Entomology Day 2016

New Frontiers

SUSAN LIMBREY

From left: Susan Henshall, Pete Boardman, Ian Wallace, David Heaver, Wendy Carter, Brett Westwood, Robin Williams Roger Plant

The theme for the day, New Frontiers, was addressed by the speakers in terms of physical frontiers represented by species on the brink of extinction, and methodological frontiers in the recording of insects and in data management.

In **'Living on the Edge', Sarah Henshall** started by talking about Buglife, with its aims of halting extinctions and achieving sustainable populations of invertebrates, it being the only organisation in Europe to bring everything from slugs and jellyfish to bumblebees and crayfish under one umbrella. She explained how it works, often in partnership with other NGOs, on conservation projects, enhancing public awareness, disseminating knowledge, assisting in development of legislation and of policy, and encouraging initiatives by other organisations, in the UK and worldwide. Engagement of the public in surveys involves information sheets on methods, on species ID and on habitat management, examples being surveys of the Scarlet Malachite Beetle *Malachius aeneus*, glow worms, and oil beetles. Campaigns include that on banning neonicotinoids, and on the importation of harmful aliens such as the Obama Flatworm through the pot-plant trade. Conservation projects include working with a land owner and translocating the Wart Biter *Dectitus verrucivorus*, and the B-Lines project which maps and models existing habitats to promote interconnectivity.

Sarah's work with Buglife started on brownfield conservation and their own Canvey Wick Nature Reserve, a brownfield site abandoned 40 years ago after its intended use as an oil refinery was discontinued. Such sites include frontiers of species colonisation and succession, bare and unstable ground, changing wet ground and aquatic habitats.

When it came to edge locations, Sarah talked about soft rock cliffs, SRC, a scarce and threatened resource nationally: less than 10% of our sea cliffs. 29 invertebrate species are found only there, of which 27 are RDB/Red List species, 20 species are strongly associated (12 RDB/Red List), and 59 species associated; of these 108 species, 10 are priority species. SRCs present constantly changing habitats where pioneer species can persist, with a high level of microhabitat variation driving species diversity. Erosion renews and rejuvenates bare ground, which is colonised and re-colonised by herbaceous plants providing pollen and nectar and favouring phytophagous species. Bare soils warm up quickly, so are good for thermophilous species. Ambush predators and visual hunters need bare ground, and pit hunters and burrowing bee and wasp species use the soft dry substrates. Some such species also need to feed on the wet areas provided by hydrological features characteristic of these cliffs: trickles and seepages, and water films where algae are

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Soft rock cliffs, Overstrand, Norfolk Sarah Henshall

grazed. Aquatic invertebrates and those with aquatic life stages breed in these seasonally and episodically variable sites, which can range from bare wet slopes to reed beds at more stable cliff-foot sites. The Cliff Tiger Beetle *Cylindera germanica* makes vertical burrows in clay patches near seepages. The Chine Beetle *Drypta dentata* is extremely local in sandy cliffs near fresh water in Dorset and the Isle of Wight. Britain's rarest bee, the 6-banded Nomad Bee *Nomada sexfasciata* now lives only on the Prawle Point SRC in South Devon, and its host of choice, the Long-horned Bee *Eucera longicornis*, is also threatened.

The quality of SRC habitats is highly dependent on what happens on the cliff top, where a broad margin with flowering plants for food sources and shelter is needed, rather than cultivation or golf courses coming up to the cliff edge. Good cliff tops are valuable to link SRC habitats. Water supply to the cliff can be threatened by land drainage and by upstream extraction. Inappropriate grazing and colonisation by non-native and invasive plants can damage SRCs and cliff tops, and climate change brings threats of increased coastal erosion changing cliff morphology and of hydrological changes.

Exposed riverine habitats, ERS, provide another example of vulnerable edge situations. Sarah worked on a stretch of the River Severn in Montgomeryshire, where a migrating meander provides seasonally exposed gravel banks with mixed and varied sediments and topographic detail. ERS are subject to extreme seasonal variability and are affected by river flow, sediment supply and adjacent land use. These disturbed and early successional habitats are hostile environments for many species. They are permanently open and warm up quickly: temperature on pebble surfaces can reach 60°C while underneath it is only 10°C, and they provide shelter and hiding places between pebbles. 48% of species found there are specialised, with a range of behavioural and physiological strategies enabling them to survive floods, some being able to survive under water, others swimming or floating, or having long legs for rapid escape. Adaptations also include long reproductive periods and quickly maturing larvae, and feeding strategies include scavenging and taking advantage of emerging aquatic invertebrates. An example is the Northern Bear Spider, *Arctosa cinerea,* which lives in silk-lined burrows under stones, and can survive long periods of submergence. Another specialist ERS spider, *Pardosa agricola*, lives at the water's edge, its long hairs allow it to move over the water surface. Of the 441 coleopteran species associated with ERS sites, 131 are specialists and 66% have RDB/Red List status, with 57 notable and 5 priority species. Examples include the 5-spot Ladybird, *Coccinella 5-punctata*, the Northern Silver-stiletto *Spiriverpa lunulata*, 1-2mm subterranean rove beetle, *Thinobius newberyi,* a UK endemic living in fine sediments on upland rivers, and the very rare ground beetle *Bembidion testaceum,* which has a strong associating with cobbles over clean sand, and is adapted to avoid and cope with rising water levels as it can swim.

Threats to ERS sites include river management with weirs and piled banks, and aggregate extraction. Cattle tread down river banks and trample sediments, and invasive species such as Himalayan Balsam affect shading and debris deposition. Climate change affects height, frequency and timing of floods.

David Heaver, in 'Finding patterns in the lists' – the Pantheon Invertebrate Database, introduced us to this joint project of Natural England and the Centre for Ecology and Hydrology. It is directed at using the vast lists of taxa accumulated from surveys, be they detailed studies of particular sites or someone's list from a day's recording, for such purposes as site management, designation of SSSIs or environmental impact assessments. It uses a lexicon of defined terms for field entomology, aims to maximise information from samples, and is intended for use by informed and non-expert users. It will use the same platform as, and provide a portal to, other on-line data sets.

Pantheon's three modules were initially named from the Egyptian pantheon: Isis, Horus and Osiris, but since Entomology Day a workshop of users has decided, to David's chagrin, to dethrone the gods Horus and Osiris, Horus now being 'Habitat Scores', and Osiris 'Habitats and Resources'. Isis, originally the acronym for Invertebrate Species Information System, equivalent to NVC classification, had two levels: broad assemblage types, BATs, of more widespread species, and specific assemblage types, SATs, of ecologically

restricted species. Since there is a cross-over between BATs and habitats, Isis is amalgamated into Habitats and Resources, but SATs are still recognised separately, nested under the habitat corresponding to the parent BAT. The three modules look at a database from different aspects so as to be able to interrogate lists.

Habitats and Resources is designed to investigate trait richness within a biotope, habitat, microhabitat or resource. A thorough literature search has yielded all relevant information, including structural elements that a species is normally associated with, as well as other requirements, and the ecological guild of larvae if that is different. Only resources essential to completion of the life cycle are considered. The result is a set of codes in nested hierarchies: broad biotope, habitat, resources.

Habitat Scores is a small but important component. It describes quality within samples, using a range of published indices and measures, grading habitats on the basis of species fidelity, and is used to inform Habitats and Resources.

As of October 2016, 10717 invertebrate species have been matched to habitats, resources etc. Species chosen are those that can be used to assess nature conservation value. They must have good ecological data available in field guides, keys, monographs, reviews etc., and there must be a specialist who can be consulted. Full faunal representation has been achieved in 24 families; for example, all moths will be coded in. 25000 invertebrate species have not been included because of poor data, their taxonomic difficulty, or there being no specialist available.

Pantheon sees the world in broad biotopes: tree associated, open habitat, wetland, coastal, dung and carrion, plant associated, and synanthropic, non-native etc. Analysis will sort a species list into sub-habitats, or associate particular species with particular resources within it and with other species using that resource. An example might be a permanent mire, with a list of 1190 species which can then be sorted by reference to the habitat structure: pools, seepages, sphagnum lawns, wetland vegetation and so on, the matter of scale also being important. Questions that Pantheon ought to be able to answer might include: 'in my woodland sample, which tree species support the most red heart-rot species?', or 'what flowers are important in my salt marsh sample, and what invertebrates use them?'

Ian Wallace's subject was Finding Caddis (Trichoptera), and he started by saying why we should be recording them, talking about the Biological Records Centre's Caddis Recording Scheme. He took each life stage of the caddis, how to find them and what identification features to look for.

Adult caddis: 'is it a caddis or a moth?'. Caddis wings are hairy, they don't have scales like moths, and their resting stance with wings tented is distinctive, though some micromoths can look a bit like caddis, and *Sisyra* (sponge fly) can look very like. Wing patterns are formed either in the membrane or by the hairs. For identification ('Oh dear, is it all wing veins and genitalia?'), Ian said that the Field Studies Council Guide was good for family characteristics but not for species. There is no comprehensive guide to living adult caddis; on-line sources are improving, and the *Collins Pocket Guide to Freshwater Life of Britain and Northern Europe* is useful. Identification does rely on genitalia, but at least these are external and not covered in scales.

Many caddis species rest in the day time, and deep sweep nets are better than beating trays, since they scuttle off or fly. Caddis produce a powerful smell of phenol, so pootering may not be a good idea. Most fly at dusk, so lights are effective, and Malaise traps too if you don't mind the sorting. Swarms of day-flying species can be netted.

Turning to earlier life stages, Ian explained the three groups: those making portable cases, or 'cased caddis'; those making retreats, or 'caseless caddis'; and a dustbin group of primitive caddis, confusingly having cased and caseless members. Eggs are laid in sheets on stones; in blobs of jelly, sloppy for underwater, firmer for above water; in an egg ball that drops off the tip of the abdomen when dipped in water, when it expands and sinks to the bottom; and some lay in crevices.

Caddis larvae are distinguished from other larvae by having two fleshy pro-legs at the rear end, each ending in a strong hard hook. They can be found by the usual freshwater survey methods, by looking at surfaces of stones and sticks, and by sorting through a lot of debris in water-side and wetland vegetation. The shelter-making species need something solid to attach to, which might include tree roots, and some make a net to catch passing debris for their shelter. Two species that make long winding mud galleries, stuck to stones, are *Tinodes pallidulus*, a Wyre specialist, and *T. rostocki*, also rare, is found in Wyre, the Shropshire side only so far. The two main keys for caddis larvae require a microscope, and dead larvae, but the Field Studies Council simple key can be used with a hand lens and live larvae. Ian then came to pupae. The caseless larvae pupate in a shelter fixed to a solid object, and the cased ones fix their case to a firm substrate and

seal the ends with a grille. There are no keys for pupae, but at maturity the adult genitalia are visible through the thin skin, and exuviae are retained in the case and, with case shape, allow identification.

Ian said that May is likely to be the most productive time for records, since the plant litter feeders grow from autumn to spring, and the alga feeders from spring to summer. He set out criteria for prioritising locations, according to existing data, conservation value, site interpretation etc., and to fill out distribution maps, and showed how data flows between recording schemes and onto maps.

For Worcestershire, for which Ian offers a check list, the Wyre Forest, and the magnificent River Severn, are very special. The county is outstanding for running water species but average to poor for still water.

In Insects in Flight, Robin Williams explained his relatively low technology photographic methods, developed over 20 years, moving from an Olympus OM2 to a Nikon D300 with an old Sigma 180mm f5.6 macro lens, and a Nikon 4T close-up lens for even closer work. He always uses flash, a Metz automatic flash mounted on top of the camera. 'Auto' setting with 1/8000sec. exposure shows wings in motion as a shimmer. This can be very beautiful, as well as allowing identification features to be seen that are normally obscured by the wings when at rest. Only when the wings are at the top or bottom of their beat are they seen in all their detail. Robin's skill and patience enable him to capture an extraordinary amount of detail: every hair in focus; body speckled with pollen; legs reaching forward to grasp a flower; tongue extended; mouth parts spread apart; head-on views with facial features. If it's impossible to catch some insects on 'auto', pre-focussing on a site and hoping to catch one can also be effective. Background is sometimes a flower or nest hole, but an out-of-focus dark or monochrome background often produces a startlingly vivid image.

Robin's favoured sites are his bamboo cane 'flats' and a stack of drilled logs facing south, to attract hymenoptera, and the flowers in his garden on the Somerset Levels. He showed us queen, worker and drone of a number of bumblebee and cuckoo bee species, with the species identifications which can be difficult even with such a clear view of the differentiating features. He photographed solitary bees to show behaviour or morphology typifying their species: a leaf-cutter bee *Megachile versicolor* entering its nest clutching a piece of leaf, *Anthophora plumipes*, showing just why it is called the Hairy-footed Flower Bee (maybe hairy legged would be more accurate) and *Dasypoda hirtipes* with its huge pollen

Gasteruption jaculator, parasitic wasp Robin Williams

combs, loaded with yellow pollen, showing why it's called the Pantaloon Bee.

Moving on to wasps, Robin's technique provided clarity even with the very small entirely black *Crossocerus* digger wasps, while a shot of the bigger and more colourful *Ectemnius lapidarius* twisting as it approaches a nest hole caught an exciting aerobatic manoeuvre. Parasitic wasps were represented by *Gasteruption jaculator,* showing the very long ovipositor and abdomen tilted up to leave the thorax and legs forming a straight line. The tiny, 2.1mm chalcid *Mesopolobus sericeus* was shown poised for flight, and a shot of the ichneumon *Perithous scurra* showed the way insect wings twist in flight.

Hoverflies seem to invite views from above and head-on. Markings on the abdomen which differentiate species, and such distinctive features as the long rostrum of *Rhingia campestris*, or the longitudinal stripes on the thorax of *Helophilus* species are clearly seen.

Robin's pictures of dragonflies included an approaching Southern Hawker with its fore wings in stasis so that detail of the veining was in focus. A Downy Emerald damselfly also flew towards us, displaying its brilliant metallic green eyes, the abdomen and fluffy thorax having a pink gloss. Robin concluded with a beautiful image of a Hummingbird Hawkmoth, its enormously long tongue extended towards a flower and the blur of its wings displaying the orange colour of the hind wings.

Southern Hawker dragonfly, male Robin Williams

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Pete Boardman talked about the Shropshire Springtail Atlas Project, and under the sub-heading 'learning to see again', wondered why as his eyesight deteriorates he goes looking for smaller and smaller things. With the emphasis on those species that can be identified in the field, he said we need to re-train the eye. Not all springtails spring: globular springtails, with reduced spring structure, are very common, and he chose to concentrate on these here. He introduced the *Field Studies Council's Key to the Collembola (Springtails) of Britain and Ireland.*

With Invertchallenge 365, identifying one species every day, in his sights, Pete started his quest at home, where on turning over a heap of bark that had fallen off a log with drilled holes for hymenoptera to nest in, which was resting against his house wall, he made the first UK record of the bright pink 2mm long *Bilobella braunerae,* which he has published jointly with Dr Peter Shaw. It is often found in the company of the bright blue 3mm long *Neanura muscorum.* Another globular springtail is the brightly patterned *Dicyrtomina saundersi* whose distinguishing marks he pointed out. An aquatic species that lives on the meniscus, *Sminthurides aquatica*, can be found when their white moulted skins float on the surface of a pond, and another aquatic species is the blue *Podura aquaticus.* Of two species of *Orchesella,* the hairy *O. villosa* is identified by its patterning, and *O. cincta* by its distinguishing pale belt. A common larger species, the long-horned *Pogonognathellus longicornis*, winds up its long antennae if irked. A species commonly found on clover, *Smithurus viridis*, has green colour patterning which varies according to temperature while in the egg stage. *Deuterosminthurus pallipes* can be bright yellow or dark brown, while *D. bicinctus* has two black bands, and the species of *Entomobrya* are differentiated by markings on the back end.

Bilobella braunerae 2mm long Pete Boardman

Pete talked about his field and laboratory training courses, showing students collecting and examining specimens, and his set-up for photography. He then went on to discuss the atlas project, under the Field Studies Council's Tomorrow's Biodiversity umbrella, with on-line maps and atlases on the web-site (www.tombio.uk) which can be constantly updated and linked to photographs, asking whether we still need a book and doubting whether a book would now be economically viable.

Wendy Carter brought the day to a lively and stimulating end with 'Shutters and Leafcutters: a Passion for Bees and Wasps'. She has been a photographer since childhood, seeing things as subjects for photography rather than as having interest in their own right. Then, when she started working at WWT, Harry Green encouraged her to apply her skills to wildlife. She decided to concentrate on bees and wasps ('always wanted to cuddle a bumblebee'!), and she is a very patient watcher, not a collector.

Wendy started by thinking identification from photographs would be straightforward, but found she needed to capture lots of detail, and to learn a new vocabulary. To give an idea of just how much detail she now captures, on a two week holiday to Dorset this year she took 7,500 photographs – mainly photographs of insects taken from many different angles. More locally, her photographs of the scarce Long-horned Nomad Bee *Nomada hirtipes* (only the second record for Worcestershire) captured the shape of the yellow spots on the abdomen, the second segment of the hind tarsi and hairs on the hind face of the antennae base, all of which distinguish it from its confusion species *Nomada panzeri.*

This 'newly found naturalist' soon became fascinated by behaviour of the insects she was watching. Why were these *Lasioglossum malachurum* bees tamping down the clay at the entrance to the nests made of soil piled up among vegetation? Why were there so many faces at the nests - were they guard bees? In trying to snap a photo of leaf-cutter bees carrying bits of leaf into her 'bee hotel', she was fascinated by the different types of leaf they were collecting. Why was there a cluster of *Anthophora plumipes* all crammed into one nest hole?

There were some unexpected findings. In the Outer Hebrides, ostensibly on a trip to see Great Yellow Bumblebees and Corncrakes, she found a bee that she couldn't key out. Geoff Trevis when consulted was also

Lasioglossum malachurum, Rough Hill — Wendy Carter

mystified, but reference to BWARS revealed it to be a very worn specimen of *Andrena clarkella*, a first for the Western Isles. Another surprise was finding oil beetle triungulin on a digger wasp *Crabro peltarius* in Dorset.

Wendy finished by speculating that technology could vie with collecting in the pursuit of records and identification, and her enthusiasm demonstrated how, starting as an amateur, anyone can get involved.

Brett Westwood, chairman for the day, brought the day to a close by thanking speakers and all those involved who helped to make this another excellent Entomology Day.

Liam Crowley showing Susan Limbrey the *Formica rufa* nest on which he'd just found *Formicoxenus nitidulus* — Rosemary Winnall