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**Invertebrates in the landscape:
invertebrate recording in site evaluation
and countryside monitoring**

Proceedings of the National Federation for Biological Recording
Annual Conference held at
the University of Sussex 5th July 1991

Supplement edited by Paul T. Harding

PREFACE

Invertebrates have recently gained in importance in the evaluation of sites and the monitoring of changes in the countryside. There are still many difficulties in using invertebrates as indicators of site quality and environmental changes, but, as the papers in this publication show, considerable progress has been made in recent years.

Central to this progress have been two closely allied developments; the national recording schemes for invertebrates, organized in collaboration with the Biological Records Centre, and the Invertebrate Site Register. Also, the establishment of local records centres, most of which are based at museums, is having a significant effect on the availability of authoritative information on invertebrates at county and district levels.

Vascular plants and birds are likely to remain the first priority for site evaluation and environmental monitoring for many years to come. However, there are some ecological features for which invertebrates are already acknowledged to be sensitive and reliable indicators, for example relic forest areas with old trees and lowland wetlands.

The difficulties of using invertebrates include the sheer number of species, the taxonomic problems of many groups, the lack of experienced taxonomists and field workers and the scarcity of truly replicable sampling techniques for many groups or biotopes. Although the speakers at the 1991 Annual Conference of the National Federation for Biological Recording could only touch on many of these topics, the published account of their presentations provides up-to-date reviews and plenty of food for thought.

The 1991 conference was organized, at short notice, by Derek Lott and Alex Tait. I am grateful to the authors for responding, more than a year after the conference, to my request, on behalf of NFBR, to provide a written version of their presentation. I am also grateful to Julie Gaunt for preparation of the camera ready copy for publication.

Paul T. Harding
Biological Records Centre

Glossary of abbreviations:

BBCS - British Butterfly Conservation Society (now Butterfly Conservation);
BRC - Biological Records Centre (Monks Wood);
DC - Development Control;
ISR - Invertebrate Site Register;
JNCC - Joint Nature Conservation Committee;
LNR - Local Nature Reserve;
LRC - Local Records Centre;
NCC - Nature Conservancy Council;
NNR - National Nature Reserve;
RDB - Red Data Book;
RSPB - Royal Society for the Protection of Birds;
SSSI - Site of Special Scientific Interest;
UDP - Unitary Development Plans.

THE INVERTEBRATE SITE REGISTER — OBJECTIVES AND ACHIEVEMENTS

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INTRODUCTION

Background

Information on the status, distribution and biology of species underpins much of nature conservation practice. The unavailability of such information for invertebrates has been the main cause of their relative neglect by conservation bodies. A large majority of practitioners in the statutory conservation agencies and voluntary bodies have little or no expertise in invertebrates. If they are to consider invertebrates when selecting sites for conservation and making decisions on their management, it is essential that the necessary information is available in an immediately usable form. In collating information from a great many diverse sources and interpreting and disseminating it, the Invertebrate Site Register (ISR) attempts to fill this information gap. The inclusion of unpublished information from amateur specialists is important in this respect as it would not otherwise be available.

The ISR is the largest and longest running in-house project concerning terrestrial and freshwater invertebrates undertaken by the Nature Conservancy Council (NCC) and its successor bodies (the Joint Nature Conservation Committee, English Nature, Scottish Natural Heritage and the Countryside Council for Wales). It started in 1980 with two contract personnel based in England and one each in Scotland and Wales. From 1983 onwards the whole team was based centrally in the Chief Scientist's Directorate of the NCC's Great Britain Headquarters. A substantial increase in personnel occurred in 1985 and, from mid-1986, computerization of the database became a central issue. When NCC was split up in 1991, the ISR moved to the Species Conservation Branch of JNCC.

Objectives

The objectives of the ISR were defined as follows by Palmer and Ball (1992):

- 1 to identify, document and evaluate sites of importance for the conservation of terrestrial and freshwater invertebrates in Great Britain, in order to provide national and local overviews of the resource and set this in a European context;
- 2 to provide a clear statement on the invertebrate fauna of individual sites, which can be used to strengthen the scientific basis of site defence and management planning, with the aim of retaining this fauna;
- 3 to maintain up-to-date statements on the national and regional status, ecology and conservation of British invertebrate species;
- 4 to contribute to the production of Red Data Books, and revision of Schedule 5 of the Wildlife and Countryside Act (1981) and implementation of the requirements of the EC Habitats and Species Directive;

- 5 to increase liaison between invertebrate zoologists and staff of the conservation agencies and to facilitate the interchange of advice and information, particularly so that future research and survey effort can be encouraged where it is most needed;
- 6 to supply progress reports on invertebrate conservation to invertebrate zoologists and other interested people.

Related projects on invertebrates

Other projects have been funded separately from the ISR, but complement its objectives:

- 1 the *ENTSCAPE entomological bibliography* — a computerized bibliography of the British national and regional entomological literature from 1930, with keywords covering taxonomic group, geographical area and subject;
- 2 the publication of *Red Data Books* on invertebrates.

METHODS

Information has been collated from many sources including published literature, museum collections, national and local biological record centres and the files of statutory conservation agencies and voluntary bodies. A special effort has been made to involve amateur specialists and to tap their considerable knowledge and experience, which are often unpublished.

Two main types of report have been produced:

- 1 *National species group reviews*. These cover a taxonomic group and identify the scarcer species. Information on the status, distribution, biology and conservation management requirements of these species is collated and eventually published in the form of data sheets.
- 2 *County ISR reports*. These cover a geographical area based on modern English and Welsh counties and Scottish regions, but broken down into smaller units in the case of larger counties or regions. Inventories of scarcer species are collated for conservation sites (SSSIs, NNRs, County Wildlife Trust and RSPB reserves, LNRs, etc.) and for sites which local naturalists consider significant.

The ISR database

One of the features of the ISR project is that the information collected to assess sites and species is closely interlinked. A relational database is the obvious way to organize the data so that they may be examined in terms of both species distribution and the occurrence of species at a location. Storage of ISR information in a relational database began in 1986.

Assessment of species statuses and the production of data sheets

Definitions of and the criteria for the various status categories are given in the Appendix. The method by which statuses are allocated is as follows. A checklist is annotated with statuses suggested by distribution maps, if available, or by taxonomic works such as the Royal Entomological Society *Handbooks for the Identification of British Insects*. This provisional list is circulated to specialists, both professional and amateur, for comment. A revised list is produced, based on these initial comments, and is used as a basis for further research. Museum collections are visited, a more extensive literature search is made with the help of ENTSCAPE and data on distribution and biology are abstracted for each of the scarcer species. This process usually results in adjustments to the preliminary statuses. Data sheets are then compiled by collating information under headings such as *Distribution, Habitat and Ecology, Status, Threats, and Management*

and Conservation. Finally, the data sheets are sent to appropriate specialists for comment and correction before publication.

Production of ISR county reports

Naturalists resident in the relevant area are contacted using membership lists from local and national societies, and contact lists maintained by local records centres and regional offices of the country agencies. They are asked to identify sites that they consider to be of importance and to indicate what they have found there (the use of sketch maps to locate features of particular interest is encouraged). Information is also sought in the literature (accessed via ENTSCAPE), the files of the regional offices of the country agencies and voluntary bodies, national and local biological record centres and the records and collections of specialists. A summary sheet is compiled for each site (Figure 1) indicating what recording has been carried out and commenting on management issues, together with a list of the scarcer species that have been found there.

Site evaluation

The importance of sites is evaluated on a four-point scale:

- A nationally important;
- B regionally important (equivalent to a recommendation that the site should be considered for SSSI status);
- C potentially important, sites which may rate A or B, but are not well enough known to judge — amounts to a recommendation for further survey;
- D no more than locally important.

Many sites remain ungraded. These are localities about which there is minimal information or only old information.

The site evaluation process is the result of expert judgement by an experienced invertebrate zoologist, on the basis of the available information. This evaluation is assessed in relation to these questions

1 *How well recorded is it?* Sites which have received very limited recording effort cannot be graded higher than 'C'. Reasonably well recorded sites (those which have been visited by several specialists over more than one season, using several different collecting techniques) can be considered further. However, many sites are exceptionally well recorded because they happen to be convenient for specialists to visit (for example, the grounds of field stations). Such sites require downgrading if they have no special features beyond intense recording effort.

2 *What are the special features of the site?* One of the main features which can be readily assessed is the presence of an assemblage of scarcer species associated with the habitats present on the site. It is, however, necessary to apply critical judgement to the species list to decide whether the site is likely to support viable resident populations. There is rarely direct proof of breeding, or estimates of population size, but it is often possible to gain some insight by considering what is known of the biology, distribution and habitat requirements of each species. For example, is the location within the known ranges of the species and does it provide the necessary niches? If there are repeated records of a species, this provides circumstantial evidence that it is resident, whilst an isolated record of a species in a well worked group might suggest that it is a vagrant. If a site is reasonably well recorded, but has no special features, a 'D' grading would be justified.

3 *Are the special features adequately represented on conservation sites in the area?* NCC has stated: 'The primary objective of nature conservation is to ensure that the natural heritage of wild fauna and flora and geological and physiographic features remains as large and diverse as possible' (NCC, 1984) and that 'The biological SSSI series is

<p align="center">INVERTEBRATE SITE REGISTER MASTER FORM</p>	<p align="right">Site number 71/3</p>
<p>Names(s) ARCOT HALL DAMDYKES MARSH</p>	
<p>County(s) Northumberland</p>	
<p>Grid Ref. NZ2475</p>	
<p>Grade B</p>	
<p>Status pSSSI</p>	
<p>Site description - Habitat</p> <p>A subsidence pond in an area of unimproved, damp pasture with associated hedgerows and patches of undisturbed deciduous woodland with an abundance of dead wood. The richest areas are west of the main pond where there is herb rich, damp meadow with a series of small pools choked with a variety of emergent vegetation.</p>	
<p>Invertebrate Interest - Coverage</p> <p>Jim Parrack has been visiting this site recently and provided both Diptera and Lepidoptera records. Tim Melling has recorded the Least Minor (RDB3) at one of its few non-coastal sites in the region and Mick Eyre's samples of the waterbeetle fauna resulted in the longest species list for a site in the region (33 species) including <u>Agabus unguicularis</u>.</p>	
<p>Comments - Conservation</p> <p>The site is adjacent to the golf club clubhouse and has been threatened by a proposal to build a golf centre and tidy up and landscape the area generally.</p>	

Figure 1. A "master form" from the ISR report for Northumberland.

intended to form a national network of areas representing in total those parts of Great Britain in which the features of nature, and especially those of greatest value to wildlife conservation, are most highly concentrated or of highest quality' (NCC, 1989). Thus, if particular assemblages of scarcer invertebrates are not adequately represented at existing protected sites in a county, region or country this justifies grading the best examples in a country or region at 'B' and the best examples nationally at 'A'. In nearly all cases, well recorded sites are likely to contain some species which are not recorded elsewhere in the region or country, but sites are rarely scheduled as SSSI on the basis of individual rare species. According to the *Guidelines for the selection of biological SSSIs* (NCC, 1989) only sites with populations of species listed in Schedule 5 of the Wildlife and Countryside Act 1981 would qualify as candidates for selection as SSSIs on this basis, except in the case of some species of butterfly and dragonfly where more specific guidelines are given. Apart from these few species which are subject to specific guidelines, Red Data Book and other scarce species 'should be conserved as part of a rich faunal assemblage'.

RESULTS AND DISCUSSION — THE EXTENT TO WHICH OBJECTIVES ARE BEING MET

Objective 1 — to document and evaluate important sites

County ISR reports document and evaluate important sites on a county-by-county basis. Reports have been prepared for all counties in England and Wales and regions in Scotland. Figure 1 shows an example of a 'master form' for a site in the report for Northumberland. Earlier ISR county reports, produced between 1981 and 1985, were classified as 'confidential' and are therefore not available outside the statutory agencies. From 1985 onwards information was collected on the basis that it was not confidential unless specified by the originator. County reports were subsequently produced in two versions, a 'confidential' version for internal use only, and a 'non-confidential' version, which was distributed to other organization, including museums, local record centres, county wildlife trusts, RSPB, the National Trust and, in some cases local authorities and utilities such as water companies. Two reports (West Midlands and Warwickshire) were completed, but were not produced in hard copy form.

Objective 2 — to provide a statement of the fauna of sites for use in site selection, defence and management

ISR county reports include a list of species from each site in the area covered by the report and a 'single site report' can be produced from the ISR database on request. Reports may be annotated with a brief account of the status, distribution and biology of each species (Figure 2). Lists of this type have been provided to reserve managers and other staff in both the country agencies and voluntary bodies, for use in site management plans and in site defence, including public inquiries. It is also possible to interrogate the database to provide information on where else particular species, or assemblages of species, have been recorded in a county, region or country. This type of analysis, which highlights the special interest of a site, has proved effective in the defence of sites.

Site selection

Colleagues working at the regional offices of NCC and its successor bodies have responsibility for scheduling SSSIs. Recommendations from the ISR have been taken seriously and a number of sites have been scheduled directly as a result of 'A' or 'B' grading in the ISR, although, more typically, the invertebrates are just one element of the interest of a site. When a site is proposed as a candidate for SSSI status, more detailed work is necessary to determine the special interest of the site and define its boundaries. This

ISR database	Glasbury Shingle Beds (SO1840)	14 AUG 1992
pRDB 2		
Negastris sabulicola (Boheman,1853) Listed in the published Red Data Books as RDB 3 Small click beetle living among shingle on northern and western rivers. Very local.	COL:Elateridae.	1986 11
Tachydromia acklandi Chvala Listed in the published Red Data Books as RDB 1 Small fly running rapidly over the surface of mud at the side of upland rivers. Very rare, with records only from a few sites in Scotland and one in Wales. More realistically should be considered RDB2.	DIP:Empididae	1986 6
RDB 3		
Bidessus minutissimus (Germar,1824) -- additional record --	COL:Dytiscidae	1987 6 1986 9
A very small black and yellow water beetle. Found in sandy shallows of rivers and at the margins of lakes e.g. Slapton Ley, Devon. Very rare, though recorded from England, Scotland and Wales with all records being in the west. Only recently noted in the last named county.		
Na		
Fleutiauxellus maritimus (Curtis,1840) Small black click beetle living among shingle on river banks (not coastal as the name would suggest). Northern and western species. Very local.	COL:Elateridae	1986 11
Georissus crenulatus (Ross,1794) Small water beetle found in trickles and flushes in muddy conditions. Widespread but very local.	COL:Hydrophilidae	1986 9
Hydraena rufipes Curtis,1830 -- additional record --	COL:Hydraenidae	1987 6 1986 10
A small black water beetle, most often recorded from amongst moss and on stones in swift-flowing rivers; also known from fen conditions in the north.		
Perileptus areolatus (Creutzer,1799) Small (2.5mm) dark brown ground beetle living among riverine shingle, often at depth within the shingle. Western species, SW peninsula, Wales & Marches, Lancs, SW Scotland. Apparently very local but secretive habits may lead to under-recording.	COL:Carabidae	1986 8
Philonthus atratus (Gravenhorst,1802) Predatory metallic blue or green/black rove beetle found in damp litter etc. England N to Yorks, very local and rare.	COL:Staphylinidae	1986 10
Thalassophilus longicornis (Sturm,1825) Small (3.5-4mm) flattened red/brown ground beetle living among riverine shingle. North western species. Wales & Marches, Cumbria & W Scotland. Rare.	COL:Carabidae	1986 9
Notable/Nb		
Bembidion fluviatile Dejean,1831 5.5-6.5 mm long black ground beetle with 4 orange spots, living on fine sands and mud by northern & western rivers. Wales, N England & Scotland. Always very local.	COL:Carabidae	1986 9
[Further species listed here]		
28 species listed Invertebrate Index = 1200		
Sources of records:		
1. Bowstead, Mr S. 48 Grimshaw Lane, Ormskirk, Lancs, Tel. 0695 73874.		
2. Carter, I.C. 1 Waterfield Close, Cheltenham.		
3. Drane, Mr A.B. 14 Rockingham Road, Cottingham, Market Harborough, Leics.		
4. Eccles, Mr T. 59 Linkstor Road, Liverpool, Tel. 051-4282665.		
5. Henson, Mr H.E. 36 Thornleigh Drive, Orton Longueville, Peterborough, PE2 0AL.		
6. Hodge, Mr P.J. 8 Harvard Road, Ringmer, Lewes, East Sussex.		
7. Hyman, Dr P. Luton Museum, Wardown Park, Luton, Beds, LU2 7HA.		
8. Johnson, Mr C. Entomology Dept, Manchester Museum, The University, Oxford Road, Manchester, M13 9PL.		
9. Key, Dr R.S. Species Branch, English Nature, Northminster House, Peterborough PE1 2TU.		
10. Lott, Mr D. Natural History Dept, Leicester Museum and Art Gallery, 96 New Walk, Leicester, LE1 6TD.		
11. Mendel, Mr H. Suffolk Biological Records Centre, The Museum, Ipswich, Suffolk, IP1 3QH.		

Figure 2. Part of an annotated species list for a site.

usually requires detailed survey work and, before NCC was split up, ISR personnel often assisted regional colleagues by identifying suitable specialists to carry out such work and arranged funding for small contracts to support the necessary work. In drawing up the SSSI schedule, which includes a statement of the special interest of the site, ISR personnel also assisted with drafting paragraphs on the invertebrate interest. Since the break up of NCC, these tasks have been undertaken by invertebrate zoologists in the headquarters (and some regions) of the country agencies. ISR personnel are no longer directly involved with site casework of this type, although data held by the ISR continue to provide a basis for such help and advice.

Examples of sites identified by the ISR include those with assemblages of invertebrates associated with riverine shingles, which were found to be poorly represented in the SSSI series in northern England and the Scottish Borders. This led directly to the scheduling of two SSSIs in Northumberland. A further site in Northumberland and one in Borders Region are being investigated as candidates for SSSI designation.

Site protection

In justifying the selection of a particular site, it is normally necessary to demonstrate that it is amongst the best representatives of its stated special features. The ISR allows investigation of the occurrence of individual scarce species, or assemblages of species, and the production of reports which demonstrate their occurrence elsewhere in the county, region, or country. Such analyses have proved very effective at public inquiries. For example, substantial input was provided to the public inquiries on Ridham Marshes in Kent and Rainham Marshes in Essex. The inspector's recommendations for Ridham Marshes, announced recently, were in favour of the conservation case.

Site management

To incorporate the requirements of invertebrates in management plans, site managers need to know the requirements of significant species and also the habitat features with which they are associated. Information on the management requirements of particular species and any perceived threats has been a priority whilst compiling data sheets. By collecting inventories of the occurrence of scarcer species on sites, and by providing annotated lists (Figure 2) and data sheets (Figure 3) to site managers, it is possible to provide them with the input they need. For example, the management plan for Moccas Park NNR was recently completed with substantial input from the ISR, which documented the internationally important saproxylic fauna at this site.

Objective 3 — to maintain up to date statements on status and ecology of species

National reviews of species groups have been produced covering a wide range of taxa. These include data sheets for 4140 scarcer British species. An example is shown in Figure 3. A brief paragraph on the status, distribution and biology on over 10 000 species is also held on the database. Figure 2 shows examples of these paragraphs. Early national reviews were, like early ISR county reports, classified as 'confidential' and are not available to outside bodies. They included reviews of non-marine molluscs, Orthoptera, macro-Lepidoptera and micro-Lepidoptera. All recent reviews are published documents and cover spiders (Merrett, 1990), Ephemeroptera and Plecoptera (Bratton, 1990), Neuroptera (Kirby, 1991), Trichoptera (Wallace, 1990), Hemiptera (Kirby, 1992a), aculeate Hymenoptera (Falk, 1991a), Diptera (Falk, 1991b) and Coleoptera (Hyman & Parsons, 1992) and pyralid moths (Parsons, 1993). Part 2 of the Diptera and Coleoptera reviews and a revision the macro-Lepidoptera and remaining micro-Lepidoptera reviews are in preparation and a review of sawflies is planned.

TAPHROPELTUS LIMBATUS**RARE**

Order HEMIPTERA

Family LYGAEIDAE

Taphropeltus limbatus (Fieber)**Identification** Southwood & Leston (1959).

Distribution South Britain, particularly the south-west. The species was first recorded in Britain from Southsea, Hampshire, in 1870, and has since been found in Bewdley Forest, Worcestershire, in 1879; Bowes Park, Middlesex, around the turn of the century; Windsor Forest, Berkshire, in 1933; at least five localities in Dorset, the most recent in 1981; the New Forest, Hampshire, a number of records over several decades to the late 1950s, and two localities in Devon, the Meavy Valley in 1909, and near Dunsford in the 1950s. It appears to be an uncommon south-western species elsewhere in Europe, and is recorded from Spain, Portugal, France and Germany.

Habitat and ecology This species is associated with ants, but the exact nature of the relationship is not clear. Continental workers have linked it with several types of ants, including species as far removed in taxonomy and nest structure as *Myrmica scabrinodis* and *Formica rufa*. Ants leave the bug unmolested, though they attack other species of Heteroptera placed near their nests. If the bugs spend much time within the nests, this might in part explain the rather sporadic and irregular records of the species in Britain, and the apparent lack of consistent habitat preferences. It has been found in wet moss beside a stream, in *Sphagnum*, amongst thick vegetation on chalk downland, beneath a stone on a chalk cliff, amongst sparse vegetation in a derelict garden in a wood, on a dry hedgebank, and "in a sandy place". The food is unknown; members of the subfamily are generally believed to be seed-feeders. It appears to overwinter as an adult. Mating has been observed in May, and oviposition in June. Nymphs in the last instar have been found in early to mid-August, so there is probably one generation per year, maturing in mid- to late August.

Status Very local, but exact status unclear. Records are few, scattered, from a rather wide range of habitats, and usually of only one or two individuals. This would suggest that the species is usually present in small numbers and may easily be overlooked, particularly in the south-west, which is not a well-worked area for Heteroptera.

Threats Uncertain. In the current state of knowledge of the biology of the species it is difficult to determine what factors might be damaging to it. The only common factor linking the recorded habitats seems to be that they are open and unshaded. Loss of such open conditions, particularly as a result of neglect of previously managed sites, may be significant. The Middlesex site was destroyed by urban development many years ago.

Conservation Four records fall certainly or probably within SSSIs: Windsor Forest, Berkshire; New Forest, Hampshire, and the Purbeck Ridge, Dorset. It is difficult to suggest positive conservation measures for the species in the current state of knowledge. More information on the biology and ecology of the species is needed. If it is genuinely a species of sporadic occurrence, associated with a number of ant species, and otherwise with no strong habitat preferences, it may be impossible to suggest overall conservation measures. Management at known sites should aim to retain open conditions: on most sites this may be best achieved by light grazing.

References Butler, E.A. (1923a), Champion, G.C. (1919), Douglas, J.W. (1875a), Groves, E.W. (1965), Massee, A.M. (1955a), Saunders, E. (1892a), Scudder, G.G.E. (1955), Scudder, G.G.E. (1957b), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Thomas, D.C. (1955b), Walker, J.J. (1916).

Figure 3. An example of a data sheet for a species from Kirby (1992a).