Invertebrates of Exposed Riverine Sediments
Phase 3 – Baseline faunas

Technical Report W1-034/TR

Jon Sadler and David Bell

Research Contractor
The University of Birmingham

Publishing Organisation
Environment Agency, Rio House, Waterside Drive, Aztec West, Almondsbury
BRISTOL BS32 4UD
Tel: 01454 624400 Fax: 01454 624409

ISBN: 1 84432 025 1

Dissemination status
Internal: Released to Regions
External: Public Domain

Keywords:
Exposed Riverine Sediments, Invertebrates, Coleoptera, Araneae, Conservation, site quality, site assessment, BAP species.

Statement of Use
This document provides baseline invertebrate survey date for a range of Exposed River Sediment types. These are from known good quality watercourses and can be used as a reference against which to compare other sites to assess their conservation quality. The environmental variables important in defining quality are also addressed. Management implications and their impacts on these habitats area also discussed and evaluated.

Research Contractor
This document was produced under R&D Project W1-034 by :
Dr J.P. Sadler, School of Geography and Environmental Sciences, The University of Birmingham, Edgbaston, Birmingham B15 2TT
Tel : 0121 414 5776 Fax : 0121 414 5528

Research Collaborator
Countryside Council for Wales, Plas Penrhos, Ffordd Penrhos, Bangor, Gwynedd, WALES LL57 2LQ.
CCW's Project Manager was Adrian Fowles.

Environment Agency Project Leader
The Environment Agency's Project Leader for R&D Project W1-034 was
Viki Hirst, Northern Region.

Further copies of this report are available from:
Environment Agency R&D Dissemination Centre, c/o
WRc, Frankland Road, Swindon, Wilts SN5 8YF

tel: 01793-865000 fax: 01793-514562 e-mail: publications@wrcplc.co.uk

EXECUTIVE SUMMARY

A total of 81 silt, sand and shingle sites across England and Wales were used to establish what factors were important in prescribing the species assemblages on Exposed Riverine Sediments. Two large species databases of Coleoptera and Araneae were created during the work. 603 species of Coleoptera were collected by a combination of pitfall trapping, hand searching and excavational techniques. A total of 92 species with conservation status of endangered, Rare or Nationally Scarce were recorded during the work and this includes 5 species on the UK BAP lists. A subset of 43 of this group can be classified as ERS specialists. The total spider dataset comprises 47 sites from England and Wales with 124 species and a total of 11,342 individuals. Although the percentage of species exhibiting fidelity to the sediments is low (c. 9%), 7 of 13 ERS specialists spiders were found during the work. Two of these, *Caviphantes saxetorum* and *Arctosa cinerea*, are Nationally Scarce. The latter appears to be a good predictor of high quality shingle sites.

Multivariate analyses of the dataset using TWINSPAN, Canonical Correspondence Analysis (CCA) and/or Redundancy Analysis (RDA) aided the interpretation of the data. An examination of the important environmental variables that define site quality using CCA and RDA identified type of substrate, habitat heterogeneity, the percentage of shade, the amount of grazing and ERS size as important presciptors of invertebrate 'quality'. The percentage of sand in the matrix was also found to be important for the Coleoptera. A number of management implications can be drawn from this work and they indicate the importance of river regulation, engineering and stocking densities for ERS invertebrates.

The species data were classified according their fidelity to ERS a national list of ERS Coleoptera was created, which now requires assessment by other experienced Coleopterists and validation by field studies. The creation of a system to score ERS sites by the rarity value of the species assemblages (the ERS QI) produced results that were used to rank sites and rivers at a national level. The best ERS sites have a markedly western distribution in the UK and are found on unregulated rivers in Wales and a number of rivers in the south west of England.

With a growing database of sites, the potential existed for a systematic review to better understand the national distributions of important ERS species. It is evident that some specialist species are much more widespread than previously recognised and their JNCC designations require revision. Nonetheless, many of the Nationally Scarce invertebrates (notably the staphylinid beetles) are still under-recorded and their national status still requires confirmation. Additionally, 2 of the Grouped ERS Action Plan species, namely *Bembidion testaceum* and *Meotica anglica* are very uncommon on ERS and their species designations require revision upwards.

USEFUL CONTACTS AND FURTHER INFORMATION

The Environment Agency Co-ordinator for the various UK BAP species associated with exposed riverine sediments is:
Mike Williams, Environment Agency, Exminster House, Exminster, Exeter, EX6 8AS
Tel: 01392 316033 Email: mike.williams@environment-agency.gov.uk

UK BAP contact point:
Adrian Fowles, Countryside Council for Wales, Plas Penrhos, Bangor, Gwynnedd
LL57 2LQ. Tel: 01248 385500 Email: a.fowles@ccw.gov.uk
www.ccw.gov.uk

The Environment Agency's contribution towards the protection of UK BAP species is described in *Focus on Biodiversity*, which contains information about exposed riverine sediments and associated invertebrates. For further information and copies of *Focus on Biodiversity* contact:
Kate Anstey, Environment Agency, Rio House, Waterside Drive, Aztec West, Almondsbury, Bristol, BS32 4UD. Tel: 01454 624400
Email: kate.anstey@environment-agency.gov.uk

ACKNOWLEDGEMENTS

Funding was this work for provided by the Environment Agency, the Countryside Council for Wales, English Nature and WBB plc. Viki Hirst (EA), Adrian Fowles (CCW), numerous Environment Agency and CCW and EN staff and Michel Hughes assisted with site selection and field logistics. Ian Morrissey and Loughborough Ecologists provided Field assistance. Taxonomic advice, guidance on sampling and species ecology and specific determinations of some species was given by Adrian Fowles, Peter Hammond, Peter Merrett, Colin Johnson. A special note of thanks is given to the Project Officer (Viki Hirst) for her considerable patience and forbearance and Colin Welch who has identified, checked and confirmed many thousands of beetle species during this project. The text has benefited from the editorial comments of Adrian Fowles (CCW), Roger Key and Martin Drake (EN), and Viki Hirst (EA). Prof. Garth Foster kindly provided data for the aquatic species from the Water Beetle Recording Scheme.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

Exposed riverine sediments (ERS) represent important primary habitats within the land-water ecotone of river corridors (Petts and Amoros 1996). Along natural rivers, their patchy but regular distribution, having a type and spacing that relates to geomorphological setting, sustains connectivity, facilitates dispersion, and contributes to the high biodiversity of river margin ecosystems (Calow and Petts 1992; Hammond 1998a; Ward et al. 1999). ERS have long been associated with rare and nationally scarce invertebrates (Cooter 1991; Godfrey 1999; Hyman & Parsons 1992: 1994; Rotheray and Robertson 1993). Work by Fowles (1989) has shown that shingle ERS are home to a wide range of rare and nationally scarce species of Coleoptera and Lott (1999) has shown similarly that softer (i.e. less compacted) sediments are also a significant conservation resource. In the highly managed landscapes found in the UK ERS are seen as providing relatively natural habitats, although river engineering, regulation and flood defense schemes, coupled with aggregate extraction are a source of real concern to conservationists and river catchment managers (Hammond 1998a). Acting upon such issues the UK Biodiversity Steering Group has created a grouped species action plan for six species of ERS Coleoptera and additional plans exist for two species of Diptera and one species of water beetle and a ground beetle (UK Biodiversity Steering Group 1995) that are seen as ERS specialist invertebrates. It is within context that jointly funded Environment Agency (EA), Countryside Council for Wales (CCW), English Nature (EN) and Scottish Natural Heritage (SNH) national projects (Eyre & Lott 1997; Eyre et al. 1998: 2000; Sadler & Petts 2000; Sadler & Bell) were created to examine the ecology and management of Exposed Riverine Sediment Invertebrates.

1.1 Background to this Project

This project is the third national R & D study funded by the EA, CCW and EN to provide 'baseline' ecological criteria for the national assessment of ERS invertebrates in England and Wales. The work supercedes earlier R & D work that provided (i) a desk-based review of the nature of the national ERS resource (Eyre and Lott, 1997), and (ii) aimed to design a nationally replicable methodological protocol (Sadler and Petts 2000).

1.1.1 Regional studies

Aside of the work of Fowles (1989) on the Ystwyth, and Eyre et al. (2000) in Scotland and northern England, there has been little systematic work on regional variation of ERS in England and Wales. In the south west, Hammond's study (1998b) which surveyed the beetles on the Rivers Teign and Bovey near their confluence, indicated the excellent invertebrate conservation resource in the area. Subsequent work (Sadler and Bell 2000) extended this dataset to include 9 more Devon and Cornish rivers in an attempt to assess the regional significance of the Teign and Bovey survey. Similar survey work on ERS in the Upper Severn catchment has shown that the ERS faunas compare favourably with other Welsh rivers, such as the Ystwyth, Wye and Tywi (Sadler et al. 2000).

This report uses all available data from the above projects (excl. Hammond 1998b) to evaluate the nature of the invertebrate ERS resource in England and Wales.

1.1.2. Aim

To provide 'baseline' ecological criteria for the national assessment of ERS invertebrates in England and Wales.

Objectives

- To sample a range of ERS sites of varying quality across England and Wales for their Coleoptera (Beetles) and Araneae (Spiders).
- To develop an ERS dataset of Coleoptera and Araneae species that can be used for national and regional assessments of ERS 'quality'.
- Where possible, to update species distribution data for the ERS grouped species action plan.
- To model the environmental variables thought to be important in defining species assemblages and / or site quality.

1.1.3 Report Structure

The report has three sections: firstly, the research design outlines how and why the research was carried out; secondly, the results of the national survey are outlined and lastly, the relevance of the work is discussed and a series of recommendations provided. The Appendices provide details of all the data collected for this Phase (ERS Phase 3) of the project.

2. RESEARCH DESIGN

2.1 The Sites

The sites are located in England and Wales and range from the South west and Dorset and Hampshire into Wales, the Welsh borders and up into Derbyshire, West Yorkshire and on into the Dales (Figure 1). An attempt has been made to sample ERS

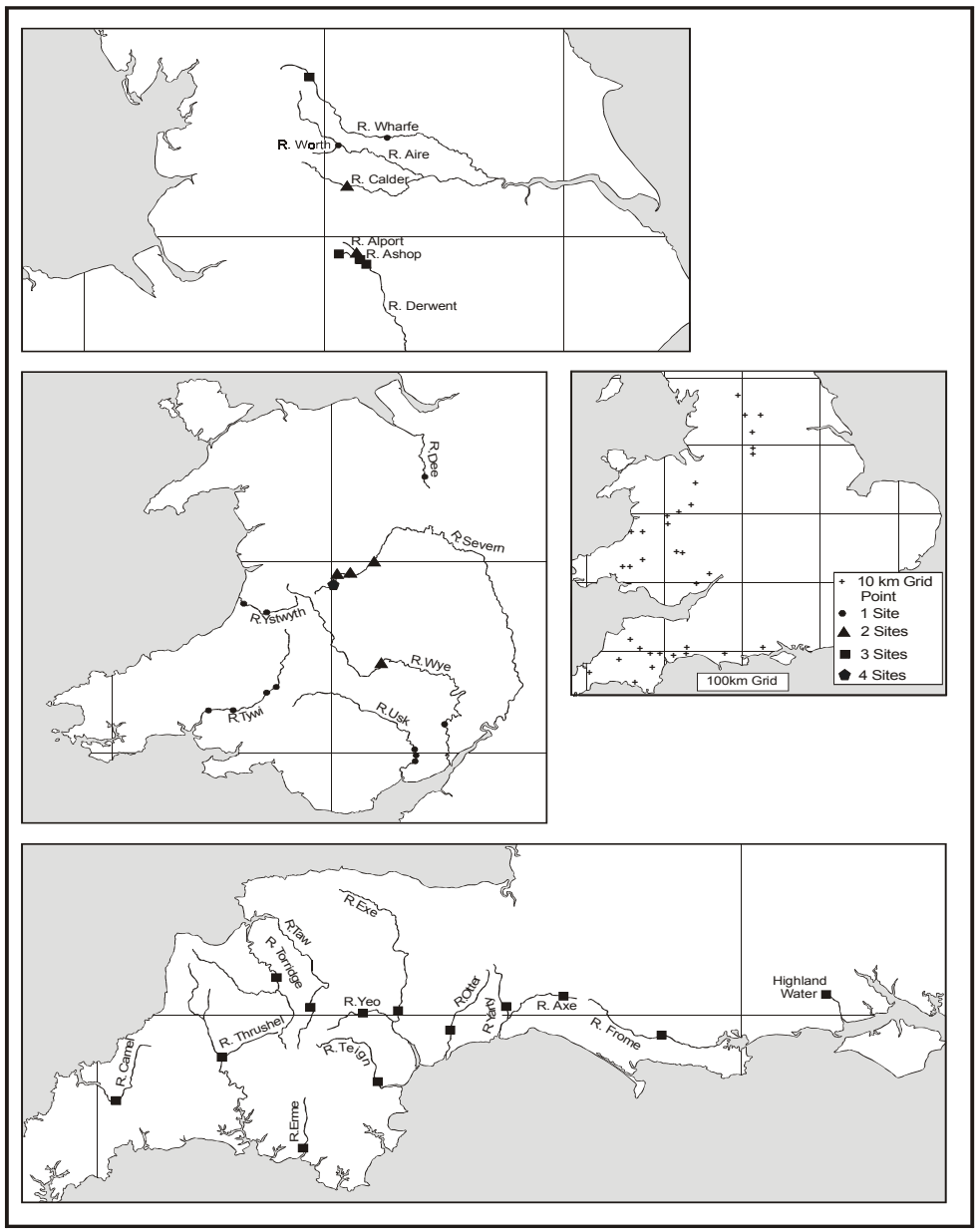


Figure 1: The location of the sample sites

with different sediment characteristics ranging from silt through to boulder, vegetated to unvegetated and heavily impaired (by either urbanisation, trampling and gravel poaching) to near 'pristine'. It should be stressed however that the dataset is heavily biased towards shingle sites (Appendix C) and has been created from the results of the following four surveys:

2.1.1 ERS National Phase 2

Appendix C provides details of the 22 the sites selected for analysis during this project. An attempt was made to sample a variety of ERS: the Welsh sites (Ty'n-yr-helyg, dolydd Hafren) were mainly unconsolidated shingles (gravel-pebble-cobble) from lowland situations. Here the sediments were characterised by a large percentage of sand (Figure 2). The site at Grogwynion, however, had a larger sediment size (cobble) and was more heavily armoured. Finer sediments were targeted on the River Dee, where a small sand point bar was selected for study. In Derbyshire, on the Alport and Ashop, the ERS were mainly small upland bars, with sediment calibre ranging from boulder through boulder to gravel (Figure 3) and lastly silt (Ashop Lower). The two reaches on the Wharfe provided an upland sequence of heavily armoured cobbles with very little sand content and a sand ERS with a gravel fringe at Castley (Figure 4).

Figure 2: The sandy toe at Ty'n-yr-helyg on the River Ystwyth

2.1.2 ERS National Phase 3

A total of 23 good quality sites were selected for study on the rivers Wye, Usk and Tywi in Wales and the Calder, Worth, Axe, Highland Water, Frome in England (Appendix C). Sediment types varied from 'classic' shingle sites on the Rivers Wye and Tywi (Figures 5-6) to sandy shingles on the Usk. Sequences of small chert ERS were sampled on the River Frome in Dorset and the Highland Water in the New Forest (Figure 7). Examples of heavily polluted and vegetated ERS on the River Calder at Elland and the River Worth in Keighley (West Yorkshire) allowed an examination of very impaired sites.

Figure 3: A small boulder ERS on the River Ashop (lower) in Derbyshire

Figure 4: Sand ERS on the Lower Wharfe at Castley. Note the 'gravel fringe' a habitat common to many sand ERS.

Figure 5: Downstream section of a large and heterogeneous ERS at Glasbury Shingles on the River Wye

Figure 6: Sandy shingle of a large and heterogeneous ERS at Llandwrda Station on the River Tywi

Figure 7: a small chert ERS on the Highland Water in New Forest, Hampshire

2.1.3 Devon ERS

A total of 30 separate bars on 10 rivers were selected for sampling (Appendix C). They ranged from coarser sediments and gently sloping ERS (eg. Torridge 1 & 2, Exe 3 – Figure 8), through diverse and complex ERS with a diversity of sediment types and potential habitat (eg. Teign 1; Figure 9) to smaller wooded and complex ERS (eg. Erme and Yarty; Figure 10).

Figure 8: A large cobble ERS on the River Exe Devon

Figure 9: Heterogeneous sediments at Site 1 on the River Teign in Devon

Figure 10: A small and heterogenous ERS in a wooded corridor on the River Erme in Devon

2.1.4 Upper Severn ERS

Six sites were selected in three 2km reaches of the Upper Severn near Newtown in Wales (Appendix C). These ERS were generally large and the predominant sediment type was cobble and shingle with varying amounts of sand and silts. The site selected exhibited some heterogeneity in sediment calibre, structure, profile and the degree to which they have been affected by livestock and/human damage. At each reach a disturbed and relatively undisturbed ERS were selected for analysis (Figures 11 & 12).

Figure 11: Site 1 at South Llandinam on the River Severn. Note the gorse scrub buffer to the right a good indication of habitat potential on Welsh ERS

2.2 Field Sampling

The field sampling was undertaken between 1997 and 1999. The ERS Phase Two data were collected during June and August – September 1997. Field work for the ERS Phase Three project took place from late May – mid July 1998 and the regional (Devon and Upper Severn) surveys were completed during late May-late June 1999.

Field sampling for invertebrates is a problematic issue and many researchers have advocated the need for standardized sampling techniques (Lott and Eyre 1996). The invertebrates were sampled using a combination of pitfall traps and hand searching techniques. The protocol follows Sadler & Petts (2000) and is described briefly below.

Figure 12: A heavily impacted ERS at Site 1 Maesmawr Hall on the River Severn

2.2.1 Pitfall Trapping

The pitfall traps were small plastic cups with an internal diameter of 10cm placed with the rim flush with the sediment surface on the ERS. About 100ml of commercial anti-freeze was placed in the bottom of the cups to assist in sample preservation and reduce evaporation. A non-toxic form of antifreeze was used where there were evident signs of public activity on the ERS. At each site pitfall traps were placed either high up on the bank to lessen the risk of flooding, and/or hidden away to avoid discovery. The number of pitfalls used varied between 9 and 12 and their orientation was modified from the usual 3m by 3m grid to account for variation in both the size and the shape of the ERS and to reduce the chance of flooding. If the ERS was large and diverse groups of pitfall traps were placed in each of the main sediment and/or habitat types. Notwithstanding, on the very large bars it was not possible to cover all available habitats.

The pitfalls were run for consecutive fortnights during the sampling periods. The traps were serviced and emptied after each fortnight and reset if damaged or flooded. This process was repeated until one near complete period of recovery was obtained, resources permitting (i.e. one fortnight). Timed hand searching, excavations and sieving were used to supplement the pitfall data.

2.2.2 Timed Hand Searching

It is clear from the results of previous ERS projects that hand searching can be an efficient method of sampling ERS invertebrates, particularly in terms of recording the smaller, cryptic species that are subterranean for most of the time. The timed hand searching was carried out using the procedure outlined by Andersen (1969) and adapted by Plachter (1986), Fowles

(1989) and Lott (1992, 1993). Searching concentrated on turning stones and capturing beetles using an aspirator (pooter) and was geared towards maximising coverage of the variation in sediment type across the ERS, starting from the waterside and working laterally across the bar towards the higher margin. Two hand searches were undertaken on each bar both of 20 minutes duration.

2.2.3 Other techniques

The hand searching was supplemented by sieving of sediments at intervals along the site and splashing the edge of the ERS with water in the Devon survey and splashing and excavations elsewhere. All invertebrates dislodged were collected using a fine sieve.

Excavation

The final technique, known as excavation (Hammond 1998a), involved digging an area of approximately $1m^2$ through the upper sediments down to the water table, at a distance of 1-2 metres away from the water. The process was continued for 30 minutes or until either (i) all the water is removed from the pit or (ii) no more invertebrates are floating to the surface of the water. Although this is not a quantitative technique it is an effective means of finding smaller invertebrates that are often missed in hand searching and under-represented in pitfall traps. Two excavations were carried out on each site.

2.2.4 Environmental Variables

A large number of environmental variables were collected at each site and these are listed in the form in Appendix D (A table of these for all Phase Three sites is given in Appendix E). The form is a modified version of that created for the ERS R& D Phase I project (Eyre & Lott, 1997), and is based upon the methodology employed in the River Habitat Survey. The variables can be divided into two main classes:

ERS Variables

Particular attention was paid to the physical structure of each ERS. Sediment calibre and the overall physical diversity (in terms of variety of sediment type and ERS structure) of the ERS are known to be important, as is the type and amount of vegetation (Andersen, 1978; 1983; Hammond, 1998a; Sadler & Petts, 2000). The ERS profile was defined as flat, gentle or sloping. Flat ERS have very little in the way of relief, whereas sloping ERS have a much steeper profile. The topography of the ERS was considered simple if it was flat and had no break of slope, hummocky if it had clear mounds of sediments, and complex if there was a combination of hummocks, flatter areas, channels, and back waters. The type and amount of vegetation cover was estimated along with the proportion of ERS shaded by trees.

ERS heterogeneity was estimated by counting the number of microhabitats on each ERS (eg. silt fringes, sand toes, back channels and so). ERS with a diverse amount of microhabitat were given scores of 3 and ERS with limited microhabitats were scored a 1. Assessing whether the ERS was grazed, trampled and/or excavated for aggregates provided an indication of the amount of 'artificial' disturbance on the ERS.

The Wider Landscape

In terms of conservation it is importance to stress that ERS are connected to the wider landscape and management of this ultimately has an impact on the riparian zone itself (Lott 1997; Nilsson 1991). Many studies have highlighted the importance of the variety and abundance of habitat available for over-wintering (cf. Andersen, 1968) and the type of land use in the riparian zone (Greenwood 1991; 1995). The former, or hibernation potential, of the ERS was graded from 3 (high) to 1 (low) based upon an assessment of the following habitat variables:

- The amount and diversity of buffer habitat in the river corridors (eg. trees, shrubs, grass tussocks and dead wood) that might be important in providing over-wintering habitat.
- The diversity and nature of the vegetation and dead wood on the ERS.
- The nature of substrate, as some small species of ERS beetle may over-winter in the sediments, and these require sandier substrates.

The adjacent land use was documented as were any evident feature indicating bank management and/or engineering.

2.3 Sorting and Identification

The taxa were identified to species level in accordance with the requirements outlined in the tender documentation. Dr D. Bell identified all the Carabidae and Araneae. Drs Sadler and Welch determined the remaining Coleoptera species. All specimens that were either: (i) species of conservation interest, or (ii) only tentatively identified were verified by Dr Welch. Voucher specimens were taken of rare or unusual species and these are stored in the Collection at the School of Geography and Environmental Sciences at Birmingham or in the collection of Dr Colin Welch. Peter Hammond (Natural History Museum), Colin Johnson (Manchester University Museum) and Adrian Fowles (CCW) verified many specific determinations of Coleoptera. Peter Merrett confirmed rare Araneae identifications.

It was not possible to determine the specific identification of the species belonging to the *Ochthephilus omalinus* agg. (Col., Staphylinidae). This group comprises three closely related species: *Ochthephilus omalinus*, *O. andalusiacus* and *O. venustulus*, but unfortunately no comparative material was available to facilitate their determination.

For the Coleoptera, the taxonomy is that of Lucht (1987), excluding the Atomarinae which follow the nomenclature of Johnson (1993). The Araneae follow the nomenclature of Roberts (1985; 87).

2.4 Data Management

All the ERS data were recorded on count sheets and placed into a series of linked Microsoft Access tables and output to Excel spreadsheets to facilitate data analysis, synthesis and interpretation, and to DMAP for the production of species maps.

2.5 Data Analysis

2.5.1 Fidelity and Conservation Status

Data on species fidelity was drawn from a number of sources, including the Phase I report (Eyre and Lott, 1997) and JNCC reviews of the Coleoptera (Hyman, 1992; 1994), coupled with standard texts (eg. Koch, 1989) and the data in the Invertebrate Sites Register (Ball, 1994).

The scheme developed in association with Adrian Fowles of CCW, is described below. The starting point was the list of ERS species supplied in the Phase One project (Eyre & Lott 1997). The following grade definitions were applied:

Grade 1

Species that are dependent for at least some stage in their life cycle on bare or sparsely vegetated sediments on the banks of rivers. Some of these species may also inhabit exposed lacustrine sediments, particularly where wave action forms banks of sediment on lake shores as these features are in many ways ecologically similar to riverine shoals.

Grade 2

Species strongly associated with exposed riverine sediments for at least some stage of their life cycle, but also characteristically found in other habitat types where extensive deposits of wet or dry bare sediments are present, such as sand dunes, soft rock cliffs, sand or gravel pits.

Grade 3

Species associated with exposed riverine sediments, but also occurring in a wide range of habitat types, such as flushes, seepages, pond margins, etc., where the presence of bare sediment is of fundamental importance for some stage of their life cycle.

Grades 4 & 5

These species may be found on ERS but are not ERS specialists. Many of these are wetland specialists and aquatic species (notably the elmid beetles). Species in the GRADE 5 category were adventitiously sampled during the survey.

In each case, there may be rare instances where the listed species have been recorded in atypical habitats, but the over-riding perception of their ecological requirements is such that the species in general is considered to exhibit the fidelity indicated.

ERS Phase Three data

An initial assessment of the fidelity rating for both the dataset of species collected during this work is given in Appendix A.

National list

The creation of a national list of ERS specialists was carried out jointly by Jon Sadler and Adrian Fowles. The resulting national list of ERS candidates (those that meet the criteria above), 'uncertain' species (which could not be allocated a fidelity grade), and rejected species is given in Appendix I. This list now requires further validation by experienced Coleopterists.

Conservation status

Data on conservation status were drawn from the national conservation reviews (Hyman, 1992; 1994) and updated where possible with other data from the literature and national recording schemes (Appendix A & B).

2.5.2 Rarity and site quality

Invertebrate species rarity has long been used to establish the 'quality' of a site with respect to its conservation status (Ratcliffe 1977) and subsequently schemes were created that used indicator species to classify and rank habitats. Harding and Rose (1986) suggested three levels of indicator species for ancient woodland – this was subsequently modified to account for regional variation (Garland 1983) or adapted to generate index scores (Alexander 1988). The production of quantitative figures of rarity using indices related to species rarity at regional and national levels is admirably discussed by Eyre and Rushton (1989). Their data was based upon 2km tetrads and dealt with regional rarity. Here the emphasis is on national rarity and this poses additional problems as ERS habitats have not been systematically surveyed and the distribution of many ERS invertebrates is poorly known. This means that rarity scores based on the national distribution of particular groups (i.e. the number of recorded 10km squares in the national grid) can only be applied to the better documented groups such as the water beetles (Foster pers. comm.), and ground and click beetles (Mendel and Clarke 1996; Mendel pers. comm.; Luff 1998; Telfer pers comm.). Many other groups of invertebrates with imperfect distribution data are known to exhibit high levels of fidelity to ERS and many are currently described as Nationally Scarce but maybe under-recorded (Eyre and Lott 1997).

To resolve these potential difficulties, an ERS quality index based on species that have medium to total fidelity to ERS was created using the conservation status assigned to species in the Recorder 3.21b biological recording package (Ball 1994), mirroring that designed for saproxylic invertebrates by Fowles (1997). As noted by subsequent researchers (eg. Eyre 1998; Eyre et al. 1998; 2000; Lott 1999) using current Nationally Scarce and Red Data Book designations in this way is problematic as their status is often gleaned from casual collections and/or the database of records is fragmented at best. To overcome this difficulty rarity scores are assigned by using current data from the biological recording schemes listed above (and reviews of several of the groups (Coleoptera: (Hyman, 1992; 1994) and Spiders (Merrett 1992)), augmented by recent publications (eg. Denton, 1999; Eyre et al. 1998; 2000; Lott,

1999; Appendix A). The ERS Quality Index (ERSQI) follows the updated Saproxylic Quality Index (SQI) outlined by Fowles et al. (1999):

Species were designated a rarity score. Common species scored 1; local species scored 2; Very Local species or those with an uncertain distribution scored 4; Notable/Notable B (N & Nb) species scored 8; Notable A (Na) and Red Data Book K (RDBK) scored 16, Red Data Book 3 (RDB3) and Red Data Book Indeterminate (RDBI) species scored 24, and Red Data Book 1-2 (RDB1-2) scored 32.

Thereafter, all qualifying species (those with fidelity ratings 1-3) scores from a site were totalled to produce the ERS quality score (SQS). The SQS is then divided by the total number of qualifying species (including common species) and multiplied by 100 to produce the ERS Quality Index.

ERS Quality indices were created only for the Coleoptera. It should be noted also that the rarity values allocated to particular species require examination by other specialist Coleopterists. The Staphylinidae need particular attention in this respect, given their ubiquity on ERS. The numbers of species of Araneae with moderate-total fidelity to the sediments was extremely low and national recording datasets are not presently available therefore no attempt was made to create an index for this order.

2.5.3 Multivariate analyses

Multivariate techniques were considered to be the most appropriate method of investigating the data as the majority of them are concerned with the interpretation of community responses to environmental gradients and the classification of sites in groups with similar statistical and ecological characteristics.

Data manipulation

The use of presence / absence data was disregarded in favour of the raw abundances. These were calculated by combining the three sampling techniques (one aggregated two-week pitfall trapping, the hand searches and excavations). The dataset was log-transformed prior to analysis, which transforms the data towards statistical normality and reduces the influence of dominant and rare species (van Tongeren 1996). Finally, rare species within the datasets were downweighted in the statistical analyses as they can have an unduly large effect on the overall statistical model (Jongman et al. 1996).

The environmental variables (those that were not ordinal or binary) were checked for normality using the Kolmogorov-Smirnov test. Any variables not normally distributed were log-transformed prior to analysis in the direct ordination (CCA or RDA).

Species Classification

Samples and sites were classified by using Two Way INdicator SPecies ANalysis (TWINSPAN) (Hill, 1979). The technique is robust, provides classifications that are easily interpretable, and has been used consistently in invertebrate studies in both the UK (Luff et al, 1989; Rushton and Eyre, 1992; Greenwood et al, 1995) and elsewhere (Sadler and Dugmore 1995).

Ordination and environmental modelling

In the first instance the Coleoptera and Araneae data were run through indirect ordination using Detrended Correspondence Analysis (DCA) to examine the patterning in the dataset and to determine the whether to use linear or non-linear methods in further analyses. Where the gradient lengths on the ordination axes are long (>4) the Canonical Correspondence Analysis (CCA) is favoured. Where gradients lengths are short (<4) Redundancy Analysis is used (ter Braak and Prentice 1988). By way of comparison, direct ordination methods described above provide a means of incorporating environmental variables as a means of resolving the variation across the species dataset, both individually and collectively.

The importance of the environmental relationships was elucidated using Canonical Correspondence Analysis (CCA) (Spiders) and Redundancy Analysis (RDA) (Beetles) and the significance of each variable was assessed using an automatic forward selection model and Monte-Carlo permutations tests (Manly 1997). All computations were completed using Canoco for Windows (ter Braak and Šmilauer 1998).

Selection of Environmental variables for analysis

Each environmental variable was examined in turn and a number of these were removed from the data as they were considered unlikely to have a major influence on the faunas (eg. evidence of fishing and boating) or varied very little (eg. impoundment) or were recorded at very few sites (eg, gravel poaching) (see Appendix F).

In the first instance, all environmental variables were used in the analyses. The results of this were inspected to establish which variables had high variance inflation factors (VIFs), indicating an inordinately large amount of multicolinearity in the environmental variables. It was clear that with both datasets (Coleoptera and Araneae) all the substrate variables had very high VIFs. This was expected, however, since the variables are proportional in any one site (i.e. they total 100%). It is not the individual variables themselves that are important, therefore, but how they interact with each other to produce the whole. This complexity was resolved by creating a composites variable, which effectively describes the medial sediment type on each ERS (termed Phi). This was done by multiplying the phi units for each substrate class by the proportion of the substrate that was found on each ERS. The products of this were summed to create a variable that provides one independent measure of substrate on each ERS (see Table 1).

Table 1: An example of the creation of the Phi variable for Elland 3 on the River Calder

Substrate	% observed	Phi Value	Proportion	Product
% boulder	5	-8.5	0.05	-0.425
% cobble	20	-6.5	0.20	-1.3
% pebble	60	-4.5	0.60	-2.7
% gravel	5	1.5	0.05	0.075
% sand	0	3.5	0	0
% silt	5	7.5	0.05	0.375
Phi Variable				**-3.975**

3. RESULTS

The raw data for the ERS Phase Two project can be found in Sadler and Petts (2000). Data from regional surveys of rivers in Devon and the Upper Severn are listed in Sadler and Bell (2000) and Sadler et al. (2000). The data collected as part of this project are listed by site and sampling technique in Appendix H.

3.1 Coleoptera

Total dataset comprises 81 sites drawn from England and Wales (Figure 1), and covers 33 national 10km grid squares. The total number of species is 603 and the total number of individuals is 53095. In terms of species richness the Staphylinidae dominate the assemblage with 215 species (over a third of the total). The Carabidae, Curculionidae, Chrysomelidae, water beetles (Dytiscidae, Haliplidae, Hydraenidae, Elmidae, Dryopidae and Sciritidae) and Elateridae have 128, 52, 42, 44 and 15 species respectively. Eighty-seven of the species recorded (14.4%) had moderate to total fidelity to ERS.

3.1.1 Conservation Status

Table 2 shows the numbers of beetles that are Rare and Nationally Scarce according the conservation reviews (Hyman 1992; 1994). The sites in which these species have been recorded are listed Tables G1-G4 in Appendix G. The total number of species with some kind of conservation status is 92. A total of 43 (=47%) of these species could be termed ERS specialists (i.e. fidelity classes 1-3). As one might anticipate the highest number of rare species were staphylinids at 37, followed by the carabids with 18 and the water beetles with 18.

Table 2: The numbers of Rare or Nationally Scarce beetles recorded in the survey(s) and the number of these that have class 3 or above fidelity to the sediments

Status	Number	Fidelity class 1-3	% with fidelity
N	13	8	62
Nb	45	15	33
Na	10	5	50
RDBK	9	6	67
RDBI	5	3	60
RDB3	6	5	83
RDB2	4	1	25
RDB1	0	0	0
TOTAL	92	43	47

3.1.2 BAP Species

In total, five species recorded in these surveys, *Perileptus areolatus*, *Lionychus quadrillum*, *Thinobius newberyi*, *Hydrochus nitidulus* and *Bidessus minutissimus* are on the UK Biodiversity Action Plan (BAP) list(s).

Figure 13 shows the distribution of the BAP species recorded in the survey. Each symbol indicates a record in one 10km square in the UK 100km grid. Table 3 shows the number of records for each species and the number of individuals captured at all sites.

Table 3: Records of UK BAP species recorded during the survey work. * indicates species are in the ERS Grouped Species Action Plan

BAP Species	Status	Number of 10 km Squares	Number of Sites	Number of Individuals
Bidessus minutissimus (Germ.)	RDB3	1	1	6
*Perileptus areolatus (Creutz.)	Na	10	16	61
*Lionychus quadrillum (Duft.)	RDB3	3	8	84
*Hydrochus nitidicollis Muls.	RDB3	1	1	1
*Thinobius newberyi Scheer.	RDBI	1	1	3
TOTALS		16	27	155

It is clear that the ground beetles *Perileptus areolatus* and *Lionychus quadrillum* were the most widely distributed of the species encountered. The former was found on all sites on the Rivers Severn, Tywi and Wye, where as the latter was recorded from all sites on the River Usk, three out of the four on the Tywi and one on the Ystwyth. It is interesting to note that although both species were found at sites on the Tywi neither was found in association on the Wye (only *Perileptus*) or the Usk (only *Lionychus*). *Perileptus areolatus* is clearly the most widespread species occurring in nearly a third of all the 10km squares sampled. The other three species were only recorded from single sites during excavations. *Bidessus minutissimus* was found 75cm down in the cobbles at Ty'n-yr-helyg on the Ystwyth and *Thinobius newberyi* was recorded in an excavation in a partially vegetated area on the sandy toe of the ERS at Llandwrda Station on the Tywi (Figure 13). *Hydrochus nitidicollis* was recorded from littoral silts at one site on the River Teign in Devon.

3.1.3 Endangered, rare and nationally scare species

No RDB1 species were recovered – not an unexpected result as only two species of ERS Coleoptera nationally have this status and neither are totally reliant on ERS. Of the four RDB2 species, the elaterid, *Negastrius sabulicola*, and the two elmids, *Stenelmis canalicualata* and *Normandia nitens* are extremely uncommon

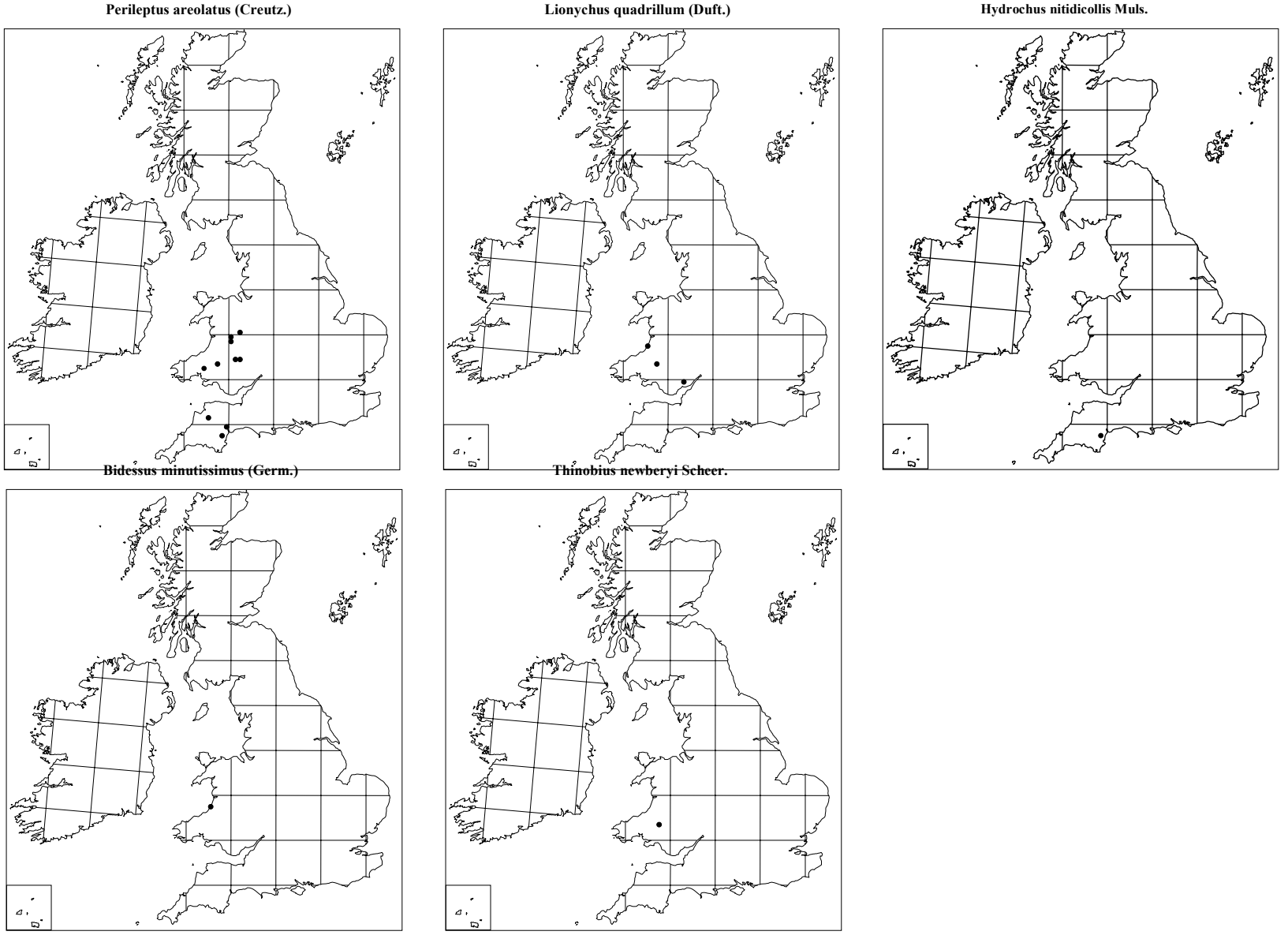


Figure 13: Records of the BAP species (plotted as 10km grid squares)

nationally. *Stenelmis* was only found at one site on the River Exe in Devon and similarly, *Normandia* was limited to one site at Monmouth in the lower reaches of the River Wye. Both species have only a handful of post 1980 records (Foster *in litt.*). *Negastrius sabulicola* was more widely distributed across Wales being found on all sites on the Usk and Wye and two sites on the Tywi (Table G2 Appendix G).

The total of 6 RDB3 species includes 5 ERS specialists. Three of these, *Bidessus minutissimus*, *Hydrochus nitidicollis* and *Lionychus quadrillum* are ERS BAP species and have been discussed above. The rare elmid, *Macronychus 4-tuberculatus*, is associated with submerged wood on large rivers and not an ERS specialist. It was recorded from both ERS at Preston Montford on the river Severn. The remaining two species, *Dryops nitidulus* and *Coccinella quinquepunctata* are tied to ERS, although the former only weakly so. Records of *D. nitidulus* exist from dune slacks and other sandy aquatic environments and it was recorded from all sites at Buckden on the Upper Wharfe. *C. quinquepunctata* exhibits more fidelity to shingle ERS and was found at all sites sampled on the Rivers Wye and Ystwyth, three sites on the Upper Severn and at Llandwrda Station on the Tywi (Tables G1-G2, G4, Appendix G).

Eight of the fourteen species with RDBK and RDBI status are gravel specialists and most of them (7 species) are staphylinids. *Bledius erraticus*, *Scopaeus gracilis*, *Gabrius astutoides*, and the BAP species *Thinobius newberyi* are recorded from solitary sites at Buckden 3 on the Wharfe, Glasbury shingles on the Wye, site 3 on the Creedy Yeo in Devon and Llandwrda Station on the Tywi respectively. *Hydrosmecta delicatula* was recovered from excavations in sandy shingles at four sites on the upper Severn, Glasbury on the Wye and and Llandwrda Station on the Tywi, while *Aloconota planifrons* was recorded from sand ERS on the Wye at Monmouth and Llangibby Bottom A1 on the Usk (Tables G1-G2; Appendix G). *Neobisnius prolixus* was the most widespread of this group and was found at 15 sites on the Rivers Ystwyth, Creedy Yeo, Tywi, Wye and Severn (Tables G1-G4; Appendix G). *Simplocaria maculosa* was found only on the silty heavily vegetated ERS on the lower Severn at Preston Montford, a similar habitat to previous records from Worcestershire (Johnson 1978) and southern Scotland (Luff and Eyre 1997). The tiny pselaphid, *Brachygluta pandellei* was recorded from the Ystwyth, Tywi and Upper Severn.

The remaining two-thirds of the total species with some kind of conservation designation have Notable A (Na), Notable B (Nb) and/or Notable status in the UK and over half of these are ERS specialists. The high incidences of gravel specialists in the Notable class are mainly small cryptic species of Staphylinidae such as the *Hydrosmecta* spp.

It is clear also that some sites have a much higher number of rarities that others (Table 4). The 'better' sites such as Glasbury on the Wye, Ty'n-yr-helyg on the Ystwyth, site 1 on the Teign and Llandwrda Station on the Tywi have a large number of species and this in part is clearly related to their size and the diversity of habitats on the ERS and the potential over-wintering habitat. The smaller polluted ERS sites (eg. Keighley on the Worth, Elland 3 on the Calder) and those sites that are heavily vegetated shingle ERS with complex floral communities (eg. many of the Devon sites eg. River Thrushel) have fewer species of conservation interest. Not surprisingly, given the availability of the shingle resource the sites with most rare and national scarce species are found in Wales and the south-west.

Table 4: Ranked list of Sites sampled in the surveys by the number of species of conservation interest

River	Site	RDB1	RDB2	RDB3	RDBI	RDBK	Na	Nb	N	Totals
Wye	Glasbury	-	1	1	-	3	4	3	3	15
Ystwyth	Ty'n-yr-helyg	-	-	3	-	2	-	4	2	11
Tywi	Llandwrda Station	-	1	1	1	2	2	1	3	11
Teign	Site 1	-	-	1	-	-	2	6	2	11
Usk	Llangibby Bottom A1 - Sand	-	2	-	-	1	-	3	4	10
Severn	Llandinam Hall - Site 1	-	-	1	-	4	2	4	2	13
Wye	Monmouth	-	1	-	-	1	-	5	2	9
Tywi	Llandovery - Site (a)	-	1	-	-	1	2	3	2	9
Otter	Site 3	-	-	-	-	1	1	6	1	9
Severn	Llandinam Hall - Site 2	-	-	-	-	5	2	1	4	12
Severn	Maesmawr Hall - Site 2	-	-	-	-	3	2	3	4	12
Wharfe	Buckden 2	-	-	1	-	-	1	3	3	8
Wharfe	Buckden 3	-	-	1	-	1	2	3	1	8
Wye	Bronydd Farm	-	1	1	-	1	2	1	2	8
Usk	Pencarreg Farm	-	1	1	-	-	1	4	1	8
Tywi	Penlan	-	1	-	-	1	2	3	1	8
Exe	Site 1	-	-	-	-	-	2	4	2	8
Severn	S. Llandinam - Site 1	-	-	1	-	4	1	2	2	10
Severn	S. Llandinam - Site 2	-	-	1	-	3	3	2	2	11
Severn	Maesmawr Hall - Site 1	-	-	-	-	3	2	3	3	11
Wharfe	Buckden 1	-	-	1	-	-	1	5	-	7
Usk	Llangibby Bottom A1 - Shingle	-	1	2	-	-	-	3	1	7
Tywi	Llandovery - Site (b)	-	1	-	-	2	2	1	1	7
Exe	Site 3	-	1	-	-	-	-	4	2	7
Teign	Site 2	-	-	-	-	-	-	4	3	7
Creedy Yeo	Site 3	-	-	-	1	-	-	3	3	7
Severn	Preston Montford 2	-	-	1	1	-	-	4	-	6
Tywi	Pferm Typica	-	1	-	1	1	1	1	1	6
Frome	Pallington 1	-	-	-	-	-	1	2	3	6
Exe	Site 2	-	-	-	-	-	-	4	2	6
Creedy Yeo	Site 1	-	-	-	-	1	-	3	2	6
Severn	Dolydd Hafren 1	-	-	-	-	1	-	2	2	5
Severn	Dolydd Hafren 2	-	-	-	-	1	-	3	1	5
Severn	Dolydd Hafren 3	-	-	-	-	2	1	1	1	5
Usk	Llangibby Bottom B	-	1	1	-	-	-	3	-	5
Otter	Site 2	-	-	-	-	-	-	2	3	5
Teign	Site 3	-	-	-	-	-	1	3	1	5
Torridge	Site 1	-	-	-	-	-	-	3	2	5
Yarty	Site 3	-	-	-	-	-	-	4	1	5
Ashop	Upper 3	-	-	-	-	1	-	2	1	4
Severn	Preston Montford 1	-	-	1	1	-	-	2	-	4
Worth	Keithleigh	-	-	-	-	-	-	3	1	4
Frome	Pallington 2	-	-	-	-	-	-	2	2	4
Erme	Site 3	-	-	-	-	-	1	2	1	4
Thrushel	Site 1	-	-	-	-	-	-	2	2	4
Torridge	Site 3	-	-	-	-	-	1	2	1	4
Yarty	Site 1	-	-	-	-	-	-	3	1	4
Alport	Upper 2	-	-	-	-	-	-	3	-	3

Ashop	Upper 1	-	-	-	-	1	-	2	-	3
Ashop	Upper 2	-	-	-	-	1	-	2	-	3
Ystwyth	Grogwynion	-	-	1	-	1	-	-	1	3
Dee	Bangor-on-Dee	-	-	-	-	-	1	1	1	3
Calder	Elland - Site 2	-	-	-	-	-	-	1	2	3
Camel	Site 2	-	-	-	1	-	1	1	-	3
Erme	Site 1	-	-	-	-	-	-	1	2	3
Taw	Site 3	-	-	-	-	-	-	2	1	3
Torridge	Site 2	-	-	-	-	-	-	-	3	3
Yarty	Site 2	-	-	-	-	-	-	1	2	3
Alport	Upper 3	-	-	-	-	-	-	2	-	2
Ashop	Lower	-	-	-	-	-	-	2	-	2
Axe	Slymlakes Farm 1+2	-	-	-	-	-	-	1	1	2
Highland Water	Lymmington 2	-	-	-	-	-	-	1	1	2
Erme	Site 2	-	-	-	-	-	-	2	-	2
Otter	Site 1	-	-	-	-	-	-	2	-	2
Thrushel	Site 2	-	-	-	-	-	-	2	-	2
Thrushel	Site 3	-	-	-	-	-	-	2	-	2
Creedy Yeo	Site 2	-	-	-	-	1	-	2	-	2
Alport	Upper 1	-	-	-	-	-	-	1	-	1
Alport	Lower 1	-	-	-	-	-	-	1	-	1
Alport	Lower 3	-	-	-	-	-	-	1	-	1
Wharfe	Castley	-	-	-	-	-	-	1	-	1
Calder	Elland - Site 3	-	-	-	-	-	-	1	-	1
Frome	Pallington 3	-	-	-	-	-	-	-	1	1
Axe	Slymlakes Farm 3	-	-	-	-	-	-	-	1	1
Highland Water	Lymmington 1	-	-	-	-	-	-	1	-	1
Camel	Site 1	-	-	-	-	-	-	1	-	1
Taw	Site 1	-	-	-	-	-	-	-	1	1
Taw	Site 2	-	-	-	-	-	-	1	-	1
Alport	Lower 2	-	-	-	-	-	-	-	-	-
Highland Water	Lymmington 3	-	-	-	-	-	-	-	-	-
Camel	Site 3	-	-	-	-	-	-	-	-	-

3.1.4 Rarity scores

The ERS Quality indices for each site are listed in ranked order (highest to lowest) in Table 5. The geographical picture suggested by merely examining the number of rarities was confirmed with the better sites having a predominantly western and northern distribution and are related to shingle (gravel-cobble) substrates. One of the highest ranked sites, Llandwrda Station on the Tywi, has more BAP species than any other site in the survey and a large number of 'quality' indicators (Table G2, Appendix G). Indeed, out of the top 19 sites, which are all in Wales, sites on the River Tywi consistently score highly. Sites on the Ystwyth, Usk and Wye also score highly, with the some of the Upper Severn sites running them a close second for 'regional honours'. The River Exe in Devon is the first site in England to score reasonably well along with the Severn at Preston Montford, site 1 on the Teign and site 3 on the Torridge. Issues concerning site quality are discussed more fully below (Section 4.1.3). Table 6 shows a ranking of the rivers in the surveys. The top 4 are all unregulated rivers originating in Wales and they have a wealth of shingle resources in their headwaters. The high score of the River Severn (despite some regulation in its upper reach) results from the

abundance of shingle ERS around Newtown and Welshpool and the dynamic nature of the flow regime. The highest ranked English rivers are the Teign and the Exe in Devon.

Table 5: Ranked site quality and ERS QI scores for the total dataset

Rivers	Sites	No. Scoring Species	Quality Score	ERS Quality Index
Tywi	Llandovery - Site (a)	13	110	846
Tywi	Llandwrda Station	21	171	814
Tywi	Llandovery - Site (b)	15	117	780
Usk	Llangibby Bottom A2 - Shingle	14	109	779
Tywi	Pferm Typica	14	103	736
Ystwyth	Ty'n-yr-helyg	20	145	725
Wye	Glasbury	26	187	719
Wye	Bronydd Farm	21	125	658
Severn	Dolydd Hafren 3	11	72	655
Tywi	Penlan	18	113	628
Ystwyth	Grogwynion	8	50	625
Usk	Llangibby Bottom B (2 reps)	14	87	621
Usk	Pencarreg Farm	17	105	618
Severn	Llandinam Hall - Rep 2	18	100	556
Severn	S. Llandinam - Rep 2	17	105	618
Severn	S. Llandinam - Rep 1	17	95	559
Exe	R1	18	96	533
Severn	Llandinam Hall - Rep 1	23	104	452
Severn	Maesmawr Hall - Rep 2	21	117	557
Severn	Maesmawr Hall - Rep 1	17	92	541
Teign	R1	27	131	485
Severn	Dolydd Hafren 1	9	43	478
Usk	Llangibby Bottom A1 - Sand	29	136	469
Frome	Pallington 3	7	30	429
Erme	R3	11	47	427
Torridge	R3	15	60	400
Dee	Bangor-on-Dee	7	28	400
Wharfe	Buckden 3	21	81	386
Yeo	R3	23	88	383
Severn	Dolydd Hafren 2	9	34	378
Wharfe	Buckden 2	18	64	356
Yeo	R1	22	77	350
Torridge	R1	13	45	346
Ashop	Upper 1	8	27	338
Severn	Preston Montford 2	9	30	333
Highland Water	Lymmington 1	6	20	333
Wharfe	Buckden 1	19	62	326
Teign	R2	24	77	321
Exe	R3	16	51	319
Ashop	Upper 3	11	35	318
Teign	R3	22	69	314
Wye	Monmouth	13	38	292
Calder	Elland - Rep 2	6	17	283
Otter	R3	17	48	282
Taw	All Reps	21	59	281
Erme	R1	18	50	278
Axe	Slymlakes Farm 1+2	13	36	277

Yarty	R1	21	58	276
Otter	R2	19	52	274
Thrushel	R1	14	38	271
Exe	R2	20	54	270
Yarty	R3	21	56	267
Frome	Pallington 1	6	16	267
Ashop	Upper 2	9	24	267
Alport	Upper 2	9	24	267
Camel	R1	10	26	260
Otter	R1	13	33	254
Worth	Keithley	8	20	250
Calder	Elland - Rep 3	4	10	250
Alport	Upper 3	11	27	245
Yeo	R2	19	46	242
Thrushel	R2	12	29	242
Axe	Slymlakes Farm 3	10	24	240
Erme	R2	16	37	231
Camel	R2	13	30	231
Severn	Preston Montford 1	7	16	229
Thrushel	R3	13	29	223
Torridge	R2	23	51	222
Yarty	R2	12	25	208
Highland Water	Lymmington 2	7	13	186
Alport	Lower 2	6	11	183
Wharfe	Castley	11	20	182
Alport	Lower 3	5	9	180
Ashop	Lower	5	9	180
Camel	R3	11	18	164
Alport	Upper 1	7	11	157
Frome	Pallington 2	4	6	150
Highland Water	Lymmington 3	4	6	150
Alport	Lower 1	7	10	143

3.1.5 Classification

The first and second divisions of the TWINSPAN classification divide the sites along a substrate axis separating the coarse cobble and boulder sites from the shingle, silt and sand ones. There is a clear cline from upland heavily armoured cobble and boulder ERS (eg. the Wharfe at Buckden and the Lower Alport, the upper reaches of the Ystwyth), through the coarser cobbles and pebble shingles (eg. River Torridge, Upper reaches of the Severn) and sandier shingles on the Rivers Usk and Wye, to the silts and sands of the Rivers Frome, Dee and Wye.

The remaining divisions separate the heavily vegetated ERS (both fine and coarse substates) from those that are poorly vegetated. Here the mature vegetation that characterises many of the shingle sites in Devon (eg. Rivers Camel, Thrushel, Yarty and so on) finds parallels with the more dense vegetation on silts and sands on the Lower Severn (Preston Montford), the Wye at Monmouth, the wooded chert ERS in the New Forest (eg. the Highland Water) and the polluted cobbles of the Rivers Worth and Calder. In total, nine ecologically meaningful groups can be identified and their characteristics are described below. The mean, maximum

and minimum values for a selection of the environmental variables for each end group are listed in Table 7.

Table 6 Rivers ranked by collective ERSQI scores (from all sites)

Rivers	No sites	Scoring sp.	ERSQI
Tywi	**5**	**31**	**861**
Ystwyth	**2**	**19**	**842**
Wye	**3**	**31**	**597**
Severn	**11**	**38**	**523**
Usk	**4**	**38**	**520**
Teign	**3**	**19**	**432**
Exe	**3**	**44**	**430**
Yeo	**3**	**40**	**413**
Dee	**1**	**8**	**400**
Wharfe	**4**	**29**	**393**
Torridge	**3**	**28**	**340**
Erme	**3**	**26**	**331**
Frome	**3**	**14**	**325**
Calder	**2**	**12**	**314**
Otter	**3**	**26**	**296**
Yarty	**3**	**21**	**286**
Ashop	**3**	**14**	**281**
Taw	**3**	**20**	**281**
Alport	**6**	**16**	**279**
Thrushel	**3**	**20**	**275**
Axe	**2**	**8**	**259**
Highland Water	**3**	**30**	**256**
Worth	**1**	**8**	**250**
Camel	**3**	**8**	**213**

Group 1

Small upland boulder-cobble ERS on the rivers Alport and Ashop. The ERS are small, grazed and surrounded by rough acid grassland and peat and have a silty shale matrix with little fine material (Table 7). Species include, *Bembidion tibiale* and the more local *Tachys parvulus, B. andreae, B. femoratum*. The rove beetles include species such as *Deleaster dichrous*, *Hydrosmectina septentrionum*, and *Hydrosmecta sp*. and the more common *Aloconota cambrica* and *A. currax*. A rather poor quality set of ERS with an ERSQI mean of 225 (Tables 5, 7)

Group 2

Sites on the Upper River Wharfe and Upper Ystwyth with predominantly heavily armoured cobble ERS with very little sand in matrix, although coarse sandy beaches occur on some ERS (Table 7). Characteristic species include gravel specialists such as *Bembidion atrocoeruleum* and *B. decorum*, accompanied by the less fastiduous *B. tibiale* and *B. punctulatum*. Rarer shingle specialist species such as the elaterid, *Fleutiauxellus maritimus*, and the stapylinids, *Deleaster dichrous*, *Lathrobium angusticolle* were common on the cobble sediments upstream

at Buckden and *Brachygluta pandellei* and *Coccinella quinquepunctata* were found on the Ystwyth. The ERSQI on this grouping was moderately high (Tables 5, 7).

Table 7: Environmental variables and the TWINSPAN classification

Environmental		Twinspan group								
Variables	**Statistic**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Phi	Mean	-2.31	-4.16	1.84	-2.03	0.51	-2.27	-1.53	-1.31	3.18
	Max	-0.55	-3.88	3.7	1.3	3.3	-0.1	1.075	2.7	6.925
	Min	-6.0	-4.5	-0.9	-5.5	-4.7	-4.7	-4.3	-4.3	-4.4
%fines	Mean	11.3	9	60	16	46	16	22	23	66
	Max	25	11	90	43	70	35	55	60	100
	Min	1.0	5.0	20.0	0.0	10.0	5.0	5.0	5.0	5.0
%org.	Mean	0.2	0.0	1.0	0.3	0.0	0.1	0.0	1.7	4.2
	Max	2	0	5	2	0	1	0	10	10
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%sand	Mean	9.3	7	58	15	39	12	20	17	25
	Max	20	10	85	40	60	25	55	40	95
	Min	1.0	5.0	20.0	0.0	10.0	5.0	5.0	0.0	0.0
%shade	Mean	33.5	13	3	0	58	15	61	87	45
	Max	100	25	10	5	90	50	100	100	100
	Min	0.0	0.0	0.0	0.0	40.0	0.0	15.0	50.0	0.0
%silt	Mean	2	2	2	1	7	3	2	6	41
	Max	5	5	10	3	10	10	10	20	90
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%Vegcov	Mean	14.1	52	17	9	48	28	35	41	73
	Max	40	70	70	55	90	50	65	100	100
	Min	0.0	25.0	0.0	0.0	20.0	10.0	8.0	0.0	0.0
bankprof (1-3)	Mean	1	1	1	1	1	1	1	1	1
	Max	1	1	1	1	1	1	2	2	2
	Min	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
ERShet (1-3)	Mean	1	1	2	2	2	3	2	1	1
	Max	1	2	3	3	3	3	3	2	2
	Min	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
ERSprof (1-3)	Mean	1.6	2	2	2	1	2	1	1	2
	Max	2	3	2	3	1	2	2	1	3
	Min	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
ERSQI (0-900)	Mean	225	446	641	597	275	330	295	264	277
	Max	338	625	779	846	346	533	427	333	429
	Min	143	326	469	356	164	222	208	223	150
ERStop (1-3)	Mean	1.1	1	1	2	1	2	2	1	1
	Max	2	2	3	3	1	3	3	1	1
	Min	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Grazed (0-1)	Mean	0.9	0	1	1	0	0	0	0	0
	Max	2	0	2	2	0	1	1	0	1
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hibpot (1-3)	Mean	2.1	2	3	2	3	3	3	3	2
	Max	3	3	3	3	3	3	3	3	3
	Min	2.0	2.0	2.0	1.0	2.0	2.0	2.0	1.0	1.0
Length (m)	Mean	47.2	46	54	65	40	46	18	16	26
	Max	120	70	100	150	55	70	25	25	100
	Min	7.0	17.0	30.0	20.0	10.0	20.0	10.0	7.0	4.0
VegType (1-3)	Mean	1.5	2	1	1	3	2	3	2	3

	Max	2	3	3	3	3	3	3	3	3
	Min	1.0	2.0	1.0	1.0	2.0	1.0	2.0	1.0	1.0
Width (m)	Mean	15.2	12	23	21	14	18	8	6	9
	Max	30	25	50	50	20	30	10	10	50
	Min	3.0	4.0	14.0	7.0	5.0	6.0	5.0	3.0	2.0

Group 3

This comprises a small group of very sandy ERS with a fair amount of silt on the fringes and in backwaters from the River Usk (all four sites) and Glasbury Shingles on the Wye. Habitat heterogeneity is high, as is the rarity value (Table 7). Species richness and fidelity is high and the assemblage includes the BAP ground beetles, *L. quadrillum* from sites on the Usk, and *P. areolatus* on the Wye. The rare Elaterid, *Negastrius sabulicola* is common to all sites and the Nationally Scarce staphylinid *Thinobius bicolor* was found at Pencarreg on the Usk and Glasbury.

Group 4

Classic 'shingle sites' with a diversity of microhabitats and a heterogeneous structure. The predominant sediment type is pebble-cobble but the matrix sediments are much richer in sands than the sites in group 2. The site quality is very high (Table 7) and the sites include ERS on the Tywi, the Usk, Wye, Severn and Ystwyth in Wales, Buckden 2 on the Wharfe and sites on the Torridge in Devon. The assemblage is dominated by high and total fidelity species such as the elaterids *Fleutiauxellus maritimus* and *Negastrius sabulicola*, the 5 spot ladybird, *Coccinella quinquepunctata,* BAP species such as *Thinobius newberyi*, *Perileptus areolatus*, *Bidessus minutissimus* and *Lionychus quadrillum* and small staphylinids such as *Hydrosmecta spp*.

Group 5

This is the first of the groups comprising all of the sites from Devon and Cornwall. The sites (on the Camel, Teign2 and 3 and Torridge1) were small, heavily vegetated and shade, and had fine substrate including a high proportion of sands and silts (Table 7). The number of rare species recorded was low (Table 4) and only relatively few species exhibited high fidelity to the sediments. The dominant species were *Ochthephilus omalinus agg.* and other wetland associated taxa such as *Agonum sp*.

Group 6

The larger, less vegetated and heterogeneous Devon ERS fall into this category, including sites on the Teign1, Exe (all sites), Torridge2 and Otter (all sites). The number of rare species is high, as is the overall fidelity of the assemblages to ERS habitats (Table 7). The species recovered include the small carabid *Tachys parvulus*, the most southerly occurrences of *Perileptus areolatus*, the endangered elmid, *Stenelmis canaliculata* (from the River Exe) and the small staphylinids, *Hydrosmecta spp*. *Hydrosmectina septentrionum* and the Nationally Scarce *Thinobius bicolor* (from the Teign 1 only).

Group 7

This group includes a mixture of very heavily vegetated small shingle ERS on the Rivers Camel1, and Yarty1-2 to more heterogeneous sites such as those on the Rivers Erme and Yeo, with a more diverse run of sediments. All sites have relatively wooded corridors and although ERS specialists are widespread, such as the carabids, *Bembidion atrocoeroleum* and *B. decorum* and the staphylinids, *Ochthephilus omalinus agg.* and *Thinodromus arcuatus*, the fauna has only relatively few rarities (Tables 5, 7; Table G3, Appendix G). The aquatic species are well represented (eg. *Hydraena rufipes* and *Ochthebius bicolon*), however, and ERS specialists staphylinids occur sporadically on Rivers such as the Erme (eg. *Philonthus atratus*) and the Creedy Yeo (*Gabrius astutoides* and *Neobisnius prolixus*).

Group 8

A group of small, partially vegetated and near shaded cobble ERS in dense woodland on the rivers Thrushel (1-3), Yarty (3) and Highland Water in the New Forest (Table 7). Characteristically, the sites have little heterogeneity of either habitat or sediment type and a paucity of ERS specialists but a few interesting rarities such as *Bembidion monticola* and *Hydraena rufipes* (on the Yarty) and *H. nigrita* from the Highland Water (Table 4, 5, 7).

Group 9

This group comprises very heavily vegetated and often wooded ERS on sand and silt substrates. This includes sand sites on the Dee, Wharfe (Castley) and silty sites at Preston Montford on the Severn and silts on the Frome at Pallington. In addition, polluted ERS on the rivers Calder and Worth and one the Highland water sites classify out in this group probably as a result of the amount of silt and organic material in the shingles. The quality scores are low-moderate (Table 7), but some sites such Monmouth and Preston Montford score more highly (Table 5). Specialist species include *Bembidion gilvipes* and *Trechus discus* from the Rivers Dee, and Severn, *Bembidion stomoides* from the Worth and the endangered elmid, *Normandia nitens* from Monmouth of the Wye.

3.1.6 Environment-species relationships

The significance of the environmental variables was assessed using forward selection routines within a RDA in Canoco for Windows 4.0 (ter Braak & Šmilauer 1998).

Run 1 – all variables

In the first run all the environmental variables were tested against the species data (excluding those that had been removed earlier; section 2.5.3; Appendix F).

A combination of both landuse and ERS variables were significantly related to the dataset (Table 8). Of the former, Moorland (p=0.005), Ungrazed improved grassland (p=0.005), Improved grassland (p=0.02), Mixed woodland (p=0.01), Coniferous plantation (p=0.04) and Urban p=(0.045) are all important and effectively describe the adjacent landuse of most of the sites sampled in the survey. The percentage of shade by trees (p=0.005), Phi (p=0.005), ERS habitat heterogeneity (p= 0.05), the percentage of sand (p=0.005), vegetation type (p=0.005), grazing (p=0.02) and ERS width (p=0.035) are the ERS variables that significantly contribute the species – environment model.

Table 8: shows the results of the forward selection of the ERS variables. (Full names of the variables can be found in Appendix F). * indicates significance at 5% level.

Variable	Var.N	LambdaA	P Value	F-Ratio
moor	12	0.1	0.005*	8.36
%shade	26	0.07	0.005*	6.05
Phi	1	0.05	0.005*	4.46
Ungrazip	16	0.03	0.005*	3.46
ERShet	25	0.03	0.005*	2.9
%sand	3	0.03	0.005*	2.35
Improgra	15	0.02	0.02*	2.2
Mixwood	10	0.02	0.01*	1.89
Conifpla	11	0.02	0.04*	1.86
urban	18	0.01	0.045*	1.78
VegType	6	0.02	0.005*	1.91
Grazed	19	0.02	0.035*	1.72
Width	9	0.01	0.02*	1.74
arable	17	0.02	0.085	1.42
Hibpot	31	0.01	0.045*	1.55
%silt	4	0.01	0.025*	1.43
ERSprof	23	0.02	0.07	1.44
scrub	13	0.01	0.18	1.17
Trampling	20	0.01	0.2	1.17
Length	8	0	0.505	0.94
ERStop	24	0.01	0.655	0.86
Vegcov	7	0.01	0.73	0.81
%org.	2	0.01	0.845	0.71

Run 2 – ERS variables

In the second run the 'landuse' variables were excluded from the analysis, in an attempt to examine the importance of the ERS variables in isolation (Table 9).

For the species dataset as a whole the percentage of shade on the ERS, ERS heterogeneity, Phi and the percentage of sand are the most important environmental variables operating on the Coleopteran community (all p=0.005). Other variables significant to the 5% level include the amount of grazing (p=0.01), the percentage of silt (p=0.025), vegetation type (p=0.02), and ERS width (p=0.05).

Table 9: Forward selection of ERS variables for the Coleoptera. * indicates significance at 5% level.

Variable	Var.N	LambdaA	P Value	F-Ratio
%shade	26	0.07	0.005*	5.66
ERShet	25	0.05	0.005*	4.09
Phi	1	0.05	0.005*	4.09
%sand	3	0.03	0.005*	2.48
Grazed	19	0.02	0.01*	2.04
%silt	4	0.02	0.025*	1.56
VegType	6	0.01	0.02*	1.59
Width	9	0.02	0.05*	1.46
Vegcov	7	0.01	0.325	1.02
Hibpot	31	0.01	0.43	1.01
Length	8	0.01	0.74	0.82

The RDA biplots showing the environmental variables and sites and species data are given as Figures 14 & 15. The percentage variation in the species data that was explained by the first ordination axis is 10.1%, falling to 5.7%, 4.2% and 3.2% for axes 2 to 4 respectively. This means that axis one is the most important axis in explaining the species-environment interaction. Figure 14 shows a differentiation across this axis of predominantly sand and silt ERS (eg. Dee, Monmouth and Preston Montford) on the right to coarser sediment (mainly cobbles) to the far left of the plot (eg. Maesmawr Hall, Llandovery, and the Exe). Significant variables correlated to axis one include Vegetation type, grazing, and % Shade. ERS habitat heterogeneity is important on Axis 2, as is percentage of sand and hibernation potential, although the latter is not significant at the 5% level (Table 10). Thus the larger more heterogenous ERS with a large amount of sand in the cobbles (eg. Glasbury, Teign 1 and sites on the Tywi and Upper Severn) are found in the upper left section of the diagram and as the symbols indicate they represent the higher quality sites. A group of heavily grazed cobble sites on the Upper Alport, Upper Ashop, Dolydd Hafren and Maemawr Hall are situated to the bottom left.

Figure 15 shows the species distributions in relation to the environmental variables. Species exhibiting high and total fidelity to shingle (such as *Fleutiauxellus maritimus, Neobisnius prolixus*, *Perileptus areolatus*, *Coccinella quinquepunctata*, *Hydrosmecta spp*. and *Bembidion atrocoeruleum*) are related to ERS habitat heterogeneity, coarser sediments and larger ERS and are located in the top left of the biplot. Species that require more 'sand' in the substrate, such as *Thinobius bicolor*, *Thinodromus arcuatus* and *Negastrius sabulicola* are more centrally placed extending along axis 2. To the far right one finds species associated with silt and sand substrates with more mature vegetation communities and greater amounts of shade, such as the ground beetles *Bembidion gilvipes*, *B. dentellum* and *Trechus discus*. Species preferring sandier fine substrates, such as *Tachyusa* spp. and *Philonthus rubripennis* are located more centrally on the plot. Species characteristically associated with upland cobbles, such as the ground beetles *Bembidion andreae* and *Nebria gyllenhali* and the staphylind *Geodromicus nigrita*, are found at the bottom of the plot along axis 2.

Table 10: The correlation scores of the Environmental Variables with the first four axes (Emboldened variables are significant at 5% level).

Variable	Axis 1	Axis 2	Axis 3	Axis 4
Av.Phi	0.5098	0.2789	0.3667	-0.1926
%sand	0.2505	0.4174	0.141	0.4486
%silt	0.4417	0.0414	0.2998	-0.4427
VegType	0.4561	0.1452	-0.2612	-0.004
Vegcov	0.5614	0.11	0.1009	-0.1525
Length	-0.4876	0.0307	0.2073	0.0057
Width	-0.4853	0.1635	0.0673	0.0706
Grazed	-0.3734	-0.1969	0.3529	-0.0285
ERShet	-0.4198	0.5168	-0.302	-0.1125
%shade	0.6485	-0.0763	-0.352	-0.0429
Hibpot	0.0462	0.2827	-0.2617	-0.049

3.1.7 Conclusions

A large and varied fauna of beetles has been collected during the survey and a proportion of them (14.4%) exhibit fidelity to ERS. Five species on the UK BAP lists were recorded during the work. Multivariate and rarity analyses indicate that the communities are related to sediment type, landuse and local site factors, such ERS habitat heterogeneity, percentage of shade, grazing levels and the type of vegetation. The high quality sites in terms of rarity and species fidelity were located in Wales and SW England.

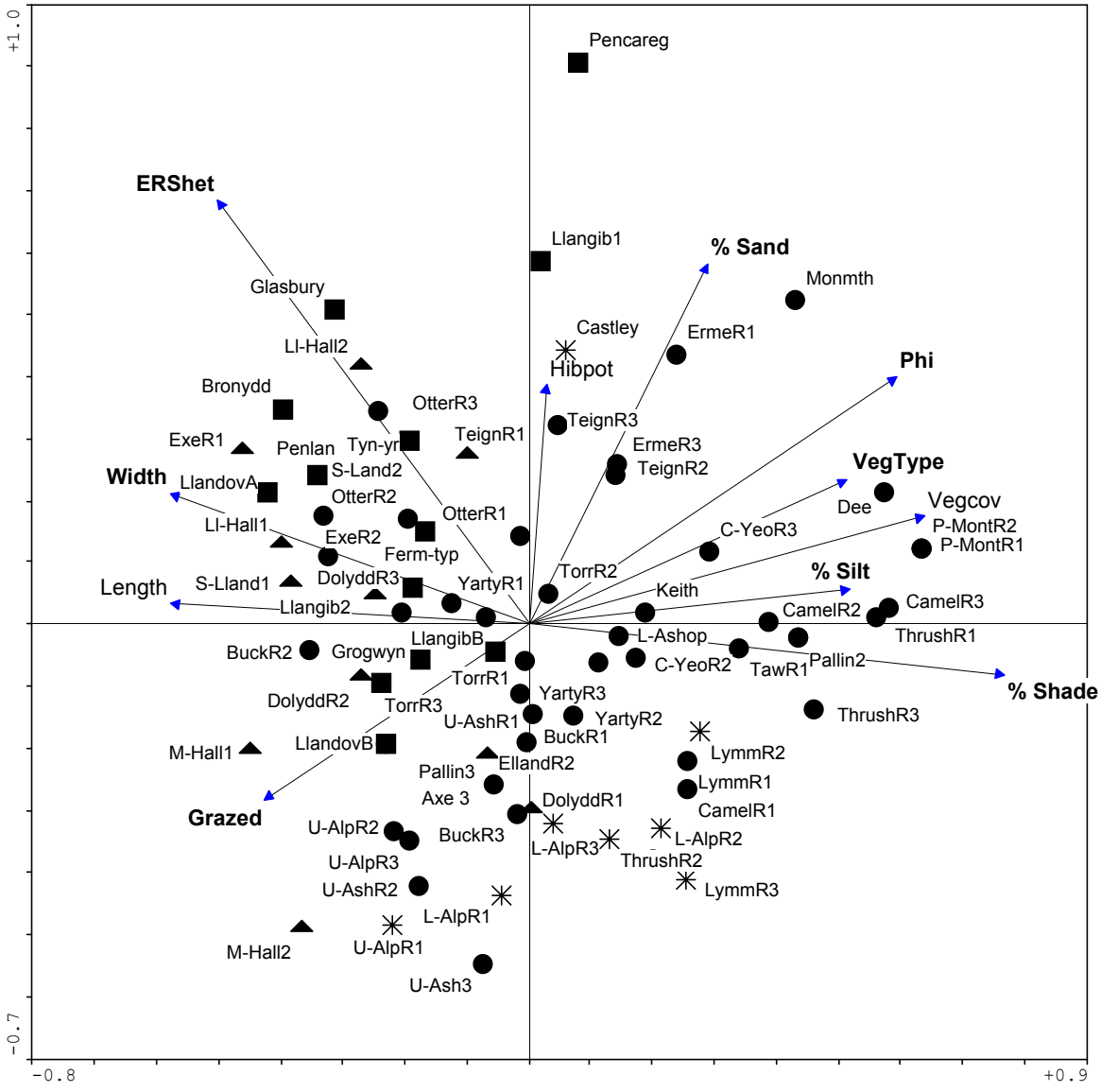


Figure 14: RDA biplot of sites against environmental variables for the Coleoptera. The symbols indicate the ERSQI scores for each site (squares = >600, triangles = 400-600, circles = 200=399, crosses = 0-199).

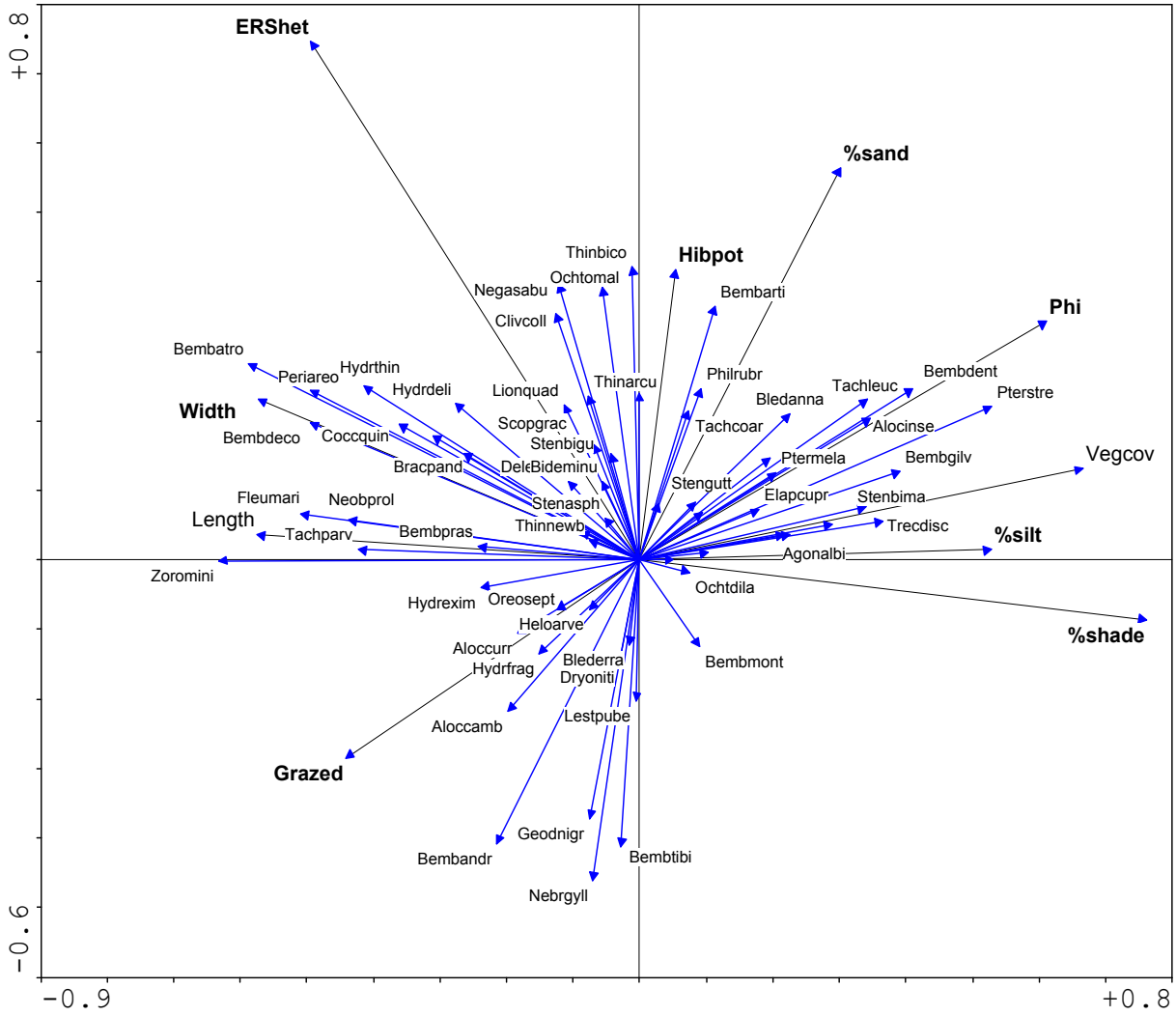


Figure 15: RDA biplots of Environmental Variables against species of Coleoptera

3.2 Araneae

The total dataset comprises 47 sites from England and Wales. The total number of species was 124 and the total number of individuals was 11,342. The majority of the species belong to the wolf spiders (Lycosidae) and money spiders (Linyphiidae).

The percentage of species exhibiting fidelity to the sediments is low (c. 9%). Most of the species are generalists in grassland and woodlands. Such a low level of fidelity is not too surprising given that only 3 species, *Diplocephalus connatus, Caviphantes saxetorum* and *Arctosa cinerea*, are known obligates to ERS, although a further 10 are thought to have moderate to high fidelity to the sediments (Eyre and Lott 1997). Seven of these 13 species were recovered during the surveys. Moreover, as the Araneae are habitat generalists and much of the literature talks of habitat choice in terms of 'damp' or 'wet' preferences and the importance of vegetation structure (Bell

et al. 1999), a preponderance of grassland and woodland related species is not an unexpected result.

3.2.1 Conservation Status

It was impossible to produce rarity analyses for all sites in the survey in the same way as has been done for the Coleoptera due to the absence of national distributional data, coupled to the low numbers of ERS specialist in the Spider fauna. Site quality assessments are based only on the species that are nationally scarce. Of the 124 species recorded in this survey, relatively few are locally distributed in the UK, and only three have any conservation status (Tables G1-G4 in Appendix G). The large wolf spider, *Arctosa cinerea* is a Nb species consistently associated with ERS and lake shore environments (Roberts 1985). *A. cinerea* was recorded during the survey on most of the large shingle sites in Wales (the sites on the Ystwyth, the Upper River Severn, the Wye, the Usk and the Tywi), although it has not been recorded from any ERS in the south-west. *Caviphantes saxetorum* usually occurs under large stones embedded in sandy-shingly riverbanks. This species, found at Buckden on the Wharfe, the River Ashop (Upper) and on the Upper Severn at Llandinam, has Na status. Elsewhere, it has been recorded from relatively few localities in Northern England, Scotland and Wales (Merrett 1992). *Diplocephalus protuberans* is a Nb species that is known only from the north of England, Scotland and north Wales (Roberts 1987). In this survey the species was recorded only from the Alport (Upper) and although not an obligate species, it is moderately tied to ERS.

3.2.2 Classification

The first division of the classification separates the data into a group of large and heterogenous ERS of predominantly Welsh sites (on the rivers Wye, Severn, Ystwyth, Tywi and Usk), which includes Castley on the Lower Wharfe. On the other side of the division there are sites that comprise upland cobbles (Buckden on the Wharfe and the ERS on the Ashop and Alport in Derbyshire), sands (Monmouth, River Wye) and silts (Pallington 1-3 on the Frome and Preston Montford on the Severn). Even at this high level in classification the species are divided between the few species with ERS fidelity such as, *Arctosa cinerea, Pardosa agricola* and *Oedothorax apicatus* and the 'generalists' that are associated with grassland and woodland. Divisions 2 and 3 split the woodland sites from the other heavily vegetated sand and silt sites and the ERS of the Upper Severn from the other Welsh sites. It was not possible to differentiate between the Welsh shingle ERS any further, even though this group was the largest in the dataset. Thus there are 4 groupings of sites that are interpretable in ecological terms.

Group 1

This comprises large and diverse ERS on the rivers Wye (Bronydd and Glasbury), the Usk (all sites), the Tywi (all sites) and the heavily trampled and disturbed sites at Dolydd Hafren 1-3 and Maesmawr Hall 1-2 on the River Severn. The dominant species are *Arctosa cinerea*, *Pardosa agricola* and *Oedothorax apicatus*.

Group 2

There are four sites in this group all from the Upper Severn catchment (near Llandinam). The sites are large, cobble point bars with varying levels of disturbance, due to trampling from livestock. The high fidelity species are evident, but these are augmented by more common species such as *Pardosa palustris* and *P. amentata*.

Group 3

This group comprises upland cobble sites on the Rivers Ashop, Alport and Wharfe (Buckden sites 1-3). The ERS are small partially grazed and the spiders are predominantly upland grassland species such as *Oedothorax agrestris*. *Arctosa cinerea* was not recorded from any of these ERS (despite very good sample recovery), although the diminutive shingle specialist, *Caviphantes saxetorum* was found on two sites on the Wharfe and on the Upper Ashop.

Group 4

A mixed group of sites spanning heavily vegetated silts on the Frome at Pallington and Severn at Preston Montford, through sands on the Wye at Monmouth, to wooded and silty (chert) gravel ERS on the Highland Water in the New Forest.

3.2.3 Species-Environment Relationships

The data were treated in the same manner as the Coleoptera with all environmental variables being assessed in the first instance.

Run 1 – all variables

The presence of adjacent moorland was the most important significant variable (p=0.005) (Table 11), along with the percentage of shade (p=0.005), the percentage of silt (p=0.02), and the percentage of vegetation cover (p=0.04). Additional 'landuse' variables related to the model were scrub (p=0.04) and improved grazing (p=0.01)

Table 11: Forward selection of the Environmental Variables during the Spider CCA. * indicates variables that are significant to the 5 % level.

Variable	Var.N	LambdaA	P Value	F-Ratio
moor	10	0.23	0.005*	3.14
%shade	24	0.2	0.005*	2.89
%silt	39	0.14	0.02*	2.06
improgra	13	0.14	0.01*	2.15
Vegcov	5	0.1	0.04*	1.61
scrub	11	0.1	0.04*	1.51
Phi	3	0.1	0.065	1.54
%sand	38	0.08	0.1	1.32
Grazed	17	0.07	0.32	1.13
ERShet	23	0.1	0.09	1.5
bankprof	20	0.06	0.32	1.02
Hibpot	29	0.06	0.31	1.04
tramplin	18	0.06	0.385	0.96

VegType	4	0.06	0.495	0.94
Length	6	0.06	0.46	0.94
ERSprof	21	0.05	0.625	0.78
ungrazip	14	0.04	0.665	0.77
ERStop	22	0.05	0.73	0.78
Mixwood	8	0.05	0.76	0.7
Grpoach	19	0.04	0.775	0.69
Width	7	0.04	0.895	0.58
arable	15	0.04	0.885	0.49

In the second run through the model the 'landuse' variables were removed from the analysis to examine the factors that might be influencing the ERS faunas at a site level.

Run 2 – ERS variables

ERS habitat heterogeneity (p=0.005) is the most significant environmental variable related to the ordination axes during the CCA of the reduced environmental dataset (Table 12). Additional significant variables include the percentage of silt (p=0.025), and grazing (p=0.005).

Table 12: Forward selection of ERS variables during the Araneae CCA. * = variables that are significant to the 5 % level.

Variable	Var.N	LambdaA	P Value	F-Ratio
ERShet	23	0.22	0.005*	2.96
%silt	39	0.16	0.025*	2.32
Grazed	17	0.14	0.005*	2.04
Vegcov	5	0.1	0.1	1.44
Phi	3	0.07	0.32	1.1
%sand	38	0.1	0.06	1.42
%shade	24	0.08	0.18	1.16
Hibpot	29	0.06	0.415	0.98
VegType	4	0.05	0.79	0.73
Length	6	0.05	0.765	0.73
Width	7	0.03	1	0.47

Axis one of the CCA ordination (Figures 16 & 17) accounts for 9.1% of the total species variation and is the most important axis of the four. Axes 2-4 add a further 5.1%, 4.4% and 3.6% of total cumulative variance respectively. ERS habitat heterogeneity is strongly correlated with axis one of the biplot (Table 13), as the percentage of shade and ERS length and width, although none are statistically significant. Axis two indicates the main substrate gradient from fine sediments to cobbles and boulders. It is no surprise, therefore, that the percentage of silt is correlated to this axis, as are vegetation type and the percentage of vegetation cover.

The CCA biplots illustrate the importance of substrate along axis 2 (Figure 16). Heavily vegetated silt and sandy ERS are at the top left of the plot (eg. Pallington 1, Preston Montford 2 and Monmouth), whereas cobble and shingle ERS predominate in the bottom right of the diagram (Upper Alport and Upper Ashop sites). It is worth noting that the heavily vegetated and shaded cobble ERS extend out along axis 1 at

the bottom right (eg. Lymm R1- R3 on the Highland Water and the sites on the Lower Alport), indicating spider assemblages that are quite different from those upland cobbles. To the left of the biplot extending down axis one are the Welsh shingle sites. This group also span along axis 2 with more armoured cobble ERS that were subjected to heavy grazing and trampling at the bottom centre left (eg. Pallington 3 on the Frome and sites on the Upper Severn), and larger sandy ERS in the top right of the plot (eg. Pencareg on the Usk and Glasbury on the River Wye).

Table 13: Inter set correlations of environmental variables with axes. Variables emboldened are significant.

Variable	Axis 1	Axis 2	Axis 3	Axis 4
Phi	-0.0057	0.4984	0.4485	-0.1335
VegType	-0.1529	0.4545	-0.3017	-0.2291
Vegcov	-0.2753	0.5545	-0.1708	-0.2146
Length	0.3719	-0.2028	-0.1318	-0.0296
Width	0.4489	-0.0852	-0.1747	-0.0292
Grazed	0.2567	-0.3078	0.256	0.0006
ERStop	0.4818	0.0272	0.0391	0.0558
ERShet	0.6753	0.1367	0.0081	0.015
%shade	-0.5087	0.3431	0.0545	0.3173
Hibpot	0.3101	0.0619	0.3023	0.287
%sand	0.305	0.2431	-0.0989	-0.117
%silt	-0.3064	0.6552	0.2835	-0.062

The few shingle specialists in the spider fauna, namely *Arctosa cinerea*, *Pardosa agricola* and *Oedothorax apicatus* are located together on axis 1 to the right of the origin, indicating a preference for larger more heterogeneous ERS (Figure 17). The tiny ERS specialist, *Caviphantes saxetorum* appears to show a preference for cobble ERS.

3.2.4 Conclusions

The spider assemblages exhibit only low fidelity to ERS and are habitat generalists as a rule. However, the few species that are shingle specialists appear to have a limited range of tolerance being found only on larger ERS with a more diverse range of sediments. Moreover it appears that the specialist Araneae on shingle sites are relatively intolerant of disturbance by livestock.

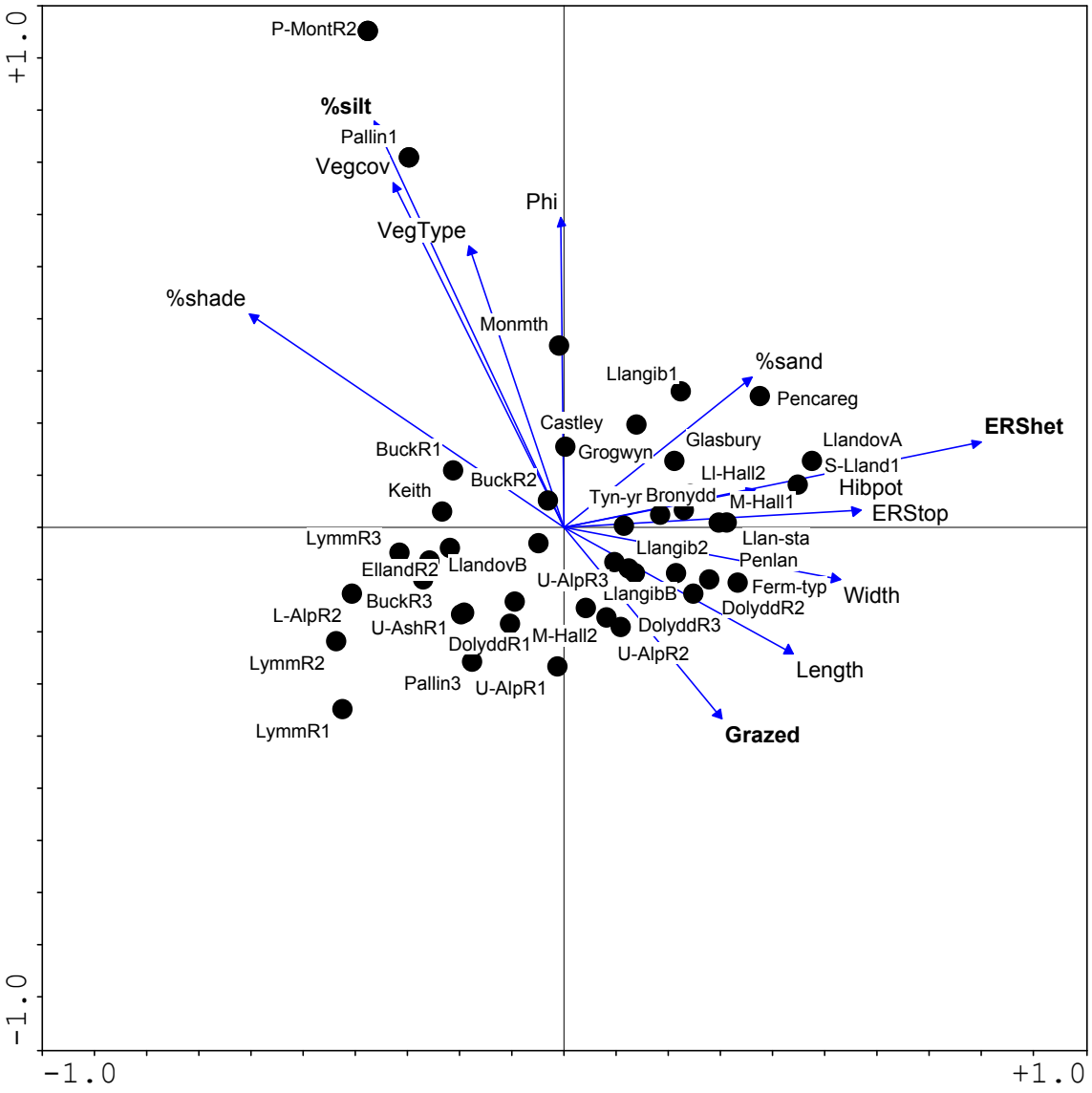


Figure 16: CCA biplot of sites against environmental variables - Araneae

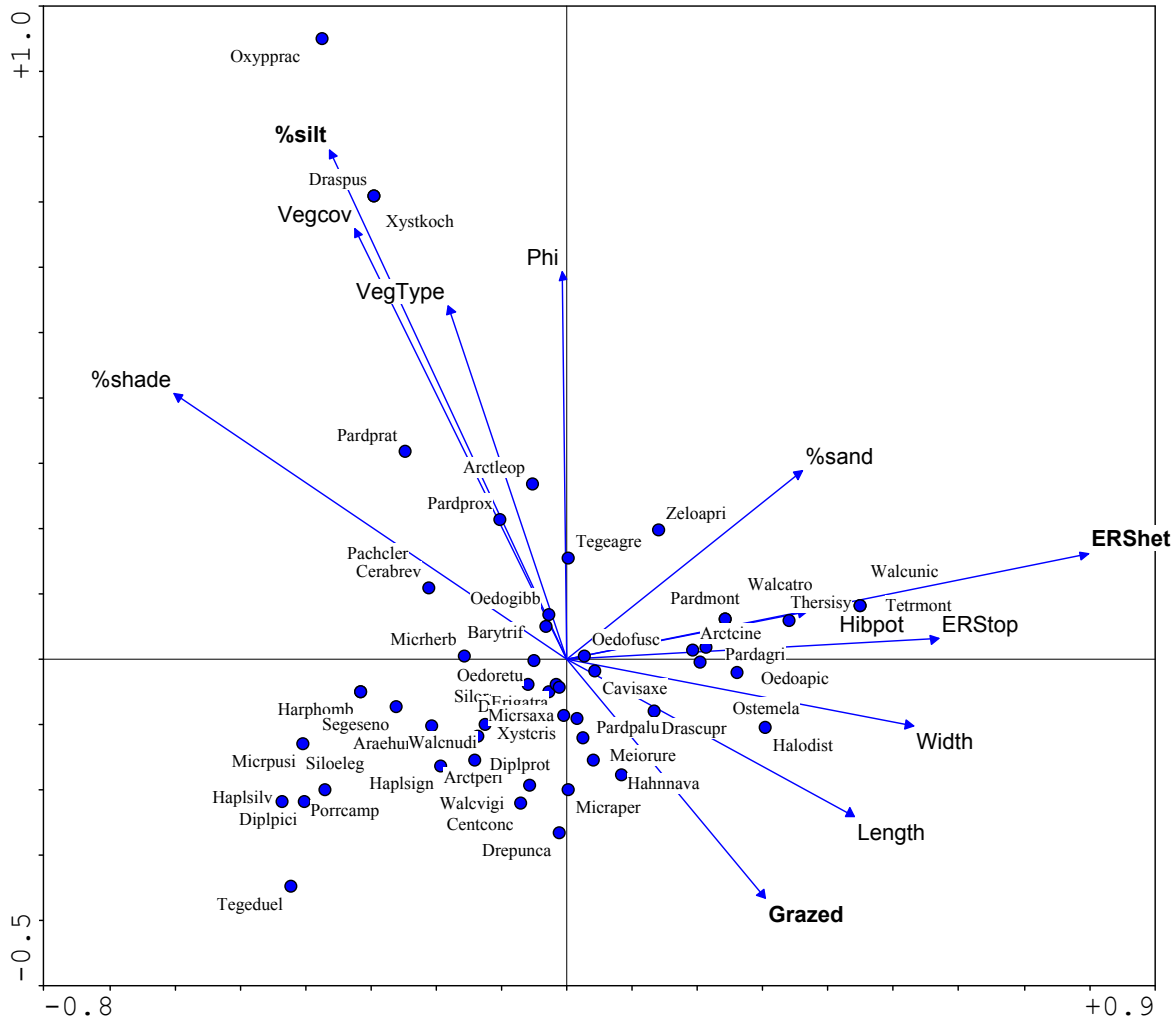


Figure 17: CCA biplots of Environmental variables against Araneae species

4. ANALYSIS AND DISCUSSION

Two large and useful databases of species occurrence on ERS habitats have been assembled as a result of this work. The datasets include a large number of species and individuals captured through standardized survey techniques. The Coleoptera, in particular, illustrate the importance of ERS as habitats that provide refuge for large numbers of endangered, Rare and Nationally Scarce species. The work, particularly when coupled with recent published records of rare and notable species from Scotland (Eyre et al. 1998; 2000), furthers our understanding of the distribution and ecology of ERS specialist species.

4.1 Conservation status and species distribution

A total of 81 sites covering 33 10km grid squares have been sampled as a result of the fieldwork detailed in this report. Eyre et al. (1998; 2000) have sampled a further 204 sites (totalling 46 grid squares). This means that for many Rare and Nationally Scarce species an attempt can be made to assess their likely distribution patterns (Table 14).

4.1.1 BAP species

As noted earlier five species presently on the British BAP list (s) were recorded during this survey work (Table 14; Figure 18). Their distributions are very limited in the UK even if one adds in the Scottish and northern England studies.

Perileptus areolatus

The most widespread species recorded in this survey, *P. areolatus* has a markedly western distribution in the UK. It is presently recorded from only 16 10km squares with one post 1970 record for Scotland on the River Nith (Eyre et al. 2000) (Table 14; Figure 18). Earlier records exist for Wales, Devon and Cornwall, the midlands, North Lancs and Dumfriesshire (Hyman 1992; Luff 1998).

Lionychus quadrillum

This species is known from only 8 post 1980 10km squares in the UK (Table 14; Figure 18). It is distributed on both river and coastal sites but it is not completely reliant on ERS elsewhere in Europe. Luff (1998) lists it from 18 pre 1970 10 km squares.

Bembidion testaceum

Not recorded during this work and found in only four post 1970 squares including the south Tyne at Beltingham (Eyre et al. 1998) (Figure 18). Former records suggest it may have previously been more widespread, although the reliability of those records is suspect, as the species is difficult to identify. *B. testaceum* is evidently very uncommon and warrants upgrading from its designation as a Notable B species.

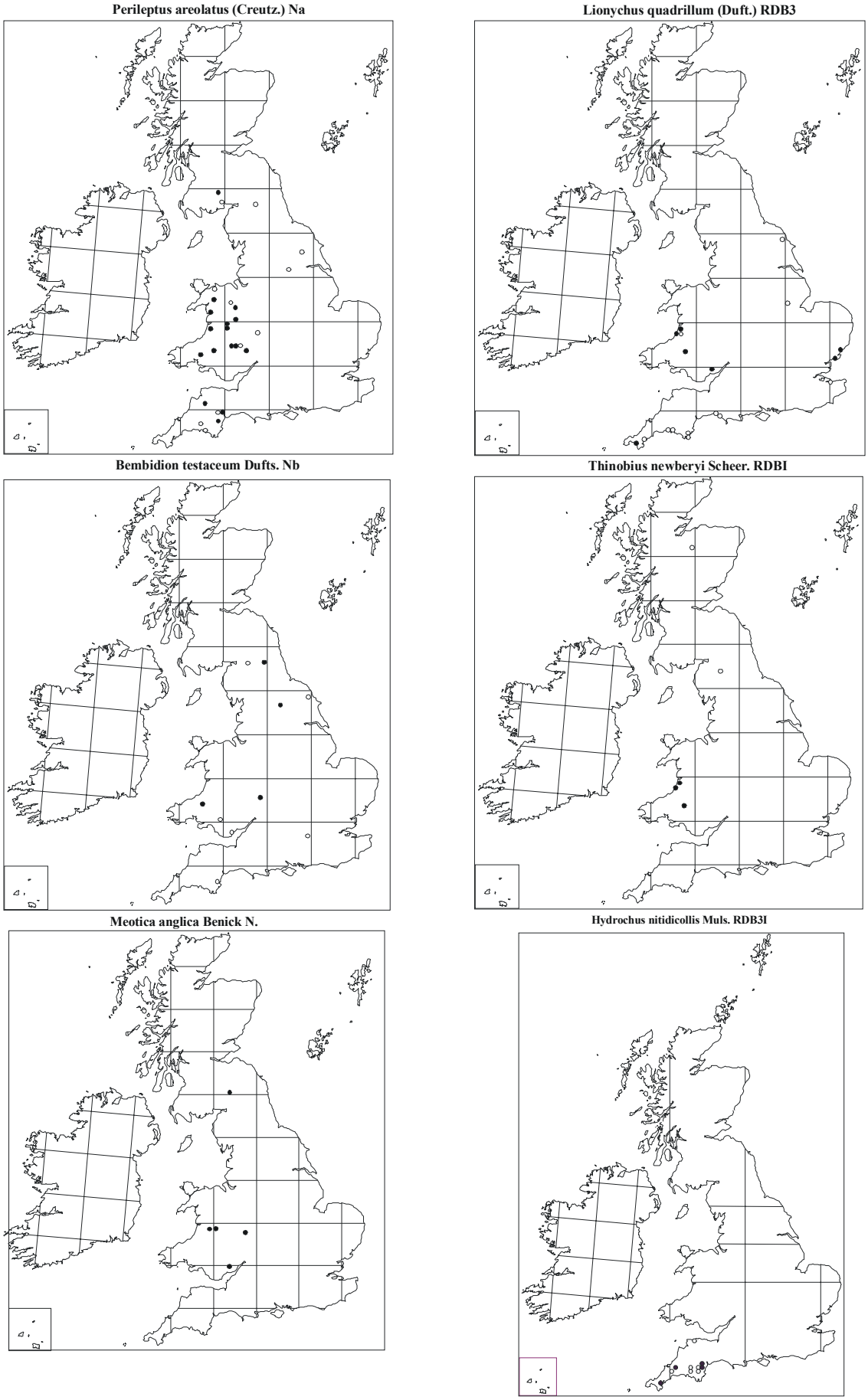


Figure 18: Current distribution of the UK ERS grouped action plan beetles (by 10km squares). Data from the current work and English Nature (ISR), Scottish Natural Heritage and Countryside Council for Wales

Hydrochus nitidicollis

H. nitidicollis has been recorded from only ten 10km squares, all in Devon and Cornwall, in the UK. There are only 4 post 1980 records of this species and recent survey work in the Devon (Hammond 1998b, Sadler and Bell 2000) has failed to increase its known distribution (Table 14; Figure 18).

Thinobius newberyi

A putative endemic this species is probably under-recorded due to its subterranean habits. There are only 3 post-1980 records in the UK (Table 14; Figure 18), all from Wales on the Rivers Ystywth, Rheidol (Fowles and Boyce 1992) and the Tywi. There are older records from Cumberland and East Inverness and Nairn (Hyman 1992).

Meotica anglica

This possible endemic and cryptic, subterranean species is probably under-recorded in the UK. The species was not found during this survey (although A. Fowles recorded it a Pencarreg on the Usk). There are only 5 10km squares with records (the Usk, Taf and Severn in Wales), the Mole in Surrey and the further records in Southern Scotland. Its current status of Notable is clearly in error and requires revision (Figure 18).

Bidessus minutissimus

This species the subject of a separate SAP and is not part of the ERS grouped species action plan, although many of the records are from shingle sites. It has been recorded from 6 post-1980 and 10 pre-1980 10km squares in the UK. The present survey work added no new records to those already on the water beetle recording scheme (Garth Foster in litt.).

Implications

The BAP species are not only uncommon nationally, but they account for a fraction (c. 0.7%) of the records resulting from this survey work. If the presence of BAP species is an important element in the conservation of ERS locally and nationally then they will prove to be effective in only the best of sites, where there is a strong assocation with their presence and site quality (Tables G1-G4; Appendix G). Although, one or more BAP species were recorded from 12 of the 33 10km squares covered by this survey (Figure 19), this represents 27 sites out of the 81 sampled (33.3%). Given that the value of a habitat is more than its ‘head count’ of rare species then a Habitat Action Plan for ERS would seem long overdue.

Table 14: Records of BAP, Rare and Nationally Scarce ERS species recorded during this work (* = ERS grouped species action plan BAP species, ‡ = SAP species).

Species	Status	This survey(s)		Literature / Or Recording Scheme Data			
		Number of 10 km Squares	Number of Records	Pre 1950 or 70 or 80 Records	Post 1950 or 70 or 80	Refinds in same 10km	Eyre et al. 1998 and 2000
‡*Bidessus minutissimus (Germ.)*	RDB3	1	1	10	6	1	
**Perileptus areolatus (Creutz.)*	Na	10	16	11	7	2	1
**Bembidion testaceum Dufts.*	Nb	0	0	6	4		
**Lionychus quadrillum (Duft.)*	RDB3	3	8	18	6	1	
**Hydrochus nitidicollis Muls.*	RDB3	1	1	10	4	1	
**Thinobius newberyi Scheer.*	RDBI	1	1	2	2		
**Meotica anglica*	N	0	0	?	5		
Trechus discus (F.)	Nb	1	2	40	23		
Tachys bistriatus (Duft.)	Nb	1	1	17	21		
Tachys parvulus Dej.	Nb	19	29	4	15		
Bembidion litorale (Ol.)	Nb	1	2	23	39	4	15
Bembidion monticola Strm.	Nb	2	2	40	53	2	12
Bembidion saxatile Gyll.	Nb	1	1	49	48		
Bembidion stomoides Dej.	Nb	1	1	27	25	3	2
Hydraena nigrita Germ.	Nb	1	1	49	50		1
Hydraena rufipes Curt.	Nb	3	4	17	36		
Ochthebius bicolon Germ.	Nb	4	10	43	77		12
Helophorus arvernicus Muls.	Nb	18	26	49	125		41
Deleaster dichrous (Grav.)	Nb	18	31				26
Bledius erraticus Er.	RDBK	1	1				
Thinobius bicolor Joy	Na	3	3				
Thinobius strandi Smet.	N	1	2				
Thinobius praetor Smet.	N	2	3		12		5
Scopaeus gracilis (Sperk)	RDBK	1	1				
Lathrobium angusticolle Bois.	Nb	5	7				14
Lathrobium ripicola Czwal.	N	2	2				
Neobisnius prolixus Er.	RDBK	10	15				

Erichsonius signaticornis Muls. & Rey	Nb	1	1		8		11
Gabrius astutoides Strand	RDBI	1	1	7	5		
Tachyusa coarctata Er.	N	2	4				
Dasygnypeta velata (Er.)	N	2	2				
Hydrosmecta fragilis (Kr.)	N	5	6		8		6
Hydrosmecta thinobioides (Kr.)	N	18	29		2		8
Hydrosmecta delicatula (Sharp)	RDBK	4	5		7		1
Hydrosmectina septentrionum Benick	N	17	24		13		2
Aloconota (s.str.) planifrons (Water.)	RDBK	2	2				
Brachygluta pandellei (Saulc.)	RDBK	4	7				4
Fleutiauxellus maritimus (Curt.)	Na	8	15		33		27
Negastrius sabulicola (Boh.)	RDB2	5	8		11	1	3
Dryops nitidulus (Heer)	RDB3	1	3	13	10	1	1
Coccinella quinquepunctata L.	RDB3	7	9		20	6	8
Baris lepidii Germ.	Na	2	2				

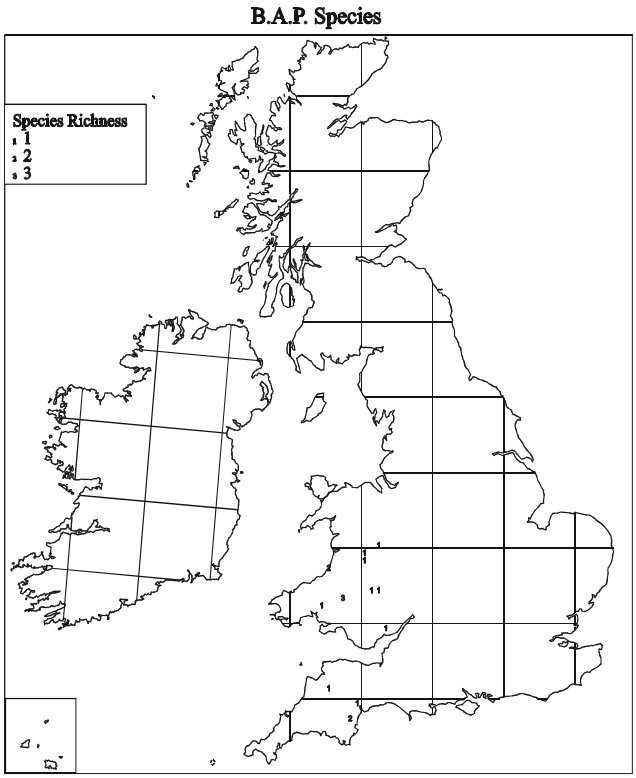


Figure 19: Species coincidence maps for the BAP species of Coleoptera recorded in the surveys

4.1.2 Rare and Endangered species

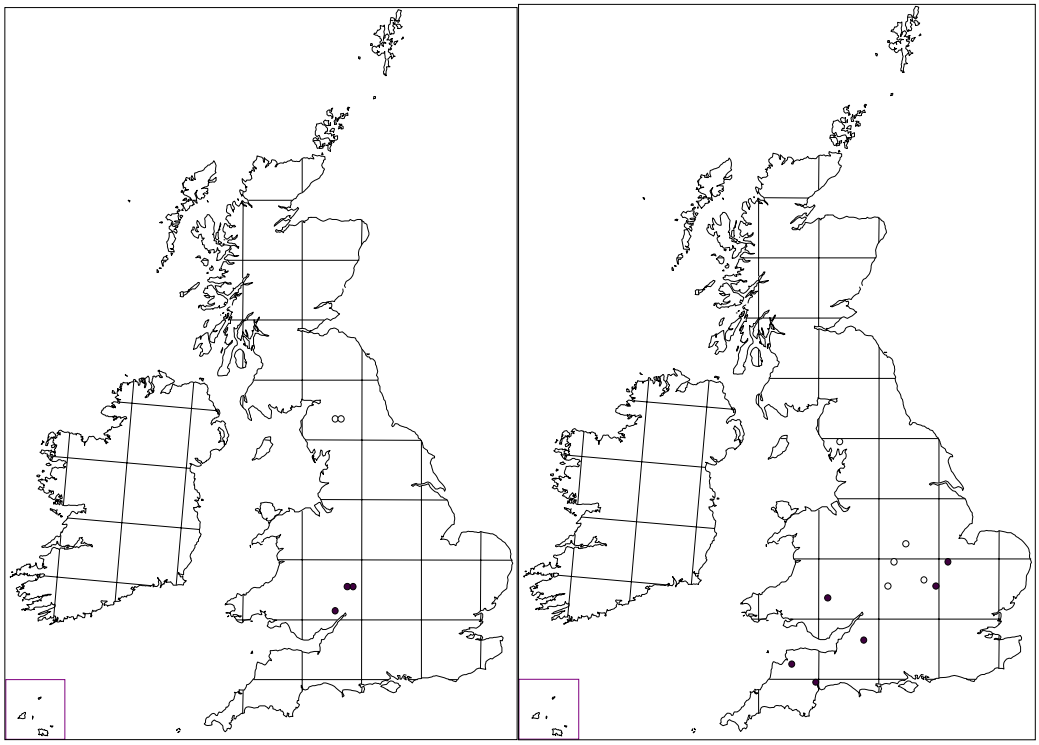
Negastrius sabulicola was the most common of the RDB2 species found during this work. With 18 post 1950 records it is more common than its status would indicate, although it is tied to the better sandy shingles in Wales (Rivers Usk, Tywi and Wye) and on the Nith, Tweed in Scotland and Tyne in north-east England (Eyre et al. 1998).

Stenelmis canaliculata and *Normandia nitens*, although not strictly ERS specialists, are associated with gravel-bed rivers. Both species are extremely uncommon nationally. *Stenelmis* was only found at one site on the River Exe in Devon and similarly, *Normandia* was found only at Monmouth on the River Wye. Both species have only a handful of post-1980 records (Figure 20), but it is possible that they are more widespread (Foster pers. comm.), perhaps inhabiting deeper water on larger rivers, where conventional sampling methods are less effective.

Of the two RDB3 species, which are not on the BAP lists, namely *Dryops nitidulus* and *Coccinella quinquepunctata*, the latter has 29 post 1970 records and is reasonably widespread in Wales and Scotland (Majerus and Fowles 1989; Majerus et al. 1997; Eyre et al. 2000). *D. nitidulus* is less frequently recorded with only 10 post 1980 10km squares (Table 14).

The paucity of distribution data on the staphylinids remains a problem. If one looks at this dataset, however, an assessment of their distribution can be estimated.

Neobisnius prolixus is the most common of the RDBK and RDBI species with 10 10km squares (Table 14). This species is also common on the shingle and sand ERS on the River Eden in Cumbria (Hewitt per. comm.) and may turn out reasonable widely distributed. By way of comparison, *Hydrosmecta delicatula* (with 4 10 km squares) appears to be least commom member of the genus and it is found only on high quality sandy shingles sites.



(a) (b)

Figure 20: The distribution of (a) *Normandia nitens* RDB2 and (B) *Stenelmis canaliculata* RDB2. Open circles indicate pre 1980 records (Data courtesy of Prof. Garth Foster - Water beetle Recording Scheme)

It is within the Nationally Scarce classes that the greatest number of species is found. Several of these are very common on ERS and their status requires examination. The elaterid *Fleutiaxellus maritimus* is a good example. Presently a Notable A species, there are recent records from 68 10km squares. Similarly, several of the water beetles, such as *Helophorus arvernicus* (125 post 1980 10km squares) and *Cercyon ustulatus* (126 post 1980 10km squares), are very widespread and should have their status revised down. A number of small cryptic species of staphylinid beetles (eg. *Hydrosmecta thinobioides* and *Hydrosmectina septentrionum*) were frequently recorded during this survey (in 18 and 17 10km square respectively (Table 14), yet they remain under-recorded nationally. The paucity of records of these two species in the dataset of Eyre et al. (1998; 2000) could be a result of biogeographical factors, but it more likely results from the use of pitfall trapping, as both *H. thinobioides* and *H. septentrionum* are less common in the pitfall data from this survey. *Deleaster dichrous* is another example of a species with a large number of documented records from other habitat types other than ERS (Hammond 1988b).

As Eyre and co-workers have stated, it is time for a reassessment of the status of several ERS species and a combined dataset now exists to make this a realistic possibility.

4.2 Site Quality

4.2.1 The ERS QI

A large and consistent national database of ERS sites in England and Wales provides a yardstick to assess the importance of the faunas. An Exposed Riverine Sediment Quality Index was used to rank the sites in the dataset. Although, the results are promising and appear to make ecological sense, the index is sensitive to sample size. A small number of scoring species (with relatively few rarities) can seriously inflate the size of the index. Small sample size can be due to fragmented sampling as in the case of Grogwynion on the River Ystwyth or a geniune occurrence. Examples of the latter include the sites on the River Worth at Keighley and the River Calder at Elland where the sample recovery was good. The low number of species here is related to the pollution and impaired nature of the ERS. At both sites the presence of notable species has the effect of giving a false impression of the quality of the sites (Table 5). In contrast, large diverse sites such as Glasbury Shingles and site one on Teign, which had areas of silts in among the shingle and sands produced high numbers of scoring species as a direct result of the abundance of habitat and thus they have the affect of reducing scores. Clearly further work is needed to reduce the influence of these in the index. Contrasting the species quality scores against the final ERS QI is a useful means of examining such problems.

4.2.2 Habitat variables

ERS habitats exhibit a great deal of heterogeneity in terms of their physical characteristics and ultimately this affects invertebrate diversity. A large number of potentially important factors were measured during this study. In the first run of the models landuse factors were strongly related to the species assemblages of both Coleoptera and Araneae. This confirms the results of the Phase 2 study where sites classified out by river catchment and is therefore not too surprising. To examine the importance of ERS habitat variables, however, the landuse variables were removed from the environmental dataset. In run two of the statistics the variables that were significantly related to Coleoptera species included substrate size (Phi), habitat heterogeneity, percentage of shade, vegetation type and ERS width. For the Araneae, the percentage of silt, ERS heterogeneity and grazing were found to be significant.

Substrate

There is an evident gradient of species that are found on silt ERS to those recorded from upland boulder and cobble ERS. This is no surprise and was illustrated in Phases 1 (Eyre and Lott 1997) and 2 (Sadler and Petts 2000) of the project (see also Lott 1996 and Hammond 1998a). For the spiders this split is more obvious, only the larger more heterogeneous bars having high fidelity faunas.

In an earlier study (Sadler & Petts 2000) it was argued that the amount of sand on ERS, and the levels of armouring and compaction of the sediments is also an important factor. The important factor appears to be the amount of sand in the matrix sediments of the ERS. Better shingle sites have loosely compacted sediments with a high percentage of sand, which provide habitat for a diverse surface and subterranean fauna. The percentage of sand was found to be significant for the Coleoptera, whereas the percentage of silt was significant for the Araneae.

ERS size and heterogeneity

ERS habitat heterogeneity was significantly related to both the beetle and spider assemblages, where as ERS width was important only for the Coleoptera. Intuitively, one might infer a link between heterogeneity of habitat and species quality. It is evident that more microhabitats not only provide greater potential for a diverse fauna, but results in the enhanced availability of overwintering sites. The link with bar width also appears to make sense, as larger ERS tend to have more habitats within them. The significance of ERS width for the Coleoptera might also be related to the nature of the sampling. The majority of the data are drawn from pitfall trapping and this is as much an idex of the mobility of the species as it is their density on the habitat (Greenslade 1964; Thiele 1977). This means that on narrow ERS, with relatively little 'core' ERS habitat, 'edge effects' are high and there is an increased possibility of capturing species from the surrounding adjacent landscape.

Bar stability and vegetation

Recent work illustrates that flow regulation can affect ERS communities by increasing bar stability and enhancing vegetation succession (Von Manderbach and Reich 1995; Niemeier et al. 1997). It is quite clear that when catchment hydology is modified by either regulation scheme or engineering to reduce the instances of flooding and/or bank erosion the ERS on rivers become less common and those that survive become more stable and then ultimately undergo vegetational succession. This work illustrates that the species assemblages on vegetated ERS (particularly shingle) are of a poorer quality than those that have simple (or ruderal) communities. It is also relevant to note that the better ERS sites were located on rivers that are unregulated (eg. Tywi, Ystwyth Usk and Wye). The message is clear: the hydrological regime is the engine that drives diversity of these systems. Any measures that alter this and reduce the flashy nature of the flow events will lead to a loss of conservation resource - the importance of this cannot be over-stated.

Disturbance

The impact of grazing and trampling by animals was found to be a significant environmental variable for both the Coleoptera and Araneae (sections 3.1.6 and 3.2.3). Indeed, the work on the Upper Severn catchment suggested quite strongly that even moderate stocking levels can have a devastating affect on the diversity and presence of shingle specialist spiders (Sadler et al. 2000). It is clear that livestock can have a serious affect on ERS invertebrates (cf. Lott 1992) by compacting the substrate and destroying habitat and possibly refuge sites (used for overwintering). Additionally, livestock defecation not only leads to enhanced siltation of the

interstitial cavities used by several species of ERS invertebrate but also to a general eutrophication of the sediments and colonization by competitors.

The other major cause for concern is gravel extraction. This is a potential problem and the Environment Agency has powers to control extraction levels. It is unfortunate that in this work only two sites with significant extraction were examined (Llandovery on the Tywi and Maesmawr Hall site 1 on the Severn). Initial findings indicate that although it is aesthetically unpleasant to see, where the gravel resource is large and the river is unregulated and able to rework sediments (such as on the Tywi) the impact on Coleopteran faunas is limited. The work on the Upper Severn catchments, however, showed quite clearly that high levels of disturbance of this nature could have significant affects on more isolated bars (Sadler et al. 2000).

The wider landscape

Eyre and Lott (1997) suggested that the number of hibernation sites was potentially an important factor for many ERS invertebrates. This will be species specific, however, and the requirements of many ERS species remain unknown. Nevertheless, the literature on Coleoptera shows that grass tussocks (Luff 1966a, b; Sotherton 1984, 1985) and wood/shrubs (Zulka 1994) are important sites, but for many specialist shingle ERS species, such as species of *Bembidion* and several staphylinids, overwintering takes place within the sediments (Andersen 1968; Dieterich 1996). An attempt to consider this aspect in this project failed to highlight any significant relationships.

One factor not considered in this study is a consideration of the amount, type and structure of adjacent ERS in the catchment, and this may be of considerable importance. At least on face value, rivers with more ERS habitat appear to have better assemblages of ERS invertebrates. The reasons for this are complex and related to the variety of habitat within the catchment, stream flow, flood regime, and the amount of substrate available for reworking by the fluvial system (Petts and Foster 1985; Petts and Thoms 1987). Metapopulation models (Stelter et al. 1997) illustrate that large numbers of bars are needed in a given catchment to support populations of invertebrates. With the present levels of autecological knowledge of ERS species and their distribution it is impossible to establish the exact numbers of bars that are required in a reach to support a diverse and rich assemblage.

It should be stressed that there are difficulties with drawing conclusions from large multivariate datasets, particularly when dealing with a large number and variety of site attributes. The amount of covariance between strongly related environmental viables such as the amount of shade, vegetation cover and vegetation type can be very high. This means that partitioning out the important factors is problematic and one must sample a range of sites with similar characteristics (except variation in the variable of interest) to fully assess the impact of one in isolation. It is one thing to describe a statistical relationship between ERS habitat diversity, site quality and the presence of rare species, but it is another to understand exactly why those relationships exist, and which fluvial processes combine to enhance and sustain them. This is an area where tightly controlled and small-scale sampling that partitions out unwanted variation could provide valuable ecological information about the nature and scale of potential impacts ion riparian habitats and ERS management.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

A total of 81 silt, sand and shingle sites across England and Wales were used to establish what factors were important in prescribing the species assemblages on Exposed Riverine Sediments. Two large species databases of Coleoptera and Araneae were created during the work. 603 species of Coleoptera were collected by a combination of pitfall trapping, hand searching and excavational techniques. A total of 92 species with conservation status of endangered, Rare or Nationally Scarce were recorded during the work and this includes 5 species on the UK BAP lists. A subset of 43 of this group can be classified as ERS specialists.

With a growing database of sites, the potential existed for a systematic review to better understand the national distributions of important ERS species. It is evident that some specialist species are much more widespread than previously recognised and their JNCC designations require revision. Nonetheless, many of the Nationally Scarce invertebrates (notably the staphylinid beetles) are still under-recorded and their national status still requires confirmation.

The creation of a system to score ERS sites by the rarity value of the species assemblages (the ERS QI) produced results that were used to rank sites at a national level. The best sites have a markedly western distribution in the UK and are found on rivers in Wales and a number of rivers in the south west of England.

An examination of the important environmental variables that define site quality identified type of substrate, habitat heterogeneity, the percentage of shade, the amount of grazing and ERS size as important presciptors of invertebrate ‘quality’. A number of management implications can be drawn from this work and they indicate the importance of river regulation, engineering and stocking densities for ERS invertebrates.

5.2 Recommendations

The work leads to the following recommendations:

1. There is a need to compile a national database of ERS invertebrate records, which can subsequently be used to better understand species distributions and species conservation status. This is particularly important for some of the staphylinid beetles, which form a substantial proportion of ERS invertebrates.

2. Elements of the ERS QI that require further work are the species status, species rarity scores and fidelity ratings. These now need to be reviewed by additional experienced Coleopterists before the scheme can be utitlised nationally.

3. There is scope for limited survey work for several of the BAP species to improve distributional and autecological data. The priorities here are *Bembidion testaceum*, *Meotica anglica* and *Thinobius newberyi*.

4. Given the importance of ERS for invertebrate species and the fact that they remain one of the few relatively natural elements of the highly modified British landscape a national BAP Habitat Action Plan is urgently required for ERS habitats.

REFERENCES

Alexander, K.N.A. (1988) The development of an index of ecological continuity for deadwood associated beetles. *Antenna*, **12**, 69-70.

Andersen, J. (1968) The effect of inundation and choice of hibernation sites of Coleoptera living on river banks. *Norsk Entomologisk Tidsskrift*, **15**, 115-133.

Andersen, J. (1969) Habitat choice and life history of Bembidion (Col., Carabidae) on river banks in central and northern Norway. *Norsk Entomologisk Tidsskrift*, **17**, 17-65.

Andersen, J. (1985) Ecomorphological adaptations of riparian Bembidiini species (Coleoptera, Carabidae). *Entomologica Generalis*, **12**, 41-46.

Bell, D., Petts, G.E. & Sadler, J.P. (1999) The distribution of species in the wooded riparian zone of three rivers in western Europe. *Regulated Rivers: Research and Management*, **15**, 141-158.

Biodiversity Steering Group (1995a) *Biodiversity: The UK Steering Group Report* Volume 1: Meeting the Rio Challenge. HMSO, London. pp.103

Biodiversity Steering Group (1995b) *Biodiversity: The UK Steering Group Report* Volume 2: Action Plans. HMSO, London. pp.324

Denton, J.S. (1999) Rare and notable Coleoptera recorded in England, 1995-97. *The Coleopterist*, **8**, 20-22.

Dieterich, M. (1996) Methods and preliminary results from a study on the habitat functions of the gravel bar interior in alluvial floodplains. *Verhandlungen der Gesellschaft für Ökologie*, **26**, 363-368. (in german).

Disney, R.H.L., Erzinclioglu, Y.Z., Henshaw, D.J.de C., Howse, D., Unwin, D.M., Withers, P. & Woods, A. (1982) Collecting methods and the adequacy of attempted fauna surveys, with reference to Diptera. *Field Studies*, **5**, 607-621.

Evans, C. & Petts, G.E. (in press) Flow processes and thermal profiles within gravel bars. *Hydrological Science Journal*.

Eyre, M.D. (1998) Invertebrates and the Environment: a time for Reassessment? *Antenna*, **22**, 63-70.

Eyre, M.D. & Lott, D.A. (eds.) (1997) *Invertebrates of Exposed Riverine Sediments*. R & D Technical Report W11. Environment Agency, Bristol. pp.93

Eyre, M.D. & Rushton, S.P. (1989) Quantification of conservation criteria using invertebrates. *Journal of Applied Ecology*, **26**, 159-171.

Eyre, M.D. & Woodward, J. (1997) Spiders in environmental surveillance and site assessment. In Eyre, M.D. (ed.) *Environmental monitoring, surveillance and*

conservation using invertebrates. EMS Publications, Newcastle Upon Tyne, pp. 26-27.

Eyre, M.D., Luff, M.L. & Lott, D.A. (1998) Rare and notable beetles species records from Scotland from survey work with pitfall traps, 1992-1996. *The Coleopterist*, **7**, 81-90.

Eyre, M.D., Luff, M.L. & Lott, D.A. (2000) Records of rare and notable beetle species from riverine sediments in Scotland and northern England. *The Coleopterist*, **9**, 25-38.

Foster, G.N. & Eyre, M.D. (1992) *Classification and ranking of water beetle communities*. JNCC, UK Nature Conservation, 1. Peterborough. pp.110

Fowles, A.P. (1989) The Coleoptera of shingle banks on the River Ystwyth, Dyfed. *Entomologist's Record*, **101**, 209-221.

Fowles, A.P. (1997) The Saproxylic Quality Index: an evaluation of dead wood habitats based on rarity scores, with examples from Wales. *The Coleopterist*, **6**, 61-66.

Fowles, A.P., Alexander, K.N.A. & Key, R.S. (1999) The Saproxylic Quality Index: evaluating wooded habitats for the conservation of dead-wood Coleoptera. *The Coleopterist*, **8**, 121-141.

Fowles, A.P. & Boyce, D.C. (1992) Rare and notable beetles from Cardiganshire (VC 46) new to Wales. *The Coleopterist*, **1**, 7-15.

Framenau, V., Reich, M. & Plachter, H. (1996) Migration and prey of *Arctosa cinerea* (Fabricius, 1777) on a braided section of an Alpine river. *Verhandlungen der Gesellschaft für Ökologies*, **26**, 369-376 (in German).

Garland, S.P. (1983) Beetles as Primary Woodland Indicators. *Sorby Record*, **No 21**, 3-38.

Godfrey, A. (1999) A review of Diptera from exposed riverine sediments based on literature records. *Dipterist's Digest*, **6**, 63-82.

Greenwood, M.T., Bickerton, M.A. & Petts, G.E. (1995a) Spatial-distribution of spiders on the floodplain of the river Trent, UK - the role of hydrological setting. *Regulated Rivers: Research and Management*, **10**, 303-313.

Greenwood, M.T., Bickerton, M.A. & Petts, G.E. (1995b) Floodplain Coleoptera distributions: River Trent. *Archiv für Hydrobiologie Supplement*, **101**, 427-437.

Hammond, P.M. (1998a) Riparian and floodplain arthropod assemblages: their characteristics and rapid assessment. In Bailey, R.G., José, P.V. & Sherwood, B.R. (eds.) *United Kingdom floodplains*. Westbury Press, Otley, pp. 237-282.

Hammond, P. (1998b) *Survey of the invertebrates on Exposed Riverine Sediments on the Rivers Teign and Bovey near their confluence*. Unpublished Report, Environment Agency, Devon Area.

Harding, P.T. & Rose, F. (1986) *Pasture-woodlands in Lowland Britain. A review of their importance for wildlife conservation*. Institute of Terrestrial Ecology, Huntingdon. pp.89

Hill, M.O. (1979a) *TWINSPAN - A FORTRAN program for arranging multivariate data in an ordered two-way table by classification of the individuals and attributes*. Ithaca, New York.

Hill, M.O. (1979b) *DECORANA - A FORTRAN program for detrended correspondence analysis and reciprocal averaging*. Ithaca, New York.

Hyman, P.S. (1992) *A Review of the Scarce and Threatened Coleoptera of Great Britain. Part 1*. JNCC, Peterborough. pp.484

Hyman, P.S. (1994) *A review of the scarce and threatened Coleoptera of Great Britain. Part 2*. JNCC, Peterborough. pp.248

Johnson, C. (1993) *Provisional Atlas of the Cryptophagidae-Atomariinae (Coleoptera) of Britain and Ireland*. Monks Wood, Huntingdon, Biological Records Centre, Institute of Terrestrial Ecology.

Koch, K. (1989) *Die Käfer Mitteleuropas. Ökologie, 1.* Goecke & Evers, Krefeld.

Lott, D.A. (1992) A survey report on the terrestrial beetles of riparian habitats along the River Soar near Loughborough, Leicestershire, March-October, 1991. Report to the NRA (Severn-Trent).

Lott, D.A. (1993) A study of the effects of the River Soar alleviation scheme upon the riparian beetle fauna. Report to the NRA (Severn-Trent).

Lott, D.A. & Eyre, M.D. (1996) Invertebrate sampling methods. In Eyre, M.D. (ed.) *Environmental Monitoring, Surveillance and Conservation using Invertebrates*. EMS Publications, Newcastle Upon Tyne, pp. 9-13.

Lott, D.A. (1996) Beetles by rivers and the conservation of riparian and floodplain habitats. In Eyre, M.D. (ed.) *Environmental Monitoring, Surveillance and Conservation using Invertebrates*. EMS Publications, Newcastle Upon Tyne, pp. 36-41.

Lott, D.A. (1999) Riparian beetles on soft sediments by the River Teme, Worcestershire. *The Coleopterist*, **8**, 7-10.

Lucht, W. H. (1987). *Die Kafer Mitteleuropas*. Krefeld, Goecke and Evers.

Luff, M.L. (1966a) The abundance and diversity of the beetle fauna of grass tussocks. *Journal of Animal Ecology*, **53**, 771-787.

Luff, M.L. (1966b) Cold hardiness of some beetles living in grass tussocks. *Entomologia Experimentalis et Applicata*, **9**, 191-199.

Luff, M.L. (1998) *Provisional atlas of the ground beetles (Coleoptera, Carabidae) of Britain*. Biological Records Centre, Institute of Terrestrial Ecology, Monks Wood, Abbots Ripton. pp.194

Luff, M.L. & Eyre, M.D. (1997) *Simplocaria maculosa* Erichson (Byrrhidae) in S. Scotland and Herefordshire. *The Coleopterist*, **5**, 84.

Luff, M.L., Eyre, M.D. & Rushton, S.P. (1989) Classification and ordination of habitats of ground beetles (Coleoptera, Carabidae) in north-east England. *Journal of Biogeography*, **16**, 121-130.

Majerus, M.E.N. & Fowles, A.P. (1989) The rediscovery of the 5-spot ladybird *Coccinella 5-punctata* L. (Col., Coccinellidae) in Britain. *Entomologist's Monthly Magazine*, **125**, 177-181.

Majerus, M.E.N., Majerus, T.M.O., Bertrand, D. & Walker, L.E. (1997) The geographic distributions of ladybirds (Coleoptera: Coccinellidae) in Britain (1984-1994). *Entomologist's Monthly Magazine*, **133**, 181-203.

Mendel, H. (1990) *Provisional Atlas of the click beetles (Coleoptera: Elateroidea) of the British Isles*. Biological Records Centre, Institute of Terrestrial Ecology, Monks Wood, Huntingdon. pp.89

Mendel, H. & Clarke, R.E. (1996) *Provisional Atlas of the click beetles (Coleoptera: Elateroidea) of Britain and Ireland*. Ipswich Borough Council Museums, Ipswich.

Merrett, P. (1992) *A review of the Nationally Notable Spiders of Great Britain*. Nature Conservancy Council, Contract Surveys 127. Peterborough. pp.67

Niemeier, S., Reich, M. & Plachter, H. (1997) Ground Beetle Communities (Coleoptera: Carabidae) on the banks of two Rivers in the Eastern Carpathians, the Ukraine. *Verhandlungen der Gesellschaft für Ökologie*, **27**, 365-372.

Petts, G.E. (1988) Accumulation of fine sediments within substrate gravels along two regulated rivers, UK. *Regulated Rivers: Research and Management*, **2**, 141-153.

Petts, G.E. (1997) The scientific basis of managing Biodiversity along river margins. In LaChavanne, J.-B. (ed.) *Biodiversity and Land-water Ecotones*. UNESCO, Paris, p. 249-268

Petts, G.E. & Amoros, C. (1996) *Fluvial Hydrosystems*. Chapman & Hall, London.

Petts, G. & Foster, I. (1985) *Rivers and Landscape*. Arnold, London.

Petts, G.E. & Thoms, M.C. (1987) Bar development in a regulated gravel-bed river. *Earth Surface Processes and Landforms*, **12**, 433-440.

Plachter, H. (1986) Composition of the carabid beetle fauna of natural riverbanks and of man-made secondary habitats. In den Boer, P.J., Luff, M.L., Mossakowski, D. & Weber, F. (eds.) *Carabids: Their Adaptations and Dynamics*. Gustav Fisher, Stuttgart, pp. 509-535.

Ratcliffe, D.A. (ed.) (1977) *A Nature Conservation Review* (1st ed). CUP, Cambridge.

Roberts, M.J. (1985) *The Spiders of Great Britain and Ireland. Volume 1 - Atypidae to Theridiosomatidae*. EJ Brill, Leiden. pp.229

Roberts, M.J. (1987) *The Spiders of Great Britain and Ireland. Volume 2 - Linyphiidae*. EJ Brill, Leiden. pp.204

Rushton, S.P. & Eyre, M.D. (1992) Grassland spider habitats in north-east England. *Journal of Biogeography*, **19**, 99-108.

Rushton, S.P., Luff, M.L. & Eyre, M.D. (1989) Effects of pasture improvement and management on the ground beetle and spider communities of upland grasslands. *Journal of Applied Ecology*, **26**, 489-503.

Sadler, J.P. & Dugmore, A.J. (1995) Habitat distribution of terrestrial Coleoptera in Iceland as indicated by numerical-analysis. *Journal of Biogeography*, **22**, 141-148.

Sadler, J.P. & Petts, G.E. (2000) *Invertebrates of Exposed Riverine Sediments - Phase 2. Sampling considerations*. Environment Agency, Bristol.

Sadler, J.P. & Bell, D. (2000) *A comparative site assessment of exposed riverine (ERS) beetles in South-West England*. English Nature Research Reports, No. 383, Peterborough.

Sadler, J.P., Bell, D & Skidmore, P. (2000) *Survey of Exposed River Sediment Invertebrates in the Upper Reaches of the River Severn*. Countryside Coucil for Wales, CCW Area Report, CCW/EA/III.

Sotherton, N.W. (1984) The distribution and abundance of predatory arthropods overwintering on farmland. *Annals of Applied Biology*, **105**, 423-429.

Sotherton, N.W. (1985) The distribution and abundance of predatory Coleoptera overwintering in field boundaries. *Annals of Applied Biology*, **106**, 17-21.

Stelter, C., Reich, M., Grimm, V. & Wissel, C. (1997) Modelling persistence in dynamic landscapes: lessons from a metapopulation of the grasshopper *Bryodema tuberculata*. *Journal of Animal Ecology*, **66**, 508-518.

Stubbs, A.E. (1992) *Provisional atlas of the long-palped craneflies (Diptera: Tipulidae) of Britain and Ireland*. Biological Records Centre, Institute of Terrestrial Ecology, Monks Wood, Huntingdon.

Von Manderbach, R. & Reich, M. (1995) Effects of dams and weirs on the ground beetle communities (Coleoptera, Carabidae) of braided sections of the Isar floodplain. *Archiv für Hydrobiologie Supplement*, **101**, 573-588. ((in German))

Wilkinson, J., Martin, J., Boon, P.J. & Holmes, N.T.H. (1998) Convergence of field survey protocols for SERCON (System for Evaluating Rivers for Conservation) and RHS (River Habitat Survey). *Aquatic Conservation-Marine and Freshwater Ecosystems*, **8**, 579-596.

Zulka, K.P. (1994) Carabids in a Central European floodplain: species distribution and survival during inundations. In Desender, K., Dufêne, M., Loreau, M., Luff, M.L. & Maelfait, J.-P. (eds.) *Carabid Beetles: Ecology and Evolution*. Kluwer, Dordrecht, pp. 399-405.

APPENDIX A

Species of Coleoptera recorded during work with their fidelity scores and national conservation status (RecStat = Status in Recorder 3.3, RecRev = revised as a result of this work)

Name	Status	Fidelity	Silt	Sand	Gravel	Cobble	Boulder	other	Wetland	RevStat	Score	RecStat	Score
Cicindela campestris L.		4		+						Local	2	Local	2
Carabus problematicus Hbst.		4								Common	1	Common	1
Carabus granulatus L.		4	+	?+					+	Local	2	Local	2
Carabus arvensis Hbst.		4								Local	2	Local	2
Carabus nemoralis Müll.		4								Common	1	Common	1
Leistus rufomarginatus Duft.		5						Wood		Local	2	Local	2
Nebria rufescens (Strom.)		4			++	++	+		++	Common	1	Common	1
Nebria brevicollis (F.)		4	+	+	+	+	?+			Common	1	Common	1
Nebria salina Fair. & Lab.		4		+						Common	1	Common	1
Notiophilus aquaticus (L.)		4								Local	2	Local	2
Notiophilus palustris (Duft.)		4	+	+					+	Local	2	Local	2
Notiophilus rufipes Curt.		4								Local	2	Local	2
Notiophilus biguttatus (F.)		4	+	+	+	+	+			Common	1	Common	1
Elaphrus cupreus Duft.		4	++	+					++	Common	1	Common	1
Elaphrus riparius (L.)		3	+	+					++	Common	1	Common	1
Loricera pilicornis (F.)		4	+	+	+	+	?+		+	Common	1	Common	1
Clivina fossor (L.)		4	+						+	Common	1	Common	1
Clivina collaris (Hbst.)		3	+	++	+	+			++	Local	2	Local	2
Dyschirius aeneus (Dej.)		2	++	+					++	Local	2	Local	2
Dyschirius globosus (Hbst.)		4							+	Common	1	Common	1
Miscodera arctica (Payk.)	Nb	4								Nb	8	Nb	8
Perileptus areolatus (Creutz.)	Na	1			++	+			++	Na	16	Na	16
Trechus secalis (Payk.)		4							++	Local	2	Local	2
Trechus quadristriatus Schr.		4	+	+						Common	1	Common	1
Trechus obtusus Er.		4	+	+						Common	1	Common	1
Trechus discus (F.)	Nb	3	+	++	?+				++	Nb	8	Nb	8

Trechus micros (Hbst.)		4	+	++	+					Local	2	Local	2
Trechus obtusus/4-striatus													
Tachys bistriatus (Duft.)	Nb	2		+	++?	??	?		+	Nb	8	Nb	8
Tachys parvulus Dej.	Nb	2	+	+	++	+	+		++	Nb	8	Nb	8
Bembidion litorale (Ol.)	Nb	1	++	+					++	Nb	8	Nb	8
Bembidion lampros (Hbst.)		4	+	+	+	+				Common	1	Common	1
Bembidion properans Steph.		4								Common	1	Common	1
Bembidion punctulatum Drap.		1		+	++	++	++		++	Local	2	Local	2
Bembidion dentellum (Thun.)		3	+						++	Local	2	Local	2
Bembidion obliquum Strm.	Nb	4	++					standing water	++	Nb	8	Nb	8
Bembidion prasinum (Duft.)		1			++	++	++		++	Very Local	4	Reg Not.	2
Bembidion tibiale (Duft.)		1			++	++	++		++	Common	1	Common	1
Bembidion atrocoeruleum Steph.		1			++	++	++		++	Local	2	Local	2
Bembidion monticola Strm.	Nb	1		+	++	+			++	Very Local	4	Nb	8
Bembidion nitidulum (Marsh.)		4	++	+					++	Local	2	Local	2
Bembidion bruxellense Wesm.		4		+	+	+			+	Local	2	Local	2
Bembidion tetracolum Say		4	+	+	+	+	+		+	Common	1	Common	1
Bembidion andreae (F.)		2	+	++	++?	+			++	Very Local	4	Reg Not.	2
Bembidion femoratum Strm.		2			+	+			++	Local	2	Local	2
Bembidion saxatile Gyll.	Nb	2		+	++				+	Nb	8	Nb	8
Bembidion decorum (Zenk.)		1			++	++	++		++	Common	1	Common	1
Bembidion genei Kust.		4	+	+	+				++	Common	1	Common	1
Bembidion stomoides Dej.	Nb	1			++	+?			++	Nb	8	Nb	8
Bembidion gilvipes Strm.	Nb	4	++						++	Nb	8	Nb	8
Bembidion quadrimaculatum (L.)		4	+	+	+				+	Common	1	Common	1
Bembidion articulatum (Panz.)		3	++	++					++	Local	2	Local	2
Bembidion obtusum Serv.		4	+	+					++	Common	1	Common	1
Bembidion (Ocys) harpaloides Serv.		4							+	Common	1	Common	1
Bembidion biguttatum (F.)		4	+						++	Common	1	Common	1
Bembidion aeneum Germ.		4	+	+	+				++	Common	1	Common	1

Bembidion unicolor Chaud.		4	++	+			+	Local	2	Local	2
Bembidion guttula (F.)		4	++	+			++	Common	1	Common	1
Bembidion unicolor Chaud./guttula (F.)											
Bembidion lunulatum (Fourc.)		4	++	+	+			Common	1	Common	1
Asaphidion flavipes (L.)		3	+	+			+	Common	1	Common	1
Asaphidion curtum (Heyden)		4						Common	1	Common	1
Asaphidion stierlini (Heyden)		4						Local	2	Local	2
Patrobus atrorufus (Strom.)		4	+				+	Common	1	Common	1
Anisodactylus binotatus (F.)		4					+	Local	2	Local	2
Harpalus rufibarbis (F.)		4		+	+	+		Common	1	Reg. No.	2
Harpalus rufipes Deg.		4		+	+	+		Common	1	Common	1
Harpalus affinis (Schr.)		4		+	+	+		Common	1	Common	1
Harpalus latus (L.)		4						Common	1	Common	1
Stenolophus skrimshiranus Steph.	Na	4	++					Na	16	Na	16
Bradycellus verbasci (Duft.)		4						Common	1	Common	1
Bradycellus harpalinus (Serv.)		4						Common	1	Common	1
Bradycellus collaris (Payk.)		4						Common	1	Common	1
Acupalpus dorsalis (F.)		4	++				++	Local	2	Local	2
Acupalpus dubius Schil.		4						Local	2	Local	2
Stomis pumicatus (Panz.)		4						Local	2	Local	2
Pterostichus (Poecilus) cupreus (L.)		4	+	+				Local	2	Local	2
Pterostichus (Poecilus) versicolor (Strm.)		4		+	?	?		Local	2	Local	2
Pterostichus strenuus (Panz.)		4	+	+	+			Common	1	Common	1
Pterostichus diligens (Strm.)		4					+	Common	1	Common	1
Pterostichus vernalis (Panz.)		4	+	+			+	Local	2	Local	2
Pterostichus nigrita (Payk.)		4	+				+	Common	1	Common	1
Pterostichus rhaeticus Heer		4	+	+			+	Common	1	Common	1
Pterostichus anthracinus (Panz.)	Nb	4					+	Nb	8	Nb	8
Pterostichus minor (Gyll.)		4	++				++	Local	2	Local	1
Pterostichus niger (Schall.)		4	+	+	+	+		Common	1	Common	1

Pterostichus melanarius (Ill.)		4							Common	1	Common	1
Pterostichus adstrictus Esch.		4							Local	2	Local	2
Pterostichus madidus (F.)		4							Common	1	Common	1
Pterostichus cristatus Duf.	Nb	4					wood		Nb	8	Nb	8
Abax parallelepipedus Pil		4							Common	1	Common	1
Synuchus nivalis (Panz.)		4							Local	2	Local	2
Calathus fuscipes (Goez.)		4							Common	1	Common	1
Calathus erratus Sahl.		4							Common	1	Common	1
Calathus ambiguus (Payk.)	Nb	4							Nb	8	Nb	8
Calathus micropterus (Duft.)		5					wood		Common	1	Common	1
Calathus melanocephalus (L.)		4							Common	1	Common	1
Laemostenus terricola (Hbst.)		4							Local	2	Local	2
Olisthopus rotundatus (Payk.)		4							Local	2	Local	2
Agonum marginatum (L.)		4	++					++	Local	2	Local	2
Agonum muelleri (Hbst.)		4	+	+	+			+	Common	1	Common	1
Agonum moestum (Duft.)		4	+	+				++	Common	1	Common	1
Agonum micans Nic.		3	++	+				++	Local	2	Local	2
Agonum fuliginosum (Panz.)		4	+					++	Common	1	Common	1
Agonum assimile (Payk.)		4	+	+	+	+			Common	1	Common	1
Agonum albipes (Payk.)		2	+	+	+	+	+	++	Common	1	Common	1
Agonum obscurum (Hbst.)		4	+					+	Local	2	Local	2
Agonum dorsale (Pont.)		4	+	+					Common	1	Common	1
Amara plebeja (Gyll.)		4							Common	1	Common	1
Amara similata (Gyll.)		4	+	+	+	+			Common	1	Common	1
Amara ovata (F.)		4	+	+					Common	1	Common	1
Amara communis (Panz.)		4							Local	2	Local	2
Amara lunicollis Schdte.		4							Local	2	Local	2
Amara aenea (Deg.)		4		+	+	?			Common	1	Common	1
Amara familiaris (Duft.)		4							Common	1	Common	1
Amara bifrons (Gyll.)		4							Local	2	Local	2
Amara fulva (Müll.)	Nb	2		++	+				Nb	8	Nb	8

Amara apricaria (Payk.)		4							Common	1	Common	1
Amara aulica (Panz.)		4							Common	1	Common	1
Amara sp.												
Chlaenius nigricornis (F.)	Nb	4	++					++	Very Local	4	Nb	8
Chlaenius vestitus (Payk.)		3	+	++	+	+		++	Local	2	Local	2
Badister bullatus (Schr.)		4							Common	1	Common	1
Demetrias atricapillus (L.)		4	+						Common	1	Common	1
Metabletus obscuroguttatus Duft		4	+					+	Local	2	Local	2
Metabletus foveatus (Fourc.)		4							Common	1	Common	1
Metabletus truncatellus (L.)		4							Common	1	Common	1
Lionychus quadrillum (Duft.)	RDB3	2		+	++	+		+	RDB3	24	RDB3	24
Brychius elevatus (Panz.)		4	+	+	++	++	++	++	Local	2	Local	2
Haliplus lineatocollis Marsh		4							Common	1	Common	1
Haliplus laminatus (Schal.)	Nb	4	+	++	+			++	Nb	8	Nb	8
Hyphydrus ovatus (L.)		4						++	Common	1	Common	1
Bidessus minutissimus (Germ.)	RDB3	1			++	+		++	RDB3	24	RDB3	24
Nebrioporus depressus elegans (Panz.)		4			++	++	++	++	Common	1	Common	1
Stictotarsus duodecimpustulatus F		4						++	Local	2	Local	2
Oreodytes septentrionalis Sahl.		4			++	++	++	++	Local	2	Local	2
Oreodytes sanmarki (Sahl.)		4			++	++	++	++	Common	1	Common	1
Noterus clavicornis (Deg.)		4						++	Local	2	Local	2
Platambus maculatus (L.)		4			++	++		++	Common	1	Common	1
Agabus bipustulatus (L.)		4							Common	1	Common	1
Ilybius fuliginosus (F.)		4	+					++	Common	1	Common	1
Gyrinus urinator Ill.	Nb	4				++	shade	++	Nb	8	Nb	8
Orectochilus villosus (Müll.)		4				++	trees?	++	Local	2	Local	2
Hydraena riparia Kug.		4	+					++	Local	2	Local	2
Hydraena rufipes Curt.	Nb	3		++	+?			++	Nb	8	Nb	8
Hydraena nigrita Germ.	Nb	1	+					++	Nb	8	Nb	8
Hydraena testacea Curt.	Nb	4	+	+	+	?		++	Nb	8	Nb	8
Hydraena gracilis Germ.		1			+	+		++	Local	2	Local	2

Ochthebius dilatatus Steph.		4					++	Local	2	Local	2
Ochthebius bicolon Germ.	Nb	1	+	+?	?'+		++	Nb	8	Nb	8
Limnebius truncatellus (Thun.)		4						Common	1	Common	1
Hydrochus nitidicollis Muls.	RDB3	1	++	?+	++	?	++	RDB3	24	RDB3	24
Helophorus flavipes (F.)		4					++	Local	2	Local	2
Helophorus grandis Ill.		4					++	Common	1	Common	1
Helophorus aequalis Thoms.		4		++	?	?	++	Common	1	Common	1
Helophorus arvernicus Muls.	Nb	1	+	+	+	+	++	Very Local	4	Nb	8
Helophorus brevipalpis Bed.		4					++	Common	1	Common	1
Helophorus brevipalpis group											
Helophorus strigifrons Thom.	Nb	4						Nb	8	Nb	8
Helophorus granularis (L.)		4						Local	2	Local	2
Helophorus sp.											
Sphaeridium scarabaeoides (L.)		5						Common	1	Common	1
Cercyon ustulatus (Preys.)	Nb	4						Nb	8	Nb	8
Cercyon atomarius (F.)		5						Common	1	Common	1
Cercyon haemorrhoidalis (F.)		4						Common	1	Common	1
Cercyon unipunctatus (L.)		5					++	Local	2	Local	2
Megasternum boletophagum Marsh.		4						Common	1	Common	1
Anacaena globulus (Payk.)		4					++	Common	1	Common	1
Anacaena limbata (F.)		4					++	Common	1	Common	1
Laccobius striatulus (F.)		4	+				++	Local	2	Local	2
Helochares lividus (Forst.)	Nb	4		++	+?			Very Local	4	Nb	8
Saprinus virescens (Payk.)	RDBK	5						RDBK	16	RDBK	16
Kissister minima (Aube)		5						Uncertain	4	Unknown	4
Paralister obscurus (Kug.)	RDB2	5						RDB2	32	RDB2	32
Nicrophorus vespilloides Hbst.		5						Local	2	Local	2
Nicrophorus vespillo (L.)		5						Common	1	Common	1
Nicrophorus sp.		5						Common	1	Common	1
Thanatophilus rugosus (L.)		5						Common	1	Common	1
Silpha tristis Ill.		5						Common	1	Common	1

Silpha atrata L.		4							Common	1	Common	1
Ptomaphagus subvillosus (Goez.)		5							Common	1	Common	1
Choleva spadicea (Sturm)		5							Local	2	Local	2
Sciodrepoides watsoni (Spnc.)		5							Common	1	Common	1
Catops morio (F.)		5							Common	1	Common	1
Catops sp.		5							Common	1	Common	1
Leiodes ferruginea (F.)		5							Local	2	Local	2
Clambus armadillo (Deg.)		4							Common	1	Common	1
Stenichnus collaris (Müll.)		4							Common	1	Common	1
Ptenidium longicorne Fuss		2		?	?	?		+	Local	2	Local	2
Ptenidium pusillum (Gyll.)		5							Common	1	Common	1
Acrotrichis atomaria (Deg.)		5							Common	1	Common	1
Proteinus crenulatus Pand.	Nb	5							Nb	8	Nb	8
Proteinus brachypterus (F.)		5							Common	1	Common	1
Lesteva punctata Er.		34	?	?	?	?		++	Local	2	Local	2
Lesteva heeri Fauv.		4						++	Common	1	Common	1
Lesteva longoelytrata Goez.		4	++					++	Common	1	Common	1
Lesteva pubescens Mann.		4	+	+	+	+	+	++	Local	2	Local	2
Geodromicus nigrita Müll.		4			+	+	+	++	Local	2	Local	2
Deleaster dichrous (Grav.)	Nb	2	+	+	+	+	+	++	Nb	8	Nb	8
Coprophilus striatulus (F.)		4							Common	1	Common	1
Ochthephilus omalinus (Er.) agg.		1	+	+	++	+	+	++	Uncertain	4	Local	2
Ochthephilus aureus (Fauv.)		1	+	+	++	+	+	++	Local	2	Local	2
Carpelimus bilineatus Steph.		3	++	?+				++	Common	1	Common	1
Carpelimus rivularis (Mots.)		3	++	++	+			++	Common	1	Common	1
Carpelimus corticinus (Grav.)		3	++	++				++	Common	1	Common	1
Carpelimus gracilis (Mann.)		2	+	+	+			+	Local	2	Local	2
Carpelimus elongatulus (Er.)		4							Common	1	Common	1
Thinodromus arcuatus (Steph.)		1	+	+	+	+		++	Local	2	Local	2
Anotylus rugosus (F.)		4						+	Common	1	Common	1
Anotylus sculpturatus (Grav.)		4							Common	1	Common	1

Anotylus tetracarinatus Block		4							Common	1	Common	1
Oxytelus sculptus Grav.		4							Common	1	Common	1
Oxytelus laqueatus (Marsh.)		5							Common	1	Common	1
Platystethus arenarius (Fourc.)		4							Common	1	Common	1
Platystethus cornutus (Grav.)		3	++	+				++	Local	2	Local	2
Platystethus nitens (Sahl.)		4							Local	2	Local	2
Bledius annae Sharp		1		++				++	Local	2	Local	2
Bledius erraticus Er.	RDBK	2		+				++	RDBK	16	RDBK	16
Thinobius bicolor Joy	Na	1			++			++	Na	16	Na	16
Thinobius strandi Smet.	N	1		++	++			++	N	8	N	8
Thinobius praetor Smet.	N	1			++			++	N	8	N	8
Thinobius newberyi Scheer.	RDBI	1			++			++	RDBI	24	RDBI	24
Stenus biguttatus (L.)		1	+					++	Uncertain	4	Local	2
Stenus comma LeC.		3		++	++			++	Common	1	Local	2
Stenus guttula Müll.		2						++	Local	2	Local	2
Stenus guynemeri Jacq.		4			+	+	+	Moss ++	Local	2	Local	2
Stenus juno (Payk.)		4	+					++	Common	1	Common	1
Stenus clavicornis (Scop.)		4							Common	1	Common	1
Stenus rogeri Kr.		4	+					++	Common	1	Common	1
Stenus bimaculatus Gyll.		4	+					++	Common	1	Common	1
Stenus boops Ljungh		4	+					++	Common	1	Common	1
Stenus pusillus Steph.		4	?	?	?	?	?	++	Common	1	Common	1
Stenus melanopus (Marsh.)		4							Common	1	Common	1
Stenus asphaltinus Er.	RDBI	2		?	?			Drier cond	RDBI	24	RDBI	24
Stenus nanus Steph.		4						+	Common	1	Common	1
Stenus crassus Steph.		4							Local	2	Local	2
Stenus brunnipes Steph.		4							Common	1	Common	1
Stenus tarsalis Ljungh		4	++	+	?			++	Common	1	Common	1
Stenus similis (Hbst.)		4							Common	1	Common	1
Stenus solutus Er.		4	+					++	Local	2	Local	2

Stenus cicindeloides Schal.		4	+					++	Local	2	Local	2
Stenus pallitarsus Steph.		4	++	+				++	Common	1	Common	1
Paederus fuscipes Curt.	Nb	4	++	+				++	Nb	8	Nb	8
Paederus riparius (L.)		4	++	+				++	Local	2	Local	2
Paederus littoralis Grav.		4	++	+				+	Common	1	Common	1
Rugilus orbiculatus (Payk.)		4							Common	1	Common	1
Rugilus erichsoni (Fauv.)		4							Common	1	Common	1
Medon brunneus (Er.)		4							Local	2	Local	2
Hypomedon propinquus (Bris.)		4						+	Local	2	Local	2
Scopaeus gracilis (Sperk)	RDBK	1			++			++	RDBK	16	RDBK	16
Lathrobium multipunctum Grav.		4	++					++	Local	2	Local	2
Lathrobium angusticolle Bois.	Nb	1		+	++	+		++	Nb	8	Nb	8
Lathrobium angustatum Bois.	Nb	4						++	Nb	8	Nb	8
Lathrobium geminum Kr.		4	+					+	Common	1	Common	1
Lathrobium ripicola Czwal.	N	3	+	+	+			++	N	8	N	8
Lathrobium fulvipenne (Grav.)		4	+					+	Common	1	Common	1
Lathrobium brunnipes (F.)		4	+					+	Common	1	Common	1
Gyrohypnus punctulatus (Payk.)		5							Common	1	Common	1
Gyrohypnus fracticornis (Müll.)		5							Uncertain	4	Unknown	4
Gyrohypnus angustatus Steph.		5							Common	1	Common	1
Gyrohypnus sp.												
Xantholinus linearis (Ol.)		4							Common	1	Common	1
Xantholinus longiventris Heer		4							Common	1	Common	1
Othius angustus Steph.		4							Common	1	Common	1
Neobisnius villosulus (Steph.)		3	++	+				+	Local	2	Local	2
Neobisnius prolixus Er.	RDBK	3		+	++	++	?+	++	RDBK	16	RDBK	16
Erichsonius signaticornis Muls. & Rey	Nb	2			+	++	+	++	Nb	8	Nb	8
Philonthus atratus (Grav.)	Na	4		++				++	Na	16	Na	16
Philonthus concinnus (Grav.)		4							Local	2	Local	2
Philonthus intermedius (Bois.)		4							Common	1	Common	1
Philonthus laminatus (Creutz.)		4							Common	1	Common	1

Philonthus tenuicornis Muls.		4							Local	2	Local	2
Philonthus cognatus Steph.		4							Common	1	Common	1
Philonthus politus (L.)		5							Common	1	Common	1
Philonthus succicola Thom.		5							Common	1	Common	1
Philonthus addendus Sharp		5							Local	2	Local	2
Philonthus decorus (Grav.)		5							Common	1	Common	1
Philonthus rotundicollis (Men.)		4	++	+					Local	2	Local	2
Philonthus varius (Gyll.)		5							Common	1	Common	1
Philonthus varians (Payk.)		5							Common	1	Common	1
Philonthus splendens (F.)		5							Common	1	Common	1
Philonthus fimetarius (Grav.)		5							Common	1	Common	1
Philonthus quisquiliarus (Gyll.)		4	+	+	+				Common	1	Common	1
Philonthus sanguinolentus Grav.		5							Common	1	Common	1
Philonthus micans (Grav.)		4	+					++	Local	2	Local	2
Philonthus rubripennis Steph.		2			++	+	+	++	Very Local	4	Local	2
Philonthus marginatus (Strom)		5							Common	1	Common	1
Philonthus sp.		5										
Gabrius astutoides Strand	RDBI	2		?	+	+?		++	RDBI	24	RDBI	24
Gabrius trossulus von Nord.		4						++	Local	2	Local	2
Gabrius velox Sharp	Nb	4	?+	?+	?++			++	Nb	8	Nb	8
Gabrius pennatus Sharp		4	+						Common	1	Common	1
Platydracus stercorarius (Ol.)		5							Local	2	Local	2
Staphylinus caesareus Ced.	RDBI	4							RDBI	24	RDBI	24
Ocypus olens Müll.		4							Common	1	Common	1
Ocypus aeneocephalus Deg.		4							Local	2	Local	2
Ocypus pedator Grav.	Na	4							Na	16	Na	16
Quedius ventralis (Arag.)	Nb	5							Nb	8	Nb	8
Quedius curtipennis Bernh.		4							Common	1	Common	1
Quedius tristis (Grav.)		4							Common	1	Common	1
Quedius molochinus (Grav.)		4							Common	1	Common	1
Quedius maurorufus (Grav.)		4							Common	1	Common	1

Quedius nitipennis (Steph.)		4				+	Common	1	Common	1
Trichophya pilicornis (Gyll.)	Nb	5					Nb	8	Nb	8
Mycetoporus lepidus (Grav.)		5					Common	1	Common	1
Mycetoporus nigricollis Steph.		5					Local	2	Local	2
Mycetoporus splendidus (Grav.)		5					?		********	
Lordithon exoletus (Er.)		4					Local	2	Local	2
Bolitobius cingulatus (Mann.)		4					Local	2	Local	2
Bolitobius inclinans (Grav.)		5					Local	2	Local	2
Sepedophilus marshami (Steph.)		4					Common	1	Common	1
Sepedophilus bipunctatus (Grav.)	Nb	5					Nb	8	Nb	8
Tachyporus nitidulus (F.)		5					Common	1	Common	1
Tachyporus obtusus (L.)		4					Common	1	Common	1
Tachyporus solutus Er.		4					Common	1	Common	1
Tachyporus pallidus Sharp		4					Local	2	Local	2
Tachyporus hypnorum (F.)		4					Common	1	Common	1
Tachyporus chrysomelinus (L.)		4					Common	1	Common	1
Tachyporus dispar (Payk.)		4					Common	1	Common	1
Tachyporus tersus Er.		4					Local	2	Local	2
Tachyporus pusillus Grav.		4					Common	1	Common	1
Tachyporus sp.										
Tachinus signatus Grav.		4					Common	1	Common	1
Tachinus marginellus (F.)		4					Common	1	Common	1
Cypha longicornis (Payk.)		4					Common	1	Common	1
Deinopsis erosus (Steph.)		4	++	+		++	Common	1	Common	1
Myllaena intermedia Er.		4					Common	1	Common	1
Myllaena elongata (Matt.)	N	4	++	+	+		N	8	N	8
Myllaena brevicornis (Matt.)		4					Common	1	Common	1
Oligota punctulata Heer		4					Uncertain	4	Unknown	4
Oligota pumilio Kies.		4					Local	2	Local	2
Cordalia obscura (Grav.)		4					Uncertain	4	Unknowm	4
Tachyusa constricta Er.		2	++	++			Local	2	Local	2

Tachyusa coarctata Er.	N	2	+	++					N	8	N	8
Tachyusa atra (Grav.)		2							Common	1	Common	1
Tachyusa leucopus (Marsh.)		2	+	+?	??				Common	1	Common	1
Dasygnypeta velata (Er.)	N	3	+	+					N	8	N	8
Gnypeta carbonaria (Mann.)		3	++	+				++	Local	2	Local	2
Gnypeta rubrior Tott.		1	++	+	+			++	Local	2	Local	2
Callicerus obscurus Grav.		4							Common	1	Common	1
Callicerus rigidicornis (Er.)		4							Common	1	Common	1
Boreophilia islandica (Kr.)		4						+	Local	2	Local	2
Hydrosmecta eximia (Sharp)		1		+	++	+		++	Very local	4	Local	2
Hydrosmecta fragilis (Kr.)	N	1			++	+		++	N	8	N	8
Hydrosmecta thinobioides (Kr.)	N	1			++	+		++	N	8	N	8
Hydrosmecta delicatula (Sharp)	RDBK	1			++			++	RDBK	16	RDBK	16
Hydrosmectina septentrionum Benick	N	1			++	+		++	N	8	N	8
Aloconota (s.str.) planifrons (Water.)	RDBK	2			++			+	RDBK	16	RDBK	16
Aloconota (s.str.) cambrica (Woll.)		1			++	+	+	++	Local	2	Local	2
Aloconota (s.str.) currax (Kr.)		1		+	++	+	+	++	Local	2	Local	2
Aloconota (s.str.) sulcifrons (Steph.)		4	++	+	+			++	Local	2	Unknown	4
Aloconota (s.str.) insecta (Thom.)		2	++	+				++	Common	1	Common	1
Aloconota (s.str.) gregaria (Er.)		4						+	Common	1	Common	1
Amischa analis (Grav.)		4							Common	1	Common	1
Amischa bifoveolata (Mann.)		5	=cavifrons						Common	1	Common	
Amischa nigrofusca (Steph.)		4							Uncertain	4	Unknown	4
Geostiba circellaris (Grav.)		4							Common	1	Common	1
Dinaraea angustula (Gyll.)		4							Local	2	Local	2
Dinaraea aequata (Er.)		5							Common	1	Common	1
Liogluta granigera (Kies.)		4							Common	1	Common	1
Liogluta longiuscula (Grav.)		4						+	Common	1	Common	1
Atheta (Philhygra) elongatula (Grav.)		4	++	+	+			++	Common	1	Common	1
Atheta (Philhygra) hygrotopora (Kr.)		4	+	+	+			++	Local	2	Local	2

Atheta (Philhygra) luridipennis (Mann.)		4					Local	2	Local	2
Atheta (Philhygra) gyllenhali (Thom.)		4	+			++	Common	1	Common	1
Atheta (Philhygra) melanocera (Thom.)		4		+	+	++	Common	1	Common	1
Atheta (Philhygra) malleus Joy		4	+	+		+	Local	2	Local	2
Atheta (Philhygra) palustris (Kies.)		4				+	Uncertain	4	Unknown	4
Atheta debilis (Er.)		3	+	+	+	++	Local	2	Local	2
Atheta divisa (Mark.)		4					Uncertain	4	Unknown	4
Atheta (Microdota) amicula (Steph.)		5					Common	1	Common	1
Atheta (Microdota) indubia (Sharp)		4								
Atheta (Mocyta) orbata (Er.)		4					Common	1	Common	1
Atheta (Mocyta) fungi (Grav.)		4					Common	1	Common	1
Atheta (Mocyta) amplicollis (Muls.)		4					Uncertain	4	Unknown	4
Atheta (Acrotona) obfuscata (Grav.)	N	4	+	+	?+	++	Nb	8	Nb	8
Atheta (Acrotona) muscorum (Bris.)		4					Common	1	Common	1
Atheta (Acrotona) aterrima (Grav.)		5					Common	1	Common	1
Atheta (Datomicra) nigra (Kr.)		5					Common	1	Common	1
Atheta (Atheta) brunneipennis Thom.		4					Local	2	Local	2
Atheta (Atheta) triangulum (Kr.)		5					Common	1	Common	1
Atheta (Atheta) graminicola (Grav.)		4	+	+		+	Common	1	Common	1
Atheta (Lohse grp. 1) laticollis (Steph.)		5					Common	1	Common	1
Atheta (Lohse grp. 1) fungicola (Thom.)		5					Common	1	Common	1
Atheta (Dimetrota) macrocera (Thom.)		5					Common	1	Common	1
Atheta (Chaetida) longicornis (Grav.)		5					Common	1	Common	1
Drusilla canaliculata (F.)		4					Common	1	Common	1
Zyras limbatus (Payk.)		4					Local	2	Local	2
Zyras humeralis (Grav.)		4					Local	2	Local	2
Ilyobates subopacus Palm	N	4				++	N	8	N	8
Chiloporata longitarsis (Er.)		3	++	+	+	+	Common	1	Common	1
Ocalea picata (Steph.)		4					Common	1	Common	1
Meotica exilis (Er.)		4					Uncertain	4	Unknown	4

Trichiusa immigrata Lohse		5							Immigrant	0	Immigrant	0
Oxypoda elongatula Aube		4	++	+				++	Common	1	Common	1
Oxypoda umbrata (Gyll.)		5							Uncertain	4	Uncertain/v. local	4
Oxypoda exoleta Er.	N	4	+	+	+				N	8	N	8
Oxypoda brachyptera (Steph.)		4							Common	1	Common	1
Oxypoda haemorrhoa (Mann.)		4							Unknown	2	Unknown	4
Aleochara (s.s.) curtula (Goez.)		5							Common	1	Common	1
Aleochara (s.s) brevipennis Grav.	N	4		+	+				N	8	N	8
Aleochara (Xenochara) lanuginosa Grav.		5							Common	1	Common	1
Aleochara (Coprochara) bilineata Gyll.		5							Common	1	Common	1
Aleochara (Coprochara) verna Say	RDBK	5							RDBK	16	RDBK	16
Aleochara (Coprochara) binotata Kr.	RDBK	5							RDBK	16	RDBK	16
Aleochara (Coprochara) bipustulata (L.)		5							Common	1	Common	1
Bryaxis bulbifer (Reich.)		4							Common	1	Common	1
Brachygluta pandellei (Saulc.)	RDBK	1			++	++	+?	++	RDBK	16	RDBK	16
Pselaphus heisei (Hbst.)		4						+	Local	2	Local	2
Cantharis nigra (Deg.)		5							Common	1	Common	1
Cantharis nigricans (Müll.)		5							Common	1	Common	1
Cantharis livida L.		5							Common	1	Common	1
Cantharis rufa L.		4							Common	1	Common	1
Rhagonycha translucida (Kryn.)	Nb	5							Nb	8	Nb	8
Rhagonycha femoralis (Brul.)		4							Common	1	Common	1
Malthodes dispar (Germ.)		5							Local	2	Local	2
Malthodes fibulatus Kies.	Nb	5							Nb	8	Nb	8
Agriotes acuminatus (Steph.)		4							Common	1	Common	1
Agriotes lineatus (L.)		4							Common	1	Common	1
Agriotes obscurus (L.)		4							Common	1	Common	1
Agriotes sputator (L.)		4							Common	1	Common	1
Adrastus pallens (F.)		4							Common	1	Common	1

Agrypnus murina (L.)		4		++				Sand		Local	2	Local	2
Ctenicera cuprea (F.)		4											
Aplotarsus incanus (Gyll.)		4			= selatosomus					Common	1	Common	1
Stenagostus rhombeus (Ol.)		4								Common	1	Common	1
Athous haemorrhoidalis (F.)		4								Common	1	Common	1
Athous bicolor (Goez.)		4								Local	2	Local	2
Hypnoidus riparius (F.)		4	+	+	+	+	+		++	Common	1	Common	1
Fleutiauxellus maritimus (Curt.)	Na	1			++	+			++	Nb	8	Na	16
Negastrius sabulicola (Boh.)	RDB2	1		++	++				+	RDB3	24	RDB2	32
Zorochros minimus (Bois.& Lac)		1		+	+	+			++	Common	1	Common	1
Trixagus dermestoides (Bonv.)		5						wood		Local	2	Local	2
Cyphon coarctatus Payk.		4								Common	1	Common	1
Cyphon palustris Thom.		4	++	+	+	+			++	Common	1	Common	1
Pomatinus substriatus (Müll.)	Na	4		+	?	?	?		++	Na	16	Na	16
Dryops ernesti des Gozis		4	+	+	+	+			++	Local	2	Local	2
Dryops nitidulus (Heer)	RDB3	3		+	+	+			++	RDB3	2	RDB3	24
Stenelmis canaliculata (Gyll.)	RDB2	4		+	++	+	??		++	RDB2	32	RDB2	32
Elmis aenea (Müll.)		4		+	++	+	+		++	Common	1	Common	1
Esolus parallelepipedus Mül		4		+	++	+	+		++	Common	1	Common	1
Oulimnius tuberculatus (Müll.)		4		+	++	+	+		++	Common	1	Common	1
Oulimnius troglodytes (Gyll.)	Nb	4	+	++					++	Nb	8	Nb	8
Limnius volckmari (Panz.)		4		+	++	+	+		++	Common	1	Common	1
Normandia nitens (Müll.)	RDB2	4			++	+			++	RDB2	32	RDB2	32
Macronychus 4-tuberculatus Müll.	RDB3	5						Wood	++	RDB3	24	RDB3	24
Heterocerus marginatus (F.)		4	++	+					++	Common	1	Common	1
Simplocaria maculosa Er.	RDBI	4	++	+				veg.	+	RDBI	24	RDBI	24
Byrrhus fasciatus (Forst.)		4								Common	1	Common	1
Byrrhus pilula (L.)		4								Common	1	Common	1
Byrrhus pustulatus (Forst.)		4								Local	2	Local	2

Byturus tomentosus (Deg.)	4					Common	1	Common	1
Brachypterus glaber (Steph.)	5					Common	1	Common	1
Pria dulcamarae (Scop.)	4					Local	2	Local	2
Meligethes aeneus (F.)	5					Common	1	Common	1
Meligethes sp.	5								
Glischrochilus quadriguttatus (F.)	5					Local	2	Local	2
Rhizophagus parallelocollis Gyll	5					Common	1	Common	1
Antherophagus nigricornis (F.)	4					Local	2	Local	2
Caenoscelis ferruginea (Sahl.)	4					Local	2	Local	2
Atomaria (Anchicera) fuscata (Schoen.)	5					Common	1	Common	1
Atomaria (Anchicera) rubella Heer	4					Common	1	Common	1
Atomaria (Anchicera) atricapilla Steph.	5					Common	1	Common	1
Atomaria (Anchicera) nitidula (Marsh.)	5					Common	1	Common	1
Atomaria (Anchicera) apicalis Er.	4					Common	1	Common	1
Atomaria (Anchicera) testacea Steph.	4					Common	1	Common	1
Atomaria (s.str) nigrirostris Steph.	5					Common	1	Common	1
Atomaria (s.str.) linearis Steph.	4					Common	1	Common	1
Stilbus testaceus (Panz.)	5					Common	1	Common	1
Stephostethus lardarius (Deg.)	5					Common	1	Common	1
Aridius bifasciatus (Reitt.)	4					Naturalised	0	Naturalised	
Aridius nodifer (West.)	5					Naturalised	0	Naturalised	
Enicmus transversus (Ol.)	4					Common	1	Common	1
Corticaria elongata (Gyll.)	4					Common	1	Common	1
Corticaria sp.									
Cortinicara gibbosa (Hbst.)	4					Common	1	Common	1
Corticarina fuscula (Gyll.)	4					Common	1	Common	1
Typhaea stercorea (L.)	5					Common	1	Common	1
Subcoccinella 24-punctata (L.)	4					Common	1	Common	1
Coccidula rufa (Hbst.)	4	+	+	+	++	Common	1	Common	1
Rhyzobius litura (F.)	4								
Tytthaspis sedecimpunctata (L.)	4				++	Local	1	Local	2

Adalia decempunctata (L.)		4						Common	1	Common	1
Adalia bipunctata (L.)		4						Common		Common	
Coccinella septempunctata L.		4						Common	1	Common	1
Coccinella quinquepunctata L.	RDB3	1		++	+			Na	16	RDB3	24
Coccinella undecimpunctata L.		4						Local	2	Local	2
Calvia 14-guttata (L.)		4						Common	1	Common	1
Propylea 14-punctata (L.)		5						Common	1	Common	1
Anatis ocellata (L.)		5						Common	1	Common	1
Rhinosimus planirostris (F.)		5				wood		Common	1	Common	1
Pyrochroa serraticornis (Scop)		5					Wood	Common	1	Common	1
Notoxus monoceros (L.)		4	++				Sand	Local	2	Local	2
Anaspis maculata Fourc.		5						Common	1	Common	1
Anaspis regimbarti Schil.		5						Common	1	Common	1
Lagria hirta (L.)		4						Common	1	Common	1
Geotrupes stercorarius (L.)		5						Common	1	Common	1
Geotrupes stercorosus (Scrib.)		5						Common	1	Common	1
Onthophagus similis (Scriba)		5						Local	2	Local	2
Aphodius (Colobopterus) erraticus (L.)		5						Common	1	Common	1
Aphodius rufipes (L.)		5						Common	1	Common	1
Aphodius luridus (F.)		5						Common	1	Common	1
Aphodius depressus (Kug.)		5						Common	1	Common	1
Aphodius sphacelatus (Panz.)		5						Common	1	Common	1
Aphodius prodromus (Brahm)		5						Common	1	Common	1
Aphodius granarius (L.)		5						Local	2	Local	2
Serica brunnea (L.)		5						Local	2	Local	2
Dorcus parallelipipedus (L)		5						Common	1	Common	1
Grammoptera ruficornis (F.)		4						Common	1	Common	1
Lema cyanella (L.)		4						Common	1	Common	1
Oulema melanopus (L.)		4						Common	1	Common	1
Chrysolina polita (L.)		4						Common	1	Common	1
Gastrophysa viridula (Deg.)		4						Common	1	Common	1

Phaedon cochleariae (F.)		4			+	Common	1	Common	1
Phaedon armoraciae (L.)		4			++	Common	1	Common	1
Hydrothassa glabra (Hbst.)		5				local	2	local	2
Hydrothassa marginella (L.)		4			+	Common	1	Common	1
Phratora vulgatissima (L.)		5				Common	1	Common	1
Phratora laticollis Suffr.		5				Common	1	Common	1
Phyllotreta nemorum (L.)		5				Common	1	Common	1
Phyllotreta undulata Kuts.		5				Common	1	Common	1
Phyllotreta tetrastigma (Com.)		4				Common	1	Common	1
Phyllotreta flexuosa (Ill.)		4				Local	2	Local	2
Phyllotreta vittata (F.)	Na	4				Na	16	Na	16
Phyllotreta ochripes (Curt.)		4				Local	2	Local	2
Phyllotreta exclamationis (Thun)		4			++	local	2	local	2
Phyllotreta atra (F.)		4				Common	1	Common	1
Phyllotreta diademata (Foud.)		4				local	2	local	2
Aphthona euphorbiae (Schr.)		4				Local	2	Local	2
Longitarsus gracilis Kuts.		4				Common	1	Common	1
Longitarsus suturalis (Marsh.)		4							
Longitarsus suturellus (Duft.)		4				Common	1	Common	1
Longitarsus luridus (Scop.)		5				Common	1	Common	1
Longitarsus anchusae (Payk.)	Nb	4				Nb	8	Nb	8
Longitarsus sp.									
Altica lythri Aube		4				Common	1	Common	1
Altica palustris Weise		4				Common	1	Common	1
Crepidodera transversa (Marsh.)		4				Common	1	Common	1
Crepidodera ferruginea (Scop.)		4				Common	1	Common	1
Hippuriphila modeeri (L.)		4	+?	+?		Common	1	Local	2
Chalcoides aurata (Marsh.)		4				Common	1	Common	1
Chalcoides plutus (Latr.)		4				Local	2	Local	2
Epitrix pubescens (Koch)		4				Common	1	Common	1
Mantura rustica (L.)	Nb	4				Nb	8	Nb	8

Chaetocnema concinna (Marsh.)		4		Common	1	Common	1
Chaetocnema hortensis (Fourc.)		4		Common	1	Common	1
Sphaeroderma testaceum (F.)		4		Common	1	Common	1
Psylliodes affinis (Payk.)		4		Common	1	Common	1
Psylliodes napi (F.)		5		Common	1	Common	1
Cassida flaveola Thun.		4		Common	1	Common	1
Cassida rubiginosa Müll.		4		Common	1	Common	1
Apion frumentarium (Payk.)		4		Common	1	Common	1
Apion haematodes Kirby		4		Common	1	Common	1
Apion (Parapion) violaceum Kirby		4		Common	1	Common	1
Apion (Parapion) curtirostre Germ.		4					
Apion (Kalcapion) pallipes Kirby		4		Local	2	Local	2
Apion (Protapion) fulvipes (Geoff.)		4	=dichroum	Common	1	Common	1
Otiorhynchus singularis (L.)		4		Common	1	Common	1
Caenopsis fissirostris (Walt.)	Nb	4		Nb	8	Nb	8
Caenopsis waltoni (Bohe.)		4		Common	1	Common	1
Phyllobius viridicollis (F.)		4		Local	2	Local	2
Phyllobius viridiaeris (Laich.)		4		Local	2	Local	2
Phyllobius roboretanus Gred.		4		Common	1	Common	1
Phyllobius oblongus (L.)		4		Common	1	Common	1
Phyllobius pomaceus Gyll.		4		Common	1	Common	1
Phyllobius glaucus (Scop.)		4		Common	1	Common	1
Phyllobius pyri (L.)		4		Common	1	Common	1
Liophloeus tessulatus (Müll.)		4		Common	1	Common	1
Barypeithes araneiformis (Schr.)		4		Common	1	Common	1
Barypeithes pellucidus (Bohe.)		4		Common	1	Common	1
Strophosoma melanogrammum (Forst.)		5		Common	1	Common	1
Strophosoma sus Steph.		4		Local	2	Local	2
Barynotus obscurus (F.)		4		Common	1	Common	1
Barynotus squamosus Germ.	Nb	4		Nb	8	Nb	8

Sitona griseus (F.)		4					Common	1	Common	1
Sitona cambricus Steph.		4					Common	1	Common	1
Sitona striatellus Gyll.		4			Gorse		Common	1	Common	1
Sitona lineatus (L.)		5					Common	1	Common	1
Sitona lepidus Gyll.		4					Common	1	Common	1
Sitona humeralis Steph.		5					Local	2	Local	2
Sitona spp.										
Tanymecus palliatus (F.)	Nb	5			Nettles?		Nb	8	Nb	8
Euophryum confine (Broun)		5					Naturalised	0	Naturalised	0
Bagous tempestivus (Hbst.)	Nb	4				++	Nb	8	Nb	8
Notaris acridulus (L.)		4	+			++	Common	1	Common	1
Grypus equiseti (F.)	Nb	4				+	Nb	8	Nb	8
Miccotrogus picirostris (F.)		4					Common	1	Common	1
Leiosoma deflexum (Panz.)		4					Common	1	Common	1
Hypera pollux (F.)		5					Local	2	Local	2
Hypera rumicis (L.)		4					Common	1	Common	1
Hypera nigrirostris (F.)		4					Common	1	Common	1
Baris lepidii Germ.	Na	3	+	++		+	Na	16	Na	16
Rhinoncus inconspectus (Hbst.)		4					Local	2	Local	2
Rhinoncus pericarpius (L.)		4					Local	2	Local	2
Rhinoncus bruchoides (Hbst.)		4					Common	1	Common	1
Rhinoncus castor (F.)		4					Common	1	Common	1
Ceutorhynchus erysimi (F.)		5					Common	1	Common	1
Ceutorhynchus litura (F.)		5					Common	1	Common	1
Ceutorhynchus sp.										
Neosirocalus floralis (Payk.)		5					Common	1	Common	1
Cidnorhinus quadrimaculatus (L.)		4					Common	1	Common	1
Rhynchaenus fagi (L.)		5			Beech		Common	1	Common	1
Rhynchaenus (Isochus) foliorum (Müll.)	Na	5					Na	16	Na	16

APPENDIX B

Species of Araneae recorded during the survey with their fidelity and substrate preference

Taxa	Status	Fidelity	Substrate						Wetness	Recorder	Score
			Silt	Sand	Shingle	Cobble	Boulder	other			
Araneae											
Segestriidae											
Segestria senoculata		4		+	+	+		Scree		Common	1
Gnaphosidae											
Drassodes cupreus		4			+	+			Heathland	Local	2
Haplodrassus signifer		5		++					Dunes	Local	2
Zelotes apricorum		4			+	+				Local	2
Micaria pulicaria		4	+	+	+				Bare grd	Common	1
Clubionidae											
Clubiona reclusa		5								Common	1
Clubiona lutescens		4							+	Common	1
Clubiona diversa		4						?Moss	+	Local	2
Thomisidae											
Xysticus cristatus		4								Common	1
Ozyptila praticola		5								Common	1
Lycosidae											
Pardosa agricola		2	+	+	+	+	?+		++	Local	2
Pardosa palustris		4	+	+				Heath		Common	1
Pardosa pullata		4		+	+	+				Common	1
Pardosa amentata		4	+	+	+	+				Common	1
Pardosa nigriceps		4	+	+	+	+		Veg.		Common	1

Alopecosa pulverulenta			5							Common	1
Trochosa ruricola		4	+	+	+	+			+	Common	1
Trochosa terricola		4	+	+	+	+			+	Common	1
Arctosa perita		4		+	+	+	?+	Heath		Local	2
Arctosa cinerea	Nb	2		+	+	+	?+			Nb	8
Pirata piraticus		4	+	+	+				++	Local	2
Agelenidae											
Agelena labyrinthica		5						Veg.		Common	1
Tegenaria agrestis		5								Local	2
Coelotes atropos		5								Common	1
Hahniidae											
Antistea elegans		4	+	+	+				++	Local	2
Hahnia nava		5								Local	2
Theridiiae											
Robertus lividus		5								Common	1
Tetragnathidae											
Pachygnatha clercki		4							+	Common	1
Pachygnatha degeeri		4								Common	1
Meta segmentata		5								Common	1
Araneidae											
Larinoides cornutus		3	+	+	+				++	Common	1
											0
Linyphiidae											0
Ceratinella brevipes		5								Common	1
Walckenaeria acuminata			4	+	+	+	+			Common	1
Walckenaeria dysderoides			4	+	+	+	+			Common	1
Walckenaeria nudipalpis			4	+	+	+	+			Common	1

Walckenaeria vigilax	4	+	+	+	+			+	Local	2
Dicymbium nigrum	5								Local	2
Gongylidium rufipes	5								Common	1
Dismodicus bifrons	5								Local	2
Hypomma bituberculatum		3	+	+				+	Common	1
Baryphyma trifrons	5							+	Local	2
Peponocranium ludicrum		5							Common	1
Pocadicnemis pumila	4	+	+	+	+				Common	1
Oedothorax gibbosus	4	+							Common	1
Oedothorax fuscus	4	+	+	+	+				Common	1
Oedothorax agrestis	4	+	+					+	Local	2
Oedothorax retusus	4	+	+	+	+				Common	1
Oedothorax apicatus	3			+	+	?+		++	Local	2
Silometopus elegans	4	+	+	+					Local	2
Silometopus reussi	4	+	+	+					Local	2
Evansia merens	5						Ants		Local	2
Tiso vagans	5								Common	1
Troxochrus scabriculus		4		+			Dunes		Local	2
Monocephalus fuscipes		5							Common	1
Gongylidiellum vivum	4							+	Common	1
Micrargus apertus	5								Local	2
Micrargus herbigradus	5								Common	0
Savignia frontata	4	+	+	+	+				Common	1
Diplocephalus cristatus		4	+	+	+	+			Common	1
Diplocephalus permixtus		5							Common	1
Diplocephalus latifrons		5							Common	1
Araeoncus humilis	5								Common	1
Milleriana inerrans	5								Local	2
Erigone vagans	4	+	+					+	Local	2
Erigone dentipalpis	4	+	+	+	+			+	Common	1

Erigone promiscua	5									Local	2
Erigone atra	4	+	+	+	+					Common	1
Leptorhoptrum robustum		3	+							Common	1
Drepanotylus uncatus	4	+	+	+					++	Local	2
Caviphantes saxetorum	Na	1			+	+	?+		+	Na	16
Jacksonella falconeri	5									Local	2
Porrhomma pygmaeum		4	+	+						Common	1
Porrhomma convexum		4	+	+						Common	1
Porrhomma pallidum	5									Local	2
Porrhomma microphthalmum		4	+	+						Local	2
Porrhomma egeria	4	+	+					subterr.		Local	2
Agyneta decora	5									Local	2
Agyneta cauta	5								?+	Local	0
Meioneta rurestris	5									Common	1
Meioneta gulosa	5									Local	2
Meioneta saxatilis	5									Common	1
Centromerita concinna		5								Common	1
Saaristoa abnormis	5									Common	1
Bathyphantes gracilis	4	+	+	+	+					Common	1
Diplostyla concolor	5									Common	1
Tapinopa longidens	5									Common	1
Lepthyphantes tenuis	4	+	+	+	+					Common	1
Lepthyphantes mengei		4	+	+	+	+				Common	1
Lepthyphantes ericaeus		5								Common	1
Lepthyphantes pallidus		4	+	+	+	+		Moorland		Local	2
Linyphia triangularis	5									Common	1
Neriene montana	5									Common	1
Microlinyphia pusilla	4	+	+	+	+					Common	1

APPENDIX C
Sampling sites and descriptions

River	Site	NGR	Description	Predominant sediment
ERS Phase 2				
Alport	Lower 1	SK142904	Small vegetated upland boulder bar	Boulder
	Lower 2	SK142904	Small vegetated upland boulder bar	Boulder
	Lower 3	SK142904	Small vegetated upland boulder bar	Boulder
Alport	Upper 1	SK142900	Small vegetated upland point bar	Gravel
	Upper 2	SK142900	Small partially vegetated upland channel bar	Gravel
	Upper 3	SK142900	Small partially vegetated upland point bar	Gravel
Ashop	Upper 1	SK142897	Small unvegetated cobble bar with mixture of sand ans shale in matrix	Cobble
	Upper 2	SK142897	Small unvegetated cobble bar with mixture of sand ans shale in matrix	Cobble
	Upper 3	SK142897	Small unvegetated cobble bar with mixture of sand ans shale in matrix	Cobble
Ashop	Lower	SK164883	Upland silt bar - vegetated quickly during the season	Silt
Ystwyth	Ty'n-yr-helyg	SN 595765	Very large point bar. Heterogeneous sediments but mainly cobble. Gorse scrub	Gravel
	Grogwynion	SN708720	Large - partially vegetated lateral bar with gorse scrub	Gravel
Severn	Dolydd Hafren 1	SJ 205007	Sandy lateral bar. Heavy vegetation - cattle trampled	Gravel
	Dolydd Hafren 2	SJ 205007	Sandy lateral bar. Little vegetation - cattle trampled	Gravel
	Dolydd Hafren 3	SJ 205007	Sandy channel bar. No vegetation - cattle trampled	Gravel
Severn	Preston Montford 1	ST 431145	Heavily vegetated silt bar in a wooded valley	Silt
	Preston Montford 2	ST 431145	Heavily vegetated silt bar in a wooded valley	Silt
Dee	Bangor-On-Dee	SJ 401467	Vegetated Sand ERS	Sand
Wharfe	Buckden 1	SD 9376	Heavily armoured cobble lateral bar, simple toporgaphy	Cobble
	Buckden 2	SD 9376	Heavily armoured cobble point bar, complex topography	Cobble
	Buckden 3	SD 9376	Heavily armoured cobble point bar. Small and partially vegetated	Cobble
Wharfe	Castley	SE 264460	Predominantly sandy large point bar - gravel fringe	

ERS Phase 3				
Wye	Glasbury	SO184403	Complex and heterogeneous, large lateral bar	Shingle (complex)
	Bronydd Farm	SO233443	Complex and heterogeneous, large lateral bar	Shingle (complex)
	Monmouth	SO511125	Vegetated and narrow sand bar - heavy vegetation as season progressed	Sand (lateral)
Usk	Pencarreg Farm	ST385986	Undulating predominately sandy lateral bar with shingle fringe	Sand (complex)
	Llangibby Bottom A1 - Sand	ST388963	Sandy and silt bar	Sandy toe of complex
	Llangibby Bottom A2 - Shingle	ST388963	Large steep compacted cobble, pebble bar	cobble - pebble
	Llangibby Bottom B (2 reps)	ST388963	Sandy point bar. Sheep grazed and trampled	Shingle/sand point bar
Tywi	Llandovery - Site (a)	SN754333	Braided stretch of heterogeneous cobble - gravel - lateral	Shingle (cobble-pebble)
	Llandovery - Site (b)	SN754333	Braided stretch of heterogeneous cobble - gravel - lateral	"
	Llandwrda Station	SN719309	Very large point bar. Heterogeneous sediments but mainly cobble. Gorse scrub	Shingle (complex)
	Pferm Typica	SN554206	Large sandy cobble-gravel bar - vehicle damage	Shingle (complex)
	Penlan	SN448205	Large sandy cobble-gravel bar - vehicle damage	Shingle (complex)
Calder	Elland - Rep 2	SE108217	Heavily polluted, stabilised gravel bar - mature vegetation	Shingle (gravel-
	Elland - Rep 3	SE108217	Heavily polluted, stabilised gravel bar - mature vegetation	"
Worth	Keithleigh	SE071417	Heavily polluted small lateral bar with some vegetation	Shingle (cobble)
Frome	Pallington 1	SY783912	Heavily vegetated silt lateral ERS	Silt
	Pallington 2	SY783912	Heavily vegetated silt lateral ERS	Silt
	Pallington 3	SY783912	Cattle trampled and cut over chert pebble	Shingle (flint)
Axe	Slymlakes Farm 1+2	SY280967	Cattle trampled, eutrophied cobble bar	pred. Cobble-pebble
	Slymlakes Farm 3	SY280967	Cattle trampled, eutrophied cobble bar	eutrophic
Highland	Lymmington 1	SU276066	Small and Wooded chert ERS	Shingle (flint)
Water	Lymmington 2	SU276066	Small and Wooded chert ERS	Shingle (flint)
	Lymmington 3	SU276066	Small and Wooded chert ERS	Shingle (flint)
ERS - Devon				
Camel	Site 1	SX017682	Mid channel bar with woody debris and dense willow scrub	Gravel and sand
	Site 2	SX016683	Heavily vegetated lateral bar	Sand, gravel fringe
	Site 3	SX015684	Lateral bar - right bank (looking downstream), woody debris	Gravel and sand
Erme	Site 1	SX634524	Large open point bar. Heterogeneous sediments and mixed open veg.	Cobble, pebble, gravel, sand
	Site 2	SX634524	Small and heterogeneous bar. Complex topography - little vegetation	Cobble, pebble, gravel, sand, silt

	Site 3	SX632522	Small heavily vegetated side bar. Dense stand of Japanese Knotweed	Cobble, pebble, gravel, sand, silt
Exe	Site 1	SX933989	Very large mid-channel bar with patchy ruderal vegetation	Cobble, pebble, sand
	Site 2	SX932988	Large complex, open side bar. Organic material plus varied sediments	Cobble, pebble, organics, sand
	Site 3	SX928990	Lateral bar - left bank (looking downstream). Simple topography	Cobble, pebble, sand
Otter	Site 1	SY095944	Heavily vegetated lateral bar - with sediments at the back	Chert (complex silt)
	Site 2	SY094943	Medium-large side bar - vegetated at back with complex topography	Chert (Complex)
	Site 3	SY094942	Medium-large point bar on LH bend. Open and sandy	Chert (gravel, pebble, cobble, sand)
Taw	Site 1	SS654021	Heavily disturbed site - small-medium side bar	Cobble, gravel , sand, mud
	Site 2	SS654021	Small lateral bar	Cobble, gravel, sand
	Site 3	SS654022	Small point bar - heavily disturbed by cattle	Cobble, gravel, sand
Teign	Site 1	SX848755	Large, complex side bar. Large willows behind, small line willows in front	Diverse, cobble-muds
	Site 2	SX848754	Large diverse side bar. Hummocky profile	Cobble, pebble, gravel, sand
	Site 3	SX848753	Large, complex side bar. Large willows behind.	Cobble, pebble, gravel, sand, silt
Thrushel	Site 1	SX415866	Well-vegetated small point bar - with band of gravel through middle	Diverse, cobble-muds
	Site 2	SX414865	Two small side bars, heavily shaded - lots of wood	Cobble with some pebble and gravel
	Site 3	SX414864	Heavily vegetated bar with diverse sediments	Diverse, cobble-muds
Torridge	Site 1	SS550132	Low-lying, flat large side bar - little ruderal vegetation	Cobble, pebble,gravel, sand
	Site 2	SS549133	Large, low-lying with muddy side channel	Cobble, pebble, gravel, sand, silt
	Site 3	SS549 134	Large point bar with steep, hummocky topography	Cobble, gravel, sand
Yarty	Site 1	ST262023	Small side bar. Open but in woodland	Cobble, some gravel and sand/silt
	Site 2	ST263021	Small side bar. Heavily shaded in woodland but complex in character	Cobble, some gravel and sand/silt
	Site 3	ST264019	Multiple bars in a small braided reach. Very complex topography	Cobble, some gravel and sand/silt
Creedy	Site 1	SX829989	Small to medium sized side bar. Much damage - gravel poaching?	Coarse, cobble, some gravel and sand/silt
Yeo	Site 2	SX830989	Small point bar - vegetated at the back.	Cobble, pebble, sand
	Site 3	SX831989	Sequence of two small bars. Predominantly gravel/pebble.	Gravel/pebble with cobbles and sand

ERS – Severn				
Severn	S. Llandinam - Site 1	SO024874	Large point bar with and sandy and silty fringe at its downstream edge	Cobble-sand
Severn	S. Llandinam - Site 2	SO023877	Larger more complex ERS, but was much more heavily trampled by stock	Cobble-sand
Severn	Llandinam Hall - Site 1	SO027897	Sheep trampled, compacted cobbles. Sands downstream	Cobble-sand
Severn	Llandinam Hall - Site 2	SO026899	Small to medium point bar with a steeper profile. Flattened cobbles with a sandy matrix. Gorse behind	Cobble-sand
Severn	Maesmawr Hall - Site 1	SO041923	Very large heterogeneous ERS. Sandy 'beach' - impaired by extraction	Cobble-sand
Severn	Maesmawr Hall - Site 2	SO047925	Eutrophic ERS comprising larger sized cobbles materials such as bricks, slates and shale	Cobble-sand

APPENDIX D
Environmental Variables for the ERS survey

A. Field Survey Details

Site name ……
River ……
Grid Ref ……
Date Set ……
Sampler Name ……
Bank (tick one) Left [ ] Right [ ] Channel [ ]

B. Impoundment for navigation (tick one)

No [ ] Yes [ ] Don't know [ ]

Impoundment for other purposes (tick one)
No [ ] Yes [ ] Don't know [ ]

C. ERS attributes

Substrate

Estimated % of each subsrtate on the ERS

Boulder (>256mm) …….
Cobble (64-256) …….
Pebble (16-64mm) …….
Gravel (2-16mm) …….
Sand (0.063-2mm) …….
Silt (0.004-0.063mm) …….
Organic matter …….

Vegetation

Vegetation structure (B=bare, S=Simple, C=complex) on ERS ……..
Estimated vegetation cover on ERS ……..

D. ERS Dimensions (at time of installation)

Length ……metres
Width ……metres

E. Land use next to ERS (tick if present)

Broadleaf/mixed woodland	[ ]
Coniferous plantation	[ ]
Moor/Heath	[ ]
Scrub/Rough	[ ]
Bog, Marsh, Fen	[ ]
Grazed improved/semi-improved grass	[ ]
Ungrazed improved/semi-improved grass	[ ]
Arable land	[ ]

Is land behind grazed by cattle?

No [ ] Yes [ ] Don't know [ ]

F. Bank Profile above ERS (tick one)

Natural / unmodified	[ ]
Artificial / modified	[ ]

G. ERS Profile

ERS Profile type (tick if present)

F= Flat (nearly)	[ ]
G=Gentle	[ ]
S=Steep (>10 degrees)	[ ]

H. ERS Topography (Tick one)

Simple (no channels)	[ ]
Humped (Back channel present)	[ ]
Complex (braided)	[ ]

I. ERS Habitat Heterogeneity **[ ]**
(1=low, 2=medium, 3=high)

J. ERS Disturbance

ERS Grazing [ ]
(1=low, 2=medium, 3=high)

ERS Trampling [ ]
(1=low, 2=medium, 3=high)

ERS extraction (gravel poaching) [ ]
(1=low, 2=medium, 3=high)

K. Extend of Shade

Percentage of ERS Shaded …….

L. Hibernation Potential

Presence of grass tussocks and deadwood high on ERS or on adjacent bank
(0=none, 1=Isolated, 2=in some quantity, 3=abundant)

Grass on ERS	[ ]
Grass on Bank	[ ]
Dead Wood on ERS	[ ]
Dead Wood on Bank	[ ]
Hibernation potential (overall) (1=low, 2=medium, 3=high)	[ ]

M. Bank above ERS dimensions (m)

Bankfull height	……
Bank Height (if different)	……
Embanked Height	……

N. Evidence of Recent Management (tick box(es))

Banks

None	[ ]
Resectioning	[ ]
Bank Mowing	[ ]
Enhancement	[ ]

Channel

None	[ ]
Resectioning	[ ]
Bank Mowing	[ ]
Enhancement	[ ]

O. Recreation (tick)

Evidence of Fishing	[ ]
Presence of boats	[ ]

P. Comments

APPENDIX E
Environmental Variables from Phase 3 Survey

Variables	Ferm-typ	Penlan	Pencareg	Axe1-2	Axe 3	Pallin1	Pallin2	Pallin3	Monmth	LymmR1	LymmR2	LymmR3	Llangib1	Llangib2	LlangibB	LlandovA	LlandovB	Keith	Glasbury	Llan-sta	Bronydd	EllandR2	EllandR3
Nav	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Impound	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
%bould	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	5	5
%cobble	0	5	0	1	1	0	0	10	0	0	0	40	0	5	0	35	35	20	0	20	10	30	20
%pebble	10	35	10	60	60	0	0	50	0	10	10	30	0	35	20	48	48	30	0	30	60	55	60
%gravel	70	45	5	30	30	0	0	35	0	70	70	30	10	20	20	10	10	15	50	30	25	5	5
%sand	20	15	85	0	0	0	0	5	95	10	10	5	80	20	55	5	5	15	50	20	5	0	0
%silt	0	0	0	5	5	90	90	0	5	0	10	0	10	0	0	0	0	15	0	0	0	5	5
%org.	0	0	0	4	4	10	10	0	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0
VegType	1	1	3	2	1	3	3	1	3	1	1	1	1	1	1	1	1	3	1	1	1	3	3
Vegcov	5	0	70	20	0	100	100	30	90	0	5	0	5	5	0	0	0	90	5	2	5	80	60
Length	80	60	30	15	4	25	25	15	20	8	10	7	40	60	40	40	20	6	100	100	40	20	7
Width	10	20	20	30	1	5	5	3	10	3	3	3	14	15	15	10	10	2	50	7	25	8	3
Mixwood	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0
conifplan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
moor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
scrub	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
bog	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
improgaz	0	1	0	1	1	1	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0
ungrazipm	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
arable	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
urban	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Grazed	1	1	0	1	1	1	1	1	0	0	0	0	1	1	2	1	1	0	0	1	0	0	0
trampling	1	1	0	2	2	1	1	2	0	0	0	1	0	0	2	1	1	0	0	1	0	1	1

Grpoach	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0
bankprof	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	2
ERSprof	2	3	2	2	2	2	2	3	3	1	1	1	1	2	2	1	1	1	1	2	1	1	1
ERStop	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	3	1	2	1	1
ERShet	3	3	3	1	1	1	1	1	1	1	1	1	2	2	1	3	1	1	3	3	3	1	1
%shade	0	0	10	0	0	60	60	0	20	50	50	100	0	0	0	0	0	0	5	1	0	0	80
hersgras	0	0	3	1	0	0	0	1	2	0	0	0	2	2	0	0	0	0	1	0	2	2	2
Hbangra	2	3	3	1	1	1	1	1	2	2	2	2	2	2	0	2	0	0	2	3	2	2	2
herswood	1	2	0	0	0	0	0	0	2	1	1	1	0	0	2	0	0	1	1	0	0	0	0
hbanwood	2	2	0	0	0	0	0	0	2	3	3	3	0	0	0	0	0	1	3	3	0	0	0
Hibpot	3	3	2	1	1	1	1	1	2	3	3	3	3	3	2	3	3	1	3	3	3	1	1
bankfull	3	5	4	0.5	0.5	1	1	1	4	2	2	2	3	3	3	1	1	4	2	3	7	10	10
bankman	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1
channone	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0	0
chandregd	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1
chanweed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chanenh	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
recfish	0	1	1	1	1	1	1	1	1	0	0	0	1	1	0	1	1	0	0	0	0	0	0
recboat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX F
List of Enviroment Variables, data type and usage

Variable	Variable Code	Variable Type	Data Type	Used in RDA/CCA	Reason for non-selection
Navigation	Nav	Landscape	Binary	No	Limited variation
Impoundment	Impound	Landscape	Binary	No	Only one example in data
% of Boulders	%bould	ERS	Percentage	No	High V.I.F.s
% of Cobbles	%cobble	ERS	Percentage	No	High V.I.F.s
% of Pebbles	%pebble	ERS	Percentage	No	High V.I.F.s
% of Gravels	%gravel	ERS	Percentage	No	High V.I.F.s
% of Sands	%sand	ERS	Percentage	Yes	
% Silts	%silt	ERS	Percentage	Yes	
% organic materials	%org.	ERS	Percentage	No	No variation
Phi Value	Phi	ERS	Phi units	Yes	
Vegetation Type on ERS	VegType	ERS	ordinal	Yes	
% Vegetation Cover on ERS	Vegcov	ERS	Percentage	Yes	
Length ERS (m)	Length	ERS	integer	Yes	
Width ERS (M)	Width	ERS	integer	Yes	
Mixed Woodland	Mixwood	Landuse	Binary	Yes	
Coniferous Plantation	conifplan	Landuse	Binary	Yes	
Moorland	moor	Landuse	Binary	Yes	
Scrubland	scrub	Landuse	Binary	Yes	
Bog and Marsh	bog	Landuse	Binary	Yes	
Improved Pasture	imprograz	Landuse	Binary	Yes	
Un-Grazed improved grassland	ungrazipm	Landuse	Binary	Yes	
Arable land	arable	Landuse	Binary	Yes	
Urban land	urban	Landuse	Binary	Yes	
Grazing on ERS	Grazed	ERS	Ordinal	Yes	
Trampling on ERS	trampling	ERS	Ordinal	Yes	
Gravel poaching	Grpoach	ERS	Ordinal	No	Only two examples in data set
Bank Profile	bankprof	Landscape	Ordinal	No	No sig. variation
ERS Profile	ERSprof	ERS	Ordinal	Yes	
ERS Topography	ERStop	ERS	Ordinal	Yes	
ERS habitat heterogeneity	ERShet	ERS	Ordinal	Yes	
% of shade from trees	%shade	ERS	Percentage	Yes	
Grass tussocks On ERS	hersgras	ERS	Ordinal	No	Covered by HibPot variable
Grass tussocks on Banks	Hbangra	Landscape	Ordinal	No	Covered by HibPot variable
Dead Wood on ERS	herswood	ERS	Ordinal	No	Covered by HibPot variable

Dead Wood on Bank	hbanwood	Landscape	Ordinal	No	Covered by HibPot variable
ERS Hibernation Potential	Hibpot	ERS	Ordinal	Yes	
Bankfull Height (m)	bankfull	Landscape	Decimal	No	No siginificant variation
Bank Management	bankman	Landscape	Binary	Yes	
Channel Management	channone	Landscape	Binary	Yes	
Dredging	chandregd	Landscape	Binary	No	No examples
Weed Removal	chanweed	Landscape	Binary	No	No examples
Channel enhancement	chanenh	Landscape	Binary	No	Few examples
Fishing	recfish	ERS	Binary	No	No siginificant variation
Boating	recboat	ERS	Binary	No	No siginificant variation

APPENDIX G
Species of Conservation interest

Table G1 – Phase 2 survey

Taxa	Status	L-AlpR1	L-AlpR2	L-AlpR3	U-AlpR1	U-AlpR2	U-AlpR3	L-Ashop	U-AshR1	U-AshR2	U-Ash3	Dee	BuckR1	BuckR2	BuckR3	Castley	DolyddR1	DolyddR2	DolyddR3	Grogwyn	P-MontR1	P-MontR2	Tyn-yr
Perileptus areolatus	Na																		+				
Tachys parvulus	Nb				+	+	+		+	+	+		+		+		+	+	+			+	+
Trechus discus	Nb																				+	+	
1.1.1.1.1.1 Bembidion gilvipes	Nb																				+	+	
Bembidion obliquum	Nb							+															
Miscodera arctica	Nb					+																	
Calathus ambiguus	Nb								+														
Chlaenius nigricornis	Nb																	+					
Lionychus quadrillum	RDB3																						+
Bidessus minutissimus	RDB3																						+
Helophorus arvernicus	Nb									+	+	+	+		+	+	+	+				+	
Proteinus crenulatus	Nb	+		+																			
Bledius erraticus	RDBK														+								
Deleaster dichrous	Nb						+						+	+									+
Thinobius strandi	N														+								
Lathrobium angustatum	Nb																						+
Lathrobium angusticolle	Nb												+	+									+
Lathrobium ripicola	N																			+			
Neobisinus prolixus	RDBK																+		+				+
Trichophya pilicornis	Nb					+																	
Ocypus pedator	Na														+								
Hydrosmecta fragilis	N													+									
Hydrosmecta thinobioides	N																+	+	+				+

Hydrosmecta delicatula	RDBK															+				
Hydrosmectina septentrionum	N					+			+			+								+
Oxypoda exoleta	N									+										
Aleochara brevipennis	N													+						
Aleochara verna	RDBK					+		+							+					
Brachygluta pandellei	RDBK																+			+
Dryops nitidulus	RDB3										+	+	+							
Macronychus quadrituberculatus	RDB3																	+	+	
Coccinella quinquepunctata	RDB3																+			+
Simplocaria maculosa	RDBI																	+	+	
Fleutiauxellus maritimus	Na										+	+	+							
Barynotus squamosus	Nb											+								
Grypus equiseti	Nb				+						+	+	+							
Baris lepidii	Na									+										
Araneae																				
Arctosa cinerea	Nb													+	+	+	+			+
Diplocephalus protuberans	Nb	+																		
Caviphantes saxetorum	Na					+	+				+	+								

Table G2 : Phase 3 survey

Taxa	Status	Glasbury	Bronydd	Monmouth	Pencarreg	LangibA (Sand)	LlangibA (Shingle)	LlangibB	Llandov(a)	Llandov(b)	Llandwrda Station	Pferm Typica	Penlan	Elland(2)	Elland(3)	Keithleigh	Pallingt(1)	Pallingt(2)	Pallingt(3)	Sylmlake(1-2)	Slymlake(3)	Lymm(1)	Lymm(2)	Lymm(3)
Perileptus areolatus (Creutz.)	Na	+	+						+	+	+		+											
Tachys parvulus Dej.	Nb	+	+		+		+													+				
Bembidion litorale (Ol.)	Nb				+	+																		
Bembidion saxatile Gyll.	Nb						+																	
Bembidion stomoides Dej.	Nb															+								
Bembidion gilvipes Strm.	Nb			+																				
Stenolophus skrimshiranus Steph.	Na																+							
Pterostichus cristatus Duf.	Nb															+								
Amara fulva (Müll.)	Nb					+	+	+	+															
Chlaenius nigricornis (F.)	Nb																+							
Lionychus quadrillum (Duft.)	RDB3				+	+	+	+	+	+	+													
Haliplus laminatus (Schal.)	Nb			+																				
Gyrinus urinator Ill.	Nb			+																				
Hydraena nirgita Germ.	Nb																					+		
Hydraena testacea Curt.	Nb	+																					+	
Helophorus arvernicus Muls.	Nb							+					+	+	+	+								
Helophorus strigifrons Thom.	Nb	+																						
Paralister obscurus (Kug.)	RDB2					+																		
Deleaster dichrous (Grav.)	Nb							+	+	+	+	+	+											
Thinobius bicolor Joy	Na	+			+																			
Thinobius praetor Smet.	N	+								+	+	+												
Thinobius newberyi Scheer.	RDBI										+													
Stenus asphaltinus Er.	RDBI											+												
Paederus fuscipes Curt.	Nb				+	+																		

Scopaeus gracilis (Sperk)	RDBK	+																					
Lathrobium angusticolle Bois.	Nb								+														
Neobisnius prolixus Er.	RDBK	+	+						+	+		+	+										
Myllaena elongata (Matt.)	N															+							
Tachyusa coarctata Er.	N				+	+											+						
Dasygnypeta velata (Er.)		+																					
Hydrosmecta thinobioides (Kr.)	N	+	+			+			+		+		+							+	+		
Hydrosmecta delicatula (Sharp)	RDBK	+									+												
Hydrosmectina septentrionum Benick	N	+	+				+		+	+	+		+	+									
Aloconota planifrons (Water.)	RDBK			+		+																	
Ilyobates subopacus Palm	N			+																			
Oxypoda exoleta Er.	N			+										+			+	+	+				
Aleochara (s.s) brevipennis Grav.	N																+						
Brachygluta pandellei (Saulc.)	RDBK									+	+												
Malthodes fibulatus Kies.	Nb			+																			
Fleutiauxellus maritimus (Curt.)	Na	+	+						+	+	+	+	+										
Negastrius sabulicola (Boh.)	RDB2	+	+		+	+	+	+				+	+										
Oulimnius troglodytes (Gyll.)	Nb			+	+																		
Normandia nitens (Müll.)	RDB2			+																			
Coccinella quinquepunctata L.	RDB3	+	+				+				+												
Longitarsus anchusae (Payk.)	Na																+	+					
Caenopsis fissirostris (Walt.)	Nb																						+
Tanymecus palliatus (F.)	Nb					+																	
Bagous tempestivus (Hbst.)	Nb																	+					
Araneae																							
Arctosa cinerea	Nb	+	+		+	+	+		+	+	+	+											

Table G3 ERS – Severn Survey

Taxa	Status	Site 1 South Llandinam		Site 2 Llandinam Hall		Site 3 Maesmawr Hall	
		Site 1	Site 2	Site 1	Site 2	Site 1	Site 2
Coleoptera							
Perileptus areolatus (Creutz.)	Na		+	+	+	+	+
Tachys parvulus Dej.	Nb				+		+
Amara fulva (Müll.)	Nb					+	
Helophorus arvernicus Muls.	Nb			+			
Deleaster dichrous (Grav.)	Nb	+	+				
Lathrobium angusticolle Bois.	Nb			+		+	+
Lathrobium ripicola Czwal.	N				+		
Neobisnius prolixus Er.	RDBK	+		+	+	+	+
Erichsonius signaticornis Muls. & Rey	Nb		+				
Hydrosmecta fragilis (Kr.)	N			+			+
Hydrosmecta thinobioides (Kr.)	N	+	+	+	+		+
Hydrosmecta delicatula (Sharp)	RDBK	+			+		
Hydrosmectina septentrionum Benick	N	+				+	+
Aleochara (s.s.) brevipennis Grav.	N				+	+	
Brachygluta pandellei (Saulc.)	RDBK		+	+	+		
Fleutiauxellus maritimus (Curt.)	Na	+	+	+		+	+
Coccinella quinquepunctata L.	RDB3	+	+	+			
Totals		7	7	9	8	7	8
Araneae							
Arctosa cinerea	Nb	+	+		+	+	+
Caviphantes saxetorum	Na		+		+		
Totals		1	2	0	2	1	1

Table G4 – Devon ERS Survey

Taxa	Status	Camel			Erme			Exe			Otter			Taw			Teign			Thrushel			Torridge			Yarty			Creedy Yeo		
		S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3
Perileptus areolatus (Creutz.)	Na							+									+		+						+						
Tachys bistriatus (Duft.)	Nb																									+					
Tachys parvulus Dej.	Nb					+		+	+		+					+	+								+				+		+
Bembidion obliquum Strm.	Nb																	+													
Bembidion monticola Strm.	Nb																				+							+			
Pterostichus anthracinus (Panz.)	Nb																						+								
Chlaenius nigricornis (F.)	Nb											+					+														
Gyrinus urinator Ill.	Nb								+																						
Hydraena rufipes Curt.	Nb																						+			+		+	+		
Ochthebius bicolon Germ.	Nb							+	+	+							+	+	+			+							+	+	+
Hydrochus nitidicollis Muls.	RDB3																+														
Helophorus arvernicus Muls.	Nb					+		+	+	+		+	+		+			+	+									+			
Helophorus strigifrons Thom.	Nb																					+									
Cercyon ustulatus (Preys.)	Nb																+														
Helochares lividus (Forst.)	Nb										+		+				+			+											
Saprinus virescens (Payk.)	RDBK												+																		
Deleaster dichrous (Grav.)	Nb	+	+		+		+	+		+			+			+	+	+	+	+	+					+	+	+		+	+
Thinobius bicolor Joy	Na																+														

Neobisnius prolixus Er.	RDBK																											+		
Philonthus atratus (Grav.)	Na						+																							
Gabrius astutoides Strand	RDBI																													+
Staphylinus caesareus Ced.	RDBI		+																											
Sepedophilus bipunctatus (Grav.)	Nb												+																	
Myllaena elongata (Matt.)	N													+													+			
Dasygnypeta velata (Er.)	N																	+												
Hydrosmecta fragilis (Kr.)	N									+								+												
Hydrosmecta thinobioides (Kr.)	N				+			+	+			+				+	+			+			+	+	+				+		+
Hydrosmectina septentrionum Benick	N				+		+	+				+	+				+	+					+	+							
Atheta (Acrotona) obfuscata (Grav.)	N																							+		+	+		+		+
Ilyobates subopacus Palm	N																			+											
Oxypoda exoleta Er.	N								+	+		+							+								+				+
Aleochara (s.str.) brevipennis Grav.	N																														
Aleochara (Coprochara) binotata Kr.	RDBK																													+	
Rhagonycha translucida (Kryn.)	Nb						+			+			+																		
Pomatinus substriatus (Müll.)	Na												+																		
Stenelmis canaliculata (Gyll.)	RDB2									+																					
Phyllotreta vittata (F.)	Na		+																												
Mantura rustica (L.)	Nb												+																		
Baris lepidii Germ.	Na							+																							

APPENDIX H
ERS Phase 3 - Coleoptera

Table H1 Slymlakes Farms Site 1-2 (River Axe)

Taxa	6/17/98 HS	EX	6/30/98 HS 1.1	Hs 1.2	Ex 1	EX 2	Total
Dyschirius globosus (Hbst.)	1	-	-	-	-	-	1
Tachys parvulus Dej.	1	-	-	-	-	-	1
Bembidion punctulatum Drap.	-	-	-	-	1	-	1
Bembidion atrocoeruleum Steph.	-	-	3	4	-	-	7
Bembidion tetracolum Say	-	-	3	-	-	-	3
Bembidion decorum (Zenk.)	6	-	6	6	-	-	18
Bembidion biguttatum (F.)	-	-	1	-	-	-	1
Agonum albipes (Payk.)	1	-	9	-	-	-	10
Agonum dorsale (Pont.)	-	-	1	-	-	-	1
Amara aenea (Deg.)	-	-	1	-	-	-	1
Hydraena gracilis Germ.	-	1	-	-	-	-	1
Ochthephilus omalinus agg.	-	1	-	-	-	-	1
Carpelimus bilineatus Steph.	-	-	-	-	1	-	1
Anotylus rugosus (F.)	-	1	1	-	-	-	2
Xantholinus linearis (Ol.)	-	-	1	-	-	-	1
Philonthus cognatus Steph.	-	-	1	-	-	-	1
Gnypeta carbonaria (Mann.)	-	-	-	1	-	-	1
Hydrosmecta thinobioides (Kr.)	-	-	-	-	1	-	1
Aloconota cambrica (Woll.)	-	2	-	-	-	1	3
Aloconota currax (Kr.)	-	-	-	1	-	-	1
Aloconota (s.str.) gregaria (Er.)	1	-	-	-	-	-	1
Aloconota sulcifrons (Steph.)	-	-	5	-	-	-	5
Atheta malleus Joy	1	-	-	-	-	-	1
Zorochros minimus (Bois.& Lac)	3	-	-	2	-	-	5
Limnius volckmari (Panz.)	-	-	1	-	-	-	1
Total							70

Table H2 Slymlakes Farm – Site 3 (River Axe)

Taxa	6/17/98 HS	6/30/98 HS(silty backwater)	6/17/98 HS	6/30/98 EX 1	6/30/98 EX 2	Total
Bembidion punctulatum Drap.	1	-	9	-	-	10
Bembidion dentellum (Thun.)	-	6	-	-	-	6
Bembidion atrocoeruleum Steph.	-	-	1	-	-	1
Bembidion decorum (Zenk.)	3	-	9	-	-	12
Bembidion articulatum (Panz.)	-	2	-	-	-	2
Bembidion biguttatum (F.)	-	1	1	-	-	2
Agonum micans Nic.	-	4	-	-	-	4
Agonum albipes (Payk.)	2	-	6	-	-	8
Helophorus brevipalpis Bed.	1	-	-	-	-	1
Stenus boops Ljungh	-	1	2	-	-	3
Philonthus quisquiliarus (Gyll)	-	1	-	-	-	1
Gnypeta carbonaria (Mann.)	1	-	-	-	-	1
Gnypeta rubrior Tott.	-	2	-	-	-	2
Hydrosmecta thinobioides (Kr.)	-	-	-	2	-	2
Atheta malleus Joy	-	-	1	-	1	2
Cantharis nigricans (Müll.)	-	-	1	-	-	1
Bembidion tetracolum Say	1	-	-	-	-	1
Atheta (Philhygra) elongatula (Grav.)	1	-	-	-	-	1
Total						60

Table H3 – Bronydd Farm (River Wye)

	6/4/98				6/19/98				
	Pitfall	HS (core)	HS(edge)	Excav	HS (bank)	HS (edge /core)	Excav 2.1	Excav 2.2	Total
Coleoptera									
Notiophilus biguttatus (F.)	1	-	-	-	-	-	-	-	1
Perileptus areolatus (Creutz.)	1	-	-	-	-	-	1	2	4
Tachys parvulus Dej.	-	-	-	-	-	2	-	-	2
Bembidion lampros (Hbst.)	14	-	-	-	1	1	-	-	16
Bembidion punctulatum Drap.	4	-	22	-	-	21	-	-	47
Bembidion dentellum (Thun.)	-	-	-	-	1	-	-	-	1
Bembidion prasinum (Duft.)	-	-	1	-	-	15	-	-	16
Bembidion tibiale (Duft.)	1	-	-	-	-	-	-	-	1
Bembidion atrocoeruleum Steph.	347	4	12	-	-	36	-	-	399
Bembidion tetracolum Say	-	-	1	-	2	-	-	-	3
Bembidion decorum (Zenk.)	-	-	-	-	-	4	-	-	4
Agonum albipes (Payk.)	-	-	1	-	-	-	-	-	1
Agonum dorsale (Pont.)	1	-	-	-	1	-	-	-	2
Amara similata (Gyll.)	-	-	-	-	1	-	-	-	1
Amara ovata (F.)	-	-	-	-	1	-	-	-	1
Amara familiaris (Duft.)	-	-	-	-	1	-	-	-	1
Demetrias atricapillus (L.)	1	-	-	-	-	1	-	-	2
Platambus maculatus (L.)	2	-	-	-	-	-	-	-	2
Helophorus brevipalpis Bed.	-	-	-	1	-	-	-	-	1
Ochthephilus aureus (Fauv.)	-	-	-	6	-	-	-	-	6
Ochthephilus omalinus agg.	-	-	-	2	-	-	-	-	2
Carpelimus corticinus (Grav.)	-	-	-	-	-	1	-	-	1
Neobisnius prolixus Er.	1	-	-	-	-	-	-	-	1
Philonthus quisquiliarus (Gyll.)	-	-	-	1	-	-	-	-	1
Tachyporus chrysomelinus (L.)	-	-	-	-	-	1	-	-	1
Tachyporus tersus Er.	1	-	-	-	-	-	-	-	1
Hydrosmecta thinobioides (Kr.)	-	-	-	-	-	-	1	2	3
Hydrosmectina septentrionum Benick	-	-	-	-	-	-	2	5	7
Aleochara (Coprochara) bipustulata (L.)	15	-	-	-	-	-	-	-	15
Hypnoidus riparius (F.)	1	-	-	-	-	-	-	-	1
Fleutiauxellus maritimus (Curt.)	652	5	-	-	-	-	-	-	657
Negastrius sabulicola (Boh.)	61	-	-	-	-	-	-	-	61
Zorochros minimus (Bois.& Lac)	46	-	-	-	-	-	2	-	48
Esolus parallelepipedus Mül	-	-	-	-	-	-	-	3	3
Limnius volckmari (Panz.)	-	-	-	-	-	-	-	1	1
Coccinella quinquepunctata	1	-	-	-	-	-	-	-	1

L.									
Coccinella undecimpunctata L.	1	-	-	-	-	-	-	-	1
Notoxus monoceros (L.)	1	-	-	-	-	-	-	-	1
Aphodius prodromus (Brahm)	1	-	-	-	-	-	-	-	1
Phyllotreta undulata Kuts.	1	-	-	-	-	-	-	-	1
Chaetocnema hortensis (Fourc.)	2	-	-	-	-	-	-	-	2
Barypeithes pellucidus (Bohe.)	1	-	-	-	-	-	-	-	1
Coccinella undecimpunctata L.	1	-	-	-	-	-	-	-	1
Aleochara (Coprochara) bilineata Gyll.	1	-	-	-	-	-	-	-	1
Atheta (Atheta) triangulum (Kr.)	1	-	-	-	-	-	-	-	1
Sitona lepidus Gyll.	1	-	-	-	-	-	-	-	1
Ochthephilus omalinus (Er.) agg.	-	-	-	2	-	1	-	-	3
Atheta (Mocyta) orbata (Er.)	-	-	-	-	-	-	1	-	1
Total									1330

Table H4 – Elland 2 (River Calder)

Taxa	6/12/98 Pitfall	HS	6/24/98 Pitfall	HS	Total
Nebria brevicollis (F.)	1	-	4	-	5
Elaphrus cupreus Duft.	-	-	1	-	1
Trechus secalis (Payk.)	1	-	-	-	1
Bembidion lampros (Hbst.)	3	-	-	-	3
Bembidion tibiale (Duft.)	-	-	1	-	1
Bembidion tetracolum Say	-	1	2	5	8
Pterostichus strenuus (Panz.)	-	-	1	-	1
Agonum muelleri (Hbst.)	2	-	1	-	3
Agonum assimile (Payk.)	-	-	1	-	1
Agonum albipes (Payk.)	-	2	-	5	7
Amara similata (Gyll.)	1	-	-	-	1
Amara ovata (F.)	2	-	2	-	4
Hydraena gracilis Germ.	1	-	-	-	1
Helophorus arvernicus Muls.	-	-	1	-	1
Sphaeridium scarabaeoides (L.)	1	-	-	-	1
Anacaena globulus (Payk.)	1	-	-	-	1
Carpelimus corticinus (Grav.)	-	-	1	-	1
Anotylus rugosus (F.)	1	-	1	-	2
Anotylus tetracarinatus Block	-	-	1	-	1
Philonthus laminatus (Creutz.)	-	-	1	-	1
Philonthus cognatus Steph.	-	-	5	-	5
Philonthus rotundicollis (Men.)	-	-	3	1	4
Tachyporus obtusus (L.)	-	-	4	-	4
Tachyporus chrysomelinus (L.)	-	-	1	-	1
Tachyporus pusillus Grav.	-	-	1	-	1
Tachinus signatus Grav.	1	-	3	-	4
Hydrosmectina septentrionum Benick	-	-	4	-	4
Atheta (Philhygra) elongatula (Grav.)	-	-	2	2	4
Atheta (Mocyta) fungi (Grav.)	-	-	4	1	5
Atheta (Atheta) graminicola (Grav.)	-	-	2	-	2
Oxypoda exoleta Er.	1	-	3	-	4
Agriotes acuminatus (Steph.)	-	-	1	-	1
Hypnoidus riparius (F.)	-	-	2	-	2
Atomaria (Anchicera) nitidula (Marsh.)	-	-	1	-	1
Aridius bifasciatus (Reitt.)	-	-	1	-	1
Adalia bipunctata (L.)	-	1	-	-	1
Longitarsus suturellus (Duft.)	-	-	1	-	1
Rhynchaenus fagi (L.)	1	-	-	-	1
Euophryum confine	-	-	2	-	2
Total					93

Table H5 – Elland 3 (River Calder)

	6/12/98	6/24/98										
	HS	pitfall 3.1	pitfall 3.2	pitfall 3.3	pitfall 3.4	pitfall 3.5	pitfall 3.6	pitfall 3.7	pitfall 3.8	pitfall 3.9	HS	Total
Taxa												
Nebria brevicollis (F.)	-	-	-	-	-	-	-	2	-	-	1	3
Bembidion lampros (Hbst.)	-	-	-	-	1	-	-	-	-	-	-	1
Bembidion nitidulum (Marsh.)	1	-	-	1	1	-	-	1	1	-	-	5
Bembidion tetracolum Say	1	-	1	1	2	-	1	4	-	2	12	24
Bembidion guttula (F.)	-	-	-	-	1	-	-	-	-	-	-	1
Agonum assimile (Payk.)	-	1	-	1	-	1	-	2	-	1	-	6
Agonum albipes (Payk.)	10	1	-	4	-	-	-	3	-	-	15	33
Helophorus arvernicus Muls.	-	1	1	-	1	-	-	-	-	-	-	3
Ochthephilus omalinus (Er.) agg.	-	-	-	-	-	-	-	-	2	-	1	3
Anotylus tetracarinatus Block	-	-	-	-	-	-	1	-	-	-	-	1
Aloconota insecta (Thom.)	1	-	-	-	-	-	-	-	-	-	-	1
Total												81

Table H6 – Fferm Typica (River Tywi)

Taxa	Pitfall	HS(core)	HS(edge)	Excav 1	Excav 2	Total
Clivina collaris (Hbst.)	7	-	-	-	-	14
Bembidion punctulatum Drap.	13	13	-	-	-	39
Bembidion atrocoeruleum Steph	1	2	-	-	-	4
Bembidion prasinum (Duft.)	-	-	1	-	-	1
Bembidion tetracolum Say	-	-	3	-	-	3
Bembidion decorum (Zenk.)	-	3	-	-	-	3
Harpalus rufipes Deg.	1	-	-	-	-	2
Agonum muelleri (Hbst.)	3	-	-	-	-	6
Agonum albipes (Payk.)	2	-	-	-	-	4
Deleaster dichrous (Grav.)	2	-	-	-	-	4
Ochthephilus aureus (Fauv.)	-	-	-	2	1	3
Anotylus rugosus (F.)	2	-	-	-	-	4
Thinobius praetor Smet.	-	-	-	3	1	4
Stenus asphaltinus Er.	-	1	-	-	-	1
Stenus juno (Payk.)	-	2	-	-	-	2
Stenus boops Ljungh	-	1	-	-	-	1
Xantholinus longiventris Heer	1	-	-	-	-	2
Neobisnius prolixus Er.	1	-	-	-	-	2
Philonthus splendens (F.)	1	-	-	-	-	2
Aleochara (Coprochara) bipustulata (L.)	1	-	-	-	-	2
Fleutiauxellus maritimus (Curt.)	8	-	-	-	-	16
Negastrius sabulicola (Boh.)	14	-	-	-	-	28
Zorochros minimus (Bois.& Lac)	7	-	-	-	-	14
Esolus parallelepipedus Mül	2	-	-	-	-	4
Limnius volckmari (Panz.)	2	-	-	-	-	4
Total						169

Table H7 – Glasbury Shingles (River Wye)

Taxa	6/4/98			6/19/98				7/2/98					Total
	Pitfall	**HS-core**	**HS-edge**	**Excav. 1**	**Excav. 2**	**HS-core**	**HS-edge**	**Excav**	**HS-core**	**HS-bar**	**HS-cobble debris**		
Notiophilus biguttatus (F.)	-	-	-	-	-	-	-	-	-	-	1	-	1
Loricera pilicornis (F.)	1	-	-	-	-	-	-	-	-	-	-	-	1
Clivina collaris (Hbst.)	-	-	-	-	-	-	-	-	-	-	1	-	1
Perileptus areolatus (Creutz.)	1	-	1	2	1	-	2	-	-	-	-	-	7
Tachys parvulus Dej.	-	11	-	2	1	12	4	-	9	3	-	-	42
Bembidion lampros (Hbst.)	18	-	1	-	-	1	-	-	1	-	-	-	21
Bembidion properans Steph.	61	7	20	-	-	4	14	-	1	-	-	-	107
Bembidion punctulatum Drap.	7	-	5	-	-	1	11	-	-	-	-	-	24
Bembidion prasinum (Duft.)	-	-	-	-	-	-	1	-	-	-	-	-	1
Bembidion atrocoeruleum Steph.	3	2	2	-	-	1	6	-	-	-	1	-	15
Bembidion tetracolum Say	12	-	-	-	-	-	-	-	8	-	-	-	20
Bembidion decorum (Zenk.)	-	1	1	-	-	-	8	-	-	-	-	-	10
Bembidion quadrimaculatum (L.)	1	-	-	-	-	-	-	-	-	-	-	-	1
Bembidion articulatum (Panz.)	-	-	-	-	-	-	1	-	-	-	-	-	1
Asaphidion flavipes (L.)	-	-	-	-	-	-	1	-	-	-	-	-	1
Harpalus rufipes Deg.	-	-	-	-	-	-	-	-	1	-	-	-	1
Harpalus affinis (Schr.)	-	-	-	-	-	-	-	-	-	1	-	-	1
Pterostichus (Poecilus) cupreus (L.)	9	-	-	-	-	-	-	-	-	-	-	-	9
Pterostichus (Poecilus) versicolor (Strm.)	1	-	-	-	-	-	-	-	-	-	-	-	1
Pterostichus strenuus (Panz.)	2	-	-	-	-	-	-	-	2	-	1	-	5
Pterostichus vernalis (Panz.)	10	-	-	-	-	-	-	-	-	1	1	-	12
Pterostichus nigrita (Payk.)	1	-	-	-	-	-	-	-	-	-	-	-	1
Agonum muelleri (Hbst.)	4	-	1	-	-	-	-	-	2	-	1	-	8
Agonum moestum (Duft.)	-	-	-	-	-	-	-	-	-	-	2	-	2
Agonum micans Nic.	-	-	-	-	-	-	-	-	-	1	-	-	1
Agonum albipes (Payk.)	4	-	-	-	-	-	-	-	-	-	-	-	4
Agonum dorsale (Pont.)	1	-	-	-	-	-	-	-	1	-	-	-	2
Amara plebeja (Gyll.)	-	-	-	-	-	-	-	-	1	-	-	-	1
Amara similata (Gyll.)	-	-	-	-	-	-	-	-	-	1	-	-	1
Amara ovata (F.)	1	-	-	-	-	-	-	-	1	2	-	-	4
Amara communis (Panz.)	-	-	-	-	-	-	-	-	-	-	1	-	1
Amara aenea (Deg.)	1	-	-	-	-	-	-	-	4	-	-	-	5
Amara familiaris (Duft.)	-	-	-	-	-	-	-	-	1	-	-	-	1
Chlaenius vestitus (Payk.)	-	-	-	-	-	-	-	-	-	-	3	-	3

Hydraena testacea Curt.	-	-	-	-	-	-	-	1	-	-	-	-	1
Helophorus strigifrons Thom.	-	-	-	-	-	-	1	-	-	-	-	-	1
Thinobius bicolor Joy	-	-	-	-	1	-	-	-	-	-	-	-	1
Stenus comma LeC.	-	-	1	-	-	-	-	-	-	-	-	-	1
Stenus clavicornis (Scop.)	-	-	-	-	-	-	1	-	-	-	1	-	2
Stenus rogeri Kr.	1	2	1	-	-	-	2	-	1	-	-	-	7
Stenus bimaculatus Gyll.	1	-	-	-	-	-	-	-	-	-	-	-	1
Stenus boops Ljungh	-	-	-	-	-	-	3	-	-	-	-	-	3
Stenus tarsalis Ljungh	1	-	-	-	-	-	-	-	-	-	-	-	1
Stenus cicindeloides Schal.	-	-	-	-	-	-	-	-	-	-	1	-	1
Scopaeus gracilis (Sperk)	1	-	-	1	-	-	-	-	-	-	-	-	2
Neobisnius prolixus Er.	2	-	-	-	-	-	1	-	-	-	-	-	3
Philonthus quisquiliarus (Gyll)	-	-	-	-	-	-	1	-	-	-	-	-	1
Gabrius pennatus Sharp	3	-	-	-	-	-	-	-	-	-	-	-	3
Quedius ventralis (Arag.)	-	-	-	-	-	-	-	-	-	-	1	-	1
Tachyporus obtusus (L.)	-	-	-	-	-	-	-	-	3	-	1	-	4
Tachyporus chrysomelinus (L.)	-	-	-	-	-	-	-	-	2	-	-	-	2
Dasygnypeta velata (Er.)	-	-	-	-	-	-	1	-	-	-	-	-	1
Hydrosmecta thinobioides (Kr.)	1	-	-	-	2	-	1	18	-	-	-	-	22
Hydrosmecta delicatula (Sharp)	-	-	-	2	-	-	-	1	-	-	-	-	3
Hydrosmectina septentrionum Benick	-	-	-	-	2	-	-	-	-	-	-	-	2
Aloconota currax (Kr.)	2	-	-	1	-	-	1	-	-	-	-	-	4
Aleochara (Coprochara) bipustulata (L.)	3	-	-	-	-	-	-	-	-	-	-	-	3
Agriotes sputator (L.)	1	-	-	-	-	-	-	-	-	-	-	-	1
Fleutiauxellus maritimus (Curt.)	49	-	-	-	-	-	-	-	-	-	-	-	49
Negastrius sabulicola (Boh.)	15	-	-	-	1	-	-	-	-	-	-	-	16
Zorochros minimus (Bois.& Lac)	6	-	-	2	1	1	-	-	27	1	-	-	38
Esolus parallelepipedus Mül	-	-	-	3	-	-	-	-	-	-	-	-	3
Limnius volckmari (Panz.)	-	-	-	2	-	-	-	-	1	-	-	-	3
Heterocerus marginatus (F.)	-	-	-	-	-	-	-	1	-	-	-	-	1
Meligethes spp.	-	-	-	-	-	-	-	-	3	2	-	-	5
Coccinella quinquepunctata L.	-	2	-	-	-	-	-	-	-	-	-	-	2
Aphodius prodromus (Brahm)	5	-	-	-	-	-	-	-	-	-	-	-	5
Gastrophysa viridula (Deg.)	-	-	-	-	-	-	-	-	-	-	1	-	1
Hydrothassa glabra (Hbst.)	1	-	-	-	-	-	-	-	-	-	-	-	1
Hydrothassa marginella (L.)	-	-	-	-	-	-	-	-	-	2	-	-	2
Phyllotreta nemorum (L.)	1	-	-	-	-	-	-	-	-	-	-	-	1
Phyllotreta exclamationis (Thun)	1	-	-	-	-	-	-	-	-	-	-	-	1
Altica lythri Aube	-	-	-	-	-	-	-	-	1	-	-	-	1
Hippuriphila modeeri (L.)	1	-	-	-	-	-	-	-	-	-	-	-	1
Sitona humeralis Steph.	1	-	-	-	-	-	-	-	-	-	-	-	1
Chaetocnema hortensis	2	-	-	-	2	-	-	-	-	-	-	-	4

(Fourc.)													
Atomaria (Anchicera) testacea Steph.	1	-	-	-	-	-	-	-	-	-	-	-	1
Phyllotreta undulata Kuts.	1	-	-	-	-	-	-	-	-	-	-	-	1
Ceutorhynchus erysimi (F.)	1	-	-	-	-	-	-	-	-	-	-	-	1
Ochthephilus omalinus agg.	1	-	-	-	1	-	1	-	-	-	-	-	3
Stenus tarsalis Ljungh	-	-	-	-	-	-	1	-	-	-	-	-	1
Total													529

Table H8 – Keighley (River Worth)

Taxa	6/12/98 HS 1	HS 2	6/24/98 Pitfall	Total
Nebria brevicollis (F.)	-	1	1	2
Clivina collaris (Hbst.)	-	-	1	1
Trechus obtusus Er.	3	-	-	3
Bembidion tibiale (Duft.)	3	2	1	6
Bembidion tetracolum Say	-	9	6	15
Bembidion stomoides Dej.	-	-	8	8
Pterostichus nigrita (Payk.)	-	-	1	1
Pterostichus cristatus Duf.	-	-	2	2
Agonum albipes (Payk.)	6	15	10	31
Amara ovata (F.)	-	-	4	4
Helophorus arvernicus Muls.	-	-	1	1
Megasternum boletophagum Marsh.	-	-	3	3
Anacaena globulus (Payk.)	-	-	4	4
Carpelimus bilineatus Steph.	-	-	1	1
Anotylus rugosus (F.)	-	-	2	2
Stenus guttula Müll.	-	1	-	1
Gyrohypnus punctulatus (Payk.)	-	-	1	1
Gyrohypnus angustatus Steph.	-	-	2	2
Philonthus decorus (Grav.)	-	-	22	22
Sepedophilus marshami (Steph.)	-	-	1	1
Tachinus signatus Grav.	-	-	9	9
Myllaena elongata (Matt.)	1	2	1	4
Hypnoidus riparius (F.)	-	-	1	1
Dryops ernesti des Gozis	-	-	1	1
Aridius bifasciatus (Reitt.)	-	1	-	1
Rhinosimus planirostris (F.)	-	-	1	1
Phaedon armoraciae (L.)	-	-	1	1
Psylliodes napi (F.)	-	-	1	1
Chiloporata longitarsis (Er.)	-	1	-	1

Table H9 – Llandovery Site A (River Tywi)

Taxa	6/9/98 Pitfall	HS (core)	HS (edge)	6/23/98 Pitfall	HS (core)	HS (edge)	Total
Perileptus areolatus (Creutz.)	5	6	-	5	-	-	16
Bembidion atrocoeruleum Steph.	27	10	2	38	10	5	92
Bembidion decorum (Zenk.)	16	2	2	20	9	5	54
Harpalus affinis (Schr.)	-	-	-	1	-	-	1
Pterostichus vernalis (Panz.)	1	-	-	-	-	-	1
Pterostichus madidus (F.)	1	-	-	-	-	-	1
Amara fulva (Müll.)	-	-	-	1	-	-	1
Lionychus quadrillum (Duft.)	-	1	-	-	-	-	1
Helophorus brevipalpis Bed.	-	-	-	1	-	-	1
Deleaster dichrous (Grav.)	1	-	-	1	-	-	2
Anotylus rugosus (F.)	1	-	-	-	-	-	1
Stenus juno (Payk.)	-	-	-	1	-	-	1
Lathrobium angusticolle Bois.	1	-	-	-	1	-	2
Neobisnius prolixus Er.	2	-	-	2	-	-	4
Tachyporus tersus Er.	1	-	-	-	-	-	1
Tachyporus pusillus	-	-	-	1	-	-	1
Hydrosmecta thinobioides (Kr.)	-	-	-	-	-	2	2
Hydrosmectina septentrionum Benick	-	-	-	-	1	1	2
Aloconota cambrica (Woll.)	-	1	-	-	-	-	1
Aleochara (Coprochara) bipustulata (L.)	1	-	-	1	-	-	2
Fleutiauxellus maritimus (Curt.)	12	-	-	1	-	-	13
Zorochros minimus (Bois.& Lac)	76	-	-	84	-	-	160
Byrrhus pilula (L.)	-	-	-	1	-	-	1
Sitona striatellus Gyll.	-	-	-	1	-	-	1
Nebrioporus depressus elegans (F.)	1	-	-	-	-	-	1
Microdota indubia	-	-	-	1	-	-	1
Total							364

Llandovery – Site B (River Tywi)

Taxa	6/9/98 Pitfall	HS	Exc	HS	6/23/98 Pitfall	Total
Nebria brevicollis (F)	-	-	-	-	1	1
Perileptus areolatus (Creutz.)	3	-	-	2	-	5
Bembidion properans Steph.	1	-	-	-	-	1
Bembidion atrocoeruleum Steph.	105	15	-	11	12	143
Bembidion andreae (F.)	2	-	-	-	-	2
Bembidion decorum (Zenk.)	3	2	-	-	1	6
Harpalus rufipes Deg.	-	-	-	-	1	1
Agonum albipes (Payk.)	-	-	-	-	1	1
Agonum dorsale (Pont.)	-	-	-	-	1	1
Amara aenea (Deg.)	-	-	-	-	1	1
Lionychus quadrillum (Duft.)	1	1	-	-	-	2
Nebrioporus depressus elegans (F.)	1	-	-	-	-	1
Hydraena gracillis Germ.	-	-	-	-	1	1
Helophorus brevipalpis Bed.	-	-	-	-	1	1
Deleaster dichrous (Grav.)	1	2	-	-	2	5
Anotylus rugosus (F.)	-	-	-	-	1	1
Thinobius praetor Smet.	-	-	2	-		2
Neobisnius prolixus Er.	1	-	-	-	2	3
Hydrosmectina septentrionum Benick	2	-	1	1	-	4
Aloconota cambrica (Woll.)	1	1	-	-	-	2
Brachygluta pandellei (Saulc.)	1	-	-	1	-	2
Fleutiauxellus maritimus (Curt.)	85	-	1	-	21	107
Zorochros minimus (Bois.& Lac)	65	-	-	-	32	97
Byrrhus pilula (L.)	-	-	-	-	1	1
Total						391

Table H11 - Llangibby Bottom A – Site 1 (Sand) (River Usk)

Taxa	6/11/98		6/25/98			
	Pitfall	HS	Pitfall	HS	Excav	Total
Cicindela campestris L.	1	-	-	-	-	1
Elaphrus riparius (L.)	-	4	-	5	-	9
Clivina fossor (L.)	-	-	-	1	-	1
Clivina collaris (Hbst.)	-	1	1	-	-	2
Dyschirius aeneus (Dej.)	-	-	-	1	-	1
Bembidion litorale (Ol.)	-	-	-	4	-	4
Bembidion lampros (Hbst.)	53	8	1	9	-	71
Bembidion properans Steph.	46	24	36	3	-	109
Bembidion dentellum (Thun.)	-	1	-	-	-	1
Bembidion atrocoeruleum Steph.	-	-	-	-	1	1
Bembidion tetracolum Say	63	17	8	1	-	89
Bembidion femoratum Strm.	60	-	-	-	-	60
Bembidion decorum (Zenk.)	-	1	-	-	-	1
Bembidion quadrimaculatum (L.)	1	3	-	1	-	5
Bembidion articulatum (Panz.)	-	1	-	2	-	3
Asaphidion flavipes (L.)	2	4	3	7	-	16
Asaphidion curtum (Heyden)	-	-	-	1	-	1
Harpalus rufipes Deg.	2	-	7	-	-	9
Harpalus affinis (Schr.)	1	-	1	-	-	2
Pterostichus (Poecilus) cupreus (L.)	9	2	37	1	-	49
Pterostichus (Poecilus) versicolor (Strm.)	-	-	13	-	-	13
Pterostichus strenuus (Panz.)	-	-	1	-	-	1
Pterostichus melanarius (Ill.)	-	-	8	-	-	8
Agonum muelleri (Hbst.)	3	-	3	4	-	10
Agonum moestum (Duft.)	-	3	4	2	-	9
Agonum albipes (Payk.)	1	16	-	1	-	18
Agonum dorsale (Pont.)	-	-	1	-	-	1
Amara ovata (F.)	-	-	3	-	-	3
Amara aenea (Deg.)	3	-	-	1	-	4
Amara fulva (Müll.)	3	-	1	-	-	4
Chlaenius vestitus (Payk.)	-	1	-	-	-	1
Metabletus foveatus (Fourc.)	4	-	-	-	-	4
Lionychus quadrillum (Duft.)	10	-	-	-	-	10
Paralister obscurus (Kug.)	1	-	-	-	-	1
Ptenidium longicorne Flach	-	-	-	-	3	3
Ptenidium pusillum (Gyll.)	1	-	-	-	-	1
Ochthephilus omalinus agg.	12	1	-	-	-	13
Carpelimus rivularis (Mots.)	-	-	-	2	-	2
Anotylus rugosus (F.)	3	1	-	-	-	4
Anotylus tetracarinatus Block	2	-	-	-	-	2
Platystethus cornutus (Grav.)	-	-	-	3	-	3
Stenus biguttatus (L.)	-	1	-	3	-	4
Stenus comma LeC.	-	2	-	2	-	4
Stenus tarsalis Ljungh	-	1	-	-	-	1
Paederus fuscipes Curt.	-	-	-	1	-	1
Gyrohypnus angustatus Steph.	1	-	-	-	-	1
Xantholinus longiventris Heer	1	-	-	-	-	1
Philonthus quisquiliarus (Gyll)	-	1	-	-	-	1

Philonthus micans (Grav.)	-	1	-	-	-	1
Philonthus rubripennis Steph.	-	2	-	1	-	3
Gabrius pennatus Sharp	1	-	-	-	-	1
Tachyporus obtusus (L.)	-	-	-	1	-	1
Tachyporus pusillus Grav.	1	-	-	-	-	1
Tachyusa constricta Er.	-	2	-	13	-	15
Tachyusa coarctata Er.	-	-	-	12	-	12
Tachyusa leucopus (Marsh.)	-	2	-	3	-	5
Hydrosmecta thinobioides (Kr.)	-	-	-	-	1	1
Aloconota planifrons (Water.)	-	1	-	3	-	4
Aloconota insecta (Thom.)	-	1	-	-	-	1
Aleochara (Coprochara) bipustulata (L.)	1	-	-	-	-	1
Agriotes sputator (L.)	1	-	-	-	-	1
Agrypnus murina (L.)	1	-	-	-	-	1
Negastrius sabulicola (Boh.)	249	-	-	-	1	250
Zorochros minimus (Bois.& Lac)	1	-	-	-	-	1
Heterocerus marginatus (F.)	-	-	-	1	-	1
Coccinella undecimpunctata L.	1	-	-	-	-	1
Notoxus monoceros (L.)	6	-	-	-	-	6
Aphodius granarius (L.)	2	-	-	-	-	2
Lema cyanella (L.)	1	-	-	-	-	1
Phaedon cochleariae (F.)	-	4	-	-	-	4
Phyllotreta diademata (Foud.)	-	1	-	-	-	1
Altica lythri Aube	-	3	-	1	-	4
Phyllobius roboretanus Gred.	1	-	-	-	-	1
Tanymecus palliatus (F.)	1	-	-	-	-	1
Rhinoncus pericarpius (L.)	3	-	-	-	-	3
Agroites obscurus	1	-	-	3	-	4
Nebria brevicollis	-	-	1	-	-	1
Coccidula rufa L.	-	-	-	1	-	1
Total						893

Table H12 - Llangibby Bottom A – Site 2 (Shingle) (River Usk)

Taxa	6/11/98 HS	6/11/98 Pitfall	5/28/98 HS	6/11/98 Excav	Total
Nebria brevicollis (F.)	-	2	-	-	2
Tachys parvulus Dej.	-	-	1	-	1
Bembidion lampros (Hbst.)	-	2	1	-	3
Bembidion properans Steph.	-	1	1	-	2
Bembidion punctulatum Drap.	1	-	1	-	2
Bembidion atrocoeruleum Steph.	-	1	1	1	3
Bembidion tetracolum Say	2	2	5	-	9
Bembidion femoratum Strm.	-	1	-	-	1
Bembidion saxatile Gyll.	-	-	3	-	3
Asaphidion flavipes (L.)	-	1	-	-	1
Harpalus rufipes Deg.	-	1	-	-	1
Harpalus affinis (Schr.)	-	4	-	-	4
Pterostichus (Poecilus) cupreus (L.)	-	9	-	-	9
Pterostichus (Poecilus) versicolor (Strm.)	-	4	-	-	4
Pterostichus melanarius (Ill.)	-	6	2	-	8
Amara ovata (F.)	-	1	-	-	1
Amara familiaris (Duft.)	-	-	1	-	1
Amara fulva (Müll.)	-	1	4	-	5
Lionychus quadrillum (Duft.)	-	16	8	-	24
Anotylus rugosus (F.)	-	1	-	-	1
Philonthus rubripennis Steph.	-	-	1	-	1
Tachyporus obtusus (L.)	-	-	2	-	2
Hydrosmectina septentrionum Benick	-	-	-	2	2
Agriotes sputator (L.)	-	4	-	-	4
Agrypnus murina (L.)	-	1	-	-	1
Negastrius sabulicola (Boh.)	-	9	-	-	9
Zorochros minimus (Bois.& Lac)	-	1	6	-	7
Limnius volckmari (Panz.)	-	-	1	-	1
Coccinella quinquepunctata L.	1	-	3	-	4
Notoxus monoceros (L.)	-	1	2	-	3
Phyllotreta nemorum (L.)	-	1	-	-	1
Sitona lineatus (L.)	-	1	-	-	1
Agonum albipes (Payk.)	1	-	-	-	1
Pterostichus vernalis	-	1	-	-	1
Agroites obscurus	-	1	-	-	1
Total					124

Table H13 – Llangibby Bottom B (River Usk)

Taxa	6/11/98 Pitfall	HS (core)	HS (edge)	6/25/98 Pitfall	HS (core)	HS (edge)	Excav	Total
Nebria brevicollis (F.)	11	-	-	6	-	-	-	17
Clivina collaris (Hbst.)	1	-	-	-	-	-	-	1
Bembidion lampros (Hbst.)	11	-	-	6	-	-	-	17
Bembidion properans Steph.	3	-	-	1	-	-	-	4
Bembidion prasinum (Duft.)	-	2	1	1	-	-	-	4
Bembidion atrocoeruleum Steph.	3	2	1	1	-	-	-	7
Bembidion tetracolum Say	351	16	-	131	17	1	-	516
Bembidion femoratum Strm.	54	-	-	15	12	-	-	81
Bembidion decorum (Zenk.)	1	-	-	2	-	-	-	3
Bembidion quadrimaculatum (L.)	11	-	-	5	-	-	-	16
Harpalus affinis (Schr.)	2	-	-	-	-	-	-	2
Pterostichus (Poecilus) cupreus (L.)	3	-	-	5	-	-	-	8
Pterostichus (Poecilus) versicolor (Strm.)	1	-	-	-	-	-	-	1
Amara aenea (Deg.)	4	-	-	1	-	-	-	5
Amara familiaris (Duft.)	1	-	-	-	-	-	-	1
Amara fulva (Müll.)	7	-	-	2	-	-	-	9
Lionychus quadrillum (Duft.)	8	-	-	2	-	-	-	10
Helophorus arvernicus Muls.	1	-	-	-	-	-	-	1
Helophorus brevipalpis Bed.	1	-	-	-	-	-	-	1
Deleaster dichrous (Grav.)	3	-	-	-	-	-	-	3
Ochthephilus spp.	-	-	-	-	-	-	-	0
Anotylus rugosus (F.)	12	-	-	-	1	-	-	13
Gyrohypnus angustatus Steph.	1	-	-	-	-	-	-	1
Xantholinus longiventris Heer	1	-	-	-	-	-	-	1
Neobisnius villosulus (Steph.)	1	-	-	-	-	-	-	1
Gabrius velox Sharp	-	-	-	-	2	-	-	2
Atheta luridipennis (Mann.)	1	-	-	-	-	-	-	1
Aleochara (Coprochara) bipustulata (L.)	7	-	-	-	-	-	-	7
Agriotes obscurus (L.)	1	-	-	-	-	-	-	1
Agrypnus murina (L.)	1	-	-	-	-	-	-	1
Hypnoidus riparius (F.)	1	-	-	-	-	-	-	1
Negastrius sabulicola (Boh.)	62	-	-	-	-	-	-	62
Zorochros minimus (Bois.& Lac)	2	-	-	-	-	-	1	3
Rhyzobius litura (F.)	-	-	-	-	1	-	-	1
Notoxus monoceros (L.)	2	-	-	-	-	-	-	2
Aphodius prodromus (Brahm)	2	-	-	-	-	-	-	2
Aphodius granarius (L.)	2	-	-	-	-	-	-	2

Phyllotreta nemorum (L.)	1	-	-	-	1	-	-	2
Chaetocnema hortensis (Fourc.)	1	-	-	-	-	-	-	1
Phyllobius roboretanus Gred.	-	1	-	-	-	-	-	1
Ochthephilus omalinus agg.	7	-	-	-	-	-	-	7
Gyrohypnus fracticornis (Müll.)	2	-	-	-	-	-	-	2
Amara sp	1	-	-	-	-	-	-	1
Agonum albipes	-	2	-	-	-	-	-	2
Bembidion punctatum	-	-	5	5	6	1	-	17
Harpalus rufipes Deg.	-	-	-	1	-	-	-	1
Total								842

Table H14 – Lymmington 1 (Highland Water)

Taxa	HS 1	Excav	Pitfall	HS	Excav	Total
Nebria brevicollis (F.)	-	-	4	-	-	4
Notiophilus palustris (Duft.)	1	-	1	-	-	2
Trechus obtusus Er.	-	-	-	1	-	1
Bembidion lampros (Hbst.)	4	-	1	-	-	5
Bembidion nitidulum (Marsh.)	1	-	1	-	-	2
Bembidion tetracolum Say	6	-	26	3	-	35
Asaphidion curtum (Heyden)	-	-	1	-	-	1
Synuchus nivalis (Panz.)	-	-	1	-	-	1
Hydraena nigrita Germ.	-	-	1	-	-	1
Hydraena riparia Kug.	-	1	1	-	-	2
Helophorus flavipes (F.)	-	-	1	-	-	1
Ptenidium pusillum (Gyll.)	-	6	6	-	6	18
Ochthephilus aureus (Fauv.)	-	1	1	-	-	2
Tachyusa constricta Er.	1	-	1	-	-	2
Hydrosmecta eximia (Sharp)	-	-	-	-	3	3
Aloconota cambrica (Woll.)	-	-	1	-	-	1
Aloconota currax (Kr.)	-	-	-	1	-	1
Drusilla canaliculata (F.)	-	-	1	-	-	1
Hypnoidus riparius (F.)	-	-	1	-	-	1
Dryops ernesti des Gozis	-	-	-	-	1	1
Onthophagus similis (Scriba)	-	-	1	-	-	1
Chaetocnema hortensis (Fourc.)	-	-	1	-	-	1
Notiophilus biguttatus	-	-	-	1	-	1
Total						88

Table H15 – Lymmington 2 (Highland Water)

	6/16/98			7/1/98			
Taxa	**Pitfall**	**HS**	**Excav**	**Pitfall**	**HS**	**Excav**	**Total**
Carabus arvensis Hbst.	-	-	-	1	-	-	1
Nebria brevicollis (F.)	14	-	-	4	-	-	18
Notiophilus biguttatus (F.)	3	2	-	2	2	-	9
Loricera pilicornis (F.)	1	-	-	-	-	-	1
Clivina fossor (L.)	1	-	-	-	-	-	1
Bembidion lampros (Hbst.)	1	1	-	16	9	-	27
Bembidion tibiale (Duft.)	-	-	-	-	1	-	1
Bembidion nitidulum (Marsh.)	-	-	-	1	-	-	1
Bembidion tetracolum Say	120	7	-	48	2	-	177
Bembidion unicolor Chaud.	-	-	-	1	-	-	1
Asaphidion curtum (Heyden)	2	-	-	7	1	-	10
Patrobus atrorufus (Strom.)	2	-	-	-	-	-	2
Pterostichus strenuus (Panz.)	2	-	-	3	-	-	5
Pterostichus melanarius (Ill.)	-	-	-	1	-	-	1
Abax parallelepipedus Pil	1	-	-	2	-	-	3
Agonum assimile (Payk.)	1	-	-	-	-	-	1
Agonum albipes (Payk.)	5	1	-	1	-	-	7
Platambus maculatus (L.)	1	-	-	-	-	-	1
Hydraena testacea Curt.	-	-	-	-	-	1	1
Silpha atrata L.	-	-	-	2	-	-	2
Ptenidium pusillum (Gyll.)	-	-	6	-	-	-	6
Ochthephilus aureus (Fauv.)	-	-	6	-	-	4	10
Anotylus rugosus (F.)	2	-	-	-	-	-	2
Xantholinus linearis (Ol.)	1	-	-	-	-	-	1
Xantholinus longiventris Heer	2	-	-	2	-	-	4
Quedius curtipennis Bernh.	1	-	-	-	-	-	1
Bolitobius inclinans (Grav.)	-	-	-	1	-	-	1
Myllaena brevicornis (Matt.)	-	-	-	-	1	-	1
Tachyusa constricta Er.	-	-	-	-	1	-	1
Hydrosmecta eximia (Sharp)	-	-	3	-	-	-	3
Aloconota cambrica (Woll.)	8	-	-	-	-	2	10
Aloconota insecta (Thom.)	1	-	-	-	1	-	2
Aloconota gregaria (Er.)	1	-	-	-	-	-	1
Atheta malleus Joy	-	-	-	1	-	-	1
Atheta (Mocyta) fungi (Grav.)	-	-	-	-	1	-	1
Drusilla canaliculata (F.)	1	-	-	-	-	-	1
Malthodes dispar (Germ.)	-	1	-	-	-	-	1
Agriotes acuminatus (Steph.)	-	-	-	5	-	-	5
Hypnoidus riparius (F.)	16	1	-	27	-	-	44
Glischrochilus quadriguttatus (F.)	-	-	-	-	1	-	1
Atomaria nigrirostris Steph.	-	-	-	1	-	-	1
Anaspis maculata Fourc.	1	-	-	-	-	-	1
Anaspis regimbarti Schil.	1	-	-	-	-	-	1
Geotrupes stercorosus	-	-	-	1	-	-	1

(Scrib.)							
Caenopsis fissirostris (Walt.)	1	-	-	-	-	-	1
Barypeithes pellucidus (Bohe.)	1	-	-	-	-	-	1
Rhynchaenus fagi (L.)	3	-	-	1	-	-	4
Euophryum confine	-	-	-	1	-	-	1
Total							378

Table H16 – Lymmington 3 (Highland Water)

Taxa	6/16/98 Pitfall	HS	Excav	6/30/98 Pitfall	7/1/98 HS	Total
Carabus problematicus Hbst.	-	-	-	2	-	2
Carabus arvensis Hbst.	1	-	-	-	-	1
Leistus rufomarginatus Duft.	-	-	-	1	-	1
Nebria brevicollis (F.)	11	1	-	29	1	42
Notiophilus biguttatus (F.)	-	1	-	3	-	4
Loricera pilicornis (F.)	-	-	-	2	-	2
Bembidion lampros (Hbst.)	-	-	-	1	-	1
Bembidion tibiale (Duft.)	-	-	-	3	7	10
Bembidion nitidulum (Marsh.)	1	1	-	7	2	11
Bembidion tetracolum Say	11	1	-	17	3	32
Asaphidion curtum (Heyden)	-	1	-	7	1	9
Pterostichus melanarius (Ill.)	-	-	-	1	-	1
Pterostichus madidus (F.)	-	-	-	7	-	7
Abax parallelepipedus Pil	2	-	-	9	-	11
Calathus micropterus (Duft.)	-	-	-	5	-	5
Agonum assimile (Payk.)	10	1	-	9	-	20
Ptenidium pusillum (Gyll.)	-	-	4	1	-	5
Proteinus brachypterus (F.)	-	-	-	1	-	1
Ochthephilus aureus (Fauv.)	-	-	4	-	-	4
Lathrobium brunnipes (F.)	-	-	-	1	-	1
Philonthus decorus (Grav.)	-	-	-	2	-	2
Mycetoporus lepidus (Grav.)	-	-	-	1	-	1
Aloconota currax (Kr.)	-	-	-	-	1	1
Geostiba circellaris (Grav.)	-	-	-	1	-	1
Agriotes acuminatus (Steph.)	-	-	-	1	-	1
Hypnoidus riparius (F.)	-	-	-	2	-	2
Trixagus dermestoides (Bonv.)	-	-	-	1	-	1
Geotrupes stercorosus (Scrib.)	-	-	-	1	-	1
Barypeithes araneiformis (Schr.)	-	1	-	7	-	8
Barypeithes pellucidus (Bohe.)	-	1	-	5	-	6
Strophosoma melanogrammum (Forst.)	-	-	-	1	-	1
Rhynchaenus fagi (L.)	-	-	2	1	-	3
Agonum albipes (Payk.)	-	6	-	1	9	16
Notiophilus rufipes	-	1	-	-	2	3
Total						217

Table H17 – Monmouth (River Wye)

Taxa	6/4/98 Pitfall	HS 3 core	HS3 edge	6/18/98 HS3 core	HS3 edge	7/17/98 Pitfall edge	Pitfall - core	Total
Nebria brevicollis (F.)	-	-	-	-	-	-	2	2
Notiophilus biguttatus (F.)	-	-	-	-	-	1	-	1
Loricera pilicornis (F.)	-	-	-	-	-	5	7	12
Clivina fossor (L.)	2	-	-	-	-	3	9	14
Clivina collaris (Hbst.)	5	-	-	2	-	14	4	25
Trechus secalis (Payk.)	-	-	-	-	-	-	2	2
Trechus micros (Hbst.)	-	-	-	-	-	-	1	1
Bembidion lampros (Hbst.)	10	4	-	1	-	1	3	19
Bembidion dentellum (Thun.)	-	-	1	-	3	2	-	6
Bembidion tetracolum Say	18	-	1	-	-	30	29	78
Bembidion gilvipes Strm.	-	-	-	1	-	1	-	2
Bembidion quadrimaculatum (L.)	-	-	-	-	-	1	-	1
Bembidion articulatum (Panz.)	-	-	2	-	-	-	-	2
Bembidion guttula (F.)	-	-	-	-	-	1	-	1
Patrobus atrorufus (Strom.)	-	-	-	-	-	-	1	1
Harpalus rufibarbis (F.)	-	-	-	-	-	-	2	2
Harpalus rufipes Deg.	-	-	-	-	-	1	4	5
Harpalus latus (L.)	-	-	-	-	-	1	-	1
Pterostichus (Poecilus) cupreus (L.)	16	-	1	2	-	14	4	37
Pterostichus strenuus (Panz.)	-	-	-	-	-	-	4	4
Pterostichus vernalis (Panz.)	-	-	-	-	-	2	2	4
Pterostichus melanarius (Ill.)	18	-	-	-	-	1	29	48
Pterostichus madidus (F.)	1	-	-	-	-	1	4	6
Abax parallelepipedus Pil	-	-	-	-	-	-	3	3
Calathus melanocephalus (L.)	-	-	-	-	-	-	1	1
Agonum muelleri (Hbst.)	-	-	-	-	-	1	-	1
Agonum micans Nic.	-	1	1	-	-	1	-	3
Agonum assimile (Payk.)	4	-	1	-	-	20	5	30
Agonum albipes (Payk.)	-	2	3	-	6	18	1	30
Agonum obscurum (Hbst.)	-	-	-	-	-	1	1	2
Amara ovata (F.)	-	2	-	5	-	2	3	12
Amara familiaris (Duft.)	-	-	-	-	-	-	1	1
Haliplus laminatus (Schal.)	-	-	-	-	-	2	-	2
Stictotarsus duodecimpustulatus F	2	-	-	-	-	9	-	11
Nebrioporus depressus (F.)	-	-	-	-	-	16	7	23
Gyrinus urinator Ill.	-	-	-	-	-	1	1	2
Orectochilus villosus (Müll.)	-	-	-	-	-	1	-	1
Helophorus brevipalpis Bed.	-	-	-	-	-	-	1	1
Ptenidium pusillum (Gyll.)	-	-	1	-	-	4	1	6
Thinodromus arcuatus (Steph.)	-	-	1	-	-	-	-	1
Carpelimus rivularis (Mots.)	-	-	-	-	1	-	-	1
Carpelimus corticinus	-	-	-	-	-	40	2	42

(Grav.)								
Anotylus rugosus (F.)	2	-	-	-	-	2	11	15
Bledius annae Sharp	-	-	1	-	-	25	-	26
Stenus juno (Payk.)	-	-	1	-	-	-	-	1
Stenus boops Ljungh	-	-	1	-	-	1	-	2
Stenus pallitarsus Steph.	-	-	1	-	-	-	-	1
Lathrobium multipunctum Grav.	-	-	-	-	-	1	-	1
Xantholinus longiventris Heer	1	-	1	-	-	-	3	5
Philonthus tenuicornis Muls.	3	-	-	-	-	-	-	3
Philonthus succicola Thom.	-	-	-	-	-	-	1	1
Philonthus rotundicollis (Men.)	-	-	-	-	-	4	17	21
Philonthus fimetarius (Grav.)	1	-	-	-	-	-	-	1
Philonthus rubripennis Steph.	-	-	3	-	-	-	-	3
Gabrius pennatus Sharp	-	-	-	-	-	1	-	1
Tachyporus obtusus (L.)	1	4	-	5	-	7	1	18
Tachinus signatus Grav.	9	1	-	-	-	1	11	22
Oligota pumilio Kies.	-	-	-	-	-	-	2	2
Tachyusa constricta Er.	-	-	1	-	-	-	-	1
Aloconota planifrons (Water.)	-	-	1	-	1	-	-	2
Aloconota gregaria (Er.)	-	-	-	-	-	-	3	3
Amischa analis (Grav.)	-	-	-	-	-	-	4	4
Dinaraea angustula (Gyll.)	-	-	-	-	-	2	-	2
Atheta (Philhygra) malleus Joy	-	-	-	-	1	-	-	1
Atheta (Mocyta) fungi (Grav.)	-	-	-	6	1	5	24	36
Ilyobates subopacus Palm	-	-	-	-	-	-	2	2
Chiloporata longitarsis (Er.)	-	-	1	-	-	-	1	2
Oxypoda umbrata (Gyll.)	-	-	-	-	-	-	1	1
Oxypoda exoleta Er.	-	1	-	-	-	1	60	62
Malthodes dispar (Germ.)	-	3	-	5	-	-	-	8
Malthodes fibulatus Kies.	-	1	-	-	-	-	-	1
Agriotes acuminatus (Steph.)	-	-	-	-	-	-	2	2
Athous bicolor (Goez.)	-	-	-	-	-	-	8	8
Hypnoidus riparius (F.)	15	1	-	1	-	-	21	38
Cyphon palustris Thom.	-	-	1	-	-	-	-	1
Dryops ernesti des Gozis	-	-	-	-	-	1	-	1
Oulimnius troglodytes (Gyll.)	-	-	-	-	-	21	19	40
Limnius volckmari (Panz.)	-	-	-	-	-	13	7	20
Normandia nitens (Müll.)	-	-	-	-	-	3	1	4
Heterocerus marginatus (F.)	-	-	-	-	-	3	-	3
Atomaria (Anchicera) fuscata (Schoen.)	-	-	-	-	-	-	1	1
Atomaria (Anchicera) atricapilla Steph.	-	-	-	-	-	-	1	1
Atomaria (Anchicera) nitidula (Marsh.)	-	-	-	-	-	5	6	11
Atomaria (Anchicera) testacea Steph.	-	-	-	-	-	10	1	11

Atomaria nigrirostris Steph.	-	-	-	-	-	1	-	1
Atomaria linearis Steph.	-	-	-	-	-	1	-	1
Aridius bifasciatus (Reitt.)	-	-	-	-	-	2	-	2
Enicmus transversus (Ol.)	-	-	-	-	-	-	3	3
Propylea 14-punctata (L.)	-	-	1	-	-	-	-	1
Anatis ocellata (L.)	1	-	-	-	-	-	-	1
Gastrophysa viridula (Deg.)	-	1	-	4	-	3	3	11
Phaedon cochleariae (F.)	-	2	2	1	2	-	-	7
Phaedon armoraciae (L.)	-	-	-	-	-	2	-	2
Phyllotreta undulata Kuts.	-	-	-	-	-	2	-	2
Phyllotreta ochripes (Curt.)	-	-	2	-	2	14	3	21
Longitarsus luridus (Scop.)	-	-	-	-	-	1	-	1
Chalcoides plutus (Latr.)	-	-	-	-	-	4	-	4
Psylliodes affinis (Payk.)	-	-	-	-	-	-	1	1
Neosirocalus floralis (Payk.)	-	-	-	-	-	2	-	2
Rhynchaenus (Isochus) foliorum (Müll.)	-	-	-	-	-	1	-	1
Agonum dorsale (Pont.)	-	1	-	-	-	-	-	1
Agonum moestrum (Duft.)	-	1	-	-	-	1	1	3
Bembidion properans Steph.	-	-	1	-	-	-	-	1
Pterostichus niger	-	-	-	-	-	-	2	2
Tachyporus chrysomelinus	-	-	-	-	-	-	2	2
Aridius nodifer (West.)	-	-	-	-	-	-	1	1
Total								907

Table H18 - Pallington 1 (River Frome)

	6/17/98		6/30/98		
	HS	Pitfall	Pitfall	HS	Total
Nebria brevicollis (F.)	-	2	1	-	3
Loricera pilicornis (F.)	-	1	-	-	1
Clivina fossor (L.)	-	1	-	-	1
Dyschirius globosus (Hbst.)	-	4	2	-	6
Bembidion lampros (Hbst.)	-	3	-	-	3
Bembidion properans Steph.	-	5	1	-	6
Bembidion tetracolum Say	-	30	5	-	35
Bembidion articulatum (Panz.)	-	1	-	-	1
Bembidion biguttatum (F.)	-	-	1	-	1
Bembidion guttula (F.)	-	1	-	-	1
Stenolophus skrimshiranus Steph.	-	1	-	-	1
Pterostichus (Poecilus) cupreus (L.)	-	5	-	-	5
Pterostichus strenuus (Panz.)	-	10	2	-	12
Pterostichus nigrita (Payk.)	-	19	6	-	25
Pterostichus minor (Gyll.)	-	1	-	-	1
Calathus fuscipes (Goez.)	-	-	1	-	1
Agonum moestum (Duft.)	-	6	2	-	8
Agonum micans Nic.	-	1	-	-	1
Agonum albipes (Payk.)	5	12	1	2	15
Chlaenius nigricornis (F.)	-	1	-	-	1
Demetrias atricapillus (L.)	-	1	1	-	2
Metabletus obscuroguttatus Duft	-	-	1	-	1
Metabletus foveatus (Fourc.)	-	1	1	-	2
Orectochilus villosus (Müll.)	-	1	1	-	2
Anacaena limbata (F.)	-	2	-	-	2
Kissister minima (Aube)	-	1	-	-	1
Ptenidium pusillum (Gyll.)	-	1	-	-	1
Carpelimus bilineatus Steph.	-	1	1	-	2
Anotylus rugosus (F.)	-	1	2	-	3
Stenus clavicornis (Scop.)	2	-	-	5	5
Stenus boops Ljungh	-	4	1	1	6
Paederus riparius (L.)	3	-	-	1	1
Xantholinus linearis (Ol.)	-	1	-	-	1
Xantholinus longiventris Heer	-	6	2	1	9
Gabrius pennatus Sharp	1	2	-	3	5
Quedius molochinus (Grav.)	-	1	-	-	1
Tachyporus hypnorum (F.)	-	-	1	-	1
Tachyporus chrysomelinus (L.)	-	1	-	-	1
Tachinus signatus Grav.	-	1	-	-	1
Cordalia obscura (Grav.)	-	-	4	-	4
Tachyusa constricta Er.	-	-	1	-	1
Tachyusa coarctata Er.	-	-	1	-	1
Aloconota gregaria (Er.)	-	-	1	-	1
Amischa analis (Grav.)	-	2	3	-	5

Atheta (Philhygra) elongatula (Grav.)	-	-	4	-	4
Atheta malleus Joy	-	1	2	-	3
Atheta (Mocyta) fungi (Grav.)	-	1	-	-	1
Oxypoda exoleta Er.	-	-	1	-	1
Aleochara (s.s) brevipennis Grav.	-	1	1	-	2
Hypnoidus riparius (F.)	-	5	3	-	8
Dryops ernesti des Gozis	1	21	16	-	37
Elmis aenea (Müll.)	1	-	3	-	3
Stilbus testaceus (Panz.)	-	1	-	-	1
Coccidula rufa (Hbst.)	-	-	-	1	1
Adalia bipunctata (L.)	-	-	-	1	1
Aphodius erraticus (L.)	-	1	-	-	1
Longitarsus anchusae (Payk.)	-	-	1	-	1
Altica lythri Aube	-	2	-	-	2
Notaris acridulus (L.)	-	7	6	-	13
Hypera pollux (F.)	-	1	-	-	1
Rhinoncus pericarpius (L.)	-	4	-	-	4
Ceutorhynchus litura (F.)	-	1	-	-	1

Table 19 - Pallington 2 (River Frome)

	6/17/98		6/30/98		
	HS	Pitfall	Pitfall	HS	Total
Elaphrus cupreus Duft.	0	0	2	0	2
Loricera pilicornis (F.)	0	1	0	0	1
Bembidion tetracolum Say	0	7	2	0	9
Bembidion biguttatum (F.)	0	0	1	0	1
Bembidion guttula (F.)	0	0	1	0	1
Pterostichus (Poecilus) cupreus (L.)	0	2	4	0	6
Pterostichus strenuus (Panz.)	0	1	10	0	11
Pterostichus nigrita (Payk.)	0	8	1	0	9
Pterostichus minor (Gyll.)	0	0	1	0	1
Pterostichus melanarius (Ill.)	0	0	2	0	2
Agonum moestum (Duft.)	0	4	7	0	11
Agonum micans Nic.	0	2	1	0	3
Agonum fuliginosum (Panz.)	0	0	2	0	2
Agonum albipes (Payk.)	0	1	0	0	1
Orectochilus villosus (Müll.)	0	1	2	0	3
Ochthebius dilatatus Steph.	0	0	1	0	1
Cercyon atomarius (F.)	0	0	1	0	1
Anacaena limbata (F.)	0	0	2	0	2
Choleva spadicea (Sturm)	0	0	1	0	1
Ptenidium pusillum (Gyll.)	0	0	1	0	1
Carpelimus bilineatus Steph.	0	0	1	0	1
Anotylus rugosus (F.)	0	0	2	0	2
Stenus juno (Payk.)	1	0	0	2	2
Stenus rogeri Kr.	1	0	2	0	2
Stenus bimaculatus Gyll.	0	0	2	1	3
Stenus boops Ljungh	2	1	1	4	6
Stenus nanus Steph.	0	0	1	0	1
Stenus solutus Er.	0	0	0	1	1
Paederus riparius (L.)	10	1	1	22	24
Paederus littoralis Grav.	2	0	0	1	1
Gyrohypnus angustatus Steph.	0	0	1	0	1
Xantholinus longiventris Heer	0	1	0	0	1
Neobisnius villosulus (Steph.)	0	0	1	0	1
Philonthus laminatus (Creutz.)	0	2	0	0	2
Philonthus cognatus Steph.	0	1	0	0	1
Philonthus varius (Gyll.)	0	0	1	0	1
Philonthus marginatus (Strom)	1	0	1	0	1
Tachyporus obtusus (L.)	0	0	1	1	2
Tachyporus hypnorum (F.)	0	0	1	0	1
Tachinus signatus Grav.	0	1	7	0	8
Cordalia obscura (Grav.)	0	0	1	0	1

Oxypoda exoleta Er.	0	0	1	0	1
Cantharis nigra (Deg.)	0	0	0	1	1
Hypnoidus riparius (F.)	2	2	1	0	3
Dryops ernesti des Gozis	0	2	6	0	8
Elmis aenea (Müll.)	0	0	1	0	1
Longitarsus anchusae (Payk.)	0	1	0	0	1
Altica lythri Aube	0	0	1	0	1
Chaetocnema hortensis (Fourc.)	0	0	1	0	1
Bagous tempestivus (Hbst.)	0	0	2	0	2
Notaris acridulus (L.)	0	5	8	0	13
Ceutorhynchus litura (F.)	0	0	0	0	0
Metabletus obscuroguttatus Duft	0	0	1	0	1
Haplodontus litura	0	0	1	0	1
Myllaena intermedia Er.	0	0	0	1	1
Total					167

Table H20 - Pallington 3 (River Frome)

Taxa	6/17/98 Excav	HS	6/30/98 Pitfall	HS	HS	Total
Nebria brevicollis (F.)	-	-	3	-	-	3
Elaphrus riparius (L.)	-	-	-	-	1	1
Bembidion tetracolum Say	-	6	6	3	1	16
Anisodactylus binotatus (F.)	-	-	1	-	-	1
Pterostichus strenuus (Panz.)	-	-	2	-	-	2
Pterostichus nigrita (Payk.)	-	-	1	-	-	1
Pterostichus melanarius (Ill.)	-	-	1	-	-	1
Agonum albipes (Payk.)	-	4	1	3	1	9
Amara aenea (Deg.)	-	1	5	-	2	8
Amara familiaris (Duft.)	-	-	1	-	-	1
Demetrias atricapillus (L.)	-	-	1	-	-	1
Metabletus foveatus (Fourc.)	-	-	1	-	1	2
Helophorus brevipalpis Bed.	-	-	1	-	-	1
Helophorus sp.	3	-	-	-	-	3
Carpelimus gracilis (Mann.)	-	-	1	-	-	1
Stenus boops Ljungh	-	-	4	-	1	5
Paederus littoralis Grav.	-	3	1	-	-	4
Hypomedon (= Sunius) propinquus (Bris.)	-	-	1	-	-	1
Xantholinus linearis (Ol.)	-	-	-	-	1	1
Philonthus atratus (Grav.)	-	-	-	1	-	1
Tachyporus nitidulus (F.)	-	-	2	-	-	2
Tachyporus chrysomelinus (L.)	-	2	2	-	-	4
Amischa analis (Grav.)	-	-	2	-	-	2
Atheta (Philhygra) elongatula (Grav.)	-	-	1	-	-	1
Oxypoda exoleta Er.	-	N	1	-	-	1
Hypnoidus riparius (F.)	-	-	1	-	-	1
Dryops ernesti des Gozis	-	-	3	-	-	3
Elmis aenea (Müll.)	-	-	1	-	-	1
Tytthaspis sedecimpunctata (L.)	-	-	2	-	1	3
Coccinella undecimpunctata L.	-	-	-	-	1	1
Chaetocnema hortensis (Fourc.)	-	-	1	-	-	1
Notaris acridulus (L.)	-	-	2	-	-	2
Notiophilus biguttatus (F.)	-	1	-	-	-	1
Bembidion genei Kust.	-	1	-	-	-	1
Bembidion atrocoeruleum Steph.	-	1	-	-	-	1

Tachyporus pusillus Grav.	-	1	-	-	-	1
Paederus riparius (L.)	-	1	-	-	-	1
Aphodius granarius (L.)	-	1	-	-	-	1
Tachyusa coarctata Er.	-	2	-	-	-	2
Total						93

Table H21 - Llanwrda Station (River Tywi)

Taxa	6/9/98 Pitfall	HS (core)	HS (edge)	Excav 1	6/23/98 pitfall 2.2	6/23/98 Pitfall	HS (core)	HS (edge)	Excav 1	Excav 2	Total
Clivina collaris (Hbst.)	2	-	-	-	-	-	-	-	-	-	2
Perileptus areolatus (Creutz.)	-	-	-	-	-	1	-	1	-	-	2
Bembidion punctulatum Drap.	-	-	3	-	-	-	-	7	-	-	10
Bembidion prasinum (Duft.)	-	-	2	-	-	-	-	-	-	-	2
Bembidion atrocoeruleum Steph	7	2	-	-	-	1	8	-	-	-	18
Bembidion tetracolum Say	2	-	-	-	-	-	-	-	-	-	2
Bembidion decorum (Zenk.)	1	-	1	-	-	-	1	4	-	-	7
Harpalus rufipes Deg.	1	-	-	-	-	-	-	-	-	-	1
Harpalus affinis (Schr.)	2	-	-	-	-	-	-	-	-	-	2
Agonum albipes (Payk.)	-	3	1	-	-	-	-	2	-	-	6
Agonum dorsale (Pont.)	-	-	-	-	-	1	-	-	-	-	1
Amara aenea (Deg.)	1	-	-	-	-	-	-	-	-	-	1
Lionychus quadrillum (Duft.)	16	-	-	-	2	4	-	-	-	-	22
Hydraena gracilis Germ.	1	-	-	-	-	-	-	-	-	-	1
Anotylus rugosus (F.)	2	-	-	-	-	-	-	-	-	-	2
Thinobius praetor Smet.	-	-	-	-	-	-	-	-	2	6	8
Thinobius newberyi Scheer.	-	-	-	-	-	-	-	-	3	-	3
Lathrobium geminum Kr.	1	-	-	-	-	-	-	-	-	-	1
Xantholinus longiventris Heer	2	-	-	-	-	-	-	-	-	-	2
Hydrosmecta thinobioides (Kr.)	1	-	-	2	-	-	-	-	2	-	5
Hydrosmecta delicatula (Sharp)	-	-	-	-	-	-	-	-	1	1	2
Hydrosmectina septentrionum Benick	-	-	-	1	-	-	-	-	-	-	1

Aloconota cambrica (Woll.)	3	-	1	-	-	-	-	-	-	-	4
Aloconota currax (Kr.)	-	4	-	-	-	-	-	2	-	-	6
Aleochara (Coprochara) bipustulata (L.)	1	-	-	-	-	-	-	-	-	-	1
Brachygluta pandellei (Saulc.)	2	-	-	-	-	-	-	-	-	-	2
Fleutiauxellus maritimus (Curt.)	15	1	-	-	-	2	-	-	-	-	18
Zorochros minimus (Bois.& Lac)	12	2	-	-	-	2	-	-	-	-	16
Cyphon palustris Thom.	1	-	-	-	-	-	-	-	-	-	1
Coccinella quinquepunctata L.	-	-	3	-	-	-	2	-	-	-	5
Deleaster dichrous (Grav.)	-	-	-	2	-	-	-	-	-	-	2
Formicidae	-	-	-	-	-	1	-	-	-	-	1
Total											157

Table H22 – Pencarreg Farm (River Usk)

	6/11/98					6/25/98					
	Pitfall	HS(core)	HS(edge)	Excav 1	Excav 2	Piftall	HS(core)	HS(edge)	Excav 1	Excav 2	Total
Nebria brevicollis (F.)						3					3
Clivina collaris (Hbst.)						4		1			5
Tachys parvulus Dej.			1								1
Bembidion litorale (Ol.)			1								1
Bembidion lampros (Hbst.)	2					1					3
Bembidion punctulatum Drap.			2					4	1	3	10
Bembidion tibiale (Duft.)								1			1
Bembidion atrocoeruleum Steph.			2							1	3
Bembidion tetracolum Say	3	9				21	7	9	1		50
Bembidion femoratum Strm.	2					20					22
Bembidion decorum (Zenk.)			3								3
Bembidion aeneum Germ.					1						1
Asaphidion flavipes (L.)						1					1
Harpalus rufipes Deg.	1	1				8					10
Harpalus affinis (Schr.)						3					3
Pterostichus melanarius (Ill.)						10					10
Agonum muelleri (Hbst.)						1					1
Agonum albipes (Payk.)			1					9			10
Agonum dorsale (Pont.)		1									1
Amara similata (Gyll.)		1									1
Amara ovata (F.)						1					1
Amara aenea (Deg.)						2					2
Amara bifrons (Gyll.)		1									1
Badister bullatus (Schr.)						1					1
Demetrias atricapillus (L.)							1	1			2

Metabletus foveatus (Fourc.)		1									1
Lionychus quadrillum (Duft.)	3	1									4
Helophorus brevipalpis Bed.										1	1
Thinobius bicolor Joy				2	1				1		4
Paederus fuscipes Curt.							1				1
Xantholinus longiventris Heer						1					1
Philonthus rotundicollis (Men.)						3					3
Philonthus rubripennis Steph.								3			3
Tachyporus obtusus (L.)		2				9	2	2			15
Tachyporus hypnorum (F.)		2									2
Tachyporus chrysomelinus (L.)		2				2					4
Tachyporus tersus Er.						1					1
Tachyusa coarctata Er.						1					1
Agriotes acuminatus (Steph.)						1					1
Negastrius sabulicola (Boh.)	17				1	47					65
Zorochros minimus (Bois.& Lac)	5		2		1	4	2			2	16
Oulimnius tuberculatus (Müll.)						1					1
Oulimnius troglodytes (Gyll.)					1						1
Atomaria (Anchicera) fuscata (Schoen.)	1										1
Enicmus transversus (Ol.)		1				1					2
Coccinella septempunctata L.			1								1
Notoxus monoceros (L.)	9	14	1			88	8	2			122
Crepidodera ferruginea (Scop.)		1									1
Sitona striatellus Gyll.						2					2
Sitona lineatus (L.)		1									1
Pterostichus cupreus	1										1
Corticaria sp.		1									1

Atheta (Mycota) fungi	1		1
Aloconota (s.str.) gregaria		1	1
Total			406

Table H23 – Penlan (River Tywi)

Taxa	6/23/98 Pitfall	HS	HS(core)	HS(edge)	Excav	Total
Carabus granulatus L.	2	-	-	-	-	2
Clivina fossor (L.)	7	-	-	-	-	7
Clivina collaris (Hbst.)	25	6	-	-	-	31
Perileptus areolatus (Creutz.)	1	-	1	-	-	2
Bembidion lampros (Hbst.)	-	1	-	-	-	1
Bembidion properans Steph.	-	2	-	-	-	2
Bembidion punctulatum Drap.	30	1	5	5	-	41
Bembidion prasinum (Duft.)	1	-	-	4	-	5
Bembidion atrocoeruleum Steph.	15	-	3	-	-	18
Bembidion decorum (Zenk.)	5	-	1	-	-	6
Agonum muelleri (Hbst.)	5	1	-	-	-	6
Agonum albipes (Payk.)	2	-	-	-	-	2
Agonum dorsale (Pont.)	1	-	-	-	-	1
Amara aenea (Deg.)	1	-	-	-	-	1
Helophorus arvernicus Muls.	1	-	-	-	-	1
Helophorus brevipalpis Bed.	1	-	-	-	-	1
Deleaster dichrous (Grav.)	2	-	2	-	-	4
Ochthephilus omalinus agg.	-	-	-	3	-	3
Anotylus rugosus (F.)	2	-	-	-	-	2
Oxytelus laqueatus (Marsh.)	2	-	-	-	-	2
Stenus melanopus (Marsh.)	1	-	-	-	-	1
Neobisnius villosulus (Steph.)	-	-	-	1	-	1
Neobisnius prolixus Er.	1	-	-	-	-	1
Philonthus intermedius (Bois.)	-	1	-	-	-	1
Tachyporus chrysomelinus (L.)	1	-	-	-	-	1
Hydrosmecta thinobioides (Kr.)	-	-	-	-	2	2
Hydrosmectina septentrionum	-	-	-	-	1	1
Aloconota currax (Kr.)	1	-	-	-	-	1
Aloconota gregaria (Er.)	1	-	-	-	-	1
Amischa analis (Grav.)	1	-	-	-	-	1
Atheta (Mocyta) amplicollis (Muls.)	1	-	-	-	-	1
Meotica exilis (Er.)	1	-	-	-	-	1
Oxypoda umbrata (Gyll.)	1	-	-	-	-	1
Aleochara (Coprochara) bipustulata (L.)	9	-	-	-	-	9
Agriotes obscurus (L.)	2	-	-	-	-	2
Fleutiauxellus maritimus (Curt.)	32	-	-	-	-	32
Negastrius sabulicola (Boh.)	5	-	-	-	-	5
Zorochros minimus (Bois.& Lac)	24	-	-	-	-	24

Typhaea stercorea (L.)	1	-	-	-	-	1
Aphodius depressus (Kug.)	1	-	-	-	-	1
Chaetocnema concinna (Marsh.)	1	-	-	-	-	1
Chaetocnema hortensis (Fourc.)	3	-	-	-	-	3
Ceutorhynchus litura (F.)	1	-	-	-	-	1
Total						231

Table H24 – Species of Araneae (Phase 3 – Survey)

Taxa	Ferm-typ	Penlan	Pencareg	Pallin1	Pallin2	Pallin3	Monmth	LymmR1	LymmR2	LymmR3	Llangib1	Llangib2	LlangibB	LlandovA	LlandovB	Keithly	Llan-sta	Bronydd	EllandR2	EllandR3	Glasbury	Total
Harpactea hombergi	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Segestria senoculata	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2
Haplodrassus silvestris	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Drassyllus pusillus	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Micaria pulicaria	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Phrurolithus festivus	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Xysticus cristatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Xystichus kochi	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Pardosa agricola	15	0	98	0	0	0	0	0	0	0	138	73	66	24	119	0	42	13	0	0	20	608
Pardosa palustris	0	4	0	0	0	1	0	0	0	0	26	10	18	0	0	0	0	2	0	0	1	62
Pardosa pullata	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	3	0	0	0	5
Pardosa prativaga	0	0	0	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Pardosa amentata	0	3	13	35	1	3	22	1	0	0	25	2	3	0	2	1	0	12	0	2	4	129
Pardosa lugubris	0	0	0	0	0	0	0	3	6	0	0	0	0	0	0	0	0	0	0	0	0	9
Pardosa proxima	0	1	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Alopecosa pulverulenta	0	0	0	4	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	5
Trochosa ruricola	0	0	2	9	1	0	2	0	0	0	16	9	2	0	2	0	0	3	0	0	1	47
Trochosa terricola	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Arctosa leopardus	0	0	0	6	0	1	2	1	0	0	7	0	0	0	0	0	0	0	0	0	0	17
Arctosa cinerea	5	0	7	0	0	0	0	0	0	0	9	20	10	2	4	0	5	2	0	0	7	71
Pirata piraticus	0	0	1	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Pirata hydrophilus	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	3
Pisaura mirabilis	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Tegenaria duellica	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Coelotes altropos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Antistea elegans	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Pachygnatha clerki	0	0	1	4	2	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	11

Pachygnatha degeeri	0	0	0	0	0	1	0	6	3	0	6	0	0	0	0	0	0	5	0	0	1	22
Lycosidae Imm.	1	9	48	0	0	1	19	0	0	0	8	60	2	5	3	0	3	0	0	0	0	159
Linyphiidae Imm.	1	1	0	0	1	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	6
Walckenaeria nudipalpis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
Dicymbium nigrum	0	0	0	0	0	0	1	0	4	0	0	0	0	0	1	0	0	0	0	0	0	6
Pocadicnemis pumilla	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Pocadicnemis juncea	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Oedothorax gibbosus	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Oedothorax fuscus	1	5	3	3	3	9	37	0	0	0	1	0	0	1	2	0	0	1	1	1	1	69
Oedothorax agrestris	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	3	0	0	5	0	0	12
Oedothorax retusus	0	0	0	3	2	13	17	0	0	0	1	0	0	1	0	0	1	0	0	0	1	39
Oedothorax apicatus	2	6	16	0	0	0	0	0	0	0	2	1	0	0	1	0	2	0	0	0	3	33
Troxochrus scabriculus	0	1	2	0	0	0	13	0	0	0	0	0	1	0	0	0	0	0	0	0	0	17
Micrargus herbigradus	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
Micrargus subaequalis	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Diplocephalus latifrons	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Diplocephalus picinus	0	0	0	0	0	0	0	3	11	0	0	0	0	0	0	1	0	0	0	0	0	15
Araeoncus humilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Milleriana inerrans	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Erigone dentipalpis	0	13	1	2	0	9	7	4	23	0	1	0	3	1	2	1	1	4	30	1	1	104
Erigone promiscua	0	0	0	0	1	0	0	1	17	1	0	0	0	0	0	0	0	0	9	0	0	29
Erigone atra	1	9	1	1	1	2	7	0	1	0	0	0	0	1	1	0	0	2	22	1	0	50
Leptorhoptrum robustum	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Halorates distinctus	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Ostearius melanopygius	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Porrhomma campbelli	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2
Agyneta decora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Meioneta rurestris	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	5
Microneta viaria	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3
Saaristoa abnormis	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Macrargus rufus	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Bathyphantes gracilis	0	0	0	0	2	0	10	1	1	0	0	0	0	0	0	1	0	0	4	0	0	19
Diplostyla concolor	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2

Lepthyphantes tenuis	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	1	0	0	11
Lepthyphantes flavipes	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	5

APPENDIX I
A list of Coleoptera associated with ERS in the UK.

Taxa	Status	Notes	ERS	Uncertain	Reject	Proposed Fidelity
CARABIDAE						
Acupalpus flavicollis	Na	wet sand - soft cliffs & ERS (also bogs?)	1			2?
Agonum albipes (Payk.)	Common	lake & river margins, soft cliffs, dunes	1			2?
Agonum micans		open mud on lake & river margins	1			3
Amara fulva	Nb	sandy heathland, dunes, sand pits & ERS	1			2?
Amara quenseli	Na	ERS, sand pits & upland morraine	1			2?
Asaphidion flavipes		sandy ground near water	1			3?
Asaphidion pallipes	Nb	soft cliffs & dunes, also sandy lake & river margins	1			2?
Bembidion andreae (F.)	Very Local	ERS & coastal habitats	1			2?
Bembidion articulatum (Panz.)	Local	water margins	1			3
Bembidion atrocoeruleum Steph.	Local	ERS	1			1
Bembidion bipunctatum	Nb	coastal sandy habitats & ERS	1			2?
Bembidion decorum (Zenk.)	Common	ERS	1			1
Bembidion dentellum (Thun.)	Local	vegetated water margins on ERS	1			3?
Bembidion femoratum		ERS, dunes & sand pits	1			2?
Bembidion fluviatile	Nb	ERS & gravel pits	1			2?
Bembidion geniculatum	Very Local	ERS	1			1
Bembidion litorale (Ol.)	Nb	ERS	1			1
Bembidion lunatum	Nb	river banks, soft cliffs & coastal shingle	1			2?
Bembidion monticola Strm.	Very Local	ERS & riverbanks	1			1
Bembidion prasinum (Duft.)	Very Local	ERS	1			1
Bembidion punctulatum Drap.	Local	ERS	1			1
Bembidion quadripustulatum	Nb	wet sand or mud on water margins	1			3?
Bembidion saxatile	Nb	ERS & coastal habitats, usually at base of cliffs	1			2?
Bembidion schueppeli	Na	ERS	1			1
Bembidion semipunctatum	Na	ERS	1			1
Bembidion stomoides Dej.	Nb	ERS	1			1
Bembidion testaceum	Nb	ERS	1			1

Bembidion tibiale (Duft.)	Common	ERS	1	1
Bembidion virens	RDB3	ERS	1	1
Chlaenius vestitus		ponds & river margins, soft cliffs, dunes	1	3?
Clivina collaris (Hbst.)	Local	ERS & humus-rich soil	1	3?
Dyschirius aeneus		soft cliffs, sand pits, riverbanks	1	2?
Dyschirius angustatus		estuarine sand & ERS	1	2?
Elaphrus riparius		water margins	1	3?
Lionychus quadrillum (Duft.)	RDB3	ERS & coastal shingle	1	2
Pelophila borealis	RDB3	silty ERS on lakes & rivers; & upland flushes	1	2?
Perileptus areolatus (Creutz.)	Na	ERS	1	1
Tachys bistriatus	Nb	damp sand on lake & river margins, also coastal	1	2?
Tachys parvulus Dej.	Nb	ERS, gravel pits, etc.	1	2?
Thalassophilus longicornis	Na	ERS	1	1
Trechus discus	Nb	wetlands, inc. river banks, ditches, gravel pits	1	3
DYTISCIDAE				
Bidessus minutissimus (Germ.)	RDB3	sandy ERS on rivers (& lakes)	1	1
GEORISSIDAE				
Georissus crenulatus	Nb	dune slacks, soft cliffs & ERS	1	2?
HYDROCHIDAE				
Hydrochus nitidicollis Muls.	RDB3	shallow pools in ERS on rivers & lakes	1	1
HELOPHORIDAE				
Helophorus arvernicus Muls.	Nb	silty river margins	1	1
HYDRAENIDAE				
Hydraena gracilis		stony rivers & lakes	1	1
Hydraena nigrita	Nb	amongst sand & gravel at edge of streams	1	1?
Hydraena rufipes Curt.	Nb	fine river gravels & quarries; also waterfalls	1	3?
Ochthebius bicolon	Nb	river banks, inc. ERS, & shaded muddy ponds	1	1
PTILIDAE				
Actidium aterrimum	RDBK	ERS	1	1
Ptenidium brenskei	Nb	ERS	1	1
Ptenidium longicorne Fuss	Local	sandy ERS and river banks?	1	2?
STAPHYLINIDAE				
Aloconota (s.str.) cambrica (Woll.)	Local	ERS	1	1
Aloconota (s.str.) currax (Kr.)	Local	ERS	1	1

Aloconota (s.str.) insecta		ERS & occ. in other habitats	1	2?
Aloconota planifrons	RDBK	sand pits, coastal shingle & ERS	1	2?
Atheta (Philhygra) debilis		ERS (& other habitats?)	1	?
Atheta (Acrotonoa) exigua		dune species in Wales, ERS in Scotland	1	2?
Atheta (Philhygra) scotica	Nb	ERS (& water meadow?)	1	1
Bledius annae Sharp	Local	sandy river banks	1	1
Bledius arcticus	RDBI	ERS	1	1
Bledius bicornis	Na	saltmarsh, river banks, dykes, coastal sand/mud	1	2?
Bledius crassicollis	RDBI	coastal seepages & gravel pits, sandy riverbanks	1	2?
Bledius defensus	RDBK	ERS	1	1
Bledius erraticus Er.	RDBK	river banks, sand quarries & dunes	1	2?
Bledius pallipes		sandy river banks (other habitats?)	1	?
Bledius subterraneus		sandy riverbanks & dunes	1	2?
Bledius terebrans	RDBK	ERS & sand dunes	1	2?
Calodera uliginosa	RDBK	river banks	1	1
Carpelimus bilineatus Steph.	Common	bare mud on rivers, lakes & flushes; manure heaps	1	3?
Carpelimus corticinus		silt in fens, dunes, soft cliffs & ERS	1	3
Carpelimus fuliginosus		muddy banks of rivers & ponds; manure heaps	1	3?
Carpelimus obesus	Nb	ERS on wet mud	1	1
Carpelimus rivularis (Mots.)	Common	bare mud on banks of rivers & streams; seepages	1	3
Carpelimus similis	Nb	ERS, ditch banks & sandpits - wet sand or mud	1	3?
Carpelimus subtilicornis	Uncertain	mainly river banks on mud & silt	1	?
Carpelimus subtilis	Nb	ERS, gravel pits & coastal cliffs - damp sand	1	2?
Carpelimus zealandicus		damp sand on water margins; soft cliffs	1	3?
Chiloporata longitarsis (Er.)	Common	muddy banks of rivers & streams	1	3
Chiloporata rubicunda	Nb	river banks on sand & shingle	1	1
Deleaster dichrous (Grav.)	Nb	ERS, sand pits & dunes	1	2?
Erichsonius signaticornis Muls. & Rey	Nb	ERS & coastal cliffs - damp sand or mud	1	2?
Gabrius astutoides Strand	RDBI	ERS & coastal habitats	1	2?
Gnypeta carbonaria (Mann.)	Local	muddy banks of rivers & streams	1	3
Gnypeta ripicola	Nb	water margins & sand pits - wet sand or mud	1	3?
Gnypeta rubrior Tott.	Local	muddy river banks	1	1
Gnypeta velata	Nb	ERS & pond margins - bare mud	1	3?
Hydrosmecta delicatula (Sharp)	RDBK	ERS	1	1

Hydrosmecta eximia (Sharp)	Very local	ERS	1	1
Hydrosmecta fragilis (Kr.)	N	ERS	1	1
Hydrosmecta thinobioides (Kr.)	N	ERS	1	1
Hydrosmectina delicatissima	RDBK	coastal shingle, gravel, flood litter	1	3?
Hydrosmectina septentrionum Benick	N	ERS	1	1
Ilyobates proprinquus	N	sand pits & sandy river banks	1	2?
Lathrobium angusticolle Bois.	Nb	ERS	1	1
Lathrobium dilutum	RDB3	ERS	1	1
Lathrobium ripicola Czwal.	N	ERS on lakes & rivers & other wetland habitats	1	3?
Meotica apicalis		muddy banks of rivers & streams	1	3
Medon ripicola	N	sand pits, coastal shingle & ERS	1	2?
Meotica anglica	N	ERS	1	1
Neobisinus procerulus	RDBK	wet sand or mud on water margins	1	3?
Neobisnius prolixus Er.	RDBK	ERS & pond margins - damp sand or mud	1	3?
Neobisnius villosulus (Steph.)	Local	ditches, gravel pits (?other habitats?), occ. ERS	1	3?
Ocalea latipennis	Local	ERS	1	1
Ochthephilus omalinus (Er.)	Local	ERS (& other habitats?)	1	?
Ochthephilus venustulus	Nb	ERS	1	1
Philonthus rubripennis Steph.	Very Local	ERS (occ. marshes?)	1	?
Philonthus varipes		ERS, sand pits	1	2?
Platystethus alutaceus		dunes, muddy banks of ponds, marshes, rarely riverbanks	1	3?
Platystethus cornutus		bare mud & peat on water margins (inc. tidal rivers)	1	3?
Scopaeus gracilis (Sperk)	RDBK	ERS	1	1
Stenus asphaltinus Er.	RDBI	dry sandy & chalky places, inc. sand pits & ERS	1	2?
Stenus assequens	N	sandy areas, inc. ERS	1	2?
Stenus biguttatus	Local	ERS (& other habitats?)	1	1
Stenus comma		bare mud on pond & river margins	1	3?
Stenus guttula		soft cliff, dunes, ERS on wet sand	1	2?
Stenus incanus	RDBK	ERS	1	1
Stenus nigritulus	N	dunes & ERS (other habitats?)	1	2?
Tachyusa atra		wet sand on lake & river margins	1	1
Tachyusa coarctata	N	river & lake margins on ERS	1	1
Tachyusa constricta	Local	sandy riverbanks	1	1
Tachyusa leucopus	Common	sandy riverbanks	1	1

Tachyusa scitula	RDBK	ERS & sand pits	1		2?
Tachyusa umbratica		sandy riverbanks' (Joy)	1		?
Thinobius bicolor	Na	ERS	1		1
Thinobius ciliatus (=praetor)	N	ERS	1		1
Thinobius longipennis	N	ERS	1		1
Thinobius major	RDBK	ERS	1		1
Thinobius newberyi	RDBI	ERS	1		1
Thinobius strandi (= crinifer)	N	ERS	1		1
Thinodromus arcuatus	Local	river banks	1		1
PSELAPHIDAE					
Bibloplectus minutissimus	RDBK	ERS & coastal shingle	1		2
Brachygluta pandellei	RDBK	ERS	1		1
SCARABAEIDAE					
Aegialia sabuleti	Nb	sandy areas, usually ERS - also dunes	1		2?
HETEROCERIDAE					
Heterocerus marginatus		pond margins & ERS	1		3?
DRYOPIDAE					
Dryops nitidulus (Heer)	RDB3	dune slacks & ERS	1		2?
ELATERIDAE					
Fleutiauxellus maritimus (Curt.)	Nb	ERS	1		1
Negastrius pulchellus	RDB2	ERS	1		1
Negastrius sabulicola (Boh.)	RDB3	ERS	1		1
Zorochros minimus (Bois.& Lac)	Common	ERS	1		1
COCCINELLIDAE					
Coccinella quinquepunctata L.	Na	ERS	1		1
CURCULIONIDAE					
Baris lepidii Germ.	Na	sandy riverbanks (other habitats?)	1		?

UNCERTAIN SPECIES

CARABIDAE					
Dyschirius politus		sand dunes, also ERS???		1	?
STAPHYLINIDAE					
Bledius gallicus		dunes (& sandy riverbanks?)		1	?

Bledius longulus		dunes (& sandy riverbanks, sand pits?)	1	?
Carpelimus gracilis		bare mud?	1	?
Neobisinus lathrobioides		?????	1	?
Ochthephilus andalusiacus	N	banks of rivers & streams - found in moss	1	?
Ochthephilus aureus (Fauv.)	Local	stream banks in general, occ. ERS	1	?
Oxypoda lentula		damp places' (Joy)	1	?
Oxypoda riparia	RDBK	sand pits & stream banks	1	?
Planeustomus flavicollis	RDBI	water margins in ERS	1	?
Planeustomus palpalis	RDBK	water margins in ERS	1	?
SCIRTIDAE				
Hydrocyphon deflexicollis	Nb	ERS & gravelly streams banks	1	?
CRYPTOPHAGIDAE				
Paramecosoma melanocephalum		river banks, inc. ERS	1	?

REJECTED SPECIES

Acupalpus dorsalis		vegetated water margins: dunes & wetlands	1
Acupalpus exiguus	Nb	sand/mud in coastal habitats, ponds & ditches, occ. ERS	1
Agonum assimile		wet woodlands	1
Agonum fuliginosum		wetlands	1
Agonum livens	Na	wetlands, esp. carr	1
Agonum marginatum		dune slacks, pond margins	1
Agonum moestum		wetlands	1
Agonum obscurum		wetlands	1
Agonum scitulum	Na	wetlands, esp. carr	1
Agonum thoreyi		wetlands	1
Asaphidion curtum		open, heavy ground inc. farmland	1
Badister anomalus	RDB1	standing water, sand pits	1
Badister dilatatus	Nb	wetlands	1
Badister unipustulatus	Nb	wetlands	1
Bembidion aeneum		predominantly coastal, esp. saltmarsh	1
Bembidion biguttatum (F.)	Common	wetlands	1
Bembidion bruxellense Wesm.	Local	wetlands	1
Bembidion clarki	Nb	wooded ponds	1
Bembidion fumigatum	Nb	wetlands	1

Bembidion genei		sand pits, soft cliffs, ditch banks	1
Bembidion gilvipes	Nb	wetlands	1
Bembidion guttula		wide range of habitats	1
Bembidion iricolor		coastal marshes	1
Bembidion lunulatum		wetlands & coastal habitats, occ. ERS	1
Bembidion nitidulum		soft cliff, fens, seepages	1
Bembidion obliquum	Nb	open mud on water margins, chiefly standing water	1
Bembidion obtusum		soft cliffs, gardens, etc.	1
Bembidion properans		wide range of habitats, usually on clayish soils	1
Bembidion tetracolum		wide range of habitats	1
Bembidion varium		mainly coastal	1
Carabus granulatus		wetlands	1
Chlaenius nigricornis	Nb	wetlands	1
Dyschirius globosus		peatlands, dunes	1
Dyschirius luedersi		marshes, dune slacks	1
Elaphrus cupreus		wetlands	1
Nebria gyllenhali		upland stream banks	1
Pterostichus gracilis	Nb	fens, lake & river margins, amongst lush vegetation	1
Pterostichus minor		wetlands	1
Pterostichus nigrita		wetlands	1
Pterostichus strenuus		wide range of habitats	1
Pterostichus vernalis		wetlands	1
Stenolophus mixtus		soft cliff, wetlands, dunes, pools	1
Trechus micros		wetlands, inc. river banks	1
Trichocellus placidus		fen litter	1
Brychius elevatus		stony rivers, not esp. ERS	1
Haliplus flavicollis		ditches, gravel pits, lakes	1
Haliplus fluviatilis		rivers, ditches, lakes	1
Haliplus fulvus		lakes & ponds	1
Haliplus immaculatus		lakes, ponds & ditches	1
Haliplus laminatus	Nb	drains & canals	1
Haliplus lineatocollis		wide range of waterbodies, inc. streams & ditches	1
Agabus biguttatus	Nb	springs	1
Agabus brunneus	RDB2	heathland streams in gravel, not ERS	1

Agabus didymus		grassy streams & ponds, dunes & ditches	1
Agabus guttatus		wide range of waterbodies, inc. streams & ditches	1
Agabus paludosus		marshes, dunes	1
Deronectes latus	Nb	fast-flowing rivers	1
Dytiscus semisulcatus		wetlands, inc. ditches & pools	1
Graptodytes pictus		wetlands, inc. ditches & pools	1
Hydroporus discretus		springs	1
Hydroporus ferrugineus	Nb	springs	1
Hydroporus marginatus	Nb	temporary water bodies, inc. chalk streams & gravel pits	1
Hydroporus obsoletus	Nb	springs & seepages	1
Hydroporus tessellatus		ditches, ponds, streams & dunes	1
Ilybius fuliginosus		wide range of water bodies	1
Ilybius quadriguttatus		ponds & ditches	1
Laccophilus hyalinus		canals, gravel pits, ditches & ponds	1
Nebrioporus elegans		rivers & lakes	1
Oreodytes davisii	Nb	stony rivers & lakes, not esp. ERS	1
Oreodytes sanmarki (Sahl.)	Common	stony rivers & lakes	1
Oreodytes septentrionalis Sahl.	Local	river gravels, occ. lakes	1
Platambus maculatus		fast-flowing rivers & stony lakes	1
Scarodytes halensis	Nb	ditches & bare mud in ponds	1
Stictonectes lepidus	Nb	bare substrates in ditches, pools, rivers & lakes	1
Stictotarsus duodecimpustulatus		rivers & lakes	1
Gyrinus urinator	Nb	shaded rivers, pupa on emergents	1
Orectochilus villosus		pools in rivers, pupa under bark	1
Helophorus strigifrons	Nb	shallow standing waters	1
Anacaena bipustulata	Nb	ditches & streams	1
Anacaena globulus		litter in wide range of wetland habitats	1
Anacaena limbata		weedy pools & drains	1
Cercyon bifenestratus	RDB3	sand & gravel pits, not on ERS	1
Cercyon convexiusculus	Nb	stagnant water	1
Cercyon marinus		wetlands, inc. ditches	1
Cercyon tristis	Nb	wetlands	1
Cercyon ustulatus	Nb	litter & mud in standing water	1
Chaetarthria similis	RDBK	silt beds along running water	1

Laccobius atrocephalus	Nb	muddy stream margins, fens & coastal seepages	1
Laccobius sinuatus	Nb	quarry pools, soft cliffs, ditches	1
Laccobius striatulus		muddy pools	1
Hydraena minutissimus	Nb	stream margins amongst rocks & moss	1
Hydraena pulchella	RDB3	pools in rivers & coastal ditch systems	1
Hydraena pygmaea	RDB3	mossy stones in shallow streams	1
Hydraena riparia		muddy banks of ponds & ditches	1
Hydraena testacea	Nb	ditches, fens & rivers	1
Limnebius nitidus	Nb	on mud in water margins, chiefly standing water	1
Ochthebius exsculptus	Nb	algal film on hard substrates in rivers, pupa in mud	1
Agathidium marginatum		sand dunes, chalk downland	1
Colon viennense		woodland clearings & river banks	1
Leiodes picea		woodland	1
Liocyrtusa minuta		woodland, soft cliffs & sand dunes	1
Acrotrichis henrici		wetlands	1
Acrotrichis sitkaensis		wetlands	1
Achenium humile	Nb	range of habitats (dunes, woods, coastal marshes, ERS)	1
Aleochara brevipennis	N	wetlands	1
Aleochara ruficornis	N	wide range of habitats	1
Aleochara verna	RDBK	dung, carrion, etc., mainly on sand	1
Alianta incana		wetlands	1
Aloconota eichhoffi	N	wetlands	1
Aloconota gregaria		litter in wide range of habitats	1
Aloconota (s.str.) sulcifrons (Steph.)	Local	wide range of habitats, inc. ERS	1
Anotylus rugosus		wide range of habitats	1
Atheta autumnalis	RDBK	saproxylic	1
Atheta basicornis	Nb	saproxylic	1
Atheta deformis	Nb	wetlands & other habitats	1
Atheta difficilis	Nb	gravel pits, flooplain wetlands	1
Atheta ebenina	RDBK	woodland	1
Atheta (Philhygra) elongatula		wide range of habitats, inc. ERS	1
Atheta graminicola		wetlands, dunes, etc.	1
Atheta (Philhygra) gyllenhali		dunes, parklands (once on ERS in Wales)	1
Atheta hygrobia	Nb	wetlands	1

Atheta (Philhygra) hygrotopora		stream banks in general	1
Atheta (Philhygra) luridipennis		chiefly woodlands, occ. shaded riverbanks	1
Atheta luteipes		wetlands/parklands	1
Atheta malleus		wetlands	1
Atheta (Philhygra) melanocera		wetlands	1
Atheta obfuscata	N	wetlands	1
Atheta (Philhygra) palustris		chiefly woodlands	1
Atheta sylvicola	RDBK	grassland, rotting vegetation, etc.	1
Atheta vilis		range of habitats, not ERS	1
Atheta volans		woodlands/wetlands	1
Bledius filipes	RDBI	sof cliffs	1
Boreophilia eremita (=islandica)		wide range of habitats, inc. mountain tops	1
Brachyusa concolor	N	water margins & wetlands	1
Calodera aethiops		range of habitats, inc. dunes	1
Calodera nigrita	N	wetlands	1
Calodera riparia	N	dunes, wetlands & ERS	1
Carpelimus impressus		ditches, gravel pits	1
Carpelimus lindrothi	Nb	margins of standing water on bare mud	1
Deinopsis erosa		wet woodlands	1
Dianous coerulescens		moss on streambanks & waterfalls, occ. ERS	1
Dochmonota clancula	Nb	wetlands	1
Gabrius bishopi	Nb	wetlands, gravel pits, carr	1
Gabrius nigritulus		range of wetland habitats	1
Gabrius pennatus		dunes, wetlands & ERS	1
Gabrius trossulus		wetlands	1
Gabrius velox	Nb	wetlands	1
Geodromicus nigrita		stream banks in general	1
Gnypeta caerulea		riverbank moss	1
Hygronoma dimidiata		wetlands	1
Ilyobates subopacus	N	wetlands	1
Lathrobium angustatum	Nb	wet places inland and on the coast	1
Lathrobium elongatum		wetlands	1
Lathrobium fulvipenne		wide range of habitats	1
Lathrobium geminum		dunes, wetlands	1

Lathrobium multipunctatum		wide range of habitats	1
Lathrobium pallidum	RDBK	wide range of habitats	1
Lathrobium quadratum		dunes, wetlands	1
Lesteva hanseni	Nb	coastal cliffs, waterfalls & stream margins	1
Lesteva heeri		moss on streambanks & waterfalls	1
Lesteva longoelytrata		wetlands, usually in moss	1
Lesteva monticola		mountain tops & upland riverbanks, not esp. ERS	1
Lesteva pubescens		stream banks in general	1
Lesteva punctata		wide range of habitats	1
Liogluta nitidula		range of habitats, not ERS	1
Myllaena elongata	N	stream banks in general	1
Ocalea rivularis	Uncertain	wetlands	1
Oxypoda elongatula		wide range of habitats	1
Oxypoda exoleta	N	wide range of habitats	1
Oxypoda nigrocincta	RDBI	wetlands	1
Oxytelus fulvipes	Na	wetlands	1
Pachnida nigella		wetlands	1
Paederus littoralis		dunes, soft cliffs, dry grassland	1
Philonthus atratus	Na	wetlands	1
Philonthus mannerheimi	N	wetlands	1
Philonthus micantoides		wetlands	1
Philonthus punctus	RDB3	coastal marshes	1
Philonthus quisquiliarius		dunes, wetlands	1
Philonthus rotundicollis		woodlands/wetlands	1
Platystethus degener		muddy pond margins	1
Platystethus nitens		wetlands	1
Platystethus nodifrons	N	wetlands	1
Quedius auricomus		riverbank moss	1
Quedius plancus		wooded streambanks	1
Quedius riparius		stream banks in general	1
Scopaeus sulcicollis		base of coastal cliffs on wet sand, occ. on chalky ground	1
Stenus argus	Nb	wetlands	1
Stenus bifoveolatus		wetlands	1
Stenus bimaculatus		wetlands	1

Stenus boops		wetlands	1
Stenus calcaratus	RDBK	tidal reed beds	1
Stenus canaliculatus		wetlands	1
Stenus carbonarius	Nb	wetlands	1
Stenus cicindeloides		wetlands	1
Stenus guynemeri		riverbank moss	1
Stenus juno		wetlands	1
Stenus latifrons		wetlands	1
Stenus melanopus		decaying vegetation, marshes	1
Stenus morio	RDBK	wetlands	1
Stenus pallitarsis		wetlands	1
Stenus pubescens		margins of standing water on bare mud	1
Stenus pusillus		wetlands	1
Stenus solutus		wetlands	1
Stenus tarsalis		wetlands	1
Tachyporus obtusus		wetlands	1
Tachyporus pallidus		wetlands	1
Xantholinus longiventris		wide range of habitats	1
Clambus nigrellus		on damp twigs in river flood refuse	1
Clambus nigriclavis		on damp twigs in river flood refuse	1
Clambus pallidulus	RDBK	wooded streambanks	1
Simplocaria maculosa Er.	RDBI	ERS & amongst moss on riverbanks	1
Heterocerus fenestratus		water margins of all types	1
Heterocerus hispidulus	RDB3	sand pits, etc.	1
Limnichus pygmaeus	Na	dune slacks, soft cliffs, dicth banks	1
Dryops ernesti		wetlands, inc. ERS	1
Elmis aenea		stony rivers, not esp. ERS	1
Esolus parallelepipedus		stony rivers, not esp. ERS	1
Limnius volckmari		stony rivers, not esp. ERS	1
Normandia nitens	RDB2	rivers, not esp. ERS	1
Oulimnius major	Na	muddy drains & rivers	1
Oulimnius rivularis	Na	fenland drains	1
Oulimnius troglodytes	Nb	ditches. wetlands, lake margins	1
Oulimnius tuberculatus		stony rivers & lakes, not esp. ERS	1

Riolus cupreus	Nb	mossy stones in rivers & on lake shores	1
Riolus subviolaceus		mossy stones in rivers & streams	1
Stenelmis canaliculata	RDB2	stony rivers, not esp. ERS	1
Fleutiauxellus quadripustulatus		wetlands	1
Hypnoidus riparius		frequent in uplands, occ. wetlands	1
Parophitistus (S.) nigricornis	RDB3	damp grassland	1
Cyanostolus aeneus	Na	waterlogged bark	1
Rhizophagus picipes	Na	waterlogged bark	1
Atomaria atra	Nb	wetland litter	1
Anisosticta 19-punctata		fens	1
Coccidula rufa		wetlands	1
Coccidula scutellata		wetlands	1
Donacia clavipes		reedbeds	1
Donacia impressa		marginal fens of lakes & rivers	1
Donacia simplex		wetlands, inc. ditches & lakes	1
Galerucella calmariensis		wetlands	1
Galerucella sagittariae		wetlands, inc. ditches & lakes	1
Longitarsus kutscherae		damp grasslands	1
Phaedon armoraciae		wetlands	1
Phaedon cochleariae		wetlands	1
Phyllotreta exclamationis		wetlands	1
Prasocuris junci		wetlands	1
Psylliodes picina		wetlands	1
Gymnetron veronicae		wetlands	1
Notaris acridulus		wetlands	1
Notaris bimaculatus	Nb	wetlands, primarily coastal	1
Notaris scirpi	Nb	wetlands	1
Poophagus sisymbrii		ditches, standing water	1
Rhinoncus inconspectus		wetlands	1
Thryogenes festucae		fens, inc. river margins	1