Bulletin of the Royal Entomological Society Autumn 2010 Volume 34 (4)

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meetings of the society

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

2011

Feb. 2-3	Postgraduate Forum **Venue: Royal Hotel, Hull** Convenor: Ms Cathleen Thomas
March 2	Verrall lecture **Venue: Natural History Museum** "The conservation and utilization of entomological interactions" by Prof. Jane Memmott
March 9	Medical & Veterinary Entomology Special Interest Group **Venue: The Linnean Society, London** Convenors: Prof. Stephen Torr Prof. Steve Lindsay Dr Mary Cameron
May 12	Conservation SIG **Venue: Rothamsted Research, Harpenden, Herts.** Convenor: Dr Alan Stewart
June 1	**RES Annual General Meeting** **Venue: Rothamsted Research, Harpenden, Herts.**
Jul 3	Insect Festival **Venue: York Museum Gardens, York** Convenor: Mrs Julie North
Sept 7-9	Ento'11 Symposium on 'Chemical Ecology' and National Meeting **Venue: University of Greenwich, Medway Campus, Chatham Maritime, Kent** Symposium Convenors: Prof. David Hall, Prof. Alan Cork, Prof. Bill Hansson & Prof. John Pickett
Sep 14-16	A joint meeting with the Soil Ecology Society **Venue: The National Marine Aquarium, Plymouth** Convenor: Prof. Rod Blackshaw
Nov 10	Insect Behaviour Special Interest Group **Venue: Rothamsted Research, Harpenden, Herts.** Convenors: Dr Jason Chapman Dr James Bell

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

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Bulletin of the Royal Entomological Society

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EDITORIAL

Had enough of the snow? It has delayed this issue of *Antenna*, so my apologies. But with the snow still on the ground, it is an opportune moment to advertise a future climate change special issue, We will join with the Climate Change SIG and run articles, comments and features. If you would like to submit copy then please contact *Antenna* by the email below. Or, if you would like to suggest themed issues then we are always happy to hear your thoughts, suggestions and of course, receiving your copy. You are always welcome to contact the editors directly, but we ask that the antenna email address (below) is used.

In this *Antenna*, you will find a great selection of articles and book reviews. Outreach was mentioned in the last Antenna and here we have an article about eating creepy crawlies. Richard Fairman shows how entomology can be taken to the public, with an exhibition in a shopping centre. This is one way of "finding out what's there", but another is the report of the insect survey in Kenya. Entomology is a broad church and the range of articles, reports and reviews in this *Antenna* illustrate that, and, in my opinion, make an interesting read.

You can contact Antenna on
Antenna@royensoc.co.uk

With seasons greetings and very best wishes for 2011, Greg, Pete and Vanja

CORRESPONDENCE

Dear Editors,

I wonder if you could help itentify the attached insect. It was taken in the Murcia region of Spain in May 2010. It was approx 1.5 centimetres.

I obtained you name from the web sight R.E.S.

Many thanks

Colin Cook
Northampton

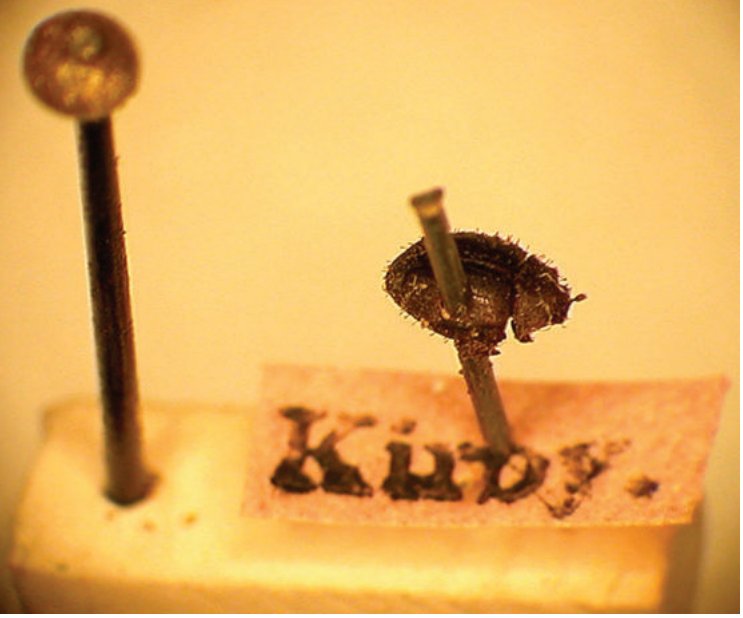

Fig. 1. The lectotype of *Cistela maritima* (Byrrhidae), the species described by T. Marsham in his *Entomologica Brittanica* (1802); the Manchester Museum.

The Manchester Museum's Entomology Collections

ARTICLE

Dmitri V. Logunov

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MM's Entomology Collections online: http://emu.man.ac.uk/mmcustom/EntQuery.php

The Manchester Museum is a large university museum with internationally important natural history collections. The Museum is one of the main attractions of the city, running in average some 200 public events and receiving some 300,000 visits each year. It is one of 32 museums in Britain with designated collections, announced by the Secretary of State on 24th June, 1997. Designation is a category given by the Government to identify non-national British museums with collections of pre-eminent importance.

The Manchester Museum is estimated to house some three million specimens of insects collected from all over the world, which are thought to make up the third or fourth largest depository in the UK, depending on group. The collections of dried insects specimens are housed in over 4,000 drawers and some 1,400 store-boxes, and historically are subdivided in two parts, the British and foreign insects kept separately. The particular strengths of the Manchester Museum's Entomology Department are the worldwide collections of Coleoptera, Dermaptera and Lepidoptera.

The origin of the Manchester's insect collections dates back to the foundation of the Museum by the 'Manchester Society for Promotion of Natural History' in 1821. This museum was acquired by the Owens College, the forerunner of the Victoria University of Manchester, in 1864. The New Museum was formally opened on June 8th, 1888 (see Alberti, 2009, for further details). The oldest insect specimens in the museum are the beetles collected by W. Kirby and described by T. Marsham in his *Entomologica Brittanica* in 1802 (see Johnson, 1996), for instance, the lectotype of *Cistela maritima* (Byrrhidae) (Fig. 1).

The formal birth of the Manchester Museum's Entomology Department was marked by the official appointment of the famous entomologist, John R. Hardy (1844-1921) as a 'Senior Assistant Keeper and Entomology Curator' in January 1908. The entomological collections however continued to be officially considered a sub-section of the Museum's Zoology Department. Hardy assembled and arranged the nucleus of the Museum's entomological collections and also obtained a lot of exotic material for the Museum, of which the C. H. Schill collection of world Lepidoptera was particularly important.

J. Hardy's successors, Harry Britten (1870-1954) and Geoffrey J. Kerrich (1909-2002), retained the title 'Assistant Keeper in Entomology'. H. Britten, who was described by W. D. Hincks as 'the greatest British entomologist since the days of Curtis and Stephens', was primarily responsible for building up the bulk of the extensive museum collection of British insects of almost all orders. He paid particular attention to the so-called 'critical groups in entomology' (parasitic Hymenoptera, Diptera, Thysanura, Phthiraptera, aquatic insects, and some others), which were largely ignored at his time by other entomologists. H. Britten was an active field worker who collected and recorded the fauna of Lancashire and Cheshire. His valuable card-index (in 25 drawers), based on his collecting

from 1920 until his death in 1954, is retained in the Manchester Museum.

Walter Douglas Hincks (1906-1961) was appointed as Assistant Keeper in Entomology in 1947, but in 1957 his title was changed to 'Keeper of Entomology'. W. D. Hincks wanted to make the Museum's Entomology Department the finest reference and study centre in the North and thus his term of the keepership saw a surge in curatorial activity and massive improvements to the collections. He commenced a total re-organisation and cataloguing of the entire insect collection and enlarged the departmental library. As a true scholar and recognized world authority on the earwigs (Dermapera) and fairy-flies (Mymaridae), W.D. Hincks elevated the taxonomic research undertaken in the Manchester Museum to the international level. Unfortunately, Hincks died in 1961 at the peak of his career.

Alan Brindle (1915-2001) was the next to be appointed Keeper of Entomology, who reorganized the museum collections of almost all insects, except for beetles, and also redesigned the new public entomological display. Furthermore, as a successor of Hincks, A. Brindle took over his interest in the Dermaptera and soon became a world authority on them. Thanks to the taxonomic studies on earwigs by Hincks and Brindle, the Manchester Museum possesses the finest collection of Dermaptera in the UK. Yet Brindle significantly augmented the Museum's Diptera collection due to his own collecting during the survey of the Diptera and smaller aquatic orders of the north-west. This survey resulted in the assemblage of a large spirit collection of adults, mainly of the Tipulidae and other Nematoceran families, and of Diptera larvae of all families.

The next Keeper of Entomology was Colin Johnson, a respected authority on Ptiliidae, Cryptophagidae and expert on several other groups of Coleoptera. His major curatorial achievements were a complete revision of all families of British Cucujoidea and intensive curatorial work on other groups of British beetles, which led to a significant extension of the existing collections (180 drawers in 1962 *vs*. 306 at present), major identification work on and reorganization of a substantial part of the foreign Coleoptera, and acquisition, mainly through own fieldwork and taxonomic studies, of a significant amount of material on smaller beetles, which previously were poorly or not represented.

The title 'Keeper of Entomology' existed until 2003, when it was changed to 'Curator of Arthropods' as a result of a complete restructuring of the Museum and its staff: the role of Keepers ceased and new posts of Curator were created. The word 'entomology' disappeared from the title because such arthropod groups as Arachnida, Myriapoda and Crustacea became the Curator's responsibilities as well. From 2004 until the present time, the staff of the Museum's Entomology Department consists of the Curator (Dmitri V. Logunov) and the Assistant Curator (Phillip Rispin), plus the Honorary Curatorial Associate (Graham Proudlove) and a variable number of volunteers.

Fig. 2. The male and female of the extinct earwig *Labidura herculeana* from St. Helena; the Manchester Museum.

Some of Manchester Museum's notable collections include:

Comprehensive collections of British insects consists of over 720,000 specimens belonging to 13,845 species, with an average of 56% species coverage for the British fauna (ranging from 100% in Raphidioptera/Dermaptera, 92% in Coleoptera to 43-48% in Diptera and Hynemoptera, and only 8% in Collembola). The collection currently occupies 1,264 drawers in 102 wooden and steel cabinets. A full account of the Museum's British entomology collections was provided by Logunov (2011), and the collections of British Coleoptera were described in detail by Johnson (2004, 2009).

The C.H. Wallace Pugh (1889-1973) Diptera collection (dried specimens), made principally in Shropshire and North Wales; received in two batches: the first part in 1972 as a donation, with the remainder and his archive in 1973 as a bequest after Pugh's death. His complete collection contained about 20,000 specimens of well over 2,000 species, and at that time it was the finest collection of its kind existing in private ownership. The C.H.W. Pugh collection formed the basis of the present Museum's collection of British Diptera (for its full account, see Logunov, 2010).

The worldwide collection of Dermaptera (3 cabinets and 60 drawers), being probably one of the most comprehensive earwig collection in the world, with over 11,000 specimens of 975 species, of which over 276 species names are represented by primary types, plus an unknown number of undetermined species. The original collection of the late W.D. Hincks was purchased by the Museum in 1961 and formed the nucleus of the Museum's earwig collection. Then it was significantly extended by A. Brindle during the course of his extensive taxonomic

research on the earwigs. A species of special importance in this collection are two specimens of the extinct giant earwig *Labidura herculeana* from St. Helena, the largest earwig species in the world (Fig. 2).

The C.H. Schill collection of world Lepidoptera (1027 drawers and store-boxes), containing over some 40,000 specimens of over 8,000 species. The collection is worldwide in scope and includes all families of butterflies, larger moths and also 40 drawers of Pyralidae with other micro-Lepidoptera. Two smaller collections of foreign Lepidoptera by C.O. Trechmann and A.L. Darrah were incorporated in the C.H. Schill collection in the mid-sixties. The collection of larger moths has been re-curated and re-housed in 39 new Hill cabinets.

The D. Longsdon (-1937) collection of world Papilionidae *sensu lato*, with the inclusion of *Parnassius* (including some 15 types by A. Bang-Haas). This collection was received by bequest of David Longsdon in 1937-38 and still remains in 12 original cabinets of 288 drawers, containing yet unknown number of specimens. The collection is well set and labelled (dated from 1890 to 1936), and arranged according to zoogeographic regions. It contains many currently red-listed or threatened species, for instance, a series of 6 specimens of the Corsican Swallowtail (*Papilio hospiton*), one of Europe's most seriously endangered butterflies (Fig. 3).

The historically important Lepidoptera collection of Joseph Sidebotham (1823-1885), consisting of two 40- and 32-drawer cabinets according to macro- and micro-Lepidoptera, and was received in 1919 from his son. It is a good example of the Victorian private entomological collections (Fig. 4). All specimens are in perfect condition, reliably identified, but only a few of them are labelled. It is known however that the majority of them was collected in Britain in the late 19th century, and some might have originated from France.

The collection of micro-Lepidoptera by Lord T.G. Walsingham (1843-1919), a total of 2,289 specimens (locality labels are poor). This collection was received in several instalments over a period of 20 years (from 1907 to 1927) through the British Museum of Natural History, as an exchange for one of the two

Fig. 3. The Corsican Swallowtail (*Papilio hospiton*) from the D. Longsdon collection of Papilionidae; the Manchester Museum.

Fig. 4. A unit-tray of various colour morphs of the Garden Tiger Moth (*Arctia caja*) from the J. Sidebotham Lepidoptera collection; the Manchester Museum.

specimens of the famous Manchester Moth, *Euclemensia woodiella* (see Logunov, 2011, for further details).

The worldwide collection of Cassidinae of the late Franz Spaeth (1863-1946), one of the best collection of the group in Europe; purchased by the Museum in 1950, thanks to the generous financial assistance by Robert W. Lloyd (1868-1958). The collection contains over 20,000 specimens of yet unknown number of species, with over 3,000 types (see Hincks, 1950). However, the collection needs a critical assessment on the actual status of types (partly done by L. Borowiec, who nowadays is the main world authority on the Cassidinae).

The worldwide collection of Staphylinidae of H.R. Last, containing well over 40,000 specimens of yet

unknown number of species, of which 392 species are represented by type specimens. Last donated his specialist Staphylinidae collection to the Museum in 1992 and his British collection to his close friend Jon Cooter. Lack of space and having personally assembled a very good collection of British Coleoptera himself, Cooter donated the British material to the museum in 1993. Last's collection also contains a few specimens from other Orders and an archive of 273 items, including Last's notebooks. These notebooks are important, as most of the specimens in this collection have a letter and a number written on the back of the card mount which cross-reference with notebook entries invariably containing greater detail than is present on the mounting card. Originally the collection of Staphylinidae was acquired in a home-made 75-drawer cabinet, and is currently undergoing a complete re-organization and re-curation: over 17,000 specimens have already been re-pinned and re-housed in 60 new drawers. It is generally held that Last's world-wide collection of rove-beetles, built up over 60+ years and containing specimens from all contemporary Staphylinidae authorities, was the finest and one of the largest collections in private hands.

The Manchester Museum's holding of type specimens, primarily in the collection of foreign insects, is over 12,000 specimens representing some 2,300 species (see Johnson, 1996). However, this figure is beyond doubt an underestimate, and the current number of types is much higher and remains to be counted. There are types from authors such as A. Brindle, G.H. Carpenter, W.D. Hincks, C. Johnson, G.V. Nikolaev, R. Petrovitz, E. Reitter, F. Spaeth, B. Wagener, and many others. A production of a complete catalogue of Manchester Museum's entomological types is seen as a priority for the curator for the foreseeable future.

The Manchester Museum also has a substantial amount of undetermined material: viz., 287 store boxes of over 50,000 mounted and labelled beetles from all families and from all over the world; plus 126 boxes with numerous papered specimens of Indian Orthoptera, Neotropical Lepidoptera (particularly, Geometridae), Finnish beetles, and other groups.

Nowadays, the work of the departmental staff is quite diverse and focuses on the following aspects:

(1) Documenting of all insect and arachnid collections (slowly, group by group) and of corresponding archives in order to make them better accessible and used. Manchester Museum's online database already contains over 80,000 records incorporated during the last five years, and this information is readily accessible online via the Museum home page <http://www.museum.manchester.ac.uk/> (the tab 'Our Collections'), or via a direct online access <http://emu.man.ac.uk/ mmcustom /Ent Query. php>.

(2) Ongoing re-housing and re-curating of the departmental collections. For instance, the collection of British Coleoptera has been recently re-housed in 23 new steel 15-drawer cabinets, and the H.R. Last collection of rove-beetles is currently being re-housed. Two years ago, the collection of Mantodea was thoroughly re-curated and (re)identified, including all the available papered and newly acquired material. It now contains 198 species (some 1,000 specimens) housed in 26 new drawers (Fig. 5). A good start has been done with re-curating of the Museum's collections of Phasmida, cockroaches, spiders, Myriapoda and some other groups.

(3) Teaching in several courses and modules for the University of Manchester, for instance, in the Urban Biodiversity and Conservation course.

(4) Proactively contributing to the extensive educational and outreach programmes run by the Manchester Museum. Although many museum public events include bug-related activities and/or entomological material, in order to further promote the entomology and taxonomy, special events are also planned and run. For instance, the '*Phasmid Days*' (run three times) and the '*Bug Days*' (two times, usually linked with the corresponding National Insect Week). These events include

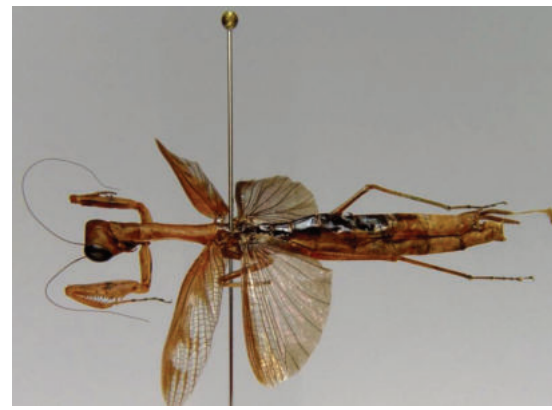

Fig. 5. The female holotype of *Dysaulophthalma nathani*, a newly described taxon from the re-curated Indian collection of Mantodea; the Manchester Museum.

Fig. 6. Handling a female of the Australian phasmid, *Eurycnema goliath*, during the Phasmid Day; the Manchester Museum.

Fig. 7. A drawer of *Parnassius* species used in the temporary exhibition 'Darwin Extravaganza' at the Manchester Museum (2009-2010).

numerous temporary displays of live insects/spiders and of Museum's insect collections, handling activities for visitors (Fig. 6), talks and behind-the-scene tours to the Entomology store. Enthusiasts from local/national nature history societies (e.g., colleagues from the Phasmid Study Group, the British Tarantula Society, the Manchester Invertebrate and Spider Club, the British Freshwater Association, and others) willingly participate in our events, helping to make them quite a success. Thousands of museum visitors of all ages enjoy their discoveries of creepy-crawlers and their importance and learn about the value of museum natural history collections. More specialized events, such as the Coleopterist Meetings (three have been organized to date), are intended to gather all those who are involved in studying beetles, both professionals and amateur experts from the North-West.

(5) Contributing to re-display of old and/or organization of new public galleries and exhibitions. In 2005-2009, the Manchester Museum has had 29 temporary exhibitions of varying sizes and duration, and almost each of them contained several or many displays with insects and other arthropods (Fig. 7).

In the last five years we have:

Loaned: 15,350 specimens, of which 530 were types.

Received: 1,900 new specimens by donation, exchange and staff research.

Received: over 70 new types by donation and research based on museum's specimens.

Received: over 345 research visits to the collections.

Run: 91 behind-the-scene tours (over 550 visitors altogether).

Run: 57 various public events (talks, outreach programmes, handling tables, etc.).

Answered: over 1,100 enquiries.

Published: 49 papers by the Curator and Honorary Curatorial Associate.

Apart from usual shortage of staff and under-funding as in other museums, the main challenges with the Manchester Museum's entomological collections are the out-of-date nomenclature of many foreign groups and even of some British insects (e.g., Diptera), the large D. Hincks & J. Dibb's world collections of Chrysomelidae and Curculionidae being still in old store-boxes and cartons and needing urgent re-housing, and a large amount of papered and/or mounted but undetermined material. The departmental staff, honorary curatorial associate and volunteers do their best trying not only to improve the storage facilities and documentation, but also to increase the use of the collections under their care and to promote museum-based taxonomy and entomology. Recently, we started a new museum blog '*Entomology Manchester*' (online at: http://entomologymanchester.wordpress.com/).

Although the Manchester Museum's entomology collections constitute an important international working resource, they unfortunately remain under-publicized and under-used. It is my hope that this article will encourage fellow-entomologists, especially those from the north-west, to use the Museum's insect collections more intensively. The collections are fully accessible for anybody wanting to study them. Lists of species for individual insect groups can be obtained from the curator. Enquiries about the borrowing of specimens, access to the collections, and associated library/archives or volunteering in the Department should be addressed to the curator, Dr Dmitri Logunov <dmitri.v.logunov@manchester.ac.uk>.

Acknowledgements

I wish to cordially thank the departmental Honorary Associate and all volunteers who have been giving us their invaluable help in (re)curating, documenting and maintaining of the Museum's entomology collections, especially: Yvonne Golding for the re-curating of Phasmida collection and for the continuous help in the organization of Phasmid and Bug Days; Martin Stiewe for the complete re-curation and (re)identification of the entire Mantodea collection; Graham Proudlove for the re-curating of the Myriapoda collection; Hovhannes Takukyan for the help in re-curating of spider collections; Janette Talbot, Eleanor Beasly and Amelia Forde for re-arranging and documenting of the entomology archives.

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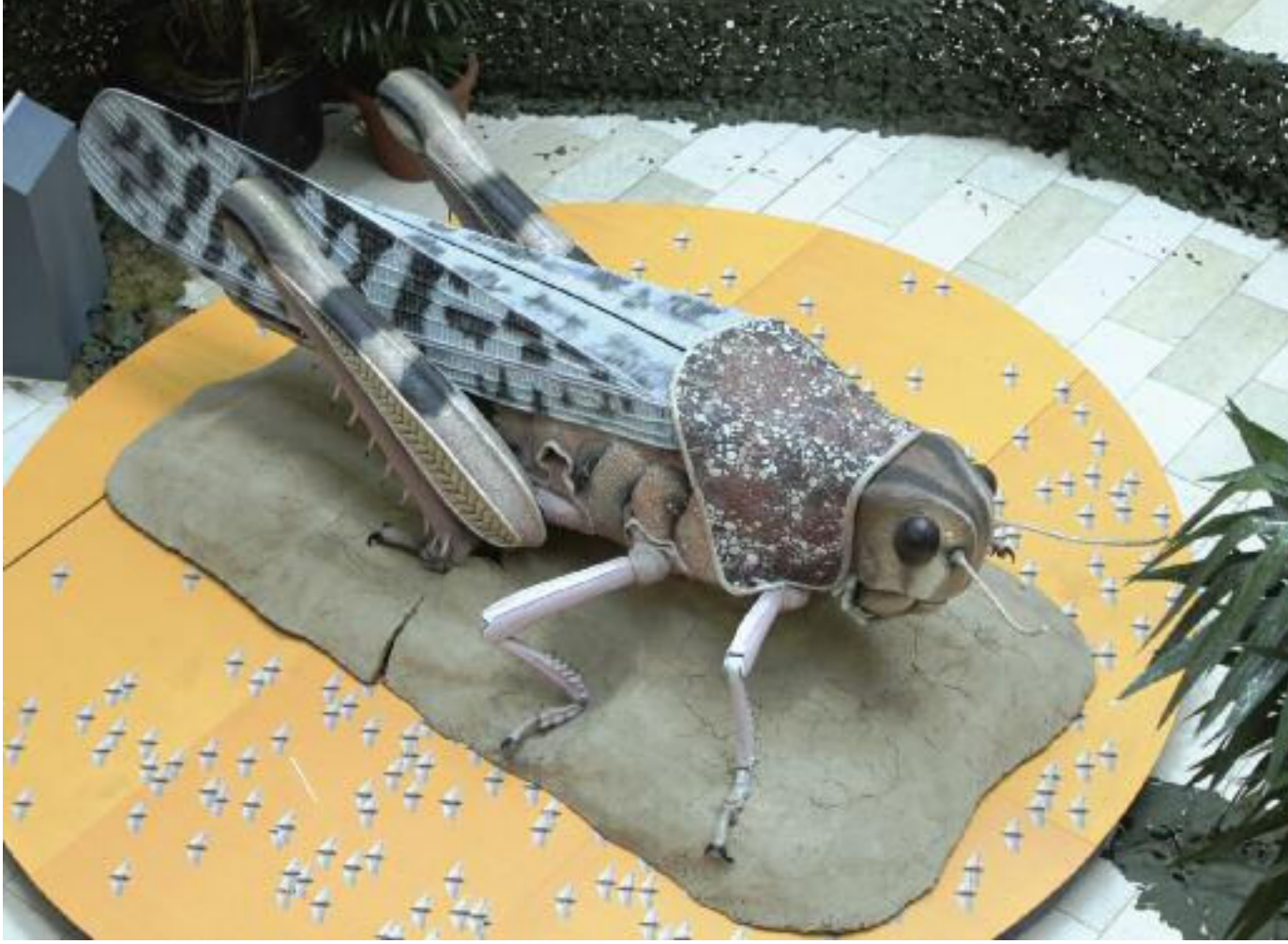


Instigating an Education in Insects: The 'Eating Creepy Crawlies' Exhibition

ARTICLE

Richard John Fairman

Richard John Fairman was born in 1982, in Leicestershire, England. After discovering an aptitude for writing during his degree studies, he received a First for his dissertation module and began to write movie and video-game reviews as a hobby. Now an established freelance writer, he writes for a wide variety of magazines and journals. Richard continues to live in Leicestershire with his beloved wife, Rachel.

Educating the young minds of tomorrow – and their guardians – can be a very challenging endeavour, but the Natural History Museum have achieved just that with their portable exhibition, entitled 'Eating Creepy Crawlies'.

The exhibition has previously appeared at Studio K in Leeds and at the Think Tank science museum in Birmingham, but this year the engaging exhibition has descended upon the Highcross Shopping Centre in Leicestershire. With this proactive, guerrilla education, shoppers who may not have otherwise given their time to learn about these fascinating creatures are intrigued by the impressive set pieces, information boards and specimens.

The exhibition is on show during the summer holidays and has proven to be a fantastic and unexpected family experience for shoppers and their children alike.

Mark Murphy, General Manager at Highcross, said: "From bug workshops to live displays, Highcross is really creating a buzz about creepy crawlies this summer and is sure to keep Leicestershire's youngsters entertained and inspired and talking about wildlife long into the new school year."

Launched by Professor David Bellamy OBE (who also hosted an educational workshop and insect Q&A session), the exhibition focuses on entomophagy and features some of the insects eaten by over 3,000 ethnic groups; from deep-fried Tarantulas in Cambodia to Scorpion soup in China, together with more eminent delicacies, such as Witchetty grubs from Australia and novelty larvae lollipops from the USA. Many of the display boards have specimens attached. Bellamy said of the exhibition: "A world without flies and bugs just wouldn't work. What a wonderful place to come and learn about it".

As well as providing details about the insects and their life cycles, the information boards also describe how the insects taste in comparison to more familiar, domestic foods. For example, on one display board, the taste of a Stink Bug is described as '…rather like eating a bitter sunflower seed'.

For some, this could seem like quite a crude, low brow method of introducing creatures of such intricacy and grace to new generations, but it does appear to be successful in its goal of capturing children's imaginations; not unlike the way the movie 'Jurassic Park' sparked an influx of young palaeontologists.

Undoubtedly, the main attractions are the crowd pleasing, giant animatronic insects. At 30 times life size, the Malaysian Jungle Nymph model demonstrates how the stick insect poses in a confrontational manner when threatened, raising its tail to appear larger and more capable of a successful counter-attack. At 60 times life size, the Desert Locust model depicts how a locust launches itself into the air using its long, powerful back legs. When the legs reach their full height, the wings on the model unfold to reveal an impressive 6.6 metre wing span; much to its spectators' delight.

The interactive displays also receive a generous amount of attention. A Honeybee head and Golden ringed Dragonfly head (also animatronic) stand on individual mounts. At 200 times life size and 80 times life size, respectively, they mainly teach users about how their jaws are used to perform different tasks.

Above all, the exhibition promotes the importance of insects as an essential component of our ecology. They may be small, but they're certainly not insignificant. We need them. They don't need us.

Uaso Narok Forest Reserve, an indegenous forest.

An insect survey of Uaso Narok Forest, Nyahururu (Kenya)

ARTICLE

Wanyoike Wamiti and Joseph Mugambi

National Museums of Kenya (Invertebrate Zoology Section)

The Uaso Narok Forest Reserve (0°02'49.87"N, 36°22'36.66"E) is a gazetted forest located in the central highlands of Kenya and is the smallest (1,973ha) of the five forest blocks constituting the Marmanet Complex.

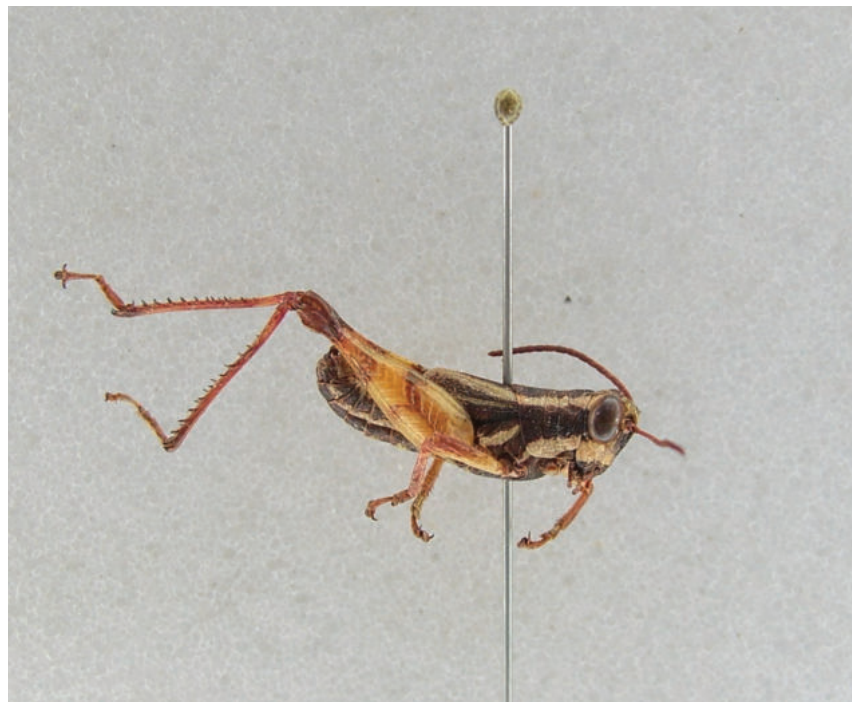
The forest's south-western parts border Nyahururu town, undoubtedly Kenya's highest altitude urban centre at 2400m (7,874ft). This reserve is managed by the Kenya Forest Service. Little is known about the forest's biodiversity except for birds (Wamiti *et al* 2010). This scarcity in forest's biodiversity information necessitated the need for this invertebrate's inventory conducted from 11-16 July 2010. The need for species present in a site is becoming increasingly important for the management of sites. Uaso Narok, like many other forest reserves in Kenya, was not

spared from past and recent destruction, so evident in the forest by the numerous remaining stamps of *Olea africana* and *Juniperus* spp. as well as the ongoing firewood collection and tree nursery bed soil extraction that we think may be overstretching the forest's capacity to maintain and sustain its ecological integrity, now and in the future.

The forest has at least five habitats: indigenous forest (20%), plantation forest (1%), bushland (65%), grassland (10%) and built up environment (4%) occupied by staff houses, cultivated gardens and offices. We sampled three habitats in the southern parts of the reserve: indigenous forest, plantation forest and bushland, in addition to two nights of light trapping outside the offices.

The following methods were used for sampling: *Direct observations and searches* –e.g., under the logs, stones and bark. Flying butterflies that could not be caught were identified and recorded where possible; *Sweep netting* – for flying insects e.g. butterflies, dragonflies, damselflies, wasps, flies and those inhabiting the forest undergrowth and grass; *Pan traps* – 18 pan traps, yellow (12) and light blue (6), filled with soapy water. placed on three mornings (09:00-13:00) along the forest edge close to, as well as some distance from flowering plants; *Pit fall traps* –20 pit fall traps were placed in each habitat surveyed. Traps were filled with 70% alcohol, laid at 10-m interval for 3 days; *Leaf litter* – litter was collected from 5 plots of 0.5 m^2 in each habitat. These were taken to the laboratory and examined a Burlese funnel; *Light trap* – a 60W Mercury Vapour Lamp was placed outside the offices on two evenings, 19:00-23:00 h,

Provisional data indicate invertebrates from two phyla, Arthropoda and Mollusca. Arthropoda was represented by three classes: Insecta, Arachinida and Crustacea. Class Insecta recorded 13 Orders (Lepidoptera, Hymenoptera, Hemiptera, Coleoptera, Diptera, Dermaptera, Neuroptera, Odonata, Isoptera, Orthoptera, Mantodea, Blattodea and Thysanoptera). Class Arachinida was represented by Orders Araneae and Pseudoscorpiones. The Lepidoptera was the most diverse groups of insects with five families of butterflies (50 species) and nine



Orthoptera (Acrididae - *Paracoptara* sp.)

Jackson's Swallowtail *Papilio jacksoni*

Garden Inspector *Precis archesia*

families of moths. The indigenous forest had more butterflies (41 species) compared to 17 and 18 in bushland and plantation forest, respectively. An interesting Orthopteran (see photo below) of the genus *Paracoptara* was collected. This specimen is different from those collected from forests west of the Rift Valley in being browner with stripes of beige compared to others that are generally green.

The high diversity of butterflies recorded within just 4 days could be attributed to availability of suitable microhabitats. Sampling for a longer period in all habitats and when most of the plants are flowering is certain to give additional species. 44% (22 species) of the butterfly are characteristic of the Afrotropical highland biome, a few of them being true forest species e.g. Jackson's Swallowtail *Papilio jacksoni* (Papilionidae). However, one species, Garden Inspector *Precis archesia* (Nymphalidae), is typical of the savannah country, showing that Uaso Narok Forest is indeed in an overlap between the wet highland climate and the drier lowlands of Laikipia Plateau.

Conspicuously missing were representatives of wood beetles e.g. Passalidae (horn beetles), Dynastinae (rhinoceros beetles), Lyctidae (powder-post beetles), Cerambycidae (timber beetles), Scolytidae (bark beetles) and Trogossitidae (bark-gnawing beetles). These Coleopteran groups rely on dead or decaying woods for most of their needs. Although other microhabitats for some of these beetles exist, e.g., living plant materials and foliage, a further survey should target sampling from all suspected areas. However, the ongoing intensive removal of dead wood by licensed firewood collectors is largely contributing to the absence of these beetles' microhabitats. This argument is further supported by Carpenter bees' (*Xylocopa sp.)* nesting in exterior timber of buildings in the offices and neighbouring homesteads due to lack of natural dead wood..

Larger nocturnal Lepidopterans were surprisingly absent from the light trap catches outside the offices/forest edge, except a Sphingidae collected inside the indigenous forest. Additional trapping deep in the forest night over is likely to give more species and perhaps some of the wood beetles.

A number of recommendations can be made from this initial survey:

1. More individuals of *Paracoptara* sp. (Orthoptera: Acrididae) are required to establish whether it is a new species or a subspecies of those collected from forests west of the Rift Valley in Kenya and Uganda.
2. Additional surveys covering all the habitats are highly recommended in different seasons (dry vs. wet). Collection is so encouraged so as to enrich the national depository at the National Museums of Kenya with specimens from this part of Kenya and to identify species and groups of conservation importance and what economic opportunities they present to national development.
3. The ongoing extraction of tree nursery bed soil and firewood collection (including removal of lying and standing dead wood) should be banned immediately as these are leading to removal of particular niches and microhabitats for breeding, hiding and/or feeding for some of the invertebrates e.g. wood beetles and some species of birds (gleaners such as woodpeckers).
4. Replanting the clear patches created by fire and/or deforestation may hasten the recovery process.

This forest is important in conservation of invertebrates particularly the butterflies. Some of the recorded species have the potential for commercial farming. The presence of high altitude (Afrotropical highland biome) and savannah species of butterflies further indicates the conservation value of the forest in harbouring species from both biomes. Together with other forest indicators and highly sensitive flora and fauna, some of the butterflies could be used in monitoring changes of the forest. A more vibrant and stringent protection and conservation effort is required now rather than later. A sound conclusion will be made when all specimens are identified.

Acknowledgements

Funds for this survey were provided by the Royal Entomological Society (Outreach Grant) to whom we are greatly indebted. Kenya Forest Service granted permission and provided logistical support. We thank staff at the National Museums of Kenya who helped with species groups' identification. Additional assistance in the field was obtained from members of Nyahururu Bird Club.

Insects from the Uaso Narok Forest Reserve

Top:
Coleoptera-Scarabaeidae (sub-family Cetoninae)

Middle:
Coleoptera (Net-winged Beetle – Lycidae)

Bottom:
Hymenoptera – Braconidae

Meeting Reports

Tracking Insects: Techniques and Analysis

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The first monthly meeting of the Society held at The Mansion House, St Albans was in April this year. The theme was 'Tracking insects: techniques and analysis'. The main purpose was to hear how fellow entomologists had approached the problem of tracking a range of different insect species and how successful they had been. The subject proved to be of considerable interest with at least five speakers from abroad offering to give talks, despite an already full programme and so the meeting could have continued quite easily for another day. In fact the meeting was oversubscribed and a cap placed on the numbers attending. The journal Science took an interest and one of their editors attended the event resulting in a profile of Mark O'Neill, the opening speaker, appearing in Science 328:1628-1629.

Species chosen for study ranged in size from 45mm down to a mere 3mm, with examples from laboratory based work, field experiments through to large-scale field studies at landscape scale. Techniques used were split evenly between the latest micro-electronic tags and conventional marking using coloured paints and pens.

Mark O'Neill (Tumbling Dice & Newcastle) began the proceedings by explaining how video cameras, new radar techniques and associated software programs can be used to monitor insect behaviour in the field, such as foraging by bumblebees and honeybees, with minimal involvement of the observer. He illustrated his talk with examples of the latest designs of harmonic radar tags for large insects developed in his laboratory.

David Chesmore (York) discussed the ways in which smaller and more 'intelligent' tags can be used to track individual insects. Tags can be either passive or active - the former does not require any power supply and so can be extremely small and light whereas an active tag uses an internal power source and is better suited to only the very largest of insects. He also reviewed the possibilities of using radar, harmonic radar and radio location for tracking insects.

Elva Robinson (York) described how miniature radio-frequency identification (RFID) transponder tags are used to monitor the movement of individual rock ants *Temnothorax albipennis* in the laboratory and how this technique can be applied to investigating how ants reach collective decisions such as task allocation.

Colin Hawes (Royal Holloway) reported on his study of the dispersal behaviour of the stag beetle *Lucanus cervus*, the UK's largest beetle, measuring up to 45mm. Movements of adults were monitored radiotelemetrically and by mark-release-recapture (MRR) in order to measure the threshold distance of connectivity between neighbouring populations. Small radio transmitters were attached to the pronotum of male stag beetles and their flight movements monitored using a hand held receiver. Keeping track of individual beetles was a time-consuming process but often exciting at times when beetles disappeared behind a row of trees and were temporarily 'lost' from view. This was also because the transmitters were rather expensive and every effort was made to ensure none was lost.

In the past there has been considerable debate over the extent to which the process of handling and marking insects with fast-drying paints or ink affects the subsequent behaviour of marked individuals (Southwood & Henderson, 2000). The same criticisms can be applied to most electronic tags which despite major

Lunchtime at The Mansion House. Elva Robinson, Len Winokur, Stephen Miles and Raymond Uffen.

advances in miniaturisation constitute a significant proportion of the bodyweight of a tagged individual and incur additional energy costs and altered body shape which may influence an insects' ability to move through the environment.

Tom Brereton (Butterfly Conservation) described a technique for individually marking grizzled skipper *Pyrgus malvae* in the field and how repeat sampling could be used to obtain more accurate estimates of the size of a number of interconnecting populations. He compared the results obtained by this very intensive method with those obtained from transect surveys which are very quick and easy to undertake.

John Muggleton (British Entomological & Natural History Society) reported on progress in monitoring the rare bee fly *Thyridanthrax fenestratus*. Although transect walks indicated that very few individuals of this fly were present at the main study site confirming its rarity status it was evident that no-one had the faintest idea of the fly's real population size. It was found that flies could be marked individually and recaptured in sufficient numbers to provide population estimates of this species for the first time. It was felt that the results from the MRR exercise were far more informative for the conservation of the fly than the comparative results obtained from transect surveys.

The problems of recording the movements of a nocturnally-active bushcricket *Leptophyes punctatissima* in 3-dimensional space were outlined by Marion Hall (Open University). The final talk by Heather Oaten (Game & Wildlife Conservation Trust) explored the technique of using rubidium chloride as an internal marker for tracking groups of marked hoverflies in wheat fields.

A vitally important aspect of MRR field studies is the need to recapture a sufficiently large proportion of marked individuals. This can be done actively in the case of large day-flying insects such as butterflies and larger flies by using a simple hand net. The study area is sampled either by walking the habitat and capturing flying individuals and those that have been disturbed from the vegetation or by adopting a more sedentary 'wait and see' approach for insects that are known to visit highly specific sites within a locality such as composite flower heads or tree stumps. Marking of both sexes can reveal differences in flight behaviour, for example, males of the silver-spotted skipper *Hesperia comma* are noticeably more active and fly longer distances than females (Adey & Wilson, 2010). Nocturnally active bush crickets, despite their large size tend to hide amongst the foliage and so Marion Hall devised a simple light-reflective tag for rapidly locating individuals in the darkness.

Recapturing marked individuals can also be achieved in a more passive way by using traps. These are often easy to deploy, but design, number and distribution can influence assessments of population size and structure. Light-traps for capturing night-flying moths (and other types of insect) allow for marked individuals to be recorded and released again thus allowing additional calculations on longevity and rates of movement. Large numbers of flying insects such as aphids, flies, small Hymenoptera and Coleoptera can be captured using sticky traps. Ideally such traps should be able to sample insects equally from all directions and the upturned 2-litre plastic lemonade bottle/sticky trap devised by Heather Oaten for sampling hoverflies and coccinellids is a good example. The round, transparent glue-covered bottle ensures that insects are exposed to the same surface area of trap from whichever direction they approach from. The Oaten sticky trap is also remarkably cheap and easy to make.

Data analysis was covered fairly briefly by each of the speakers and tended to of a practical nature on the wish to obtain more marked individuals to increase the accuracy of population estimates. Repeat sampling is one way of overcoming this problem and Tom Brereton was keener than most by living in a caravan all season right next to his butterflies so that he could study them more closely.

Although the meeting focussed very much on tracking individuals and the recovery of marked insects at local habitat and landscape scales, many insect species move over considerably longer distances during their life time. Considerable effort has been devoted to studying long range aerial dispersal and migration of insects using various forms of radar (for modern reviews see Chapman *et al.*, 2011; Drake & Reynolds, in press).

There were breaks for refreshments and discussion. Lunch was most enjoyable as always and members made good use of the Society's library facilities. One or two more adventurous souls (I know who they are) tried the fancy lift which takes you upstairs to the Council room.

Two of the speakers unfortunately failed to make it on the day but their summaries are included below for completeness. Each speaker has kindly provided information on the equipment they used and a list of suppliers. This should prove particularly useful for anyone wishing to obtain the latest micro-tags for tracking insects.

All in all, a most interesting and enjoyable day.

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Implementing Smart Field Technology for Tracking and Real Time Monitoring of Invertebrates

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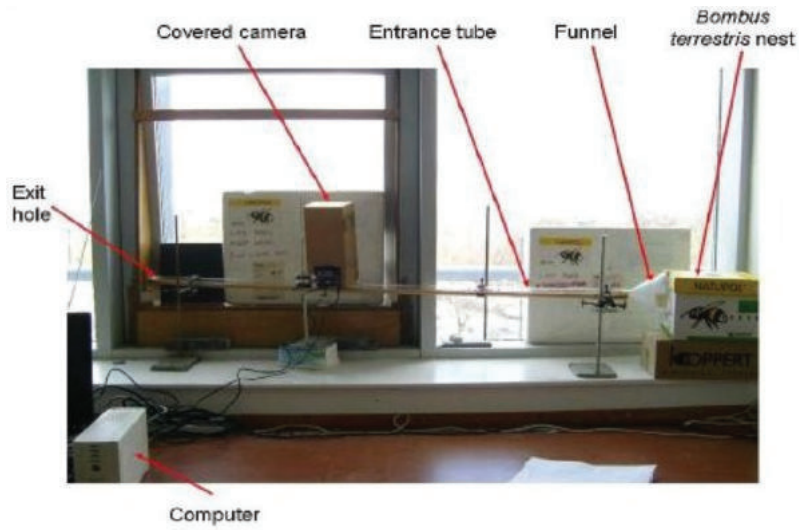

Figure 1. A Smart Nest using a vision-based motion detector to count forager movement.

One of the major problems of field based ecological work is sheer boredom: it is tedious to sit for hours in order to gather the necessary observations required to understand how study organisms behave and interact. In the case of invertebrates, this problem is compounded by the small size and sheer number of individuals. Automation - that is using technology to tag and track insects and other invertebrates offers a potential solution.

Technology for tracking can range from simple coloured (or numbered) tags to sophisticated computer based surveillance systems. Despite hardware and software limitations computer based approaches offer the hope of being able to make detailed ecological observations in the field in an automated fashion. This of course frees the ecologist from the relative drudgery of having to sit in the field allowing them to do other things, for example to devote more time to analysing data or building behavioural models.

If we take the study of bumblebee foraging behaviour as an example, it is clear that the deployment of automated tracking systems allows a rich set of data to be collected routinely:

Simple counting: the flux of foragers entering and leaving the colony can be measured as a function of time of day, ambient weather conditions and the availability of forage.

In the case of systems using vision or radio frequency identification **(RFID)** tagging to count the insects, individuals can be tracked. This means that it is possible to look at the fates of individual insects yielding valuable information on forager lifetime and time they spend outside (and inside) the colony when foraging. In addition, vision based camera traps allow pollen loads to be visually inspected without removal.

Systems which use simple counting and **RFID** and vision based identification and counting have been deployed at The University of Newcastle upon Tyne. Currently Roy Sanderson and colleagues are using a relatively robust approach based on infra red detectors to look at forager flux in nests of the bumblebee *Bombus terrestris* in agri-ecosystems while Gordon Port, Mark O'Neill and colleagues are concentrating on vision-based approaches in order to observe individual (marked) foragers. Visual camera traps, and to a lesser extent **RFID** tagging approaches may also be used to monitor flowers in order to determine which insects are pollinating them. For example, Gordon Port, Sarah Barlow and Mark O'Neill (University of Newcastle upon Tyne & Tumbling Dice Ltd) are

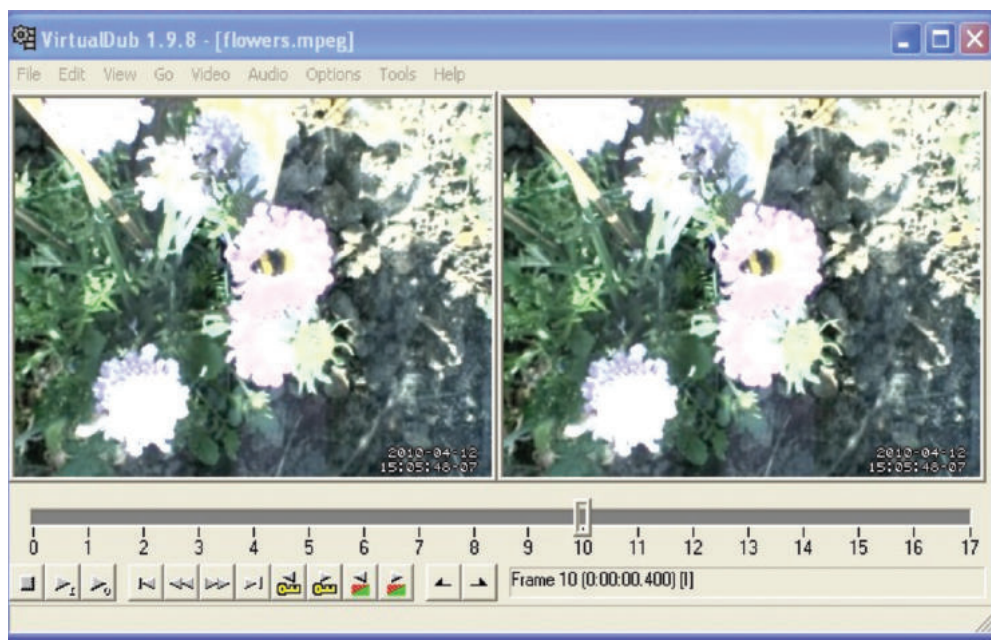

Figure 2. Showing a specimen of the bumblebee *Bombus pratorum* captured while pollinating field scabious *Knautia arvensis*.

currently using a system based on visual camera trapping in order to determine the principal pollinators of flowers in upland meadows. This system is based on open source software and consists of:

1. A motion detection system which records visitors to flowers and stores (image) data on a logging computer as a movie.
2. A video editor which allows the ecologists to play the movie and also look at and abstract individual frames from it. Insects "captured" by the trap can be identified either using a field guide or using further computer based tools. For example, the **DAISY** system (Gaston & O'Neill, 2004; O'Neill, 2007) can be used to identify insect images to species if suitable training sets exist.

While they are not a panacea, these systems are ideal for the automated tracking of insects *at fixed locations*

(e.g. forager bumblebees leaving and entering their colony or pollinators visiting flowers). What about methodologies *which can track an insect anywhere within an ecosystem*?

There has been some work done in this area. For example Juliet Osborne and colleagues (Rothamsted Research) have used a passive harmonic radar approach to track bees, butterflies and other insects within agri-ecosystems (Riley *et al.*, 1998, Reynolds *et al.*, 2007). Additionally, **VHF** based active tracking technology has been used to study the migration of dragonflies (Wikelski *et al.*, 2006) and to provide real time in-flight telemetry from the hawk moth *Agrius convolvuli* (Ando *et al.*, 2002; Wang *et al.*, 2008).

There are significant problems associated with these systems. For example, harmonic radars suppress ground 'clutter,' but terrain and vegetation, although not sources of

Figure 3. Showing how a radio tracking antenna can be much larger than the tracked insect (in this case a *Xylocopa* sp.)

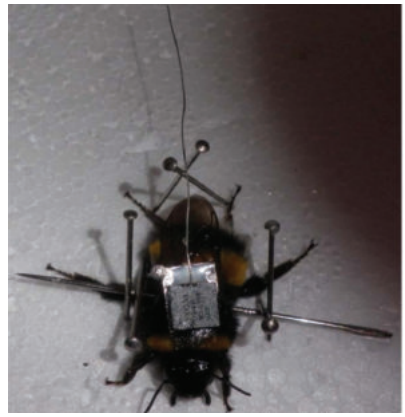

Figure 4. Showing a mock up of an **IFF** transponder tag on a *Bombus terrestris dalmatinus* forager (left) and detail of a VHF radio transmitter on a dragonfly (*Aeshna* sp.) (right).

echo, may still act as a barrier beyond which a tagged insect will not be detected. Because of the frequency bands used, current active **VHF** and harmonic radar tracking tags need long aerials (of the order of several centimetres) in order to work efficiently. Aerial systems which are as large or larger than the insects being tracked may of course adversely affect behaviour.

At Tumbling Dice we think that long term, active tagging offers the most viable solution to long range invertebrate tracking. Consequently we are currently designing a novel radio tag. This tag which weighs < 300 mg can be flown on insects as small as large workers of *Bombus terrestris* and can provide in-flight telemetry in addition to simple (**RFID** style) identification services.

Military technology has faced most of the challenges (except for extremes of weight and power) which the ecological community is facing today when trying to tag and track small organisms. It may be productive to look at military solutions to tracking problems such as using Identification Friend or Foe (**IFF**) transponder technology or **AWACS** for inspiration when deploying technology to tag and track invertebrates.

The road is hard, but if we can get even some way along it, the face of ecological research will be fundamentally changed by the deployment of technology.

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The Technology of Tracking and Tagging Insects

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This talk was cancelled due to illness

The concept of tagging insects for monitoring purposes is not new but are advances in electronic technology providing new prospects for creating smaller and more "intelligent" tags? There are two main applications for insect tags: tracking for locating and following insects, and tagging to detect when an insect approaches a given location. Both methods have many limitations primarily caused by the requirement for a tag to be less than 10% of the animal's body weight. For insects, this may be in the order of milligrams, hence only large insects such as dragonflies are generally suitable.

Tags are divided into two types – passive and active. The former does not require any power supply which means that its weight and size can be minimised, however, the reading distance (distance between tag and transmitting antenna) will be small, typically less than a few metres and may be as low as 50cm. This limitation is due to the need to transmit power to the tag which also results in a physically large antenna. An active tag has its own power source (increased weight) which means that the reading distance can be much further. Such tags have been successfully used with large beetles. Active tags can also have more functionality such as memory, temperature monitoring and even GPS location, however, they are all too heavy for insects and only suitable for birds and mammals.

Tracking methods include radar, harmonic radar and radio location used mainly for birds and mammals. The most widespread methods are radar and harmonic radar which rely on the scattering of electromagnetic energy from the insect; this is detected by an antenna which may be hand held or static (permanent or vehicle mounted) in the case of large radars. Information such as distance and direction can be determined if the receiving antenna can be orientated or scanned. Harmonic radar requires a small tag consisting of an antenna and a diode to be attached to the insect; the diode re-radiates the energy back at twice the transmitter frequency which is then detected at the receiver. Problems with radar and particularly harmonic radar include line of sight, i.e. the signal will be lost if the insect(s) go behind an object such as a hedge, and low received signal level due to the insect (and hence tag) being physically small and/or a long distance away.

Tags are commonly used in industry and the commercial sectors for security applications (e.g. taking items out of shops) and tracking the progress of items through production lines, etc. Such tags are called RFID (Radio Frequency Identification) and in their simplest form simply indicate the tag's presence or absence. Such tags are found in retail outlets for security purposes and are typically 50mm x 50mm in size and require a reader antenna to be more than $1m^2$ to achieve a read distance of around 0.5m. Smaller PIT (passive integrated transponder) tags contain microchips with unique identifiers that can be detected using a reader. More complex PIT tags can monitor temperature and store user-supplied data; however, they will not record temperature since they have no power. PIT tags can be small, around 12mm in length and 2mm in diameter but their weight is 90mg and are not suitable for all but the largest insects. Read distance can be up to 1m and low frequency devices can read through wood, soil, etc.

What of the future? The main limitations for tags are power requirements, physical size and effective distance. One of the main trade-offs is detection distance vs. antenna size. In order to achieve a long distance, a low radio frequency must be used which requires a large antenna. Addition of a battery to the tag allows for longer distances but increases the weight and size considerably. Given these inherent problems, there is unfortunately little prospect for the ultimate tag – long transmission distance, physically small and lightweight. However, there are still many potential applications where tags can be successfully employed in entomology and indicated by the remainder of the presentations in the meeting.

The slides for the presentation can be found at: http://www-users.york.ac.uk/~edc1/

Radio-tagging Ants: Investigating the Influence of Individuals on Collective Behaviour

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Collective behaviour occurs when groups of individuals act in a coordinated manner. Social insects are fantastic models of collective behaviour, coordinating their actions to produce physical structures, such as termite mounds or honeycomb, and biological formations such as trail networks or bee swarms. These collective behaviours are determined not by centralised control, but by the simple behaviours of the individuals which interact to produce complex group level patterns. Many models of 'self-organised' collective behaviour assume that all the individuals in the group are identical, but in reality we know this is not the case. To understand collective behaviour, we must identify the rules followed by individual members and the variation between members of a group. In order to do this, some means of reliably identifying the individuals is required. Previous methods of identifying social insects such as bees, wasps and ants have been primarily visual, mostly using coloured numbered discs or combinations of paint dots. While these methods have been used successfully in many studies, they require the labour intensive process of decoding the visual information. Radio-frequency identification (**RFID**) technology allows every individual in a colony to be tagged with its own unique passive microtransponder, which transmits its identity via a reader straight to a computer, making decoding automatic. This kind of technology has been used successfully on bees and wasps, using tags weighing 2-18mg (Sumner *et al.*, 2007; Molet *et al.*, 2008). New RFID tags produced by PharmaSeq, New Jersey are much smaller than previous types, weighing just 89µg. This allows the application of this technology to ants for the first time (see Figure 1).

These tiny RFID microtransponders contain a chip with a unique ID, a capacitor for storing energy, and the facility to produce a radio signal. The RFID readers contain a laser light source and a radio aerial, and connect directly to the computer. When an RFID tag passes under the reader, the light from the laser supplies sufficient energy for the microtransponder to transmit its ID. The computer can then record the ID, the time and date of detection, and the reader transmitting the record (i.e. the location, if multiple readers are fixed in various locations). Experiments using this system have been performed using the rock ant *Temnothorax albipennis*, which naturally forms colonies of c100-200 individuals, making it possible to RFID-tag all the workers (Robinson *et al.*, 2009a). The major advantage of this system, the small size of the RFID tags, comes with a drawback – the tags are only detected by the reader if they pass within 3mm and in the right orientation. This calls for careful experimental design to ensure effective ant recording.

This technology has been applied to two issues of collective organisation: task allocation and collective organisation. Task allocation is an important process in social insect colonies, which must flexibly allocate their workforce in response to demand for different tasks, e.g. foraging, brood care and nest maintenance. Various factors are known to affect which task a worker performs: physiology, experience, spatial location, age. These factors are often studied in isolation, but by using RFID tags on all ants in a colony, we were able to match up an ant's age cohort and level of fat stores with its previous activity inside and outside the nest, and with its preferred spatial location in the nest (Robinson, Feinerman & Franks, 2009). We then changed the demand for certain tasks, and investigated which ants responded to those changes in

Figure 1. Radio-tagged *Temnothorax albipennis* worker. Scale bar 1mm. Photograph by Nigel Franks.

demand. When we increased the demand for foragers, it was the ants with lowest fat stores which responded, irrespective of their age, previous experience and location. This suggests that ants can use their own internal physiology as a task cue. When we increased demand for brood care, ants with high levels of previous intra-nest activity took on the task of transporting the extra brood. This suggests that brood transport is a self-organised task, with the ants that spend time patrolling the inside of the nest being the most likely to encounter the new brood and then transport it to the brood pile. The colony thus combines physiological thresholds with simple task-encounter mechanisms, allowing very flexible task organisation (Robinson, Feinerman & Franks, 2009). The second issue we tackled with this new technology is collective decision-making. If the cavity in which these ants nest breaks open, the colony must make a collective decision to move to a new home. Ant colonies are known to be choosy about the quality of their nests, and previously it was thought that some scouts directly compared the quality of available alternatives. By using the RFID-technology to identify all the scouts which visited each nest and whether they were involved in recruitment, we were able to show that direct comparison does not play a key role in nest choice (Robinson *et al.*, 2009b). Rather, individual scouts use a simple internal threshold of acceptability. If the nest quality exceeds that threshold they accept it and recruit others; if the nest is of low quality, the ants simply reject it and keep searching. This allows the colony to choose the better of two nests, without any individuals needing to compare their qualities.

RFID-technology has shed new light on the organisation of collective behaviour. Ongoing developments linking the RFID system to automatic doors to exclude certain ants from contributing to specific tasks will provide further insights into collective organisation.

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Monitoring Dispersal: Mark-release-recapture and Radio-tracking Stag Beetles

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The stag beetle, *Lucanus cervus*, is listed as near threatened in the UK. It is Britain's largest native terrestrial beetle with its own UK Species Action Plan and in recent years has become a flagship species for insect conservation. Males are easily recognised by their prominent 'antlers' (mandibles), an identification feature which has been successfully used in engaging the public in national surveys of the beetle.

Studies were undertaken during the period 2006-2009. As far as the author is aware, the data obtained provide the first scientific information on the movement and dispersal of *L. cervus* in the UK, information which is fundamental to providing appropriate conservation for this insect. Dispersal movements were monitored radiotelemetrically (RT) and by mark-release-recapture (MRR) in order to estimate the threshold distance of connectivity between neighbouring populations. Two monitoring sites were used, a private garden and a tree surgeon's timber storage yard, both of which had a plentiful supply of dead and decaying wood and produced a good annual emergence of stag beetles. Adult beetles were captured using pitfall traps, a butterfly net and by hand. A novel 4-spot decimal system was devised to mark each captured beetle with a unique code using a Pentel MicroCorrect needlepoint corrector (Pentel Stationery Ltd.), suitable for use on short-lived adult beetles.

Radiotelemetric studies were carried out using miniature transmitters (tags) (Biotrack Ltd. & Titley Electronics) glued to the pronotum of the beetles (Figs 1 & 2). Each tag had its own unique radiofrequency and was individually tracked with a receiver and two antennae (one for direction and approximate location, one for precise location. Tagged beetles were tracked three times a day for 15-21 days (limited by battery life).

Of the 138 beetles captured, marked and released in the MRR study (100 males, 38 females), 38% (36 males, 16 females) were recaptured at least once in subsequent visits to the same garden, and individual beetles were recaptured up to eight times over a period of 27 days. Both MRR and RT studies showed male dispersal behaviour to consist of frequent short flights with little ground movement (maximum distance travelled by an individual beetle = 225m). Female dispersal behaviour comprised mostly consecutive walks on the ground towards potential ovipositing sites (maximum distance travelled by an individual = 29m). Colonisation of new sites depends on the dispersal ability of females, which according to the data obtained appears to be very

limited. If this is the case, then it is suggested that conservation effort should be directed towards using suitably aged logs to continually replenish decaying wood at isolated known emergence sites, and stag beetle log pile 'stepping stones' be put in place to link at risk populations. Populations that remain isolated have an increased probability of extinction.

Funding for the purchase of radiotelemetry equipment was provided by: English Nature (now Natural England), People's Trust for Endangered Species and Royal Holloway University of London.

Equipment

Pentel (Stationery) Ltd., Swindon, Wiltshire

Biotrack Ltd., 52 Furzebrook Road, Wareham, Dorset, BH20 5AX
www.biotrack.co.uk

Titley Electronics, Unit 3, 4 Endeavour Close, Ballina, NSW 2478, Australia
www.titley.com.au

Marking Butterflies for Conservation: Grizzled Skipper Case Study

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Mark-release recapture (MRR) is a low cost and effective method that can be used to generate data to help understand and conserve butterfly populations, particularly for specialist species restricted to semi-natural habitats. The method involves unbiased repeat sampling across the flight area of a species of interest, with efforts made to capture and mark all individuals encountered. All that is needed is a butterfly net to catch the butterflies, a set of waterproof pens for marking and a detailed map/GPS to plot the positions of sightings. By placing different coloured spots on the wing in different positions (Fig. 1), many hundreds of butterflies can be individually marked. In the marking process, insects remain in the net and are handled so that wings fold in their natural direction. Ink is then applied through the net (wide mesh netting required) to particular locations on the wing whilst the butterfly is settled. Studies have shown that, with care and experience, butterflies are little affected by marking and typically return to their previous behaviour soon after. At the point of each capture or subsequent recapture, the date, time, location within the site, sex, wing-wear and behaviour are recorded, in addition to the capture number of the insect.

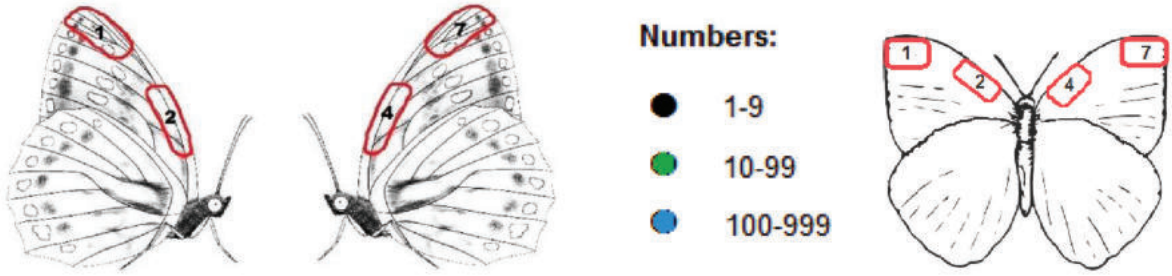

Fig.1 Butterfly marking system

With sufficient effort made to ensure that a high proportion of recaptures are made, a variety of models have been developed (e.g. by Schnabel, Joll-Seber and Craig) to enable the estimation of absolute population size from MRR data, with an associated measure of error. Daily MRR abundance estimates have been used in conjunction with transects counts made on the same day, to validate butterfly transects as a rapid and robust method for monitoring specialist butterfly species. Through MRR data on a wide range of demographic parameters can be obtained to better understand butterfly population structure. These include information on lifespan, sex-ratio, residence, mobility (distance between captures), vagility and emigrates rates.

MRR studies have been completed on most declining UK specialist butterfly species that are conservation priorities. One such example is the Grizzled Skipper *Pyrgus malvae*, with marking studies completed in West Sussex downland and coppice woodland habitats between 1993 and 1995. Over the three years, 1790 captures were made of 1080 individuals, with annual recapture rates of 35-39% for females and 41-52% for males. Individuals tend to live for about a week to ten days in the adult stage, although some live for up to a month. Females and males live about the same time. The study showed that in fragmented lowland landscapes supporting frequent patches of suitable semi-natural habitat , the butterfly forms networks of largely separate colonies (a metapopulation), linked by occasional movements (6% of the total) between them. Large colonies may support 1000 individuals or more on the peak day (usually mid to late May), although most populations are small (less than 30 present on the peak day). Most individual movements between captures were less than 200m, with the maximum detected being 1.5km confirming the low mobility of most individuals. The MRR work highlighted the need for both site management and landscape-scale conservation in order to effectively conserve the species in the long-term.

Names and addresses of suppliers

Alana Ecology Ltd, New Street, Bishop's Castle, Shropshire, SY9 5DQ. UK
http://www.alanaecology.com/

ALS, Station Road, Hindolveston, Norfolk. NR20 5DE. UK
http://www.angleps.com/nets.php

Bioquip, c/o Focalpoint Optics, Unit 8, Marbury House Farm, Bentleys Farm Lane, Higher Whitley, Warrington, WA4 4QW
http://www.bioquip.net/index.html

NHBS Environment Bookstore, 2 -3 Wills Road, Totnes, Devon, TQ9 5XN, UK
http://www.nhbs.com

Watkins & Doncaster, PO Box 5, Cranbrook, Kent, TN18 5EZ, UK.
http://www.watdon.co.uk/the-naturalists/index.html

A Mark-recapture Study on the Mottled Bee-fly *Thyridanthrax fenestratus*: What a Transect can never tell you

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In the UK transects or standardised walks seem to have largely replaced mark-recapture studies as the main way of assessing the numbers of butterfly, and other groups, for conservation work; perhaps on the grounds that they are cheaper and less time consuming (e.g. see Thomas (1983)). However this need not be the case and much useful data is being lost by their adoption.

The mottled bee-fly *Thyridanthrax fenestratus* (Fig.1) is a parasitoid of the solitary wasp *Ammophila pubescens*. The wasp makes burrows in bare, sandy soil which it provisions with caterpillars and where it lays its eggs. The wasp larva feeds on the caterpillars. The bee-fly in turn lays its eggs into the wasp burrow and the bee-fly larva eats the wasp larva when it is about to pupate. The bee-fly is, therefore, a bare ground species and its habitats are the paths and tracks that cross the lowland heaths of southern England. It has a very localised distribution in England and is a Biodiversity Action Plan RDB3 species. In 1999 and 2000 a series of transects were walked at Thursley Common National Nature Reserve (NNR) with the aim of assessing the relative abundance of the bee-fly in different parts of the common and for comparisons with other sites. The transect used existing paths and tracks, was about 4 km in length and was divided into 14 sections. A target time of two hours was set for completing the transect. In each of the years several observers were used and the transect was walked eight times. In both years the same two adjacent sections of the transect had the most sightings of the bee-fly with a total of 19 seen over eight visits to these sections in 1999 and 23 seen in 2000. The total number of sightings over eight visits for the whole transect was 59 in 1999 and 66 in 2000. There is, of course, no way of knowing

whether different flies were seen on each visit or in each section of the transect on the same visit. From this study we gained information about the best habitats and flight times, and concluded that the population, at this the best UK site, was quite small.

It seemed that more information might be collected by a mark-recapture study. Against this was the belief that the bee-fly was difficult to catch, short-lived, fragile and with a wing measuring 8 x 3mm would be difficult to mark. Nevertheless a mark-recapture study was carried out on Thursley Common NNR in 2001. In flight the flies were, indeed, difficult to catch with a net but they could be caught on the ground if the net was brought down directly over them. A black net of 2mm mesh was used. This allowed the fly to be seen and marked within the net thus avoiding direct handling. Once in the net the fly was confined within a fold and marked on the wing using a medium tip permanent ink Stabilo® overhead projector pen. The mesh size of the net was sufficient to allow the tip of the pen to pass through. Up to two marks were applied to each wing which enabled individual marks to be applied to fifteen specimens with each available colour. Eighty flies were individually marked in this way. Permanent marker pens can be recommended for other flying insects as the ink dries immediately, the mark has no appreciable weight and remains as long as the wing is intact. (Acrylic or enamel paints are poor substitutes, neither dries immediately, both can add weight to a delicate wing and the former is liable to fall off.) Marked flies were given at least 24 hours to mix with the unmarked population before recapture was attempted. The study ran from 24th July until 15th August and of the 80 flies marked 14 were recaptured. Two individuals survived for at least 17 days and the mean observed days survived was seven. The maximum observed distance moved was 340 metres by two individuals and the fastest movement was 175 metres in two hours. The speed of movement meant that an individual could traverse the whole heath in its lifetime and would be able to reach the next nearest heath. A smaller population of the bee-fly on Chobham Common NNR was marked in 2002 and 2004 and here one individual was observed to have moved 1.6 km in seven days confirming the dispersal potential suggested by the results from Thursley Common. The mean numbers of days survived at Chobham was six. A disadvantage of working with *T. fenestratus* is that it only flies in bright sunshine and we have yet to find its resting place when the sun is not shining. Periods of inclement weather meant that population estimates had to be restricted to the use of Bailey's Triple Catch method (Bailey, 1951). This suggested a population of up to 142 bee-flies at Thursley and 48 at Chobham. The mark-recapture time was limited, like the transect walks, to two hours. The cost of equipment, marker pens and net, was minimal. Yet the previously unknown information gained about the biology of this species and the potential for the acquisition of more data exceeds that which could be obtained from a transect walk. How much more could we learn if those doing 'butterfly walks' were given a marker pen and a net?

Automotive failure prevented me from presenting this talk at the meeting. I was, however, able to transmit the visual aids electronically to the meeting, where Stephen Miles and Raymond Uffen endeavoured successfully to present the methodology and results. I should like to express my appreciation for their efforts and for the assistance of the staff in the RES office in dealing with the transmission of the files.

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Tracking the Speckled Bushcricket, *Leptophyes punctatissima*: Monitoring the position of individuals around the clock and in three dimensions

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Leptophyes punctatissima is a medium sized, flightless tettigoniid, with a wide distribution in Europe. Adults emerge in late July after six nymphal instars. The peak of mating is during August and adults are active day and night. Previous field work on this species is limited, though a study by Duncan (1960) suggested that nymphs feed on low vegetation while adults move up into trees to mate. However, he did not identify individuals. My study of a population in an old apple orchard in northern Germany, in collaboration with David Robinson (Open University) and Juergen Rheinlaender (University of Frankfurt), aimed to monitor the movements of individually marked adults in three-dimensional space.

We built a 5m x 10m platform at a height of 1.7m around two adjacent 5.5m tall apple trees to give us access to all parts of the canopy and the low vegetation surrounding the base of each tree (Fig. 1). All adults were captured shortly after emergence. They were marked with a number painted on the back with yellow modeller's enamel paint. Yellow was chosen because many of the leaves of the apple tree had yellow patches, so the numbers did not disrupt the animals' camouflage. Based on an idea from Heller and von Helverson (1990), each insect was also given a tag on its leg with a matching number. The tag was made from highly reflective sticky tape (Scotchlite® reflective self adhesive tape: 8850 silver with pressure sensitive adhesive, made by 3M). This was inconspicuous during the day but could be used to locate the insects at night. Shining a torch on the tag revealed it as a bright spot in the dark, even from 50 metres away or more. As well as giving us access, the platform allowed us to record the position of any insect in 3-D space using X, Y and Z coordinates. Taking one corner of the platform as the origin, we marked X and Y coordinates along the edges. Z coordinates were measured with a ruler above (+) and below (-) the platform, which was absolutely level rather than parallel to the ground. Inter-observer reliability measurements of insect positions based on these coordinates gave an error of ±4cm.We scanned the two trees and the area surrounding them several times in each 24-hour period and quickly recorded the position of each marked adult by placing a small numbered peg next to it and noting the number of the insect against each peg number. This allowed us to record all insect positions in a short space of time, with minimal insect movement, after which we could go back and measure coordinates at our leisure. Positions outside the area of the platform were recorded approximately in two dimensions, based on distances from the platform origin.

The distance an individual moved between consecutive position records was estimated as a straight line in 3-D space between the two sets of coordinates. Obviously, this is a minimum distance since it does not allow for meandering or backtracking. Results showed that, for a flightless insect, adults can move large distances, with some recorded more than 50 m from where they were originally caught. Males move around more than females, mainly because they are very active when singing. Mean height in the vegetation also increases with age for both males and females, which fits with Duncan's observations. However, this is not a straightforward gradual movement up into the tree canopy. Some adults stay low down and some nymphs are found high in the trees. Movement is not unidirectional and individuals move out horizontally from the low vegetation at the base of the tree as well as vertically up the tree. The pattern is more one of random dispersal in three dimensions rather than moving higher *per se*.

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Figure 1. Experimental platform for observing the position of speckled bushcrickets in the canopy.

Internal Marking of Flying Insects with Rubidium Chloride

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The element Rubidium (Rb) was first suggested by Berry *et al.* (1972) as a way to mark insects in order to identify their feeding habits. Rubidium itself is an alkali metal and therefore very reactive but exists as a very stable salt; rubidium chloride (RbCl). It is used by organisms in the same way as Potassium, owing to its close proximity in the periodic table, but it exists in very low concentrations in the environment and can be detected in organisms using Atomic Absorption Spectroscopy (AAS). Provided relatively low concentrations are used in marking studies, rubidium chloride confers no disadvantage to the insects' fecundity, longevity or behaviour (Qureshi *et al.*, 2004).

Rubidium chloride was used in this study to determine whether floral field margins surrounding cereal crops in southern England were being utilised by flying aphid predators. Two studies were conducted; firstly, a pilot study to determine the effectiveness of rubidium chloride at marking in an open system and, secondly, a large scale study to examine the movements of the female hoverfly *Episyrphus balteatus*, a ubiquitous species in the UK.

The pilot study consisted of 30 net tent enclosures positioned on a sown floral field margin randomly divided into two groups. One group received a 10-second spray of 3000ppm rubidium chloride (treatment), the other group a 10-second spray of distilled water (control). After spraying each tent received four newly hatched adults of *E. balteatus* and three adults of the two-spot ladybird *Adalia bipunctata*. After 72 hours the insects were recovered, killed, subjected to a digestion protocol and analysed for rubidium. Table 1 shows the results of a t-test between treatment and control.

Table 1. Results of the pilot study.

Species	No. recovered		P-value	Rb. Concentration
	Control	Treatment (Rb)		
E. balteatus	13	8	<0.001	140 times more Rb (ppm) present in treatment than control
A. bipunctata	11	11	<0.001	150 times more Rb (ppm) present in treatment than control

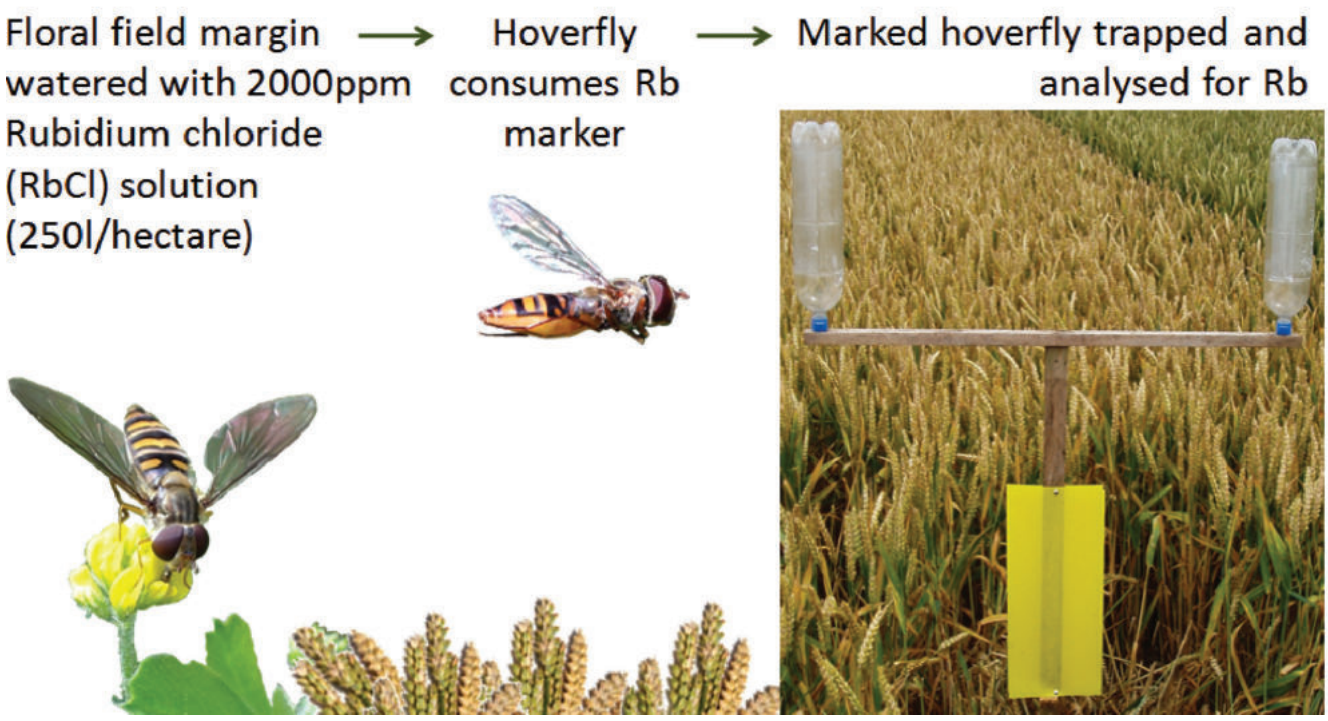

Figure 1. Marking *Episyrphus balteatus* in the field

The pilot study demonstrated rubidium chloride could be used successfully to mark two types of aphid predator. Following on from this a large scale study investigating the movements of female *E. balteatus* in an open system was conducted as outlined in Figure 1. A grid of 78 trapping stations consisting of two cylindrical and two yellow sticky traps was set up over a field of wheat and the grid of traps overlapped into adjacent fields. Four days after spraying the 0.5 hectare floral field margin with a 2000ppm solution of rubidium chloride, traps were collected in and all female *E. balteatus* tested for the presence of rubidium. Of the 867 individuals tested, only 13 (1.5%) exceeded the rubidium threshold concentration (thresholds are obtained through testing control individuals for Rb; an individual is considered marked if its concentration exceeds the average control Rb concentration value, plus three standard deviations). The 13 marked individuals were all located in the field within 120m of the floral strip. The low recovery rate could be attributed to: the immigration of large numbers of *E. balteatus*; surrounding floral resources being used; the lack of movement from the floral resource; and recently hatching *E. balteatus* being caught directly. The study, however, did demonstrate that rubidium chloride could be used successfully in an open system to mark floral feeding insects.

Table 2. Costs and benefits of using rubidium chloride as a marker.

Costs	**Benefits**
RbCl is expensive (ca. £155/100g 99% purity)	Proves utilisation of a resource
Requires expertise in using Atomic Absorption Spectroscopy	Easy to use, non-toxic in such low concentrations
'One-catch' only since insects killed to analyse	Minimal labour in the field
Sample preparations and digestions are time consuming and require hazardous chemicals	Can potentially mark very large numbers of insects
Persistence (days) of the mark depends on feeding rate	Potential to identify food webs at different trophic levels e.g. predators
Timing of movement unknown, i.e. when fed	Can easily recover large numbers of target organisms

There are several costs and benefits in using rubidium chloride as outlined in Table 2.

Thus rubidium chloride is a very useful tool for determining the use of pollen and nectar by flower feeding aphid predators, providing its costs are acknowledged and could also be extremely useful at examining trophic interactions in the field in future studies.

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The Royal Entomological Society Scholarships

In order to address the lack of Entomology training in Higher Education, the RES has initiated three scholarships to be awarded, on an annual basis, to students attending the MSc course in Entomology at the Silwood Park campus of Imperial College London. The first of the RES Scholars started in October 2010 and are introduced below, in their own words.

Hayley Brant

I applied for the Entomology MSc because I've always found that region of biological sciences the most interesting. After working with mosquitoes as my final year project, I decided that I wanted to study insects in more detail. Whilst volunteering at the Cole Museum of Zoology, I participated in sorting through the insect collection. This furthered my interest in insects, and has led me to apply for a volunteering position at the Natural History Museum working in the Entomology Department, and my application has been successful. This will provide extra experience in insect identification. I graduated with a First Class degree in Biological Sciences from Reading University this summer. The Entomology MSc will teach me key skills, and give me the possibility of going onto postgraduate entomological research.

Kyle Shackleton

Ever since I was young I have had a fascination with wildlife, visiting zoos and aquaria, watching nature documentaries and reading literature. While at secondary school, I was lucky enough to do my work experience at the Natural History Museum in the department of Entomology. I spent this time cataloguing beetle specimens under the guidance of some top scientists in the field. It was always my desire to go further and study animals at university.

Only during the third year of my undergraduate degree in Conservation Biology, did my passion for insects in particular really start to shine through in doing a woodland study of Collembola and a separate Aquatic and Invertebrate Biology module. During the Collembola study, I enjoyed every minute of sampling, sorting through my samples in the lab (yes really) and discovering what I had gathered (not just the Collembola). Even when my degree was coming to an end, I was hungry to continue learning. I had given some thought to doing a master's degree before this, but I now knew which direction I wanted to take.

I want to do MSc Entomology at Imperial because it is a unique course in the UK as it allows me to focus on insects. I looked into several other courses but this felt right for me. I hope to gain a good understanding of what is involved in research and to receive a range of skills which will help me in whichever career path I choose, whether that is research or elsewhere. Perhaps most importantly for me, I want to do this masters course because I want to enjoy learning about a subject I am so passionate about.

Tom Cull

Since I first discovered insects early on in my life I'm forever inclined to stop and look more deeply into my surroundings to spot the wealth of invertebrates that presents itself. It's always amazed me that something as small as an insect could be so complex, and could make up a group of organisms with diversity equally as impressive.

Throughout my education I've learned the increasing importance of entomology in the world today. The recent CCD epidemic in honeybees has been of particular interest, as well as the role insects play in biological control, biomimetics and as vectors for parasites. I have continually focussed my education with the ultimate aim of specialising in entomology, and this has served to deepen my interest in the area.

For these reasons I am extremely grateful for the opportunity to be able to study such a course, which will lead me to a career for which I have forever held a great interest and passion.

Insect Festival 2011

Not IF, but when

Given the huge enthusiasm that greeted the first RES Insect Festival in 2009 we are repeating the event in 2011.

Sunday 3 July at York Museum – put the date in your diary now.

Previously at IF09

"What a brilliant event. The children had a fantastic time (the Leaders did as well!). There was so much to see and do. My bag was bulging by the time I got home with lots of books, ID charts, leaflets etc. All the stands were excellent and the children loved being able to see first hand all the insects you had on show. Adults and children alike found the bug hunt very interesting - you don't realise what there is in your own back garden until you look more closely". (Julie Lund, Cub Scout Leader, Osbaldwick and Murton Cub Scouts).

"If the aim of Insect Festival was to raise public awareness of entomology, I think you have definitely succeeded". (Sam Heads, Portsmouth University - Minibeast Hunts).

"The Insect Festival certainly attracted a lot of people. I think the aspects I enjoyed most were that of networking with likeminded and active field entomologists, learning of new developments, projects, discoveries & techniques &c. It was also an excellent opportunity to promote our geographical area of interest to active workers; the sites need all the help they can get in terms of survey & monitoring". (Helen Kirk, Thorne and Hatfield Moors Conservation Forum).

"The entire day was a terrific success. The feedback at our table was fantastic. The interest in both the collections and Natural History in general was particularly pleasing". (Stuart Ogilvy, York Museum Trust).

"I enjoyed the day immensely. It was so nice to meet so many people with an interest in nature, We hope to have enticed some into the Butterfly Conservation fold, even if not, so many children were on the site that if only a small percentage develop into amateur entomologists the show has done a great job". (David Baker, Butterfly Conservation).

"Byron was over the moon with his prize for the Insect Festival art competition. The whole family enjoyed the festival. The children's highlights were making the insect models, seeing the bee colony and guessing the number of stick insects in the jar. We all learnt many new things about insects and have been mini beast hunting in our own garden. Thanks for a fantastic day out". (Mrs Carnie Pollock, mum of Byron, age 5).

Coming soon IF11

We already have a number of exhibitors signed-up. IF you wish to:

- offer a display
- run an activity
- help on the day
- or have other suggestions please contact one of the organising committee as soon as possible or contact RES HQ.

We look forward to seeing you in York on Sunday 3 July 2011

Julie North, julie.north@hse.gsi.gov.uk, Luke Tilley, luke.tilley@york.ac.uk, Gordon Port, Gordon.Port@newcastle.ac.uk

Society News

Council Matters March 2010

The March Council was chaired by the President, Prof. Lin Field, who welcomed Dr Nina Wedell to her first Council meeting.

The Registrar reported on a meeting of the Conservation Committee in December, which unfortunately had been hampered by a very heavy snowfall. Nevertheless, the Committee had short-listed potential Marsh award recipients. The eventual awardee of the 2010 Marsh Award for Insect Conservation was Dr Roger Key (formerly of English Nature/Natural England and now an independent consultant) for his outstanding work on many aspects of insect conservation and education. The Registrar reported later to Council that Dr Key had agreed to assist Prof. Haines in coordination of National Insect Week.

The Conservation Committee endorsed, on behalf of the Society, a Code of Conservation in respect of Invertebrate Translocation and have responded to a Defra consultation on the 'Fifth Quinquennial Review of Schedules 5 and 8 of The Wildlife and Countryside Act 1981' via the Invertebrate Link group.

Professor Claridge reported on the Westwood award for taxonomic excellent, which will be awarded to Dr Art Borkent (Royal British Columbia Museum) for his masterful monograph on 'The Frog-Biting Midges of the World' (abstract available at www.mapress.com/zootaxa/2008/f/z01804p456f.pdf). The Council discussed the best mechanism for presenting the award to Dr Borkent, who unfortunately was not able to attend the 2010 European Congress of Entomology in Budapest (the most immediate platform for presentation).

The Honorary treasurer, Prof. Hardie, on behalf of the Finance Committee, advised that there will be no change to the Society subscription rates for the 2011 – 2012 year. Following from Dr Wilson's letter to Antenna, regarding the cost of on-line access to Journals, Council discussed the general issue of Journal access but devolved the details of the matter to the Publications Committee to consider.

Council Matters May 2010

The President welcomed Prof. Haines, National Insect Week (NIW) coordinator, as a visitor to Council. Prof. Haines gave an update of the activities leading up to National Insect Week and explained the NIW'10 strapline 'Discover Diversity in the World of Insects' as befitting NIW being the Society's contribution to the International Year of Biodiversity.

The Registrar gave further details on preparation for the Society's bid for the European Congress of Entomology (ECE) 2014. Costings had been obtained from several bodies but York University had produced the most attractive package. The Registrar cautioned that predicted finances were on the basis of an expected attendance of 600 delegates (in line with ECE guidelines). Council also agreed that Ento'14 will be integrated into ECE 2014, rather than being held separately.

Council Matters June 2010

The June Council Meeting was held at Rothamsted Research prior to the Annual General Meeting. Most of the work of the Council was concerned with imminent events such as National Insect Week in June and Ento' 10 in July. The Council also further discussed the Society's bid to hold the ECE. This finalised bid will be presented by the President at the current ECE, this August.

A report on the Cockayne Trust was received from Mr John Badmin (Regional Honorary Secretary South) who is the Society's representative to the Cockayne Committee. The Trust is a fund established to maintain and study the Cockayne Collection of half-a-million British and Irish Lepidoptera, held in the Natural History Museum.

Annual General Meeting 2010

The AGM was held in the Fowden Hall, Rothamsted Conference Centre. The President announced that Prof. John Pickett, Prof. Janet Hemingway, Prof. Chris Haines, Dr Graham Matthews and Prof. Peter Cranston are awarded Honorary Fellowships for their many and varied contributions to the Society and entomology in general.

The Honorary Secretary, Dr Archie Murchie, summarised the Annual Trustee's report, outlining on slides the structure and workings of the Society and how we now face a period of consolidation after the 'move' and given the current macroeconomic situation. Prof. Jim Hardie, Honorary Treasurer, continued in the same vein in his report on the Annual Accounts. Despite the difficult financial climate, the Society's finances are healthy. With increasing share prices, the Society has cautiously embarked on converting cash funds to a broader portfolio with potentially better yielding investments. Therefore, although there is no great opportunity for extending activities, the existing work of the Society will be maintained.

The President announced the following award winners (as below).

The outgoing President expressed much thanks to Dr Gordon Port and Dr Richard Harrington for their sterling work on Council, including serving as her Vice Presidents during part of her tenure. This AGM also marked the end of Prof. Mike Claridge's term of office as Honorary Editorial Officer. It almost goes without saying that publications, and hence the input of the Honorary Editorial Officer, are crucial to the scientific standing and financial wellbeing of the Society. On behalf of the Society, the President expressed wholehearted gratitude to Prof. Claridge's canny stewardship of all

Dr Graham Matthews receiving his Honorary Fellowship of the Society from the outgoing President prof. Lin Field.

The new President, Prof. Stuart Reynolds, presenting Prof. Lin Field with a Society tankard as a momento of her Presidency.

issues surrounding the Society's publications. The President also personally and gratefully acknowledged the assistance provided by the Society staff, who did their utmost to make her term as straightforward as possible. The guidance provided by the Registrar, Mr Bill Blakemore, in particular, was much appreciated. The final act of the outgoing President was to announce that the following be elected as Trustees of the Society for next Council term: Prof. Jenny Mordue, Dr Jens Rolff and Dr Rebecca Farley.

Prof. Lin Field stood down and invited the new President, Prof. Stuart Reynolds, to take the Chair. Professor Reynolds paid tribute to Prof. Field's work as President over the past two years, which he noted had been 'interesting times'. He then explained that Prof. Field had not completely relinquished her Council activities, as she had been duly elected to serve as Honorary Editorial Officer from the close of the meeting. No outstanding business had been received, so the President announced the date of the next AGM (as Wednesday 1st June 2011 at Rothamsted – unless otherwise notified) and invited his predecessor to give her address. Prof. Field gave a fascinating account of her work, titled 'Insecticide Resistance, the Battle against the Pests', which detailed the threats that pests pose to food production and health, and how the value of insecticides can be undermined by insecticide resistance. Yet, conversely, understanding the mechanisms of resistance have shed increased light on the mode of action of insecticides, which in turn could lead to more targeted products. At the end of her talk, the President, on behalf of the Society, presented Prof. Field with an engraved tankard as a memento of her service.

Archie K. Murchie (Hon Secretary)

RES Journal awards

Celia K. Boone, Diane L. Six & Kenneth F. Raffa

'The enemy of my enemy is still my enemy: competitors add to predator load of a tree-killing bark beetle'
Agricultural and Forest Entomology (2008) **10**, 411-421

Remy Ware, Benjamin Yguel & Michael Majerus

'Effects of competition, cannibalism and intra-guild predation on larval development of the European coccinellid *Adalia bipunctata* and the invasive species *Harmonia axyridis*'
Ecological Entomology (2009) **34**, 12-19

Chris D. Thomas, Caroline R. Bulman & Robert J. Wilson

'Where within a geographical range do species survive best? A matter of scale'
Insect Conservation and Diversity (2008) **1**, 2-8

E. Maori, N. Paldi, S. Shafir, H. Kalev, E. Tsur, E. Glick and I. Sela

'IAPV, a bee-affecting virus associated with Colony Collapse Disorder can be silenced by dsRNA ingestion'
Insect Molecular Biology (2009) **18**, 55-60

The Marsh Award for Insect Conservation

Dr Roger Key

The Alfred Russel Wallace Award for outstanding PhD thesis

Dr Tom M. Fayle, University of Cambridge.
'Ant Community Structure in a Rain Forest Microcosm'

The J. O. Westwood Medal

Dr Art Borkent, Royal British Columbia Museum.
'The Frog-Biting Midges of the World (Corethrellidae: Diptera)' *Zootaxa* **1804**, 456 pp.

RES Student Awards

1st Louise Cuttiford, Imperial College
'Insects: the accidental investigators'

2nd Borame Dickens, Imperial College
'Carmine: the colour of desire'

3rd Christopher Ayre, University of Plymouth
'Wanted - the ant mugger of Central America; or, what a spider must do to keep its reputation'

SCHEDULE OF NEW FELLOWS AND MEMBERS

as at 1st December 2010

New Fellows (1st Announcement)
Dr Marlin E. Rice
Dr Daniel Peter Bray

Upgrade To Fellowship (1st Announcement)
None

New Fellows (2nd Announcement And Election)
Dr Moses Moboluwaji Omole (Second Reading as at 21.10.10)
Professor Rebeca B. Rosengaus (Second Reading as at 21.10.10)
Dr Nirmala Xavier (First Reading as at 11.11.10)

Upgrade To Fellowship (2nd Announcement And Election)
Mr Terence John Dillon (Second Reading as at 21.10.10)

New Members Admitted
Mr Randy Drew (as at 21.10.10)
Dr Darren Mark Evans (as at 21.10.10)
Dr Lars B Pettersson (as at 21.10.10)
Mrs Nancy Reed (as at 11.11.10)
Mr Neil Edward Narjoram (as at 11.11.10)
Mrs Tara-Jane Marjoram (as at 11.11.10)
Mr Rory O'neill (as at 11.11.10)
Mr David Andrew Fleming

New Student Members Admitted
Miss Susannah Townroe (as at 21.10.10)
Miss Bryony Mary Skelton (as at 21.10.10)
Miss Hayley Jones (as at 11.11.10)
Mr Nawzad Kadir (as at 11.11.10)
Miss Emily Owen (as at 11.11.10)
Mr Kiran Ramesh Gadhave (as at 11.11.10)
Mr Nathan Charles Medd

Re - Instatements to Fellowship
None

Deaths
None

Verrall Supper 2010

Professor Helmut van Emden & Dr Archie K. Murchie

The 2010 Verrall lecture was delivered by Professor Chris Thomas from the University of York. Professor Thomas's talk was titled "Insects and climate change: ecological and evolutionary dynamics at shifting range boundaries", and was a very clear and user-friendly description of how insects in the UK are responding to global warming… in the most part by moving their ranges further north. However, the precise detail of how climate change affects individual species is fascinating, with some species altering their host plant preferences and others adapting morphologically by, for example, investing in wings for greater dispersal. Professor Thomas also touched on the thorny area of conservation and climate change, whereby he suggested that some species at risk in their southern habitats could be translocated into more northern latitudes. The combined topics of climate change and introduced species are certainly guaranteed to provoke discussion!

The lecture was introduced by Professor Lin Field, President of the RES, who also invited Professor Byungjin Kim to make a short presentation welcoming participation in the International Congress of Entomology, which is being hosted by the Entomological Society of South Korea in 2012. Mrs Kim and Mrs Miller added a touch of eastern glamour by attending the lecture in their traditional Korean dress.

Many thanks are due to the Natural History Museum for going to considerable lengths to accommodate the lecture when the normal lecture theatre was unavailable. This involved videoing the lecture and projecting it real-time to another room, so that all who attended (upwards of 110) were catered for. The Museum also made the splendid facilities of Darwin Centre 2 available to tour.

Fig.1. (L-R) Professor Kim, Mrs Kim, Mrs Miller, Professor Miller

Following the lecture, a large proportion of the audience moved on to the Senior Common Room of Imperial College's Sherfield Building for the 2010 Annual Meeting of the *Verrall Association of Entomologists* (informally known as the 'Verrall Supper'). This is not an RES event, but is organised for UK entomologists (whether professional or amateur) by the Entomological Club, that ancient and exclusive group of just eight members. In 1961, the Verrall Supper moved from a Tuesday in January to the first Wednesday in March at the request of the RES to coincide with the AGM, in the hope numbers at the AGM would be increased thereby. Later, the RES moved the AGM to June; but the Verrall did not follow suit.

This year, 200 people had booked for the Verrall, the largest attendance for quite a few years. There was much relief that the dreadful queues at the bar of 2009 were not repeated. More space had been created by moving about one in three of the large settees out of the room, and by reducing the area allocated to dining tables through the simple expedient of replacing three long tables by four shorter ones. Additionally, a beer keg at the wine bar helped reduce overcrowding at the main bar.

The event has quite a number of characteristics that many would regard as somewhat dated. The dress code for men is suits and ties (a rare sight these days and also not always followed at the Verrall - do people these days not own such dress items?), grace said before the meal and toasts afterwards. There is also the weird convention that the amount of the members' subscription, the money that pays for the event, shall be optional. Why not drop these 'anachronisms' and just sell tickets for the Supper at a fixed price? Well, the

Fig. 2. The Verrall dining area

answer is that Verrall Suppers started in 1887 when such traditions were quite normal, and each year the back of the invitation still reminds folk that "*The object is … to continue the Verrall Supper as nearly as possible along the lines of the annual Entomological Club Supper given from 1887-1911 by the late Mr. G. H. Verrall……. The amount of the annual subscription is optional, in order that no entomologist should be prevented from attending for reasons of cost*".

In 2009, the caterers had made a bit of an error, and had served superb fillet steaks from a menu which should have cost £10 more than we paid for it. Inevitably such 'generosity' could not be repeated, and this year's menu had to be rather less ambitious though still tasty. The starter was a tomato and watercress tart with walnut and stilton dressing, the main course some nicely pan-fried salmon with a delicious dill and saffron sauce, and the dessert was a chocolate tart with vanilla cream and cumquat sauce.

Each year the Chair is taken by a member of the Entomological Club. This year it should have been Dr Peter Edwards, but at short notice he was unable to come, and Professor van Emden (since it is his role to prepare the Chairman's briefing) substituted for him.

After the Loyal Toast and the toast to the memory of the dipterist George Verrall, who was the founder of the Verrall Suppers, the Chairman asked those present to stand in grateful memory of the contributions to entomology made by members who had died in the past year. These were Dr Martin Birch (Oxford) who had actually first met his future wife at a Verrall Supper in the mid 1960s, Rev. Anthony Harbottle (Windsor), Dr J.C. Hartley (Nottingham), Dr B.J. Selman (Newcastle), Dr P. Skidmore (Retford, Nottinghamshire) and Professor Chris Wilkinson (Hawkchurch, Devon).

It is always a pleasure when overseas entomologists join us while visiting the UK, and some even now arrange their travelling with this in mind! This year the Chairman was able to welcome Dr Steve Clement (Washington State University), Dr Peter Kwapong (Cape Coast University, Ghana), Dr Roland Mühlethaler (Humboldt University, Berlin), Professor Osamu Yata and Dr Kenichi Odagiri (University of Kyushu, Japan), Professor Zoya Yefremova (University of Ulyanovsk in Russia), Professor and Mrs Byung-jin Kim (Wonkwang University, South Korea) and Professor and Mrs Tom Miller (University of California, Riverside campus). Mrs Kim and Mrs Miller delighted us by wearing Korean national costume. Professor Kim will be President of the next International Congress of Entomology in Daegu, South Korea in 2012 and he invited us all to that important entomological event. A brochure about the Congress was available at the Verrall Enquiry Desk. Professor Kim then handed the Chairman an envelope containing a generous sum of money (which he referred to as "Kim's Scholarship"), to be used to enable some students to attend the Verrall next year.

In closing the dinner, the Chairman referred to the financial dilemma caused by Imperial College seeking to help their finances in difficult times by raising their income whereas entomologists, in the same difficult times, were seeking to help their finances by reducing expenditure. He feared that the 'suggested subscription' to the Verrall Association for 2011 would need to be increased by considerably more than inflation. That was the bad news, the good news was that the bar was still open to 11 o'clock!

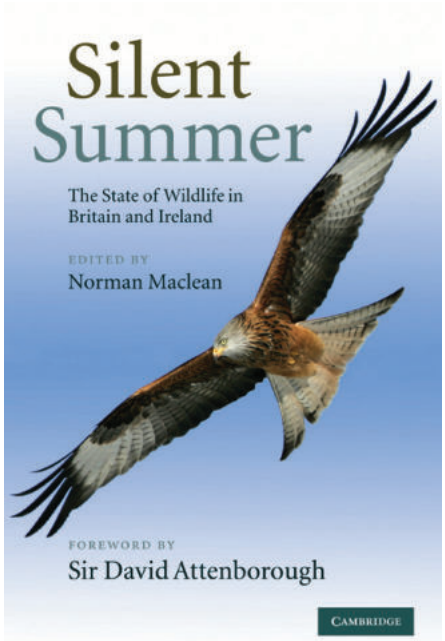
Book Reviews

Silent Summer: The State of Wildlife in Britain and Ireland.

Edited by Norman Maclean.

765pp, (Cambridge University Press, 2010). Hard cover £27.99.

ISBN 978-0-521-51966-3.



Every now and again a really good entomology book appears. Think *Insect Herbivory* by Mick Crawley, *Evolution of the Insects* by David Grimaldi and Michael Engel or *Bumblebees, their behaviour and ecology* by Dave Goulson – informative, insightful and a true delight to read. *Silent Summer* fails into this rare category. It is true that it is aimed mainly at a British readership and potentially of little interest to those members of this Society who live abroad, but this would be to do the book a disservice. The way in which the wildlife data has been assembled from a variety of sources – the historical literature, individual published accounts, regional reports and properly conducted national surveys and then analysed to produce a comprehensive picture of the status of the region's fauna and flora applies to any country. Having given birth to the Industrial Revolution 250 years ago, these islands have endured modern lifestyles – cities, road and rail networks, progressive agriculture and overpopulation longer than anywhere else and their potentiating interactions on wildlife continue to surprise. Reading this should give you a view into your country's future.

This book takes its name from an earlier best seller, *Silent Spring* by Rachel Carson who painted an idyllic picture of wildlife in harmony with its surroundings eventually silenced by modern farming practices. Life is far more complex in reality and prophesies prone to error. In fact today, people in industrialised countries are better fed than ever before and rushing around the countryside in ever-increasing numbers making a great deal of noise in the process – silent countryside it aint. This has largely been a one-way process versus nature, with towns expanding onto green field sites, endless road building and more efficient agriculture gradually and stealthily reducing the extent and quality of the rich diversity of semi-natural habitats that have evolved across Britain and Ireland since the last ice age. Degradation, reduction and loss of habitats and loss of animal and plant species appear to be reaching a critical phase and there is a distinct quietness to be heard in some corners of the countryside. This book is a timely review of the state of Britain and Ireland's wildlife today, ten years into the twenty-first century.

A similar review was attempted at the beginning of the new millennium, but at £150 a copy, failed miserably to reach its target audience and is rarely cited. This is to be deplored at it contained many important articles on British wildlife. The editor in chief of *Silent Summer*, Professor Norman Maclean, an Emeritus Professor of Genetics at Southampton University, with a strong interest in wildlife conservation, has not made the same mistake, and has brought together national experts on a very wide range of taxa groups to summarise their knowledge in a hardback book at an affordable price (£28).

The good news for entomologists is that for once there are more chapters on insects and other invertebrates than the usual four-legged / feathery animals that tend to skew our perception of the natural world. Rejoice. We all know that watching wildlife programmes on television gives a hopelessly distorted view of the true wealth of animal and plant life on earth. BBC and ITV please note. One reviewer of the book even criticised the amount of space devoted to insects, though how he can state this when Alan Stubbs had to cover three of the largest insect Orders (>14000 species) in a single account compared to two chapters on birds (a mere 350 species) is a bit rich. However he was perfectly right to point out the omission of a chapter on fungi was a serious error.

Factors driving changes in wildlife abundance are discussed first. Tim Sparks and colleagues set the scene with a chapter on 'Climate Change' and how this has affected species abundance, latitudinal and altitudinal shifts in distribution and phenology over recent decades. There are very informative papers on 'Agriculture, woodland and semi-natural habitats' by Ken Norris, 'Urbanisation and Development' by Kevin Gaston and Karl Evans; 'Water pollution' by Michael Hughes and Carl Sayer and the 'Impacts of hormone-disrupting chemicals on wildlife' by Charles Tyler and Rhys Goodhead. There are also chapters on the impacts of plant and vertebrate animal introductions which we are all familiar with and a fascinating account of recent trends and effects of recreational angling. The final chapter here entitled 'Twenty-five questions in ecology' is an abridged version of a longer paper on 100 questions of high policy relevance published in the Journal of Applied Ecology. Some readers may find these questions stimulating: some are solvable, some are potentially enlightening, others I suspect are highly unlikely to achieve a correlation coefficient above 0.4 and thus of low predictive value.

The second section deals with conservation in action and summarises the progress we have made in implementing

conservation measures across the UK (with some notable successes), our role in international conservation and in particular our government's responsibility for looking after globally rare and endangered species in UK Overseas Territories.

The third section, the real meat of the book, comprises 21 chapters and deals with the state of our wildlife, group by group. Vertebrates are split into mammals, bats, birds, fishes, reptiles and amphibians with a special chapter devoted to the conservation of the grey partridge. There are individual chapters on riverflies (Cyril Bennett and Warren Gilchrist), bumblebees (Dave Goulson), butterflies (Jeremy Thomas), moths (Butterfly Conservation and Ian Woiwod), dragonflies (Peter Mill, Steve Brooks and Adrian Parr), flies, beetles, bees, wasps and ants (Alan Stubbs), Hemiptera (Alan Stewart and Peter Kirby) and Orthoptera and allied insects (Judith Marshall). There is also a very informative paper on other invertebrates including spiders, harvestmen, woodlice and platyhelminths by Richard Chadd and Brian Eversham. Several chapters cut across taxa and cover habitats such as freshwater, the littoral zone, offshore waters, and a novel one on aerial plankton (Richard Harrington, Chris Shortall and Ian Woiwod). Declines and losses and increases and additions to each insect group are reviewed and discussed in relation to contributing factors such as habitat degradation, climate change, light pollution, water quality and pesticides and herbicides. The oft quoted amounts of pesticides used in our gardens are way out of date and clearly overstated, but acquiring commercial figures is difficult even for a former insider.

Much of what the authors have written about should be fairly common knowledge to any UK entomologist reasonably acquainted with their group of interest, but having all the information on so many groups in one place means that we can reach a much more balanced assessment of the overall state of our country's wildlife and this is the great benefit of this book. It appears we have lost far more native species than we have gained and that this process may be accelerating. Besides direct human impact, introduced species such as deer have deleterious effects at a range of scales and trophic levels, altering vegetational structure and composition and severely disrupting the abundance of associated plant herbivores such as insects and their parasitoids. Aquatic habitats are not immune: river systems are invaded by introduced crayfish and predatory fish. Fragmentation of the landscape and climate change also exert changes.

This book is a rich source of information about the state of our fauna and flora and a copy should find its way onto the bookshelf of every entomologist in the UK. With such knowledge we should be able to make better informed choices about the future management of our countryside. I, for one endorse Buglife's innovative idea of trying to reverse the trends by planting corridors of native flowers across our countryside as a simple way of providing additional nectar sources for bees and providing links between populations of many other insect species. My enthusiasm here may be in response to my local farmer who this year replaced his pear orchard below our property with a mass of poly tunnels for growing soft fruit – it is fast becoming a desert for native wildlife. And seemingly no planning permission required.

The editor, Norman Maclean, is to be congratulated for publishing an excellent book.

John Badmin

Extreme insects

by Richard Jones

Published by Harper Collins
ISBN 978 000 731077 7
Price £30.00

Extreme Insects is a dramatic introduction to the vast range of morphologies, behaviours, life histories and physiologies that are displayed by insects. It presents a synopsis of a wide range of extreme categories, divided into three sections, Form, Evolution and Impact. Form features a number of morphological extremes such as, the largest, oldest, the whitest, shortest lived, longest, smallest, fastest flier, the furriest, smallest egg and largest feet. The section covering evolution reveals adaptations including, the best mimic, most cold tolerant, best architect, longest lived adult and the most explosive. Impacts then offers classes that include the most valuable, the most dangerous, irritating, useful, most destructive and endangered.

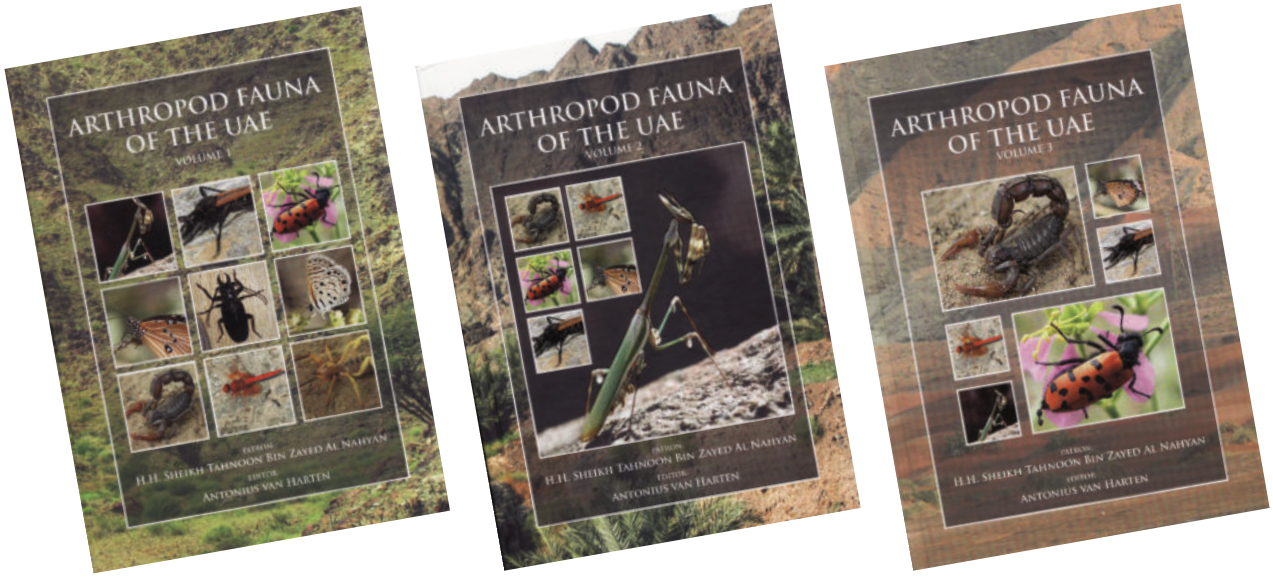
This is a book that will delight and intrigue, it is a catalogue of the bizarre and strange that will peak the curiosity of would be entomologists and fire the imagination of young naturalists. Extreme insects is recommended to anyone who is curious about the outer limits of the microcosm.

Arthropod Fauna of the United Arab Emirates, volumes 1,2 & 3.

Edited by Antonius van Harten

ISBN vol 1, 978-9948-03-642-5, ISBN vol 2, 978-9948-15-090-9 ISBN vol 3, 978-9948-15-616-1

Price vol 1 & 2 £38.00 each, vol 3 £40.00.



This three volume work represents a tremendous achievement, being the culmination of a project to construct a baseline study of the arthropods of the region almost from scratch. Between 2005 & 2007 experts in a range of taxonomic groups from around the world were invited to collect and catalogue specimens in the UAE and then contribute chapters to these proposed volumes. Chapters were then written and submitted and the three volumes chart the progress of this ambitious work. A volume was published each year from 2008 to 2010 each one representing the information available at the time. The volumes concentrate on the orders Diptera, Hymenoptera, Coleoptera and Lepidoptera but include chapters on the Orthoptera, Hemiptera, Psocoptera, Blattoptera and Dermaptera as well as covering some arachnid groups such as the Prosigmatid mites, Pseudoscorpions and the spider families Linyphiidae and Salticidae.

Each chapter deals with a single family and all are well illustrated with an excellent series of either photographs or line drawings or sometimes both. Many but not all chapters also posses keys to the genera or species within the family. While the work acknowledges it is far from complete and part of the ongoing process of documenting the arthropod fauna of the UAE. These three volumes are a wonderful foundation on which to build and will be essential to anyone studying the arthropods of the region . The entomological team and their royal patrons are to be congratulated.

The volumes are attractively bound but weigh in at 5.4 kilograms so if you are ordering them by post ensure your postman is in training.

British Damselflies – a DVD Guide

Graham Sherwin

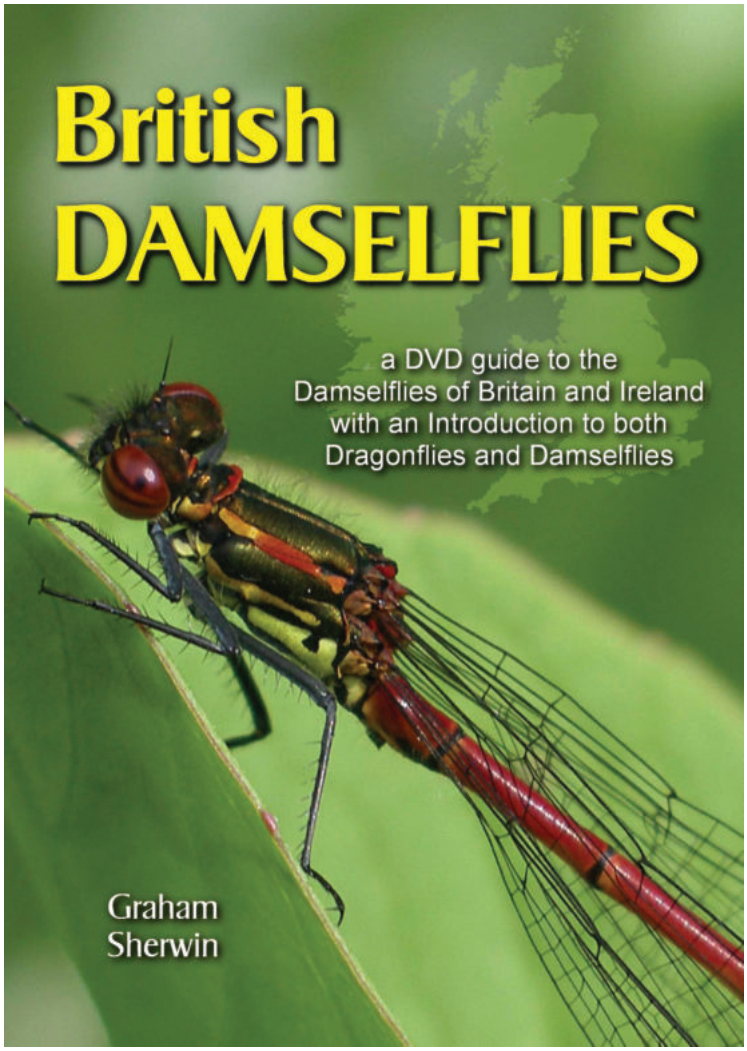
Reviewed by Dr Richard Billinton, School of Biomedical and Biological Sciences, University of Plymouth

Running time: 150 minutes

Format 4:3 – Encoded for UK/Europe

Price: £18.50 + Postage and Packing

The past 20 years have seen a big increase in the number and quality of identification guides for British Odonata which has undoubtedly contributed to the upsurge in non-specialist interest in them. The release of a DVD guide follows on from a number of very high quality illustrated or photographic guides and may represent a logical, technological progression. Although I was sceptical at first about the idea of a DVD guide, not being able to understand if it was meant to be a field guide or a virtual coffee table book, the quality of the footage and the professional and intuitive way in which it has been put together made it very enjoyable to watch and a useful resource for both beginners and experts alike. At all points, the quality of the footage is exceptional and the images are frame filling and most importantly are still. One can only wonder how many hours of footage that did not meet the authors' high standards must have ended up on the virtual cutting room floor.



The DVD follows what has become the accepted identification guide format with an introduction to the guide explaining how to use it, an introduction to the biology of the Odonata covering anatomy, predators and life cycle, some hints and tips on examining and watching subjects followed by the species accounts. Instead of being able to flick between sections or species, navigation is via a series of easy to use menu pages that allow the viewer to access the introductory sequences or sequences of particular species. The sections are all divided up into short subsections so it is easy to find any sequence quickly, without having to fast forward excessively. One small criticism of the whole DVD is that the narration, while accurate and informative, is a little monotonous at times.

The introduction to Odonata and their biology lasts about 60 minutes and would have been very interesting even as a separate DVD. This section is done very well and gives a good overview of the life cycle of the Odonata. It includes some fascinating footage of what must be rarely filmed behaviours such as inter and intraspecific cannibalism and mixed or multiple copulation. The sequences on emergence are very detailed and the use of time lapse allows the viewer to see the whole process in detail in a short time. The footage of *Cordulia aenea* crawling across the grass, up a tree trunk and eventually being predated by ants during emergence is possibly unique and gruesomely detailed down to an ant puncturing the eye of the emerging adult. My only slight criticism of this section is that the aquatic life stages are covered only very briefly and there little mention of how useful the collection and identification of exuviae can be in population monitoring. However, as an identification guide, it is perhaps to be expected that the adult stages are featured preferentially.

The main body of the DVD is the identification section which covers all 20 Zygoptera (Damselfly) species recorded in Britain and Ireland as well as short sequences on two potential colonists (*Lestes virens* and *Erythromma lindenii*). Not covered are the species that have recently become extinct and this is a shame particularly given the recent rediscovery of *Coenagrion scitulum*. Each species is dealt with in a separate section lasting several minutes with an introduction to the species including favoured habitats followed by the identification of males and females, mating/breeding behaviour and other species likely to be encountered in the same habitats. Importantly, there are some sequences showing how the species changes from teneral to adult as it ages, information that is often missing from conventional illustrated field guides. All of the images are videos and not stills and as the author states, judicious use of the pause button can be helpful for studying identification features more closely. The DVD goes to great lengths to show similar species on split screens so that they can be compared. Indeed, for the tricky to identify *Lestes* group, there is a series of split screens showing males and females of the 6 species from different angles. The key identification features are clearly illustrated and explained along with some extra hints and tips from the author and all of the important information is summed up in a brief species account much as in a field guide. The species account page shows extra information such as flight period and distribution along with a brief text summary of the identification features with key features highlighted in capitals. This section is not really appropriate for watching as a single section (it lasts about 90 minutes) but it can be dipped into just as a conventional identification guide to refresh the memory before going into the field, to confirm the identification of a species on returning from the field or simply to while away some time during the long dark winter months. If future advances in technology will allow the transferral of the DVD to a small portable device that could be carried in the field then this section might be able to be used as a true field guide.

Given the quality of production of this DVD and the stunning footage it contains, I think that it will be of interest to enthusiasts and novices alike and may well solve the perennial problem of what to buy as a present for anyone with an interest in wildlife. A sister DVD covering the 25 resident, five vagrant and two potential vagrant species of Anisoptera (Dragonflies) is currently being made and I am awaiting it eagerly.

Copies can be ordered either from http://www.gswildlife.co.uk/sales.html or via the British Dragonfly Society shop http://www.dragonflysoc.org.uk/shop.html (the BDS and thus British Odonata benefit from sales via their shop). Some sample clips are available at: http://www.gswildlife.co.uk/british_damselflies.html.

Diary

Assistant Editor: Craig Macadam (e-mail: craig.macadam@bradan-aquasurveys.co.uk)

Abbreviations

AAB	Association of Applied Biologists
AES	Amateur Entomologists' Society
BAS	British Arachnological Society
BC	Butterfly Conservation
BENHS	British Entomological and Natural History Society
BENHS (WS)	BENHS workshops held at Dinton Pastures Country Park, Davis Street, Hurst, Reading RG10 0GH. Grid reference SU 784 718. I: Ian McLean, 109 Miller Way, Brampton, Huntingdon, Cambridgeshire PE18 8TZ.
BES	British Ecological Society
BISG	Bloomsbury Insect Science Group meetings held at Birkbeck College, Department of Biology, Malet Street, London, Room 232.
BMIG	British Myriapod and Isopod Group. I: www.bmig.org.uk
DaNES	Derbyshire and Nottinghamshire Entomological Society
ECSS	Ecology and Conservation Studies Society. Meetings start at 6:30pm and are held in Room B29, Senate House, Malet Street. London WC1E.
EEC	Edinburgh Entomological Club
ESA	Entomological Society of America
FBA	Freshwater Biological Association I: www.fba.org.uk
FSC	Field Studies Council. I: www.field-studies-council.org
KFC	Kent Field Club
KMBRC	Kent and Medway Biological Records Centre
LCES	Lancashire and Cheshire Entomological Society
LNHS	London Natural History Society
LSL	The Linnean Society of London, Burlington House, Piccadilly, London W1V 0LQ.
NFBR	National Federation for Biological Recording
NHM	The Natural History Museum, Cromwell Road, London SW7.
RES	Royal Entomological Society
RS (CHT)	The Royal Society, 6 Carlton House Terrace, London SW1Y 5AG.
SHNH	Society for the History of Natural History (Hon. Sec.) c/o NHM.
YNU	Yorkshire Naturalists' Union. I: http://www.ynu.org.uk
ZSL	The Zoological Society of London, Regent's Park, London NW1 4RY.
I:	Information from:

Contributions please! Your support is needed to make this diary effective so please send any relevant items to the diary's compiler, **Craig Macadam**, E-mail: craig.macadam@bradan-aquasurveys.co.uk. No charge is made for entries. To ensure that adequate notice of meetings, etc. is given, please **allow at least 6 months' advance notice**.

Meetings of the Society

Recently, Special Interest Group (SIG) meetings have been held at Rothamsted, Harpenden and usually begin with registration and refreshments at 10am for a 10.30am start. Details of the day's programme can be downloaded from the RES website (www.royensoc.co.uk) and include a registration form, which has to be completed in advance so that refreshments can be organised. All meetings finish by 5pm.

Some SIG or monthly meetings may begin after lunch and be held at a different location, so it is best to consult the diary or the RES website for full details. Regional meetings, by definition, will be held locally.

2011

Feb. 2-3 Postgraduate Forum
Venue: Royal Hotel, Hull
Convenor: Ms Cathleen Thomas

March 2 Verrall Lecture
Venue: Natural History Museum
By Professor Jane Memmott, Bristol University
"The conservation and utilization of entomological interactions"

March 31 Medical & Veterinary Entomology Special Interest Group
On the theme of: 'Novel Methods of Vector Control'
Venue: The Linnean Society of London, Burlington House, Piccadilly from 10.00 to 17.00
Convenors: Prof. Stephen Torr, Prof. Steve Lindsay & Dr Mary Cameron

May 12 Conservation Special Interest Group
'The impact of climate change on insect conservation'
Venue: Rothamsted Research, Harpenden, Herts.
Convenor: Dr Alan Stewart

June 1 RES Annual General Meeting
Venue: Rothamsted Research, Harpenden, Herts.

Jul 3 Insect Festival
Venue: York Museum Gardens, York
Convenor: Mrs Julie North

Sept 7-9 Ento'11 Symposium on 'Chemical Ecology' "Reception, Detection and Deception" and National Meeting
Venue: University of Greenwich, Medway Campus, Chatham Maritime, Kent
Symposium Convenors: Prof. David Hall, Prof. Alan Cork, Prof. Bill Hansson & Prof. John Pickett

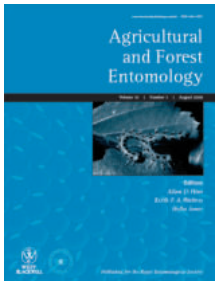
Sept 14-16 A joint meeting with the Soil Ecology Society
Venue: The National Marine Aquarium, Plymouth
Convenor: Prof. Rod Blackshaw

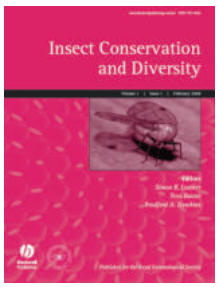
Nov 10 Insect Behaviour Special Interest Group
Venue: Rothamsted Research, Harpenden, Herts.
Convenors: Drs Jason Chapman & James Bell

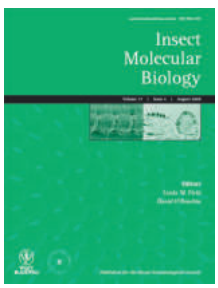
Diary of other Meetings

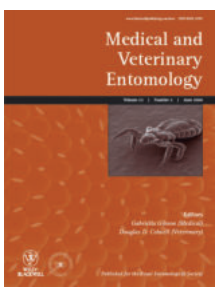
2011

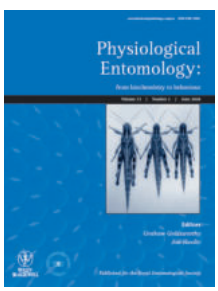
January 29 Insect Film Festival.
Venue: The University of Plymouth
I: Peter Smithers, email: psmithers@plymouth.ac.uk or tel: 01752 584547











Publications of the Royal Entomological Society

Agricultural and Forest Entomology provides a multi-disciplinary and international forum in which researchers can present their work on all aspects of agricultural and forest entomology to other researchers, policy makers and professionals.
2011 print or online prices: UK £590, Euroland € 751, USA $1,091, Rest of World $1,272
2011 print and online prices: UK £679, Euroland € 864, USA $1,255, Rest of World $1,463

Ecological Entomology publishes top-quality original research on the ecology of terrestrial and aquatic insects and related invertebrate taxa. Our aim is to publish papers that will be of considerable interest to the wide community of ecologists.
2011 print or online prices: (with Insect Conservation and Diversity) UK £973, Euroland € 1,236, USA $1,800, Rest of World $2,099
2011 print and online prices: UK £1,119, Euroland € 1,422, USA $2,070, Rest of World $2,414

Insect Conservation and Diversity explicitly associates the two concepts of insect diversity and insect conservation for the benefit of invertebrate conservation. The journal places an emphasis on wild arthropods and specific relations between arthropod conservation and diversity.
2011 print or online prices: UK £590, Euroland € 751, USA $1,091, Rest of World $1,272
2011 print and online prices: UK £679, Euroland € 864, USA $1,255, Rest of World $1,463

Insect Molecular Biology has been dedicated to providing researchers with the opportunity to publish high quality original research on topics broadly related to insect molecular biology since 1992. *IMB* is particularly interested in publishing research in insect genomics/genes and proteomics/proteins.
2011 print or online prices: UK £984, Euroland € 1,249, USA $1,818, Rest of World $2,120
2011 print and online prices: UK £1,131, Euroland € 1,437, USA $2,091, Rest of World $2,438

Medical and Veterinary Entomology is the leading periodical in its field. The Journal covers all aspects of the biology and control of insects, ticks, mites and other artropods of medical and veterinary importance.
2011 print or online prices: UK £566, Euroland € 721, USA $1,048, Rest of World $1,223
2011 print and online prices: UK £651, Euroland € 830, USA $1,206, Rest of World $1,407

Physiological Entomology is designed primarily to serve the interests of experimentalists who work on the behaviour of insects and other arthropods. It thus has a bias towards physiological and experimental approaches, but retains the Royal Entomological Society's traditional interest in the general physiology of arthropods.
2011 print or online prices: UK £522, Euroland € 664, USA $965, Rest of World $1,126
2011 print and online prices: UK £600, Euroland € 764, USA $1,110, Rest of World $1,295

Systematic Entomology encourages the submission of taxonomic papers that contain information of interest to a wider audience, e.g. papers bearing on the theoretical, genetic, agricultural, medical and biodiversity issues. Emphasis is also placed on the selection of comprehensive, revisionary or integrated systematics studies of broader biological or zoogeographical relevance.
2011 print or online prices: UK £940, Euroland € 1,195, USA $1,739, Rest of World $2,029
2011 print and online prices: UK £1,081, Euroland € 1,375, USA $2,000, Rest of World $2,334

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

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

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

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

www.royensoc.co.uk

RECOGNISING ACHIEVEMENT

Royal Entomological Society
– Society Awards –

THE ROYAL ENTOMOLOGICAL SOCIETY STUDENT AWARDS

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

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

RES JOURNAL AWARDS SCHEME

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

Prize: £500 and Certificate for each participating Journal.

THE LJ GOODMAN AWARD FOR INSECT BIOLOGY

Award Criteria: For advancing the education of the public in the knowledge, understanding and appreciation of all aspects of Insect Physiology, thereby promoting the control and conservation of insect species.

Prize: £1,000, also additional awards may be given.

THE MARSH AWARD FOR INSECT CONSERVATION

Award Criteria: For an outstanding contribution to Insect Conservation; on the basis of 'Lifetime Achievement', or 'Considerable and Exemplary Contribution' to a significant project or undertakings. In exceptional circumstances two prizes may be awarded to reflect each criterion.

Prize: £1000 and Certificate.

POSTGRADUATE AWARD: THE ALFRED RUSSEL WALLACE AWARD

Award Criteria: For post-graduates who have been awarded a PhD, whose work is considered by their Head of Department to be outstanding. The research involved should be a major contribution to the Science of Entomology.

Prize: £750 plus Certificate, plus one year's free Membership. The winner will also be invited to present their work at a Society Meeting.

JO WESTWOOD MEDAL – AWARD FOR INSECT TAXONOMY

Award Criteria: The best comprehensive taxonomic work on a group of Insects, or, related Arthropods (including terrestrial and freshwater Hexapods, Myriapods, Arachnids and their relatives). Typically, this will be a taxonomic revision or monograph.

Prize: A specially struck silver gilt medal inscribed with the winners name. Also costs incurred in attending the International Congress of Entomology, European Congress of Entomology, or other major meeting (specified by the Adjudicators) to present his/her work.

THE WIGGLESWORTH MEMORIAL LECTURE AND AWARD

Award criteria: The outstanding services to the science of Entomology. The award will be made to a researcher who has contributed outstanding work to the science and who best reflects Sir Vincent Wigglesworth's standards of personal involvement in every aspect of his/her research.

Prize: A specially struck gilt medal inscribed with the winners name. Also the costs of attending the International Congress of Entomology to give the Wigglesworth Lecture.

BOOK PURCHASE SCHEME FOR FELLOWS AND MEMBERS IN DEVELOPING COUNTRIES

Award Criteria: To provide assistance in purchasing specialist Taxonomic books, that will assist in the identification of Insect groups being studied in developing countries and their regions. Applicants will be required to demonstrate need and specify particular texts.

Prize: Any one applicant may be awarded up to £200 in a three year period. The Society will purchase the texts awarded and send them to the applicant. The applicants may, themselves, provide any additional funds in excess of the amount awarded.

OUTREACH AND CONFERENCE PARTICIPATION FUNDS

Award Criteria: ORF: Grants to support activities which further the Society's aims. This may range from, help to purchase equipment, to help in funding expeditions/meetings. CPF: Grants to assist applicants who are participating in a meeting or conference in some way, e.g. presenting a paper/poster.

Prize: ORF: Monetary grant. CPF: Monetary grant.

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

Royal Entomological Society
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