris. Alec Harmer's article is a fascinating piece of entomological detective work revealing how he tracked down the provenance of these remarkable works of art . The article is accompanied by full page reproductions of many of the paintings. Both of these articles provide a truly unexpected but delightful start to 2013. Jan Freedman reports on the exhibition Beetlemania which ran in Plymouth City Museum last summer. This was designed as a touring exhibition, so if you fancy Beetlemania at a venue near you, contact Jan to ascertain when it will be free.

We also have a series of articles outlining the progress of two research programmes that examine the role of pollinators in the UK and Europe: The Insect Pollinators Initiative, and Status and Trends in European Pollinators. These interim reports came out of a discussion at Ento' 12, and I hope they will be the first of many articles that will report on the progress of such collaborative research programmes.

Society news contains all the usual features, with the addition of Gordon Port's survey of our membership. This is a thought-provoking document that reveals much about the Society. It was interesting to see that just under 50% of the members and fellows considered themselves both professional and amateur entomologists, suggesting the absence of any boundaries between work and their leisure activities. This would also imply an underlying passion for the natural world. I recall a colleague of mine being asked about his job as a biologist, to which he replied, "being a biologist is who I am not what I do". It seems that many members and fellows have chosen entomology as a life-style rather than a profession. It is good to see that our society has this solid foundation, but it is also vital that this passion and curiosity is communicated to the next generation. Initiatives such as National Insect Week and the Insect Festival play an important role in achieving this and are vital to the future of the RES, so I am delighted that the next edition will contain a full report of NIW 2012.

The unexpected is always interesting, so I hope that you enjoy this edition and the year to come.

Peter Smithers

Dacke et al., Dung Beetles Use the Milky Way for Orientation, Current Biology (2013), http://dx.doi.org/10.1016/j.cub.2012.12.034

Guidelines for submitting photographs

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

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

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

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

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

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

300dpi

72dpi

CORRESPONDENCE

The Butterfly House Industry

Michael Boppré FRES and Dick Vane-Wright have produced what they hope will be an influential (if not controversial!) paper on "The Butterfly House Industry". Published in the open access journal Conservation and Society, the pdf can be downloaded by anyone, free of charge and without registration at: http://www.conservationandsociety.org/text.asp?2012/10/3/285/101831.

The website also provides the opportunity to post comments.

Abstract:

This paper addresses the mass supply and use of butterflies for live exhibits, discusses the risks to biodiversity which this creates, and the educational opportunities it presents. Over the past 30 years a new type of insect zoo has become popular worldwide: the butterfly house. This has given rise to the global Butterfly House Industry (BHI) based on the mass production of butterfly pupae as a cash crop. Production is largely carried out by privately-owned butterfly farms in tropical countries, notably Central America and Southeast Asia. Most pupae are exported to North America and Europe, although the number of butterfly houses in tropical countries is growing.

The BHI is described with respect to its stakeholders, their diverse interests, and its extent. It is estimated that the global turnover of the BHI is in the order of USD 100 million. From a conservation perspective, there is a tension between risks and benefits. The risks to biodiversity are primarily unsustainable production, potential bastardisation of local faunas and floras, and genetic mixing within and even between butterfly species. This paper discusses general ways of managing these risks.

Ethical concerns range from fair trade issues to animal husbandry and the use of wildlife for entertainment. For the risks to biodiversity and unresolved ethical issues to be tolerable, the BHI needs to make a significant contribution to conservation, primarily through effective education about butterfly biology as a means to raise public awareness of basic ecological processes, and conservation and environmental issues. It should also engage with local conservation initiatives.

Currently the BHI's great potential for public good in these respects is rarely realised. The paper concludes by looking at the special nature of the BHI, and its need for effective self-regulation if it is to continue to escape from public scrutiny and the introduction of restrictive regulations. The BHI needs to engage in active cooperation between its various stakeholders regarding a raft of critical issues if it is to survive and fulfil a beneficial role in society. The BHI also needs to forge active partnerships with conservation NGOs, educationalists, and scientists—communities that also need to recognise their own responsibilities towards the industry.

We also discuss the need for an effective umbrella organisation for the BHI, as well as a "Code for trading and exhibiting live butterflies".

Tyranny of Publishers

Dear Chairman Clements,

Thank you for the invitation to comment on your report.

First, the publication of peer-reviewed scientific papers is essential to our personal professional advancement and to the growth of knowledge of the field of entomology world wide. I would like to underscore your recommendation that the Society needs to plan carefully in the midst of changes in the business of publication and information retrieval. It is becoming expensive for authors to publish papers in prestigious journals. It is becoming more expensive for institutions to buy journals because they are being taken over by profitable international corporations. The Librarian of the Bio sciences library at the University of California at Berkeley, recently questioned whether the Bio sciences library could continue to subscribe to expensive prestigious journals. An alternative is for libraries to form a non-profit consortium to publish journals. I wrote to her:

"What I don't understand is why you allow yourselves to be victimized when you could be in control of the costs of publications. The quality of the journal depends on the editor, editorial panel, and the reputations of the authors who submit their manuscripts to be published. When I arrived on the Berkeley campus in 1960, it was common for volunteers from the faculty to serve as editors of scientific journals. It was a lot of work, but it didn't require a "for profit" Wall-street firm to do the job. The editors received manuscripts, sought reviews, accepted or rejected manuscripts for publication and wrote the authors, marked the accepted manuscripts for the printer, carried the manuscripts to local printer (my printer also printed wedding invitations), picked up the galleys and mailed the galleys to the authors and checked the galleys for errors, received the galleys from the authors, returned the galleys to the printer for corrections, made up the list of articles to be published, instructed the printer on what to put on the cover, picked up the printed journals, addressed the envelopes to be mailed to the society membership, stuffed the journal in the mailing envelopes, and took the journal to the San Francisco Post Office. I received no money. The modest annual subscription paid for the printer's cost, postage, and mailing envelopes.

Why not revolt against the commercial firms by forming a non-profit international consortium of libraries to publish high quality papers economically with volunteer editors and modest expenditures for publication on line?

Second, I would like to disagree with the option in your report to "unsubscribe to a number of journals". Judging by the Financial Statement the society must be the wealthest such organization on earth. I would encourage the Society to increase rather than decrease subscriptions world wide and with special attention to giving extra financial support for regional journals with volunteer officers. My comments are based on my voluntary service as an editor and officer of the Pacific Coast Entomological Society from 1962-1979. Your financial support of regional journals would benefit entomologists throughout the world by providing an educational service to young entomologists. Local journals are usually the first places in which an entomologist publishes a paper. Regional editors offer advice to first time authors in the preparation of manuscripts and illustrations. Regional journals provide experience for future editors of larger journals".

Howell Daly [hvdaly@pacbell.net]

Plate 1. Comma *Polygonia c-album* (L.); Six-spot Burnet *Zygaena filipendulae stephensi* Dupont; White Plume *Pterophorus pentadactyla* (L.).
Photo © R. Horton-Fawkes.

ARTICLE

Like Father, Like Son: The 'Lost' Entomological Paintings of John Harris (1767-1832) and the remarkable Harris Legacy

"There is a satisfaction when contemplating a fine example of eighteenth-century representational art which, combined with an element of romance and substantial scientific advancement, can but rarely be experienced in this modern age."

Robert Mays.[1]

Alec S. Harmer

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Introduction

The thought of entomological treasures buried and forgotten for centuries, still waiting to be unearthed, is a tantalising prospect. I was fortunate enough to be involved in just such a find quite recently.

This article has been prompted by my recent introduction to nine original watercolours painted by John Harris more than two centuries ago, and my recognition of their historical significance. Originally, I was unaware he was the son of Moses Harris (author of *The Aurelian*) or that his name and reputation was probably more familiar to bibliophiles of antiquarian books, particularly in the United States. It is documented that he painted 'Insects, Fruit, Flowers, Miniatures, Sea pieces, Subjects in Rustic-life &c',[2] but until now the existence of any examples of his entomological subjects appeared to be unknown. Whilst my research failed to locate any more, nevertheless it has been generously rewarded in other ways. My initial intention was to establish the artist's identity and, so far as was possible, seek corroborative evidence to support the paintings' provenance, and in this respect I have succeeded. Along the way, however, I came to appreciate that these paintings are more than just 'a fine example of eighteenth-century representational art': they connected three generations of a most remarkably talented family: father, son and grandson, each one a master in his respective field of the fine arts. Much of what I learned has not only provided a fascinating insight into their lives and careers, but previously has never been collated, particularly in respect of Moses Harris. Therefore, I have taken the opportunity to include it here as a contribution to the enduring Harris legacy.

Plate 2. Small Tortoiseshell *Aglais urticae* (L.); Privet Hawk-moth *Sphinx ligustri* (L.). Photo © R. Horton-Fawkes.

Moses Harris (1730 c.1788) and *The Aurelian*

As will become apparent in due course, the origin of these watercolours, painted in 1796, lays even further back: to a period that was a golden age in British entomology and when patronage of the arts flourished amongst the wealthy eighteenth-century social aristocracy of Georgian England. In London, in 1766, Moses Harris (Fig.1), a talented artist and keen entomologist, finally sees the culmination of years of his labours published: *The Aurelian*, but only after a 'tedious Length of Time' and delay caused by 'the unsteady and fallacious Behaviour of a Person, too nearly connected in my Concerns'.[3] It is a book that will later be described as 'the pinnacle of 18th century English entomological literature'.[4]

His name is doubtless well known to all with more than just a passing interest as to the origins of entomology in this country. Most likely, though, our acquaintance with one of its greatest founding fathers does not extend much beyond the often reproduced frontispiece from that book, in which a young man (thought to be a self-portrait) in period dress, complete with a tricorn hat, is seated on a bank in an idyllic sylvan setting. Across his lap lies his clap net (or batfolder)[5] and he is displaying the day's captures in his pinning box, while pointing to a fellow collector in the middle distance. Several factors and qualities contributed to Harris producing arguably the most historically important and iconic book on English butterflies and moths ever published. An ardent field entomologist, his paintings reflected his successful breeding endeavours, and his straightforward informative text was largely derived from his personal observations. From his studies he went on to pioneer the classification of Lepidoptera based on wing venation. Above all, he was a supremely gifted artist with a meticulous eye for detail and accuracy of colour.[6]

Dedicated to the members of the Society of Aurelians, of which he was Secretary, *The Aurelian* was published in 1766. It originally contained forty-one beautifully hand-coloured engravings executed by him, with three more plates added in the second issue in 1773. The fact that it was republished several times, the last being in 1840, is a measure of its enduring popularity. Its original price of five guineas ensured its exclusivity; nowadays, a complete copy in good condition can command upwards of £10,000,[7] depending on the edition, the colourist's skill, etc. Thus, only a fortunate few have been privileged to be acquainted with an original copy of his *magnum opus*. Harris also wrote and illustrated several works on insects (notably Lepidoptera but also other Orders) both for himself and other authors, and occasionally painted other natural history subjects such as seashells.

Figure 1. Self-portrait of Moses Harris (1730 *c.*1788) at the age of 49. From *Exposition of English Insects*. Photo © A. S. Harmer.

Yet despite his fame during his lifetime, what little we know about him he provided himself in *The Aurelian*. With this in mind I endeavoured to discover more about his life. Robert Mays records that Moses was born in Churchyard Alley, Holborn, London, on the 15th April 1730 to Joseph and Mary Harris, and had at least two brothers, William and John.[8] Building on this, and bearing in mind that the general paucity of detail, numerous namesakes, lack of middle names and absence of house numbers (street numbering was still decades away) contained in parish registers make positive confirmation difficult, my online research came up with the following additional information which I hope is fairly reliable. Moses Harris was baptised on the 27th April 1730; his parent's surname is misspelt (Harries) in the parish register of St Andrew, Holborn, but the address is the same.[9] Also recorded in the same register is the christening of his brother Joseph on 14th August 1726 (same address).[10] It is quite likely that the John Harris born on the 13th November 1727 and baptised on the 7th December in the nearby parish of St Giles, Cripplegate, is the brother mentioned by Mays; while no address is recorded, the names of the parents are the same. If indeed they are Moses's parents, we learn for the first time that his father was a 'Fan-Maker',[11] an occupation important enough to warrant its own livery company. Fans of the period were often beautifully hand-

Plate 4. Cinnabar *Tyria jacobaeae* (L.); Cream-spot Tiger *Arctia villica britannica* Oberthür. Photo © R. Horton-Fawkes.

Plate 5. Purple Hairstreak *Neozephryrus quercus* (L.); Green Silver-lines *Pseudoips prasinana britannica* Warren; Dun-bar *Cosmia trapezina* (L.); Scalloped Hazel *Odontopera bidentata* (Clerck); Oak Tortrix *Tortrix viridana* (L.) Photo © R. Horton-Fawkes.

Plate 6. Red Admiral *Vanessa atalanta* (L.); Small Magpie *Eurrhypara hortulata* (L.). Photo © R. Horton-Fawkes.

Plate 7. Peacock *Inachis io* (L.); Mullein *Shargacucullia verbasci* (L.). Photo © R. Horton-Fawkes.

painted miniature works of art - an indication, perhaps, from whom Moses inherited his talent.

Moses was fourteen when he became apprenticed to the London geographer and globe maker Charles Price.[12] But instead of completing his apprenticeship, at the age of nineteen he and his wife, Mary, emigrated to Nova Scotia aboard the *Winchelsea*, arriving in Chebucto Harbour in June 1749. They were among the first group of settlers sent out on the Cornwallis ships to found Halifax (with free subsistence during the passage and for twelve months thereafter).[13] The passenger list apparently gave his occupation as a sawyer and this would have entitled him to the same privileges of land, rent and tax exemptions being offered to private soldiers and seamen. Given the circumstances, however, it is more likely that the original handwritten entry was meant to have read 'surveyor'; on one of the several maps he produced during his short stay there is the inscription 'A plan of Halifax Survey'd by M. Harris'.[14] His maps of the early settlement provided images of this new country for an eager public back in England. Of these, the 'Porcupine Map' is the most well known and admired on account of the insects and animals he included; it is probably the first published picture of a butterfly - White Admiral (*Limenitis arthemis*) - by him and almost certainly the first Canadian butterfly to be figured. This map, together with a plate depicting plants of Nova Scotia, drawn the month after his arrival, appeared in the February issue of the 'Gentleman's Magazine' in 1750 (vol. 20). The couple are recorded as returning to England in 1750.[15]

My research found that on their return they either went to live with his parents in Church Yard Alley, Fetter Lane, Holborn, or (in the absence of house numbers) had their own accommodation within that address; the former is the more probable bearing in mind his likely financial situation at that time. The baptisms of three of their children - Mary Arabella, William and Arabella - are recorded in the parish register of St Andrew, Holborn.[16] Unfortunately it omits their father's occupation but does confirm the address. The burial of his father Joseph, of Fetter Lane, is recorded as the 1st of May 1757, but I have been unable to establish the date of his mother's death owing to the numerous namesakes listed – for instance, two Mary Harrises are recorded on consecutive pages in the same parish register. The young family continued to live there at least until 1759, and possibly at least a further eight years: from 1758 and presumably until the publication of *The Aurelian*, Moses was available to take subscriptions for it at New Bond Street.[17] At this point it is perhaps worth mentioning one intriguing record I came across, relating to the intended marriage of a Moses Harris, widower of the parish of St Dunstan in the west of London to an Agnes Cole (under 21 years of age), and spinster of the parish of St Martin in the Field, dated 7th July 1766.[18] If this is indeed the same Moses, it might explain the circumstances of the birth of his son John in 1767, some eighteen years since his first marriage.

Figure 2. The trade cards of Moses Harris. Sarah Banks' Unfortunately, Moses Harris's card is not dated; the most likely explanation being that she was presented with both of them by John at the same time in 1793, some five years after his father's death. Sarah Banks Collection, British Museum: Department of Prints & Drawings. ©Trustees of the British Museum

According to Mays, Harris had moved south of the Thames, to Deptford, by 1768. His sojourn there does not appear to have been as long as implied in his grandson's memoir (reproduced further on); by 1770, Mays records him living in Crayford, Kent, where he probably stayed for a couple of years at least,[19] much to the frustration of Dru Drury, who employed his services to colour the prints for his *Illustrations of Natural History*.[20] 'I wish to heaven you was removed from the place where you are now buried, and come to London, for then I could scold you by word of mouth . . .', wrote an exasperated Drury to Harris in April 1770, some two months after some prints William Harris had collected for colouring by his father still had not been returned, consequently delaying publication.

At some stage in this chronological jigsaw he returned to the other side of the Thames, to the rural outskirts of London; an undated trade card in the British Museum (Fig. 2), on which he describes himself as a 'Painter & Engraver', has his address as 'White House, Princes Row – White Chapel'.[21]

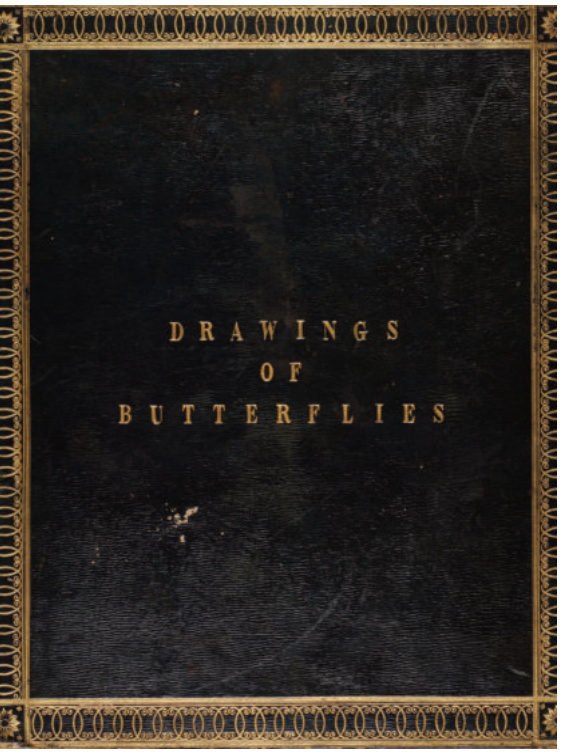
His last known residence, 8 Duke ('s) Court, St Martin's Lane (near Charing Cross), appears in the Royal Academy's list of contributors for their exhibition in 1785. This was the only time he exhibited and his entry was titled 'English Insects',[22] although described by some authors as a 'frame of insects'. Possibly he may have resided there some years previously: around 1778 he carried out an intaglio commission of George Washington (Harris's reversed surname can just be discerned underneath the intaglio) for Josiah Wedgwood,[23] who had opened a shop in 1767 at the corner of Newport Street and St Martin's Lane. The date of Harris's death still remains uncertain, although it is generally acknowledged as being *circa* 1788.[24] Hopefully, in the future, some diligent genealogist may be able to add to this family history.

A chance conversation and a wonderful find

I mentioned earlier the high prices that a copy of *The Aurelian* can command.

Plate 8. Black-veined White *Aporia crataegi* (L.); Brindled Beauty *Lycia hirtaria* (Clerck). Apart from being the mirror image, John Harris's painting is almost identical to the plate in *The Aurelian*. Photo © R. Horton-Fawkes.

Plate 9. Moses Harris's original painting (?) for *The Aurelian* (Plate IX). Note the many compositional differences between this painting and John Harris's, and the addition of the Hebrew Character *Orthosia gothica* (L.). Photo © The Natural History Museum, London.



Fortunately a facsimile version was produced by Robert Mays in 1986[25] and although he was disappointed with the colour reproduction of the plates, the book nevertheless has several redeeming qualities. Firstly, it brought Moses Harris's paintings to a wider audience; indeed, had I not possessed a copy of his book, an entomological treasure might well have never seen the light of day. Secondly, his additional text is an indispensable source of information, including several references I found particularly useful. He mentioned that the original watercolour paintings for *The Aurelian* had been bequeathed to the nation in 1937 by Lionel Walter Rothschild and were deposited in the archives of the Natural History Museum (more about these presently), and also the collection of some sets of prints from Dru Drury by Moses Harris's son in February 1770, which later enabled me to establish that Moses Harris had at least two children, both sons (later confirmed by John Harris, Junior). Of the elder one, William, nothing further seems to have been recorded.

Several years ago my mother-in-law, Margaret Fuller, happened to mention my keen interest in Lepidoptera in conversation with her neighbour, who replied that he had some butterfly paintings. Although informed of this at the time I did not follow the matter up immediately, but eventually in early 2010 the opportunity arose for me to meet the paintings' custodian, Richard Hawksworth Horton-Fawkes, and view them. He produced an old book bound in dark blue straight-grained goatskin, with ornate gold decoration around the edges and spine. On the front cover, in gold capital letters, were the words 'Drawings of Butterflies', and the same wording, carefully handwritten, was repeated on the first of the 17 gilt-edged leaves inside. The wording on the spine was simply 'Drawings'. Unfortunately there was no bookbinder's ticket present to say by whom or when they had been bound. Affixed to the leaves were nine beautifully executed watercolour paintings on vellum (a fine form of parchment made from goat skin), each approximately 23.5 cm x 27.5cm, edged by a single pencil line; the remaining leaves were blank. With the exception of the last painting, they all bore a discreet monogram, cleverly designed to incorporate all the letters in 'J. Harris'; in addition, the third painting was dated 1796 (Fig. 3), and the last was signed: 'Jn' Harris Pinxt' (Fig. 4) (*Pinxit* being the Latin for: 'he painted it.'). The paintings, overall, were in excellent condition, with only a couple having suffered some discolouration to the vellum. Some minor paint damage and staining was evident, but the overall freshness of the colours remained undiminished by the passage of two centuries.[26]

Figure 3. detail from Plate 10 showing John Harris's monogram and date. © R. Horton-Fawkes.

The historical significance of these paintings did not register with me at first, until I turned to the last painting (Plate 9). There was something vaguely familiar about the mussel shells and the broken pieces of clay pipe and crockery at the bottom of the picture; after taking several photographs I returned

Figure 4. Signature of John Harris on Plate 10 for comparison with Fig. 3.© R. Horton-Fawkes.

Figure 5. Walter Hawksworth Fawkes. Painted by J. Hoppner Esq, R.A., and engraved by W. Say, 92 Norton Street, Marylebone. Photo © R. Horton-Fawkes.

Plate 10. Marbled White *Melanargia galathea* (L.); Painted Lady *Vanessa cardui* (L.). Photo © R. Horton-Fawkes.

home to dig out my copy of Robert Mays' book. There, on Plate XI was the same painting! A revisit a few days later confirmed that the nine paintings were copies of some of the first eleven plates in *The Aurelian* (plates III and VII being omitted), although not in the same order. But most strikingly was the fact that John Harris's paintings were all mirror images of the plates in the book.

Who originally purchased the paintings and why is uncertain, but almost certainly it would have been one of Richard Horton-Fawkes's ancestors, the most likely being Walter Hawksworth Fawkes (1769–1825) of Farnley Hall, in Yorkshire (Fig. 5). A prominent landowner, writer and MP for Yorkshire (albeit briefly), with historical, antiquarian, literary and sporting interests, he is most recognised perhaps for his great patronage of Joseph Turner, R.A. (1775-1851), who from 1808 became a regular guest at Farnley Hall. In addition to the many views he painted of the estate, he also undertook some twenty drawings of birds for Walter Fawkes's *The Farnley Hall Bird Book*, published 1815-1816 (now in Leeds Art Gallery), demonstrating Fawkes's strong interest in natural history.

The circumstances in which Walter Fawkes might have become aware of John Harris's work will probably always remain a matter of conjecture. It may well have been through Walter's association with Turner. Both Turner and Harris were contemporary exhibitors at the Royal Academy annual exhibitions in 1797 and 1802; with an interest in the arts, it is quite likely Fawkes would have travelled to London to attend this important event in the social and cultural calendar. Harris is listed as being a regular exhibitor between 1797 and 1814.[27] Of the thirteen works exhibited by him during this period, only three featured entomological subjects (two in 1797, the other in 1802); these paintings were simply listed as 'Insects'. Only two of his other entries were of natural history subjects: 'Basket fruit', also in 1802, and 'The blackbird' in 1811. His expertise in drawing fruit is amply demonstrated in Plate 8. It could well be that one of the paintings featured here (possibly Plate 9, the only one signed in full) was exhibited at the Royal Academy.

Another possibility is that Fawkes became aware of Harris's talents through the famous Edwardes of Halifax[28] (Halifax is approximately ten miles from Farnley Hall). For nearly a century they were highly successful antiquarian booksellers, innovative bookbinders and book decorators at the very top of their profession; John Harris worked for James Edwards at the company's London branch in Pall Mall. A great friend of James happened to be James Robson of New Bond Street; both gentlemen were involved in the printing and sale of *The Aurelian* after the author's death.

Due to intervening circumstances my research had to be put on temporary hold until the following year when in April 2011 a visit was made to the library of the Natural History Museum, London, primarily to establish if John Harris had copied from his father's original paintings for *The Aurelian*, which then might solve the mirror image anomaly. In the limited time available during the visit, it became evident that he had not done so, but instead had worked from the plates in *The Aurelian*.

Resolving this issue promptly and unexpectedly raised yet another. Examination of Moses Harris's paintings revealed they departed (often quite significantly) from his final published plates; no more so was this evident than in his original painting that lay before us in the Museum library. It featured the Painted Lady and Marbled White; however, in contrast to both the corresponding plate in *The Aurelian* and John Harris's painting (Plate 10), three of the butterflies were facing in different directions. In addition, the male and female Marbled White undersides had been swapped around, the male Painted Lady pupa was omitted, the brick replaced by a tuft of grass upon which a Painted Lady now rested instead; the shells, broken clay pipes, crockery etc. were absent, replaced by plain bare earth and a small blue-flowered plant. In the light of Moses Harris's own admission in the Preface to *The Aurelian* that it was his first attempt at engraving, I was puzzled as to why he would have elected to introduce such radical alterations at the critical engraving stage, if indeed this were the case.

Up to this point all the literature I had read referred to the Rothschild bequest as being the original paintings for *The Aurelian*.[29] Terry Dillon then drew my attention to *Some British Moths*, by Norman Riley,[30] in which are reproduced sixteen of these paintings. Riley commented on the fact that their compositions differed in nearly every case when compared to the published plates; however, neither he nor Arthur Lisney in his most authoritative account of Moses Harris in *A Bibliography of British Lepidoptera, 1608 1799*,[31] queried the fact that possibly they were not the original paintings for *The Aurelian*. After referring to them, Lisney mentions that Harris had apparently intended to publish a new edition of the book, but for some unknown reason this was never accomplished. This view is one shared by the Natural History Museum on its website; reiterating Lisney's comments, it adds 'further research is being conducted to confirm this.'

Evidence in support of these paintings being intended for a revised edition seems pretty conclusive. In the sixteen paintings figured in Riley's book twelve additional species are included that do not appear in *The Aurelian*. One painting, illustrating The Unicorn (Convolvulus Hawk-moth) and the Little Gate-keeper (Small Heath), is dated 1785; another, depicting the life-history of the 'Bee-Tiger' (Death's Head Hawk-moth), includes in the caption that the caterpillar was found in a field of potatoes on July 29th 1778.[32] Some of his notes below the paintings have references to Linnaeus and include some of his Latin names - both absent in the first edition of *The Aurelian*. Incidentally, the paintings themselves are bound into the comparatively rare third edition of *The Aurelian* published in 1794. It will be interesting to learn the outcome of the Museum's research. All in all, there must still remain the possibility John Harris could have used the actual originals . . . we are unlikely to ever know. As few readers will have had the opportunity to appreciate the beauty of Moses Harris's work first hand, the 'original painting' for Plate IX of *The Aurelian* is reproduced here (Plate 9) , illustrating these points and affording an opportunity to compare the two artists' work.

John Harris senior (1767–1832)

Very soon into my research I fortunately came across a reference to a memoir about John Harris written by his son, also named John, which had been found inside the first volume of what has come to be known as the 'Reeves Bible'. [33] Philip J. Weimerskirch

wrote an excellent piece for *Book Collector*[34]about this memoir, and while it is beyond the scope of this article to include his exhaustive research into the titles and names contained in the memoir, a copy may be obtained from the Library of the Natural History Museum, London. He began with an enquiry that appeared in the magazine *Notes and Queries* on the 26 April 1851, from one 'T.C.W.':

"Harris, Painter in Water-Colours. – Some friends of mine have a large paper copy of the edition of the Bible, published in 1802 by Messrs. Nicoll, of Pall-Mall, and known as 'Reeves Bible', which is adorned with a large number of small original drawings in water-colour by 'J. Harris, of Walworth, Surrey.' I should be obliged if any of your correspondents can give me any information respecting Mr Harris, and can tell me whether he is still living. The drawings were made before the year 1819".

This request elicited the following reply from John Harris, Junior, which was published in the same magazine later that year on 25 October. … "the said Bible was illustrated with original drawings by my father, J. Harris of Walworth, who died seventeen years since [later corrected by his son to 1832], and that I am his only son surviving him in his profession. Any further communication relative to him I shall be most happy to give on a personal interview." *J. Harris, 40, Sidmouth Street, Regent Square. Sept. 27, 1851.*

[This Bible is now in the Houghton Library, at Harvard University, Massachusetts. Following the Museum's suggestion that we should try to establish further corroborative provenance for the paintings, an illustration signed by John Harris from the Bible was obtained to enable a comparison of the signatures (Fig. 6)].

By kind permission of Houghton Library, Harvard University, the following is a transcript of this memoir. I have tried to retain his original punctuation (it is sometimes difficult to discern between his commas and full stops) and grammar, and a few comments have been included for clarification purposes. The first page, reproduced on Fig. 7, shows both his beautiful handwriting and obvious affection for his father.

John Harris. Artist. 1767–1832

John Harris, born in London on the 5 of June 1767. Painted Insects, Fruit, Flowers, Miniatures, Sea pieces, Subjects in Rustic-life &c. In addition to these his talents were often called to the services of Booksellers and Publishers, in making designs for the illustrating of Books by Copper-plates &c. He practiced for some years in ornamenting Books, with Paintings on their Edges, Covers, and occasionally by Illuminations and Paintings in Gold & Colours in their interior. Some of the most celebrated of his works extant, are the Etch'd and Illuminated Plates to Frois[s]arts Chronicles, translated and Edited, by Tho^{s}. Johns Esq^{r}. of Haverford West. Published by the late Ja^{s}. Edwards Esq^{r}. of Pall Mall, about 48 years since, and subsequently by the late Messr White and Cochrane of Fleet Street. Also Mr. John Whittakers Magna Carta. Printed in letters of Gold. (This work is Atlas 4^{0}. [40] was Published in 1816. Dedicated to His late Majesty George IV when Prince Regent,) and he and myself, his son, were the first two artists, engaged in making designs for each of the pages of the Book, Consisting of Regal Paraphernalia, Implements of War, Armorial Bearings &c &c of King John, and The Barons of England of the 13 Centenary. One of the Most celebrated Copies of this work, is the one executed for the late King Geo^{e}, IV. Done jointly by My Father and Myself, for M^{r} Whittaker, who had Received the Royal Command, to get one executed in the highest style of Illuminated art. This Copy is now in the British Museum, and is shown to Visitors, as a superbe Volumn, on account of the Printing in Gold-letters. The taste and beauty of the Designs, and the execution of the Various Illuminations &c. and for the Elegance of the Binding forming upon the whole a Book, almost unequaled.

There are also two Copies of the Bible, (the Old & New Testaments with the Apocrypha, known as Reeves's Bible) which were Illustrated by Original Designs to each Book and Chapter, done in Indian Ink, in one of the Copies, the other in Gold & Colours [using pencil, someone has crossed out the 'Gold &', and written the word 'Water']. They were executed for M^{r}. White, who I believe sold the one done in Indian Ink, to Her late Majesty Queen Charlotte, and the satisfaction given by this first Copy done caused him to receive a

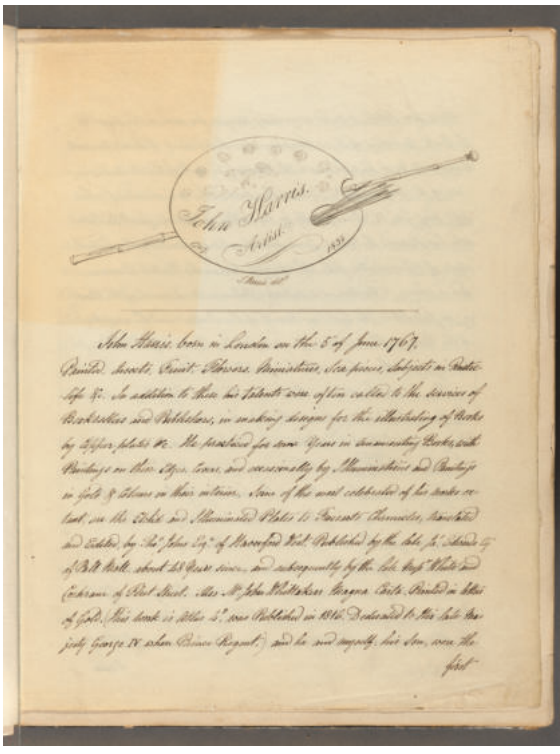


Figure 7. First page of John Harris, Junior's memoir of his father. (Unpublished manuscript). Call no. f Bi 65.802, Houghton Library, Harvard University.

Commission for the other Copy, to be done in colours. I am not aware what became of this Copy, but presume it is the one now in the possession of M^{r} George Livamore [Livermore]. Queen Charlottes Library was dispersed, but I do not know what became of that Bible. The Original designs for these numerous illustrations, are now in the possession of the Writer.

His industry was such, that he generally Painted some subject for the Annual Exhibition of the Royal Academy. As an artist in the Painting of Subjects of Natural History 'Viz Insects, Shells &c &c He was I believe, without a rival, and this may in a great measure have been obtain'd by him of his Father, the celebrated Moses Harris, one of the most clever Men of his time, as a Naturalist, Painter & Engraver of his own works, and whose name will never perish, while his works exist, Viz. The System of Colours, History of English Insects, The Aurelian &c &c of which works there are Copies in the Library's of the British Museum, and in those of many of the Nobility & Gentry of the Kingdom. The subject of this memoir was the second Son of the said Moses Harris, and in his Child-hood show'd a taste not only for the fine arts but also in his Youth for Shipbuilding. Residing at that time in the

neighbourhood of Deptford Dock-Yard, he had frequent opportunities of watching the Shipwrights at work, and ultimately set about to Build a Model of a Sloop (which I, his Son, still possess, and value for his sake) its nearly 3ft, in length Clinker built. (Not dug out of a solid piece of timber) but fairly put together. I have merely mentioned this circumstance to show his industry and perseverance in early life. He was articled to a Mr. Thos Martyn, the author of several works on Spiders Insects, Shells &c, and upon these works he was employ'd, making the Drawings, for the Engravings &c. And Painting & Colouring them from the natural subjects, for the works as Published, Mr. Martyn, being no Artist. On the termination of his time with Mr. Martyn, Mr. Edwards the Bookseller of Pall Mall, sought his assistance on Italian works of art, (which he at that time imported) to Paint up, in the early style of Italian art, in which employment he continued till Mr. Edward's retirement from business [around 1804].

It now only remains to state that he followed his profession in the various branches, till within a few months of his Decease, his faculties began to fail him, that at the last he attempted to execute works, but found himself inadequate to the task. He Died in May. 1832, aged 65. Years, and lies buried at Kennington New Church. In the Parish of Lambeth, Surry.

This Memoir is by me his son John Harris, an Artist, following a variety of branches connected with the Fine Arts, but priding himself more particularly upon executing fac-simile Leaves for perfecting rare old Books. *July 13,th 1854. 34 Gloucester Place, Kentish Town, London.*

N.B. The Pencil Drawing Portrait of My Father is taken from a Miniature done by himself about the Year 1820, and is copied by me John Harris, to accompany this Memoir. (Fig. 8).

Figure 8. Self-portrait of Moses Harris copied by John Harris (*circa* 1820). Call no. f Bi 65.802 v.1, Houghton Library, Harvard University.

The Thomas Martyn mentioned by John Harris, junior, resided at 10 Great Marlborough Street, London in 1786. His early attempts using independent and established artists to illustrate his books proved unsatisfactory in terms of cost and inconsistency of quality for scientific accuracy. He decided instead to set up his own 'private establishment instituted for the purpose of instructing youth in the art of illustrating and painting subjects in natural history.';[35] by 1789 he had ten scholars or apprentices working for him. How successful this academy proved to be may be judged by the plates in *The Universal Conchologist*[36] and the fact that his publications gained accolades from many of the crowned heads of Europe. The technique of dense hand-colouring Martyn required of his students in the plates for the '*Conchologist*' is evident in John Harris's paintings.

The reference to the publisher and bookseller James Edwards proved helpful in respect of the paintings' provenance. Edward Bayntun-Coward identified the gold tooling to the binding I mentioned earlier as being the work of Staggemeier & Welcher of 11 and 12 Villiers Street (at the end of the 18th century German binders dominated the London trade). Described as 'one of the most prolific workshops producing "extra" quality work in London', they also 'worked extensively for James Edwards, the Pall Mall bookseller.'[37]

Apart from the reference to Deptford, it appears his father resided his entire life within the area now covered by the London boroughs of Lambeth and Southwark; although moving several times, it was always within a very small radius.[38]

Were it not for this fortunate memoir, we would know very little at all about John Harris, Senior; my research has been unable to establish very much more about him or to locate further examples of his work. It is a name that occurs quite often among artists, publishers and engravers around the period, leading to understandable confusion. For instance, in Huon Mallalieu's biography of John Harris[39] he mentions examples of his work in Exeter Museum (The Royal Albert Memorial Museum). From my enquiries, this appears not to be so: there are a couple of sketches by a John Harris, but it transpired he was the mayor of Exeter in 1822.

John Harris, Junior (1791–1873)

Of his own artistic achievements mentioned in his memoir, John Harris, junior has been somewhat modest. He was born in 1791 and obviously inherited his father's talent, being only nineteen when he exhibited at the Royal Academy. Soon afterwards he enrolled as a student there and specialised in portraits in miniature, before moving into the field of producing facsimiles of early typography and woodcuts. He worked at the British Museum for a time, eventually branching out on his own. In the early decades of the nineteenth century, the acquisition of rare books was a passion amongst the wealthy. Often, these books would be missing a page or two, and the skills of artists like John Harris would be called upon to produce a facsimile of these. His work was of such a standard that on one occasion he was called in by the British Museum to identify his work in a rare volume, only managing to do so after considerable examination of the book; thereafter, the museum trustees required him to sign any future work. But sometimes even then this was not foolproof: his minute signature sometimes went unobserved as in the instance when, for many years, the Museum reproduced as genuine a signed Harris facsimile of the printer's device of William Caxton! Together with his father he completed the illuminations in the British Library vellum copy of John Whittaker's 1816 gold-printed Magna Carta referred to in his memoir. As a keen freemason he undertook commissions for a series of designs for tracing boards used in Masonic rituals and provided many illustrations for various Masonic periodicals. Sadly, after nearly forty years, the demands his work imposed upon his eyesight eventually led to his total blindness at the age of sixty-six. Fortunately he and his wife were financially supported by friends and previous clients in his remaining years. He died in 1873, aged eighty-two. More information about him can be found in Barry Gaines' article published in the Bulletin of the John Rylands University Library,[40] and on several freemasonry websites.[41]

Discussion

Earlier, it was mentioned that John Harris's paintings were mirror images of the plates in *The Aurelian*. In seeking an explanation as to why this should be so, I hope I am not doing him a disservice by suggesting he may have employed a *camera obscura* or other optical device; copying by freehand or tracing (a method later used and described by his son)[42] would not necessarily result in image reversal. Although faithful to the plates in *The Aurelian*, his work is not an exact copy. Whilst the size and position of the individual insects is identical in both artists' paintings, some cropping, usually to one or both sides of the picture, is evident in John Harris's work. Other more subtle differences are also apparent, some deliberate perhaps for aesthetic reasons or because he did not intend his work to be a faithful reproduction. For example, a missing leg or two, a reduction in the number of newly-emerged larvae or ova, a larval posture altered, the odd leaf omitted here and there etc. Other changes perhaps have been introduced unintentionally through lack of entomological knowledge: in Plate 1 the Six-spot Burnet originally figured by his father (although just named The Burnet Moth), has been transformed into the Five-spot Burnet, and the Cinnabar larvae in Plate 4 lack the setae clearly depicted in *The Aurelian*. Elsewhere, slight differences in wing patterns can be found. Throughout, though, the accuracy of his colours is superb.

Why John Harris should choose to copy rather than produce his own compositions seems straightforward enough: unlike his father, he was not an entomologist and consequently he would not have had the live material necessary to create his own designs. Furthermore, time would have been money, and in the circumstances why bother to reinvent the wheel? This practical approach towards utilising his father's work is nicely illustrated in his trade card (Fig. 9), but no doubt he also derived a certain amount of pride and satisfaction in being able to emulate him. Whether these paintings were specially commissioned is uncertain. As the son of Moses Harris, John's name would have had a certain caché and it would be understandable to want to acquire paintings by him, particularly those featuring his father's work. The selection of vellum (rather than paper) would have been normal for a commission of this type and period; it is a difficult and exacting medium, but one with which he would have been extremely knowledgeable and

Figure 9. The trade cards of John Harris. Sarah Banks' handwritten date on the card refers to its acquisition, usually contemporaneous with the business being active. ©Trustees of the British Museum

comfortable - a testimony to his consummate skill as a copyist and superb watercolourist.

It remains only to say that more than two centuries later, it is gratifying to know that at last his work can be appreciated by a far greater audience than he could have possibly imagined. Rightfully, he deserves to stand alongside his father as one of our finest entomological illustrators.

Acknowledgements

I am deeply indebted to Richard and Joan Horton-Fawkes for their enthusiasm, assistance and for permitting me the privilege of announcing this important discovery. I would also like to acknowledge my grateful thanks to the following: Margaret Fuller; David Wilson for photographing the paintings (his skill in this field and association with Robert Mays's publication made him the ideal choice); James Capobianco, Reference Librarian, Houghton Library, Harvard College Library, Harvard University, Cambridge, Massachusetts; Terry Dillon for his knowledge of antiquarian entomological books and generous access to his unrivalled private entomological library; Steve Hayes, of Synergie, Lymington; Entomological Library, Natural History Museum, London; John Badmin, Editor of the Journal of the British Entomological & Natural History Society; The Royal Academy for information on Exhibitors; John Madin, Curator of Art, Royal Albert Memorial Museum, Exeter; Edward Bayntun-Coward, of George Bayntun, Bath; Alison Wright, Department of Prints & Drawings, British Museum; and finally Peter Smithers, Editor of *Antenna* for his enthusiasm and support throughout for this project.

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2. John Harris. Artist. 1767 1832. A memoir by his son, John Harris, jr. (unpublished manuscript). Call no. f Bi 65.802, Houghton Library, Harvard University.
3. Harris, M. 1766. *The Aurelian or Natural History of English Insects; namely Moths and Butterflies. Together with the plants on which they feed*. London: printed for the author.
4. Dunbar, D. 2010. *British Butterflies: A History in Books*. British Library, London. p. 40.
5. Also known as a 'bat fowler', the only known surviving example of this splendid piece of collecting apparatus is from an incomplete net frame discovered in the Hope Museum at Oxford by the late Malcolm Simpson, who had it meticulously restored. After his death in 2010 it was returned to the museum (*see* Recommended further reading).
6. His awareness of colour in the natural world led to the publication of *Natural System of Colours* in 1766 (later edited by Thomas Martyn and republished in 1811), in which is featured his famous prismatic colour wheel, illustrating his theory on the relationship of colours. The original painting is in the Royal Academy of Arts, and for entomologists who may not be aware of this facet of his work, it is well worth a view on the Academy's website: www.royalacademyprints.com/image/808463/moses-harris.
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9/10. London Metropolitan Archives, St Andrew, Holborn, Register of Baptisms, 1724 1739/40, P82/AND2/A/001/MS06667, Item 009.

11. London Metropolitan Archives, St. Giles, Cripplegate, Composite register 1726/7 1733, P69/GIS/A/002/MS06419, Item 016. For the history of fan making *see* The Worshipful Company of Fan Makers website: www.fanmakers.com
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17. Lisney, A. A. 1960. *A bibliography of British lepidoptera, 1608 1799*. London. Illustration page 156: Proposals For Harris's *Aurelian*. 'Engraving by Subscription A Collection of Prints of Butterflies & Moths. Drawn from the Life, by M. Harris.' Subscriptions were being taken by him at Mr Biddle's Watch Maker in New Bond Street in 1758.
18. London and Surrey, England Marriage Bonds and Allegations, 1597 1921.
19. Mays, R. Harris, Moses (1730 *c.*1788), *entomologist and artist*. Oxford Dictionary of National Biography. Oxford University Press 2004 11. On the last plate (XLIV) in *The Aurelian* is depicted a 'Spotted Elephant' (Bedstraw Hawk-moth) larva that Moses Harris had the good fortune to find at Barnscray near Crayford in Kent in August. He does not state the year but the plate is dated March 1st 1773, making it likely that he found it in 1772, lending support to Mays statement that he was resident there around the time.
20. Smith, C. H. 1842. *The Naturalist's Library* (edited by W. Jardine). Vol. XIII. Mammalia vol. 1. 'Memoir of Dru Drury'. Edinburgh: 48 49.
21. Trade cards became an increasingly popular method for advertising one's business from the mid-eighteenth century onwards with the advent of the statutory abolition of shop signs that overhung the narrow streets. Apart from blocking out the daylight, failure of the often neglected ironwork that supported these heavy signs occasionally proved fatal.
22. Graves, A. *The Royal Academy of Arts; A complete dictionary of contributors and their work from its foundation in 1769 to 1904*. London 1905.
23. Hobson, R. L. 1903. Catalogue of the collection of English Pottery in the Department of British and Medieval Antiquities and Ethnography of the British Museum London, BMP 1903. 1551.

    Dawson, A. 1984. Masterpieces of Wedgwood in the British Museum, London BMP1984: page 36, fig 23.

    The Metropolitan Museum of Art, New York's webpage: www.metmuseum.org/Collections/search-the-collections/10004050 has a photograph.
24. Lisney, A. A. 'Moses Harris', *A bibliography of British lepidoptera, 1608 1799* (London, 1960): 156 75. On page 157 he mentions a copy of *The Aurelian* that belonged to Lord Crawford in which there is a note dated 1789 stating that the volume was purchased from Harris's widow. Possibly Harris's last commission was some illustrations for William Martyn's *New Dictionary of Natural History*, Harrison & Co. London. 1785 (this book may have been issued in fasicules, as the plates are dated at weekly intervals). One of the very last plates in the book, signed by Moses Harris, is dated 17th January 1787 by the publisher. If the completion of this commission and publication were fairly contemporaneous, it would put his death between 1787 and 1789.
25. Harris, M. 1766. *The Aurelian or Natural History of English Insects; namely Moths and Butterflies. Together with the plants on which they feed*. Introduced by Robert Mays. Newnes Country Life Books, Middlesex, England. 1986.

26. In their reproduction here, a minimal amount of aesthetic digital restoration has been undertaken, without compromising the integrity or originality of the artist's work. On *Plate 1* some water-caused smudging has been removed from the vellum background in the vicinity of the young larva at the base of the grass; on *Plate 6* a stain can be seen on the nettle leaves; where this continued onto the background vellum area, it has been removed; on *Plate 7* a scratch in the paint to the leaf on which the Peacock is resting, has been repaired; and again on *Plate 10* some water-caused smudging has been removed from the vellum background. Interestingly, the paint damage to the Privet Hawk-moth pupa on *Plate 3* has revealed Harris's pencil work underneath.
27. Graves, A. *The Royal Academy of Arts; A complete dictionary of contributors and their work from its foundation in 1769 to 1904*. London 1905.
28. Bentley, Jr, G. E. *"The Edwardses of Halifax" as Booksellers by Catalogue 1747 1835*. Studies in Bibliography, 45 (1992): 187 222.
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    Riley, N. 1944. *Some British Moths*. Penguin Books Ltd, London; and

    Newman, L. H. 1965. *Hawk-Moths of Great Britain and Europe*. Cassell & Co. London: 52.
30. Riley, N. 1944. *Some British Moths*. Penguin Books Ltd, London.
31. Lisney, A. A. 'Moses Harris', *A bibliography of British lepidoptera, 1608 1799* (London, 1960): 156 75.
32. Apart from some compositional changes, both these paintings already appear as plates XXI and XXXVII in *The Aurelian*, published twelve years earlier; neither painting includes any new species.
33. Its proper title is *Holy Bible, Containing the Old Testament and the New*. It was published in London by John Reeves in 1802 and consisted of nine volumes, illustrated with over 700 water-colour drawings by John Harris senior, and is now in the Houghton Library of Harvard University, Massachusetts. An illustration from this, signed by him is shown on *(Fig 6)* (courtesy of Houghton Library, Harvard University. Call no. f Bi 65.802 v1. Houghton Library, Harvard College Library).
34. Weimerskirch, P. J. 1993. John Harris, Sr., 1767 1832: a memoir by his son, John Harris Jr., 1791-1873. *Book Collector*, 42; 245 52.
35. Thomas, M. 1789. A short account of the nature, principle and progress of a private establishment instituted for the purpose of instructing youth in the art of illustrating and painting subjects in natural history.
36. Thomas, M. 1789. *The Universal Conchologist*. London. (See also University of Glasgow Library Special Collections Department's webpage: www.special.lib.gla.ac.uk/exhibns/month/july2009.html. A first edition of the rare complete set sold for over £86,000 at Sotheby's auction in New York in 2011.
37. Magg Bros. Ltd (1996). *Bookbinding in the British Isles: sixteenth to the twentieth century, Part 1*. Magg Bros. Ltd. London 1996: 72.
38. On his trade-card (Fig.9) (dated 1793) his address is Princes Square, Cleaver Street, Kennington; in 1797 he was living in Amelia Street, Walworth; by 1801 he was residing at 35, Penton Street, Walworth; by 1810 he had moved to 27, Mansion House Row (now Cottington Street), Kennington, where he remained until shortly before his death, when he is recorded by P. J. Weimerskirch as living in Wandsworth Road.
39. Mallalieu, H.. Harris, John (1767 1832), *watercolour painter and illustrator*. Oxford Dictionary of National Biography. Oxford University Press 2004 11.
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Beetlemania!

An exhibition exploring the natural, scientific and cultural importance of

ARTICLE

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Behind *Beetlemania!*

Coleoptera are the largest Order of organisms on the planet. There are over 370,000 different species, compared to only around 4,500 species of mammal. New beetles are being discovered each year, with an enormous 3,485 new species discovered in 2011 alone (Wilkins, 2012).

Humans have evolved a very strong association with these colourful creatures: they have been portrayed in myths, early literature, cars and even a rather familiar rock group! The idea of an exhibition about beetles was developed in early 2010 by the author in partnership with Peter Smithers and Dave Bilton from Plymouth University, and Andrew Whitehouse from Buglife – The Invertebrate Conservation Trust.

The exhibition was divided into five sections to cover:

- What beetles are
- Imaging through time
- Beetles role in culture
- Museum collections and conservation
- Beetle activities

Beetles, beetles everywhere!

The first section of the exhibition explored what beetles are and where they fit into all the other organisms on earth. Large, wall-mounted panels explained how taxonomists make sense of the hundreds and thousands of different species. The different Phyla, Classes, Orders, Families and Genera and species were explained, using the Bombardier Beetle (*Brachinus crepitans*) and Human (*Homo sapiens*) as comparisons.

The general life cycle of beetles was displayed in large graphic panels, demonstrating that different species have astonishingly different lengths of life cycle. The larvae of the huge Stag Beetle (*Lucanus cervus*),for example, can live for up to five years, whereas the adults only live between the months of May and August! At the other extreme, some species, such as the Wheat Weevil (*Sitophilus granarius*) can have at least four generations in a single year! The display case in this section included several microscope slides from Plymouth City Museum and Art Gallery's (PCMAG) natural history collections. The slides contain beautifully preserved larvae of many different species demonstrating the variety of shapes and sizes of different species of these little youngsters.

The largest and smallest beetles in the world and in the UK were also discussed on a panel with supporting specimens in the display case. A large spirit-preserved Goliath Beetle (*Goliath* sp.) was displayed alongside a male and female Stag Beetle (*Lucanus cervus*), and the tiny Titan (*Nephanes titan*). Other specimens in the exhibition demonstrated the variety of size within this incredibly diverse Order.

A wall of beetles

There are 160 Families of beetles worldwide (Lawrence *et al*. 1999) and 70 in the UK (Duff, 2008). PCMAG holds over 30,000 specimens collected by James Higman Keys and donated to the museum after his death. This provided the perfect opportunity to display a nationally important collection with many of the specimens being on display to the public for the first time.

Old drawers from a redundant cabinet were lined with UV protecting security film. Each was cleaned, lined with Plastazote, and mirror plates added to the back. 18 old drawers were used to display 18 different Families of beetles from the Keys collection. Each Family was re-pinned from Keys original drawer into the old drawers and new species labels were printed and pinned. Each Family took two and a half hours to complete.

The wall of beetles had a strong visual impact to allow the general public to see the vast variety of beetles. It was made clear that within each tray, *only a selection of species were displayed*. The wall of beetles only touched the surface of this amazing Order of insects. Many species in these Families are small, so the old drawers were mounted low and magnifying glasses with built in LED lights were available

DIVISION	BOMBARDIER BEETLE	HUMAN
Kingdom	Animalia	Animalia
Phylum	Arthropoda	Chordata
Class	Insecta	Mammalia
Order	Coleoptera	Primates
Family	Carabidae	Hominidae
Genus/species	*Brachinus crepitans*	*Homo sapiens*

Explanation of the different Phylum, Class, Order, Families and Genus and species

Capturing Coleoptera

How beetles have been captured was the focus of the next section. From early microscope slides to beautiful glass plate negatives, and from the incredible detail of Scanning Electron Microscopes (SEMs) to artists' interpretation of behaviour, beetles have been immortalised in many different ways, each as beautiful as the last.

The invention of the first microscopes in 1590 by two Dutch spectacle makers, Zaccharias Janssen and his father Hans, opened up the miniature world in all its incredible beauty. Microscopes became more affordable in the 1800s, allowing amateurs and scientists alike to marvel at things never before seen with the naked eye. PCMAG holds over 500 microscope slides mounted by James Higman Keys. Slides were displayed in the exhibition alongside large framed images of the slide. Slides were, and still are, incredibly useful to study the small parts of beetles.

An early photography method using glass dates back to the 1840s. Taking photographs using microscopes, collectors were able to take detailed close ups of beetles and other insects. These would have been printed and used as reference for identification, or for publications. A selection of James Higman Keys glass plate negatives were displayed on a light box. Five glass plates were matched to one of Keys publications where he describes a new species of weevil (Keys, 1911). Before this publication there was just one species (*Barypithes pellucidus*) in his collection.

SEMs have revealed the details of the insect world with jaw dropping results. Large scale SEM images of the tiny water beetle *Oomtelecopon sebastiani* were mounted on the wall; one large 3D image and four large close ups of this tiny beetle's head. 3D glasses were provided, alongside the life size specimen of *Oomtelecopon sebastiani*, giving the visitors a true sense of scale.

Alongside large images by scientists were some beautiful watercolour illustrations of beetles which had been painted in the wild using the subtle and loose method pioneered by the artist David Measures. These were loaned by local artists John Walters and Jennie Hale. These watercolours are unique in that they are sketched from life and capture the different behaviours that were observed at that time. John Walters, for example, observed an Oil Beetle (*Meloe proscarabaeus*) in the wild and sketched its different movements alongside annotated notes. A beautiful large scale metal sculpture of a Devil's Coach Horse (*Ocypus olens*) was developed by Gary Thrussell. This incredibly detailed and morphologically accurate model was specially made for this exhibition (below).

Beetles role in culture

From the Ancient Egyptians to comic book superheroes, these incredible insects have been a part of human culture for millennia. The accompanying display case contained many objects linked to the graphic panels, including scarab jewellery from Ancient Egypt, Ladybird books, The Beatles LP, VW beetle model cars, greeting cards and much more!

Over 2,000 years ago, the Ancient Egyptians believed that ball-rolling dung beetles were sacred. These iconic beetles were thought to represent the god Khepri who rolled the sun through the sky, then through the underworld (night), only to roll it back again at sunrise. This beetle has been associated with rebirth and the afterlife by the Minoans and the Romans; the adult scarabs emerging from balls of dung fascinated these early cultures.

The Death Watch Beetle (*Xestobium rufouillosum*) has had a strong fascination by humans over the last hundred years. In the early evenings, a gentle 'tap tap tap' could be heard coming from the beams of old houses. The eerie sound would send shivers down the owners' spines. The sound implied that Death itself was on its way. Fortunately, the tapping noise is not made by something supernatural. A small male Death Watch Beetle bangs his head on the inside of wooden beams to attract a female. The chilling sound has inspired horror writing over the years. Edgar Allan Poe's, *The Tell-Tale Heart*, is a story of a man slowly going insane. He believes he can hear the beating heart of a dead man. The sound is in fact the Death Watch Beetle tapping his head. John Keat's 1818 poem, *Endymion*, mentions the eerie sound of the beetle;

"Beset with painful gusts, within ye hear,
No sound so loud as when on curtain'd bier,
The Death-watch tick is stifled."

Beetles appear in modern Western culture. The Volkswagen Beetle is a classic example. Originally called the Volkswagen Type-1, this is the longest running car of a single design ever produced. One of the most successful rock groups in the history of music may have their name from this group of insects. There are, unfortunately, different stories about how they got their name. The bass guitarist, Stuart Sutcliff, suggested *The Beetles* and John Lennon liked this name, as there was a link with *Buddy Holly and the Crickets*. Lennon wanted to re-spell it with an 'a' as in music 'beat'. Paul McCartney, however, has said that the spelling came to him in a vision. It may simply be that *The Beatles* got their name from the collective noun for a group of beetles, which is 'a beat' (Persails, 1994).

The colourful elytra of some beetles have been used to decorate temples! The Japanese Empress Suiko was crowned in 592AD and the Temple of Horyuji, in Nara, was built for her. This temple was decorated with 9,000 wing cases of the beautifully sparkly Buprestid Beetle, *Chrysochroa fulgidissima*. The ceiling of one of the rooms in the Royal Palace in Brussels, Belguim, is covered with over 1.6 million wing cases of this beautiful tropical beetle.

Coleoptera have also been included in some very early art. The German artist, Albrecht Dürer, produced a famous water colour of a single Stag Beetle in 1505. At the time insects were often thought of as some of the lowest of animals, but Dürer's painting portrays this big beast as a proud creature. He also associated the Stag Beetle with religious paintings of Christ, linking the emergence of the adult from the pupae with the resurrection of Jesus.

Surprisingly, this group of insects appears to be fairly popular in literature. Richard Marsh's Victorian supernatural book *The Beetle* (1897) tells the tale of a shape-shifting beetle from Ancient Egypt terrorising London. *The Beetle* was published at the same time as Bram Stoker's *Dracula*, and sold more copies! *The Metamorphosis*, by Franz Kafka (1915), is a strange story of a man who wakes up to discover he is a giant beetle and the stranger events that follow! The more sinister *Boxer Beetle*, by Ned Beauman (2010), describes an entomologist at the outbreak of World War 2 who discovers a beetle with swastika markings on its elytra.

The more familiar beetle, the Ladybird, has been an iconic symbol on children's books for almost 100 years. Ladybird Books were first printed in 1915, with the Ladybird logo on the very first one. The logo has changed through time, by starting with an open-winged Ladybird, which changed to the familiar closed winged Ladybird in the 1950s. A beetle was also to become a comic book superhero. In 1939, *The Blue Beetle* first appeared as rookie police officer; Dan Garret put on a chainmail suit and ate special vitamins to battle crime at night. This has been recently revamped, with a young boy, Jamie Reyes, who discovers a strange scarab beetle. The beetle fused itself to his spine, giving Jamie superhuman powers which he uses to battle intergalactic aliens.

Importance of museum collections

Two important collectors from PCMAG's natural history collections are highlighted in the exhibition, James Higman Keys and Jack Spittle. The Keys Coleoptera collection was bequeathed to PCMAG after his death in 1941. He lived in Plymouth and worked full time in his father's book printing business. During his life he amassed an enormous collection of over 26,000 British beetles, and over 4,000 foreign beetles, 500 microscope slides and over 40 glass plate negatives. Keys supplemented his British beetle collection with an extremely detailed catalogue with notes relating directly to the specimens.

Ronald John Spittle, known to his friends as Jack, was another meticulous collector. He worked for the Severn River Board, and later the Devon River Authority. He sampled water in streams and rivers across Devon and Somerset, which allowed him to also collect freshwater invertebrates. From the 1970s to the mid-1980s, he amassed over 15,000 freshwater insects which are preserved in spirit.

James Higman Keys (left) and Ronald John Spittle (right).

Beetles under threat

Around 90 species of beetle are thought to have become extinct in the UK in the last 200 years. Many beetles are specially adapted to live in a certain environment with certain animals and plants. Increased development of the countryside and intensive farming are the two main reasons that their delicate habitat is being lost. In the South West, there are some of the UK's rarest beetles, including the Blue Ground Beetle (*Carabus intricatus*), the Cliff Tiger Beetle (*Cylindera germanica*), the Black Oil Beetle (*Meloe proscarabaeus*), and the Lesser Silver Water Beetle (*Hydrochara caraboides*).

Beetle activities

A children's activity area was developed in one corner of the gallery. There was a lot of information in the exhibition with a total of 25 graphic panels, so this activity area allowed the children to focus on what they had seen in the exhibition and use their imagination. As well as three activities, leaflets, beetle identification posters and books were included for the children to look at.

One activity focused on the large SEM images displayed. An A4 fact sheet was printed, with information about SEMs and their use. On the back was an SEM image of a full beetle (*Hydraena riparia*), with three zoomed in close ups of different beetle parts. The children had to use their knowledge learnt from the exhibition and the fact sheet to label the beetle parts. This activity was potentially quite quick to complete, but was intended for the children to take away with them so they would have the amazing images and information with them.

Real specimens have proved very popular with education outreach activities. Beetles, however, are very fragile little creatures. The activity area included a handling section using beetles specimens in resin. Visitors used

magnifying glasses to look closely at the beetles, draw them, and, from the information in the exhibition, label the different parts. This has been successful with previous natural history exhibitions, and members of the public appear to respect the resin specimens; in past exhibitions none have been stolen!

The final activity allowed the visitor to use their imagination and knowledge from the exhibition to create their own beetle. It could be any shape, size and colour. Once they had finished, they had to give their beetle a scientific name, using some examples of Latin words provided. This activity also provided feedback from the younger visitors, with a space for their Latin name, common name, where it would live, and what they thought about the exhibition. Once they had created a new species, it was hung on the wall, creating a beetle environment in the museum. This proved popular with children and adults alike, and provided extremely useful feedback about the exhibition.

Beetles on tour!

Beetlemania! is the first exhibition at PCMAG to focus solely on one Order of insects. The variety of interesting facts about Coleoptera and the association of these little insects to humans have made this exhibition fun for everyone. An enormous 7,502 specimens from the natural history collections were displayed, most of which for the first time, allowing the visitor to see the variety of beauty in many different Families. Responses and feedback after the first two weeks of the exhibtition were incredibly positive, with over 60 new species created by children and adults for the beetle environment.

The graphic panels in this exhibition have been produced so they can tour to other museum venues. A touring schedule is currently being developed with partners in the South West. If you are interested in finding out more about borrowing the *Beetlemania!* exhibition, please contact the author.

Acknowledgements

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We have been fortunate to work with many local artists who have worked on some pieces specially for the exhibition; John Walters and Jennie Hale's beautiful watercolour illustrations; Gary Thrussell from Thrussell and Thrussell created an enormous metal Devil's Coach Horse.

An enormous thanks also to the many people who helped with images, including, The J. Paul Getty Museum, Los Angeles, Ladybird Books Ltd., Paul Brock, Thorsten Haustein, Adam Hawtin, Greg Hitchcock, Roger Key, Tapio Kujala, Jonathan Michaelson, Phil Roxby, Dragisa Savic and Mark Telfer.

Weblinks

Plymouth City Museum and Art Gallery: http://www.plymouth.gov.uk/museums

Plymouth University: http://www.plymouth.ac.uk/

Buglife: http://www.buglife.org.uk/

Royal Entomological Society: http://www.royensoc.co.uk/

John Walters: http://johnwalters.co.uk/

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Salsa Invertebraxa

– A Graphic Novel by Paul Phippen –

Peter Smithers & Duncan Allen

As the sun sinks below the horizon of another tropical day in rural Cambodia, the shadows cast by the vast temple complex of Angkor Wat deepen and merge drawing the deep blanket of a tropical night across the surrounding villages. Families finish the day's work and dowse their lights leaving a lone artist bathed in the glow from his computer monitor, its bright radiance now a beacon for the forest insects that fly in and strut across his screen. This is Paul Phippen, designer and illustrator, an artist fascinated by the creatures that stalk his workplace each night. Paul is a graphic artist who has spent six years producing a graphic novel whose characters are all insects.

The novel is a complex and enigmatic fantasy set in another world but linked to the biology of our own. It charts the dance of life across a fantastic forest that will ignite a hint of nostalgia in any entomologist who has spent time in the tropics. *Salsa Invertebraxa* is a rich and colourful tropical tapestry that hauls the reader into the microcosm, a journey across two days that charts the interactions of two symbiotic insects which encounter a carnival of invertebrate form and colour.

Graphic novels with an entomological theme are few and far between, it could even be a first. So *Antenna* was keen to talk to Paul and discover how and why the novel was created. Our assignation with Paul was almost as exotic as the book, meet beneath the tail of the dinosaur in the entrance of the Natural History Museum had been the plan. Paul was waiting and so after introducing ourselves, coffees are obtained and we sit down to learn how he came to produce *Salsa Invertebraxa*.

Paul was relaxed and easy to engage with, confessing only slightly nervously that we were the first entomologists he had actually spoken with but was relieved to find us a sympathetic audience. He need not have worried as Duncan and I were hooked after the first page. As a recent illustration graduate Paul had produced a cartoon of a mosquito in a leather flying helmet and found himself intrigued by the image.

"It was 1996, I was in my room in Dulwich, just doodling, and this is something I very rarely do, just doodle. As I doodled I drew a mosquito reclining and casually blowing blood bubbles as if he was in an opium den, it was all very stylized with him wearing goggles and flying helmet. I thought to myself that this would be a great subject. Every artist looks for their muse or a subject to call their own and I didn't know of any other artists at that time who were working on insects".

Later he discovered a scorpion fly in his flat in London and was amazed by the alien nature of the insect. These unlikely starting points grew over the next few years and became a deep fascination with the insect world, which led Paul to trawl through text books and museum exhibits in search of a basis for the novel that he was developing.

"In the beginning the project started off very stylized and cartoony, with the insects being very anthropomorphic. The more I studied insects the more I realized I was doing the subject a total disservice. They are much more wonderful and fascinating in their own right so to stray away from their true form would produce an inferior result".

The novel was, in total, fifteen years in the making. The first nine years the book occupied the side-lines as a hobby, while Paul had a career making video-games, and progress was a patchy affair of scatter-shod ideas and early drafts. Full time production began in 2005. It was another six long years to completion in 2011, with the characters gradually evolving on the pages of Pauls sketchbooks. Paul's style had been influenced by artists like Alan Lee and James Gurney, whose high definition, ultra-real style lent itself to depicting Paul's imaginary forest and the creatures that inhabit it. He had begun with a mosquito and a louse, then using his imagination evolved them into more exotic forms.

"I had a whole series of sketches developing the mosquito and the

second character which is based on a louse. This is a little unusual as I picked the two most unpopular parasites of humans. It was a totally unconscious decision; the louse ended up as a combination of six different species of louse. What really attracted me to lice were the claws and the antenna. The antenna I noticed, have these strange indentations that look like speakers. I looked at lots of SEM's and saw just how different they were from that of the larger insects, and this fascinated me".

Paul describes this process of creating these images as being like jazz improvisations but with insect forms. While the insects and other invertebrates are clearly an exotic fantasy, Paul has purposely kept his creations linked to those in our forests, his creations being strongly influenced by the insects that stalk across his monitor each night back in Cambodia. The idea that two individuals could be the focus of a story that is played out around them was inspired by films like *Star Wars*, with its two robot characters that are the thread that connects the various plots, and the films of Akira Kurosawa. Whilst the story has a distinctly Darwinian flavour with characters being predated on a regular basis there is also a sense of mischief which was inspired by films from Studio Ghibli.

The story is inexplicable with no recognizable behaviours I could detect, but to some extent this reflects our current understanding of complex tropical systems. There is still so much to discover!

The text was added after the graphics were completed with the intention of adding an additional layer to the novel, as while the images tell a story the text is a poetic narration that emphasizes the cyclical nature of life in the forest. Duncan and I were amazed at the diversity of morphologies that appeared in the book and I have to confess we played the game of trying to assign each fantasy invertebrate to a known taxa and managed almost 90% of the characters. However, our academic impulses aside, *Salsa Invertebraxa* is a visual treat which should be enjoyed for its own sake. Readers should lose themselves in the imagery and revel in the mystery of the behaviors that are played out before them. *Salsa Invertebraxa* is a riot of entomology that should fascinate and enchant anyone who has even a vague

Details and more images can be found at http://www.behance.net/gallery/Salsa-Invertebraxa-(A-Graphic-Novel)/2349816

The novel can be bought from http://www.pecksniffpress.com/ordering.html Price $41.00 inc international P&P

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ARTICLE

The Insect Pollinators Initiative and Status and Trends in European Pollinators

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There is currently much concern about pollinator declines, globally and in the UK (Biesmeijer *et al.* 2006). Animal pollination is important for many wild plants and crop species (Klein *et al.* 2007, Ollerton *et al.* 2011) and the value of pollination services provided by animals has been estimated at €153 billion globally for 2005 (Gallai *et al.* 2009). There are multiple threats to insect pollinators including diseases, intensive land-use, invasive species and environmental changes such as habitat loss and climate change (Potts *et al.* 2010). It is essential that we understand these threats to pollinators and their possible consequences for the environment, conservation and food security.

In 2009 and 2010, two programmes were set up to investigate the threats to insect pollinators in the UK and Europe. The UK Insect Pollinators Initiative (IPI) is jointly funded by the Biotechnology and Biological Sciences Research Council, the Department for Environment, Food and Rural Affairs, the Natural Environment Research Council, the Scottish Government and the Wellcome Trust, under the auspices of the Living With Environmental Change programme. The IPI is funding nine projects aiming to research the causes and consequences of threats to insect pollinators, and subsequently inform future mitigation strategies.

The European project Status and Trends in European Pollinators (STEP) brings together scientists working on insect pollinators from across Europe to investigate pollinator declines at a European level, measure the ecological and economic impacts of declining pollinator services and review potential and existing mitigation options. This project is funded by the EU Seventh Framework Programme (FP7; 244090).

At ENTO'12 a session convened by Catherine Horsforth (NERC Centre for Ecology and Hydrology & University of Leeds) brought together researchers from both programmes to discuss findings from the STEP project and three of the nine projects funded under the IPI. Dr Luísa Carvalheiro (University of Leeds, NCB Naturalis) presented findings from a STEP study investigating the links between historical land use change and plant and pollinator populations; Dr Katherine Baldock (University of Bristol) presented an overview of and initial findings from the IPI project "Urban Pollinators: their Ecology and Conservation"; Dr Michael Garratt (University of Reading) presented recent findings from the "Sustainable Pollination Services for UK Crops" project; and Dr Deepa Senapathi (University of Reading) presented the preliminary findings from the project entitled "Linking Agriculture and Land use change to pollinator communities".

For further information about the UK Insect Pollinators Initiative please see the website www.insectpollinators initiative.net

For further information about the project Status and Trends in European Pollinators please see the website www.step-project.net

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Assessing how the rate of decline of pollinator diversity is changing through time

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What do we know about pollinator declines?

Several abiotic (e.g. landuse and climate) and biotic (e.g. alien invasive species) changes can negatively affect pollinators (see Potts et al. 2011, Montero-Castano & Vila 2012). Agricultural expansion and consequent habitat fragmentation, spillover of pesticides and eutrophication are known to have important negative effects on the diversity and abundance of many flower visitors (Winfree et al. 2009; Holzschuh et al. 2008; Van Dyck et al. 2009). Indeed, during the past century Europe's agricultural expansion and industrialization peaked (FAO 2012, EEA 2010), which was paralleled by drastic declines in pollinator abundance and richness (Biesmeijer et al. 2006; Bommarco *et al.* 2011; Dupont et al. 2011). Serious declines in the number of native pollinator species have also being reported for Central and North America (Dias et al. 1999; NAPPC, 2007), being estimated that over the next 300 years, up to half a million insect species may become extinct (Mawdsley & Stork 1995).

More than 80% of plant species depends on insects for pollination (Ollerton et al., 2011), so pollinator declines can have important effects for the conservation of wild plant diversity, the maintenance of natural ecosystems and finally on agriculture (Garibaldi et al. 2009). Moreover, as species are embedded in complex networks of interactions losses of mutualistic partners can lead to a cascade of local extinctions (e.g. Memmott et al. 2004).

Efforts to closely follow these changes in flower visitor communities have been recently made, with the implementation of long-term monitoring schemes (e.g. UK Butterfly Monitoring Scheme implemented in 1976, Botham et al. 2008). However, for most countries such high quality data are not available, evaluation of diversity declines being dependent on historical databases of species presences (Biesmeijer et al. 2006).Such studies indicate that declines have occurred in the past, but it is still unclear exactly when these changes took place (did most diversity decline occur during the 50s and have they been accentuated since the 90s?).Moreover, it is also unclear how representative the patterns of change in one group are of patterns of change inoverall flower visitors. If certain groups of species are to be used as bioindicators of biodiversity loss, it is crucial to understand how analogous changes among different groups of species are.

What has been done to halt such declines?

Concern about biodiversity loss, its ecological, social, economic and ethical consequences has increased greatly in recent decades, entering the political agenda in many countries. Ambitious international and national biodiversity policy targets (from Rio 1992 to CBD Aichi targets) have been agreed and have led to a considerable public investment in conservation. Several countries in Europe have invested in management measures in the past 20-25 years that aim to maintain biodiversity. Such practices involve hedgerow creation, plus the regulation and reduction of pesticide use in croplandsas well as the establishment of flower margins or agri-environment

schemes (Kleijn&Sutherland, 2003). There are reports that such practices may have benefited some species of flower visitors, leading to amelioration of declines on some species (e.g., Backman&Tiainen, 2002; Kleijn & Sutherland 2003; Carvell et al. 2007). However, the ability to colonize restored habitats differs among groups, and agri-environment schemes have mixed biodiversity effects, benefiting mostly common and widespread species (Kleijn et al. 2006).

While there is a widespread perception that investment in environmentally-friendly measures has been unsuccessful in slowing down biodiversity losses, until recently there have been no extensive quantitative comparisons of the rate of change of multiple taxa before and after the implementation of environmentally-friendly policies.

The Project

Our research project is part of STEP project (Status and Trends of European Pollinators; www.STEP-project.net) and runs in collaboration with Prof. Koos Biesmeijer (NCB-Naturalis), Prof. Bill Kunin (University of Leeds) and several researchers in EIS, FLORON, Alterra/WUR, De Vlinderstichting, INBO/BioBel, KULeuven, University of Mons, BSBI, Butterfly Conservation and the University of Reading.

We will combine improved and robust rarefaction and extrapolation methods with a meta-analytical approach, and apply them to a substantially larger dataset to calculate biodiversity change between four 20-year periods in three European countries at multiple spatial scales (10x10km cells to the whole country). We will also evaluate changes in patterns of biotic homogenization, by investigating how similarity (and thus turnover) of species assemblages across space (evaluated by comparing assemblages in 10km grid cells) changes over time. Combining a multi-scale analysis of species-richness change (see Figure 2) with assemblage similarity analysis allows us to detect, e.g. whether any fine scale richness losses caused by local species extinctions are being masked by expansion of a few increasingly ubiquitous species.

We focus on three countries for which we have access to large historical records databases on plants and flower visitors: the United Kingdom, the Netherlands and Belgium. Four 20-year time periods are being compared: 1950-1969, 1970-1989, and 1990-2009, and whenever possible 1930-1949, covering a period during which the studied countries were subjected to substantial changes in land-use, climate and environmental policies. Given the recent concern about the potential ecological, economic and social consequences of pollinator decline, we focus our analyses on three groups of flower visiting insects which contribute to plant pollination: bees (Hymenoptera: Apoidea), hoverflies (Diptera: Syrphidae) and butterflies (Lepidoptera: Papilionoidea and Hesperioidea) and on wild plants (taking into account their dependence on insects for pollination). Given the importance of bees for pollination, and the recognized high susceptibility of bumble bees (Apidae, Bombini) to environmental changes, we analyse bumble bees separately from other bees.

This is the first study to evaluate changes in the rates of biodiversity loss at different spatial scales and for such a broad number of taxa, taking into account not only loss of species but also homogenization patterns. This project will provide estimates of biodiversity change patterns for several taxa (plants and pollinators, see example in Figure 2). Such estimates can then be used to assess how much of the variation in patterns of richness change can be explained by changes in landscape and climate. Our findings will have important implications for future research in conservation, community and population ecology.

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Urban Pollinators: their ecology and conservation

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Urban landscapes are surprisingly heterogeneous with oases of lush greenery hidden in the concrete sprawl that hide a great deal of nature. It is widely recognised that insect pollinators are under threat due to a combination of factors, including habitat fragmentation, agrochemicals, climate change, and non-native species (Potts et al. 2010). There are two schools of thought concerning the effect of urbanisation on pollinating insects. On one hand, urbanisation is considered to be one of the major causes of insect decline, in particular through the alteration of ecological features important to pollinators, such as food and nesting sites. On the other hand, some urban habitats are remarkably good for pollinators; half of all German Apidae species have been found in urban Berlin (Saure 1996), 35% of British hoverfly species can be found in a garden in Leicester (Owen 1991). Urban areas could buffer pollinator communities from some of these threats; acting as a refuge from pesticides, and providing a supply of pollen and nectar resources from early in the year until well into the autumn due to the high abundance of non-native flowers. As urban land cover in the UK reaches 7% (UK National Ecosystem Assessment, 2011) and is likely to increase, it is important to know what pollinators are found where in towns and cities.

The Urban Pollinators Project, funded under the UK's Insect Pollinator Initiative and led by researchers at the University of Bristol, aims to investigate insect pollinators, including hoverflies and bees, in urban areas across the UK. The project team includes academics from the Universities of Bristol, Edinburgh, Leeds and Reading, taxonomists at the National Museum of Wales, local councils and local Wildlife Trusts.

The Urban Pollinators Project is investigating three questions:

1. How does the insect pollinator biodiversity in urban areas compare to that of nature reserves and farmland?

In order to examine how the pollinator communities in urban habitats compare to other habitats, in 2011 the project team collected data at three different sites (farmland, nature reserves, and urban areas) in and

around 12 cities across the UK, ranging from Dundee in the north to Southampton on the south coast. A dedicated team of fieldworkers recorded insects visiting flowers and the plant species on which they were feeding across the 36 sites from May until September. Sampling was conducted along 2m wide transects with a distance of 1km walked per site, split proportionally between the broad habitat types present in the sampling site. All insects were identified to species by Mike Wilson, Mark Pavett, John Deeming, and Brian Levey at the National Museum of Wales during the winter months – no mean feat considering >10,000 specimens were collected! The data will be used to construct flower-visitor networks for each site showing the interactions between plant and potential pollinators. The architecture of these networks can tell a lot about the likely resilience of plant-pollinator communities to environmental change.

It could be hypothesised that the abundance and species richness of insect flower visitors will be greatest for nature reserves (the most 'conserved' habitats), and lowest in the urban habitats (the most 'developed' habitats). However, initial analyses presented at Ento'12 suggest that these measures are comparable between urban habitats, farmland, and nature reserves; urban habitats, it appears, are surprisingly diverse. Further analyses of the flower-visitor networks will allow comparison of the structure of the plant-pollinator communities in the three habitats to determine if they differ in their resilience to environmental change.

2. Where are the hot-spots of insect pollinator biodiversity in urban environments?

During 2012 a range of urban habitats have been sampled more intensively in order to identify potential hotspots of pollinator diversity in urban environments. Urban habitats sampled include allotments, gardens, parks, cemeteries, man-made surfaces (e.g. car parks), urban nature reserves, road verges and pavements. These include potentially diverse nature reserves and gardens, as well as concreted areas that are common within urban environments and likely to be biodiversity poor. In each city insects were sampled along transects totalling 1 km for each habitat, with the 1 km distance divided into ten 100 m transects stratified geographically across the city. As most gardens are too small to accommodate a 100 m transect groups of ten gardens were sampled in each of ten regions per city. In total 180 sites were sampled per city, of which 100 were gardens.

3. What can we do to improve insect pollinator diversity and abundance in urban areas?

In the third and final phase, the project is investigating ways in which urban habitats can be enhanced for pollinator communities. Sowing wildflower seed mixes in urban areas is becoming increasingly popular throughout the UK; for example, more than ten hectares of wild flower meadows were sown at the London 2012 Olympic site, creating the largest ever man-made flower meadow. The project is working in partnership with local councils to plant nectar- and pollen-rich flower meadows in parks, school playing fields, and university grounds, and in 2013 there will be a total of 15 flower meadows in each of Bristol, Reading, Leeds, and Edinburgh. The aim of the meadows is to provide additional and sustained pollen and nectar resources for urban pollinator communities. Three types of meadows have been sown: a perennial mix, and two types of annual meadows with differing

management strategies. The meadows will be sampled in 2013 to investigate the effect of adding nectar and pollen-rich flowers on urban pollinator communities. The findings can also be used by councils to alter their planting strategies to become more pollinator-friendly. For example, opting out of traditionally attractive bedding plants that offer little in terms of pollen and nectar, and instead planting native wildflowers could be both pleasing to the human eye and also beneficial for insect pollinators.

For further information about the project please see our website www.urbanpollinators.org, catch up on news from the last field season on our blog www.urbanpollinators.blogspot.co.uk or follow us on Twitter @BrisUrbPolls, @LdsUrbPolls, @ReadingUrbPolls, @EdUrbPolls. For further information about the UK Insect Pollinators Initiative please visit www.insectpollinatorsinitiative.net

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AgriLand: Linking agriculture and land use change to pollinator communities

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Introduction

There is increasing evidence that the abundance and diversity of both wild (Biesmeijer et al. 2006; Goulson et al. 2008; Patiny et al. 2009) and managed (De la Rua et al. 2009; Potts et al. 2010) pollinators have declined. Pollinating insects are vital in providing pollination services to both crop and wild plant populations. Corresponding declines in animal-pollinated plants (Biesmeijer et al. 2006; Carvell et al. 2006) suggests possible causal links between pollinator and wildflower losses, however, the decline in pollinator communities and the nature of any links to floral changes is still ambiguous. What is apparent, however, is that changes in land use and agricultural intensification may be amongst the most likely causes of pollinator and plant declines (Kremen et al. 2002; Hendrickx et al. 2007). The AgriLand project aims to quantify the links between land use changes and parallel shifts in pollinator communities.

The Project

The AgriLand Project is one of several projects that form part of the UK government funded Insect Pollinator Initiative (IPI). This project has several components, and one of the main aspects is to ask the question: **how have historic shifts in land use impacted pollinator communities?** In order to do that, a team at the University of Reading, in collaboration with the University of Leeds and the Centre for Hydrology and Ecology (CEH), have looked at sites with contrasting recent changes in land use and for which historical pollinator surveys are available. Another component of the project, led by the University of Leeds, is looking at sites with recent contrasting changes in land use, land management and available resources for pollinators, and assessing the pollinator communities in those sites. Combining the results from both these components will help provide a much better understanding of the impact of land use changes in Britain on pollinator communities. In this article we focus on the historic change aspect of the project which included using land use data as well as pollinator data from historic and contemporary time periods.

Land Use Data & Change Detection

In order to detect changes in land use, both **historic and current digitised land use maps** are required. The earliest available land cover maps of Britain - The Dudley Stamp Maps - cover the time period 1925-1948. These have been recently digitised by Natural England and made available through the Environment Agency (http://magic.defra.gov.uk/datadoc/metadata.asp?dataset=259). The latest land cover map available for the UK is the LCM 2007 produced by CEH (http://www.ceh.ac.uk/LandCoverMap2007.html). Changes in land use were analysed by first reclassifying the LCM 2007 to ensure the land-cover categories matched those of the Dudley Stamp maps and then comparing the two at various spatial scales. Change detection analyses were performed at the site level and also at 2km (Fig. 1) and 6km buffer zones around the sites and all analyses were performed in ArcGIS 10.

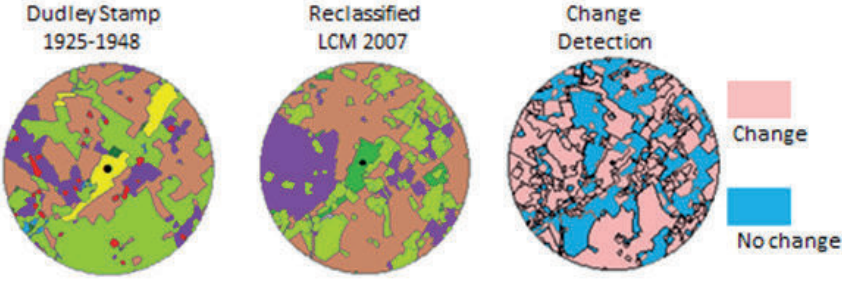

Figure 1. Example of change detection between the historic and current land cover maps at the 2km buffer zone level of one site indicating areas where land use has changed and areas where it has remained unchanged.

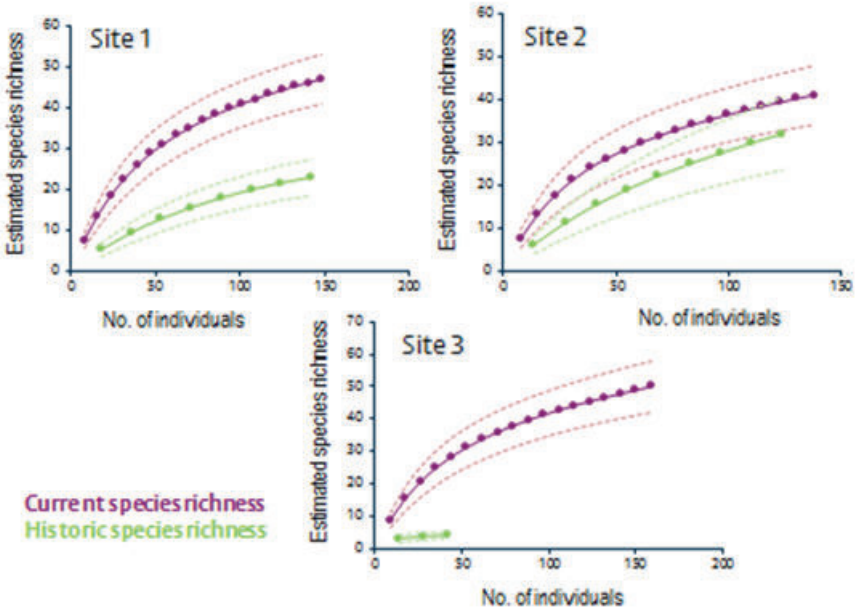

Figure 2. Rarefaction curves from three sites showing different examples of estimated species richness (±95% CI) compared between current and historic periods. Site 1 shows significant changes in species richness; site 2 no significant change in species richness and site 3 has insufficient historic data to draw any conclusions.

Pollinator Data & Shift Detection

The time period documented in the Dudley Stamp maps directed us to select matching **historic pollinator records** for the same time period which have been compiled by the Bees, Wasps & Ants Recording Society (BWARS) database (http://www. bwars.com/). We restricted our pollinator data search to bees and wasps only and found 24 sites with both historical land use and pollinator data in the following counties of the U.K.: Yorkshire (7 sites); Cambridgeshire (1 site); Kent (1 site); Bedfordshire (8 sites) and Dorset (7 sites). These 24 sites were re-surveyed in the spring and summer of 2011 and 2012 and all specimens collected were pinned and identified to species level where possible.

The overall diversity for different sites within a region / landscape (diversity) is determined by two different things: (i) diversity - the mean species diversity at site level and (ii) diversity - the change in species diversity at site level (Whittaker 1972). To investigate whether there had been any changes in species richness and/or composition over our time period, rarefaction methods were firstly performed on the data for each site using the software Estimates 8.20 (Fig. 2). This process compared historic and current estimates of species richness (a measure of diversity) for each site and was chosen because it allowed for the difference in sample sizes and collector method between time periods. A measure of diversity was also performed using Lennon's Diversity Index (Lennon et al. 2001). This specific measure of diversity was used as it accounts for differences in species richness between samples.

Analysis of the results is on-going and it is interesting to note that some sites have seen a shift in species richness, while others show no in change species richness but distinct changes in community composition. Determining whether these shifts are due to changes in land use is still a work in progress. We also plan to explore these relationships further by looking at patterns in changes in relation to life-history traits such as nesting behaviour, feeding preferences and foraging distance, for example. This will help answer the question of whether bees with particular life histories are more or less sensitive to land use change. Impacts at varying spatial scales will also be explored to determine the scale at which land use changes impact pollinators with different foraging and dispersal distances.

This analysis, combined with the other areas on the AgriLand project, will provide a unique and detailed examination of how the management (past and present) of the British Isles affects both wild and managed pollinator populations, floral resources and pollination services. This evidence could then be used to inform land management decisions and provide practical advice for farmers, beekeepers, policy makers and conservationists.

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Sustainable Pollination Services for UK Crops

Crop Pollination

As well as being essential to the functioning of wild ecosystems, insect pollinators contribute to the pollination of 84% of European crop species (Williams 1994) and are responsible for an estimated 35% of world food production (Klien et al. 2007). Insect pollination can increase fruit and seed production; improve quality, speed up ripening and even improve taste. Insect pollination, as an ecosystem service to agriculture, has been valued at €153 billion globally (Gallai et al. 2009) and over £430 million in the UK alone (Breeze et al. 2011).

Crop pollination in the UK is carried out by honey bees as well as many wild insects, including bumblebees, solitary bees, hoverflies, butterflies and moths. There is an increasing body of evidence, however, highlighting the decline of both wild and managed insect pollinators. The recent plight of the honey bee has been well documented with significant losses seen in parts of Europe (Potts et al. 2010) and the US (van Englesdorp et al. 2008). Alarmingly, we have also seen UK declines in the abundance and diversity of many wild pollinators including solitary bees, hoverflies (Biesmeijer et al. 2006) and bumblebees (Goulson et al. 2008).

Despite the importance of insect pollinators and the threats their declines pose to the future of UK agriculture, there are still many unknowns in the ecology and economics of insect crop pollination. We do not know the true contribution made by insects to the yield and quality of many crops; which insects are the most important to UK agriculture; and whether UK pollination services are currently adequate. Furthermore, there is still much to learn about the environmental factors that drive the abundance and diversity of wild pollinator communities.

The Project

The Sustainable Pollination Services for UK Crops project aims to address these unknowns and has the following objectives:

- Establish the contribution of wild and managed pollinators to crop production in the UK.
- Determine to what extent insect pollinators influence crop yield and quality and whether crop pollination services are currently limiting.
- Understand the influence of local landscape on pollinator communities

Figure 1. Pollinator specimens collected in UK crops during the 2011 field season. Photograph: Michael Garrett

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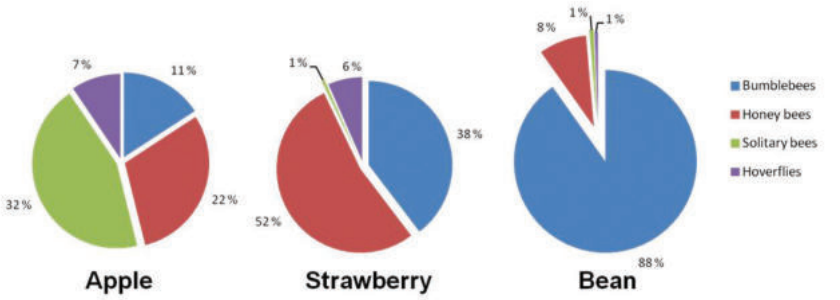

Figure 2. Percentage of visits made by four important groups of pollinators to flowers of three UK crops.

In 2011 a dedicated team of researchers from the University of Reading and the University of Leeds began fieldwork on three important UK crops: apples, field beans and strawberries. Pollinator surveys on working farms across the country using coloured water traps, hand netting and timed crop observations (Fig. 1) have established which pollinator groups are most active in our focal crops. Using exclusion bags and hand pollination experiments during crop flowering, we have also begun to understand the contribution made by insect pollinators to crop yield and quality. With data from detailed 'ground truthing' landscape surveys, we can establish what features of UK landscapes influence pollinator communities in a positive way and thus promote effective crop pollination.

Crop Pollinators

Our surveys have shown that crop pollinator communities are very crop specific and some crops utilise a more diverse range of pollinators than others (Fig. 2). For example, bumblebees are clearly the predominant bean pollinators, whilst apples are readily visited by solitary bees, hoverflies, bumblebees and honey bees. This can partially be explained by the morphology of both apple and bean flowers. Apples have a very open flower with nectar accessible by many different insects. Beans, by contrast, have a flower with nectar that must be earned. Acquisition of this reward requires the pollinator to physically access the base of the flower and in so doing triggers a keel promoting pollination (Delaplane and Mayer 2000). Bumblebees are one of a few groups of pollinators physically capable of this action (Fig. 3). These findings have important implications for management of wild and domesticated pollinators, and any strategies aimed at improving insect pollination of any crop needs to be targeted at those groups of species that are active pollinators of the crop in question.

Figure 3. The bumblebee *Bombus pascuorum* visiting field beans *vicia faba*.
Photograph by Louise Truslove

Crop Pollination Service

So what contribution are these insect pollinators making to the yield and quality of our study crops? If we take apples as an example, our study shows that bagging of blossoms to exclude insects, significantly reduces the number of apples produced (Fig. 4). This is not new; the reliance of apples on insect pollinators has been long appreciated (Free, 1964), but what we have shown is that we can improve fruit set further with the addition of viable pollination by hand, producing the same pattern seen for apple seed number. Given the link between seed number and quality (Voltz et al. 1996), this means that in some instances, apple yield and quality could be improved by increasing the activity and efficiency of pollinators in orchards.

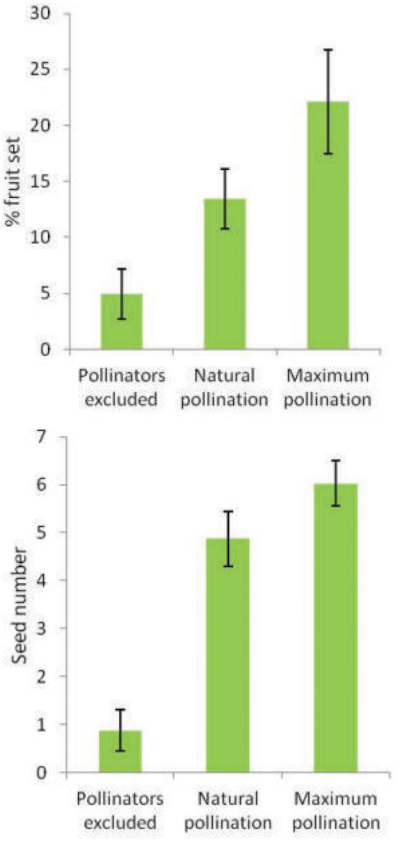

Figure 4. The effects of pollinator exclusion and hand pollination to simulate maximum pollination on fruit set and seed number (mean ± SEM).

Crop Pollinator Friendly Landscapes

In order to exist and flourish in any landscape, insect pollinators require a place to nest and forage resources to support them throughout their active adult life; this can last a matter of weeks for some solitary bees or many months for bumblebee queens (Michener 2000). The ecology of insect pollinators in the UK is diverse, to say the least; from the predatory larvae of hoverflies to the highly social ground nesting bumblebees. So invariably, more diverse landscapes contain more ecological niches and thus support a more diverse pollinator community. Furthermore, landscapes containing higher semi-natural landscape (Ricketts et al. 2008) and increased floral resources (Carvell et al. 2011) are known to increase pollinator numbers.

Using our detailed landscape surveys we will be able to identify what features of a landscape promote an abundant and effective pollinator community in each of our focal crops. With this information we will be able to inform policy makers and land managers alike to promote pollinator friendly landscape management practices and thus improve crop pollination services.

The Future

Much progress has been made in this important area of research and this will continue through the coming seasons. The Sustainable Pollination Services for UK Crops project is also developing UK wide pollination service maps. By highlighting areas where pollination services may be at risk, these maps will be invaluable and timely resources for future agricultural management given the upcoming reforms to the European Common Agricultural Policy. Findings from this research will be used to ensure sustainable crop pollination services and improved food security in the face of both land-use and climate change in the coming decades.

Acknowledgements

Many thanks to all the researchers involved in this project and thank you to all funders of the Insect Pollinators Initiative (BBSRC, Defra, NERC, Scottish Government, the Wellcome Trust). We would also like to thank farmers and landowners whose cooperation is essential for continued research in this area.

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Society News

What do Members want?

The scene: The interior of the activist's den. A small group of entomologists are discussing their sorrows

Reg (not the Registrar, but one of the activists): The RES has bled us white. And what have they ever given us *in return*?

Xerxes (an entomologist): Antenna.

Reg: Oh yeah, yeah they gave us that. Yeah. That's true.

Masked entomologist: And the meetings!

Stan (another entomologist): Oh yes... the meetings, Reg, you remember what it used to be like.

Reg: All right, I'll grant you that Antenna and the meetings are two things that the RES *have* done...

Matthias (another entomologist): And the Journals...

Reg: *(sharply)* Well *yes obviously* the Journals... the Journals go without saying. But apart from Antenna, the meetings and the Journals...

Another Masked Activist: SIGs...

Other Masked Voices: Library... Postgrad forum... National Insect Week...

Reg: Yes... all right, fair enough...

Activist Near Front: And the Handbooks...

Omnes: Oh yes! True!

Francis: Yeah. That's something we'd really miss, Reg.

Masked Activist at Back: Grants!

Stan: *And* we have an Annual Meeting now.
(more general murmurs of agreement)

Reg: All right... all right... but apart from meetings and Antenna and Journals and grants and the library and SIGs and the Postgrad forum and handbooks and National Insect Week... what *has* the RES done for *us*?

Background to the questionnaire

The Membership Committee has the objective of improving the Society's services to its members, but how do we know what members want from the RES? In discussion everyone suggests a different priority list and clearly, what may be important for some may be of little relevance to others. What we need is some objective information from a large cross section of the membership – hence the Membership Questionnaire distributed last year. The preliminary results have been considered by the Membership Committee and some of the results are given.

How representative were the respondents?

233 responses were received representing over 14% of the membership; 162 were from members within the UK (Fig. 1) and 71 were from International members (Fig. 2). This reflects the ratio in the total membership.

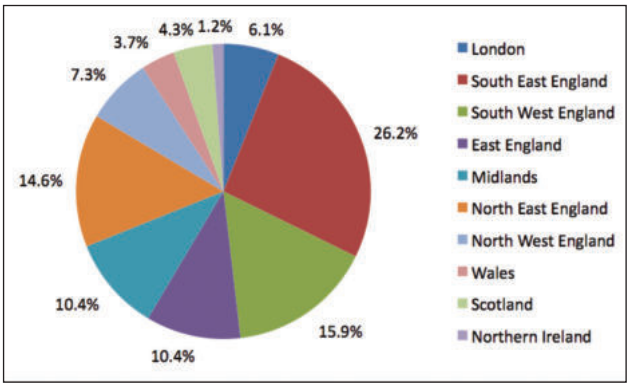


Figure 1. The location of RES UK Members.

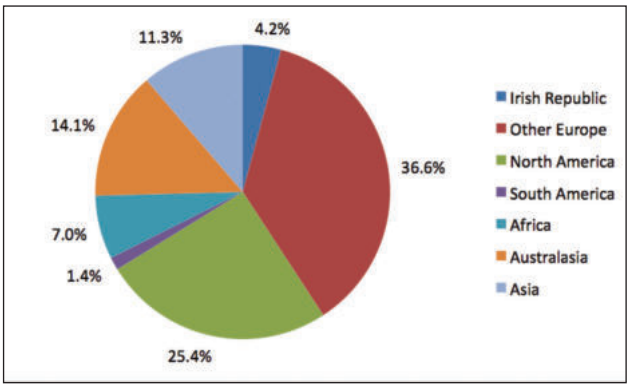


Figure 2. The location of RES International Members.

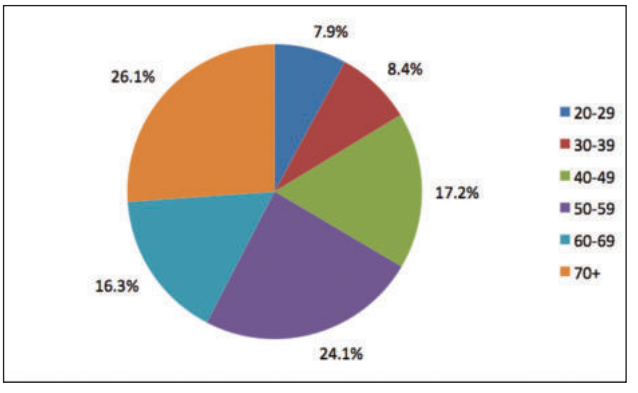


Figure 3. The age distribution of RES Members.

The age distribution (Fig.3) of the respondents is also similar to the age distribution of the membership as a whole. It is of concern that such a large proportion of the membership is over 60. We do recruit a large number from younger age groups, but

they often leave the Society after a time. This is an issue that the Membership Committee is addressing as a priority.

Of those who completed the survey 78% were Fellows and 22% were Members and 85% were male and 15% female (throughout this report, unless otherwise specified, Fellows and Members are referred to collectively as members).

Interests

Some members regard themselves as Professional, others as Amateur and yet others as both, lucky enough to be paid as entomologists, but with a keen interest outside of their work (Fig. 4).

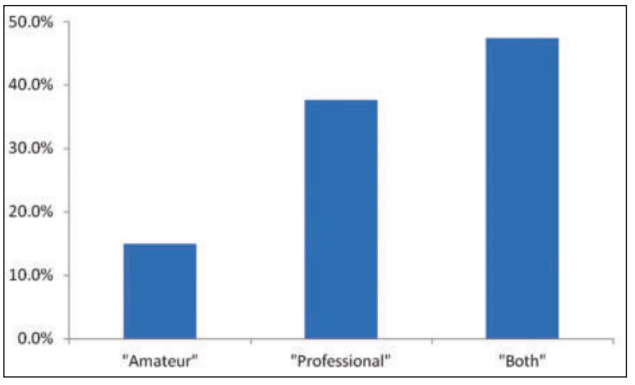


Figure 4. Percentage of respondents who consider themselves Amateur, Professional or Both?

In terms of members' main interests the categories are shown in Fig. 5. Thirty seven people had "other interests", and many of these were more specialised than the categories suggested or were related to a single taxonomic group.

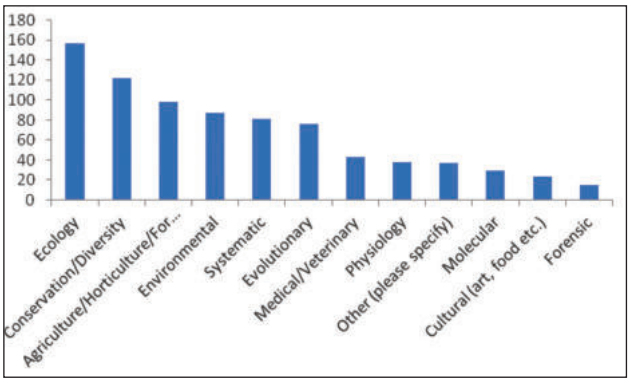


Figure 5. The main entomological interests of respondents.

What has the RES done for us?

The questionnaire listed a wide range of activities and facilities that the RES provides and Fig. 6 shows them ranked by their average importance to members. There were some expected differences between members based in the UK or elsewhere as meetings and events are less accessible to the latter. International members gave higher ratings to *Antenna* and the journals than UK members. When asked what the best thing about the RES was, many of the responses reflected the top four or five categories from Fig. 6, but one highly regarded feature is not included in the list: The role of the RES in enabling networking and contacts.

The ability to make contacts is linked to the various meetings, and the Special Interest Groups (SIGs) play an important role here. SIGs have more relevance to the UK members and their average importance is shown in Fig. 7.

Figure 6. The average importance of activities and facilities for members, where 1 is unimportant and 4 is very important.

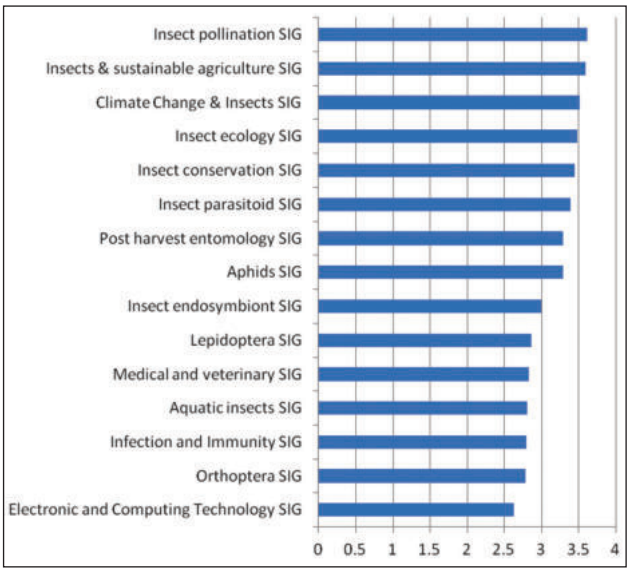


Figure 7. The average importance of Special Interest Groups for UK members, where 1 is unimportant and 4 is very important.

What could the RES do better?

Members were asked how they rated the RES compared to other Learned Societies and 65% said the RES was "about the same" (25% said the RES was "better" and 10% said the RES was "worse"). There was a wide range of suggestions as to what we might do better and what our worst feature was. These suggestions are being forwarded to the relevant committees of the RES for consideration and the outcome will be reported through *Antenna*. A small selection of the suggestions is shown below by way of example:

- A photographic library
- Provide a compendium of UK/Ireland reference collections, points of contact and their status
- Maybe more joint events with other learned and amateur societies?
- Higher profile for the decline in museum based taxonomic skills

- More contact with Local Natural History Societies
- Better access to the library
- Electronic payment for membership
- Internationalization
- The society should circulate the list of members and fellows so that they can interact with each other

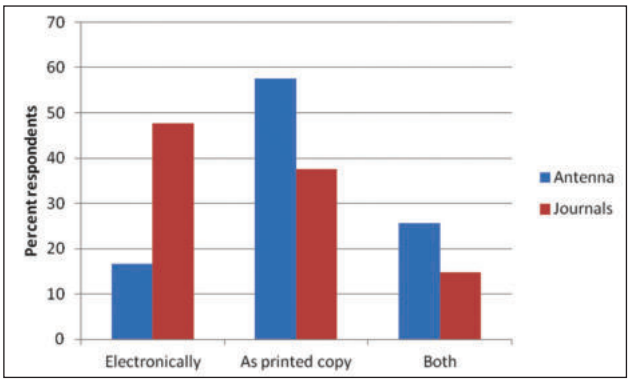


Figure 8. The percent respondents who would prefer *Antenna* or the journals electronically, as printed copy or as both.

We can be certain that the results of the survey and the suggestions received will inform the deliberations of the Membership and other committees for some time to come.

There has been some debate about electronic access to the Journals and *Antenna* (96% of respondents have access to the internet). Members were asked whether they preferred printed copy, electronic access or both. There was a majority in favour of receiving a printed copy of *Antenna* (total responses 203) and a slight majority in favour of receiving journals electronically (total responses 106) (Fig. 8).

The future

We will produce further comments as the information obtained is considered, but in the meantime would like to thank all of those who have responded to the questionnaire. If you would like to add your views the questionnaire is still available at:

https://www.surveymonkey.com/s/RESMemberSurvey

If you have specific comments then please contact me.

The Membership Committee all helped to trial and refine the questionnaire, but the results reported here and any comments are my responsibility. Please contact me with any comments or corrections.

Gordon Port (Gordon.Port@newcastle.ac.uk) on behalf of the Membership Committee (with thanks to *Monty Python* for the enduring influence on me!)

SCHEDULE OF NEW FELLOWS AND MEMBERS

as at 5th December 2012

New Honorary Fellows
None

New Fellows (1st Announcement)
Revd Dr Andrew Wakeham-Dawson
Dr Stefano Vanin

Upgrade to Fellowship (1st Announcement)
Mrs Jennifer Anne Stockan

New Fellows (2nd Announcement and Election)
Dr Balagopalan Unni
Dr Michael J Yabsley

Upgrade to Fellowship (2nd Announcement and Election)
None

New Members Admitted
Mr Frank Edwin Aitken (as at 3.10.12)
Mrs Helen Dickinson (as at 3.10.12)
Dr Derek Parkinson
Mrs Julie Burton
Dr Steve Yanoviak
Mr Julian Richard Fox

New Student Members Admitted
Miss Kerry Mackay (as at 3.10.12)
Miss Sarah Catherine Paul
Miss Mariana Isabel De Niz-Hidalgo
Ms Anna Namyatova
Miss Hannah Rachel Wickenden

Re-Instatements to Fellowship
None

Re-Instatements to Membership
None

Re-Instatements to Student Membership
Miss Claire Gent

Deaths
Dr D J Stradling, 1971, Devon
Mr P A Sokoloff, 1977, Kent

Entomology alive and well but now further north!

Some of you may have heard that Imperial College, after providing entomological training for more than 50 years is no longer in a position to do so. Imperial College stopped its undergraduate provision in 1996, if I remember correctly Andrew Salisbury now at RHS Wisley, was one of our last graduates, but continued to deliver postgraduate entomology training at Silwood Park until 2012. The good news is that the MSc and associated teaching and research staff have found a new home in Shropshire, at Harper Adams University College and staff and students are enjoying themselves immensely. The Royal Entomological Society has continued to support the student scholarship scheme in its new location and details of the latest recipients are shown below.

On another note, I hope to produce an article on the history of entomology at Silwood Park in a future issue and would welcome contributions from ex-graduates and staff of all ages.

Simon R Leather
Professor of Entomology
Harper Adams University College

Araminta Sarah Lang

I have chosen to study entomology as I have always been enthusiastic about insects. I became more passionate about them whilst working as a volunteer for wildlife and conservation charities and whilst studying for my degree in Ecology. I always wanted to be independent with financing the course, however, I realised that I would require a supplement to my finances. Receiving the scholarship has reduced this considerably and enabled me to continue to study entomology and hopefully pursue one of my lifetime goals of going on to work within the field.

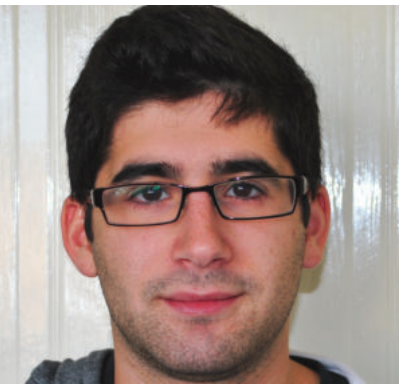
Ashleigh Whiffin

My interest in insects began as a small child where I would attempt to keep flies and ants as pets, always unable to understand why they kept dying! In recent years my immature interest has been rekindled. I was reintroduced to insects in a rather unconventional way during my undergraduate degree in forensic science. I was immediately fascinated by the concept of forensic entomology and how incredibly useful insects can be. Over the past three years this interest has grown to be quite the passion, and now that I have become familiar with insects of forensic importance I am keen to gain a wider knowledge of entomology and explore the vast and diverse world of insects.

This MSc is the perfect opportunity for me to do just that. I feel it is the necessary step I need to take to equip me with the knowledge I need to pursue a career in entomology. Although my current aspiration is to one day be involved in the forensic application of entomology, I am excited to discover other avenues. As well as the desire to be involved in entomological research, I also hope to incorporate teaching into my career and am very interested in getting involved in outreach projects. I would love to one day enthuse new generations of entomologists, in the same way that I myself was encouraged.

Receiving this scholarship has significantly eased my financial situation and enabled me to pursue my dream which I am very grateful for. I would like to say a very big thank you to the RES for this opportunity.

Craig Perl



Initially, my fascination with the world of insects was that of a natural historian. I wanted to know what everything was called and, more than anything, I loved looking at stuff. My knowledge and interests have been broadened by my undergraduate biology degree and the various people who have nurtured my passion for entomology, most notably my A-level teacher RK Snook and undergraduate supervisor GM Orledge. Due to their, and others, encouragement and advice I am very keen to pursue a scientific career. Despite this, simply looking at stuff is and always will be my obsession. It's difficult to express exactly why you find something so intriguing; you just know that you do. In some ways it's such an integral part of your life, you don't really understand why everyone else doesn't "get it". Following a moth down a darkened alley while en route to the pub is, apparently, odd behaviour.

I'm enormously grateful to be one of the recipients of the RES scholarship; it has certainly eased the financial burden that I face; a burden shared with every other postgraduate student in contemporary Britain. I'm hoping the MSc will make me a better scientist and a strong doctoral candidate, allowing me to continue to study insects in a scientific context, as well as providing a brilliant excuse to look at more stuff. Furthermore, the role of every good scientist should be battling wilful ignorance – I want everyone to "get it", and if not, at least ensure people can appreciate the enormity of entomology and its varied applications.

Bug Hunt with All Saints Children's Centre, Kent

Frances Hawkes [mail to: F.M.Hawkes@greenwich.ac.uk]

Thanks to outreach funding from the Royal Entomological Society, All Saints Children's Centre in Chatham, Kent, were able to take a group of children on a bug hunt at Riverside Country Park on 8th August 2012. Given the summer we experienced that year, no one was expecting clear blue skies for our much-anticipated morning of pond dipping and meadow sweeping, but we were lucky enough to have a warm day with only a tiny sprinkle of rain at half time.

Our first activity saw everyone get pretty wet anyway, such is the nature of pond dipping! Riverside Country Park had a new pond put in only three years ago, with purpose-built decks for groups to access the water safely. In such a short space of time, the pond has become remarkably well established, and the children were thrilled to find all manner of creatures emerging in their nets. Immediately obvious were the tens of small sticklebacks and pond snails. Once the group began to see past the pond weed, which we learnt oxygenates the water like trees do the air, they found caddis and damselfly nymphs, pond skaters, water boatmen with their little air-bubble floats, and 'bloodworms', the aquatic stage of midge species. It was great to see the children dipping their nets in open water, then seeing if they caught anything different from the edges or the deeper, muddier water. The dragonflies darting over the water obliged us with a display of the adult stage of insects with aquatic nymphs and the children also found water mites and identified several leeches in their trays.

After a break to wash up, we set off to one of the meadows at Riverside Country Park, which has been left uncut to provide many microhabitats to support invertebrates and the communities that depend on them. Equipped with our sweep nets, we quickly started to bring in some interesting individuals – including those we could hear before we could see. The first creature to be gently captured was a Roesel's bush-cricket, quickly followed by a meadow grasshopper, providing the perfect chance for the children to spot their differences in antennae length. These were soon joined by a green grasshopper and a very large dark bush-cricket. They also caught, with some help, several butterfly species, including meadow browns, a gatekeeper, a cabbage white and the first common blue butterfly seen on the site that year. It was with great delight that the children learnt how the common blue will often lay its eggs on bird's-foot trefoil, or 'eggs and bacon', so the caterpillars have plenty of vegetation (not eggs and bacon!) to eat when they hatch. A 'micromoth' found its way into a net, but quickly escaped. The children did, though, manage to uncover an incredibly tiny shield bug. Everyone spotted the brightly coloured caterpillars of the cinnabar moth feeding on ragwort in the meadow, and there were lots of soldier beetles flying around, however, the children only came across one ladybird all morning!

Although not of course insects, there were some amazing arachnids in the meadow, including orb web spiders and an ambushing crab spider. The prize find went to the spotter of an enormous, strikingly coloured female wasp spider. After we heard from our wonderful guide Simon about how the changing climate was making the UK a warmer, more suitable home for these recent arrivals, we had a look around the vegetation where she was found so she could be released near her web. There we saw her beautifully patterned web, and a very tiny male wasp spider, which was presumably waiting for the return of his future mate!

This was the first time All Saints Children's Centre had been on a guided bug hunt, and Riverside Country Park was an excellent location, with diverse habitats and great facilities. Our guide, Simon, was surprised by the variety of insects we found and shared his extensive knowledge with everybody. Most participants had never been bug-hunting before, and relished the opportunity to learn something new and take part in an activity that all ages could enjoy.

Judging by the squeals of delight (from both adults and children) each time we added to our catches, the event was a huge success, enjoyed by all, including curious passers-by! The only remaining question was 'When can we do it again!?'

All Saints Children's Centre, a Sure Start Children's Centre, works primarily with children from nought to five, but also with parents, guardians, carers and siblings to encourage families to grow together and achieve their full potential. Funding was provided by the Royal Entomological Society Outreach Fund, and All Saint's Children's Centre would like to extend their thanks to the RES for making possible such a valuable and enjoyable opportunity to encourage a lifelong fascination and respect for insects and

The tenth anniversary meeting of the North American Forensic Entomology Association – Vegas style!

Andrew J. Hart [1]
and
Amoret P. Whitaker [2]

[1] Specialist Forensic Services, Metropolitan Police Service, London, UK

[2] The Natural History Museum, London, UK

The tenth anniversary meeting of the North American Forensic Entomology Association (NAFEA) took place in Las Vegas on 17th to 19th July 2012. The Royal Entomological Society (RES) kindly awarded conference funds to two London-based forensic entomologists which supported their attendance at the meeting and enabled them to deliver oral presentations on their work. Amoret Whitaker is a PhD student and casework consultant based at the Natural History Museum (NHM), who gave a presentation co-authored with Martin Hall (also from the NHM) entitled "Where did we go wrong: a review of past cases". Amoret described a review of the past 100 cases involving entomological evidence carried out at the NHM and reassessed them to determine their accuracy; this review will subsequently be submitted for publication in a peer-reviewed journal. Andrew Hart, formerly of the Forensic Science Service and now working at the Metropolitan Police Service, gave a presentation co-authored with Martin Hall entitled "Towards Accreditation in Forensic Entomology in the United Kingdom" in which he outlined the current situation with regard to forensic entomology in the UK and how standards could potentially be introduced. This work will eventually form an Appendix to the new "Codes of Practice and Conduct" produced by the Home Office Forensic Science Regulator following a review by interested parties. Both presenters received positive feedback and their presentations generated a number of interesting questions and comments by other attendees.

The meeting was attended by university professors, their students and practising forensic entomologists from around the world. It was preceded by a workshop on Experimental Design and Statistics, aimed specifically at analysing the type of data generated in forensic entomology research. Also scheduled was an interesting and lively panel discussion on a recent high profile case in the USA, with the prosecution and defence entomologists outlining their findings. The meeting was an excellent opportunity for generating potential international collaborations and for keeping up-to-date on the latest research in forensic entomology on a global scale, which would not have been possible without the generous support of the RES.

Meeting Review: Great Scottish Insects

Jenni Stockan & Andy Evans

Culicoides obsoletus (female).

This Scottish Regional meeting, held in Edinburgh on 24 October 2012, aimed to be a celebration of the 14,000 insects found in Scotland and the entomologists who have studied them. With none more infamous than the Scottish midge (*Culicoides* spp.), the day began with a look at these much loathed insects. Alison Blackwell of Advanced Pest Solutions, began by examining their taxonomy, biology and ecology. She outlined the more serious role of midges in the transmission of blue-tongue and Schmallenberg viruses in livestock and then described the modelling techniques they have used to predict both the nuisance level of midges to humans and the potential spread of livestock viruses. Dr Blackwell identified the issues and knowledge gaps still remaining in this field of entomology including the shortage of trained taxonomists, inconsistent surveillance and the potential responses of midges to land-use and climate change.

Giant midge conducting interviews.

Dr Andy Evans presented research on another pest species in Scotland, the wheat bulb fly, *Delia coarctata*. Fundamental to this research were the questions of why this phytophagous fly lays its eggs in bare soil, and whether it has a future in Scotland. Although a serious pest on wheat and spring barley, Dr Evans presented convincing evidence that the preferred host plant of this species is couch grass *Elymus repens*, an invader of disturbed bare ground. With a predicted increase in rainfall in eastern Scotland, the fly is likely to become less of a problem in the future.

The meeting moved from considering the control of pest insects to conserving rare ones with a presentation by Michelle Appleby on the great yellow bumblebee, *Bombus distinguendus*. Once widespread, *B. distinguendus* is now confined to the north and west of Scotland. The Bumblebee Conservation Trust is carrying out survey work, primarily with volunteers, to monitor the status and distribution of the bee. Creating, managing and extending suitable habitat for this species were challenges facing the Trust.

Jenni Stockan (The James Hutton Institute) then described a project investigating the timing and severity of grazing on birch saplings in the Scottish uplands, and subsequent effects on the leaf mining fauna. The project has shown that heavy grazing reduces leaf miner abundance and species richness but that the timing of grazing has little impact. These results were considered in the context of birch woodland regeneration in Scotland.

The Chequered Skipper, *Carterocephalus palaemon*, argued Dr Tom Prescott of Butterfly Conservation Scotland, is Scotland's most iconic butterfly. This species was only discovered in Scotland in 1942; a finding that was particularly important given the last sighting in England occurred just thirty years later. In contrast to the previous talk, Dr Prescott described how scrub and woodland expansion are proving detrimental to this butterfly which requires open glades of *Molinia*-dominated grassland. Modelling aimed at predicting where the butterfly could occur together with cattle grazing are tools being used to help conserve the species.

The final talk in this session considered another charismatic Scottish insect – the Azure Hawker, *Aeshna caerulea*. Jonathan Willet

Azure Hawker, *Aeshna caerulea*

(Highland Council) described its identification, behaviour and habitat requirements. The dragonfly copes with its sub-optimal habitat by an extended life cycle and obligate diapause, and through reduced competition. The species also has an unusual adaptation of being able to change colour to blend in with its surroundings. Possible population declines cannot be quantified due to a lack of recording effort. As this was a meeting as much about entomologists as their subject matter, the behaviour and characteristics of the *scoticus* subspecies of Odonatist was also described complete with shorts, net and colander!

The second part of the day focussed on past entomologists and with good reason; Scottish entomologists have, historically, had a disproportionately high impact on insect science. Dr John Clark (University of St. Andrews) depicted how the life of Andrew Murray (1812-1878) was shaped by his Scottish upbringing. A lawyer early on in his career, his entomological and botanical interests developed following an involvement in the Oregon Exploration Society. Murray's most notable publication, the *Catalogue of the Coleoptera of Scotland*, appeared in 1853. He later moved to London to a position within the Royal Horticultural Society where he continued to pursue his interest in Coleoptera, particularly those species of economic importance. Murray famously opposed the Darwin-Wallace theory of evolution particularly the mechanism of natural selection.

Another opponent of Darwin and Wallace was David Sharp (1840-1922), whose influence on the taxonomy of Coleoptera was discussed by Professor Garth Foster. Sharp moved from south-east England to Edinburgh in the 1860s to complete his medical training. His years spent working at an asylum in Dumfries in charge of a sole patient gave him the time and means to pursue his interest in beetles. The patient in question was described by Balfour-Browne as 'a gentleman of weak intellect – not an entomologist!" who on one occasion accidentally swallowed a sample of beetle specimens. Sharp described in excess of 7,200 specimens, produced 777 publications and more infamously set fire to Wicken Fen! He served as the President of this Society from 1887 to 1888.

Our final presentation of the day by Geoff Hancock of the Hunterian Museum, Glasgow, examined the life of James Joseph Francis Xavier King (1855-1933) who managed to combine a career as artist and teacher with that of an entomologist. A contemporary of many notable entomologists of the day including Malloch and Donisthorpe, King was a prolific and painstaking collector of all insects but, like Murray, was especially interested in economic entomology. One of his publications, notable as perhaps being the shortest ever printed, appeared in the Entomologists' Monthly Magazine in 1881.

The convenors would like to thank all those who attended and contributed to this meeting.

Wrigglesworth Advert

Insects in Line

Entomological Illustrators and Artists

Figure. 1. The scorpion, *Liocheles neocaledonicus* (Hemiscorpiidae), from New Caledonia.

Vladimir Timokhanov

science_art@mail.ru

I always had a thirst for drawing, it was a natural, innate desire. Nobody encouraged or taught me, because none of my close relatives shared this interest. I spent many hours with my elder brother (currently, a professional entomologist) going into the field collecting insects. During those field excursions I observed insect behaviour in nature and learnt a lot of insect natural history.

I attended Kazakh National University and in 1996 graduated as a mining engineer. After the graduation, I worked for more than three years as a shift foreman constructing motor-vehicle tunnels. Although my youthful passions for drawing and insects never left me, it seemed that both were about to become neglected. In 2002, my life suddenly changed when I was invited to illustrate the two-volume edition '*Red data book of Kazakhstan*' (2006). Sample illustrations of mine prepared for this project were highly praised by specialists and thus I was commissioned to illustrate the volume devoted to invertebrates (100 illustrations in total). Naturally, I grabbed this fantastic opportunity not only because this was what I always desired from the time of my childhood but, more importantly, because finally I got a real opportunity to express myself as an artist, freely and creatively, and be personally responsible for any outcome. This work gave me a chance to meet and communicate with zoologists and entomologists, who were equally passionate about their research subjects as I was about drawing.

Since then I have been constantly occupied as a professional artist, illustrating natural history books, such as '*Astonishing world of invertebrates*', '*Through the pages of Red Data Book*', '*Dangerous arthropods of Kazakhstan*', '*Ants, mantids and dragonflies*', '*Red data book of Almaty Region*', and many others. I have presented my works at several personal exhibitions, taken part in a few UNESCO and IUCN projects, and prepared illustrations for a number of academic and popular journals, such as *Tethys Entomological Research* (Kazakhstan), *Arthropoda Selecta* (Russia), *Biological Sciences Review* (UK), etc.

Entomological drawing continues to be an important means of portraying insects, despite the existence of high-quality digital macro-photography. My early drawings were on paper, but I now use digital formats to produce my illustrations, working on graphic plane-table Wacom, in such graphic programs as Adobe Photoshop and others, which enable me to produce detailed, high quality illustrations.

Currently, I am very interested in visualization and new computer technologies. Apart from ongoing illustration projects, I have been working on the development of an interactive digital educational biological resource, allowing one to improve visualization of teaching material and to adopt new educational tools which can increase motivation and quality of learning. I am happy to collaborate with any interested individual or organization.

Fig. 2. The Common Yellow Jacket, *Paravespula vulgaris* (Vespidae), on grapes.

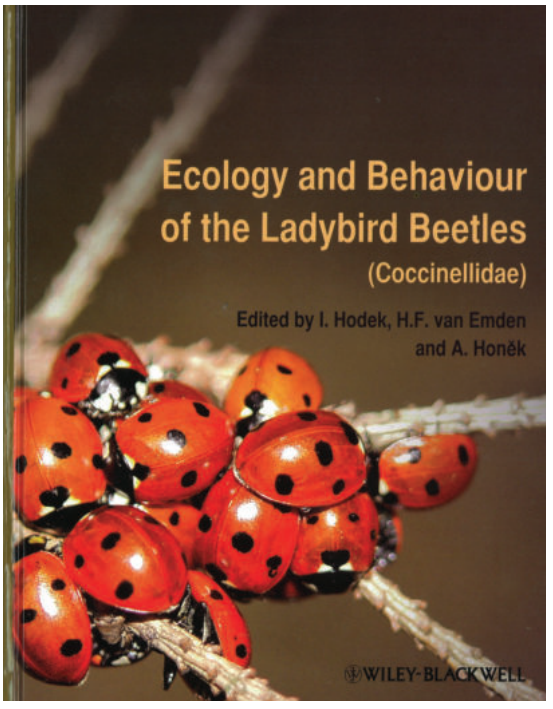
Fig. 3. The Red Assassin Bug, *Rhynocoris iracundus* (Reduviidae), from Kazakhstan.

Book Reviews

Ecology and Behaviour of the Ladybird Beetles (Coccinellidae)

Edited by I. Hodek, H.F. van Emden and A. Honěk

Wiley-Blackwell



A contributors perspective.

I consider myself extremely fortunate that two landmark books on Coccinellidae were published during my PhD studies: the New Naturalist "Ladybirds" (Majerus, 1994) and Ecology of Coccinellidae (Hodek and Honěk, 1996) which followed on from Biology of Coccinellidae (Hodek, 1973). I devoured both and so have many of the students that I have worked with over the years. I am sure that readers will be equally enthused and inspired by the Ecology and Behaviour of the Ladybird Beetles (Coccinellidae), an exciting new book edited by Hodek, van Emden and Honěk and published by Wiley-Blackwell. The editorial team are entomologists renowned and respected worldwide and as an author of one of the chapters (Natural Enemies of Ladybird Beetles) it was a great privilege to work with them all.

There are estimated to be 6,000 described species of Coccinellidae including 360 genera and 42 tribes. The first chapter explores the phylogeny and classification of Coccinellidae highlighting the complex phylogenetic relations which are yet to be fully resolved. However, this chapter eloquently takes the reader through the recent changes in classification and highlights the need for further understanding of the relationships of subfamilies and tribes within the family. Over the last 15 years there have been tremendous advances in genetic studies and the second chapter reflects on the use of coccinellids as genetic models for over a century while providing an excellent overview of molecular studies of coccinellids. They highlight that "Coccinellid genetic studies possess as much potential for the future as have manifested in the past." The following chapter, on the life history and development of ladybirds, draws meticulously on an inspirational range of data sources which are conveniently tabulated to provide comparison between species at a glance.

Honěk provides an overview of the distribution and habitats of coccinellids in the fourth chapter. This chapter is a particular highlight of mine not only because it places the detailed information from the first chapters, which refer to many laboratory studies, into a field context but because it spans from the microclimate scale to the landscape scale so effectively.

The trophic interactions of coccinellids have been a source of fascination to many scientists not least because of the widely recognised potential of coccinellids as biological control agents. Therefore, it is not surprising that the chapter on food relationships is more than 100 pages long – a book in itself and a tribute to all the work in this field. The inclusion of research on the behavioural ecology of ladybirds highlights the wealth of evidence that has accrued recently on ladybird behaviour and specifically the role of chemical ecology. The breadth of the review is indicated by 31 pages of references which are a rich resource in themselves.

Diapause and dormancy are important constituents of life history but are deserving of their own chapter. These complex physiological processes are explained clearly in chapter 6 and the species-specific case studies highlight the diversity of strategies employed within this family. Hodek, the author of this chapter, has made major contributions to understanding of diapause and dormancy. I very much hope this inspirational chapter will encourage a new generation of scientists to work on the many fascinating questions that Hodek evokes in his conclusions.

The previous books (Ecology of Coccinellidae and Biology of Coccinellidae) did not include a chapter specifically dedicated to intra-guild interactions. However, intra-guild interactions have received increased attention over the last decade because of the spread of *Harmonia axyridis*, harlequin ladybird, across the globe. *Harmonia axyridis* is considered a voracious intra-guild predator and as such an invasive alien species that poses a threat to biodiversity. However, such intra-guild interactions are not unique to *H. axyridis*. Many of the predatory coccinellids consume a variety of intra-guild prey and many coccinellids are intra-guild prey. This chapter provides an excellent overview of the many studies in this field but highlights the need for an increase in scale of experiments coupled with inclusion of more species (both intra-guild predators and prey).

I had the pleasure of being a co-author for chapter 8 which was expertly led by Piotr Ceryngier alongside Remy Poland. Mike Majerus should have been a co-author of this chapter and it was a great sadness that he was not able to contribute directly. He made such major contributions across the coccinellid research community and we have ensured that his ideas and thoughts were included. I imagine that the enjoyment we had in writing this chapter together was reflected throughout

the book. Working on the natural enemies of ladybirds is tricky! The ephemeral nature of parasites in the field is confounded by the low prevalence of many parasites. So this chapter represents the patient and diligent work of many scientists documenting these tricky organisms and their relationship with coccinellids. I hope readers will find this chapter of use and will enjoy the unique world of parasites.

Chemical ecology is a theme throughout many of the chapters but chapter 9 specifically describes the semiochemicals underpinning the coccinellid biology and behavioural ecology. There have been major research developments which have contributed to understanding of semiochemicals and coccinellids in recent years. It has been a fascinating field to follow. This eloquent chapter provides details which draw successfully on the knowledge developed through many of the other chapters.

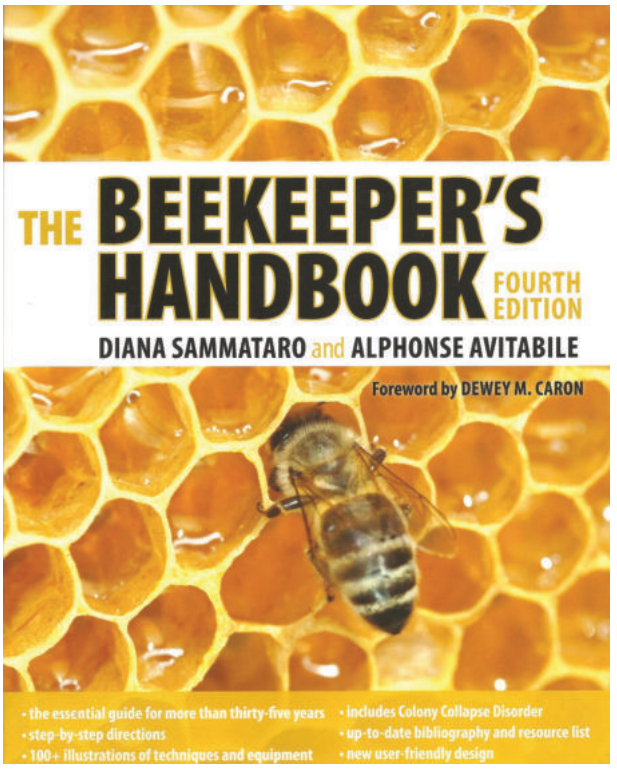
Michaud and Harwood outline methods for quantifying the impact of coccinellids on their prey in chapter 10 including many innovative developments. Relevantly, this chapter leads into the chapter on coccinellids in biological control which examines the wealth of research in this field. Conservation and augmentative biological control have been the focus of recent work and it is clear that the detailed information contained in the preceding chapters of this book will be of applied use.

The book ends perfectly with insights from van Emden and Hodek. Their depth of entomological understanding is immense and their mentoring, alongside Honěk, is evident throughout the chapters in this book. One of the many outstanding features of this book is the summary of data in well-structured tables throughout the chapters which provide an excellent means of rapidly assimilating information. This eloquent and comprehensive publication is testament to all the editors and contributing authors and provides an excellent basis on which to build research.

Helen Roy
NERC Centre for Ecology & Hydrology

The Beekeeper's Handbook Fourth Edition

by Diana Sammataro and Alphonse Avitabile



Intended for beekeepers from novice through to experienced, this updated edition presents a wealth of information in an easy to read and assimilate format. It contains many well drawn illustrations to help the reader understand the complexities of the beekeeper's craft, many aspects of which would not be possible using pictures. Hints and guidelines are liberally sprinkled through the text in a helpful, informative manner as are blank spaces and pages at the end of each chapter to permit the reader to add notes as required.

Chapters cover all major headings together with less obvious headings such as 'Products of the hive' which includes a complete run-down of the components and properties of honey, beeswax, propolis, royal jelly etc., together with information on preparation and extraction. The advantages and disadvantages of numerous procedures such as the timing of re-queening, use of bee escapes, shaking or brushing etc., are included with bullet points to enable each beekeeper to assess their individual situation and act accordingly. Particular reference is made to the diseases, pathogens, pests and parasites of bees as well as colony collapse disorder and how these may be recognised and treated whenever possible.

A full bibliography is included for those requiring additional subject matter together with names and addresses of larger equipment suppliers and website addresses where available. No space is wasted – even the inside of the front cover has various 'Fun facts' printed on it and conversion tables listed at the back.

In short, a comprehensive guide to all the practical and theoretical aspects of good bee husbandry. The only criticism which could be levelled against it is that it is assumed that all readers will be using Langstroth hives. Whilst it is true that virtually all hives are now of the Langstroth type, other styles also exist, each with their good and bad features and to cater for readers using these, particularly beginners, the inclusion of some basic information would be useful.

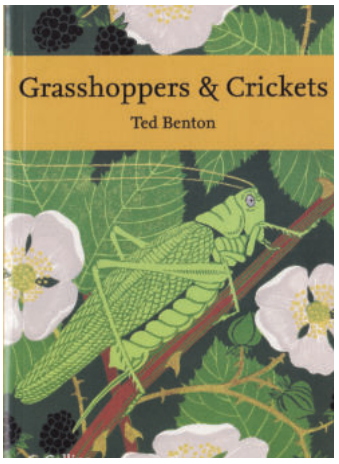
Adrian Arnold
Managing Director ACIS R&D Ltd., Novice beekeeper

The New Naturalist Library
Grasshoppers and Crickets

Ted Benton

Published by Collins

Paperback £30 ISBN 9780007277247



Following his previous volume on Bumblebees, Ted Benton has again produced an excellent addition to the New Naturalist library. His background in philosophy and social sciences gives the book a different perspective to the previous landmark publications on the British Orthoptera by Ragge (1965) and Haes and Marshall (1988). It is packed with fascinating information which is presented in a clear and readable format.

Our relationship with these insects is discussed with references to the work of Dickens, the love of the songs of crickets in eastern cultures, the use of grasshopper symbols in the financial heart of London and more practically as a source of food.

The main groups of orthopterans are introduced which puts the 28 British species in to context amongst the 25,000 species known worldwide. Chapter 2 focuses on the structure of these insects with reference to their special features of singing, hearing, jumping and flying. This is well illustrated with line drawings and has added another dimension to my understanding when observing the behaviour of these insects in the field.

The following chapters cover the complex life histories, mating strategies, courtship and songs. This draws on the work of many naturalists and scientists from Darwin and Wallace's debate on sexual selection to the numerous studies being conducted on orthopterans throughout the world today. These studies are concisely presented, and reveal how complex the lives of these insects are and their importance as the subjects of evolutionary and life-strategy research.

A large section of the book then deals with identification of the British species including recent additions. The key, combined with the well-illustrated species accounts and DVD, should enable beginners to identify grasshoppers and crickets with relative ease. Of course, in the same way as bird watchers rely on calls and songs to find birds many of the Orthoptera are easier to locate by sound, so recordings have supplemented previous identification guides. For the first time in the New Naturalist series a DVD has been included with the book. This goes a step further than the sound recordings by showing the insects in action, feeding, calling and mating. The video captured is not 'television quality' but is not intended to be so. Instead Ted has brilliantly captured these insects behaving in the field as he saw and heard them and has not edited out the sounds of passing cars, children and traffic, which, as he says "are part of the environment in which these insects live today". As well as personal favourites, such as the wonderful displays of the rufous and mottled grasshoppers, this video has opened my eyes to new subjects to seek out and observe, such as the 'vibrating' and leg flicking behaviour of courting groundhoppers.

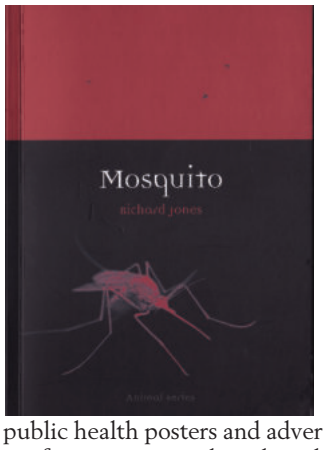
Finally the ecology and conservation of the British species is discussed with reference to some of the classic studies conducted in Britain by Clark and Richards & Waloff in the 1940s and 50s. A commentary to the DVD is given with 29 pages of references.

This is an outstanding book and excellent reference for British orthopterists and I hope it will inspire more people to take a closer look at the lives of these beautiful and fascinating insects.

Mosquito

Richard Jones

Reaktion Books Ltd £9.99 ISBN 9781861899231



Like other books in this series Mosquito details man's relationship with these fascinating insects. It begins with an exploration of the ways in which various cultures have represented them, from early sketches in the 1637 book De Animalibus Insectis to the more scientifically accurate drawings in John Curtis's book, British Entomology. From North American Indian ceremonial masks, to giant metal sculptures and the unlikely notion of mosquitoes as cuddly toys. There is also a history of the name and its use in English literature. The book goes on to explore how and why the females drink blood. How they locate their meal and the various ways that humans have tried to prevent this. Mosquito continues with an exploration of its life cycle, habitat and the ways that this insect has slowed human exploration and endeavour. Malaria and other mosquito born diseases are discussed at length as is the relentless war that humans have waged in order to limit their impacts on our societies. It charts the over confident optimism associated with the introduction of DDT and our awakening to the resultant environmental crisis. Richard Jones has produced a book that explores the biology of these familiar flies whilst revealing their place in our social and cultural history. The book is lavishly illustrated with a diversity of images ranging from entomological illustrations to public health posters and advertisements for insecticides which document the changes in our view of these insects. Appended is a fascinating time line that plots the chronology of our discoveries and interactions. Mosquito offers an unbiased perspective of an insect that we all love to hate, it should illuminate and entertain anyone with an interest in exploring our relationship to the natural world.

Peter Smithers

Diary

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

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

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

MEETINGS OF THE ROYAL ENTOMOLOGICAL SOCIETY 2013

Mar 6 **Verrall Lecture by Professor Michael T. Siva-Jothy**
Venue: Flett Lecture Hall, Natural History Museum
Bed Bugs: An emergent problem and an excellent model
In the last two decades bed bugs have re-emerged as a major economic pest in the developing world. Although they spread no disease, they have had huge economic impact in the USA, particularly in the hospitality industry. I will present empirical research on bed bug ecology, behaviour and physiology that was primarily driven by the need to understand the role of sexual selection in driving adaptation in this insect. This work has subsequently become important in defining effective control strategies, but the insect's unique biology also provides an opportunity to address currently important questions in pure biology.

April 12 **Insect Parasitoid Special Interest Group**
Venue: University of York, Heslington, York
Convenor: Dr Peter Mayhew (peter.mayhew@york.ac.uk)

June 5 **Society Annual General Meeting**

July 7 **2013 INSECT FESTIVAL**
Venue: Yorkshire Museum & Gardens, York
Convenors: Luke Tilley - luke@royensoc.co.uk (general enquiries and activities),
Julie North - julie@royensoc.co.uk (exhibitor enquiries),
Gordon Port - gordon.port@newcastle.ac.uk (press enquiries),
Peter Smithers - p.smithers@plymouth.ac.uk
The aim of Insect Festival is to raise public awareness of insects and entomology, a great opportunity for young and old to discover the fascinating world of insects.

Sep 4-6 **Ento'13 National Meeting and International Symposium**
The Evolution of Insect Mating System: 30 Years of Thornhill and Alcock
Venue: University of St. Andrews
Convenors: Dr David Shuker, Prof. Leigh Simmons and Dr Graham Stone
The International Symposium
The International Symposium will celebrate 30 years of Thornhill and Alcock's ground-breaking book *The Evolution of Insect Mating Systems.* The book has had an enormous impact on multiple generations of entomologists and behavioural ecologists, and we will celebrate that achievement and explore the progress we have made in understanding insect mating systems and reproductive behaviour since 1983. The original book covered many aspects of insect mating systems, from the evolution of sex and sexual systems, through to how ecology and sexual selection interact to shape the mating systems we see. Much has happened in the three decades since the book was published, including major advances in our understanding of the evolution of sex, sexual selection (especially mate choice and post-copulatory sexual selection), the mechanistic basis of reproductive behaviour, and of course sexual conflict. Insects have played a major role in all these developments, as the symposium and the accompanying volume will highlight.

Symposium speakers include:
Göran Arnqvist (Uppsala)
Boris Baer (University of Western Australia)
Roger Butlin (University of Sheffield)
Ben Normark (UMASS)
Leigh Simmons (University of Western Australia)
Nina Wedell (University of Exeter)
National Science Meeting
The National Meeting will comprise a series of themed sessions as well as general entomology sessions open to talks on any entomological topic. Depending on the presentations offered by delegates, sessions may be combined or delegates may be asked to present a poster instead of a talk (or vice versa)
Proposed Themed Sessions:
Pollinator Behaviour, Ecology and Evolution
Beneficial Insects: Biological Control and Beyond
Sexual Selection in Insects
Entomology for the Masses: Impact and Outreach
Insect Community Ecology
Insect Genomics

Sep 11 **Aphid Special Interest Group**
Venue: Christ Church, Priory Terrace, Leamington Spa
Convenor: Dr Rosemary Collier (rosemary.collier@warwick.ac.uk)

Oct 16 **Climate Change Special Interest Group**
Venue: Rothamsted Research, Harpenden
Convenors: Dr Richard Harrington (richard.harrington@rothamsted.ac.uk) and Dr Howard Bell
Offers of talks in all areas relating to the impacts of climate change on insects are welcomed, for example: invasive species, insect-borne diseases, pest management, ecosystem services, biodiversity, conservation and population dynamics.

Oct 23 **Joint Aquatic Insect / Insects and Sustainable Agriculture Special Interest Groups**
Convenors: Ms Jenni Stockan, Mr Craig McAdam and Dr John Holland

Nov 14 **South-East Regional and East Malling Centenary Meeting**
Venue: East Malling Research, Kent
Convenor: Mr John Badmin and Prof. Jerry Cross

2014

Jun
23-29 **National Insect Week**

Aug 2-8 **European Congress of Entomology**
Venue: University of York, Heslington, York
Confirmed plenary speakers:
Bruno Lemaitre - Ecole Polytechnique Federale, Lausanne, Switzerland.
Nancy Moran - Yale University, New Haven, USA.
Vojtech Novotny - Czech Academy of Sciences, Ceske Budejovice, Czech Republic.
A call is now open for proposals for scientific sessions. Each session will comprise one keynote presentation (30 mins) followed by eight invited or contributed talks (15 mins each). The keynote speaker will receive a 50% reduction in registration fees only. To encourage international participation the committee encourages applications where joint organisers are based in different countries from one another. Proposals for sessions must be made on the proposal form, which can be downloaded from www.ece2014.com
Deadline for proposals: 1 April 2013

2015

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

Diary of other Meetings

2013

Mar 12 **Aberdeen Entomological Club**
Upland insects - Nick Littlewood, The James Hutton Institute
Venue: The James Hutton Institute, Aberdeen
Contact: jenni.stockan@hutton.ac.uk

Apr 6 **An introduction to insects and the different insect groups.**
The day is suitable for anyone aged 18 and over and will include various talks and demonstrations by the leaders using photographic slides, video microscopes and museum specimens.
Venue: Chilcomb House, Chilcomb Lane, Winchester, UK.
Cost: £15.00
Contact: Christine Taylor +44 (0)1962 826726
http://www.amentsoc.org/events/listings/0561/

Apr 13 **Hoverflies Workshop**
An introduction to some of the 270+ hoverflies found in the UK.
Venue: Chilcomb House, Chilcomb Lane, Winchester, UK.
Cost: £15.00
Contact: Christine Taylor +44 (0)1962 826726
http://www.amentsoc.org/events/listings/0561/

Apr 20 **Buglife Members Day**
On Saturday 20th April, Buglife will be holding their annual Members Day.
Venue: Ferry Meadows, Ham Lane, Peterborough, PE2 5UU, UK.
Contact: Buglife: info@buglife.org.uk

Apr 27 **AES Members' Day and AGM 2013**
Members' Day will involve talks, workshops, displays, member exhibits, tours and a children's insect craft table.
Venue: Bristol Museum and Art Gallery, Queen's Road, Bristol, BS8 1RL , UK.
Contact: Dafydd Lewis (secretary@amentsoc.org)

May 17-23 **Louth Festival of the Bees 2013**
17th-23rd: Art exhibitions at various Louth venues, featuring works by specialists in botanical painting and artists for whom bees and wildflowers provide inspiration through drawing, painting, photography and sound. The exhibitions will be curated through scientific eyes, revealing the significance of biodiversity throughout the Lincolnshire Marsh and Wolds.
23rd: Conference Day. Louth's British Legion Hall hosts exhibitions, demonstrations, workshops and trade stands, all related to wildflowers and their pollinators. In the evening talks will be given by Brigit Strawbridge on Wild Bees, Mark Schofield on Wildflowers, Jane Bayley on African Beekeeping and Val Littlewood on Painting Insects.
Location: Louth, Lincolnshire, UK.
Contact: Biff Vernon (biff@biffvernon.freeserve.co.uk)

Jun 14-16 **Hoverflies, Soldierflies and Robberflies: and introduction to Diptera.**
Hoverflies, soldierflies, robberflies and related families include some of our largest and most colourful insects. Some are easy to find whereas others require dedicated searching, but these groups are all within reach of anyone with an interest in insects.
Venue: Flatford Mill, Flatford Lane, East Bergholt, Suffolk, CO7 6UL, UK.
Contact: Field Studies Council (enquiries.fm@field-studies-council.org)
+44 (0)845 330 7368

Jun 22 **Introduction to Insects 2013**
This course introduces the major groups of insects: how to find them, how to recognise them and how they use their habitats.
Venue: The Wildlife Centre, Greenwich Park, London, SE10 8QY, UK.
Contact: Field Studies Council (enquiries.fm@field-studies-council.org)
+44 (0)845 330 7368

Aug 8 **The 6th International symposium on the biology and ecology of galling arthropods and related endophytes.**
The Symposium will provide a valuable forum and networking opportunities for researchers, systematists, evolutionary biologists and ecologists with interests in the biology, ecology, physiology taxonomy, and evolution of gall forming arthropods. For the first time the program has been expanded to include leaf mining arthropods, due to their close affinities to their galling counterparts.
Venue: Lamington Plateau, Brisbane, Queensland, Australia.
Contact: Sally Brown (sally.brown@sallybcc.com.au) +61407178200

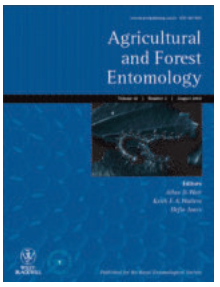
Sept 9-13 **Aphidophaga 12 - the 12th International Symposium on the ecology and behaviour of natural enemies of aphids.**
Venue: Belgrade University, Serbia
Contact: Professor Helmut van Emden (h.f.vanemden@reading.ac.uk) Spur E, TOB1 Earley Gate, tel:0118 378 8493 Fax:0118 935 2421 Best postal address (because of location on campus) to use is Department of Agriculture, University of Reading, Earley Gate, Reading, RG6 6AR, UK.

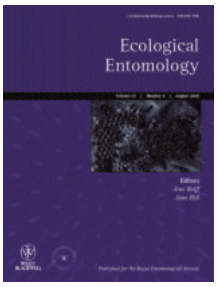
Oct 12 **AES Annual Exhibition and Trade Fair 2013**
The annual AES Annual Exhibition and Trade Fair is the entomology show to attend. The show takes place at Kempton Park Racecourse near London and exhibitors and traders pack two floors of exhibition space.The exhibition is open to members of the public and not just members of the AES. Should you wish to join the AES then you can do so on the day but you don't have to be a member to attend. Tickets can be bought on the gate.Traders include those selling books, equipment, livestock, specimens and food plants. In addition, the show is attended by most of the major invertebrate societies and organisations within the UK.
Venue: Kempton Park Racecourse, Sunbury-on-Thames, TW16 5AQ, UK.
Contact: Wayne Jarvis exhibition@amentsoc.org

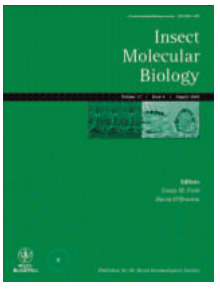
Nov 08-12 **Global Conference on Entomology 2013**
The major objective of the conference is to showcase recent advances in entomological research and development in the insect world. The skills and knowledge of entomologists are needed worldwide helping farmers to produce crops and livestock more efficiently through sound pest management strategies, fighting to save endangered species and fragile ecosystems, and preventing insects from spreading agents that cause serious diseases.
Venue: Kuching, Sarawak, Malaysia
Contact: Dr V Sivaram info@gce2013.com

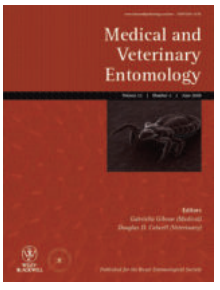
2014

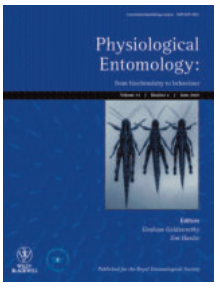
July 13-18 **XVII Congress for the International Union for the Study of Social Insects.**
The purpose of the Union is to promote and encourage the study of social insects and other social organisms in the broadest sense. Both research and the dissemination of knowledge about social insects and other social organisms through publications, educational programmes, and activities are encouraged. The Union further pursues these objectives via the organization of Congresses and Symposia, publication of the journal Insectes Sociaux, and recognition of distinguished service with awards.
Venue: Cairns Convention Centre, Cairns, Australia
Contact: IUSSI2014 Secretariat info@iussi2014.com

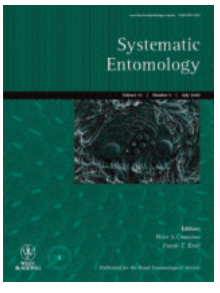












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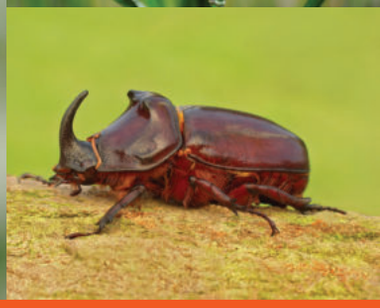
RES STUDENT AWARD 2013

WRITE AN ENTOMOLOGICAL ARTICLE AND WIN!



Requirement

Write an article about any Entomological topic that would be of interest to the general public. The article must be easy to read and written in a popular style. It should be no more than 800 words in length.

Who can enter?

The competition is open to all undergraduates and postgraduates, on both full and part-time study.

Prizes

First Prize: A £350 cheque and your article submitted for inclusion in Antenna.

Second Prize: A £250 cheque and your article submitted for inclusion in Antenna.

Third Prize: A £150 cheque and your article submitted for inclusion in Antenna.

Entries

You can send electronically via e-mail to: **bill@royensoc.co.uk**

Alternatively, complete the attached entry form, and submit it with five copies of your entry to:

The Registrar,
Royal Entomological Society,
The Mansion House,
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St Albans, Herts AL2 3NS

For further information telephone: **01727 899387**

Please include:

- Your name and address (including postcode)
- Your e-mail address
- The name and address (including postcode) of your academic institution
- Evidence of your student status

The Judges

The judges panel will be made up of three Fellows of the Royal Entomological Society. The judges decision is final.

Closing date

The closing date for entries is 31 December 2013. The winner will be announced in the Spring 2014 edition of *Antenna*.

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