



Wyre Forest Study Group

Worcestershire Entomological Day

The Importance of Invertebrates in Ecological Evaluation ~ Saturday 20th October 2007 MIKE BLOXHAM

It was the turn of our past Chairman Mike Bloxham to arrange the speakers for this year's Entomology Day. The day as usual proved most interesting with excellent speakers and a range of informative displays. Mike took notes during the talks and he has summarised these as follows.

The Importance of Invertebrates in Ecological Evaluation, with special reference to the fauna of decaying wood *Keith Alexander*

Keith Alexander began by stating that some basic understanding of invertebrate ecology was essential both for the recorder and also for the recipient of any invertebrate information, if adequate understanding of its importance was to be possible. To this end he set out to show some current difficulties that had to be overcome to improve the situation.

Firstly, ecological evaluation continues traditionally to be dominated by plant ecology and knowledge of this is regarded by conservation professionals as by far the most valuable aspect of most site information. Consideration of plant species and their distribution is a priority to them and the invertebrate ecologist labours within the straight jacket of associated habitat classification. Whilst the value of a list of plants can be seen, the terms 'woodland' and 'grassland' have but a very general resonance in insect study.

Recent years have seen a number of invertebrate ecologists attempt analysis of key invertebrate requirements. Charles Elton (1966) was one such pioneer, noting that insects require combinations of suitable features for success. Structure was discussed together with the significance of open ground, tall grass & herb and the nature of scrub. A good understanding of structure is integral to study of invertebrates.

Workers from related disciplines such as Oliver Rackham (2006) have also evaluated arboreal structure: the extent of woodland canopy, the history of coppicing and its nature have been analysed, and special features of significant habitats such as wood pasture identified where widely spaced trees and grazing animals maintain a particular structure. The significance of non woodland trees in hedges and fields, plantation and garden have also been examined. Tansley (see Rackham 2006) and Vera (2000) explored the evolution of current woodland structure with the former favouring the concept of an original dense forest canopy with mankind creating much of the current structure to meet needs. The latter sees the canopy structure as being more open and diverse and shaped from an earlier time by large herbivore activity, with man naturally taking over in more recent times.

The work of Keith Alexander and others has recently brought into focus the significance of more precise structural considerations as a prerequisite for understanding many essentials governing the ecology of invertebrates. Through a project initiated by English Nature, he and colleagues have examined the thousands of native invertebrate species to develop a new classification of invertebrate habitats in terms of species assemblages characteristic of certain combinations of conditions. Lists of species for a site have little value to nature conservationists unless interpreted in the context of the characteristic habitats which host them. Much of Keith's own work has centred on the fauna of decaying wood and especially ancient and veteran trees, and he has taken the EN-initiated work further. He identifies the four key influences on species composition at a particular site as the density of woody plant canopy, the age structure of woody plants, the size of the population of larger trees, and site history (as indicative of ecological continuity). Tree ecology had become the key consideration rather than woodland ecology.

Associated with the emerging importance of structures and influences came a further advance with the valuable concept of species assemblages. Certain insects readily associated with decaying wood could be designated as forming a saproxylic assemblage (with certain characteristics of lifestyle, mobility etc). English Nature's ISIS (Invertebrate Species-habitat Information System) assemblage classification Webb & Lott (2006) pinpoints a number of starting points for tree associated species including canopy species and wood decay species. The latter is relevant to any student of decaying wood invertebrates and their conservation because it separates out the species list by type of deadwood:

- the heartwood assemblage - very difficult to study as its members emerge infrequently and unpredictably from a habitat which is usually difficult to access.
- the bark and sapwood assemblage is easier but still not straightforward because many members are still concealed in relatively robust structures integral to the life of a tree.
- the assemblage in fungal fruit bodies is easy to survey - bodies can be removed for detailed study when needed, without damaging the fungal mycelium within the tree.

The intention of the ISIS assemblage classification system is to enable site condition monitoring using short term invertebrate survey.

The speaker then turned his attention to the general situation with regard to the use of invertebrates as tools for ecological evaluation. Published records were very



Wyre Forest Study Group

often woefully inadequate for ecological evaluation, largely because they were not accompanied by sufficient data (location of capture on the tree, tree species etc). Reports & notes were not adequate or frequently could not be associated with captures.

Examples were given where information on species ecology gleaned from the published entomological literature were quite inadequate, as the wrong information had been recorded. The key four features noted above were rarely noted by entomologists. It is important that entomologists learn to think ecologically when surveying sites and making records if they are to have an influence on nature conservation management. What does finding an adult insect tell us? Larvae are the best indication of breeding habitat!

Regular attention to a site can provide enough species to analyse the site fauna in terms of an Index of Ecological Continuity (IEC) that measures the quality of old growth habitat (Alexander 2004) and a Saproxyllic Quality Index (SQI) measuring species rarity (Fowles et al. 1999). These can be used to compare the tested site with results from other sites in Britain. Thus a degree of ecological evaluation is possible.

Unfortunately many of the species included in the indexes are uncommon. There are complex reasons for this which may include lack of recording, low mobility, inability to find suitable hosts nearby on dispersal and rarity of right niche.

He concluded with the observation that invertebrate specialists need to pay close attention to a number of things. Structural features are important in every sense as is topology. It is also very necessary to understand ageing and decaying processes in trees (trees lose height naturally with age and can therefore easily be killed by overshadowing when in close proximity of many young taller competing trees). The specialist also needs to study larval habits whenever possible. Our records so often refer to adults! Geographic features are useful - does a certain species have a different host tree in different parts of the country? There is a need to document key features for each record. A list of indicator species coupled with such observations can give considerable assistance in evaluation of habitats with significant amounts of decaying wood and can provide progress in management of these. Detailed photographic records of a site can be very valuable. Unfortunately much remains to be discovered and any inclination to manage on the basis of the discovery of a handful of rarities should be discouraged, as it can end up as an exercise in gardening!

References

- ALEXANDER, K.N.A., 2004. Revision of the Index of Ecological Continuity as used for saproxyllic beetles. English Nature Research Report No. 574. Peterborough: English Nature.
- ELTON, C., 1966. The Pattern of Animal Communities. London: Chapman & Hall.
- FOWLES, A.P., ALEXANDER, K.N.A. & KEY, R.S. 1999. The Saproxyllic Quality Index: evaluating wooded habitats for the conservation of dead-wood Coleoptera. The Coleopterist 8: 121-141.
- RACKHAM, O., 2006. Woodlands. Collins New Naturalist No. 100. 609 pp.
- VERA, F.W.M., 2000. Grazing Ecology and Forest History. Wallingford: CABI. 525 pp.
- WEBB, J.R. & LOTT, D.A., 2006. The development of ISIS: a habitat-based invertebrate assemblage classification system for assessing conservation interest in England. Journal of Insect Conservation 10: 179-188.

Have there been any Entomological Surveys in Worcestershire?

Harry Green

Harry Green has delved deeply into the wildlife archives of the county on numerous occasions whilst checking the details of old specimen collections and the documents of earlier generations of naturalists. This time he was able to introduce us to Charles Hastings, who had the distinction of producing what looked like a promising first in the recording of local wildlife in 'Natural History of Worcestershire' (1834). Unfortunately it provided no detailed information on local insects.

Of much greater significance was the work of John Edward Fletcher. He provided information for the Victoria County History of Worcestershire (1901). He was a remarkable individual, with a talent for observation and his enthusiasm led him to collect a wide range of different insects which he identified to a high standard of accuracy. His collection (dated approximately as from 1850 to 1870) consisted of many boxes of specimens which languished (unloved and probably little seen) in the basement of the Museum in Worcester until the search for records revealed it a few years ago. Unfortunately by this time, invading live invertebrates, moulds and physical damage had ravaged the collection to such an extent that assorted remains amidst bare pins were the norm and labels (frequently with good information on locality and date of collection although the naming by collection cluster was less easy to follow) were at times difficult to read. His collection contains the first specimens of land caddis recorded in the County.

Recent years have seen a considerable amount of recording activity, much of it by professionals and associated with a level of confidentiality often applicable to commercial work. Nonetheless authors such as Paul Whitehead (particularly on Bredon Hill) and



Wyre Forest Study Group

David Grundy (larger moths) have managed to make significant additions to existing information sets. From the foregoing, it is also easy to see that records from the County may not necessarily have found their way onto national databases.

Of the larger studies carried out in the County, The Wyre Orchard Project (carried out by members of the Wyre Forest Study Group) with Rosemary Winnall and Malcolm Smart as compilers in chief, can lay claim to be the most comprehensive short-term investigation so far. It produced a considerable volume of information and additionally managed to supplement the growing amount of data on the Noble Chafer. This beetle has been extensively studied by the speaker and colleagues during recent years and has been found in a number of locations. Its status as a national rarity still looks secure because the great majority of records come from the endangered habitat of old orchards in Worcestershire and Herefordshire. It is somewhat ironic that the authors of the Orchard Survey became increasingly aware of what was not being recorded as the work progressed. This is surely going to remain a consistent failure of invertebrate survey in general, both in this county and elsewhere.

It is probably true to say that entomological survey in the county has been patchy and has produced the most consistent rewards for those who have limited their work to a study of a limited number of insects, butterflies being a favoured subject. The conservation of Brown Hairstreak in Grafton Wood with John and Miriam Tilt as staunch supporters, has been a success story because it has not only been possible to facilitate successful breeding by selective management of the foodplant (blackthorn), but has also enabled involvement of the neighbouring farming community as active participants by reduction of hedge flailing in the vicinity. Other transect studies elsewhere have suggested that decline of grizzled skipper and the wall butterfly has not been reversed.

Detailed study of invertebrates at Pipershill Common by David Green showed this site to be of great importance for saproxylic invertebrates, and work at Croome Park and Hanbury Hall by others have also revealed these sites to be of similar importance.

Worcestershire has been well served by its dragonfly recorder Mike Averill. He has not only produced a most informative book on all the species found locally, but has maintained his level of interest in the Order, whilst giving most useful training to many budding entomologists.

Whilst our speaker felt that this account was not the place for naming more than a selected few entomologists, he

did feel it appropriate to mention his colleague Brett Westwood.

"Together we have mapped the distribution of Land Caddis; he made the first recent discovery of the great hornet robber fly *Asilus crabroniformis* in a field near Kidderminster and he played a large part in the re-discovery of the shining guest ant *Formicoxenus nitidulus* whilst examining wood ant nests in the Wyre Forest."

The importance of routine individual vigilance as an essential complement to more formal survey ran as a thread through the talk. It is appropriate that one of the concluding comments referred to the doyen of recent Worcestershire recorders, the late Fred Fincher, who published a paper on the county's Orthoptera many years ago. In conclusion the speaker suggested that invertebrates would be important in detecting the first effects of climate change with new invaders and change of winter survival patterns as shown by a picture of a solitary humming bird hawkmoth nectaring at a snowdrop!

A Current Recording Initiative the Malvern Hills

Geoff Trevis

Entomology day can provide a speaker with a chance to explain a completely new project - one where little actual work other than preliminary planning has taken place, but from which some original outcomes are expected when the actual field work is finished.

This initiative still remains largely at the planning stage, partly because the 2007 weather prevented any significant inroads from being made in actual recording.

Geoff Trevis outlined some salient features of the Malverns and gave general indications as to how these would need to be incorporated into survey methodology. He started by pointing out that the range is orientated virtually along a North South Line and that this affects the characteristics of the sunshine to which the hills are subjected in a number of interesting ways (bright morning sunshine at Great Malvern contrasting with shade at Colwall at the same time).

Any recording on the hills requires mention to be made of essential features - the survey sample points are likely to be very distinctly different in spite of some apparent similarities:

- Altitude is an obvious variable with North Hill being by some distance the highest.
- Exposure commensurate with altitude will be an interesting variable and some assessment of this will be

most valuable. There are some areas where erosion is a factor and these might produce a locally unique fauna.

- The general weather patterns experienced on the hills are reasonably characteristic and ought to affect not only sampling during the survey but also the preferences/distribution of some invertebrates.
- The geology is a dominant feature with frequently thin soils on pre-cambrian bedrock. The various quarries are unsympathetic to a wide range of invertebrates except on the bare crests and in crevices where exposed light soils have the potential to host aculeates as well as other potentially interesting species.
- Habitats are reasonably predictable, with a hill crowned by acid grassland and bare earth with gravel merging on descent frequently into bracken areas with increasing scrub intrusion, until some form of deciduous woodland (often merging into garden shrubberies) dominates on the lower slopes. There are some substantial coniferous intrusions on the central hills and isolated hawthorn can also merge to give some fringe/ hedge elements. There is some evidence that the variation in habitats and vegetation structure on the Western slopes is greater than on the Eastern ones. In general much of the survey will be taking place on areas characterized by thin soils with fewer flowers.

Information suggests that the invertebrate surveyor will be faced with some problems similar to workers in Scotland or Wales. Earlier invertebrate records exist (for example, over 100 species are recorded from North Hill) and the survey hopes to add to these by survey of food resources and their associated invertebrates with attention to adults and larvae. Nesting sites of aculeate bees and wasps will be targeted and patterns of predation and parasitism are also areas of interest.

An initial survey for hymenoptera had shown that spring, when the hawthorn is in flower, was particularly productive with a wide range of species recorded on Broad Down, including the RDB species *Andrena bucephala*. However, when those blossoms vanished at summer's approach, there was little development of alternative pollen and nectar sources and bee populations also declined markedly. Nonetheless, some sites along paths on the east side of the hills had been identified as being of potential interest with cleptoparasitic species being noted along with ants. These areas have yet to be surveyed more fully and will be a focus during 2008.

Although data presented, because of Geoff's particular interests, was concentrated upon aculeate hymenoptera, future survey work will need to be planned to cover as wide a range of invertebrates as possible. Doubtless there will be much to be learned about Coleoptera and

the larger Lepidoptera will be of considerable interest. It is hoped that additional light will be shed on the ecology of the grayling and other butterflies regularly recorded. A special watch will be kept for fritillary activity, the high brown being a target species for the survey.

Very unusual surveys

Rose Bedeguars & Oak Galls

Robin Williams

Robin Williams has chosen a very special task in targeting plant galls for his investigations. These offer some almost unique opportunities for the student. It is possible (though very difficult) either to study the activities of gall-inducing insects as they go about their normal activities such as ovipositing on various parts of a foodplant, or to study their life histories as they develop within the plant galls they have induced. This is usually a more productive route. Initially it is disarmingly simple. The galls are secured (usually without too much difficulty), larvae of various sorts develop within them and finally adults emerge.

Robin's work has mostly involved study of the emerging Hymenoptera - gall wasps and other closely associated wasp species. He commenced by giving a short visual tour of various oak galls to show forms, location on the tree and choice of oak species where relevant. We saw spangle galls on leaves (*Neuroterus numismalis* & *N. quercusbaccarum* - the common spangle), *Andricus corruptrix* in a terminal bud and *Andricus testaceipes* as pyramidal eruptions at the very base of a young oak trunk. At this stage it was necessary to note that, dependant on the type & location of a gall, it might contain adults of an asexual or sexual generation. Robin showed us *Biorhiza pallida* oak apple galls and mentioned that a sexual generation of the causer is going to emerge.

The figure given (from the FSC leaflet 'A Guide to Plant galls in Britain') briefly explains the situation. The galls of asexual and sexual generations of a single gall wasp species are usually reasonably distinctive (as can be seen in the diagram).

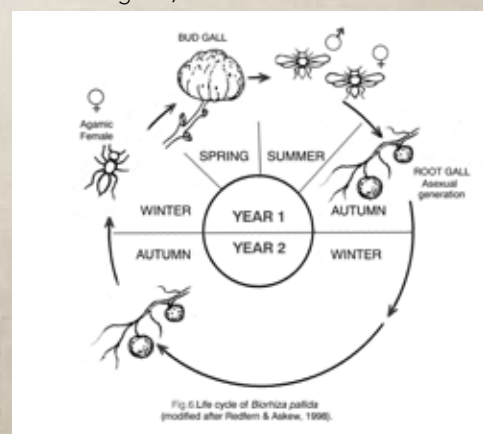


Fig. 6. Life cycle of *Biorhiza pallida* (modified after Padgett & Askew, 1996).



Andricus quercuscalicis male, oak gall causer Robin Williams

Illustrating further using his main subject for the talk - the oak marble gall - he showed galls of the sexual generation in Turkey oak buds and the asexual generation (the familiar oak marble gall) on the English oak.

When study of marble gall inhabitants commences, various insects emerge over a period of time and the role of the insect that has emerged within the gall is of great importance.

- Is it a specimen of the original gall causer that laid the egg on the host plant & initiated the gall? We saw pictures of female *Andricus kollari* which is the gall causer. It has asexual and sexual generations.
- Is it an inquiline? The speaker showed pictures of *Synergus* species (including *S. reinhardi* male and *S. umbraculus*) from oak marble galls. These small wasps lay their eggs in an existing marble gall where they develop in the food store along with the causer. They may well have no effect on the causer development unless they come into direct contact. If this happens the causer larva may die. This will be an accidental event because the inquiline does not appear to target the causer larva. Inquilines are fully sexual so you may find males & females emerging from a marble gall.
- Is it a parasitoid? We were shown *Torymus auratus* as a representative of the brilliantly coloured chalcid wasps that deliberately target the causer larva and use their long ovipositors to drill through the gall until a larva is located. An egg is then deposited, hatches and feeds on the causer larva with fatal results. The parasitoid pupates and then the developed adult tunnels out of the marble gall to mate and restart the cycle. Again, these wasps are fully sexual. The diversity of parasitoid form was further demonstrated with pictures of *Mesopolobus amaenus* and *Eurytoma brunniventris* (with ornate and strongly haired antennae).

We were reminded that certain parasitoids might target not only the gall causer larva but also inquiline larvae.

Some thirty different species have been recorded so far and the precise nature of all the interactions inside the oak marble gall is still incompletely known!

Robin Williams concluded his lecture with a synopsis of Hymenoptera bred from the rose bedeguar (robin's pincushion). A shot of an older gall showed it to be multicellular with the potential to host quite large insect populations. We saw *Diplolepis rosae* (causer) and an ichneumon parasitoid *Orthopelma mediator* (which also targets some other *Diplolepis* species). Others were more intimately linked with the gall (*Torymus bedeguaris*, *Pteromalis bedeguaris* and *Eurytoma rosae*). From the names the reader will see that some of the genera concerned in this study are likely to have intimate connections with a variety of plant galls and have successfully exploited these highly specialized niches.

This work is ongoing and our speaker, together with Dr Dick Askew - one of Britain's leading experts on small parasitic wasps, has been led into a thorough revision of many keys to facilitate progress for future entomologists who might embark with him on this singularly interesting Odyssey. He has published these and also details of the galls from which the wasps emerged. We were delighted to be granted a glimpse into this tiny world.



Chalcid *Torymus auratus* (nitens) female, parasitoid Robin Williams

The place of Insect Photography as an aid to an increased interest and knowledge of previously less well - known groups.

Now everyone can join in! Kevin McGee

Those who regularly attend meetings of the Study Group will be well aware of the speaker's remarkable artistic and photographic talents. He has (in a similar way to the previous speaker) developed the art of insect photography over a considerable period and has attained a standard of end product which often enables a specialist to determine the identity of the creature portrayed. Kevin mentioned the great opportunities that a combination of advanced digital technology in cameras

and electronic communication via the web were now offering. We had seen a steady increase of high quality images readily available to all and a growing number of images sometimes covering whole insect groups could now be accessed. He was keen to emphasise the importance of a lucky encounter with a really interesting species as a catalyst to study of a particular group of insects. All these factors, combined with the production of a number of landmark publications on invertebrates in recent times (e.g Stubbs & Falk on Hoverflies) have given photographers additional confidence when interpreting and publishing material.

He then showed remarkable pictures of a very wide range of extremely scarce insects. In a number of cases these had been most useful to Worcestershire invertebrate experts such as John Meiklejohn, Tony Simpson and Paul Whitehead, enabling them both to assess specific habitats and add new species to the County invertebrate records on occasions.

During the talk he spoke about techniques and the necessity to become thoroughly familiar with camera and set-up. Whilst there was no need for excessively expensive equipment, it was essential to practice hard in a variety of field conditions. You would then be confident and a confident photographer is always likely to put

that extra bit of concentration to produce the critically important image. It is important to avoid digital tricks with images if possible. Modern image processing offers a tempting bait to those who enjoy tinkering and forget that an image faithful to the appearance of the insect in the field is essential. The photographer might also have to carry other equipment to capture certain insects so a recorder could see it alive, or to retain a specimen (remembering the country code, permission from site managers and legislation referring to protection of rare species). Above all, get a picture! Kevin mentioned the speed with which an interesting specimen can vanish, leaving the photographer with a vacant leaf!!

Concluding Comments

Rosemary Winnall

Rosemary Winnall finished the day with an update on Grow with Wyre, the Wyre Forest Landscapes Partnership Scheme.

She concluded by thanking all the speakers for their fascinating talks, especially Dr. Keith Alexander and Robin Williams for travelling so far to speak to us. She thanked the participants for attending, Mike Bloxham for organising the event, the committee for helping during the day, and Professor Susan Limbrey for chairing with style!

Speakers from left, Geoff Trevis, Keith Alexander, Robin Williams, Harry Green, Kevin McGee

Rosemary Winnall

