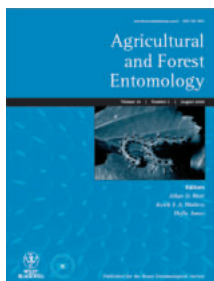


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ON THE BALL

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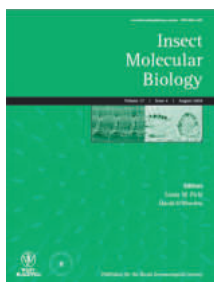
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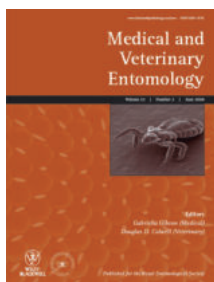
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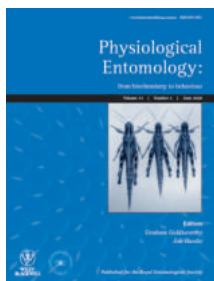


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COVER PICTURE

Edith Sarmiento-Ponce (and cricket).

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Bulletin of the Royal Entomological Society

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EDITORIAL



Hello and welcome to *Antenna* 41(2). I'm pleased to report that we have another packed issue, bulging with articles, reports and other entomological content to keep you up to date and 'on the ball' when it comes to RES activities and the interests of our authors. We begin this issue with an eagerly anticipated article from Jeremy Thomas on Daneway Banks, a SSSI and nature reserve recently acquired by the RES in partnership with Gloucestershire Wildlife Trust. In addition to detailing the entomological significance of this joint venture, particularly for conservation of the Large Blue butterfly, Jeremy also provides an overview of the opening of the site in 2016 by HRH the Prince of Wales, as well as a fascinating

account of the intricate interdependencies between the flora and fauna present. Jeremy and the GWT have been the dictionary definition of 'on the ball' in realising the value of this site, with many years of hard work culminating in creation of a stunning slice of Cotswolds calcareous grassland, now secure for future generations of both insects and entomologists to enjoy. We follow this with a piece by John Feltwell, asking us all to be 'on the ball' when it comes to reporting Asian Hornet sightings in the UK, providing help and advice on how to do so, along with an account of this pest's occurrence across the country in 2016. Invasive species are also the subject of Peter Cranston & Penny Gullan's account of a pressing insect issue further afield – that of invasional meltdown on Easter Island as driven by yellow crazy ants. Fortunately, it seems that 'on the ball' biocontrol efforts may be able to assist here, via control of invasive scale insects to deliver indirect impacts upon the offending *Anoplolepis gracilipes*. Tackling invasives such as these requires investment in applied entomology, and fittingly sandwiched between these two articles, Clive Betts *et al.* recount their efforts to fill the mounting skills gap that exists here within our profession. With ever-increasing uncertainty regarding future pest outbreaks, and the availability of conventional controls for the species responsible, addressing the current paucity of applied entomologists is a pressing issue that should be all too familiar to the readership of *Antenna*, requiring us all to be 'on the ball' with our efforts to tackle this troubling trend wherever we can. In our final article of the issue, Richard Kelly reports on the entomological attributes of Weston Park Museum in Sheffield in the latest instalment of his informative series on UK collections.

The royal link within Jeremy Thomas's Daneway Banks article continues in the first of our Society News pieces, with Hugh Loxdale providing an entertaining account of the Patrons Lunch. Also included here are reports on this year's Verrall Lecture and last year's Ento 16, as well as information of relevance to all those looking to attend Ento 17. We've also included a short report on cricket mate-finding from Edith Sarmiento-Ponce who's been 'on the ball' in securing Society support for overseas conferences and training opportunities to support her PhD. As you'll have seen on the front cover, Edith's talents also extend to photography – this shot being a dream-come-true for an editor in search of a strapline!



Guidelines for submitting photographs

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

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

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

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

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

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



300dpi



72dpi



Daneway Banks, Spring 2016.

Photo David Simcox

Daneway Banks – the Royal Entomological Society’s new nature reserve for insects

The Royal Entomological Society is proud to announce a major new conservation initiative: the co-purchase with Gloucestershire Wildlife Trust (GWT) of Daneway Banks in the Cotswold’s Sapperton valley, the Society’s first (co-)owned nature reserve. Daneway’s 40 acres of prime limestone downland, together with 2.5 acres of ancient beech, yew, hawthorn and hazel woodland, have long been considered exceptional for biodiversity, even by the high standards of Cotswold grasslands. It is indeed a very special Site of Special Scientific Interest, famed not only for supporting large populations of Endangered Species but also for the sheer variety of scarce, local or unusual insects and plants that breed in remarkable

abundance within its boundaries. In addition, in 2014-16 it supported the second largest population in the UK (and possibly the world) of the Large Blue butterfly, our only species of insect to be listed as a globally ‘Endangered Species’ by the International Union for Conservation of Nature. Special too was the formal opening of Daneway Banks as a nature reserve by HRH the Prince of Wales in July 2016.

Jeremy Thomas

Chair of The Royal Entomological Society’s Conservation Committee
Emeritus Professor of Ecology,
The University of Oxford
jeremy.thomas@zoo.ox.ac.uk

Background

From the Presidencies of Charles (1915-16) and Walter Rothschild (1921-22) onwards, The Royal Entomological Society has established an enviable record in advocating and pioneering the conservation of insects.

Welcome to Daneway Banks Nature Reserve

The home of the large blue butterfly in Gloucestershire

The large blue butterfly at Daneway Banks

The large blue butterfly disappeared from here in the 1950s and became nationally extinct in 1979. A science-led partnership re-introduced the species and Daneway Banks now supports one of the largest colonies in the country. Large blue butterflies can be seen flying between mid-June and mid-July.

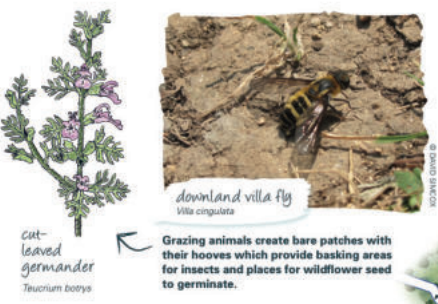


To avoid disturbing wildlife, please follow the way-marked route shown on this map and keep dogs on leads at all times. The walk is 1.5km in length and steep in places.



This is the only site in the UK where large blues lay their eggs on both wild thyme and marjoram.

Large blue caterpillars mimic the chemistry and behaviour of a red ant grub, deceived, the ant carries it to its underground brood-chamber, whereupon the caterpillar attacks and eats ant grubs.



Please be aware
The large blue butterfly is a European Protected Species and listed under the Wildlife and Countryside Act 1981. This makes it illegal to kill or disturb the butterfly or to damage its habitat.

Management of Daneway Banks

Daneway Banks is grazed by rare breed animals, usually Norfolk horn sheep and Welsh mountain ponies. Grazing prevents any single plant species from dominating the sward and encourages high numbers of the red ant which are crucial to the survival of the large blue butterfly.



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Figure 1. Information board at the entrance to Daneway Banks.

Photo David Simcox

In its first half century, the emphasis was on re-establishing the extinct Large Copper butterfly to the British Isles, protecting the Large Blue, and working alongside Charles Rothschild's fledgling Society for the Promotion of Nature Reserves, the precursor of today's 800,000-strong County Wildlife Trusts. With the growth of these and other dedicated conservation societies, and the establishment in 1949 of the government's Nature Conservancy, the RES' focus shifted towards influencing policy and good practice rather than carrying out practical conservation itself. For example, in the 1960s the RES established and serviced the 'Joint Committee for Conservation for British Insects', and remains a key partner of its successor 'Invertebrate Link', an enormously important forum for co-ordinating, nurturing, influencing and promoting the conservation of insects. During the 1970s-80s the RES oversaw and hosted the selection and publication committees for the *British Red Data Books: Insects*. More recently, the RES has been the global leader in propagating the scientific knowledge that underpins insect conservation, exemplified by two ground-breaking international symposia:

The Conservation of Insects and their Habitats (1989) and *Insect Conservation Biology* (2003), and its journal *Insect Conservation and Diversity* (2008-).

Notwithstanding this shift in emphasis, RES Council and its Conservation Committee have explored an aspiration in recent years that our Society should also, in some measure, return to its roots by making a significant contribution to practical conservation through owning and maintaining a show-case nature reserve that was of national or international importance for insects. The first candidate site, offered as a gift by its owner, was rejected in 2011, after inspection by the then President Stuart Reynolds and me, due to its low biodiversity value, small size, and its potential liability in terms of running costs, accessibility and a risk of bad publicity. Despite this, Council accepted the principle that the RES should seek a top quality reserve were a suitable site to become available. The opportunity arose in 2014, when the Gloucestershire Wildlife Trust approached us to explore co-ownership of Daneway Banks (Fig 1), a site they

had rented since 1968 but which was now offered for sale at a most generous price. In addition to halving the capital cost, GWT would benefit from the expertise of RES Fellows in management recommendations, monitoring and scientific and educational input, whilst the RES would help save and (co-)own a reserve that not only made a tangible contribution to insect diversity but was also amenable to entomological research and educational activities (e.g. Fig 2). Crucially, all day-to-day practicalities – such as scrub control, grazing management, fencing and water supply – and any local issues were the responsibility of resident GWT reserve managers. It seemed, and still seems, a marriage made in heaven, and after two years of amicable negotiation the deal was completed and Daneway was (half) ours!

The wildlife of Daneway Banks SSSI

Consisting of a series of south-east facing slopes and flatter strips overlying Jurassic limestone and some Fuller's Earth, Daneway Banks is a beautiful



Figure 2. Undergraduate biology students from New College, Oxford with tutor Prof Ashleigh Griffin (centre) study the Large Blues at Daneway, June 2016. Photo Jeremy Thomas

downland as well as a species-rich one (see Fig 1 for map). The main sward is classed as *Bromus erectus* – *Brachypodium pinnatum* grassland (National Vegetation class CG5a), interspersed with patches of scrub and woodland, and occasional cliffs and scree from small abandoned quarries. When I first surveyed Daneway in 1973, one's immediate impression – like that of pretty much all Cotswold downland in those post-myxomatosis days – was of an abandoned thatch of knee-high unfarmed *Brachypodium*, with flowers and insects hardly apparent among the dense shady sward. Today, after 40 years of targeted conservation grazing, it is ranked among the top five grasslands for flora

in the Cotswolds, especially since the turn of the century when the regime was adjusted to restore optimum habitat for both thyme flowering and the red ant *Myrmica sabuleti*, the essential sequential foods of Large Blue butterfly larvae (Fig 3).

From mid-autumn to spring, Daneway Banks is grazed by Norfolk Horn sheep and Welsh Mountain ponies from the nearby Butts Farm Rare Breeds Centre, themselves an attractive feature of the site (Fig 4). By late winter the sward is predominantly short (with scattered taller patches) revealing an ant-scape of thousands of Yellow Meadow ant hills – known locally as emmett casts – seen at their best when casting long shadows in the

winter sun. The land is then left ungrazed through spring and summer, allowing a succession of flowers to bloom and set seed, and for insects to breed, in a sward that remains sparse and heterogeneous on its infertile soils. By mid-April, much of Daneway turns pale yellow with the blooms of cowslips (top image), matched by Kidney vetch on thinner soils. These give way, respectively, to the deeper yellow and pinks of rock-rose and wild thyme during June, and by high summer marjoram and harebells in abundance make a purple-blue backdrop to the cerise of pyramidal orchids.

Interspersed among these prominent species grow a diversity of other calcareous plants (Fig. 5). Of special interest are two national rarities, Cut leaved Germander *Teucrium botrys* and Cut-Leaved Selfheal *Prunella laciniata*. Other Red Data or Nationally Notable plants include Frog Orchid *Coeloglossum viride*, Fly orchid *Orchis insectifera*, Musk orchid *Herminium monorchis*, Green-winger orchid *Anacamptis morio* (in hundreds), Greater butterfly orchid *Platanthera chlorantha*, Slender bedstraw *Galium pumilum*, Dwarf rock-bristle *Seligeria pusilla*, Angular Solomon's-seal *Polygonatum odoratus*, Meadow saffron *Colchicum autumnale*, Hound's-tongue *Cynoglossum officinale*, Dwarf spurge *Euphorbia exigua*, and Sainfoin *Onobrychis vicifolia*. Most, if not all, of



Figure 3. Left: adult Large Blue butterfly *Maculinea arion* ovipositing on flowerbuds on wild thyme. Right: Large Blue larva being 'milked' for secretions by a *Myrmica sabuleti* worker prior its adoption into the ant nest. At this stage it weighs c 1% of its final body mass.

Photos David Simcox



Figure 4. Welsh Mountain ponies (and Norfolk Horn Sheep) from the Butts Farm Rare Breeds Centre graze Daneway Banks from autumn to early spring. © Paul Nicholls Photography

these plants have increased, and in some cases reappeared after long absences, under 'Large Blue management'.

The diverse flora coupled with a warm but heterogeneous microclimate and soil structure supports an

abundance of common and rare insects, which in turn are host to predatory and parasitic species (Fig. 6). In truth, the species list for Daneway Banks is very far from complete for most taxa; indeed, more than 80% of the 221 insects on the official SSSI species-list

are macro-Lepidoptera. One of RES' first tasks will be to remedy this, an enticing prospect for, if the well-studied vascular plants and macro-lepidoptera – of which 20% and 19% of British species respectively are recorded from Daneway – are remotely representative of other taxa, we might tentatively predict that approaching 5,000 further insects species await discovery there! Nevertheless, aside from the Large Blue butterfly (described later), insect life is noticeably abundant on the site. Among known rarities breeding in good numbers are four striking Diptera: Inane hoverfly *Volucella inanis*, Dotted bee-fly *Bombylius discolor*, Western bee-fly *B. canescens* and the Downland Villa *Villa cingulata*. The last (Figs 6, 9) is especially welcome since it was not reported from the UK during the second half of the 20th century, but has recently reappeared on a handful of calcareous sites, mainly in the Chilterns. The population at Daneway is exceptionally large, and the striped adults are readily seen flicking eggs onto the bare ground of paths and



Green winged orchid



Fly orchid



Frog orchid



Cut-leaved Germander



Cut-leaved self-heal

Figure 5. Some of the rarer plants on Daneway Banks. Image of Green-winged orchid courtesy of Jeremy Thomas. All other images courtesy of David Simcox.

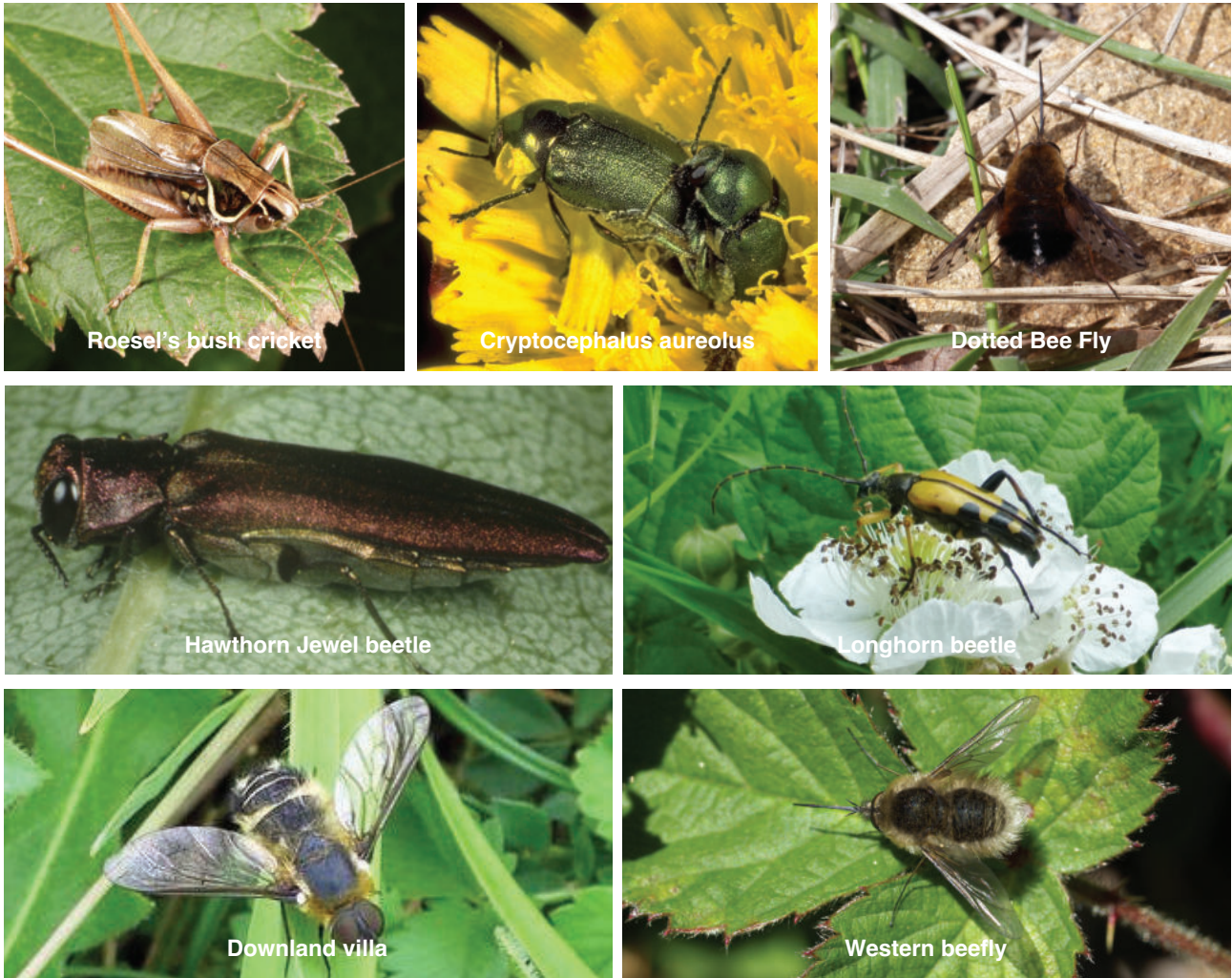


Figure 6. Some of the scarcer insects on Daneway Banks. Photos Roger Key (Roesel's bush-cricket, *C. aureoles*, Hawthorn jewel beetle), and David Simcox (Dotted beefly, Western beefly, and Downland villa), and Christopher Hancock (Longhorn beetle).

scrapes during high summer: I counted about 30, with four in one spot, on July 21st 2016.

Other notable insects include the Hawthorn jewel beetle *Agrilus sinuatus*, *Cionus nigritarsis*, *Cryptocephalus aureoles*, *Variimorda villosa*, glow-worm *Lampyrus noctiluca*, Roesel's bush-cricket *Metrioptera roeselii*, and the largest known UK population of the ant *Myrmica lobicornis*. Moths include the Knot grass *Acronicta rumicis*, Forester *Adscita stictica*, Drab looper *Minoa murinata*, Shaded broad-bar *Scotopteryx chenopodiata* and Sulphur pearl *Sitochroa palealis*. Notable butterflies are the Small blue *Cupido minimus* (in abundance) Dark Green and Small pearl-bordered fritillaries (the latter breeding in small numbers extending from the neighbouring Siccaridge Wood reserve), Dingy skipper *Erynnis tages*, Grizzled skipper *Pyrgus malvae*, and regular sightings of Marsh fritillary *Euphydryas aurinia* from a permanent

colony nearby. The Duke of Burgundy *Hamearis lucina* is currently absent from Daneway but expected to return to breed on the abundant cowslips, many of which now exist in optimum growth-forms for its specialist larvae, thanks to the expert advice of David Simcox and Sarah Meredith.

Rare vertebrates are not a feature of Daneway banks, although the more widespread species may be common. The site supports Common toad *Bufo bufo*, Grass snake *Natrix natrix*, Adder *Vipera berus* (in high numbers for the Cotswolds), Slow-worm *Anguis fragilis*, and Common lizard *Zootoca vivipara*. Breeding birds include Skylark *Alauda arvensis*, Yellowhammer *Emberiza citrinella*, Song thrush *Turdus philomelos* and Bullfinch *Pyrrhula pyrrhula*. Buzzards are ubiquitous overhead, and the downs frequently echo to the croak of raven. Dormice breed across the road but have yet to be reported from Daneway.

The Large Blue butterfly, *Maculinea arion*

The Royal Entomological Society has a long association with the Large Blue butterfly: it is thus fitting that we now (co-)own a major site. The classic experiments by EB Purefoy, TA Chapman and FW Frohawk that revealed how its larvae, after briefly feeding on thyme flowerheads, live underground as social parasites eating *Myrmica* ant grubs, were first published in *Trans./Proc. Ent. Soc. Lond.* in 1915-19. Then in 1931, when insect conservation was almost unknown, the RES established the 'Butterfly Valley' reserve at The Dizzard, Cornwall, to protect one of the Large Blue's finest sites. For 8 years butterfly collectors were excluded, but unfortunately the local farmer Mr. Samwin was also barred from swaling (gorse-burning) and grazing the site, and the colony became extinct. Undaunted, the RES led the calls for constraint among collectors throughout the 1940s and

'50s, and in 1948 sponsored a survey of West Country sites by Capt. RA Jackson. In 1963, represented by Graham Howarth, the RES was one of five founders of *The Joint Committee for the Conservation of the Large Blue Butterfly*, the consortium that still leads the national programme to restore this species. And in 2002, the Society commissioned a portrait of the Large Blue as a present to its patron, The Queen, in celebration of her Golden Jubilee.

The Cotswolds was one of three main regions (of six) where the Large Blue butterfly bred before its extinction as a UK species in 1979. Although a classic collecting ground for this most coveted of butterflies, the credentials of only 11 out of c.32 Cotswold 'sites' rest on more than a single record, and just four of them, including Daneway Banks, have records spanning more than 50 years. The earliest account for it at Daneway, or indeed anywhere in the Cotswolds, was by RE Trye in 1858; the last definite one is for 1947, although it probably persisted until 1951 when, according to Peter Crow, "a schoolmaster from Minchinhampton helped 'clear out' the locality by inviting parties of boys at the school to Large Blue catching excursions". In fact collectors are unlikely to have been more than the final straw for a population that, like all others, was in steep decline due to the progressive abandonment of the Large Blue's unproductive swards by farmers, and later through the loss of rabbits to myxomatosis.

The story of the Large Blue larva's chemical and acoustical mimicry of – and dependency on – a single species of *Myrmica* rather than any of its three more common congeners (or *Lasius flavus*) as was previously supposed are told in RES symposium volumes 19 and 21. Suffice it to say that my population dynamic models indicate that a minimum of 68% of the larvae must be successfully adopted into brood-rich *M. sabuleti* colonies for the butterfly to have a positive growth rate. The carrying capacity of a site is determined largely by the density of this ant, which can reach three nests per square metre in its optimum habitat. This comprises of a herb-rich sward on porous southern-facing soils where the turf is grazed to 1-2 cm in height in spring and autumn, allowing the sun to heat the ground sufficiently for this thermophilous ant to rear brood from early March to mid-November. Thyme

is insignificant as a food but a wide distribution is needed to ensure that enough *M. sabuleti* nests receive larvae. Sadly, this knowledge of the land management needed by the Large Blue came too late to save it in the UK once swards had shifted to shady later plagioclimaxes or successions.

The story of the restoration of appropriate habitat for the Large Blue by a consortium of 14 scientific and conservation organisations, directed by David Simcox and myself, to currently c. 100 UK nature reserves and other sites, and our successful re-introduction of a near identical race of Large Blue from Sweden in 1983 (Devonshire) and 1992 (Somerset and Gloucestershire), is also too familiar to describe in detail here. By the time of the 25-year celebration of its re-establishment, the butterfly had spread to over 30 sites, mainly in Somerset, and although most were small satellite colonies, the core populations were exceptionally large for this rarity, exceeding known numbers anywhere else in the world.

We struggled, however, in the Cotswolds. There, the early introductions to Rough Banks and Barnsley Warren failed because the adult butterflies emerged too late to synchronise with flower-bud production of thyme, leaving the females to oviposit on occasional late-flowering plants growing in the coolest spots within sites, i.e. the only places where *M. sabuleti* was absent! We had taken them an isotherm too far. In Somerset, where spring and summer local climates were ~1.5 °C cooler than the source sites in Sweden, the synchrony was imperfect but adequate; in the Cotswolds, where temperatures were a further half degree cooler, it was not.

Daneway Banks always seemed a more promising site for restoration. At the nadir of under-grazing in the 1970s-80s, 10% of its thyme plants still remained within foraging range of *Myrmica sabuleti*, nowhere near enough for the Large Blue yet among the highest then in the Cotswolds. Gradually, ant densities increased and thyme spread, reaching 65% co-occurrence in 1998 and >90% since 2010 under GWT's targeted grazing. The trial introduction of Large Blues to Daneway by myself and David Simcox, from a thriving colony on Somerset Wildlife Trust's Green Down, initially produced promising results in 2001-04,

with growth matching model predictions. However, continuity of grazing proved elusive with the then grazier, and ceased after a severe incidence of bovine TB, causing the ant to decline and the butterfly to disappear. A second introduction by Simcox and Sarah Meredith in 2010 was successful. Exemplary management under a new grazier has achieved optimum habitat at Daneway, and by 2014-16 it already supported the second largest population of Large Blue in the country, with an estimated 101,831 eggs laid in 2016, equivalent to roughly 4,000 adults. In addition to the improved habitat, the butterfly had itself adapted better to UK conditions by 2010 after 18 generations of selection on Green Down. Adult emergences now occurred earlier and synchronised precisely with Thyme flowering. During the same period, the emergence simultaneously shifted c. 14 days later on a second site to which it had spread in Somerset, after similarly strong selection to oviposit on Marjoram – its early foodplant in southern Europe – which flowers later than thyme. We used both colonies as sources for the 2010 introduction, since both plants are widespread on Daneway, roughly doubling the number of accessible *Myrmica sabuleti* nests than if thyme alone were exploited. As well as increased numbers, this results in an extended emergence with an interesting double peak on Daneway, where roughly equal numbers of eggs are now laid on each plant. Another adaptation from the Somerset populations has been of increased adult dispersal by this normally sedentary species as it spread by stepping-stone colonisation to new sites across the landscape. This attribute, together with back-up plans for emergency grazing if ever needed, make us confident of long-term success on Daneway and wider afield in the Cotswolds, as other reserves receive similar management. These, as in Somerset, should support a meta-population of Large Blue colonies, in this case with Daneway at the core, with each able to repopulate its neighbours by natural dispersal should a local loss occur.

Opening of Daneway Banks nature reserve by HRH The Prince of Wales

The Prince of Wales' involvement with Daneway began when he read in the local paper at nearby Highgrove



Figure 7. Left: HRH The Prince of Wales seated with Ellie Harrison on a new bench carved with illustrations of the Large Blue butterfly's life cycle, during a tour of Daneway Banks with Prof Jeremy Thomas, Chairman of the RES Conservation Committee (centre) and Gloucestershire Wildlife Trust CEO Roger Mortlock. Right: The RES party at the reception. From left: Bill Blakemore, Luke Tilley, Archie Murchie, Kirsty Whiteford, Clive Farrell, David George, Adam Hart, HRH, John Pickett. © Paul Nicholls Photography

of GWT's appeal for funds to purchase the property, and generously donated £25,000. Arrangements for a private visit soon morphed into an official opening, held on 21st July 2016. The preparations needed for one morning's royal visit rather surprised me, and were ably handled for the RES team by Luke Tilley. In the first place, it required a welcoming party of the (highly supportive) Lord Lieutenant of Gloucestershire, accompanied by the High Sheriff, the Mayor of Stroud and councillors. The route for the tour of the site was carefully walked and timed with Prince Charles' secretary, though needless to say we overran on the day, in no small part due to Prince Charles' keen interest in and many questions on the project. Security Police needed to vet the site, while Clarence House oversaw the media.

It was a delightful morning for all concerned and, though initially overcast, mercifully dry. It started with the 40 minute tour of the nature reserve by the Prince of Wales with Gloucestershire Wildlife Trust CEO Roger Mortlock and me (representing the RES). Stopping at fixed points to talk first with David Simcox and Sarah Meredith, and see eggs and larvae of the Large Blue, we then talked to the grazier who had brought her Welsh Mountain ponies over for the day. Finally, we were joined by GWT President Ellie Harrison of Countryfile fame, and stopped to admire a new carved wooden bench depicting the lifecycle of the Large Blue (Fig 7).

The tour was followed by an outdoors reception at the newly re-opened Daneway Inn, situated below the Banks, where His Royal Highness spoke at length and with evident

enjoyment with the eight other members of the RES party (Fig 7) before moving on to meet GWT staff, volunteers and key donors. Finally, Prince Charles was invited by Ellie Harrison to unveil a commemorative plaque, now mounted on the reserve's carved bench, but before doing so he gave an impromptu 10 minute speech at which he extolled the importance of this and similar conservation initiatives, and again showed his clear enjoyment of the visit. Proceedings ended, after Prince Charles' departure, with rousing speeches by (then) RES President John Pickett and GWT Chairman Francis Rundall (Fig 8), before guests were given conducted tours of the site during which a few late Large Blues and many Downland Villa beeflies (Fig 9), were seen by the party, although not, alas, by Prince Charles in the more overcast weather during his morning tour.



Figure 8. An excellent day for the RES is rounded off with a rousing speech by (then) President John Pickett. © Paul Nicholls Photography



Figure 9. Downland Villa bee fly photographed by guest Christopher Hancock of the Somerset Wildlife Trust on Daneway Banks, 21 July 2016.



Figure 10. A special 'Rare Find' beer brewed by Wadsworth to commemorate the Large Blue at Daneway. Photo Archie Murchie

Visiting Daneway Banks

Fellows and Members are encouraged to visit Daneway Banks, which is located at OS grid reference SO937034, half a mile west of the village of Sapperton and 1 mile north (as the insect flies) of the A419, midway between Stroud and Cirencester. The main entrance (see map on Fig 1) is 250 yards north of the Daneway Inn pub. Please note that apart from in Sapperton, very few parking spaces are available except in the pub carpark, which visitors are welcome to use so long as they also patronise the pub, which provides excellent light meals; it even has a special beer, 'Rare Find', brewed in honour of the Large Blue (Fig 10)! The site is especially busy during the main Large Blue flight period, from mid-June to mid-July, when we hope to provide additional parking in the field adjoining the pub – please check the RES website nearer the time for advice.



Large Blue, www.gloucestershirowildlifetrust.co.uk © Keith Warmington

For those visiting Daneway Banks and wishing to input sightings, please submit any records of insects (and other wildlife) seen to Luke Tilley luke@royensoc.co.uk. To avoid confusion and potential embarrassment, it is essential to obtain prior permission before taking collecting equipment onto the site, and since it is an SSSI, formal permission is also required from Natural England to kill or remove specimens. For private visits, please also keep to the footpath or the additional routes indicated on the site map, although we intend to organise visiting days when Fellows and Members can wander throughout. Guidelines and information will shortly be placed on the RES website following a RES-GWT meeting in April 2017. Despite some inevitable constraints due to the vulnerability of this site, please visit and enjoy our wonderful new reserve.

Acknowledgements: Many RES Fellows and staff have encouraged, helped and taken part during the long process of approving and acquiring Daneway Banks, and in preparing for the Royal Visit. To single out a very few, I am deeply grateful to Clive Farrell, Bill Blakemore, Luke Tilley, and John Pickett, as well as to David Simcox, Sarah Meredith and Gloucestershire Wildlife Trust Director, Roger Mortlock. I also thank the late GM Spooner and David Simcox for access to their unpublished accounts of the historical occurrence of the Large Blue. Roger Key, Christopher Hancock, Paul Nicholls and David Simcox kindly provided the images.

Frontal view of the Asian hornet displaying its dark thorax, black wings and yellow legs.



The arrival of the Asian hornet, *Vespa velutina* Lepeletier, 1836 into the UK in 2016

Asian hornets finally arrived in the UK in the autumn of 2016 and are now causing a great deal of concern for the authorities and for the general public.

The press had a field day. There were horror stories of Asian hornets arriving on our shores, including phrases such as '*a swarm of killer hornets...*' (Daily Telegraph Sept 2016) and '*killer hornets*' (The Times Oct 2016), mixed with level-headed reporting from The Independent (4 Oct 2016). The only problem was that there was a dearth of imagery of the Asian hornet so the public were entertained by our English hornet, or the really nasty-looking Giant Asian hornet, *Vespa mandarinia*, which isn't part of this story, but stimulated alarmist comments like '*these insects are the last thing you will see before you die*'.

John Feltwell
Wildlife Matters,
Battle,
East Sussex

Everyone is after the Asian hornet: BWARS, Defra, CEH, Fera, BBKA, APHA, MRA, NBU, NNSS, our 25,000+ beekeepers and citizen scientists. No wonder the outbreak of Asian hornets in the West County was cleared up in 46 days, or was it?

The Asian Hornet

The Asian hornet belongs to the *Vespa* genus, and its specific name of *velutina* refers to its downy abdomen and velvet-like thorax. It is slightly smaller than the European hornet, *Vespa crabro*. It is also the only dark hornet in Europe as the Midi-Libre says *une livre aussi foncée* (Midi-Libre, 2016). Key features are the dark thorax, the yellow tarsi, the narrow head and a yellow line on the 4th abdominal segment (Feltwell, 2016). The Asian hornet is

said to resemble the sub-species, *V. v. nigrithorax* from Asia (Villemant *et al.*, 2006).

The European Hornet and sub-species

The mainland European hornet looks slightly different from the English hornet, *V. crabro*, because the English subspecies has a ring of orange on the proximal end of its head, whereas the French one has a ring of maroon, as in the photograph opposite. The Asian hornet thus looks more like the mainland (French) European hornet than the English one, but it has finer, thinner features on the face.

Life History

Asian hornets have a different life history compared to European hornets in that they have two types of nests, a primary one low down in vegetation, or in a shed or eaves of a roof, followed by a secondary larger nest high in a tree, constructed when the primary nest is self-supporting. This is explained and illustrated with field examples in Bruneau's comprehensive 2011 six-page paper, where detail is also provided of other *Vespa* species with which it could be confused. Further background to the species, its distribution, habitats and threats are on the BWARS website (Roberts *et al.*, 2016), and more recently in Franklin *et al.*, 2017.

Mainland European Distribution

The first confirmed specimen of the Asian hornet in Europe was found feeding on a kaki fruit in a garden in Nérac (Lot-et-Garonne) in southwest France in November 2005 (Villemant *et al.*, 2006). It may have arrived earlier, in 2004, before being found, but it spread rapidly, crossing the Pyrénées with the first recorded specimen in Spain in August 2010 (Lopez, S. *et al.*, 2011; Goldarazena *et al.*, 2015). The species seems to have expanded its range in France such that it is now found over about three quarters of the country, up to the English Channel and possibly now into Belgium.

The Long Anticipated arrival (2004-2016)

Like the potential arrival of the parasitic mite *Varroa*, the Asian hornet arrival was long anticipated in the UK, and dangers recognised early (Bee Craft, 2011). A border force had been



Preserved specimens of the English hornet (left) and French hornet (right). These specimens, and others, are presently being tested at the Marine Research Laboratory (MRA) laboratories in Plymouth for RNA extraction to understand what viruses may be common to either or both and whether they are also to be found in Asian hornets, and in honeybees (which already are heavily infected with viruses courtesy of *Varroa destructor*). The striking phenotypic difference of the English Hornet is recognised as *V. c. gribodoi* by Joseph Bequaerti (Bequaerti, 1931) who updated the old name of *V. c. vexator* given by Moses Harris (Harris, 1776) because of his uncertain 'English' status.

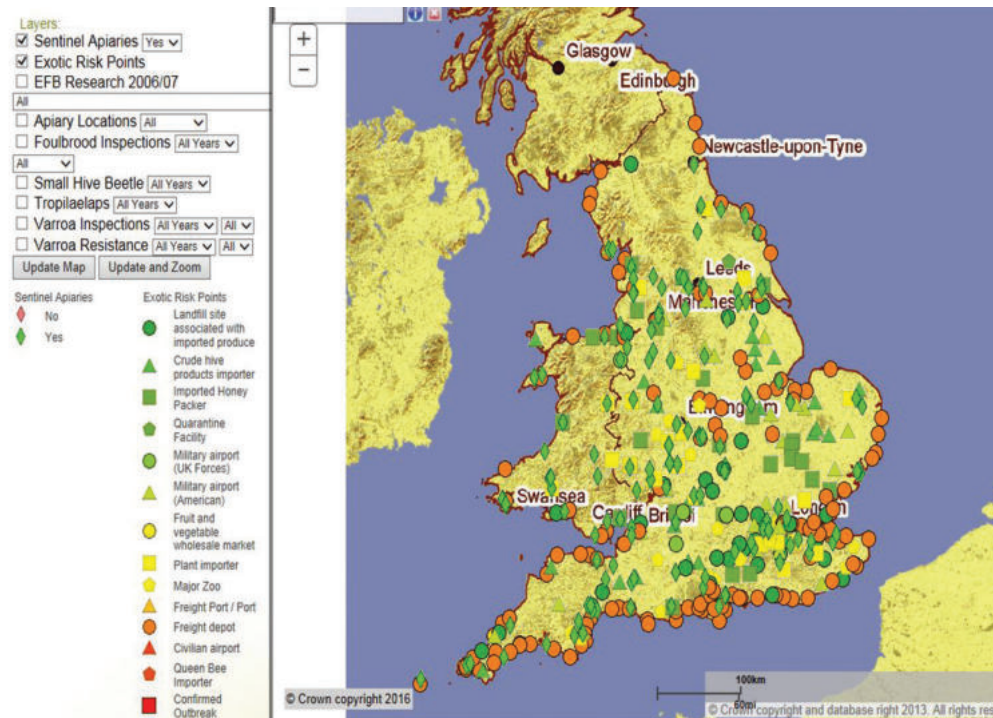


Front view of the face of the Asian hornet showing the yellow-orange frons and clypeus and the dark brown compound eyes and dark antennae; the hornet is eating honey. The face is narrower than the European hornet.

put in place and Action Plans prepared to be rolled-out immediately on arrival. The organisations involved were the Animal and Plant Health Agency (APHA), the Department for Environment, Food and Rural Affairs (Defra) and the National Bee Unit (NBU). Nicola Spence (Defra Deputy Director for Plant and Bee Health) appeared on the radio in 2016 confirming that...*'we have been anticipating the arrival of the Asian hornet for some years...'*. In anticipation of this arrival a series of 'sentinel' honeybee hives were located at likely entry points, such as at ports and airports, as shown in the map opposite from 2013. These were regularly monitored for any Asian hornets. None were found.

How did it arrive in Europe?

The Asian hornet did not have to arrive on the Calais-Dover route, it could arrive in any port in the UK (Feltwell, 2016). It is quite capable of flying, or being blown, over the Channel



Plan of England, Wales and Scotland showing where sentinel apiaries were positioned, often close to freight depots and importers of fruit and vegetables, airports, zoos and landfill sites. These apiaries also monitor other threats to bees. Reproduced courtesy of the National Bee Unit (NBU).

Arrival date	Event	Reference
France		
2004	Possibly into France undetected	Goldarazena et al., 2015
2005 (Nov)	First recorded in Southwest France	Villemant et al., 2006.
Spain		
2010	First recorded in Northern Spain	Goldarazena et al., 2015
Belgium		
2004	Spreads to Belgium	Bruneau, 2011
Portugal		
?2010	Spreads to Portugal	Gosso-Silva, 2012
Italy		
2013 (June)	Sighted in Liguria (N. Italy)	Vita, 2013
Channel Islands		
26 July 2016	Small colony in Alderney, CI, nest and larvae destroyed.	GOV.JE, 2016; GOV.GG, 2016
09 August 2016	One photographed in Jersey, CI	GOV.JE, 2016
UK: England		
20 Sept 2016	Arrived in Gloucestershire	GOV.UK, 2016a
21 Sept 2016	Local control centre opened in Tetbury	GOV.UK, 2016a
29 Sept 2016	Inspectors from the National Bee Unit state they have only found Asian hornets at 6 sites within 500 metres of the original discovery of one of these hornets in Tetbury in Gloucestershire.	BBKA, 2016a
04 Oct 2016	Tim Lovett (BBKA) states that the evidence suggested the invasion started some time ago in Somerset	The Independent, 4 Oct 2016
04 Oct 2016	'An Asian hornet has been found north of the Mendip Hills in North Somerset'	ITV, 2016a,b
04 Oct 2016	'3-mile surveillance zone has been set up and a local control centre will be opened.' n Somerset	BBKA, 2016b
04 Oct 2016	Defra reports 'Asian hornet outbreak contained'	GOV.UK, 2016b
UK: Scotland		
20 March 2017	'Warning! The Asian Hornet lands in Scotland'	Pest Control News (PCN)

Table 1. Chronology of the Asian hornet's arrival in Europe.

(Spence, 2016). In the event, it arrived in the West Country, most probably via a port importing pottery or potted plants, in which impregnated hibernating queens were present. Once out of the consignment the queens would quickly found colonies. Gonzalez and co-workers stated that the species was similarly suspected to have arrived in France via the horticulture trade, possibly in imported pottery from China (Goldarazena *et al.*, 2015). It has subsequently spread rapidly in Europe (Table 1) at an estimated 80-100km/year (NBU, 2017).

NNSS (2016) state that Asian hornets are '*most likely to be found in southern parts of England on goods among which it could be accidentally imported (such as soil with imported pot plants, cut flowers, fruit or timber).*' Active months are between April and November.

The Arrival in the Channel Isles in August 2016

The first account of Asian hornets in the UK was a small colony in Alderney in late July 2016, followed by a single specimen found in Jersey on 9 August 2016 (GOV.JE, 2016, GOV.GG, 2016).

The Arrival in England in September 2016

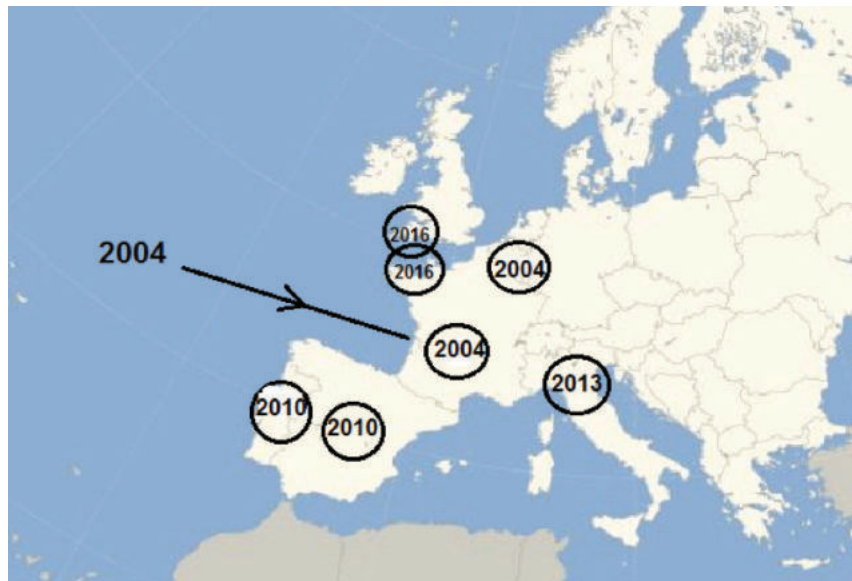
The first arrival of the Asian hornet on the UK mainland was in the Tetbury area of Gloucestershire in September 2016. This was reported by Defra and APHA in a Press Release dated 20 September 2016 (GOV.UK, 2016a).

Rolling out the well-established protocol

The protocol for this pest's arrival was put into effect rapidly following detection – a three mile surveillance (cordon) zone was put around Tetbury. Bee inspectors were drafted in to check for hornets. Infra-red cameras and traps were used to locate nests. Nest disposal experts were also on hand to deploy pesticides to kill the hornets when found. Modelling was used to predict potential at risk areas, calculating that spread of the Asian hornet was not likely to have occurred outside the surveillance zone.

Threats to pollinators

The Asian hornet is a real threat to honeybees since they hawk in front of hives and snatch honeybees in flight.



Map showing the years in which the Asian hornet colonised various countries. Attribution: "Blank Map of Europe" by Ssolbergj, used under CC-BY-SA / Annotated from original.

They quickly reduce the size of the honeybee colony in this way, until they can enter unchallenged and eat the larvae. This can take just a few days, with multiple hives being affected simultaneously. The author is aware of two beekeepers losing 60 and 80 hives respectively in the Cévennes mountains of Southern France to Asian hornets in the autumn of 2016 (personal communications), figures that are no doubt repeated across France.

The threat is not only to honeybees. Asian hornets will probably take most pollinators and predate their nests if they can get to them, with the author having photographed these hornets taking bumblebees in France (see images overleaf) in late November. The Vita infographic has a photograph of an Asian hornet eating a hoverfly, suggesting that many important pollinators are at risk (Vita (Europe) Ltd, 2017).

What people can do

Citizen science may play an important role in monitoring future Asian hornet outbreaks, despite many people misidentifying this species. 'The Asian Hornet Watch' app for mobile phones was launched by Centre for Ecology & Hydrology (CEH) in March 2017 which should help citizen scientists to more reliably separate species. Photographs can be uploaded directly to CEH for verification, including automatic map referencing.

The 'Non-Native Species Secretariat' (NNSS) have been asking people to

send in their Asian hornet records, with photographs that can be checked by entomologists (NNSS, 2016). This request has been repeated by Defra, BBKA and CEH, with advice given to stay away from Asian hornet nests. To raise awareness, Vita have released a free 'Infographic' (a poster with colour photographs on the Asian hornet) to the wider public (Vita (Europe) Ltd, 2017) and BeeBase-registered beekeepers are frequently emailed with any relevant updates.

Control

Size matters when making a trap for Asian hornets, especially for one that will not simultaneously target European hornets or honeybees. There are several proprietary traps for Asian hornets (Vita (Europe) Ltd.) 2014, Thorne, 2016, Save Our Bees, 2016), but most amateur beekeepers like to make their own equipment and follow simple designs using plastic drinks bottles (NBU, 2012).

The Vita trap is a wooden box fitted to the bottom of the hive which relies on Asian hornets entering into side holes from which they cannot escape. The trap has entrance holes of 7mm diameter to allow the wasps to enter, and exit holes of 5mm diameter to prevent the Asian hornets getting out, whilst allowing honeybees to escape. Thorne's have their own Asian hornet traps that come with sachets of wasp attractant (Thorne, 2016).

In my own experience, I found that operating an ultra-violet (MV) moth



A mainland (French) European hornet feeding on a juicy cherry stone; note the maroon back of the head.



1



The British form of the European hornet: note the yellow at the back of the head.



2



Three Asian hornets and a bumblebee imbibing honey outdoors – peacefully for the moment.



3

A sequence of three photographs follows where an Asian hornet struggles with a bumblebee and eventually flies off with it.

No. 1. In mortal combat, both stinging.

No. 2. The hornet rolling the bumblebee around to find weak points for stinging. Note the long legs embracing the bumblebee.

No. 3. Biting the defeated bumblebee and ready to fly off with its prey.

trap successfully caught large numbers of European hornets. The trap was operated in East Sussex during the week that the Tetbury (Gloucestershire) news story broke; sixteen *V. crabro* and 120 *V. vulgaris* were captured, but no *V. velutina*. I do not know if Asian hornets also respond to MV, but this is a possibility. In spring 2017 the NBU will be deploying Véto-Pharma traps as part of their

surveillance, as the French Beekeeping Technical Institute has found these effective (Véto-Pharma, 2017).

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Fig. 12. *Thyreonotus bidens*, one of the crickets found by Gergő Szövényi.

Entomology, employability and Erasmus+: Developing the nature conservationists of the future through experiential learning in the Portuguese montado



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Background to the project

Careers in nature conservation can take many forms and can start in many different ways. Across Europe, however, employers in the sector say that there is a consistent lack of key skills in candidates applying for jobs. This is particularly so in graduates hoping to move into nature conservation. An internal communication by the European Commission (2011) states:

“There is a strong need for flexible, innovative learning approaches and delivery methods: to improve quality and relevance while expanding student numbers, to widen participation to diverse groups of learners, and to combat drop-out.”

Internationally, 60% of students say they go to university in order to get a good job (Foley, 2016) and there is a strong drive to integrate employability skills in all university teaching (Olivier, 2014). In the UK, “student employability” is a key metric to measure university performance, principally via league tables that employ data from the National Student Satisfaction (NSS) and Destination of Leavers in Higher Education (DELHE) surveys. These metrics have also been woven into the new Teaching Excellence Framework (TEF) that places all UK universities into categories, theoretically to demonstrate the effectiveness of the teaching at each university.

Whilst there is debate about what constitutes a good employability metric,



Fig. 1. The project team at the University's research facility.

the skills required to work in the environment and conservation sector, across Europe, are not necessarily being delivered as part of undergraduate programmes. In 2010 the Natural Environment Research Council led a review of higher level skills needs in the environment sector on behalf of the Environment Research Funder's Forum (LANTRA, 2010). In total, the review identified 224 skills needed by those working on issues connected with the natural environment. In particular, it identified 15 critical skills that are in short supply that included, predictably perhaps, fieldwork, taxonomy, systematics and public interpretation.

For some time a consortium of partners¹ working in the environment and conservation sector have been considering ways to address commonly seen skills shortages in candidates for work placements, volunteer work and established posts. An ERASMUS+ project, "Careers in Nature Conservation" (<http://careersinconservation.elte.hu/>) developed out of our discussions in 2015.

The project has six main objectives:

- Share European differences, needs, strengths and weaknesses in biodiversity management career guidance.
- Identify employer knowledge and skills needs and link to Higher Education Institution (HEI) career guidance.
- Produce, test, evaluate and re-test an Open Educational Resource in biodiversity employability guidance for HEI students.

- Seek a validation pathway for career guidance (European Credit Transfer and Accumulation System).
- Increase awareness of the biodiversity management sector to HEI career guidance professionals.
- Produce learning materials for entrepreneurial and innovative thinking in the biodiversity management sector.

Considerable effort has been made developing learning support materials, networking and training sessions that will deliver to these objectives. An important feature of this work has been to include staff from sector organizations along with university staff and students in the development and testing stages to make sure the materials are fit for purpose. The

materials and sessions are tested during week-long intensive programmes, delivered in each of the three partner countries, and feature staff and students travelling to each country to take part in each test programme. The first of these tests was in Portugal in October 2016 (Figure 1).

The Portuguese montado

The montado is a Mediterranean agro-silvo-pastoral system in Portugal (*dehesa* in Spain) mainly consisting of cork oak (*Quercus suber*), holm oak (*Quercus ilex*) and large areas of structurally diverse grassland. Centuries of human intervention, such as livestock grazing, created this savannah-like landscape where the dense shrub understory is usually absent. The trees are tighter together here and there, but mostly they form an open woodland with lots of space between the trees, therefore providing an ideal place for a rich herbaceous layer maintained by grazing (Olea and Miguel-Ayanz, 2006) (Figure 2).

Montados extend over plain areas as well as foothills and gentle slopes. They are generally characterized by the Mediterranean climate with some oceanic strains in parts closer to the sea and continental weather strains in the middle parts of the Iberian Peninsula. The summers are long and hot, during which most of the grasslands turn yellow and dry waiting for the typically mild, wet winter and spring to arrive when they can prosper. These lands have low soil fertility so full agricultural use would have not been beneficial (Paleo, 2010). This prospect urged



Fig. 2. The project team in the montado learning about cork production.

¹ Ambios Ltd and University of Exeter (UK), University of Évora and SPEA (Portugal), Eötvös Loránd University and Barn Owl Foundation (Hungary)

people (even in the Middle Ages) to try a new concept centered around livestock production and pasture, which became an efficient way of bringing nature and biodiversity conservation together with agriculture and silviculture.

How the montado ecosystem works

The montado is a semi-natural ecosystem, which means it has been maintained by humans for a long period of time forming the shape and look it has now. An ecosystem consists of many important parts and it needs every one of them to function properly. The montado's natural ecosystem has been transformed for the benefit of the people, yet a sustainable environment has been created by leaving the vital components and connections intact (Paleo, 2010).

The oak trees play a fundamental role in the stability of the ecosystem since they create a unique microclimate in their immediate vicinity by shading the fauna and flora from the sun's heat and radiation (Paleo, 2010). They greatly aid the soil's otherwise low water holding capacity (Joffre and Rambal, 1988) and they harbour many species. These evergreen trees provide food for the plant eaters when the grass is dry and a shelter when heavy rains come.

The montado also offers ecosystem services to humankind, including tree products (acorns for animal fodder and cork with its multitude of uses, see Pereira *et al.*, 2015) cultural and recreational benefits, hydrologic regulation, erosion control (by providing soil stability) and sequestration of CO₂ (Olea and Miguel-Ayanz 2006).

The grassland supports rich plant and animal biodiversity, including centipedes, beetles, grasshoppers and many other arthropods. Millipedes are a common sight in the area; they work as detritivores to recycle the dead organic matter, and the various fungi in the soil do the same. The invertebrates, along with small vertebrates, are the main source of food for the numerous and diverse bird species living in the montado periodically or permanently, like the endangered black stork (*Ciconia nigra*) and Spanish imperial eagle (*Aquila adalberti*). Some of the birds provide vital ecosystem services, like the Eurasian jay (*Garrulus glandarius*) – contributing to the

natural regeneration of the oaks by collecting and hiding acorns for the winter, some of which are forgotten and thus able to germinate.

Human intervention is important in maintaining the ecosystem and biodiversity of the montado by preserving the two alternate states of succession: the woodland and the grassland. The livestock controls the shrub layer by grazing and helps maintain the annual herbaceous plants, while their droppings increase soil nutrition (Paleo, 2010).

The montados have become part of the Natura 2000 network (Olea and Miguel-Ayanz, 2006) because they are a biodiversity hotspot and a great example of a human-shaped, but stable and sustainable ecosystem, which works in favour of human and nature equally.

Our project visited the montado at Herdade da Mitra (<http://www.mitra-nature.uevora.pt/herdade-da-mitra>), an experimental site of 290Ha owned by the University of Évora. Here a group of nine undergraduate students were trained to deliver three wildlife walks that they designed and researched with the help of staff from three European universities and nature conservation NGOs. This is the story of one of those walks and how the insects of the montado helped our students develop new knowledge, understanding and skills.

The insects of Herdade da Mitra

An entomologist stepping into well-managed montado on a warm October

day cannot fail to be amazed at the number and diversity of insects that they immediately encounter. The entomological focus of montado research has tended to be on tree pests like Cerambycid Coleoptera (eg Torresvila *et al.*, 2013), on other species of saproxylic insects, such as certain Coleoptera and Diptera, Syrphidae (eg Ramirez-Hernández *et al.*, 2014), Carabid and Staphylinid beetles (eg Taboada *et al.*, 2010) and on ant communities (eg Reyes-López *et al.*, 2003). The montado grasshoppers (particularly Acrididae) (Figure 3) and Tenebrionid beetles (Figure 4) do not seem to be well researched, despite their abundance and diversity. Lemos *et al.* (2016) comment on this lack of research concerning Orthoptera. Their fieldwork alone has revealed six species new to Portugal.

We had five days available for field work alongside presentations and workshops with colleagues and students. During this time we relied only on sweep-nets (Fig 5), pooters and several small butterfly nets, along with head-torches at night. The dominant insects at Mitra, in terms of numbers, were the ant communities of the genus *Messor* whose trails decorated any open land. The grasshoppers and crickets were second for numbers and were the most diverse of all the insects we observed, with 36 species being identified from this visit. Remarkably this amounts to *circa* 25% of the Portuguese orthopteran fauna seen in this one area during just a few days in October! Also conspicuous, in sufficiently large numbers that you had to tread carefully at times, were six



Fig 3. *Oedipoda caerulescens*, one of the abundant, colourful and highly active grasshoppers in and around the montado.



Fig. 4. *Messor* nest with darkling beetle.



Fig. 5. Gergő Szövényi with his sweep net on a night time hunt, with head torch and moon.

species of “Darkling” beetles and, notably, the tiger beetles *Cicindela campestris* and *C. maroccana* which were abundant on some paths (Figures 6 and 7). Other insects seen frequently and/or in large numbers included five species of praying mantid, the small darter dragonfly *Sympetrum fosconlombii*, a variety of grassbugs (Hemiptera:Heteroptera, Miridae) and, under what seemed like every stone, web-weavers (Embioptera).

After five days our incidental observations (i.e. in between the main project activities) totalled 79 species across eight Orders: Orthoptera (36 species); Mantodea (5 species); Coleoptera (18 species); Hymenoptera (10 species); Hemiptera-Heteroptera (5 species); Odonata (1 species); Lepidoptera (3 species); Embioptera (1 species) (Figures 8 – 13 show a range of insects seen). We visited Mitra in mid October with daily peak temperatures of around 25°C and misty mornings preceded by cool nights. With profuse Spring wildflowers and long Summer days it is easy to imagine a vastly richer fauna that could be described using proper sampling methods over a period of time.

Employability and entomology

In the past few years one of the project partners, Ambios Ltd, have trained or otherwise supported over 200 learners who have wanted to start or progress a career in the nature conservation sector. Around 2% have arrived with an interest in invertebrates of any sort and the level of field recognition and background knowledge of even the commonest insects has been notably poor.

Yet insects provide a perfect subject to promote the range of skills needed in the sector: they are relatively easy to find and capture without harming them or the captor; they preserve easily; a hugely diverse range can be found in a very small area; there is a wealth of ID, taxonomic and support materials available for insects at all levels; they have remarkable and fascinating natural histories; they underpin almost all terrestrial and freshwater ecosystems; we encounter them all the time and many interact with us in interesting or important ways. The challenge is to distil this mass of opportunity into a coherent and useful programme of skills development.



Fig. 6. The edge of the montado: wherever we looked there were tiger beetles, darkling beetles, grasshoppers and ants.



Fig. 7. *Cicindela maroccana*, one of the abundant tiger beetles at the edges of the montado

The employability skills we chose to focus on evolved into the following programme:

1. Exploring and characterising the montado habitat;
2. Choosing the target species from those observed and tracked over several visits to the montado;
3. Finding and capturing them using the most appropriate methods selected from a range that were demonstrated;
4. Identifying the target species as best as possible using a variety of sources;
5. Investigating their natural history to be able to tell their stories *in situ*;
6. Planning a walk through the montado to tell members of the public the stories of the target species.

This programme would fit any organism, but the opportunity presented by the prolific and diverse insect fauna far exceeded that offered by any other animal group, with the added bonus of being able to show live and preserved specimens which would be difficult or even impossible with other groups of animals.

How it all worked – as told by the students

During our week at the University of Évora we spent an equal amount of time in the class room and in the field, a huge contrast to our usual university schedules of lectures and practical sessions. In the class room we were taught many skills, such as how to create a professional CV,

entrepreneurship skills and how we should go about getting work experience in order to become successful in the conservation sector. We all found this beneficial as it was specifically concentrated around gaps in our knowledge and tailored to the field of conservation. Field work sessions took place in the montado itself; this was particularly exciting for the Hungarian and English students as the montado is unique in species composition and management. We spent time with specialists, each in a different topic related to conservation, who were able to teach us about different species, where we might find them and how conservation efforts are currently working to ensure they are able to thrive.

A major part of the week was putting together a thirty minute nature walk for a group of 10-15 people in the montado, focusing on a specific group of animals – birds, beetles or grasshoppers. To begin, we walked around the montado looking for specific areas where we expected beetles might be found. This included low scrub and leaf detritus since many beetles act as detritivores. During this initial session we captured a few beetles and gained a good idea of where we should return to find more to show the group during our walk. We were then able to use the captured beetles to identify specimens and research interesting facts about them, such as the speed tiger beetles are able to run 9km/h (125 body lengths a second!), which could be valuable to engage our audience. Following our time

researching we retraced the walk we had previously done, spending time preparing what we may say at specific places we wished to stop at and thinking about habitats we may wish to highlight to our group.

We were rather nervous for our final walk as none of our group members had previously completed such a task. However, during the time we were showing our audience around the montado it became clear that we were fully capable (Fig 14 shows one of the other teams talking about grasshoppers on their walk). We began by explaining to our audience what a beetle is and how they behave; we then moved on to highlight areas in which they may live, taking time to feature detailed information on the diversity of beetle habitats and diets. To encourage group participation we handed out empty pots to members of the audience in the hope that they may be able to capture a few species that we had previously seen. At this point we found it useful to show the audience photos of the beetles we had already spotted so that they were aware of what to look for. At the end of the talk we also showed specimens that had previously been caught to draw attention to the diversity of beetles.

Was the training successful?

The project evaluated the effectiveness of the training at Mitra using the methodology devised by Betts and Roper (2014). Prior to the trip to Mitra the students were asked to rate their confidence (a proven proxy for improved skill and knowledge – see



Fig. 8. *Iris oratoria* in the montado.



Fig. 9. *Bembix* digging a nest on a montado path.

Betts & Roper, 2014) for a number of key topics. The same questions were then asked 12 weeks after the training and the scores compared for each topic. The results show that, for each of the nine trainees and across all the topics, there was an increase in confidence of between 6% and 119%, with a median value of 38%.

The largest increases in confidence were in knowledge of the nature conservation sector (median of 103%), biodiversity management skills (median of 42%) and wildlife audits (median of 35%). Whilst benefits to our learners were carefully planned, there was always an element of uncertainty, especially with intensive field-based work in an unfamiliar environment where learner engagement can be difficult to maintain at high levels. Consequently, the project team were very pleased that there were such large increases recorded (an increase of 25% was our target; this is statistically significant using the evaluation method deployed see Betts & Roper, 2014).

Feedback from the students is also revealing:

Student 1: "I found the most valuable aspect of this project was that I learnt things I would not have learnt as part of my degree. This included being able to identify specific groups of beetles such as the Tenebrionids and learning about an ecosystem (the montado) I had not previously known about. I gained confidence during my time at the University of Évora as I am now able to stand up in front of a group of people I have not previously met and speak without being worried about how they may react to my presentation"

Student 2: "Through presentations given by employers and trainers I gained a lot of information about the nature conservation sector and what skills I might need. The field work around the montado was also beneficial, we gained some identification and presentation skills and teamwork experience."

Student 3: "The wildlife audit walk was an interesting way of challenging us, making us work as a team and overcome our difficulties; it was also where we learnt about different animals and environments that, despite being right in front of our eyes, might have been left undisclosed."



Fig. 10. A large potter wasp (*Eumenes* sp.) collecting mud from dew-soaked soil.



Figure. 11. Staphylinid beetles caught *in flagrante*.

Conclusions

The training programme as a whole was clearly successful, although the benefits to individuals were predictably least for those who had undertaken previous work in the sector and greatest for those who had little or no such experience. The accessibility of the montado habitat and its diverse insect fauna greatly aided the practical experience of fieldwork and public interpretation. This model, with some careful refinements, will be tested again in Hungary and the UK in April and August 2017. Again we will rely on the insect fauna at our test sites to provide a focus for the skills training.

Perhaps the most important aspect of this training programme is that it begins to address, admittedly in a small way, the continued decline in field skills, particularly identification skills and particularly for invertebrates. Lawler (2016) discusses this situation and employs the term (coined by a colleague) “ecological or species illiteracy”, which appears to be a genuine threat to the future of the nature conservation sector, and also the whole of ecological science. We hope that the model we have deployed, or at least some aspects of it, can be developed further to address this problem more widely in the future. Finally, we suggest that there may need to be a re-focus of Biological Science degrees where the teaching and learning experienced may not be delivering a sufficiently holistic understanding of the natural world.

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Fig. 13. *Calliptamus barbarous*, another of the abundant grasshoppers.



Fig. 14. The "Grasshopper Team" leading their wildlife walk.



About the Authors

Clive Betts (second from left) is a lifelong entomologist and founding member of Ambios, a not-for-profit organisation dedicated to nature conservation and training. Clive contributes to the Careers in Nature Conservation project in a number of

ways but is most at home with a net in his hand getting over-excited at some beetle or wasp and sharing his passion for insects with others.

Laura Jelinek (far left) is a Hungarian student from Budapest (Hungary), currently in the third year of Biology studies at Eötvös Loránd University.

This project is helping Laura gain better knowledge and skills related to nature conservation, testing herself in an international environment and building her networks.

Cláudia Lopes (far right) was born in the Azores (Portugal) and graduated with a Bachelor's degree in Biology from the University of Évora. Cláudia is now continuing her studies towards a Masters in Conservation Biology at Évora. The Careers in Conservation project is helping Cláudia learn new skills, enhance existing ones, and have contact with different people from other cultures, with various life experiences and levels of knowledge.

Katie Mitchell (third from left) is a second year student at the University of Exeter studying a degree in Biological Science. Katie joined the Careers in Conservation project as it can be difficult to get hands on experience in this field. She is particularly interested in the conservation of wild species *in situ* in protected areas and national parks and is seeking a career in the sector following this course.

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Fig. 1. The robber or coconut crab, *Birgus latro*.

Scales, crazies, parasites and meltdown, at Christmas

In mid-2016, we flew from Canberra completely across Australia to Perth, then a further 2,600 km (3 hrs) northwest towards Indonesia. Our destination was Christmas Island ('C.I.'), which despite its proximity to Java is administratively part of Australia. We were joining a group of volunteers/nature tourists attending Bird'n'Nature Week to learn about and modestly assist with bird research on Christmas Island - but with a sub-agenda that included sighting the 10–11 endemic species or subspecies of birds. Australian birders know the destination well as it is close to Asia, and thus receives interesting migratory over-shoots ('vagrants') far more often than the main continent. The island makes the news also for it being a target for migrant humans seeking entry to Australia by boat, and for the highly controversial 'detention centre' that continues but perhaps may close.

**Peter S. Cranston
& Penny J. Gullan**

Although it was not strictly part of our visit, we were interested to see an insect-driven phenomenon that exemplifies the term invasional meltdown in the ecological literature. This term was invoked by Daniel Simberloff and Betsy von Holle (1999) for the induction of negative impacts on native ecosystems by an invading non-indigenous species being aggravated by positive interactions among exotic species. The un-impacted Christmas Island ecosystem was unusual in its domination by land crabs, notably the abundant red crab, *Gecarcoidea natalis*, and the largest terrestrial arthropod in the world, the robber or coconut crab, *Birgus latro* (Fig. 1). In the presence of abundant crabs the forest floor is clear of leaf litter and most seedlings and crab burrowing maintains uncompacted soil in an open, diverse forest (O'Dowd & Lake 1989). Estimates of numbers of robber crabs are one million and the



Fig. 2. The yellow lac scale insect *Tachardina aurantiaca*.

meet. Scale insects, particularly a species of lac scale insect (Kerriidae) and several species of soft scale insects (Coccidae), became abundant within the native forest where their waste products provide carbohydrate-rich honeydew to other insects, especially ants. With the invasion of the yellow crazy ant (*Anoplolepis gracilipes*) last century, a species capable of forming supercolonies of billions of individuals met a perfect carbohydrate food source in the scale insect honeydew. As studies by scientists at La Trobe University and Monash University (Melbourne) have shown, these supercolonies of yellow crazy ants incapacitate crabs by spraying formic acid into the crabs' joints and eyes, thus rendering millions of them moribund or dead, available as food for the ants. After ant invasion, the numbers of crabs plummeted, with commensurate changes in the forests, where leaf litter accumulated and the understory grew dense. The consequent reductions in crab migrations meant that was no spectacle to draw tourists.

All was not lost - what we viewed in mid-2016 included some substantial areas of clear understory, numerous burrows, quite abundant crabs and very few scale insects. This resulted from the Federal Government agency, Parks Australia, in collaboration with academic researchers at La Trobe and Monash Universities, using a range of chemical control baiting techniques against the yellow crazy ants as documented by Green & O'Dowd (2009). However, this is very expensive, time-consuming and controversial with residents. Furthermore, it would need to continue in perpetuity simply to lower the ant numbers since eradication by baiting is deemed impossible. So what next? The demonstration that ant numbers reduced dramatically if ants were excluded from the scale insects and their honeydew led to suggestions that control of scales alone ought to reduce ant numbers. The main honeydew-producer used by the yellow crazy ants on Christmas Island is the yellow lac scale insect (*Tachardina aurantiaca*) (Fig. 2) and so it became the target of a control effort.

In the country that introduced cane toads to 'control' cane grubs 80 years ago, biological control remains controversial and not only in public perception. Although ants appear impervious to biological control, some biocontrol successes involve scale



Fig. 3. Yellow crazy ant biological control facility containing plants of several native species infested with scale insect populations.

red crabs may have peaked at more than 60 million individuals in the immediate past. During the annual mass migration of the red crabs from land to sea, during the island's annual wet season usually starting in November, many millions of female crabs release their fertilised eggs into the ocean. This phenomenon formed the basis for some specialist 'wonders

of the natural world' ecotourism, important to an island where the main economic activity is mining of phosphate, a depleting resource.

For this unique and idyllic system, conserved in a substantial national park, to collapse such that it became the 'poster' exemplar of ecological meltdown (O'Dowd et al, 2003), two kinds of invasive insects needed to

insects, such as the control of the native Australian cottony cushion scale (*Icerya purchasi*) worldwide by *Rodolia cardinalis*, an Australian ladybird. For the Christmas Island lac scale insect problem, researchers studied *Tachardina aurantiaca* in its native range in South East Asia. This lac is rare there, but diligent searching in Malaysia revealed a microparasitic encyrtid wasp *Tachardiaephagus somervillei* that was controlling lac numbers. Given past errors, but with ongoing success with other wasps as biocontrol agents, trials were undertaken in Malaysia across potential non-target scale insects. All reliable historical records suggest that *Tachardiaephagus* are specialists on

family Kerriidae (*Kerria* and *Tachardina*, with one record on *Paratachardina*). Scientific and public reviews of the proposal to release this wasp species to target yellow lac scale were well received. During our visit we saw the rearing facility (Fig. 3) containing plants of several native species infested with scale insect populations into which the encyrtids were to be released to deliver large numbers of cultivated encyrtids for release in the wild. Official approval in the form of an Import Permit came shortly thereafter and release into the facility from insects reared in Malaysia commenced in early December 2016. Over Christmas the first generation of

C.I. raised encyrtids appeared. Field releases at 4 sites in January 2017 are being monitored and compared to 4 established control sites imminently. Let's keep our fingers crossed for a successful biological control story - we need more!

We thank Lisa Preston, logistical organiser of Christmas Island Bird'n'Nature Week for hosting the large crew of researchers and nature tourists, Luke O'Loughlin for taking the two of us to see the facilities for microparasite rearing, and Judy West for some background information.

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Entomological collections at Weston Park Museum, Sheffield

The Weston Park Museum in Sheffield holds the city's natural history displays and cares for the natural science collections. The museum is set within beautiful parklands which were once the grounds of Weston House where the original museum stood, forming in 1875 out of the Sheffield Literary & Philosophical Society. A new museum building was built in the 1930s to replace Weston House and this is where the Sheffield City Museum resided alongside the Mappin Art Gallery. Similarly to Bristol Museum, the Sheffield Museum was hit during the Sheffield Blitz of December 1940 and most of the Mappin Art Gallery was destroyed. Extensive renovations didn't begin until 2003 when a £17 million project created the newly formed Weston Park Museum. Further

renovations in 2016 brought the museum up to its current standard.

The museum has a long history of utilizing its collections for environmental monitoring. The museum today holds the Weston Park Weather Station which is one of the longest running in the country; it was founded 130 years ago by the then curator of the museum Elijah Howarth (1853-1938) who collected data from the station for 54 years. The Biological Records Centre in Sheffield is also one of the oldest in the country and was set up by a previous curator of the museum, David Spalding, some 50 years ago. The current natural sciences curator Alistair McLean is a trustee and vice president of the very active Sorby Natural History Society and the county recorder for Odonata, and the museum

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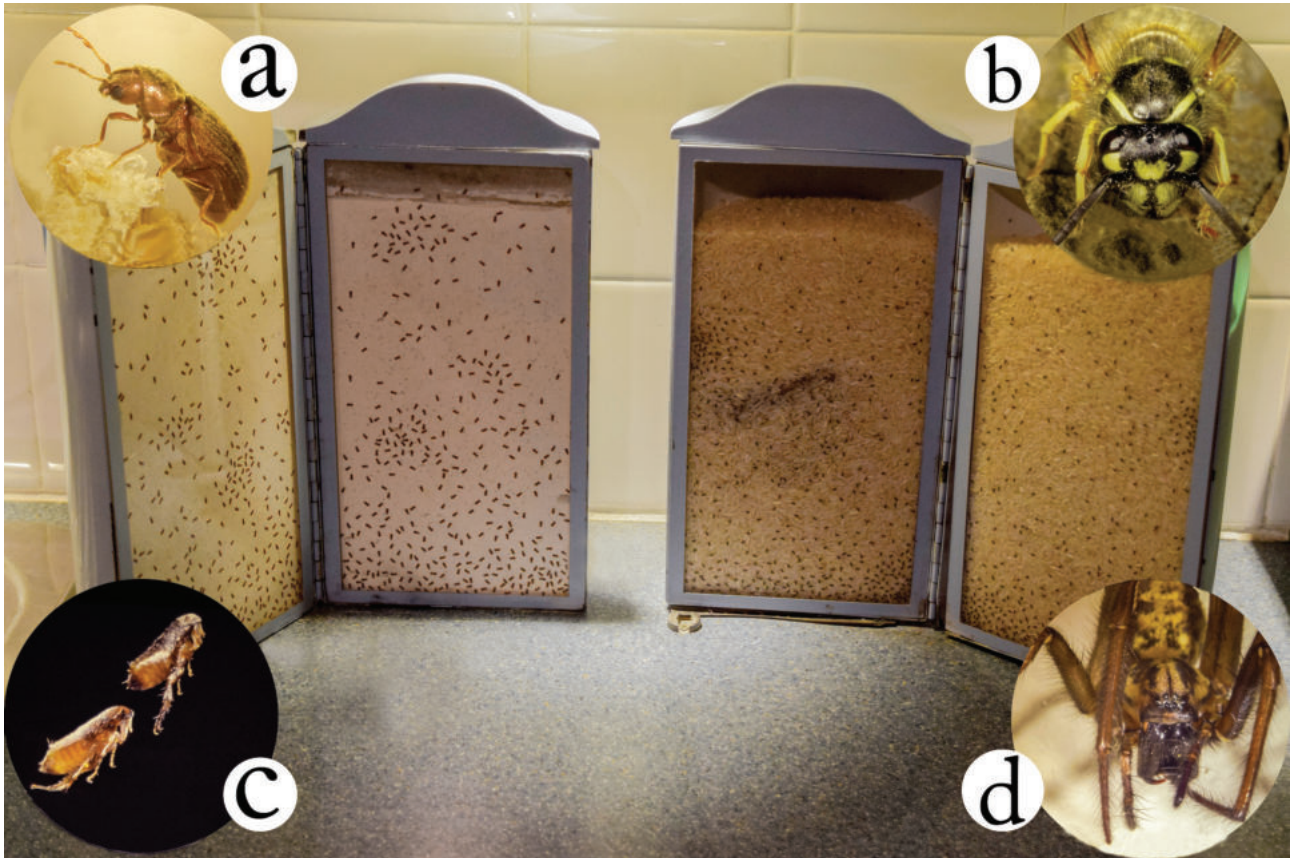


Figure 1. What on Earth! display showing the creatures you can find in your kitchen.

maintains close ties with the society. Gina Allnatt is the natural science curatorial assistant and hosted my visit to the museum. The museum is very active with collection and recording of the local flora and fauna and regularly hosts BioBlitzes. The next BioBlitz will also be a kind of natural history festival organised by the museum. Keep an eye on the museum's website for more information.

Insects on display

What on Earth! is the name of the natural sciences gallery at the Weston Park Museum. There are plenty of insects on display here in different settings. There are a few different habitat displays including moorlands, woodlands and swamps. The first display is about the moors and coniferous woodlands of Sheffield with information about how changing climate affects local wildlife, such as in the case of the Migrant hawker dragonfly (*Aeshna mixta*) finding more footing in the area and outcompeting local species, and the gatekeeper butterfly (*Pyronia tithonus*) which is also better able to breed in the area due to warmer winters. There are drawers of insects that visitors are freely able to

pull out and look at; Gina tells me this is a great way to get people interested in insect collections, because the majority of people don't realise that most of a museum's collections are behind the scenes and visitors really appreciate having this glimpse behind the curtain. The swamp display illustrates the Sheffield area 310 million years ago and has examples of the kinds of giant insects one might have seen roaming the lands at this time.

The next section is designed to make visitors aware of the animals they share their homes with every day and perhaps don't realise (Fig. 1). It is a mock-up of a kitchen with plagues of beasts taking over every corner. There are rice weevils (*Sitophilus oryzae*) and flour beetles (*Tribolium castaneum*) in storage jars; cockroaches (*Blatta orientalis*) on the tea towels; blow fly maggots (*Calliphora vicina*) on leftover meat; furniture beetles (*Anobium punctatum*) in the cupboards and devil's coach-horse beetles (*Ocyopus olens*), silverfish (*Lepisma saccharina*) and house spiders (*Tegenaria duellica*) in the sink. There are also examples of insects that may visit your house seeking shelter, such as the white-

shouldered house moth (*Endrosis sarcitrella*).

In addition to these displays the exhibit contains smaller sections providing information on invertebrates in leaf litter and the microcosms beneath our feet. There is also an interesting project ongoing to record the activities of a honey bee hive in the park that surrounds the museum and a live feed is set up so that visitors can watch the bees at work. Outside of the natural sciences gallery there is a really interesting project that engages local schools in making giant replica insect models from household items (Fig. 2).

Behind the scenes

T.D. Fearnough collection

Fearnough was a collector and natural history specialist alive in the mid-20th century and was a prolific recorder of Lepidoptera in the local area. Whilst working he lived in Sheffield and collected local species leading to collections at the Sheffield Museum and contributions to our knowledge of British Lepidoptera through many publications with the *Entomologist's Record*, such as 'Butterflies of the Sheffield District' (Fearnough, 1938). Upon retiring he



Figure 2. Models of insects made from household items by local schools.

moved to the Isle of Wight and continued his collecting there, producing further papers such as 'Butterflies of the Isle of Wight' (Fearnough, 1972). The museum received his collections in 1983 following his death, which consisted of his meticulous collection of butterflies and an unusual collection of wings from the family Geometridae.

There are many ways to develop a natural history collection. One could collect as many specimens as possible and present them in the most time efficient manner without much care for attention or preservation; there are many examples of these collections around the country, and although the quantity is impressive the presentation

is often messy and data lacking. Alternatively, one could spend more time on presentation and preservation resulting in a smaller but arguably more useful collection for future researchers. The Fearnough collection is an impressive example of the latter and, although relatively small compared to some other Victorian collections, it is meticulously presented, preserved and recorded. Each of the butterfly specimens is positioned perfectly with columns of dorsal and ventral aspects for each species and each specimen is in exquisite condition (Fig. 3). There are examples of aberrations and varieties which he published on.

Accompanying the collection are two volumes of meticulously hand-

drawn and painted books presenting global species of the swallowtail genus *Papilio* (Fig. 4). The Geometridae collection is unusual in that it is presented more in the style of a stamp collection, with wings removed from the body and placed under glass within a collection book (Fig. 5). The collection is impressive, containing 2,650 specimens along with notes.

The majority of butterfly specimens are from the local areas of South Yorkshire and Derbyshire, but do extend to as far afield as Norfolk, Dorset and Perthshire. There are skippers (Hesperiidae), such as the Grizzled (*Pyrgus malvae*), Large (*Ochlodes sylvanus*), Small (*Thymelicus sylvestris*), Essex (*T. lineola*), Lulworth (*T. action*),



Figure 3. An example of a drawer from fritillaries from Fearnough's butterfly collection.



Figure 4. An example of a hand painted swallowtail (*Papilio*) from the Fearnough collection.

Silver Spotted (*Hesperia comma*) and Chequered (*Carterocephalus palaemon*), collected from Derby, Brading Down, Reigate, Canvey Island, Baliard Down Dorset, Sketting Thorpe and Folkestone.

Hairstreaks (Lycaenidae) are also plentiful in this collection, including the Green Hairstreak (*Callophrys rubi*) from Derby and Loxley; the Black Hairstreak (*Satyrium pruni*) from Sailey Forest and Branston, Staffordshire; the Brown Hairstreak (*Thecla betulae*) from Okehampton, Devon and Bornwell Wold and the Purple Hairstreak (*Neozephyrus quercus*) from Silverstone and Norfolk. There are also Duke of Burgundys (Riodinidae: *Hamearis Lucina*) from Castor Hanglands and

Arnside; Holly Blues (Lycaenidae: *Celastrina argiolus*) from Holmesfield Wood, Derby; and Swallowtails from Norfolk. Representatives of the family Pieridae include the Large White (*Pieris brassicae*) and Small White (*Pieris rapae*) from the Sheffield/Rotherham area; additionally there are Green-veined Whites (*Pieris napi*) from Yorkshire and Derby; 'Northern' Green-veined Whites from Perth; Bath Whites (*Pontia daplidice*) from Eastbourne and Pale-clouded Yellows (*Colias hyale*) from Devon.

Lepidoptera from A. Smith and A. Whittaker

The Smith and Whittaker collections are much larger in scale with a wider

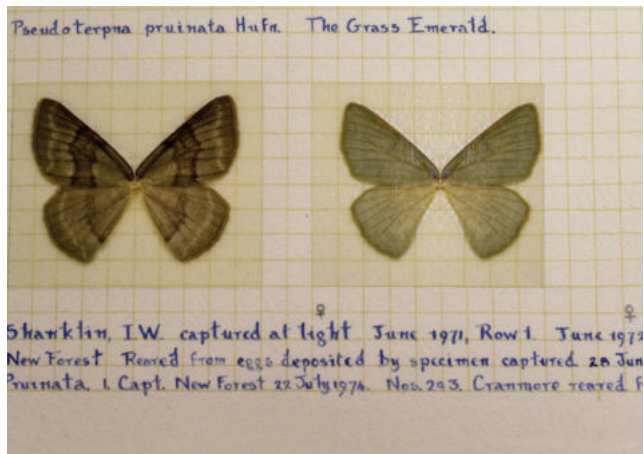


Figure 5. An example of a moth (Geometridae) from the Fearnough collection.

diversity of species, but they are not presented or preserved in such a meticulous way as the Fearnough collection. The Smith collection consists of several cabinets of British Lepidoptera from a wide range of areas including the local Yorkshire, Derbyshire and Staffordshire and further afield into Oxfordshire, Wiltshire, Nottinghamshire, Northamptonshire, Somerset, Surrey, Worcestershire, Ayr, Banff, Bute and Argyll amongst others. There are several boxes of global taxa which are still in their paper travelling pouches awaiting curation. The pouches are stored in some delightful Victorian-aged biscuit tins, which I'm sure would make an interesting social history display of their own (Fig. 6). The museum is planning



Figure 6. Several examples of butterflies from the Smith collection.



Figure 7. Examples of the 'panorpid' orders in the collections. Inset from top left to bottom right are Raphidiidae, Panorpidae and Osmylidae.

to better organise the specimens in these boxes for potential researchers. The notebooks that accompany the collection contain identifications, but the plan is to go through and identify the contents to current standards so that potential researchers know which species are present. The Arthur Whittaker collection of 1946 is another well-presented collection with a range of British taxa from superfamilies Papiliones, Sphingae, Bombyces, Agrotides, Geometides, Psycheae and Micropteryges, all recorded in a printed note book. The drawers have well preserved adults alongside blown caterpillars and pupae.

General collection

The general collection is impressive in terms of size and diversity, containing the majority of the museum's 140,000 insect specimens. In addition there are 6,000 vertebrate, 10,000 plant and

20,000 fossil specimens. The majority of this collection is accessioned and is in the process of being added to digital collections databases on the museum website. Information about specific collections can be found on the FENSCORE database, although some of this information may be out of date. Continuing development of the collections is prevalent in the curators' minds, and as well as continuing to collect specimens from the local area they actively encourage private collectors to eventually donate their collections to the museum. Alongside the importance of collections for scientific inquiry, Gina is keen to increase the awareness of the social history of collections, and their interpretation as a point of civic pride in which local residents can feel more involved.

The taxa in the collection includes the usual high numbers of Coleoptera

(beetles), Lepidoptera (butterflies and moths), including a large amount of Nymphalidae, and Diptera (true flies), with smaller but not insignificant collections of Hemiptera (true bugs), Trichoptera (caddisflies), Mecoptera (scorpionflies), Neuroptera (lacewings), Plecoptera (stoneflies), Megaloptera (alderflies), Raphidioptera (snakeflies), Orthoptera (crickets, grasshoppers and allies), Phasmatodea (stick and leaf insects), Odonata (dragonflies and damselflies), Blattodea (cockroaches), Mantodea (mantids) and Hymenoptera (bees, wasps, ants and sawflies). Most of the specimens are British with many from the local area.

The 'panorpid' orders are all British and are mostly from Sheffield or the wider South Yorkshire area, but there are also scorpionflies from Derby and lacewings from the rest of Yorkshire. These have not been worked on recently and are in need of identification and organising which Gina tells me is forthcoming. There are examples of lacewing families Chrysomelidae and Osmylidae; the scorpionfly family Panorpidae; the alderfly family Sialidae and the snakefly family Raphidiidae (Fig. 7).

There are 6 cabinets of Diptera, most of which were collected in South Yorkshire by Austin Brackenbury, Derek Whitley, Susan Ashurst, Tim Bird and J.A. Dickinson. This collection contains lots of Syrphidae, as well as a decent diversity of other families including Tipulidae, Scatophagidae and Anthomyiidae.

The beetle collection (Fig. 8) consists of around 35 wooden pinning boxes and a further 10 unaccessioned boxes with a wide range of families represented. Particularly abundant are weevils (Curculionidae), rove beetles (Staphylinidae) and ground beetles (Carabidae) with further representatives of ladybirds (Coccinellidae), water beetles (e.g. Dytiscidae and Histeridae), jewel beetles (Buprestidae), longhorns (Cerambycidae) and a large range of other less abundant families.

The bug collection is also largely British, except for a couple of examples of large tropicals in display boxes and with little accompanying data. Alongside local collections there are also examples of non-local British taxa, such as those found in the Horwood collection. The British material includes *Lygocoris*, *Cyllocoris*, *Harpocera*, *Manalocoris*, *Dryophilocoris*, *Psallus*,



Figure 8. Examples from the beetle collection.



Figure 9. A dobsonfly (Megaloptera), cockroach (Blattodea) and grasshopper (Orthoptera) from various parts of the world.



Figure 10. Quaternary subfossil insect segments.

Philaneus, *Aphrophora*, *Neophilaenus*, *Evacanthus*, *Idiocerus* and *Occopis*.

Examples of other tropical taxa include beetles and butterflies from unknown localities, stick-insects from Java, Venezuela, Malaysia, Australia and New Guinea; mantids from Pretoria and some general drawers of tropical crickets, grasshoppers (some in locust state), mantids, cockroaches and dobsonflies which were either reared in the laboratories at Sheffield University or are from unspecified localities (Fig. 9).

Palaeoentomology

The fossil insect collections at Sheffield are not extensive but are relatively taxonomically and stratigraphically diverse. Unfortunately there are no true fossils from the local area, but there are some segments of subfossils from local peat formations at Thorne Waste, Yorkshire and from Messingham in Lincolnshire of Quaternary age (Fig. 10).

There are several specimens of insects in Baltic amber from Kaliningrad, Russia (labelled as Samland, Königsberg, Prussia) (Fig. 11). They consist of several dipterans, ants, lacewings, a possible moth, a cricket and a cockroach, but they have yet to be formally identified. Much of the amber from this region is considered as Eocene in age according to Legalov (2016) who described several species of beetle from similar amber deposits. There are also three rock compression fossils (Fig. 12), one being an isolated beetle elytra from the Middle Jurassic of Queensland, Australia, identified as *Simmondsia subpiriformis*, which is a beetle in the family Taldycupedidae (Dunstan, 1923). There are two specimens from the United States, one identified as Tipulidae (Diptera) from the Oligocene, but without specific locality information, and one from the Eocene of Colorado identified as *Cuterebra ascarides* in the dipteran family Oestridae (Scudder, 1877).

Other hidden treasures found tucked away in the stacks include a selection of 18th and 19th century monographs on British insects including "A Natural History of English Insects" by Eleazar Albin, written in 1710 and including beautifully hand-painted plates. Also, in addition to the insect collections, there are small collections of other invertebrates including a few Myriapods and a small collection of scorpions (Fig. 13), and finally an unusual collection of wasps nests (Fig. 14).

The Weston Park Museum in Sheffield has an impressive collection of insects and a long history of working closely with recorders and researchers to utilize the collections for the benefit of environmental and systematic research. The collections are actively added to by museum staff and by local collectors and so will continue to be a most useful resource for studying invertebrates of the Sheffield and South Yorkshire area.

I'd like to acknowledge Gina Allnatt for sending me the image used in

Figure 4 of T.D. Fearnough's hand-painted note-book, and Scott Gouldsbrough of WeirdBadger Photography & Graphic Design for designing the figures in this article. Contact details are at the bottom of this article if you'd like to know more about their services. And as always if you are a curator or collections manager for an insect collection in the UK and you would like the collection to be featured in a future issue then please do get in touch.

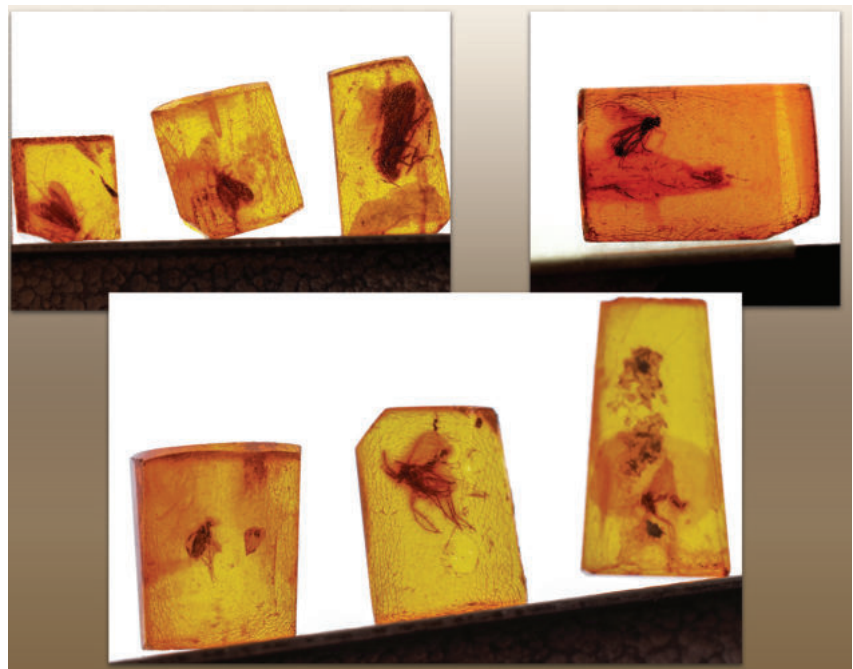


Figure 11. Insects from Baltic amber from Kaliningrad, Russia.



Figure 12. Rock compression fossils from the Eocene of the United States.



Figure 13. Examples of other invertebrates in the collections including a millipede, centipede and scorpion.



Figure 14. A wasps nest, part of a collection of similar specimens.

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Society News

The Patron's Lunch: An entomologist's eye view of Her Majesty's 90th Birthday Party in The Mall, London

Hugh D. Loxdale, Hon. FRES, MBE

Her Majesty Queen Elizabeth II is Patron of the Royal Entomological Society (RES), and as a gracious gesture, she invited guests from many of the organisations and charities that she supports, including from the RES, to her 90th birthday party held in The Mall in London, north-east of Buckingham Palace, on Sunday 12th June last year. As stated on the official Patron's Lunch website (<http://www.thepatrons-lunch.com/about-2>)

"On Sunday June 12th 2016, The Mall in St James's Park was transformed for its largest ever street party to celebrate The Queen's patronage of over 600 charities and organisations on the occasion of her 90th birthday.

The Patron's Lunch was the climax to a fantastic weekend of celebrations. It began with a Service of Thanksgiving at St Paul's Cathedral on Friday 10th June followed by Trooping the Colour on Saturday 11th June and culminated with The Patron's Lunch as the celebratory finale on the Sunday.

The Patron's Lunch was an iconic event recognising the un-relenting support and service our Monarch has given to the community over her 63 year reign. The commitment to helping others was the cause for the National and Commonwealth wide celebration, inviting the very people and organisations she has helped over the decades."

Later on the same website, it gives more details of the actual occasion itself: *"On Sunday 12th June 2016 The Mall was home to a truly magnificent event, The Patron's Lunch; a classic British 'street party' lunch for 10,000 guests, the first of its kind ever to be held on The Mall. The vast majority of tickets were made available to the 'Patron's Organisations', the event provided a very special opportunity for all who have been touched by Her Majesty The Queen to publicly thank her and to be proud of the work and service that their own charity*

or organisation has provided to this nation or those nations across the Commonwealth.

Her Majesty The Queen was joined by the Duke of Edinburgh and other members of the Royal Family to celebrate the occasion. Their Royal Highnesses, The Duke of Cambridge and Prince Harry were Joint-Presidents of The Patron's Lunch; honouring the dedication shown by Her Majesty to so many charities and organisations.

Much to the thrill of the guests, The Duke & Duchess of Cambridge & Prince Harry along with other members of The Royal Family took part in a Royal walkabout greeting and talking with guests along The Mall, after this Her Majesty The Queen and The Duke of Edinburgh followed down The Mall in their State Review Range Rover waving at the guests as they passed.

The day itself delivered an electric festival-themed atmosphere enjoyed not only by the guests on The Mall, but also by the general public who braved the weather to join the festivities at large screens situated in the Royal Parks, Green Park and St James's Park."

The RES Registrar, Mr. Bill Blakemore, had duly been sent a collection of e-tickets and generously distributed them, via Kirsty Whiteford, RES Senior Administrator, to persons associated with the Society, whom he deemed had made a material contribution to the running of the Society and, as in our case, their spouse, and in some other cases, their children too, as with Kirsty who was accompanied by her two daughters. In this light, my wife Nicola and I felt very privileged to be amongst those invited to attend this truly once-in-a-lifetime event, indeed a great honour for both of us. Besides ourselves and Kirsty and her clan, other RES invitees we met on the day included the Director of Outreach at RES, Dr Luke Tilley and

his wife Jennifer; Dr Jennifer (Jen) Banfield-Zanin, pest management ecologist/ physiologist and Project Manager in the Entomology Department of Stockbridge Technology Centre as well as RES Vice President, Membership Committee Member and Editorial Assistant of *Antenna*; Dr Jenni Stockan, senior entomologist-ecologist at The James Hutton Institute, Aberdeen, Scotland, recipient of the 2012 Award for early research career entomologist and currently Honorary Regional Secretary of the RES for Scotland; Dr Alvin Helden, insect ecologist, Deputy Head of the Faculty of Science & Technology, Department of Animal & Environmental Biology, Anglia Ruskin University, Cambridge, U.K., RES Regional Honorary Secretary for the East, and co-organiser of the very successful RES Annual Meeting held at his university in 2012; and Dr Sarah Beynon, insect ecologist and conservationist, she of Dr Beynon's Bug Farm, St. David's, Pembrokeshire, Wales, U.K., and recipient in 2014 of the RES's Wallace Award for the 'best entomological thesis leading to a PhD written in the English language'... to name but a few of the 'ento celebs' attending the lunch.

On the day of the big event, Nicola and I travelled down by rail from Luton, where we stayed overnight, on the Thameslink Line to be there by the stipulated time for admission of around 10.00am. The day was reasonably warm and dry then, although rain had been forecast for later in the morning. I thought I was being sensible by suggesting to Nicola that on arrival at St. Pancras main railway station, we catch a tube on the Piccadilly Line, getting off at Green Park, and then walk through the park to reach The Mall and our destination, Gate 5. All very good in theory, but not in practice, as it turned out. On reaching the park, many people were already streaming towards

The Mall and we joined in the general throng. On arriving at the southern corner of the park near Constitution Hill, we could see that large wooden fences had been erected to prevent entrance via that side to The Mall. How then to get to the gate we needed to go to, which was on the other side of The Mall? Answer: Ask a policeman. On approaching one such officer of the law, we and the others around us were informed in no uncertain terms that for security reasons we could not go across The Mall near the front of Buckingham Palace. Rather, we would have to go around to the other side via the back of the Palace (Grosvenor Place), thence to proceed in an orderly fashion to join Birdcage Walk and enter our entry point, which took us through St. James's Park to find our place number along the many hundreds of tables set out for the lunch (in fact, one of 700 trestle tables laid for the 10,000 guests).

When we got to gate 5, another policeman, decidedly more burly and less friendly than the first, told us that we could not, for some inexplicable reason known only to himself, enter at this exact point after all, but would have to go further along Birdcage Walk to enter the park. Already it had started to rain ... and rain ... and dressed as we were in our best bib and tucker, we were fearful that soon we would be drenched. Nicola said to the policeman in a determined voice: "There's no way we are we going further in all this rain. We are going to enter here and that's that"... whereupon to my astonishment, we simply bypassed him and went in, first showing our e-tickets to the ushers dressed in their striking turquoise cagoules and black trousers guarding the entrance to the park itself. We queued in a long line with other folks also dressed in their finery waiting to pass through the security tent with its scanners. Meanwhile, other similarly dressed staff handed out plastic ponchos which we immediately donned as the rain ran down us in veritable streams. I noticed that even the pigeons were sheltering under the trees in the park to get out of the torrential rain (!), whilst it was sad to see the elegant ladies in their high heels and gentlemen in their best shiny shoes sinking slowly into the gravel and mud of the path as we waited patiently to enter. Eventually however, we got to the security hut and were met by a group of Welsh constables, male and female, who made the best of things

and tried to cheer us up with witty banter, all spoken in a mellifluous Welsh dialect. Having got through this barrier, we proceeded to the main seating area to find our allotted table. And lo and behold, we immediately started to see familiar RES faces, peering out from under the hoods of their ponchos, smiling despite all as the rain dripped off their noses and finger tips! We sat down and started to examine what was in our individual hampers. And then a miracle happened: the rain clouds began to depart and it started to dry up as the sun finally deigned to show itself. We

happily chatted away with our immediate neighbours, meanwhile munching our Royal fare, and had a very nice time indeed.

The proceedings were incredibly well organised, with mobile wagons where the Marks and Spencer hampers were distributed to the guests, whilst nearby were similarly large mobile toilets, if I can put it like that. The hampers were made of wickerwork, with turquoise leather handles and straps with strong buckles, and were filled with a range of excellent fare, produce from the British Isles – sandwiches of various sorts, a small bottle of wine, fruit juice, a



Dr Sarah Beynon and Luke enjoying their lunch.



A golden eagle swoops past!

dessert (the exact nature of which I can no longer remember, but I assure you it was good!), plus pale blue plastic plates, wine glasses, cutlery and serviettes, all inscribed with the Patron's Lunch label and logo.

Soon afterwards, the various processions began, a truly fantastic parade, led by troupes of dancers in an array of bright colours, followed by a diverse range of bands, everything from Scots bands playing bagpipe, fife and drum to contemporary Jazz bands, a Royal Naval ship, a giant golden eagle and other British wildlife, a large golden symbol for 90, followed in turn by dozens of banner waving people, each representing one of the organisations that the Queen is currently patron of, the rear being brought up by contingents of military personnel from the three forces, army, navy and air force.

The Queen, famously known for her association with rain, was not taking any chances this time and after a suitable while, after the rains had finally abated and the sunshine finally broken through the veil of clouds, the general 'buzz' informed us that Her majesty was approaching. As we collectively moved to the edge of The Mall, we were privileged to see the Royal couple standing in a black, open top saloon, the Duke of Edinburgh beside the Queen as they were driven slowly past, waving to the assembled throng, the Queen dressed in a magnificent cerise outfit. Later, the joint Presidents of the Patron's Lunch, The Royal Princes William and Harry, William, the Duke of Cambridge accompanied by his wife Catherine, also drove past, to the delight of the crowds. Furthermore, Peter Phillips, elder child and only son of Princess Anne, and Chief Organiser of the Patron's Lunch, walked along The Mall and talked to, and shook hands with, many people along the route, a very cheery and friendly presence for sure. At the end of The Mall, on a stage with a large screen to project her image to the assembled guests, the Queen "paid tribute to the attendees and thanked well-wishers, humorously quipping: "How I will feel if people are still singing happy birthday in December remains to be seen." (<https://www.magistrates-association.org.uk/news/patrons-lunch>)

As that website concludes "The magnificent Patron's Lunch celebrations on Sunday 12 June, provided a very special opportunity for all who have been touched by Her Majesty The Queen to publicly thank her and to be proud of the



Her Majesty The Queen and Prince Philip being driven along The Mall.



The Queen delivering her speech to the guests on a platform at the end of The Mall and shown on a big screen for all to see!

work and service that their own charity or organisation has provided to this nation or those nations across the Commonwealth." As I cannot put this any better myself, I cite this verbatim. As for Nicola and I, we had a splendid day, leaving The Mall at around 4.00pm, when, as we noticed, most other people started to drift away for home. For me personally, having been taken when very young with my elder sister Rosalind by our parents to see the film at the local cinema about the Queen's coronation, *A Queen is Crowned*, possibly my earliest memory, it seemed as if my life had in some kind of mysterious way come full circle and that this was confirmation, if any were needed, of my continuing admiration and affection for The Queen over my lifetime to date, and hopefully, for many more years to come. Of course, I cannot speak for H.M. herself and her

husband during her ultra-long reign of 64 years, and their long marriage together, and indeed would of course not presume to do so, but if the enthusiasm of the 10,000 guests was anything to go by, and the fact that after an uncertain start, the Heaven's smiled brightly on this amazing and glorious occasion, then I am sure that she had every reason to feel pleased with how things turned out on this her big birthday.

Acknowledgements

I most sincerely thank the Registrar for his generosity in presenting Nicola and I with the tickets to attend the Patron's Lunch. I also thank the organisers of the Patron's Lunch for the provision of ponchos to keep us all dry during the celebrations...and of course, for the wonderful Royal lunch and pageantry.

Tales from Television

A. K. Murchie (Hon Secretary)

The 2017 Verrall lecture was given by Dr George McGavin of Oxford University Museum as he is known to entomologists, and as the One Show's resident 'bug' expert as he is to millions of viewers. George was introduced to a packed Flett lecture theatre by Dr Gavin Broad of the Natural History Museum, who recounted exchanging specimens with George and also mentioned his personal favourite publication being *The Pop-Up Book of Bugs*.

George's lecture was framed in the context of his own entomological experience. He explained his early interest in Natural History and how at school he had been chided for "rummaging around" and asking "irrelevant questions". One prescient comment was that "even a passing fly would distract him". From his undergraduate days at Edinburgh, he did his PhD at Silwood Park, worked at the Natural History Museum and then achieved his dream job as curator of entomology at the Hope Museum in Oxford. George gave the audience a brief virtual tour of some of the notable specimens in the Museum, including a rather squashed Tsetse fly sent to Westwood by David Livingstone and a specimen of the Bath White (*Pontia daplidice*), the oldest surviving example of a pinned insect, dating from 1702 and collected in, of all places, Cambridge.

George explained that nowadays he is best known for his TV work. This started with *Expedition Borneo* in 2007. He was brought in as the expedition's invertebrate specialist, to make "flies and beetles more interesting". The success of *Expedition Borneo* led on to other similarly-themed BBC documentaries including *Lost Land of the Jaguar*, *Lost Land of the Volcano*, *Lost Land of the Tiger* and *The Dark*. In a recurrent theme, George explained that audiences love big hairy animals and, with no control in the edit, some really interesting insect species get passed over. He has then to make a special effort and showed a famous clip from *Expedition Borneo*, when he almost gets stuck in a massive, hollowed-out fallen tree trunk, absolutely crawling with beasties. He said that he was bitten all over and



Dr George McGavin (right) and the RES president, Prof. Michael Hassell (left), catch up before the 2017 Verrall lecture.



'The hand lens – a weapon of mass education' (photograph courtesy of Sally-Ann Spence @minibeastmayhem)

itching for days afterwards but had no idea what had had a go at him. So, there are risks to filming in jungles. George reported with some envy that his camera-man had been parasitised by a human bot fly and could hear it munching away in his scalp. He felt it would have been great television to let

it grow to fruition but unfortunately the camera-man was not so keen.

George remarked that jungles are green hell, hugely interesting and biodiverse but hot, wet and unpredictable. He showed some footage of filming on the edge of a volcano crater, where he had sited a

moth trap. The whole scene had been set up with the help of a helicopter and had cost about £10,000. Unfortunately in the evening there was torrential downpour, which seemed to all but scupper the whole moth trapping enterprise. However, the sheer diversity in the forest came to his rescue with thousands of moths attracted in despite the awful weather. One arctiid moth when grabbed produced a distasteful foam from its thorax. George explained that you can't just say it tastes awful, you have to demonstrate it. However, the big news item of *Lost Land of the Volcano* was a new species of woolly giant rat. So again, the hairy mammals grab the limelight. For a rat though, it was quite cute.

George then talked about his ongoing work with the BBC's *One Show*, an early evening magazine programme that attracts an audience of 5 million plus. He explained how each segment takes weeks to research and set-up, hours to film and yet is distilled down to 3-4 minutes. He showed a clip with horse flies, with himself as the host (in the entomological sense) and said that, "They [the producers] want to make you bleed, within reason. It makes good TV." Having become a well-established broadcaster has allowed him to do some really unusual programmes. One of which was *After Life: the Strange Science of Decay*, which involved setting up a kitchen in a transparent box at Edinburgh zoo and letting everything rot. Time lapse cameras were dotted all over the place and picked up the process of decay with the flies front of stage. George showed the carcass of a pig hollowed out by blow flies with nothing remaining apart from skin and bones. He told how after filming he had to get a taxi to the airport and having become habituated to the smell of decay, he didn't realise that it had clung to his clothes. The taxi driver offered him a can of Lynx deodorant, which he duly applied, ending up smelling of "dead pig and adolescent".

George talked about *Miniature Britain*, where he travelled around the country introducing viewers to the microscopic world as revealed by the Hirox microscope system, which allowed 3D manipulation of specimens. He used the same microscope on the *Oak Tree: Nature's Greatest Survivor*. This award-winning documentary told the story of a 400 year-old oak tree, combining natural

history and history, with of course dollops of entomology. George showed some remarkable images of an acorn weevil, although the accompanying soundtrack was literally bells and whistles.

George finished his talk with some general comments about communicating science. At Oxford he might have a tutorial with five students, whilst on the *One Show* he can talk to 5 million. He has to moderate his language though: 'haemolymph' becomes 'insect blood', a 'rostrum' becomes a 'snout'. Another television show was titled 'Monkey Planet', whereas strictly-speaking 'Primate Planet' would have been better. He said that people who commission TV shows are funny beasts. On one hand they say they want something innovative and groundbreaking, but on the other hand, they want to play safe. Lastly, he said we all have a role to play in educating the public and showed a slide of a pest controller's van with a honey bee on the side. "The hand lens should be a weapon of mass education," he said, "every child under 10 should have one."

The RES President, Prof. Michael Hassell, concluded proceedings by presenting George with the President's Medal and thanking him for a lecture delivered with humour and panache.



Dr George McGavin in full flow at the 2017 Verrall lecture.

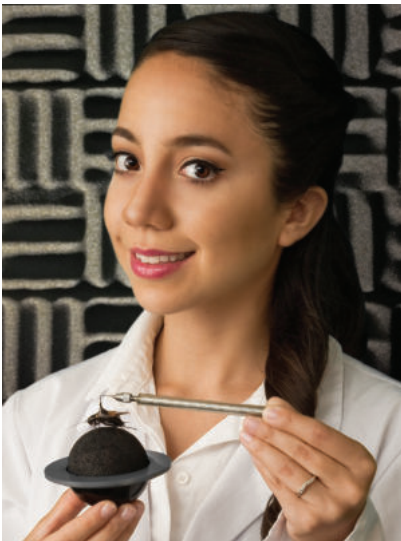


After an informative and entertaining Verrall lecture, Dr George McGavin was presented with the President's Medal by RES President, Prof. Michael Hassell (photograph courtesy of Sally-Ann Spence @minibeastmayhem)



Finding a mate through a song

Edith Julieta Sarmiento-Ponce



Male crickets produce sounds to attract females for mating. Their wings have a specific structure for sound production. A file on one wing is rubbed against a scraper on the other wing, together producing a species-specific loud pattern of sound pulses. Male crickets generate three types of songs. They produce a “calling song” to attract females in the vicinity. Once the female has approached the singing male, he changes to a “courtship song”, which is used to convince the female to mate. The third one is a “rivalry song”, and it is used during fights between males to defend territory from other competing individuals. By contrast, female *G. bimaculatus* are mute, as they

have a different wing structure that prevents them from producing any songs.

The behaviour in which a female cricket is attracted to a singing male is known as “phonotaxis”. Females may be several meters away from singing males and have to walk over grass, sand, soil or stones to reach them, using only their song for orientation. Both males and females have their hearing organs on their front legs, where the tympanic membrane vibrates with the presence of sound. These mechanical vibrations are then transformed into electrical impulses that travel to the brain where the recognition of the song pattern occurs. Female *G. bimaculatus* will

Imagine being a small insect trying to find a mate, which might be several meters away from you. How would you solve this problem? We introduce you to the behavioural strategy that male and female crickets of the species *Gryllus bimaculatus* use to attract or find a mate.

The bispotted cricket, *G. bimaculatus*, carries a pair of distinctive dot-like marks on the base of its wings. This cricket is commonly known as the Mediterranean field cricket. It is widely used as food source for insectivorous animals such as spiders, amphibians, and reptiles kept as pets or in zoos, as these crickets are bred easily, and do not need prolonged cold exposure to complete their life cycle.

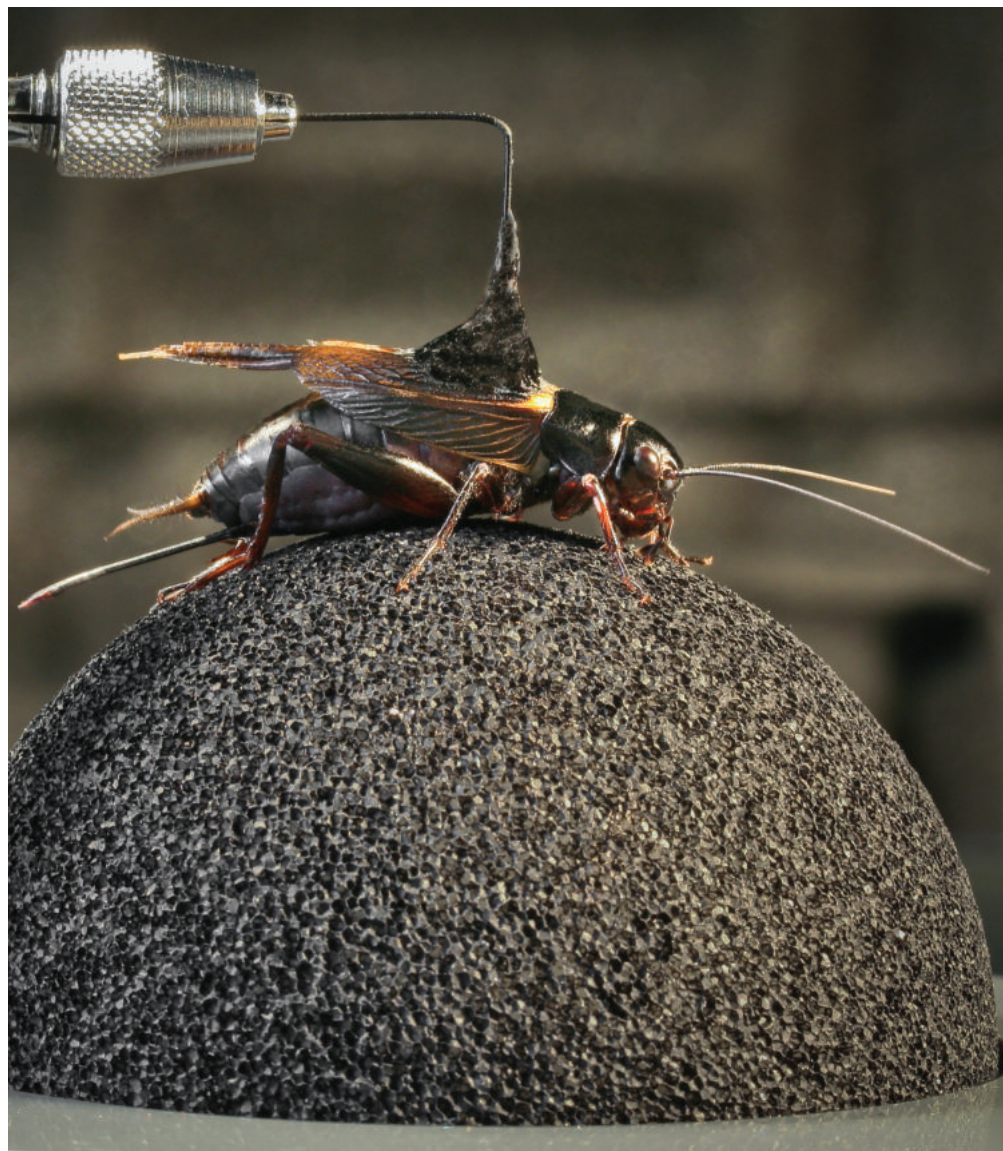
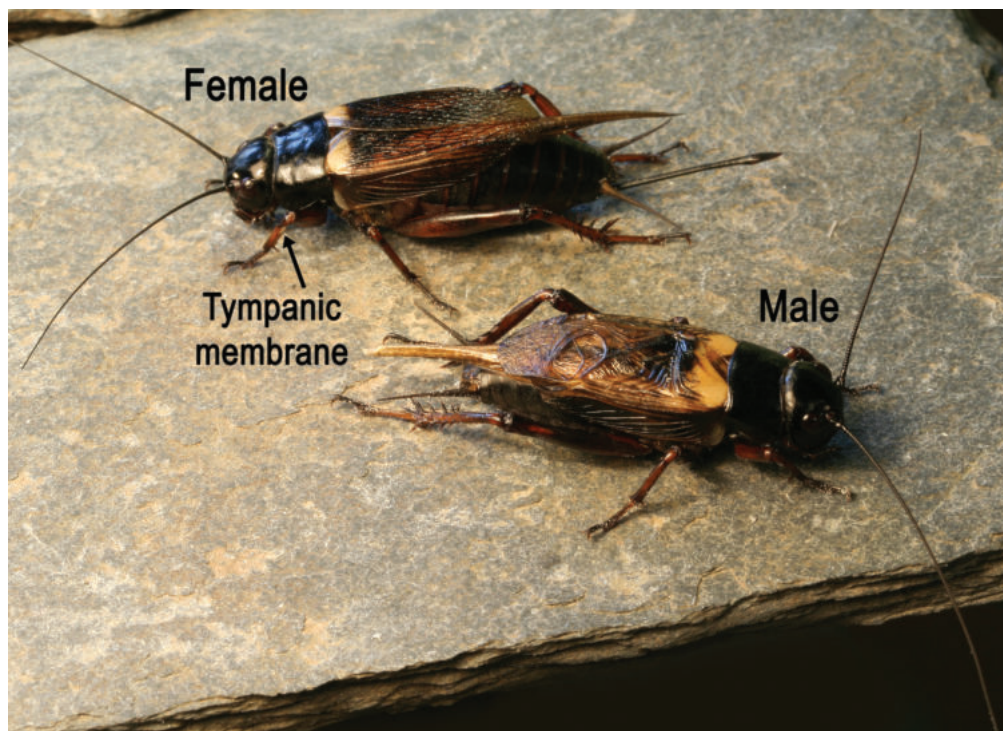


always mate with males of the same species, as they respond only to their own species-specific sound.

At the University of Cambridge's Department of Zoology, we breed *G. bimaculatus* and analyse female phonotactic behaviour. In our experiments we tether a female cricket on top of a floating trackball, allowing a free rotation of the ball when she walks. Male songs are played alternating from a right speaker and a left speaker, typically for a duration of 30 seconds. If the sound is attractive, the female will orient towards the active speaker. If the sound is not attractive she will rotate the trackball randomly, ignoring the unattractive song. The trackball is positioned on top of an optical sensor that monitors its movements, it measures the direction and speed of the trackball when the female is walking. It thus allows a precise measurement of the cricket's phonotactic walking behaviour when it orients towards a sound source. In order to analyse the female acoustic preferences, we test different acoustic parameters such as frequency, sound intensity, and song pattern.

My PhD research focuses on the phonotactic behaviour of female crickets (*G. bimaculatus*). So far, I have studied the effect of age on the attraction to sound in adult females, the effect of the substrate texture on their phonotactic response, how females respond to different sound patterns, and the phonotactic response of *G. bimaculatus* strains from different regions such as Japan and Europe.

I am grateful to my supervisor Dr Berthold Hedwig, the Newnham College Cambridge, the Cambridge Department of Zoology and the Royal Entomological Society for generously supporting my attendance at a scientific meeting in Argentina to present the results of my research. I am also grateful to CONACyT (Mexican financial body), Cambridge Trust, and Newnham College for supporting my PhD studies. I have also received support via an Outreach Fund from the RES to attend a training course on *Animal Acoustics* in Denmark. During this course, participants attended technical and bioacoustic lectures and undertook MATLAB signal analysis exercises and practicals. I am again grateful for the support of the RES which allowed me to attend this meeting and obtain invaluable international experience of great relevance to my PhD on *G. bimaculatus*.



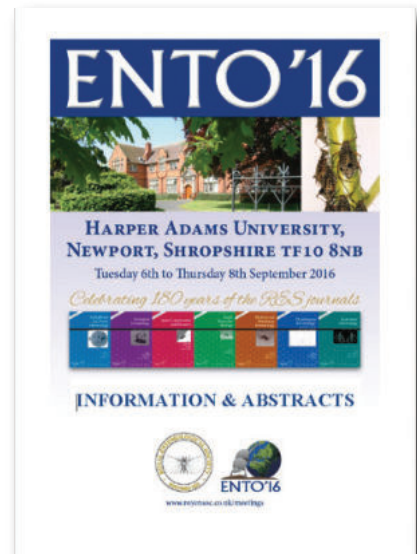
ENTO'16 at Harper Adams

Prof. Simon Leather

A couple of years ago whilst attending a Royal Entomological Society Council meeting, I rashly volunteered to host ENTO'16, the annual meeting of the Society, at Harper Adams University. I had a bit of an ulterior motive; we entomologists had only been based at Harper since 2012 and I thought it would help with publicising our new research centre and postgraduate courses in entomology and integrated pest management. Once this was approved by Council I let my colleagues know that I had 'volunteered' them and also approached entomologists at our two nearest universities, Keele and Staffordshire, and roped in their entomologists to join our organising committee. The conference theme was

the Society journals to celebrate the 180th anniversary of RES publishing.

As a result of a poll of Society members, we decided that the final day of the conference would be all about Outreach. The morning session was devoted to talks for the delegates and the afternoon was open to the public and members of the university. The Open session began with a talk by M.G. (Maya) Leonard, best-selling author of *Beetle Boy* and *Beetle Queen*, followed by exhibits and activities in the exhibition hall. In the spirit of outreach, we also persuaded our three plenary speakers to agree to be videoed and livestreamed to YouTube. Their excellent talks can be seen by following the links below.



1. "How virulence proteins modulate plant processes to promote insect colonisation" Saskia Hogenhout - John Innes Centre, Norwich, UK <https://www.youtube.com/watch?askia> Hogenhout - John Innes Centre, Norwich, UK https://www.youtube.com/watch?v=NqPH_h3xHoQ;
2. "The scent of the fly" Peter Witzgall - Swedish University of Agricultural Sciences, Uppsala, Sweden <https://www.youtube.com/watch?v=d1PUxQGoAzE>;
3. "Citizen Science and invasive species" Helen Roy - Centre for Ecology & Hydrology, Wallingford, UK https://www.youtube.com/watch?v=H_Kyw2WeVC4

To make decision-making simple, we only ran two concurrent sessions, and hopefully this meant that most people did not have to miss any talks that they particularly wanted to hear. The conference proper began on the Tuesday, but about half the delegates arrived the evening before and enjoyed an entomologically-based Pub Quiz. The winning team perhaps had an advantage in that most of their members were slightly older than average.



The winning Pub Quiz team sitting in the centre of the picture.

We felt that the conference went very well, with all the journals well represented, although getting systematic entomologists to speak proved slightly more difficult than we had anticipated. The student speakers were terrific and the talks covered the whole gamut of entomology. The venue, although I may be slightly biased, was agreed by all to be excellent and provided some excellent photo opportunities.

Other highlights were the two wine receptions, the poster session and the conference dinner at which Nobel Prize winner Sir Paul Nurse, who apparently has an inordinate fondness for beetles, received an Honorary Fellowship.

The old cliché goes that a “picture paints a thousand words” and who I am to argue, so I will let them tell the rest of the story with the odd bit of help from me.



Main venue glinting in the morning sun.



Andrew Salisbury (@AndrewSalisbury) · Sep 6
[#Ento16](#) Nice start to first full day & I found barberis sawfly. Have filled out the survey - [this.org.uk/advice/profile](#).

Andy Salisbury enjoying the early morning view at Harper Adams University.



The RES President, a very relaxed Mike Hassell, opens the proceedings.



Sir Paul Nurse on hearing that he is to receive an Honorary Fellowship.



A fine example of synchronised beard pulling.



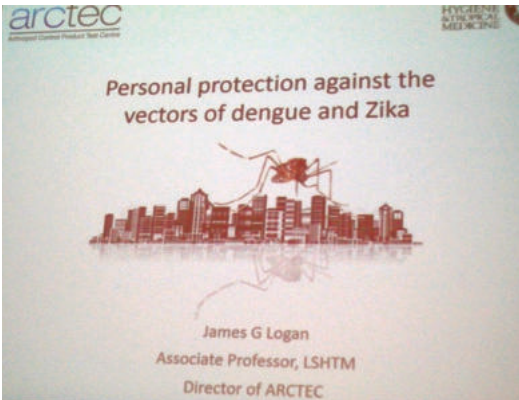
Happy helpers.



International speakers – Sandy Smith from University of Toronto.



Entomologically themed fashion.



Bang-up to date topics.



Ambitious themes.



Making an impact.



Prize winning talks.



Posters.



Punny titles.



Enthusiastic speakers.

I was reminded by Jess that I scolded her for not knowing enough entomology when I conducted her exit viva when I was external examiner at UCL.



Engaging authors.



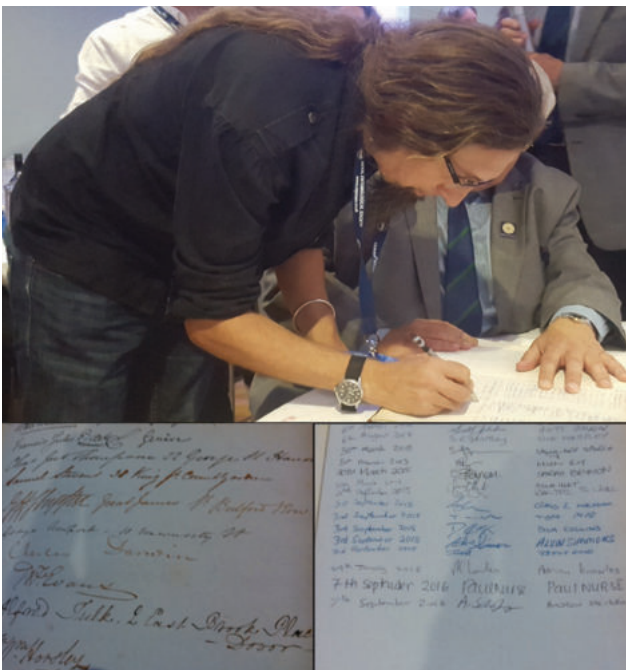
Proud to be Collembolaologists.



Smiling faces (free drinks).



Cavorting ceilidh dancers.



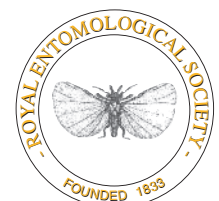
Joining Darwin (and Sir Paul Nurse) in the book!



Fantastic personal end to the conference!

And finally...

*A huge thank you to all the organisers,
helpers, delegates, those behind the scenes and the
Royal Entomological Society*



Ento'17 International Symposium & National Science Meeting



“Entomological Networks: Ecology, Behaviour and Evolution”

Newcastle University

Tuesday 12th to Thursday 14th September 2017

Celebrating 20 years since Ento '97 at Newcastle

Photographs of Ento meetings

This year marks the 20th birthday of the RES Ento meetings and the first meeting, in 1997, was also held in Newcastle. We will be compiling a pictorial record of the last 19 meetings and, if you have any photos, please send copies to Gordon Port together with a note of which meeting they were taken at and, if possible, the identities of any people in the photos.

Mentoring scheme

With the theme of *Entomological Networks* we will be trialling a new feature this year; a mentoring programme for the benefit of junior entomologists. Junior entomologists might include undergraduates, PhD students, postdocs, newly appointed researchers/ lecturers etc. all of whom might benefit from contact with and advice from more senior entomologists. Given the range of experience of junior entomologists the senior entomologists might be PhD students or people at any later stage in their career. It is possible that some people may wish to act as mentors, but also benefit from contact with a mentor of their own.

If you are an ENTee, interested in being linked with a ENTOr, or willing to be a ENTOr, or both please contact the organisers at ento17@royensoc.co.uk

The organisers will endeavour to put suitable ENTOrs and ENTees in contact before the meeting and we will arrange an opportunity for you to meet during the meeting.

RES Public Understanding of Entomology SIG

Wednesday 13th afternoon (1.30 - 5.30pm) will include the first meeting of the RES Public Understanding of Entomology SIG which will focus on how entomologists communicate with the public and how the public connects with entomology in return. The SIG at Ento'17 will provide a forum that is dedicated to the examination of the public perception and understanding of entomology. There will be speakers from the media, education and politics, talking about how to improve the communication of insect science. The afternoon will also be an opportunity to discuss the role of citizen scientists, teachers and journalists, and how key concepts in entomology can be tailored for different audiences to achieve the greatest impact. Those wishing to attend can find further details on RES website and should register in advance.

Ento'17 Meeting Programme

The keynote presentations are listed elsewhere in this issue of *Antenna*. The Keynote Presentations will be complemented by a range of symposium sessions on the following broad themes:

- Social networks
- Cognition
- Parental care
- Sexual selection
- Molecular Ecology
- Predator-prey interactions
- Ecological networks

Registration and accommodation booking details are available on the website www.royensoc.co.uk/meetings.

Ento'17 Convenors: Gordon Port (Gordon.Port@newcastle.ac.uk) , Darren Evans (Darren.Evans@newcastle.ac.uk)
Newcastle University, James Gilbert (James.Gilbert@hull.ac.uk) University of Hull



SCHEDULE OF NEW FELLOWS AND MEMBERS

as at 1st March 2017



New Honorary Fellows

None

New Fellows (1st Announcement)

Dr Binu Antony
Dr Hannah Elizabeth Moore
Dr Jeffrey M. Marcus
Professor Ratnayake Kaluarachchige Sriyani Dias
Dr Rajendramani Gnaneswaran
Mr Martin Williamson

Upgrade to Fellowship (1st Announcement)

Dr Lara Ellen Harrup

New Fellows (2nd Announcement and Election)

Dr Shao-Ji Hu
Professor Andrew Paul Gutierrez

Upgrade to Fellowship (2nd Announcement and Election)

Professor Toby Johann Anselm Bruce
Professor Saskia Adriane Hogenhout

New Members Admitted

Dr Vincenzo Di Ilio
Dr Benjamin Kennedy
Mr Richard White
Dr Christoph hm-Kühnle
Dr Gunjan Srivastava
Dr Rashmi Nautiyal

New Student Members Admitted

Miss Sandrine Chaillout	Ms Emeline Favreau
Miss Vicki Senior	Miss Mandana Ghaempanah
Mrs Sandra Edmunds	Mr Jhaman Kundun
Miss Kirsten Farncombe	Mr Christopher David Edwards
Mr Anthony Abbott	Mr Todd Antony Jenkins
Mr Christopher Ahuchaogu	Mr Daniel Leybourne
Ms Jillian Joiner	Miss Anna-Marie Matczak
Mr Conor Kimball	Ms Charlotte Powell
Mr Roberto Padovani	Mr Joseph Williamson
Miss Emmanuelle Sophie Briolat	

Re-Instatements to Fellowship

None

Re-Instatements to Membership

Dr Aurora Sampson

Re-Instatements to Student Membership

None

Deaths

Dr C F Hinks, 1964, Cornwall
Mr B C Jackson, 1980, Benfleet
Mr C R Vardy, 1969, Harefield

Diary

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

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

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

MEETINGS OF THE ROYAL ENTOMOLOGICAL SOCIETY

2017

Jul 2 **Insect Festival**
Venue: Yorkshire Museum Gardens and Hospitium, York

Sep 12 – 14 **Ento' 17 Annual Science Meeting and International Symposium**
Entomological Networks: Ecology, Behaviour and Evolution
Venue: Newcastle University

Convenors: Gordon Port
Darren Evans
James Gilbert

Symposium speakers:

Lars Chittka (QMUL)
Sheena Cotter (Lincoln)
Mathieu Lihoreau (Toulouse)
David Shuker (St Andrews)
Allen Moore (Georgia)
Yoshifumi Yamawaki (Kyushu)
Ramiro Morales-Hojas (Rothamsted)

Sep 23 **Bristol Insect Festival**
Venue: Bristol City Museum
More information from psmithers@plymouth.ac.uk

Oct 24 **Insect Pollination SIG**
Venue: National Museum of Scotland, Edinburgh
Convenors: Drs Jenni Stockan
(jenni.stockan@hutton.ac.uk);
Michael Garratt
(m.p.garratt@reading.ac.uk)
Confirmed speakers:
Dr Adam Vanbergen
(NERC Centre for Ecology and Hydrology)
Dr Lorna Cole (SRUC).

Nov 1 **Orthoptera SIG**
Venue: Neil Chalmers Room, Natural History Museum, London
Convenor: Bjorn Beckmann orthoptera@ceh.ac.uk

Other Meetings

2017

Jul 9-12 **9th International Conference on Urban Pests**
Venue: Conference Aston/Aston University, Birmingham, UK
Convenor/Chair:
Dr Matthew Davies (Killgerm Chemicals Ltd)
For further information on the ICUP conference please refer to: <http://www.icup2017.org.uk/>

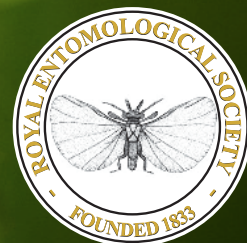
Sep 4-8 **26th International Conference of the World Association for the Advancement of Veterinary Parasitology (WAAVP 2017)**
"Combating Zoonoses: Strength in East - West Partnerships"
Venue: Kuala Lumpur Convention Centre, Kuala Lumpur, Malaysia
For further details please visit: www.waavp2017kl.org

2018

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

RES STUDENT AWARD 2017

Write an entomological article and WIN!



www.royensoc.co.uk

REQUIREMENT

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

WHO CAN ENTER?

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

PRIZES

First Prize: A £400 cheque and your article submitted for inclusion in *Antenna*.

Second Prize: A £300 cheque and your article submitted for inclusion in *Antenna*.

Third Prize: A £200 cheque and your article submitted for inclusion in *Antenna*.

ENTRIES

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

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

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

For further information telephone:
01727 899387

Please include:

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

THE JUDGES

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

CLOSING DATE

The closing date for entries is 31 December 2017. The winner will be announced in the Spring 2018 edition of *Antenna* and on our website.

PLEASE CUT AND RETURN THIS PORTION WITH YOUR ENTRY

Article title: _____

Student name: _____

Address: _____

Telephone: _____

E-mail: _____

Name of academic institution:





author guidelines

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

AIMS AND SCOPE

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

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

READERSHIP

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

INSTRUCTIONS FOR AUTHORS

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

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

PAGE CHARGES

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

REVIEW AND PUBLICATION PROCESS

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

SUBMISSION PROCESS

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

EDITORIAL BOARD

Editors: Peter Smithers (University of Plymouth) and David George (Stockbridge Technology Centre)

Editorial Assistant: Jennifer Banfield-Zanin (Stockbridge Technology Centre)

Consulting Editor: Prof Jim Hardie (RES)

Assistant Editors: Prof Adam Hart (University of Gloucestershire), Prof Hugh Loxdale MBE (Cardiff University), Dr Tom Pope (Harper Adams University) and Ms Alice Mockford (Harper Adams University)



International Symposium & National Science Meeting

Entomological Networks: Ecology, Behaviour and Evolution

Newcastle University, Newcastle
Tuesday 12th to
Thursday 14th September 2017

Common green shieldbug (*Palomena prasina*)
eggs hatching out



Meeting Convenors:

Gordon Port (Newcastle University)
Gordon.port@newcastle.ac.uk

Darren Evans (Newcastle University)
Darren.evans@newcastle.ac.uk

James Gilbert (University of Hull)
james.gilbert@hull.ac.uk

Keynote Speakers:

Lars Chittka – Queen Mary University

Audrey Dussutour – University of Toulouse

Janice Edgerly – Santa Clara University

Jenny Hodgson – University of Liverpool

Mathieu Lihoreau – University of Toulouse

Charlotte Miller & Sheena Cotter – University of Lincoln

Allen Moore – University of Georgia

Ramiro Morales-Hojas – Rothamsted Research

Nicola Nadeau – University of Sheffield

Ana Sendova-Franks – University of West of England

David Shuker – University of St Andrews

Nina Wedell – University of Exeter

Yoshifumi Yamawaki – Kyushu University

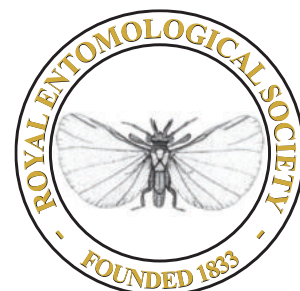


Marsh Fritillaries *Euphydryas aurinia*



Predation

DEADLINE FOR SUBMISSION OF ABSTRACTS: 31 May 2017 –
Please send to: ento17@royensoc.co.uk



For registration and submission details visit:
www.royensoc.co.uk/meetings