

UK NATURE CONSERVATION

No. 1

Classification and ranking of water beetle communities

by

G.N. Foster
&
M.D. Eyre

Further copies can be obtained from
The Joint Nature Conservation Committee
Monkstone House, City Road,
Peterborough, PE1 1JY

Copyright JNCC 1992

ISBN 1873701-01-2

CLASSIFICATION AND RANKING OF WATER BEETLE COMMUNITIES IN BRITAIN

by G.N. Foster and M.D. Eyre

CONTENTS

Introduction	2
Procedure	2
Checklist	3
Ordination of species and sites	3
Classification	4
Site listings	4
Discussion	4
Acknowledgements	6
References	7
Southern Scotland	11
North-East England	21
Wales	36
Midlands	50
Lincolnshire and northern East Anglia	60
South-West and Southern England	82
The Weald	91
Appendix 1 Species scores	105

Note: this document was compiled, with a few amendments, from two reports prepared in 1988 and 1989. The material has been restructured to allow information for each of the seven study areas to be viewed separately. GNF 1991.

Addresses to contact GNF:- The Scottish Agricultural College, Dept. of Environmental Sciences, Auchincruive, Ayr KA6 5HW; telephone 0292 520331; fax 0292 521119; 3 Eglinton Terrace, Ayr KA7 1JJ; telephone 0292 260064.

CLASSIFICATION AND RANKING OF WATER BEETLE COMMUNITIES IN BRITAIN

G.N. Foster & M.D. Eyre

INTRODUCTION

Aquatic Coleoptera as a group possess all of the attributes needed for evaluation of the conservation status of wetland sites (Foster, 1987). Perhaps the most important is that the majority of water beetle species are predatory. It has been argued (Davis, Rolls, & Balla, 1987) that the number of predatory invertebrates at any site is an important indicator of environmental quality; the same authors also point out that assessment of subgroups of predatory species, particularly the Odonata and aquatic Coleoptera, rather than the entire range of macroinvertebrate predators, should result in considerable savings in time and cost of a biological monitoring programme.

The study of aquatic Coleoptera lends itself to the production of comprehensive species lists, the objective classification and ordination of which is now easily achieved by multivariate analysis techniques available on software for mainframe and micro-computers. About 5'000 such lists are available from Britain and Ireland as a result of the recording scheme formally initiated in 1979. Once classified into assemblage types the lists can be used to rank sites by reference to a point-scoring system (Foster, 1987). This classification and ranking exercise provides a structure in which to fit new site lists for the objective evaluation of site status. Comprehensive lists are more valuable than lists of rarities alone because the common species are used as indicators to assign sites to assemblage groups. This report summarises a series of regional surveys and is based on 2,102 lists.

PROCEDURE

Records acquired for the National Recording Scheme are mainly available on field record cards listing about 300 water beetle taxa (Biological Records Centre card reference RA36, replaced in 1990 by RA71). From these were extracted site lists. "Modern" (post-1950 but usually much more recent) lists were selected, mainly because these were more likely to cover the full range of water beetle taxa currently recognised than the older lists. For the purposes of classification the age of the list would otherwise have been largely immaterial. Lists were ordinated and classified using the computer programs DECORANA (Hill, 1979a) and TWINSpan (Hill, 1979b) respectively.

Sites were ranked within end-groups using the following hierarchy of factors:

the number of species listed in the British Red Data Book (Shirt, 1987) (RDB 1 - category 1, "endangered", RDB 2 - category 2, "vulnerable", RDB 3 - category 3, "rare");

a "species-quality score" (SQS), the mean score per species to one decimal place for points awarded for each species present, ranging from 1 for the commoner species through a geometric progression to 32 for the rarest species (Foster, Foster, Eyre & Bilton, 1990; see Appendix 1 for examples);

in the event of a tie on SQS -

the number of Nationally Notable List A species (Na) (see Ball, 1986 for details, but note that listings have been amended);

then -

the number of Nationally Notable List B species (Nb) (Ball, 1986);

and in the event of a tie on Nb -

the total number of species (NOS).

The aggregate of points, i.e. $SQS \times NOS$ (= "WET"), is included in the site listings because it has appeal as a measure of quality, >100 points generally indicating "top sites". It is, however, dependent on seasonal factors and the diligence of the surveyor or surveyors. Good sites generally attract more visits and visitors and thus accumulate greater aggregates.

A SQS of 2 or more usually indicates a "good" site as do high species numbers and the presence of one Na species or several Nb species. The tie-breaking parts of the hierarchy have little value other than to rank data on the page.

CHECKLIST

Most species were identified to levels accepted at present, involving several changes from the most recent British checklist (Pope, 1977). Species not recognised at the time were *Anacaena limbata* and *A. lutescens* (treated as *limbata* s.l. throughout). Elmids were largely ignored in many Sussex sites surveyed in the 1960's and in north-east England in the 1970's.

ORDINATION OF SPECIES AND SITES

Ordination was undertaken by means of detrended correspondence analysis using the computer program DECORANA (Hill, 1979a). This form of analysis is an improvement on reciprocal averaging and has been described as the best method of metric ordination available (Kenkel & Orloci, 1986). DECORANA produces four axes from which may be interpreted environmental gradients using species and site data. The use of ordination of species lists followed by interpretation of the environmental gradients is termed "indirect gradient analysis" (Ter Braak, 1986). DECORANA has the option of "downweighting" the occurrence of rare species in proportion to their frequency; this is to avoid the tendency of individual samples with rare species to distort the analysis. In practice we have found it unnecessary to undertake downweighting. Eigen-values are a measure of "species-turnover"

from end to end of each axis. Larger values therefore indicate greater, and usually more interpretable, changes in species composition.

CLASSIFICATION

Sites were classified by means of two-way indicator species analysis using the computer program TWINSpan (Hill, 1979b), which constructs ordered two-way tables of species and sites. At each level the data are divided into pairs of groups, the data within each group being re-ordered and further split at the next level. It is up to the investigator to decide at which level to accept an "end-group" that best describes a community or assemblage type. It has been argued (Wright, Moss, Armitage & Furse, 1984) that the division process should be stopped at a set level, thus forcing the investigator to accept 4, 8, 16, etc. community types. We have argued (Eyre, Ball & Foster, 1986) the need to take the division to the end-group that makes biological sense to the investigator. This introduces a measure of subjectivity into an otherwise objective process.

The divisive approach produces a hierarchy that can be represented by a dendrogram. The TWINSpan program also produces a key using "differential" species, i.e. those specially diagnostic of each division of the classification. This permits the identification of the appropriate end-group for site data not included in the original analysis. We prefer, as a first approximation, to use species frequency tables for this purpose. Clearly their other main use is to characterise the assemblage types.

SITE LISTINGS

The binary codes at the beginning of each end-group listing refer to the placing of end-groups in the TWINSpan classification. The number of sites in the original analysis is indicated together with additional sites used to test the system (e.g. "7 + 1" = seven sites in analysis plus one site later found to fit into the end-group). Such extra sites are indicated in the lists by lack of a reference number and by the use of italics.

DISCUSSION

The method proposed for the evaluation of sites using water beetle lists appears to be robust. It is only weak when very small numbers of species are encountered (see Foster, Spirit & Counsell, 1991 for an example) or when the original classification is based on badly compiled lists, i.e. either resulting from the combination of lists from widely different habitats or lacking coverage of one major group such as the palpicorns (Hydrophilidae and Hydraenidae). The main danger of the method is that very rare habitats might be force-fitted into larger groups; this can be avoided by use of methods to measure "typicalness" such as were employed for the data from north-east England. Also, such rare habitats are likely to have high species-quality scores. In fact it could be argued that species-quality scores alone would suffice to rate a site good, ordinary or poor. For the sites from southern Scotland a threshold value of 1.7-1.8 appears to divide the good sites from the rest in each

group. In other regions a different threshold may be appropriate or the threshold may differ from group to group. Some groups consist almost entirely of high quality sites, others of degraded habitats of little conservation value. The original concept was that it might be possible to obtain an objective listing of top quality sites within each habitat type. In practice the classification of habitats includes a management/pollution component as has been found with detailed analysis of data from the Wash drainage system (Foster et al., 1990).

The value of RDB and Notable listings is apparent from the consistent similarities in ranking by means of species-quality score or by presence of RDB/Notable species. It could therefore be argued that RDB/Notable species alone will serve to evaluate a site. The value of such an approach depends mainly on the correct choice of RDB/Notable species in the first place. This is possible for RDB species without reference to an extensive modern recording scheme but is unlikely to be the case for Notable species (Foster, 1991). The use of well selected RDB/Notable species is an acceptable simplification of procedure so long as the sites under evaluation support the rarer species.

The greatest danger of using the Nationally Notable listings is that those responsible for scheduling, etc. may fail to appreciate that there could be a huge difference between a site that has been found to support, for example, five notable species - a spider, a fly, a beetle, a bug and a snail - and one that as a result of a specialist survey is found to support five notable spiders, or five notable water beetles, etc. The importance of examining one or two groups in detail, as opposed to a broad and ill-defined range of invertebrates, cannot be over-emphasised.

One feature that became apparent during the evaluation was that there was in practice no reason why Nationally Notable List A species should not be accorded the same status as RDB 3 species. The definition of Nationally Scarce species (found in between 16 and 100 ten km squares - Nature Conservancy Council, 1989) indicates that this is accepted procedure for SSSI selection, RDB species being, almost by default, those occurring in 15 or less ten km squares.

The usefulness of the full site list approach to wetland site evaluation can be tested by anyone with lists of adult water beetle species from the regions so far reviewed. A species-quality score is calculated from the information such as is provided in Appendix 1. The group into which the list best fits can be estimated (again we must emphasise as a first approximation) using the appropriate species frequency table and by reference to the description of the group. It is then possible to place the site at its appropriate level within the ranked site lists.

We welcome comments, good or bad, on the applicability of the method.

ACKNOWLEDGEMENTS

We are grateful to Mrs. Margaret Palmer and to Dr. Stuart Ball, of the then Nature Conservancy Council, for arranging financial support for this analysis. It is not feasible to name everyone who contributed to the data analysed but the following listings for selected regions cover most of the people involved.

The following contributed records for Lincolnshire and northern East Anglia:- Dr R.B. Angus, Dr R. Baker, D.T. Bilton, J.H. Bratton, M.A. Collier, A.B. Drane, R.J. Driscoll, A.P. Foster, A.P. Fowles, Dr Laurie Friday, A. Garside, P. Hodge, Dr R.S. Key, P. Kirby, S. Lambert, Prof. D. Larson, D. Lee, D.A. Lott, Dr I.F.G. McLean, R.S. Merritt, Prof. J.A. Owen, Mrs. Margaret A. Palmer, M. Sinclair, Dr A.C. Warne, Dr R.C. Welch, and G.F. Wildridge.

Major contributors to the Midlands data file were:- K.G. Allenby, R.H. Dunn, D.G. Holland, R. S. Merritt, Dr. I.D. Wallace and Dr. A.C. Warne.

The following provided records for Wales:- Dr. K.N.A. Alexander, Dr. R.B. Angus, D.T. Bilton, D. Boyce, R.H. Dunn, A.P. Foster, A.P. Fowles, N.A. Holford, Dr. P. Holmes, R.A. Jenkins, Dr. R.S. Key, D.A. Lott, Dr. M.L. Luff, R.S. Merritt, Dr. S.J. Ormerod, Mrs. M. Palmer, C. Reid and B. van Vondel.

It is not possible to acknowledge all of those landowners who gave permission for access to sites. The following examples must suffice. Permission was willingly given for access to Catfield Fen, East Walton Common and the military training area at Stanford. Conservation bodies allowing access to their reserves were the Cambridgeshire and Isle of Ely Naturalists' Trust, the Bedfordshire & Huntingdonshire Naturalists' Trust, the Lincolnshire and South Humberside Trust for Nature Conservation, the National Trust, the Nature Conservancy Council and the Norfolk Naturalists' Trust. Dr A.G. Irwin, of the Castle Museum, Norwich, proved specially helpful in arranging access to Norfolk sites. In Wales Mr. A.P. Fowles and Mr. I.K. Morgan, among others, helped by providing information on sites and access.

We would also like to acknowledge the financial support provided by the Environmental Research Fund for the surveys around the Wash undertaken in 1986 and 1987.

REFERENCES

- ALLEN, A.A., 1935. Some recent captures of Coleoptera. *Entomologist's monthly Magazine* 71 64-67.
- ALLEN, A.A., 1956. Two apparently new county records of Dytiscidae (Col.). *Entomologist's monthly Magazine* 92 278.
- ANGUS, R.B., 1965. Some new records of Coleoptera from Pembrokeshire. *Entomologist's monthly Magazine* 101 13.
- ANGUS, R.B., 1977. A re-evaluation of the taxonomy and distribution of some European species of *Hydrochus* Leach (Col., Hydrophilidae). *Entomologist's monthly Magazine* 112 (1976) 177-201.
- ARMITAGE, P., 1982. The invertebrates of some freshwater habitats on the Axmouth-Lyme Regis National Nature Reserve. *Proceedings of the Dorset Natural History & Archaeological Society* 104, 149-154.
- BAKER, R., DRISCOLL, R.J. & LAMBLEY, P., 1978. The River Wensum (1). *Transactions of the Norfolk & Norwich Naturalists' Society* 24 197-219.
- BALFOUR-BROWNE, F., 1958. *British Water Beetles* 3, Ray Society.
- BALFOUR-BROWNE, J., 1942. The aquatic Coleoptera (including Hydrophilidae, Sphaeridiinae) of North Wales. *Entomologist's monthly Magazine* 78 273-280.
- BALFOUR-BROWNE, J., 1947. On the aquatic Coleoptera of Pembrokeshire. *Entomologist's monthly Magazine* 83 18-19.
- BALL, S.G., 1986. Terrestrial and freshwater invertebrates with Red Data Book, Notable or Habitat Indicator status. *Invertebrate Site Register Report* 86, Nature Conservancy Council, 171 pp.
- BEEBEE, T.J.C., 1987. Eutrophication of heathland pools at a site in Southern England: causes and effects, with particular reference to the Amphibia. *Biological Conservation* 42, 39-52.
- TER BRAAK, C.J.F., 1986. Canonical correspondence analysis: a new eigenvector technique for multivariate direct gradient analysis. *Ecology* 67, 1167-1179.
- BILTON, D.T., 1987. Some aquatic Coleoptera from Lincolnshire. *Entomologist's Gazette* 38 217-223.
- BRIGGS, J.D. (Ed.), 1988. *Montgomery Canal Ecological Survey*. Internal Report to British Waterways Board.
- CARR, R., 1985. Aquatic Coleoptera from Longrope Wood, East Kent, with further records of *Limnebius crinifer* Rey (Hydraenidae). *Entomologist's monthly Magazine* 121, 213-214.
- CARR, R., 1987. A classification and evaluation of water beetle habitats in Kent. Unpublished report to Nature Conservancy Council, 16 pp.

DAVIS, J.A., ROLLS, S.W. & BALLA, S.A., 1987. The role of the Odonata and aquatic Coleoptera as indicators of environmental quality in wetlands. In: Mayer, J.D. (Ed.) *The Role of Invertebrates in Conservation and Biological Survey*, Western Australian Department of Conservation and Land Management Report, 31-42.

DILLWYN, L.W., 1829. *Memoranda relating to Coleopterous Insects found in the neighbourhood of Swansea*. Unpublished MS.

EYRE, M.D., BALL, S.G. & FOSTER, G.N., 1986. An initial classification of the habitats of aquatic Coleoptera in north-east England. *Journal of Applied Ecology* 23, 841-852.

FOSTER, G.N., 1991. Conserving insects of aquatic and wetland habitats, with special reference to beetles. Chapter 10 in: Collins, N.M. & Thomas, J. (eds) *Conservation of Insects and Habitats*. Royal Entomological Society Symposium, 237-262 (in press).

FOSTER, G.N. & BILTON, D.T., 1985a. *Water beetles in Wales in September 1985*. Report to Nature Conservancy Council.

FOSTER, G.N. & BILTON, D.T., 1985b. *A survey of the aquatic Coleoptera of the Malltraeth Marshes, Anglesey*. Report to Nature Conservancy Council.

FOSTER, G.N., FOSTER, A.P., EYRE, M.D. & BILTON, D.T. 1990. Classification of water beetle assemblages in arable fenland and ranking of sites in relation to conservation value. *Freshwater Biology* 22 343-354.

FOSTER, G.N., SPIRIT, M.G. & COUNSELL, D., 1991. A survey of water beetles in the Western Highlands and on Mull. *Glasgow Naturalist* 22 21-29.

HILL, M.O., 1979a. DECORANA - A FORTAN program for detrended correspondence analysis and reciprocal averaging. Ecology and Systematics, Cornell University, Ithaca, New York.

HILL, M.O., 1979b. TWINSpan - A FORTAN program for arranging multivariate data in an ordered two-way table by classification of the individuals and attributes. Ecology and Systematics, Cornell University, Ithaca, New York.

JONES, J.R.E., 1943. The fauna of the River Teifi, West Wales. *Journal of Animal Ecology* 12 115-123.

JONES, J.R.E., 1948. The fauna of four streams in the 'Black Mountain' district of South Wales. *Journal of Animal Ecology* 17 51-65.

JONES, J.R.E., 1949. An ecological study of the River Rheidol, North Cardiganshire, Wales. *Journal of Animal Ecology* 18 67-88.

JONES, J.R.E., 1949. A further ecological study of calcareous streams in the Black Mountain district of South Wales. *Journal of Animal Ecology* 18 142-159.

- KENKEL, N.C. & ORLOCI, L., 1986. Applying metric and nonmetric multidimensional scaling to ecological studies. *Ecology* 67, 919-928.
- LAMONT, F., 1986. A survey of the invertebrate fauna of Slapton Ley. Unpublished Third Year Project, Chelsea College, 55 pp.
- LAURIE, E.M.O., 1942. The fauna of an upland pond and its inflowing stream at Ystumtuen, North Cardiganshire, Wales. *Journal of Animal Ecology* 11 165-181.
- LAURIE, R.D. & JONES, J.R.E., 1938. The faunistic recovery of a lead-polluted river in North Cardiganshire, Wales. *Journal of Animal Ecology* 7 272-289.
- MORGAN, I.K., 1988. A summary of interesting beetle records from Carmarthenshire in 1987. *Dyfed Invertebrate Group Newsletter* 9, 14-16.
- NATURE CONSERVANCY COUNCIL, 1989. *Guidelines for Selection of Biological SSSIs*. Nature Conservancy Council, Peterborough.
- ORMEROD, S.J., 1985. *Stenelmis canaliculata* (Gyllenhal 1808) (Col., Elminthidae) new to Wales. *Entomologist's monthly Magazine* 121 54.
- PALMER, M., 1974. The ecology of the invertebrate community of Borough Fen Decoy pond. *Wildfowl* 25 143-147.
- PALMER, M., 1981. Relationship between species richness of macrophytes and insects in some water bodies in the Norfolk Breckland. *Entomologist's monthly Magazine* 117 35-45.
- PEARCE, E.J., 1937. The occurrence in England and Wales of *Haliphus heydeni* Wehncke. *Entomologist's monthly Magazine* 73 193.
- PEARCE, E.J., 1948. Additional records of Coleoptera, Orthoptera and Hymenoptera for or within the South Wales area. *Entomologist's monthly Magazine* 84 86-87.
- PETERKEN, G.F. & WELCH, R.C. (Eds), 1975. Bedford Purlieus: its history, ecology and management. *Monks Wood Symposium* 7, Institute of Terrestrial Ecology.
- POPE, R.D. (Ed.), 1977. Part 3: Coleoptera and Strepsiptera. A check list of British insects. *Handbooks for the identification of British Insects* 11, 105 pp.
- PRICE, A., 1959a. The Hydradephaga of the Kidwelly district of Carmarthenshire an interim report. *Nature in Wales* 5 843-849.
- PRICE, A., 1959b. As A.P. in *Nature in Wales* 5 861.
- PRICE, A., 1961. Exhibits. *Proceedings of the South London entomological and natural History Society* 1961 46-47.
- PRICE, A., 1962. *Dytiscus marginalis* L. (Col., Dytiscidae) in copulation under ice. *Entomologist's monthly Magazine* 98 48.
- SAGE, B.L., 1977. The Coleoptera of Skomer Island, Pembrokeshire, and their ecology. *Nature in Wales* 15 184-208.

SHIRT, D.B. (Ed.), 1987. *British Red Data Books: Insects 2*.
Insects. Nature Conservancy Council, 402 pp.

TOMLIN, J.R. le B., 1919. New localities for *Hydrovatus clypealis*
Sharp. *Entomologist's monthly Mag.* 55 159.

TOMLIN, J.R. le B., 1933. Additions to the Coleoptera of
Glamorgan. *Transactions of the Cardiff Naturalists' Society* 66
87-102.

WALLACE, I.D., 1979. *Bidessus minutissimus* (Germar) in North
Wales. *Balfour-Browne Club Newsletter* 13 8.

WARNE, A.C., 1976. *The Coleoptera of fens on Anglesey and the*
Lleyn Peninsula with appendices on Orthoptera and aquatic
Hemiptera. Report to Nature Conservancy Council.

WRIGHT, J.F., MOSS, D., ARMITAGE, P.D. & FURSE, M.T., 1984. A
preliminary classification of running-water sites in Great
Britain based on macro-invertebrate species and the prediction of
community type using environmental data. *Freshwater Biology* 14,
221-256.

Southern Scotland

This area included the recording vice-counties of Dumfriesshire, Kirkcudbrightshire (the Stewartry), Wigtownshire, Peeblesshire, Selkirkshire, Roxburghshire and Berwickshire (72-74, 78-81). Administratively the area now constitutes the Dumfries & Galloway and Borders Regions. Records were derived from 193 sites.

Red Data Book Species

Seven of the 143 species recorded:

Category 2 - *Hydroporus rufifrons*, *Donacia obscura*;

Category 3 - *Bidessus minutissimus*, *Hydroporus elongatulus*, *H. glabriusculus*, *Hydrochus brevis* s.s.

Ordination

One extremity of axis 1 of DECORANA was occupied by species associated with riverine habitats. Without downweighting the axis ran to brackish pools but with downweighting it ran to upland flushes and bogs. Downweighting had no effect on axis 2 (upland flushes to fens) or axis 3 (open acid water to brackish water).

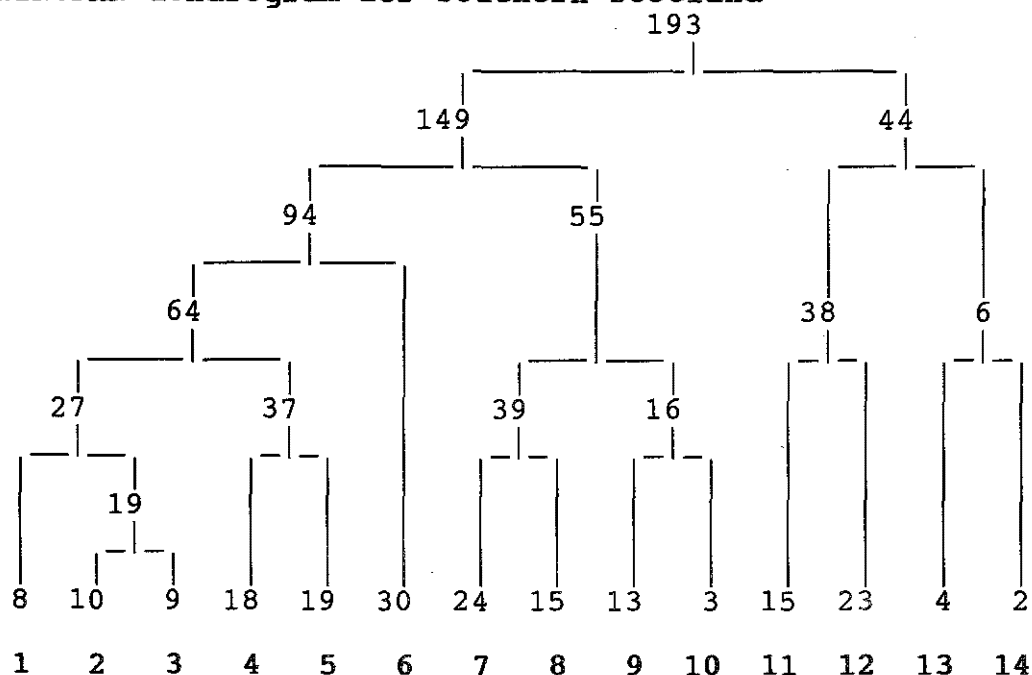
Eigen-values for DECORANA

Axis 1	Axis 2	Axis 3	Axis 4
0.423	0.226	0.191	0.128

Classification

Fourteen end-groups were recognised, most split at level 5, one at level 6. The major subdivision at level 1 was clearly associated with water flow but the river/stream subdivision included the community of wave-washed lake shores. The highest quality sites of the still water subdivision were divided into two groups of fen sites.

TWINSPAN dendrogram for Southern Scotland



Species frequency table for Southern Scotland

This shows the frequencies of species in end-groups (D = 21-40%, C = 41-60%, B = 61-80%, A = 81-100%). Species order is given as in TWINSpan. Entries in lower case indicate habitat groups with less than five sites.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>Porhydrus lineatus</i>	-	-	-	-	-	-	D	-	-	-	-	-	-	-
<i>Hydroporus tessellatus</i>	-	-	-	-	-	-	-	-	-	a	-	-	-	-
<i>Agabus conspersus</i>	-	-	-	-	-	-	-	-	-	d	-	-	-	-
<i>Ilybius ater</i>	-	-	-	-	-	-	B	-	D	-	-	-	-	-
<i>Helophorus fulgidicollis</i>	-	-	-	-	-	-	-	-	-	b	-	-	-	-
<i>Ochthebius auriculatus</i>	-	-	-	-	-	-	-	-	-	d	-	-	-	-
<i>Ochthebius marinus</i>	-	-	-	-	-	-	-	-	-	b	-	-	-	-
<i>Agabus nebulosus</i>	B	-	-	-	-	-	D	-	D	d	-	-	-	-
<i>Colymbetes fuscus</i>	-	-	-	-	-	D	B	-	B	-	-	-	-	-
<i>Gyrinus caspius</i>	-	-	-	-	-	-	D	-	-	-	-	-	-	-
<i>Dytiscus semisulcatus</i>	-	-	-	-	-	-	D	-	-	-	-	-	-	-
<i>Hygrotus inaequalis</i>	-	-	-	-	-	-	B	D	A	-	-	-	-	-
<i>Coelambus impresso.</i>	-	-	-	-	-	-	D	-	D	d	-	-	-	-
<i>Laccobius minutus</i>	-	-	-	-	-	-	D	D	D	d	-	-	-	-
<i>Ochthebius minimus</i>	-	-	-	-	-	-	-	-	C	-	-	-	-	-
<i>Rhantus exsoletus</i>	D	C	-	-	-	D	A	-	-	-	-	-	d	-
<i>Laccobius bipunctatus</i>	-	-	-	-	-	C	B	D	D	d	-	-	-	-
<i>Hydroporus melanarius</i>	-	C	C	-	D	-	-	-	-	-	-	-	-	-
<i>Hydroporus morio</i>	-	-	C	-	-	-	-	-	-	-	-	-	-	-
<i>Hydroporus gyllenhalii</i>	D	A	A	-	C	B	D	D	-	-	-	-	d	-
<i>Hydroporus obscurus</i>	-	C	B	-	-	D	-	-	-	-	-	-	-	-
<i>Agabus congener</i>	-	-	C	-	-	B	-	-	-	-	-	-	-	-
<i>Enochrus fuscipennis</i>	-	-	-	-	-	D	-	-	-	-	-	-	-	-
<i>Hydroporus glabriusculus</i>	-	-	-	-	-	D	-	-	-	-	-	-	-	-
<i>Hydroporus umbrosus</i>	C	-	C	-	D	A	B	-	D	-	-	-	-	-
<i>Laccornis oblongus</i>	-	-	-	-	-	D	-	-	-	-	-	-	-	-
<i>Agabus affinis</i>	-	D	D	-	C	A	C	-	D	-	-	-	d	-
<i>Rhantus suturellus</i>	-	-	D	-	-	D	D	-	-	-	-	-	-	-
<i>Hydroporus angustatus</i>	-	-	-	-	-	B	C	-	C	-	-	-	-	-
<i>Agabus unguicularis</i>	-	-	-	-	-	D	C	-	-	-	-	-	-	-
<i>Coelostoma orbiculare</i>	-	-	-	-	-	C	D	-	D	-	-	-	-	-
<i>Enochrus coarctatus</i>	D	-	-	-	-	D	D	-	-	-	-	-	-	-
<i>Ochthebius dilatatus</i>	-	-	-	-	-	-	-	-	-	d	-	-	-	-
<i>Hydroporus erythro.</i>	B	B	D	D	C	A	A	D	C	-	-	-	d	-
<i>Hydroporus striola</i>	B	-	D	D	D	B	B	-	B	-	-	-	-	-
<i>Hydrobius fuscipes</i>	D	B	C	C	C	B	A	D	B	b	-	-	-	-
<i>Hydroporus incognitus</i>	D	C	-	B	D	C	C	D	D	-	-	-	-	-
<i>Hydroporus planus</i>	C	-	-	-	-	D	D	-	B	a	-	-	-	-
<i>Agabus sturmii</i>	D	B	C	C	D	B	A	C	B	-	-	-	-	-
<i>Dytiscus marginalis</i>	-	D	-	-	-	D	D	-	-	-	-	-	-	-
<i>Helophorus grandis</i>	-	-	D	D	C	C	C	D	C	b	D	-	-	-
<i>Anacaena lutescens</i>	D	-	-	-	D	A	B	-	C	-	-	-	-	-
<i>Chaetarthria seminulum</i>	-	-	-	-	-	D	-	-	D	-	-	-	-	-
<i>Hydroporus memnonius</i>	C	-	-	D	A	B	C	-	D	-	D	-	-	-
<i>Hydroporus tristis</i>	D	C	C	-	D	C	-	-	-	-	-	-	-	-
<i>Agabus arcticus</i>	-	C	D	-	-	-	-	-	-	-	-	-	-	-
<i>Agabus melanocornis</i>	D	-	C	-	-	-	D	-	-	-	-	-	-	c
<i>Hydroporus pubescens</i>	A	A	A	B	C	B	B	D	C	b	C	D	-	C

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Hydroporus nigrita	D	B	C	C	B	C	C	-	D	-	-	D	-	-
Hydroporus obsoletus	-	-	-	-	-	-	-	-	-	-	-	-	d	-
Agabus paludosus	-	-	D	D	D	D	D	-	-	-	-	-	-	-
Hydroporus discretus	C	-	D	-	D	-	D	-	-	-	-	D	-	-
Limnebius truncatellus	D	D	D	A	B	A	A	C	B	-	A	B	d	c
Agabus bipustulatus	A	A	A	A	B	A	A	B	B	d	B	C	d	-
Helophorus flavipes	C	B	B	C	C	B	A	C	-	d	B	C	-	-
Anacaena globulus	C	A	B	B	A	B	B	C	B	-	C	B	d	-
Hydraena britteni	-	-	-	-	C	C	D	-	-	-	C	-	-	-
Hydroporus palustris	C	B	-	C	C	A	A	A	A	-	C	-	a	c
Gyrinus substriatus	C	B	D	-	-	-	D	C	-	-	D	-	d	-
Helophorus aequalis	D	-	C	-	D	C	C	D	D	a	D	D	-	-
Helophorus obscurus	-	-	-	-	C	-	D	-	D	d	D	-	-	c
Ilybius fuliginosus	C	C	-	D	-	D	B	A	B	d	B	-	c	-
Helophorus minutus	-	-	-	-	-	-	D	-	C	b	D	-	-	c
Haliphus ruficollis	-	-	-	-	-	C	A	B	D	d	D	-	c	-
Haliphus flavicollis	-	-	-	-	-	-	-	D	-	-	-	-	-	-
Haliphus fulvus	-	-	-	-	-	-	B	C	-	-	-	-	c	-
Haliphus lineolatus	-	-	-	-	-	-	C	-	-	-	-	-	d	-
Haliphus obliquus	-	-	-	-	-	-	D	-	-	-	-	-	d	-
Graptodytes pictus	-	-	-	-	-	-	-	-	-	-	-	-	-	a
Potamonectes assimilis	-	-	-	-	-	-	D	D	-	-	-	-	d	c
Haliphus confinis	-	-	-	-	-	-	D	-	-	-	-	-	-	-
Hyphydrus ovatus	-	-	-	-	-	-	D	-	-	-	-	-	-	a
Hygrotus quinquelineatus	-	-	-	-	-	-	-	-	-	-	-	-	c	-
Gyrinus aeratus	-	-	-	-	-	-	-	-	-	-	-	-	d	-
Agabus guttatus	-	-	D	-	D	-	-	-	-	-	-	D	c	-
Potamonectes elegans	-	-	-	-	-	-	-	D	-	-	B	C	c	c
Oreodytes davisii	-	-	-	-	-	-	-	-	-	-	-	D	-	-
Oreodytes sanmarki	-	-	-	-	-	-	-	-	-	-	B	B	c	c
Platambus maculatus	-	-	-	-	-	-	-	D	-	-	B	C	b	a
Brychius elevatus	-	-	-	-	-	-	-	-	-	-	D	-	-	-
Oreodytes septentrion.	-	-	-	-	-	-	-	-	-	-	B	D	d	a
Helophorus arvernicus	-	-	-	-	-	-	-	-	-	-	B	D	-	-
Laccobius striatulus	-	-	-	-	-	-	-	-	-	-	C	-	-	-
Ochthebius exsculptus	-	-	-	-	-	-	-	-	-	-	D	-	-	-
Hydraena gracilis	-	-	-	-	-	-	-	-	-	-	C	D	-	-
Hydraea minutissima	-	-	-	-	-	-	-	-	-	-	D	-	-	-
Elmis aenea	-	-	-	-	-	-	-	-	-	-	B	D	-	-
Esolus parallelepipedus	-	-	-	-	-	-	-	-	-	-	B	-	-	-
Limnius volckmari	-	-	-	-	-	-	-	-	-	-	B	D	-	-
Orectochilus villosus	-	-	-	-	-	-	-	-	-	-	D	-	-	-
Dryops luridus	-	-	-	-	-	-	-	-	-	-	D	-	-	-
Oulimnius tuberculatus	-	-	-	-	-	-	-	-	-	-	C	-	-	-
Stictotarsus 12-pust.	-	-	-	-	-	-	-	D	-	-	C	-	c	c
Haliphus lineatocollis	D	D	-	D	-	-	D	C	-	-	B	C	d	-
Haliphus wehnckeii	-	-	-	-	-	-	D	C	-	-	D	-	d	-
Helophorus brevipalpis	C	D	D	D	D	A	A	B	A	a	A	B	d	-
Hydraena riparia	-	-	-	-	-	D	D	D	D	-	B	-	-	a

Groups and site scores for Southern Scotland

Group 1 00000 - 8 sites			SQS	NOS	WET	RDB	Na	Nb
163	NX	824894 Chapel Pond	2.1	21	45	0	0	2
20	NT	361142 Windylaw Loch	1.6	21	33	0	0	0
72	NT	527147 Ormiston	1.6	9	15	0	0	0
107	NX	096605 marsh near Stranraer	1.4	8	11	0	0	0
48	NT	403102 Broadlee Loch	1.3	17	22	0	0	0
110	NX	14-54- Torrs Warren bog	1.3	15	20	0	0	0
42	NT	464173 Woolaw Moss	1.3	11	14	0	0	0
94	NT	76-14- Kale Water A	1.1	9	10	0	0	0

These are ponds or lakes that tend to dry out to below the marginal vegetation line. The Chapel Pond is the only modern site known for *Agabus labiatus* in southern Scotland. This species is associated with ponds that dry out and with permanent, highly acid, ponds. The larvae have swimming hairs (subgenus *Eriglenus*) and hunt in open water. The adults are flightless and this species is thought to be an important relict species of fishless pools. The high score for the Chapel Pond owes as much to the occurrence of three other species local in Scotland, in particular *Porhydrus lineatus*. It is interesting to note that Torrs Warren is a site with an old record for *A. labiatus*.

Group 2 000010 - 10 + 1 sites			SQS	NOS	WET	RDB	Na	Nb
131	NX	469840 Long L. Dungeon	2.0	18	36	0	0	1
129	NX	472787 Loch Dee	1.9	18	35	0	0	2
140	NX	549735 Loch Gower	1.9	19	36	0	0	1
23	NT	342134 Kingside Loch	1.9	15	28	0	0	1
132	NX	47-83- Silver Flowe	1.8	23	42	0	0	3
154	NX	706786 Knowetops Lochs	1.8	34	61	0	0	2
	NX	345773 Creebank dam pond	1.6	18	29	0	0	1
7	NT	02-00- Lochanhead	1.6	25	40	0	0	0
157	NX	70-90- Stroanshalloch Loch	1.5	18	27	0	0	0
172	NX	960927 Forest of Ae	1.3	8	10	0	0	0
142	NX	527991 Lamford	1.1	16	18	0	0	0

These are mostly upland sites on peat, some being ancient lochs with exposed rock. An eleventh site not included in TWINSPAN is clearly of "average" quality within this group.

Group 3 000011 - 9 sites			SQS	NOS	WET	RDB	Na	Nb
130	NX	404827 Bennan lochans	2.1	18	38	0	0	2
187	NY	43-82- Tinnisburn Forest	1.6	17	27	0	1	0
164	NX	806993 Waste Pot	1.6	20	31	0	0	0
104	NT	854687 Coldingham Common	1.5	22	33	0	0	0
90	NT	67-49- Dogden Moss	1.4	13	18	0	0	0
106	NW	97-62- Green Burn Moss	1.4	9	13	0	0	0
83	NT	68-05- Catcleugh Shin	1.3	12	16	0	0	0
186	NY	41-87- Newcastleton	1.3	10	13	0	0	0
14	NT	190528 Whim Moss	1.3	9	12	0	0	0

These are upland mires with open pools and fringing *Sphagnum* bog, mainly on deep peat. Some of these lochans have only a thin covering of peat over granite but appear to be separated from Group 2 by virtue of the deep peat community. Coldingham Common and the small Waste Pot site score similarly and are possibly more typical. *Acilius canaliculatus* (Na) occurred at the Tinnisburn Forest site but not in association with other rare species.

Group 4 00010 - 18 sites					SQS	NOS	WET	RDB	Na	Nb
108	NX	124352	Damnaglour		2.0	7	14	0	1	0
70	NT	557223	Kames N. Loch Moss		1.7	16	28	0	1	0
15b	NT	233188	Chapelhope Burn		1.6	14	22	0	0	1
116	NX	255688	Gall Moss of Dirneark		1.6	8	13	0	0	1
114	NX	170650	New Luce curling pond		1.5	8	12	0	0	1
113	NX	17-69-	Pultodie		1.4	16	23	0	0	1
178	NY	129653	Priestland Flow		1.4	16	22	0	0	0
120	NX	38-61-	Barraer		1.4	8	11	0	0	0
56	NT	465267	Hartwoodburn		1.4	7	10	0	0	0
30	NT	377372	Traquair		1.3	11	14	0	0	0
42	NT	464173	Woolaw Moss		1.3	11	14	0	0	0
102	NT	748628	Monynut Water		1.3	7	9	0	0	0
16	NT	27-14-	Midgehope		1.2	13	15	0	0	0
82	NT	516423	Threepwood Moss		1.2	12	14	0	0	0
27	NT	391117	Hoscote, Borthwick		1.2	10	12	0	0	0
87	NT	643262	Perch Pond		1.2	8	9	0	0	0
8	NT	055175	Tweedhopefoot		1.2	6	7	0	0	0
136	NX	580555	Anwoth dam		1.0	8	8	0	0	0

These are poor quality sites, mostly damponds or degraded fens and bogs, three (15b, 113, 116) of the latter retaining the relict species *Hydroporus longicornis* (Nb). Damnaglour and Kames North Loch Moss score highly largely on the basis of *Hydroporus obsoletus* (Na) and *Laccornis oblongus* (Na) respectively.

Group 5 00011 - 19 sites					SQS	NOS	WET	RDB	Na	Nb
138	NX	586602	Nether Rusko		2.3	12	28	1	0	0
135	NX	591588	Rusko oxbows		2.2	20	44	1	0	1
119	NX	38-62-	Bishop Burn moss		1.9	13	24	0	0	1
185	NY	356704	Solway Moss		1.8	10	18	0	0	1
105	NT	912687	St. Abbs dampond		1.7	17	28	0	0	0
98	NT	71-49-	Hule Moss		1.5	20	29	0	0	0
167	NX	985771	Fountainbleau		1.4	22	30	0	0	0
38	NT	449164	Harden Moss		1.3	28	37	0	0	1
152	NX	79-61-	Corra moss		1.3	20	26	0	0	0
65	NT	552099	Stonedge Hill		1.3	16	20	0	0	0
115	NX	16-70-	Glenwhilly Station		1.3	12	15	0	0	0
92	NT	697518	East of Westruther		1.3	8	10	0	0	0
19	NT	225444	Meldon-Eddleston		1.2	12	14	0	0	0
97	NT	78-2--	Linton Moss		1.2	11	13	0	0	0
158	NX	833654	Culloch Burn		1.2	6	7	0	0	0
84	NT	605197	Monks' Pond		1.1	14	15	0	0	0
141	NX	59-81-	Garroch		1.1	9	10	0	0	0
18	NT	224456	Stewarton		1.1	8	9	0	0	0
170	NX	910800	by Cluden Water		1.0	9	9	0	0	0

These are mainly stagnant water sites subject to drying out. The two highest scoring sites, which are adjacent oxbow systems, support *Hydroporus rufifrons* (RDB2). Of the rest, Harden Moss supported the largest number of species; this is an area of wet patches surrounding a "well-eye", which contained running water species such as *Hydraena gracilis* and *Elmis aenea*. The dampond at St. Abbs Head appears in this group because of the beetles found in flushes above the main pond's margin.

Group 6 001 - 30 + 1 sites				SQS	NOS	WET	RDB	Na	Nb
88	NT	674394	Lurgie Loch moss	3.7	35	130	3	1	2
73	NT	517293	Beanrigg Moss	3.0	33	100	2	1	1
61	NT	421235	Hutlerburn Loch	3.9	14	55	1	0	0
181	NY	109878	Perchall	3.0	39	115	1	2	5
66	NT	533123	Adderstonelee Moss	2.9	30	88	1	2	2
39	NT	49-19-	Groundstone Moss	2.9	31	89	1	1	2
49	NT	474247	Dunhog Moss	2.7	27	73	1	1	0
74	NT	506299	Batts Burn Moss	2.7	27	74	1	0	2
75	NT	517290	Blackpool Moss	2.7	25	67	1	0	2
11	NT	103418	Mount Bog	2.6	37	96	1	1	1
44	NT	458184	Blind Moss	2.6	35	91	1	0	3
41	NT	460172	Woolaw Loch moss	2.5	34	85	1	0	3
	NX	733478	Newlaw Moss	2.7	7	19	0	1	1
58	NT	460245	Brown Moor Heights	2.2	13	28	0	0	2
79	NT	548368	Gattonside Moss	2.0	27	54	0	1	3
151	NX	770478	Heart Moss	2.0	29	59	0	1	2
55	NT	497272	Whitmuir Hall Moss	2.0	21	41	0	1	1
51	NT	484266	Deepslaid Moss	1.9	35	67	0	1	3
34	NT	488177	Tandlaw Moss	1.8	29	53	0	1	1
127	NX	43-47-	High Blair, Sorbie	1.8	21	37	0	0	1
68	NT	516127	Newfield Moss	1.7	32	55	0	1	1
35	NT	421109	Wester Braxholme	1.7	46	77	0	0	2
89	NT	634425	Gordon Moss	1.6	40	64	0	1	1
53	NT	488256	Greenhill moss	1.6	24	39	0	1	1
188	NY	460837	Whisgills	1.6	22	35	0	0	0
25	NT	386147	Alemoor Loch	1.5	39	57	0	0	1
59	NT	458248	Ashkirk	1.5	14	21	0	0	1
63	NT	533007	Windshiel	1.5	24	35	0	0	0
171	NX	990874	Black Loch, Ae	1.5	15	22	0	0	0
95	NT	780547	The Hen Poo	1.4	15	21	0	0	1
145	NX	622777	Achie	1.4	14	20	0	0	1

These are with few exceptions natural and undisturbed sites. They are dominated by deep mesotrophic fen with small pools and rate highly because of species numbers and the presence of relict species such as *Hydroporus elongatulus*, *H. glabriusculus*, *Hydrochus brevis* and *Dryops anglicanus* (all RDB3), and *Laccornis oblongus*, *Agabus uliginosus* and *Acilius canaliculatus* (all Na). Many sites support several *Enochrus* species. Clearly this is a group in which a large number of sites is of national - or international - importance. About 16 of the sites are either part of NNR or are SSSI.

Group 7 0100 - 24 + 4 sites		SQS	NOS	WET	RDB	Na	Nb
77 NT	506293 Lang Moss	3.0	39	117	2	1	2
78 NT	50-29- Lindean Resr E end	3.0	38	114	2	1	1
	NT 071833 Upper Loch	2.9	43	125	1	1	5
43 NT	493154 Kippielaw Moss	2.9	25	73	1	0	2
50 NT	474247 Hare Moss	2.6	35	91	1	0	1
124 NX	37-71- Dow Lochs	2.3	31	72	1	0	1
147 NX	641781 Ken Bridge oxbows	2.3	28	65	1	0	1
137 NX	58-50- Carrick ponds	2.5	71	175	0	0	10
144 NX	676668 Woodhall Loch	2.5	57	140	0	0	8
	NX 863547 White Loch	2.4	17	41	0	0	2
177 NY	07-83- Upper & Mill Lochs	2.0	44	87	0	0	3
	NX 728707 Loch Lurkie	2.0	25	51	0	0	2
57 NT	498290 Lindean Resr W end	2.0	26	44	0	0	1
67 NT	540120 Birnie Loch	1.8	51	90	0	1	2
54 NT	483207 Sinton Mossend	1.8	34	62	0	1	1
47 NT	491187 Boghall Moss	1.8	25	46	0	1	1
76 NT	504285 Murder Moss	1.8	38	69	0	1	0
126 NX	46-35- Drummoral pond	1.8	24	44	0	0	2
165 NX	90-68- Loch Arthur	1.7	29	49	0	0	2
21 NT	351142 Goose Loch	1.7	17	29	0	0	2
52 NT	498277 Racecourse moss	1.6	22	36	0	0	2
46 NT	452190 Shielswood Loch	1.6	37	60	0	0	1
	NT 075834 Mill Loch	1.6	29	46	0	0	0
26 NT	382167 Hellmoor Loch	1.6	24	39	0	0	0
22 NT	353139 Crooked Loch	1.5	34	51	0	0	0
36 NT	433117 Branhholme Easter L.	1.5	17	25	0	0	0
31 NT	348371 Putt's Pool	1.4	26	36	0	0	0
24 NT	357156 Back Loch Marsh	1.3	23	29	0	0	0

This group is complementary to Group 6, comprising sites with mesotrophic or eutrophic fen but here influenced by the presence of large areas of open, permanent water. The first four sites listed all support *Hydroporus elongatulus* (RDB 3). Other RDB 3 species are *H. glabriusculus* and *Hydrochus brevis* (77, 78). *Donacia obscura* (124) and *Hydroporus rufifrons* (147) are RDB 2.

Lang Moss, also known as Nether Whitlaw Moss, appears to be the best site, followed by a fen (78) on the opposite side of the road in the edge of Lindean reservoir.

Four lists not in the original TWINSPAN are included in the table. Loch Lurkie is clearly an "average" site. Further survey work on the Lochmaben lochs revealed that *Hydroporus elongatulus* occurred in the Upper Loch, thus substantially upgrading it. Mill Loch was downgraded.

Loch Arthur (also known as Lotus Loch) appears to have been classified into this group because of under-representation. This site is a reedswamp over gravel with *Ilybius fenestratus*, *Gyrinus aeratus* and *Orectochilus villosus*, none of which is found in the other sites. It appears to be intermediate between Groups 7 and 8. White Loch would appear to belong to the same group as Loch Arthur.

Group 8 0101 - 15 sites					SQS	NOS	WET	RDB	Na	Nb
162	NX	84-71-	Milton Loch		2.6	16	41	0	0	3
118	NX	307545	Loch Hempton		2.1	17	35	0	0	3
166	NX	96-63-	Loch Kindar		1.9	30	56	0	1	0
155	NX	76-84-	Loch Urr		1.9	14	26	0	0	3
123	NX	359755	Clachaneasy		1.7	14	24	0	0	1
184	NY	243758	Eaglesfield		1.4	18	25	0	0	2
29	NT	375118	Girnwood dam		1.4	15	21	0	0	0
81	NT	510324	Cauldshiels Loch		1.4	7	10	0	0	0
17	NT	237207	St. Mary's Loch		1.3	15	20	0	0	0
175	NY	01-87-	Barony hatchery pond		1.2	21	26	0	0	1
99	NT	76-13-	Towford		1.2	33	40	0	0	0
15c	NT	233188	Riskinhope pools		1.2	20	23	0	0	0
69	NT	587178	Denholm pond		1.1	14	16	0	0	0
150	NX	618901	High Bridge of Ken		1.0	21	21	0	0	0
60	NT	405209	Akermoor Loch		1.0	8	8	0	0	0

These are lakes and ponds with bare substratum and poorly developed vegetation, usually *Carex rostrata*. Loch Kindar was the only site in the survey known to support *Gyrinus distinctus* (Na), a species that is characteristic of lowland "Atlantic" lakes. Milton Loch has a large range of such species (several *Haliphus* spp., *Hygrotus quinquelineatus*, *Hydroporus angustatus*, *Porhydrus lineatus*, *Ilybius fenestratus* and *Gyrinus marinus*). Loch Hempton, a loch with thin emergent vegetation over eroded peat, had another Atlantic feature, the presence of five species of gyrenid.

Group 9 0110 - 13 sites					SQS	NOS	WET	RDB	Na	Nb
176	NY	083812	Castle Loch		2.0	17	34	0	0	2
134	NX	596487	Kirkandrews		1.9	35	67	0	0	3
85	NT	614262	Woodhead Moss		1.8	23	42	0	1	1
173	NY	033651	The Flooders		1.8	31	56	0	0	4
86	NT	684269	Ploughlands Pond		1.7	24	40	0	0	0
156	NX	792909	Moniaive		1.5	10	15	0	0	0
37	NT	491122	Hawick Moor		1.4	32	45	0	0	2
101	NT	76-35-	Whitmuirhaugh		1.3	21	27	0	0	0
109	NX	114394	Port Logan		1.3	15	19	0	0	0
179	NY	179783	"Flat Top"		1.3	15	19	0	0	0
93	NT	744198	Whitton Loch		1.1	16	17	0	0	0
80	NT	539252	Lilliesleaf Moss		1.1	13	14	0	0	0
161	NX	82-75-	Glen Burn dam		1.0	8	8	0	0	0

These are a mixture of man-made ponds on mud and lochs subject to enrichment. Non-brackish coastal pools come into this category and the pool above Kirkandrews Merse contains almost the complete range of "coastal refugia" species relict in the Solway area (including *Graptodytes granularis* and *Enochrus testaceus*). Degraded sites that would otherwise fit in Group 6 (e.g. Woodhead Moss, a site retaining *Laccornis oblongus* (Na)) and Group 8 (e.g. Castle Loch) scarcely justify ranking.

Group 10 0111 - 3 sites					SQS	NOS	WET	RDB	Na	Nb
174	NY	056652	Eastpark pools		2.1	16	33	0	0	3
128	NX	467595	Barholm Merse		1.9	12	23	0	0	3
117	NX	37-39-	Cairndoon		1.4	9	13	0	0	0

There has been insufficient sampling of merseland pools on the Scottish side of the Solway. The Eastpark pools are scrapes created for the natterjack toad. There are no other modern sites known for *Agabus conspersus* (Nb) in Scotland.

Group 11 100 - 15 sites		SQS	NOS	WET	RDB	Na	Nb
169	NX 97-77- R Nith, Dumfries	2.1	50	103	1	1	2
100	NT 774576 Whiteadder Water	2.4	7	17	0	1	2
33	NT 439073 Northhouse Burn	1.8	34	61	0	1	7
180	NY 104855 R Annan	1.8	27	48	0	1	4
160	NX 837799 Old Water B	1.8	29	51	0	1	2
5	NS 809076 R Nith, Mennock	1.7	29	49	0	0	4
28	NT 325253 Cutcarwood	1.7	23	39	0	0	2
15a	NT 233188 Chapelhope Burn	1.6	23	36	0	0	2
121	NX 334695 R Bladnoch, Glasloch	1.6	15	25	0	0	2
71	NT 56-18- Teviot Water	1.5	29	44	0	0	2
182	NY 18-93- Dryfe Water	1.5	27	41	0	1	2
111	NX 183587 Water of Luce	1.5	24	36	0	0	2
96	NT 76-13- Kale Water B	1.5	21	31	0	0	0
9	NT 079293 Holms Water	1.3	23	30	0	0	1
159	NX 885796 Old Water A	1.3	8	10	0	0	0

These are the larger river sites, being separated from Group 12 by the presence of species occurring in large expanses of shallow water running over shingle (*Esolus parallelepipedus*), those living amongst marginal emergent vegetation (*Ilybius fuliginosus*) and those living on silt at the edge (*Laccobius striatulus*, *Hydraena riparia*).

The Nith at Dumfries is the only modern Scottish site for *Bidessus minutissimus* (RDB 2) and is now immediately adjacent to the bridge on the Dumfries bypass. The Old Water at Marglolly Bridge (160) scores almost identically to the River Nith at Mennock but is one of only two modern sites for *Deronectes latus* (Na) in the region.

Group 12 101 - 23 sites		SQS	NOS	WET	RDB	Na	Nb
189	NY 474828 Liddel Water	2.0	10	20	0	1	1
6	NS 903074 Lavern Burn	2.0	10	20	0	1	0
190	NY 501833 Kershope Burn	1.8	20	35	0	0	2
2	NS 71-06- Euchan Water	1.6	18	30	0	1	1
1	NS 546000 Water of Deugh	1.6	15	24	0	0	2
149	NX 640953 Water of Ken	1.5	13	20	0	0	2
168	NX 913798 Cluden River	1.5	10	15	0	0	1
62	NT 590070 Rule Water	1.5	6	9	0	0	0
133	NX 478833 Cooran Lane	1.4	18	26	0	0	1
143	NX 590922 Marbrack Burn	1.4	11	15	0	0	1
153	NX 78-74- Areeming Burn	1.4	9	13	0	0	0
112	NX 173647 New Luce	1.3	10	13	0	0	1
191	NY 52-85- Scotch Kershope	1.3	24	32	0	0	0
12	NT 134528 West Linton	1.3	8	10	0	0	0
64	NT 54-02- Robert's Linn Burn	1.2	14	17	0	0	1
3	NS 749186 Fingland	1.2	14	17	0	0	0
32	NT 339415 Clearburn Loch	1.2	9	11	0	0	0
103	NT 840276 Halter Burn	1.2	9	11	0	0	0
13	NT 127538 King Seat	1.1	11	12	0	0	0
139	NX 560700 Loch Fleet inflow	1.1	11	12	0	0	0
4	NS 748157 Glengap	1.1	8	9	0	0	0
91	NT 699501 Fangrist Burn trib.	1.1	7	8	0	0	0
183	NY 292673 River Kirtle	1.1	7	8	0	0	0

These are species-poor streams of which the best have *Agabus biguttatus* (6) or *Hydraena rufipes* (2, 189), the only Na species in the group. The Kershope Burn had the two Nb species most often recorded in this group, *Helophorus arvernicus* and *Laccobius atrocephalus*. Clearburn Loch appears in this group because of the presence of *Platambus maculatus*.

Group 13 110 - 4 sites				SQS	NOS	WET	RDB	Na	Nb
148	NX	693831	Loch Howie	2.3	10	23	0	0	2
146	NX	64-74	Loch Ken at Lochside	1.7	18	30	0	1	1
10	NT	17-16-	Loch Skene	1.2	6	7	0	0	0
45	NT	492115	Williestruther Resr	1.2	6	7	0	0	0

These lakes have been classified into the main running water division because of the presence of either *Oreodytes sanmarki* or *Platambus maculatus*. They have wave-washed shores with a poor fauna. The Loch Howie list includes a peat bog species and the Loch Ken site lies at the inflow of several streams and the sample contained several stream species, notably *Hydroporus obsoletus*.

This group is under-represented and might best be considered subordinate to Group 8.

Group 14 111 - 2 + 1 sites				SQS	NOS	WET	RDB	Na	Nb
	NX	386685	River Cree C	3.2	6	19	0	0	2
122	NX	394669	River Cree A	2.0	9	18	0	0	0
125	NX	37-71-	River Cree B	1.7	11	19	0	0	0

The two samples used in TWINSpan were obtained by different workers. *Hyphydrus ovatus*, *Graptodytes pictus*, *Oreodytes septentrionalis*, *Platambus maculatus* and *Hydraena riparia* were common to both samples. The Cree is a deep river with beds of vegetation including water lilies over silt. Part of the River Cree was classified by Holmes & Newbold (1984) into group C3i by virtue of a plant community associated with fine sediments in an uncharacteristically stable section of a river traversing an upland bog or fen. The water is peat-stained and is low in bases in nutrients but plants thrive because of substrate stability rather than nutrient enrichment. This perfectly describes the sections sampled for beetles. This type of habitat is scarce within Scotland.

A third sample was taken later (C). It was found to belong to the Cree group using the complete range of preferential and non-preferential species but it would have run to Group 13 on the basis of the presence or absence of *Hyphydrus ovatus*, the only species "offered" by the TWINSpan printout. It shared *Graptodytes pictus*, *Oreodytes septentrionalis* and *Hydraena riparia* with the other Cree samples and had in addition *Helophorus strigifrons* and *Laccobius atrocephalus*. This emphasises the danger of using the TWINSpan key uncritically.

North-East England

The area investigated was that of the recording vice-counties of Durham, South and North Northumberland (66-68), which have been administratively constituted as Northumberland, Durham, Tyne & Wear and part of Cleveland since 1974. Records were assembled for 550 sites but analysis was limited to the 383 sites with five or more species. The analysis presented here is based on all records acquired for each site, several being visited more than once. An earlier analysis (Eyre, Ball & Foster, 1986) produced similar results but was based on records acquired during the first visit to each site.

Red Data Book Species

Three of the 137 species recorded:

Category 2 - *Hydroporus rufifrons*, *H. scalesianus* (neither species included in TWINSPAN);

Category 3 - *Helophorus dorsalis*.

Ordination

The ordination of similar data for North-East England (differing in that species lists were those of the first visit only) have been discussed and illustrated by Eyre et al. (1986). Without downweighting of rare species, axis 1 was apparently related to acidity and axis 2 to conductivity. With downweighting, axis 2 appeared to be related to flow.

Eigen-values for DECORANA

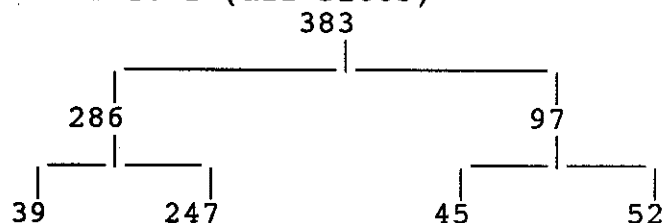
	Axis 1	Axis 2	Axis 3	Axis 4
All sites				
without downweighting	0.472	0.332	0.232	0.198
with downweighting	0.383	0.315	0.162	0.129
Without rivers group				
without downweighting	0.448	0.290	0.235	0.191
with downweighting	0.387	0.185	0.152	0.122

Classification

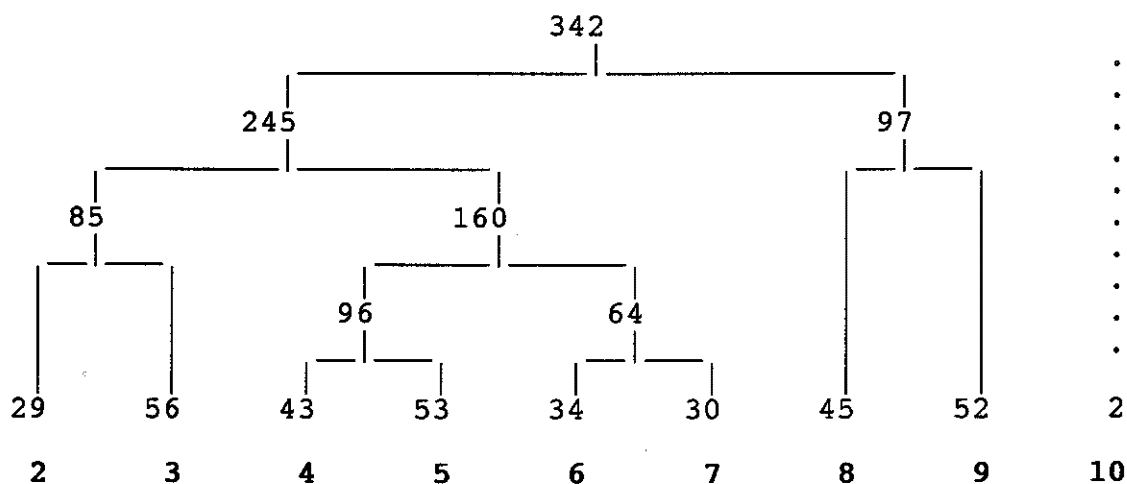
The initial classification resulted in river sites being grouped close together at level 2. This affected the classification of the remaining 344 sites. A further classification was carried out without the river sites. This gave a further eight groups. An analysis of "typicalness" (Eyre *et al.*, 1986) indicated that two saltmarsh sites in Group 3 could be separated as a tenth group.

TWINSPAN dendrograms for North-east England

ANALYSIS 1 (all sites)



ANALYSIS 2 (excluding Group 1)



Species frequency table for North-East England

This shows the frequencies of species in end-groups (D = 21-40%, C = 41-60%, B = 61-80%, A = 81-100%). Species order is given as in TWINSpan. Entries in lower case indicate habitat groups with less than five sites.

	1	2	3	4	5	6	7	8	9	10
Oreodytes davisii	D	-	-	-	-	-	-	-	-	-
Oreodytes sanmarki	B	-	-	-	-	-	-	-	-	-
Oreodytes septentrionalis	D	-	-	-	-	-	-	-	-	-
Platambus maculatus	C	-	-	-	-	-	-	-	-	-
Hydraena gracilis	D	-	-	-	-	-	-	-	-	-
Agabus nebulosus	-	-	C	-	-	-	-	-	-	-
Haliphus lineolatus	-	D	-	-	-	-	-	-	-	-
Potamonectes assimilis	-	D	-	-	-	-	-	-	-	-
Potamonectes elegans	D	D	-	-	-	-	-	-	-	-
Laccobius minutus	-	D	-	-	-	-	-	-	-	-
Haliphus immaculatus	-	D	-	-	-	-	-	-	-	-
Haliphus wehnckeii	-	D	-	-	-	-	-	-	-	-
Hygrotus inaequalis	-	B	B	-	-	-	-	-	-	c
Ilybius subaeneus	-	-	D	-	-	-	-	-	-	-
Haliphus ruficollis	-	C	B	-	D	-	-	-	-	-
Coelambus impressopunctatus	-	-	C	-	-	-	-	-	-	c
Hydroporus angustatus	-	-	D	-	-	-	-	-	-	-
Ilybius ater	-	-	C	-	-	-	-	-	-	-
Colymbetes fuscus	-	-	B	-	-	-	-	-	-	a
Ilybius fuliginosus	D	C	C	B	-	C	-	-	-	-
Laccobius bipunctatus	-	D	C	D	D	-	-	-	-	-
Anacaena limbata s.l.	-	-	-	D	D	-	-	-	-	-
Agabus didymus	-	-	-	-	-	D	-	-	-	-
Hydroporus tessellatus	-	-	-	-	-	D	D	-	-	-
Agabus paludosus	-	-	-	-	-	D	-	-	-	-
Helophorus grandis	-	-	D	-	B	C	C	-	-	-
Helophorus obscurus	-	-	-	-	D	-	C	-	-	-
Hydroporus striola	-	-	D	-	B	-	-	-	-	-
Haliphus lineatocollis	-	D	-	D	-	C	-	-	-	c
Hydroporus palustris	-	B	B	B	C	D	-	-	-	c
Hydroporus planus	-	D	B	D	B	D	A	-	-	a
Helophorus brevipalpis	B	C	C	C	C	B	B	-	-	a
Hydrobius fuscipes	-	C	A	B	B	-	C	-	-	a
Haliphus apicalis	-	-	-	-	-	-	-	-	-	a
Agabus conspersus	-	-	-	-	-	-	-	-	-	a
Ochthebius marinus	-	-	-	-	-	-	-	-	-	a
Dytiscus dimidiatus	-	-	-	-	-	-	-	-	-	c
Helophorus fulgidicollis	-	-	-	-	-	-	-	-	-	c
Helophorus griseus	-	-	-	-	-	-	-	-	-	c
Helophorus minutus	-	C	C	-	D	-	D	-	-	-
Hydroporus erythrocephalus	-	-	C	D	D	-	-	-	-	-
Hydroporus umbrosus	-	-	D	C	D	-	-	D	-	-
Agabus sturmii	-	C	B	C	C	-	-	D	-	c
Gyrinus substriatus	-	D	-	D	-	-	-	-	-	-
Helophorus aequalis	-	-	C	D	C	D	C	-	D	a
Limnebius truncatellus	C	D	D	B	D	D	D	-	C	-
Hydroporus incognitus	-	-	-	C	C	-	-	D	D	-
Agabus bipustulatus	-	D	A	C	A	C	B	A	B	-
Hydroporus memnonius	-	-	-	D	D	-	C	-	D	-
Anacaena globulus	C	-	-	B	C	B	C	C	B	-
Hydroporus nigrita	-	-	-	-	D	-	-	-	B	-
Hydroporus pubescens	-	-	C	C	C	-	D	A	C	c

	1	2	3	4	5	6	7	8	9	10
Helophorus flavipes	D	-	-	C	D	D	-	B	A	-
Hydroporus gyllenhalii	-	-	-	D	-	-	-	A	D	-
Hydroporus obscurus	-	-	-	-	-	-	-	D	-	-
Hydroporus tristis	-	-	-	-	-	-	-	B	-	-
Agabus arcticus	-	-	-	-	-	-	-	D	-	-
Hydroporus melanarius	-	-	-	-	-	-	-	C	D	-
Hydroporus morio	-	-	-	-	-	-	-	C	-	-
Agabus congener	-	-	-	-	-	-	-	D	-	-
Agabus guttatus	-	-	-	-	-	-	-	-	C	-

Groups and site scores for North-East England

Group	1	00	Analysis	1 - 39 sites	SQS	NOS	WET	RDB	Na	Nb
122	NY	798624	River	Allen	3.8	5	19	0	0	1
123	NY	798640	River	Allen	2.8	5	14	0	0	1
214	NZ	054598	Stocksfield	Burn	2.6	5	13	0	0	0
36	NT	997308	below	Doddington Bridge	2.4	10	24	0	1	2
110	NY	702483	Gilderdale	Burn	2.4	5	12	0	0	0
115	NY	774554	Carrs	Burn	2.4	5	12	0	0	0
380	NY	683748	Lampert		2.3	14	32	0	2	3
382	NY	635694	River	Irthing Gorge	2.2	18	40	0	2	3
384	NU	062173	River	Breamish	2.2	5	11	0	0	2
218	NZ	055600	Stocksfield	Burn	2.1	7	15	0	0	0
171	NY	90-28-	Low	Force	2.0	10	20	0	0	0
240	NZ	17-46-	Burnhopeside		1.9	8	15	0	0	1
159	NY	806714	Folly	Lake	1.9	7	13	0	0	0
381	NU	120137	Abberwick		1.8	11	20	0	1	2
223	NZ	074661	Whittle	Burn	1.7	12	20	0	0	1
138	NY	773894	Tarset	Burn	1.7	11	19	0	0	0
9	NT	857117	Rowhope	Burn	1.7	6	10	0	0	1
12	NT	883326	Fleehope		1.7	6	10	0	0	1
333	NZ	217849	Catch	Burn	1.7	6	10	0	0	1
170	NY	889925	River	Rede	1.5	6	9	0	0	1
383	NT	998307	above	Doddington Bridge	1.5	6	9	0	0	1
251	NZ	183535	Kyo	Burn	1.5	6	9	0	0	1
8	NT	846114	Carshope		1.5	8	12	0	0	0
14	NT	899285	Hethpool		1.4	7	10	0	0	0
287	NZ	166767	Kirkley	Mill	1.3	7	9	0	0	0
20	NT	922059	River	Alwin	1.2	5	6	0	0	0
21	NT	922060	River	Alwin	1.2	5	6	0	0	0
72	NU	105197	Eglingham		1.2	5	6	0	0	0
202	NY	985997	River	Coquet	1.1	9	10	0	0	0
145	NY	84-30-	Widdybank	Fell	1.1	8	9	0	0	0
243	NZ	145563	Pont	Burn	1.1	8	9	0	0	0
76	NU	151155	Hulne	Park	1.1	7	8	0	0	0
189	NY	925727	Chollerton		1.1	7	8	0	0	0
225	NZ	017704	River	Pont	1.1	7	8	0	0	0
291	NZ	119850	River	Wansbeck	1.1	7	8	0	0	0
211	NZ	031511	Derwent	Bridge	1.0	7	7	0	0	0
43	NT	956526	Whiteadder	Water	1.0	6	6	0	0	0
227	NZ	041788	River	Blyth	1.0	6	6	0	0	0
215	NZ	093570	Hollings		1.0	5	5	0	0	0

No attempt was made to subdivide the river group. The high quality scores for the sites with few species owe to the presence of *Oreodytes davisii* (not Nationally Notable). The best of the species-rich sites are in the River Irthing, the Gorge having *Deronectes latus* (Na), *Ochthebius exsculptus* (Nb), *Hydraena pulchella* (Na), *Riolus cupreus* and *R. subviolaceus* (both Nb), and at Lampert having *Helophorus arvernensis* (Nb), *O. exsculptus*, *Hydraena pulchella* and *H. rufipes* (Na). The River Till below Doddington Bridge supports *Orectochilus villosus* (not Nationally Notable but rare in the region), *Georissus crenulatus* (Na), *H. arvernensis* and *Ochthebius bicolon* (Nb). *Hydroporus rufifrons* (RDB 2) was found in this area in October 1987 at NT 988316; although it occurred in a stream the habitat was almost certainly a neighbouring temporary marsh. The River Aln above Abberwick also had *G. crenulatus* and *O. bicolon* and was one of the few sites for *Hydraena minutissima* (Nb).

Group 2 000 Analysis 2 - 29 + 6 sites					SQS	NOS	WET	RDB	Na	Nb
132	NY	777700	Greenlee Lough		2.5	12	30	0	0	1
155	NY	804676	Grindon Lough		2.0	6	12	0	0	1
278	NZ	167633	Bewes Hills		1.9	17	32	0	0	1
326	NZ	237735	Wide Open		1.8	9	16	0	0	0
174	NY	947498	Newbiggin Hall		1.8	8	14	0	0	0
	NZ	40-38-	New Winning		1.8	6	11	0	0	0
96	NU	223315	Seahouses		1.7	18	30	0	0	1
233	NZ	073867	Angerton North Moor		1.7	6	10	0	0	0
88	NU	225172	Littlehoughton		1.6	19	30	0	0	3
42	NT	999420	Bowsden		1.6	14	23	0	0	2
364	NZ	318752	Holywell Pond		1.6	12	19	0	0	0
	NZ	29-45-	Brasside Pond		1.6	9	14	0	0	0
277	NZ	168634	Bewes Hills		1.5	28	42	0	0	1
	NZ	195623	Axwell Park		1.5	19	29	0	0	0
39	NT	972402	Brackenside		1.5	13	20	0	0	0
64	NU	035475	Cheswick		1.5	10	15	0	0	0
	NZ	33-57-	Barmston Pond		1.5	6	9	0	0	0
270	NZ	147658	The Reigh		1.4	23	33	0	0	2
61	NU	007467	Oxford		1.4	7	10	0	0	1
91	NU	242242	Rise Moor Lough		1.4	16	22	0	0	0
	NZ	164632	Ryton Willows 'Curling'		1.4	14	19	0	0	0
40	NT	974411	Woodside		1.4	11	15	0	0	0
358	NZ	369504	Warden Law		1.3	19	25	0	0	1
60	NU	004405	Lowick		1.3	9	12	0	0	0
283	NZ	194628	Shibdon Pond		1.3	9	12	0	0	0
65	NU	072425	Beal		1.3	8	10	0	0	0
	NZ	164633	Bewes Hills		1.2	19	22	0	0	0
89	NU	225193	Stamford		1.2	12	14	0	0	0
317	NZ	205764	Blagdon Park		1.2	9	11	0	0	0
32	NT	999257	Middleton Hall		1.2	6	7	0	0	0
368	NZ	302908	Lynemouth		1.1	7	8	0	0	0
13	NT	898286	Hethpool		1.0	11	11	0	0	0
41	NT	999419	Bowsden		1.0	9	9	0	0	0
116	NY	722620	Plenmeller Common		1.0	9	9	0	0	0
86	NU	278016	Radcliffe		1.0	6	6	0	0	0

These are permanent lakes or ponds with areas of bare substratum, the best two being natural loughs. Greenlee Lough supports *Coelambus novemlineatus*, Grindon Lough *Ilybius subaeneus* and Bewes Hills *Laccobius sinuatus*, all Nb species. *C. novemlineatus* is a relict species the range of which has declined this century; Greenlee Lough is the only known site in the north-east.

Group 3 001 Analysis 2 - 56 + 18 sites		SQS	NOS	WET	RDB	Na	Nb
NZ	311696 Hadrian Park	2.0	16	32	0	0	2
268 NZ	154649 Ryton Willows	1.7	32	54	0	0	2
289 NZ	195736 Prestwick Carr	1.6	36	56	0	0	2
343 NZ	268907 Linton Colliery	1.6	16	25	0	0	2
347 NZ	33-11- Neasham Clay Pits	1.6	23	36	0	0	0
NZ	128633 Tenter Hills	1.6	10	16	0	0	0
NZ	196633 Blaydon Gas Works	1.5	22	33	0	0	2
NZ	223554 Pockerley	1.5	15	23	0	0	2
300 NZ	26-29- Leasingthorne	1.5	23	35	0	0	1
260 NZ	126636 Tenter Hills	1.5	23	34	0	0	1
NZ	139652 Clara Vale	1.5	22	33	0	0	1
250 NZ	182534 East Kyo	1.5	18	27	0	0	1
275 NZ	152696 Callerton Common	1.5	15	22	0	0	1
363 NZ	307727 Backworth	1.5	8	12	0	0	1
NZ	195628 Shibdon Pond	1.5	19	28	0	0	0
NZ	025556 Ministeracres Park	1.5	6	9	0	0	0
329 NZ	247754 Arcot	1.4	33	45	0	0	1
319 NZ	214714 Havannah	1.4	26	36	0	0	1
305 NZ	24-49- Walldridge Fell	1.4	20	28	0	0	1
339 NZ	274897 Ellington	1.4	20	28	0	0	1
341 NZ	285892 Ashington	1.4	16	23	0	0	1
NZ	157649 Ryton Willows 'Cut'	1.4	25	36	0	0	0
80 NU	107248 Quarryhouse Moor	1.4	24	34	0	0	0
257 NZ	113639 Wylam Wood House	1.4	20	28	0	0	0
351 NZ	34-38- Cassop Vale	1.4	18	25	0	0	0
256 NZ	107628 Priestclose Wood	1.4	17	24	0	0	0
338 NZ	254876 Coneygarth Moor	1.4	16	22	0	0	0
323 NZ	228734 Big Waters	1.4	13	18	0	0	0
324 NZ	224753 Brenkley	1.4	10	14	0	0	1
332 NZ	293758 East Cramlington	1.3	26	34	0	0	1
249 NZ	17-59- Gibside	1.3	24	30	0	0	1
253 NZ	181588 Gibside	1.3	22	29	0	0	1
228 NZ	083735 Stamfordham	1.3	14	18	0	0	1
261 NZ	129642 Castle Hill	1.3	12	16	0	0	1
292 NZ	120871 Meldon Park	1.3	12	16	0	0	1
NZ	340608 Boldon	1.3	24	30	0	0	0
322 NZ	222719 Havannah Drift	1.3	20	25	0	0	0
282 NZ	196624 Axwell Park	1.3	20	25	0	0	0
216 NZ	019605 Riding Mill	1.3	19	25	0	0	0
NZ	171594 Lilly Brickworks	1.3	17	22	0	0	0
350 NZ	30-32- Ferryhill Cut	1.3	15	19	0	0	0
367 NZ	311887 Blue Holes	1.3	13	17	0	0	0
180 NY	969586 Woodfoot	1.3	13	17	0	0	0
336 NZ	244873 Coney Garth	1.3	12	16	0	0	0
52 NU	088166 Shepherds Law	1.3	11	14	0	0	0
NZ	268544 Birtley	1.3	11	13	0	0	0
312 NZ	212678 Kenton Bar	1.3	10	13	0	0	0
325 NZ	223753 Brenkley	1.2	22	27	0	0	0
NZ	122632 Bradley Hall	1.2	18	21	0	0	0
NZ	153650 Ryton Willows 'Glebe'	1.2	16	19	0	0	0
276 NZ	153694 Callerton Common	1.2	15	18	0	0	0
90 NU	238248 Low Newton	1.2	13	15	0	0	0
303 NZ	20-34- Willington	1.2	12	14	0	0	0
335 NZ	243872 Bothal Barns	1.2	5	6	0	0	0
82 NU	120302 Belford	1.1	20	22	0	0	0
345 NZ	288940 Cresswell	1.1	19	20	0	0	0
47 NU	017188 Calder	1.1	17	20	0	0	0
281 NZ	197600 Windy Hill Carr	1.1	16	18	0	0	0
17 NT	884323 Kilham	1.1	15	17	0	0	0
NZ	141596 High Spen	1.1	15	17	0	0	0

Group 3 (cont.)				SQS	NOS	WET	RDB	Na	Nb
311	NZ	214627	Derwenthaugh	1.1	15	16	0	0	0
361	NZ	362622	Whiteleas	1.1	14	16	0	0	0
295	NZ	281109	Hell Kettles	1.1	14	16	0	0	0
265	NZ	130656	Close House	1.1	13	14	0	0	0
	NZ	183599	Hollingside Pond	1.1	13	14	0	0	0
359	NZ	342609	Mount Pleasant	1.1	11	12	0	0	0
	NZ	128573	Chopwell	1.1	10	11	0	0	0
84	NU	136428	Holy Island	1.1	10	11	0	0	1
310	NZ	26-54-	Birtley	1.1	8	9	0	0	0
	NZ	37-50-	Warden Law	1.1	8	9	0	0	0
	NZ	176594	Ladyhaugh	1.0	10	10	0	0	0
309	NZ	24-55-	Urpeth	1.0	9	9	0	0	0
252	NZ	183578	Burnopfield	1.0	8	8	0	0	0
274	NZ	157655	Reigh Marsh	1.0	5	5	0	0	0

These are mostly man-made ponds with dense vegetation and a soft substratum, of which a characteristic species in north-east England is *Ilybius subaeneus* (Nb). Hadrian Park is the only site in the region for *Enochrus coarctatus* (Nb). This is a good example of a group with no outstanding natural sites but from which one or two sites should be conserved.

Group 4 0100 Analysis 2 - 43 + 1 sites						SQS	NOS	WET	RDB	Na	Nb
15	NT	862381	Campfield Kettlehole			2.4	18	43	0	1	1
106	NY	663896	Wellhaugh			1.8	17	31	0	0	2
236	NZ	012947	Fallowlees Lough			1.7	19	33	0	0	1
193	NY	935824	Sweethope Lough			1.7	18	31	0	0	0
178	NY	958599	Linnel Wood			1.7	17	29	0	0	0
199	NY	977953	Dough Crag Lough			1.7	14	24	0	0	0
154	NY	802633	Morralee Wood			1.6	22	35	0	1	1
186	NY	96-68-	Fawcett Hill			1.5	14	21	0	0	1
162	NY	829704	Shield on the Wall Lough			1.5	17	26	0	0	0
139	NY	798865	Bimmerhill			1.5	15	22	0	0	0
	NZ	197629	Shibdon Meadow			1.4	20	27	0	0	1
232	NY	078818	Bolam Lake			1.4	11	16	0	0	1
348	NZ	31-24-	Preston-le-Skerne			1.4	17	23	0	0	0
217	NZ	043611	Stocksfield			1.4	10	14	0	0	0
231	NZ	041898	Rothley Lake			1.3	12	16	0	0	1
296	NZ	28-16-	Black Path Pond			1.3	14	18	0	0	0
194	NY	935864	Linnheads			1.3	12	16	0	0	0
66	NU	003501	Tweedsmouth			1.3	11	14	0	0	0
192	NY	932842	Harwood Forest			1.2	17	21	0	0	0
164	NY	806864	Hareshaw Common			1.2	16	19	0	0	0
156	NY	829674	Hind Shields			1.2	13	16	0	0	0
160	NY	808714	Halleypike Lough			1.2	13	16	0	0	0
93	NU	254217	Scrog Hill			1.2	13	15	0	0	0
100	NY	692593	Lanehead Lambley			1.2	12	14	0	0	0
143	NY	86-29-	Wat Garth			1.2	12	14	0	0	0
56	NU	021204	Roddam			1.2	11	13	0	0	0
237	NZ	041900	Rothley Lake			1.2	9	11	0	0	0
264	NZ	127668	Hillhead Quarry			1.2	5	6	0	0	0
279	NZ	175607	Thornley Wood			1.1	17	19	0	0	0
119	NY	783642	Beltingham			1.1	16	18	0	0	0
31	NT	974285	Humbleton			1.1	13	14	0	0	0
44	NU	078023	Nelly Moss Lake			1.1	13	14	0	0	0
273	NZ	154657	Reigh Burn Mine			1.1	13	14	0	0	0
245	NZ	178592	Gibside			1.1	12	13	0	0	0
53	NU	017200	Calder			1.1	11	12	0	0	0
30	NT	97-27-	Brownslaw			1.1	11	12	0	0	0
121	NY	784695	Broomlee Lough			1.1	11	12	0	0	0
158	NY	884663	Glen Dhu Quarry			1.1	11	10	0	0	0
185	NY	968619	Dipton Wood			1.1	8	9	0	0	0
307	NZ	27-40-	Hollingside Lane			1.1	8	9	0	0	0
344	NZ	272985	Chevington Drift			1.1	8	9	0	0	0
74	NU	122174	Kimmer Lough			1.1	7	8	0	0	0
33	NT	943342	Milfield			1.0	9	9	0	0	0
120	NY	78-64-	Beltingham			1.0	6	6	0	0	0

The Campfield Kettlehole supports *Agabus uliginosus* (Na) and *A. unguicularis* (Nb). Wellhaugh was a sandy pond beside the North Tyne with Notable species more characteristic of Group 1; it was destroyed in the Kielder Water impoundment. With this site removed the best sites are all mesotrophic quagmires in the edges of natural loughs.

Group 5 0101 Analysis 2 - 53 + 6 sites						SQS	NOS	WET	RDB	Na	Nb
	NZ	45-35-	Hart Bog			2.8	35	95	1	1	2
346	NZ	32-11-	Neasham Fen			3.6	7	25	0	1	1
290	NZ	192775	Bellasis Bridge			2.2	15	33	0	1	0
293	NZ	104908	Netherwitton			1.9	22	41	0	0	2
117	NY	765680	Crag Lough			1.9	10	19	0	0	0
166	NY	86-88-	Corsenside Common			1.8	24	42	0	0	0
352	NZ	32-45-	Field House			1.6	15	24	0	0	1
203	NZ	079324	Cabin Hill			1.6	11	18	0	0	1
306	NZ	26-44-	Framwellgate Moor			1.5	13	19	0	0	1
314	NZ	221698	Brunton			1.5	11	16	0	0	1
204	NZ	080324	Cabin Hill			1.5	8	12	0	0	1
77	NU	160137	Hulne Park			1.5	15	23	0	0	0
315	NZ	204728	Dinnington			1.4	20	28	0	0	1
118	NY	770680	38th Mile Castle			1.4	19	26	0	0	1
355	NZ	38-45-	Hesleden Moor West			1.4	17	24	0	0	1
302	NZ	29-23-	Heworth House			1.4	17	23	0	0	1
342	NZ	211972	Eshott South Farm			1.4	15	21	0	0	1
299	NZ	20-26-	Fielden Bridge			1.4	14	20	0	0	1
308	NZ	24-54-	Urpeth			1.4	12	17	0	0	1
144	NY	82-32-	Low End			1.4	10	14	0	0	0
	NZ	256561	Kibblesworth			1.4	10	14	0	0	0
81	NU	168295	Newham Fen			1.3	30	38	0	0	1
220	NZ	051659	Stelling Hall			1.3	16	21	0	0	0
328	NZ	242748	Seaton Burn			1.3	14	18	0	0	0
78	NU	167136	Hulne Park			1.3	10	13	0	0	0
294	NZ	160903	Hebron			1.3	9	12	0	0	0
168	NY	862951	Elishaw			1.3	9	12	0	0	0
48	NU	037198	Wooperton			1.3	8	10	0	0	0
226	NZ	012732	Ryal			1.3	6	8	0	0	0
163	NY	837749	Broadpool Common			1.2	19	23	0	0	0
	NZ	260573	Long Acre Wood			1.2	18	22	0	0	0
	NZ	138599	North Farm			1.2	19	22	0	0	0
219	NZ	051644	North Acomb			1.2	16	19	0	0	0
241	NZ	18-48-	Burnhope			1.2	14	17	0	0	0
331	NZ	255701	Gosforth Park			1.2	13	16	0	0	0
239	NZ	14-38-	Sunniside			1.2	13	15	0	0	0
297	NZ	28-16-	Brinkburn Pond			1.2	12	14	0	0	0
246	NZ	175589	Gibside			1.2	12	14	0	0	0
259	NZ	114676	Rudchester			1.2	11	13	0	0	0
16	NT	876372	Branxton Kettlehole			1.2	6	7	0	0	0
356	NZ	328585	West Moor			1.2	6	7	0	0	0
58	NU	041377	Kyloe Hills			1.1	18	20	0	0	0
366	NZ	332747	Holywell			1.1	17	19	0	0	0
244	NZ	168503	Annfield Plain			1.1	15	17	0	0	0
35	NT	970397	Barmoor Bridge			1.1	15	16	0	0	0
248	NZ	174584	Gibside			1.1	15	16	0	0	0
262	NZ	122655	Wylam Rift			1.1	14	16	0	0	0
210	NZ	001566	Kellas Plantation			1.1	13	14	0	0	0
330	NZ	241771	Plessey North Moor			1.1	11	12	0	0	0
269	NZ	146659	Reigh Burn			1.1	11	12	0	0	0
280	NZ	172629	Blaydon Burn			1.1	9	10	0	0	0
298	NZ	28-16-	Horse Field Pond			1.1	9	10	0	0	0
95	NU	253221	Dunstonstead Links			1.1	9	10	0	0	0
	NZ	29-45-	Brasside			1.1	8	9	0	0	0
	NZ	180599	Owlet Hill			1.0	18	18	0	0	0
255	NZ	19-59-	Fellside			1.0	7	7	0	0	0
224	NZ	075662	Whittle Dene			1.0	6	6	0	0	0
83	NU	155333	Spindlestone			1.0	5	5	0	0	0
247	NZ	17-58-	Gibside			1.0	5	5	0	0	0

The sites are marshes subject to winter flooding. They are usually associated with permanent water but Neasham Fen, with *Agabus uliginosus* and *A. chalconatus* (Nb), and Bellasis Bridge with *A. uliginosus* are the driest sites. Netherwitton supported *A. unguicularis* and *Ilybius guttiger* (Nb). The outstanding site - the top site for accumulated species-score in north-east England - is Hart Bog, a small bog in a kettlehole on drift overlying the magnesian limestone. It supports *Hydroporus scalesianus* (RDB 2) in one of the only two sites known for this species in Britain outside Norfolk. The other rare species there is *Laccornis oblongus* (Na).

Group 6 0110 Analysis 2 - 34 + 3 sites				SQS	NOS	WET	RDB	Na	Nb
376	NZ	45-40-	Castle Eden Dene	2.5	21	52	1	0	5
313	NZ	214698	Brunton Bridge	1.8	6	11	0	0	0
375	NZ	44-40-	Castle Eden Dene	1.7	11	19	0	0	1
26	NT	997166	Ingram	1.6	11	18	0	0	0
327	NZ	244747	Sandys Letch	1.6	5	8	0	0	0
334	NZ	235802	Pegwhistle Burn	1.5	8	12	0	0	1
360	NZ	358621	Boldon	1.5	10	15	0	0	0
321	NZ	221701	Ouseburn	1.5	6	9	0	0	0
374	NZ	464403	Castle Eden Dene	1.4	12	17	0	0	1
157	NY	829689	Cowey Sike	1.4	8	11	0	0	1
112	NY	742509	Whitfield Moor	1.4	7	10	0	0	1
	NZ	36-22-	Old Skillington	1.4	14	20	0	0	0
	NZ	40-33-	Hurworth Burn	1.4	8	11	0	0	0
149	NY	864452	Allenheads	1.4	7	10	0	0	0
371	NZ	412388	Castle Eden Dene	1.3	11	14	0	0	1
	NZ	37-34-	River Skerne	1.3	12	16	0	0	0
286	NZ	167744	River Pont	1.3	10	13	0	0	0
318	NZ	214702	Brunton	1.3	10	13	0	0	0
258	NZ	115635	Stanley Burn	1.3	8	10	0	0	0
6	NT	886077	Shilmoor	1.2	13	16	0	0	0
372	NZ	434459	Hawthorn Dene	1.2	9	11	0	0	0
369	NZ	40-16-	Coatham Burn	1.2	6	7	0	0	0
229	NZ	035817	Path Head	1.2	5	6	0	0	0
340	NZ	28-85-	River Wansbeck	1.2	5	6	0	0	0
354	NZ	34-48-	Hetton Bog	1.2	5	6	0	0	0
101	NY	641648	Gap Shields	1.1	10	11	0	0	0
284	NZ	147738	Small Burn	1.1	7	8	0	0	0
25	NT	991109	Alnham	1.0	8	8	0	0	0
182	NY	929611	Diptonmill	1.0	8	8	0	0	0
353	NZ	32-49-	Chilton Moor	1.0	8	8	0	0	0
49	NU	059172	River Breamish	1.0	7	7	0	0	0
285	NZ	168744	Berwick Hall Bridge	1.0	7	7	0	0	0
38	NT	937488	Spital Burn Bridge	1.0	6	6	0	0	0
288	NZ	176736	Prestwick Mill	1.0	6	6	0	0	0
230	NZ	036824	Swilder Burn	1.0	6	6	0	0	0
54	NU	016201	Roddam	1.0	5	5	0	0	0
63	NU	027485	Scremerston	1.0	5	5	0	0	0

These are lowland sites with slow-moving water including intermittent seepages in woodland. Seepages on the cliffs at Castle Eden (376) support *Helophorus dorsalis* (RDB 3) in its only known site in northern Britain, and a mixture of Nb species characteristic of brackish, running or temporary water. Sites away from Castle Eden Dene are generally of poor quality.

Group 7 0111 Analysis 2 - 30 + 5 sites					SQS	NOS	WET	RDB	Na	Nb
197	NY	909921	Elsdon Burn		2.2	12	26	0	0	2
362	NZ	375615	Boldon Flats		2.0	24	47	0	1	0
242	NZ	132575	Chopwell Wood		2.0	10	20	0	1	0
349	NZ	32-26-	Morden Carrs		1.8	16	28	0	0	1
266	NZ	132657	Claytons Wood		1.7	19	32	0	0	3
373	NZ	43-46-	Hawthorn Quarry		1.5	19	28	0	0	2
263	NZ	128659	Ashbank Wood		1.4	11	15	0	0	1
370	NZ	41-27-	Wynyard Forest		1.4	8	11	0	0	1
271	NZ	148681	Holmside		1.4	7	10	0	0	1
365	NZ	327734	Briardene Burn		1.4	19	26	0	0	0
85	NU	247092	Alnmouth Bay		1.3	11	14	0	0	2
92	NU	24-24-	Low Newton		1.3	9	12	0	0	0
337	NZ	254837	Choppington		1.2	13	15	0	0	0
	NZ	154623	Greenside		1.2	13	15	0	0	0
320	NZ	219736	Dinnington		1.2	12	14	0	0	0
267	NZ	135659	Castle Ward		1.2	9	11	0	0	0
272	NZ	155622	Bog Wood		1.2	6	7	0	0	0
222	NZ	073659	Whittle Dene		1.2	6	7	0	0	0
357	NZ	332565	Washington		1.2	6	7	0	0	0
	NZ	184604	Winlaton Mill		1.2	6	7	0	0	0
79	NU	171135	Hulne Park		1.2	5	6	0	0	0
221	NZ	065688	Coldside		1.2	5	6	0	0	0
	NZ	195633	Blaydon		1.1	17	19	0	0	0
	NZ	128572	Armonside Farm		1.1	14	16	0	0	0
	NZ	129643	Castle Hill		1.1	11	12	0	0	0
181	NY	903698	Chesters		1.1	8	9	0	0	0
304	NZ	27-38-	Butterby Marsh		1.1	7	8	0	0	0
87	NU	282019	Bondicarr		1.0	7	7	0	0	0
103	NY	677629	Wydon Eals		1.0	7	7	0	0	0
62	NU	022480	Cheswick		1.0	6	6	0	0	0
316	NZ	206751	Brenkley		1.0	6	6	0	0	0
24	NT	98-09-	Scrainwood		1.0	5	5	0	0	0
94	NU	257215	Dunstanburgh Castle		1.0	5	5	0	0	0
254	NZ	182595	Gibside		1.0	5	5	0	0	0
301	NZ	28-21-	Aycliffe		1.0	5	5	0	0	0

These are lowland temporary pools, often caused by mining subsidence and lying in pasture. The Elsdon Burn site and Morden Carrs are the only one known localities for *Helophorus strigifrons* (Nb) in north-east England; Chopwell Wood supports *Agabus melanarius* (Na) and Boldon Flats *A. uliginosus* (Na).

Group 8 10 Analysis 2 - 45 + 2 sites		SQS	NOS	WET	RDB	Na	Nb
	NU 01-27- Cold Martin Moss	2.2	13	29	0	0	1
125	NY 79-67- Muckle Moss	2.1	22	46	0	0	2
3	NT 825038 Featherwood	2.1	12	25	0	0	1
235	NZ 009958 Chartners Lough	2.1	13	27	0	0	1
	NZ 14-38- Sunnyside	1.9	11	21	0	0	0
191	NY 923836 Aid Moss	1.8	8	14	0	0	0
140	NY 70-98- East Kielder Moor	1.7	17	29	0	0	1
46	NU 087017 Blackburn Moss	1.7	15	25	0	0	1
18	NT 918043 Harbottle Lake	1.7	14	24	0	0	1
195	NY 939884 Scald Law	1.7	6	10	0	0	1
55	NU 011274 Cold Martin Moss	1.7	15	25	0	0	0
73	NU 11-17- Kimmer Lough	1.7	13	22	0	0	0
196	NY 933896 Blaxter Lough	1.7	10	17	0	0	0
137	NY 707860 Falstone Moss	1.7	10	17	0	0	0
147	NY 852434 Allenheads	1.6	11	18	0	0	1
150	NY 873449 Rookhope Head	1.6	7	11	0	0	1
34	NT 96-37- Ford Moss	1.6	19	31	0	0	0
124	NY 79-66- Thorngrifton Common	1.6	12	19	0	0	0
207	NY 034499 Muggleswick	1.6	9	14	0	0	0
205	NY 00-46- Muggleswick Common	1.6	8	13	0	0	0
213	NY 034500 Muggleswick	1.6	8	13	0	0	0
107	NY 684895 Plashetts	1.5	10	15	0	0	1
71	NU 132084 Black Lough	1.5	15	22	0	0	0
4	NT 839042 Ridlees Cairn	1.5	6	9	0	0	0
142	NY 763979 Drowning Flow	1.5	6	9	0	0	0
172	NY 98-34- Bollihope Common	1.5	6	9	0	0	0
133	NY 793734 Haughton Common	1.4	10	14	0	0	0
104	NY 672700 The Wou	1.4	9	13	0	0	0
128	NY 727788 Gowany Knowe	1.4	9	13	0	0	0
151	NY 805525 Black Hill	1.4	8	11	0	0	0
102	NY 667693 Peteral	1.4	7	10	0	0	0
188	NY 973688 Stagshaw	1.4	7	10	0	0	0
59	NU 050364 Holburn Moss	1.3	12	15	0	0	0
75	NU 144127 Brizlees	1.3	11	14	0	0	0
50	NU 056198 "Percy's Kettlehole"	1.3	9	12	0	0	0
130	NY 74-73- Henshaw Common	1.3	9	12	0	0	0
113	NY 744505 Whitfield Moor	1.3	8	10	0	0	0
198	NY 96-90- Steng Moss	1.3	7	9	0	0	0
127	NY 723774 Felecia Moss	1.3	7	9	0	0	0
200	NY 979956 Darden Moss	1.3	6	8	0	0	0
161	NY 811709 Hemmel Rigg Moss	1.3	6	8	0	0	0
167	NY 822916 Padon Hill	1.3	6	8	0	0	0
23	NT 939017 Holystone Common	1.2	6	7	0	0	0
109	NY 617967 Deadwater Fell	1.2	5	6	0	0	0
190	NY 925780 Colt Crag Lough	1.1	12	13	0	0	0
129	NY 734789 Wark Forest	1.1	11	12	0	0	0
105	NY 686793 Coom Rigg NNR	1.1	7	8	0	0	0

The best of the upland mires are those with large open water pools and the worst are those with an unbroken sward of active *Sphagnum*. Muckle Moss is a relatively low altitude site; it supports *Ilybius aenescens* and *Enochrus affinis* (both Nb), two species not found together at other sites. Cold Martin Moss achieved a higher ranking on the basis of a second visit.

Group 9 11 Analysis 2 - 52 + 1 sites				SQS	NOS	WET	RDB	Na	Nb
184	NY	963613	Dipton Wood	1.9	9	17	0	1	0
208	NZ	037498	Muggleswick	1.9	7	13	0	0	2
177	NY	951565	Leadpipe Hall	1.8	10	18	0	1	0
1	NT	694065	Carter Bar	1.8	6	11	0	0	1
45	NU	07-09-	Thrunton Crag	1.8	9	16	0	0	0
187	NY	971612	Dipton Wood	1.7	11	19	0	1	0
28	NT	91-20-	Cheviot	1.7	6	10	0	0	1
146	NY	806453	Coalcleugh	1.7	6	10	0	0	0
206	NZ	01-47-	Muggleswick Common	1.6	7	11	0	0	1
234	NZ	000955	Chartners	1.6	11	18	0	0	0
29	NT	96-26-	Wooler Common	1.6	7	11	0	0	0
51	NU	07-10-	Thrunton Crag	1.6	5	8	0	0	0
152	NY	84-58-	Hexhamshire Common	1.5	10	15	0	0	0
201	NY	985996	Hepple	1.5	6	9	0	0	0
27	NT	993177	Reaveley Hill	1.4	10	14	0	0	0
173	NY	92-43-	Bank Foot	1.4	10	14	0	0	0
2	NT	71-04-	Girdle Fell	1.3	14	18	0	0	1
148	NY	854480	Dirt Pot	1.3	16	21	0	0	0
131	NY	740774	The Lakes	1.3	11	14	0	0	0
7	NT	89-01-	Watty Bells Cairn	1.3	10	13	0	0	0
97	NY	567903	Hobbs Flow	1.3	10	13	0	0	0
68	NU	11-08-	Edlingham	1.3	9	12	0	0	0
171	NY	96-53-	Blanchland Moor	1.3	8	10	0	0	0
114	NY	764525	Whitfield Moor	1.3	8	10	0	0	0
98	NY	68-48-	Great Heaplaw	1.2	13	16	0	0	0
19	NT	922044	Harbottle Crags	1.2	12	14	0	0	0
111	NY	754498	Mohope Moor	1.2	10	12	0	0	0
165	NY	86-81-	Percy's Moss	1.2	6	7	0	0	0
209	NZ	001561	Slaley Hall	1.2	6	7	0	0	0
22	NT	923017	Holystone Common	1.2	5	6	0	0	0
99	NY	662554	Glendue Fell	1.2	5	6	0	0	0
70	NU	125084	Wide Hope Plantation	1.2	5	6	0	0	0
135	NY	79-74-	Wark Forest	1.2	5	6	0	0	0
136	NY	703864	Falstone Moor	1.2	5	6	0	0	0
57	NU	09-20-	Harehope	1.1	15	17	0	0	0
	NT	68-03-	Carter Bar	1.1	9	10	0	0	0
141	NY	72-98-	Redesdale Forest	1.1	9	10	0	0	0
238	NZ	043992	Rothbury	1.1	9	10	0	0	0
169	NY	87-93-	Otterburn	1.1	9	10	0	0	0
11	NT	879205	Henhole	1.1	8	9	0	0	0
175	NY	901562	Burntridge Moor	1.1	8	9	0	0	0
176	NY	95-54-	Slaley Forest	1.1	8	9	0	0	0
108	NY	616968	Deadwater Fell	1.1	8	9	0	0	0
10	NT	877212	College Valley Burn	1.1	7	8	0	0	0
212	NZ	032504	Deans	1.1	7	8	0	0	0
134	NY	79-73-	Wark Forest	1.1	7	8	0	0	0
67	NU	116048	Longframlington Moor	1.1	7	8	0	0	0
153	NY	898561	Burntridge Moor	1.0	8	8	0	0	0
37	NT	994385	Moss Wood	1.0	7	7	0	0	0
69	NU	12-08-	Edlingham	1.0	7	7	0	0	0
183	NY	959668	Beaufort Wood	1.0	6	6	0	0	0
5	NT	864095	Stillhope	1.0	5	5	0	0	0
126	NY	713777	Felecia Crags	1.0	5	5	0	0	0

These are mainly upland mires with running water. The woodland sites support *Agabus melanarius* (Na). The valley mire at Muggleswick supported *Hydroporus ferrugineus* and *H. longicornis* (both Nb).

Group 10 - 2 sites			SQS	NOS	WET	RDB	Na	Nb
378	NZ 507226	Salt Holme	2.5	11	27	0	1	4
379	NZ 508254	Cowpen Marsh	1.6	13	21	0	0	4

Salt Holme was the best of the two saltmarsh sites investigated; it supported *Dytiscus dimidiatus* (Na) and *Haliphus apicalis*, *Agabus conspersus* and *Helophorus griseus* (all Nb). The Cowpen Marsh had *Haliphus apicalis*, *A.conspersus* and *Helophorus fulgidicollis* (Nb).

Wales

The area of the survey corresponded to the thirteen recording vice-counties of Wales (35 and 41-52) and fell within the administrative boundary of Wales. The data are easily the least satisfactory of the seven data sets so far surveyed (the others being southern Scotland, north-east England, the West Midlands, Lincolnshire/northern East Anglia, south-west England and the Weald). Under-recording and selective recording are problems common to all data sets but analysis of the Welsh data is made particularly difficult by uneven coverage and by selective sampling methods. At one extreme data derive from 'kick-sampling' work such as is undertaken by Welsh Water Authority and at the other extreme some lists are based on wetland beetles caught in pitfall traps operated by the Welsh Peatland Invertebrate Survey team.

Despite these apparent deficiencies it proved easy to develop an intelligible TWINSPAN classification. 230 species lists were analysed with a few kept in reserve for the purpose of testing the classification. The analysis was based on 192 species with the *Anacaena limbata* complex classified as a single species. Site names used in the survey are as spelt by the Ordnance Survey.

Red Data Book Species

The extent to which one credits Wales with Red Data Book species greatly depends on willingness to accept old records without voucher material. The following account is not an attempt to cover all RDB records for Wales. It is, however, hoped that most of the modern information has been included.

Few of the species lists suitable for multivariate analysis included RDB species. *Ochthebius poweri* (RDB 3) for example, occurs on a wet, vertical cliff above rockpools occupied by *O. subinteger lejolisii* but neither could be said to occur with the other. As neither occurred with any other species at any other site there is no information on which to identify the position of these species in multivariate matrices. Incomplete species lists for Skomer Island (Sage 1977) prevent inclusion of the only modern Welsh records for *Graptodytes flavipes* and the only Welsh record for *G. bilineatus*.

Category 1 - There are no Welsh RDB 1 species. The record for *Ochthebius aeneus* by Tomlin for Candleston in 1913 (Balfour-Browne 1958) is based on a specimen of *O. minimus* seen by GNF. *Hydrochara caraboides* was recorded from "spring brooks" in vc 46 (Carpenter 1927). This species is declining in Britain and now appears to be confined to the turbary peat areas of the Somerset Levels. There is an early record (Dillwyn 1829) for a canal at Crwmllyn when, judging from other species listed, that area provided a similar series of habitats to those of the turbary areas of the Somerset Levels today. *H. caraboides* can fly and it is possible that Carpenter's record was based on a stray specimen but it is more likely that there was an error in identification.

Category 2 - *Hydroporus rufifrons*, *Graptodytes flavipes* [not in survey], *Normandia nitens* [not in survey], *Stenelmis canaliculata*.

Hydroporus rufifrons - Price (1959) recorded this species from Cwnigaer, a field beside Kidwelly Castle, and there are specimens in Cardiff Museum. None could be found at Cwnigaer in September 1988. This species is genuinely in decline because its

habitat is so easily drained. There are only three other Welsh records. The location of the old record for vc 49 cannot be fixed. Tomlin (1933) noted M. Hallett's record for Porthcawl. The only recent record stems from the Welsh Peatlands Invertebrate Survey, a single female caught on 26 June 1987 at Gwaun Garthenor (vc 46, SN 638558).

Graptodytes flavipes - Sage (1977) reported the last record of this species in Wales, on Skomer. There are earlier records for the mainland of vc 45 in SM 72 by F. Balfour-Browne at Rhodiad and at Dowrog Common in 1931, and by J. Balfour-Browne at Rhosson, Pwll Trefeiddan and Treleddydd Fawr in 1946. The species was selected for RDB status, despite its occasional abundance in the New Forest, Dorset and on the Lizard, because it is characteristic of the endangered wet heathland of southern England.

Normandia nitens - GNF has identified a specimen taken in the River Wye in Monmouthshire near to Symonds Yat in 1972 by I.D. Wallace.

Stenelmis canaliculata - Ormerod (1985) recorded this species from the River Wye at Glasbury in 1982.

Category 3 - *Haliphus mucronatus*, *H. variegatus* [old records only], *Hydrovatus clypealis* [not in survey], *Bidessus minutissimus*, *Graptodytes bilineatus* [not in survey], *Hydrochus ignicollis*, *Hydrophilus piceus*, *Ochthebius poweri*, *Hydraena pygmaea* [not in survey], *Oulimnius major* [not in survey].

Haliphus variegatus - Pearce (1948) gave the last record for Wales, from beside the Kenfig Pool, Glamorgan, in 1946. He also noted an earlier record for Monmouthshire (Roggiatt in 1931) and the existence of a specimen from St. David's in the J.W. Allen collection in Cambridge. He did not indicate a date for capture but Allen was active in the 1910's. This is a declining species with recent records for Somerset, Norfolk, East Sussex and East Kent. The species is mainly associated with shallow, temporary habitats in relict sites. It is possible that the species still occurs in south Wales in coastal ponds.

Hydrovatus clypealis - Tomlin (1919) noted this species at Oxwich. J. Balfour-Browne (1947) found this species "in numbers, principally in the larval stages with a few teneral adults, in a series of shallow muddy pools near Porth Sele" in August 1946. The pools were indicated at SM 75-25- in Balfour-Browne's record card return. Price (1959b) recorded the species in "numbers in a canal near Kidwelly". He had earlier (1959a) described this as the Collier's Line Canal. This has been destroyed as a habitat suitable for *H. clypealis* by dredging in 1986.

Bidessus minutissimus - J. Balfour-Browne (1942) found this species in the River Conway in 1940 and Jones (1949) found it in the Afon Rheidol in 1947; the species was still in the Rheidol in 1985 but could not be found in the Conway (Foster & Bilton 1985a). Jones (1943) also reported the species from the Afon Tywi. Wallace (1979) recorded the species in the River Dee (SJ 113433) and Fowles has since found the species in the Afon Ystwyth.

Graptodytes bilineatus - The only Welsh record is for Skomer Island by Sage (1977). The specimens were collected by the warden, D.R. Saunders, in the South Pond on 3 September 1966 and identified by Sage (personal communication). The specimens no longer exist but the recent discovery of this species in Ireland, Dorset and the Channel Isles indicates that the species should no longer be regarded as eastern in distribution. In fact, it is part of an Atlantic wet heath fauna extending to Spain.

Hydrochus spp. - There are no Welsh records of *Hydrochus elongatus* s.s.; the species found on Anglesey by Dr. A.C. Warne (1976) was *Hydrochus ignicollis*. Angus (1977) recorded a specimen or specimens from W. Jansons' collection in Manchester University Museum labelled "Wales, J.A. Brewer". Other Welsh records for *elongatus* cannot be accepted unless checked for *ignicollis*.

Ochthebius poweri - J. Balfour-Browne (1947) discovered the only known site for *O. poweri* in Wales. His comments (p. 18) bear repeating - "*Ochthebius poweri* Rye is otherwise recorded in this country from South Devon and Dorset. There can be little doubt that the peculiar habitat of this little species accounts for the relatively restricted distribution in this country. Abroad it is of wide distribution, being recorded by d'Orchymont from Spain, Algeria, Venezia Julia, Sicily, Corfu, Crete, Samos and Rhodes, with Southern Britain as its most northern station. The immense stretch of country between southern England and the province of Andalusia in Spain from which no records of the species have ever been claimed must also be accounted for by the peculiarity of the habitat. The species is found only in the weakest trickles of water on vertical or near vertical cliffs on the coast, apparently beyond the reach of the highest tides, but within the limits of blown spindrift. The area in which I took it to the number of some 40 larvae and adults within half an hour covered some 9 square yards only and was devoid of any visible vegetation. The water coursed down it a little more than the speed and volume of condensations of steam on a window-pane. In nearby areas where the flow of water was stronger not a single specimen could be found. Similarly in the nearby areas with no free water no adults could be found but the larvae occurred in these drier areas only and could be seen in some numbers."

The Welsh find was made at Whitesand Bay in August 1946. Balfour-Browne noted in his journal that the site was on boulder clay. The species was confined to a small area of exposed glacial drift overlying the bedrock on the promontory at the north end of the bay. The site was visited on 11 September 1988 and one specimen was found by splashing a small section of wet mud overlying the bedrock at the north end of the bay into a rockpool. No more specimens could be found at that point, at any other point around the bay or in subsequent searches of several sections of cliff line with seepage at Newgale, Little Haven and north of Tenby. The only other modern British records are for the sandstone cliffs from Exmouth to Torquay.

Hydraena pygmaea - There are no modern records for Wales. That for Dyfed is by Jones (1948) from the Nant Pedol in vc 44. in 1947. Only one specimen was recorded.

Oulimnius major - GNF recently identified a specimen taken with *Normandia nitens* in the River Wye near Symonds Yat in 1972 by I.D. Wallace.

Donacia obscura - This species is one of the donaciines least likely to be taken by terrestrial coleopterists based in southern England. It is possibly common in western lakes on *Carex rostrata* and its vulnerability has been over-rated. Nevertheless it would appear to be a relict lake species and merits comment wherever it occurs. Dr. M.E. Cox (in Shirt 1987) reported modern Welsh records for Llyn-y-Parc by P. Kirby in 1980 and by Dr R.S. Key at Aberithon in 1982. Morgan (1988) reported records in 1974 and 1987 from the Talley Lakes and from Taliaris Lake in 1974.

The relative importance of axes 1 and 2 differed with and without downweighting as indicated by eigen-values.

Axis 1 Axis 2 Axis 3 Axis 4

Without downweighting	0.595	0.403	0.289	0.250
With downweighting	0.500	0.431	0.189	0.148

With downweighting the same clusters of indicator species occurred at the extremities of axes 1 and 2, axes 3 and 4 remaining uninterpretable.

Fourteen end-groups were identified by taking TWINSPAN to level 6 and by removing *Helophorus brevipalpis* from the analysis. One site was clearly misclassified and had to be moved within the matrix from Group 3 to Group 12.

Two sets of survey data in the analysis, that of Dr. C.M. Drake for the Wentlooge and Caldicot Levels, and that for the Malltraeth Marshes (Foster & Bilton 1985b), had previously been analysed using TWINSpan. Drake's data could only be divided on the basis of one large group (now dominating Group 2) and individual outliers. The samples from the Malltraeth Marshes were originally divided into seven groups, and this division has survived analysis of the Welsh data *in toto*.

TWINSPAN dendrogram for Wales

```
graph TD
    230 --- 197
    230 --- 33
    197 --- 93
    197 --- 104
    33 --- 15
    33 --- 18
    93 --- 31
    93 --- 62
    104 --- 65
    104 --- 39
    31 --- 3
    31 --- 28
    62 --- 51
    62 --- 8
    51 --- 3
    51 --- 5
    65 --- 47
    65 --- 18
    47 --- 15
    47 --- 16
    18 --- 7
    18 --- 11
    39 --- 31
    39 --- 8
    15 --- 6
    15 --- 7
    18 --- 9
    18 --- 10
    31 --- 11
    31 --- 12
    8 --- 13
    8 --- 14
```

3 28 51 8 3 15 16 16 7 11 31 8 15 18

1 2 3 4 5 6 7 8 9 10 11 12 13 14

General descriptions of habitats associated with Welsh water beetle assemblages.

- 1 Deep rich fens with reedbeds all on Anglesey
- 2 Rich fen ditches, mainly in south Wales
- 3 Ditches, ponds, borrow pits, oxbow pools and lakes with rich vegetation and some exposed substrate
- 4 Canals and lakes
- 5 Saltmarsh pools and tidal lagoons
- 6 Acid flushes and *Sphagnum* pools
- 7 Temporary acid pools
- 8 Larger mire systems, mainly mesotrophic and with permanent water
- 9 Temporary coastal pools with slight brackish influence
- 10 Temporary pools without brackish influence in coastal marshes
- 11 Shallower valley and basin mires
- 12 Acid mires with deep pools or lakes
- 13 Small streams
- 14 Rivers

Species frequency table for Wales

D = 21-40%, C = 41-60%, B = 61-80%, A > 80%. Entries in lower case indicate groups with less than five sites.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>Haliphus fluviatilis</i>		D		B										
<i>Haliphus lineatocollis</i>	b	A	C			D	D	D					D	D
<i>Ilybius quadriguttatus</i>	b	D												
<i>Hydroporus palustris</i>	b	B	A	D		D	A	D		D	D			D
<i>Hygrotus versicolor</i>	d			D										
<i>Gyrinus substriatus</i>	b	D	D				B				D			
<i>Laccobius bipunctatus</i>	b	B	D				C	D						
<i>Limnebius nitidus</i>	d													
<i>Haliphus lineolatus</i>	d			A										
<i>Haliphus obliquus</i>	d													
<i>Haliphus ruficollis</i>	b	A	B	D			C				D	D		
<i>Noterus crassicornis</i>	d													
<i>Coelambus confluens</i>	d													
<i>Agabus sturmi</i>	d	C	D				C				C			
<i>Ilybius ater</i>	d	D												
<i>Colymbetes fuscus</i>	b	C	D				D							
<i>Gyrinus caspius</i>	d				d									
<i>Enochrus bicolor</i>					b									
<i>Ochthebius viridis</i>					a									
<i>Haliphus confinis</i>				D										
<i>Noterus clavicornis</i>	b	A	C											
<i>Laccophilus minutus</i>		B	C											
<i>Hyphydrus ovatus</i>	d	B	D	A										
<i>Hygrotus inaequalis</i>	b	A	B		d		D	D						
<i>Porhydrus lineatus</i>		B	D											
<i>Peltodytes caesus</i>		D												
<i>Haliphus heydeni</i>		D												
<i>Haliphus immaculatus</i>		B		D										
<i>Suphrodytes dorsalis</i>		D												
<i>Copelatus haemorrhoidalis</i>		D												
<i>Agabus conspersus</i>					c									
<i>Rhantus grapii</i>	b	D												
<i>Hydaticus transversalis</i>		D												
<i>Gyrinus paykulli</i>	d													
<i>Gyrinus suffriani</i>	b													
<i>Helophorus griseus</i>		D												
<i>Cercyon convexiusculus</i>		D												
<i>Laccobius biguttatus</i>	d	D												
<i>Laccobius minutus</i>		D		D										
<i>Helochares lividus</i>		C												
<i>Enochrus coarctatus</i>	d	D									D			
<i>Enochrus melanocephalus</i>		D			c									
<i>Enochrus ochropterus</i>	d	D									D	C		
<i>Enochrus testaceus</i>	d	C												
<i>Cymbiodyta marginella</i>		C							D					
<i>Hydrophilus piceus</i>		D												
<i>Berosus affinis</i>		C												
<i>Ochthebius marinus</i>		D			a									
<i>Hydraena testacea</i>		D												
<i>Haliphus flavicollis</i>		D		D										
<i>Haliphus wehncke</i>	d	B	D	A										
<i>Laccophilus hyalinus</i>		C		C										
<i>Hydroporus angustatus</i>	a	C						D						
<i>Graptodytes pictus</i>	d	B		D										
<i>Helophorus minutus</i>	d	A	D		d						D	D		

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Helophorus obscurus		C			d			C	D					
Hydroporus incognitus	d						D							
Hydroporus pubescens	d	D	D		d	C	B			D	B	C		
Helophorus fulgidicollis					b		D							
Hydroporus erythroceph.	b	D	D				B	D		D	B	C		
Hydroporus planus	d	C			d	D	D							
Agabus nebulosus					c		D							
Agabus unguicularis	b													
Ilybius guttiger	a													
Dytiscus marginalis		D												
Dytiscus semisulcatus							D					D		
Hydrobius fuscipes	d	B	D			D	C	C	B	D				
Ochthebius punctatus					b									
Agabus melanocornis									C			C		
Cercyon lateralis									D					
Cercyon tristis								D	D					
Hydroporus gyllenhalii	d						C			B	C			
Hydroporus longulus										D				
Hydroporus melanarius										C				
Hydroporus obscurus										D		C		
Hydroporus tristis										C	B			
Hydroporus umbrosus	d									D	D	D		
Graptodytes granularis	d													
Agabus affinis	d									C	C	D		
Ilybius aenescens												D		
Rhantus bistriatus	d											D		
Coelostoma orbiculare	d	D					D		D	D				
Helochares punctatus	d									D		A		
Enochrus affinis	d						D					C		
Enochrus fuscipennis					c							C		
Chaetarthria seminulum	d									D				
Hydraena britteni									D					
Hydroporus striola	a	D					D	D						
Hydroporus tessellatus	d	C			d	D	D	C			D			
Anacaena limbata s.l.	b	B	C		d	C	B	B	B	D	B	C	D	
Ochthebius minimus	a	B	D		d			A	D					
Helophorus grandis		B			d	D	C		C		D			
Hydroporus memnonius	d				d	D	D		C	D				
Agabus bipustulatus	a	D	C		d	B	A	C	B	B	C	C		
Helophorus aequalis	d	C			d	D	C		A	D	D			
Hydroporus nigrita						C	D			D				
Agabus guttatus						D								
Helophorus flavipes						B	B		D	B	C	A	D	
Cercyon impressus									D					
Paracymus scutellaris												D		
Limnebius truncatellus	d				d	B	B	D			C		D	D
Dryops luridus					d	D	D	C						
Anacaena globulus	d	C				C	C	C	D	A			B	
Megasternum obscurum								C	C					
Agabus paludosus													D	
Ilybius fuliginosus	d		C		d			B				D	D	D
Laccobius atrocephalus	d													
Hydraena riparia	b	D						D	D					
Oreodytes septentrionalis														B
Limnius volckmari														C
Oulimnius tuberculatus														C
Brychius elevatus													D	D
Oreodytes sanmarkii													B	C
Elmis aenea														C

1 2 3 4 5 6 7 8 9 10 11 12 13 14

Platambus maculatus													C	D
Hydraena gracilis													D	D
Potamonectes elegans				B										B
Stictotarsus 12-pust.	d			D									D	D
Laccobius striatulus													D	

Groups and site scores for Wales

Group 1	0000	3 - sites	SQS	NOS	WET	RDB	Na	Nb
9 SH	305785	Llyn Cerrig Bach	2.8	36	101	0	2	3
68 SH	50-81-	Cors Goch	3.1	42	131	0	1	11
37 SH	450714	Llyn Gwaith-glo	2.0	9	18	0	0	2

Deep, rich fens on Anglesey, the best two being the only Welsh sites for *Gyrinus suffriani* (Na), Llyn Cerrig Bach also supporting *G. paykulli* (Na) in its only known Welsh station. All three sites *Ilybius guttiger* and two have *Agabus unguicularis* (both Nb).

Group 2	0001	- 28 sites	SQS	NOS	WET	RDB	Na	Nb
225 SS	4--8--	Caldicot Level	3.3	47	153	2	1	10
214 SS	3--8--	Caldicot Level	3.5	51	176	1	2	10
218 SS	3--8--	Caldicot Level	3.3	58	189	1	2	11
223 SS	4--8--	Caldicot Level	3.3	56	186	1	1	12
211 SS	2--8--	Wentlooge Level	3.2	54	173	1	1	10
228 SS	4--8--	Caldicot Level	3.2	54	172	1	1	8
203 SS	78-84-	Margam Moors	2.5	24	60	1	0	2
213 SS	3--8--	Caldicot Level	3.2	51	161	0	1	12
217 SS	3--8--	Caldicot Level	3.1	32	98	0	1	4
212 SS	2--0--	Wentlooge Level	3.0	52	156	0	1	11
208 SS	2--7--	Wentlooge Level	3.0	30	90	0	1	3
226 SS	4--8--	Caldicot Level	2.7	41	112	0	0	8
216 SS	3--8--	Caldicot Level	2.7	24	64	0	0	3
215 SS	3--8--	Caldicot Level	2.7	23	61	0	0	3
221 SS	42-86-	Magor Reserve	2.6	37	97	0	0	9
227 SS	4--8--	Caldicot Level	2.5	38	96	0	0	7
210 SS	2--8--	Wentlooge Level	2.5	32	79	0	0	3
209 SS	2--8--	Wentlooge Level	2.4	36	88	0	0	5
224 SS	4--8--	Caldicot Level	2.2	35	76	0	0	5
222 SS	4--8--	Wentlooge Level	2.2	44	95	0	0	3
219 SS	3--8--	Wentlooge Level	2.1	7	15	0	0	0
206 SS	223783	Wentlooge Level	2.0	13	26	0	0	2
207 SS	2--7--	Wentlooge Level	1.9	21	40	0	0	2
25 SH	436692	Malltreath Marshes	1.9	13	24	0	0	0
184 SO	150943	Montgomery Canal	1.8	5	9	0	0	0
57 SH	497814	Cors Goch	1.7	7	12	0	0	1
229 SH	366695	Aberffraw	1.6	14	23	0	0	2
17 SH	40-65-	Malltraeth Sands	1.6	9	14	0	0	2

Rich fen ditches, the best being on the southern marshes with *Haliphus mucronatus* (RDB 3) on the Caldicot Level and the Margam Moors and *Hydrophilus piceus* (RDB 3) common on the Caldicot Level. Other species not found elsewhere in Wales are *Peltodytes caesus* (Nb), *Suphrodytes dorsalis*, *Hydaticus transversalis* (Na), *Limnoxenus niger* (Na) and *Berosus affinis* (Nb).

Group 3 00100 - 51 + 2 sites				SQS	NOS	WET	RDB	Na	Nb
	SO	126706	Mere Pool	2.9	12	35	0	2	1
26	SH	437693	Malltraeth Marshes	2.9	18	52	0	0	2
30	SH	438716	Malltraeth Marshes	2.8	17	48	0	0	2
94	SJ	260131	Bank Lock	2.6	7	18	0	0	1
33	SH	440715	Malltraeth Marshes	2.5	18	45	0	0	2
122	SN	399060	Kidwelly	2.5	17	42	0	0	1
36	SH	447775	Cefni Reservoir	2.4	17	41	0	0	0
64	SH	565791	Tynymynydd	2.4	12	29	0	0	0
19	SH	411658	Newborough Forest	2.3	9	21	0	0	0
150	SN	69-62-	Maeslyn	2.2	13	28	0	0	1
11	SH	30-76-	Llyn Dinam	2.2	6	13	0	0	0
93	SJ	253135	Wern Bridge	2.2	5	11	0	0	0
7	SH	397651	Newborough Warren	2.1	16	33	0	0	2
195	SS	002967	Trewent	2.1	12	25	0	0	2
34	SH	442714	Malltraeth Marshes	2.1	16	33	0	0	1
10	SH	30-76-	Llyn Dinam	2.1	16	33	0	0	1
28	SH	432715	Capel Mawr	2.1	15	32	0	0	1
60	SH	5--3--	Llyn Ystumlllyn	2.1	14	29	0	0	0
96	SJ	24-13-	Guilsfield Arm	2.1	8	17	0	0	0
22	SH	435692	Malltraeth Marshes	2.0	24	47	0	0	1
67	SH	58-75-	Beaumaris Reservoir	2.0	18	36	0	0	0
	SO	123704	Black Pool	2.0	8	16	0	0	0
136	SN	569499	Falondale Lake	2.0	5	10	0	0	0
101	SM	811082	St Ishmael's	1.9	23	43	0	1	2
8	SH	304781	Dinam Fawr	1.9	25	48	0	0	3
43	SH	456726	Malltraeth Marshes	1.9	14	27	0	0	2
29	SH	436703	Malltraeth Marshes	1.9	20	38	0	0	0
13	SH	392762	Gwalchmai	1.8	18	32	0	0	2
135	SN	50-43-	High Mead	1.8	16	29	0	0	1
42	SH	455713	Malltraeth Marshes	1.8	12	22	0	0	1
35	SH	447715	Malltraeth Marshes	1.8	13	23	0	0	0
44	SH	458728	Malltraeth Marsh	1.8	12	21	0	0	0
6	SH	36-67-	Cwiningar Trefriw	1.8	6	11	0	0	0
113	SN	155106	East Ludchurch	1.8	6	11	0	0	0
174	SO	04-92-	Caersws-Aberhafes	1.8	5	9	0	0	0
202	SS	687941	Crymlyn Bog	1.7	22	37	0	0	1
199	SS	120989	The Burrows	1.7	10	17	0	0	0
131	SN	568152	Llyn Llech Owen	1.6	8	13	0	0	1
132	SN	561204	Dryslwyn	1.6	8	13	0	0	0
119	SN	293085	Laugharne Burrows	1.6	13	21	0	0	0
111	SN	117005	The Ritec	1.6	10	16	0	0	0
56	SH	47-81-	Cors Erddreiniog	1.6	37	58	0	0	2
48	SH	464737	Afon Cefni	1.6	16	25	0	0	0
20	SH	41-66-	Newborough Warren	1.5	25	38	0	0	0
204	SS	750916	Baglan Moors	1.5	24	37	0	0	0
91	SJ	175145	Upper Maen Farm	1.5	14	21	0	0	0
89	SJ	08-52-	Clawddnewydd	1.5	6	9	0	0	0
40	SH	453712	Malltraeth Marshes	1.4	14	20	0	0	0
112	SN	118004	Tenby	1.4	13	18	0	0	0
39	SH	452710	Malltraeth Marshes	1.3	14	18	0	0	0
21	SH	435690	Malltraeth Marshes	1.2	12	14	0	0	0
62	SH	515785	Pentraeth	1.1	7	8	0	0	0
15	SH	385944	Cemaes Bay	1.0	7	7	0	0	0

Ditches, borrow pits, oxbow pools, other pond and lake sites with rich vegetation and some exposed substratum, often with both species of *Noterus*. The best site, Mere Pool, was surveyed by a UWIST team in 1987 and yielded *Agabus labiatus* (Na - one of only two sites in Wales) and *Phytobius canaliculatus* (Na).

Group 4 00101 - 8 sites				SQS	NOS	WET	RDB	Na	Nb
141	SN	632332	Upper Talley Lake	3.7	12	44	1	0	1
186	SO	167965	Montgomery Canal 49	2.7	7	19	0	0	1
188	SO	194991	Montgomery Canal 43	2.7	7	19	0	0	0
187	SO	175972	Montgomery Canal 48	2.5	8	20	0	0	0
185	SO	163956	Montgomery Canal 50	2.4	7	17	0	0	0
85	SH	930350	Llyn Tegid	2.4	5	12	0	0	0
23	SH	435698	Malltraeth Marshes	2.2	18	40	0	0	0
95	SJ	265188	Parsons Bridge	2.2	6	13	0	0	0

These are canal and lake habitats dominated by *Haliphus* spp. *Donacia obscura* (RDB 2) was found at Upper Talley Lake by A.P. Fowles on 7 May 1987. The lake is one of only two Welsh sites away from Anglesey with a modern record for *Noterus crassicornis* (Nb).

Group 5 0011 - 3 sites				SQS	NOS	WET	RDB	Na	Nb
2	SH	263795	Trearddur Bay	4.2	6	25	0	1	4
201	SS	53-95-	Penclawdd	2.2	6	13	0	0	4
200	SS	49-92-	Llanrhidian	1.4	16	23	0	2	3

Tidal pools and saltmarshes with *Ochthebius* including *O. punctatus* (Na) at Trearddur Bay and Llanrhidian.

Group 6 010000 - 15 sites				SQS	NOS	WET	RDB	Na	Nb
169	SO	01-57-	Aberithon Turbary	3.4	7	24	0	1	1
77	SH	66-60-	Tal y Llyn Ogwen	3.2	5	16	0	0	1
168	SO	08-45-	Pentre-caeau	2.7	6	16	0	1	1
74	SH	619557	Llyn Glas	2.3	8	18	0	0	2
159	SN	85-10-	Coelbren	2.2	12	26	0	0	3
124	SN	451375	New Inn	2.2	10	22	0	0	2
173	SO	0--9--	Llyn Mawr	2.2	6	13	0	0	0
80	SH	66-70-	Coedydd Aber	1.7	17	28	0	0	2
104	SM	808314	Portheiddy Moor	1.7	10	17	0	0	2
164	SN	997554	Newbridge-on-Wye	1.7	13	22	0	0	1
166	SO	032453	Pen-y-garreg	1.6	26	25	0	0	1
58	SH	4--8--	Cors Nant-isaf	1.6	11	18	0	0	1
71	SH	662489	Blaenau Ffestiniog	1.2	5	6	0	0	0
125	SN	497352	Crug y Bedw Forest	1.1	11	12	0	0	0
172	SO	017593	Newbridge-on-Wye	1.0	8	8	0	0	0

Acid flushes and edges of upland lakes and acid pools. The group is characterised by *Hydroporus ferrugineus*, *H. longulus*, *Laccobius atratus*, *L. atrocephalus* and *Chaetarthria seminulum* (all Nb). *Donacia impressa* (Na) occurs at Aberithon (also *D. obscura* according to Shirt (1987)). Llyn Glas is the only modern site known for *Potamonectes griseostriatus* (Nb) in Wales. *Dryops striatellus* (Na) occurs at Pentre-caeau along with *Hydroglyphus geminus* (Nb) in its only Welsh locality away from the Caldicot Levels.

Group 7 010001 - 16 sites				SQS	NOS	WET	RDB	Na	Nb
194	SR	925950	Elegug Stacks	2.2	6	13	0	1	0
192	SR	887999	Broomhill Burrows	1.7	6	10	0	0	1
134	SN	574334	Afon Cothi	1.6	21	33	0	0	1
49	SH	469723	Pentre Berw	1.6	20	31	0	0	1
102	SM	899128	Haverfordwest	1.6	11	17	0	0	0
73	SH	615555	Cwm Glas	1.5	6	9	0	0	0
177	SO	14-48-	Llanbedr Hill	1.4	16	23	0	0	2
79	SH	665709	Aber	1.4	12	17	0	0	1
45	SH	459726	Malltraeth Marshes	1.4	14	20	0	0	0
38	SH	451706	Malltraeth Marshes	1.3	15	19	0	0	0
12	SH	377766	Gwalchmai	1.3	8	10	0	0	0
130	SN	498632	Hengwrt	1.3	7	9	0	0	0
197	SS	061976	Manorbier	1.2	10	12	0	0	0
71	SH	662489	Blaenau Ffestiniog	1.2	5	6	0	0	0
175	SO	188329	Talgarth	1.2	5	6	0	0	0
27	SH	438695	Malltraeth Marshes	1.1	12	13	0	0	0
99	SM	793262	Waun Caerfarchell	1.0	6	6	0	0	0

Temporary acid pools, some coastal and some on mountains. The pool near Elegug Stacks is the only known Welsh site for *Dryops similis* (Na). *Laccobius atrocephalus* (Nb) is the commonest Notable species.

Group 8 01001 - 16 sites				SQS	NOS	WET	RDB	Na	Nb
52	SH	490778	Cors-y-farl	2.6	35	91	1	0	3
158	SN	723847	Llyn Syfydrin	2.3	12	27	0	0	1
179	SO	19-48-	Rhosgoch Common	2.1	36	74	0	0	3
163	SN	96-25-	Traeth Mawr	2.0	24	47	0	0	4
70	SH	661488	Blaenau Ffestiniog	2.0	7	14	0	0	1
5	SH	304379	Cors Geirch	1.9	27	50	0	0	5
171	SO	015573	The Bog	1.9	18	34	0	0	1
183	SO	14-71-	Llanbister	1.7	21	35	0	0	3
53	SH	49-77-	Cors Bodeilio	1.7	22	38	0	0	1
54	SH	446885	Pen-y-graig-wen	1.7	10	17	0	0	0
51	SH	474706	Ynys Ferw Bach	1.5	44	64	0	0	3
190	SO	23-72-	Fountain Head	1.5	26	38	0	0	2
87	SH	976776	Gors Cottage	1.5	11	16	0	0	0
181	SO	18-66-	Rhiw Pool	1.3	21	28	0	0	0
88	SJ	016531	Clocaenog Forest	1.3	10	13	0	0	0
65	SH	578749	Cyffir Mawr	1.2	17	21	0	0	0

Mire systems dominated by species of mesotrophic or oligotrophic conditions such as *Enochrus* spp. and *Helochares punctatus* (Nb). The fauna of Cors-y-farl is similar to that of acid bogs developing on base-rich fens in East Anglia. *Hydrochus ignicollis* was found there by Warne (1976) but it could not be found again in 1985.

Group 9 01010 - 7 sites				SQS	NOS	WET	RDB	Na	Nb
118	SN	18-45-	Pentwd Marshes	2.7	9	24	0	0	0
205	SS	8--7--	Merthyr Mawr Warren	2.0	8	16	0	0	2
90	SJ	015784	Rhuddlan	1.8	8	14	0	0	2
47	SH	464727	Malltraeth Marshes	1.8	10	18	0	0	0
46	SH	460726	Malltraeth Marshes	1.5	16	24	0	0	1
41	SH	455715	Malltraeth Marshes	1.5	16	24	0	0	0
193	SR	895997	Castlemartin Corse	1.4	12	17	0	0	0

Temporary coastal pools with a limited fauna influenced by occasional brackish conditions, the most interesting species being *Berosus signaticollis* (Nb) at Merthyr Mawr, its only modern Welsh station, though with old records from the same coastal stretch.

Group 10 01011 - 11 sites		SQS	NOS	WET	RDB	Na	Nb
144	SN 63-55- Gwaun Garthenor	3.3	17	56	1	0	1
98	SM 770268 Dowrog Common	2.5	13	32	0	0	3
24	SH 436691 Malltraeth Marshes	2.2	13	28	0	0	2
198	SS 119985 Cors Penally	2.0	10	20	0	0	1
107	SM 911317 Western Cleddau	1.9	10	19	0	0	1
18	SH 4--6-- Newborough Warren	1.8	12	21	0	1	1
145	SN 670594 Gwaun Ystrad Caron	1.8	10	18	0	0	0
106	SM 895317 Llangloffan Fen	1.7	15	26	0	0	0
32	SH 439717 Malltraeth Marshes	1.6	14	22	0	0	1
110	SN 046348 Dyffryn Gwaun	1.2	11	13	0	0	1
31	SH 438717 Malltraeth Marshes	1.0	10	10	0	0	0

Temporary pools without brackish influence in old fen areas. The most recent Welsh record of *Hydroporus rufifrons* (RDB 2) is from Gwaun Garthenor. *Georissus crenulatus* (Na) is under-recorded and may be common in duneslack areas; there are several records for Newborough Warren. The shining female form of *Hydroporus memnonius* occurs at Western Cleddau and is considered to be a relict form in England and Wales. The matt form does not occur on Anglesey but dominates the population of the Welsh mainland.

Group 11 0110 - 31 sites		SQS	NOS	WET	RDB	Na	Nb
78	SH 673603 Gwern Gof Uchaf	3.3	8	26	0	0	2
146	SN 60-67- Llyn Eiddwen	3.1	16	49	0	0	4
157	SN 71-64- Cors Caron	3.1	16	50	0	0	1
108	SM 945375 Goodwick	3.0	5	15	0	0	1
156	SN 71-54- Figyn Blaen Brefi	3.0	9	27	0	0	1
137	SN 56-64- Cors Caranod	2.7	17	46	0	0	2
72	SH 665493 Blaenau Ffestiniog	2.6	5	13	0	1	0
151	SN 6--6-- Cors Caron	2.6	16	41	0	0	1
138	SN 59-63- Cors Llyn Farch	2.6	11	29	0	0	1
147	SN 65-64- Comin Esgair Maen	2.6	11	29	0	0	1
161	SN 85-75- Gors Lwyd	2.6	11	29	0	0	1
142	SN 677348 Cors Farlais	2.5	6	15	0	0	1
1	SH 263793 Trearddur Bay	2.5	14	35	0	0	0
16	SH 45-48- Cors Graianog	2.4	25	61	0	0	5
143	SN 61-52- Tyhir	2.4	16	39	0	0	2
129	SN 483502 Cors Gorsgoch	2.3	15	35	0	0	3
3	SH 217828 Holyhead Mountain	2.2	17	38	0	1	1
126	SN 41-49- Rhos Llawr-Cwrt	2.2	29	65	0	0	6
105	SM 887320 Mathry	2.2	27	59	0	0	2
59	SH 448911 Penysarn	2.1	16	33	0	0	0
153	SN 63-91- Cors Fochno	2.0	12	24	0	0	2
115	SN 143295 Waun Isaf	2.0	11	22	0	0	2
154	SN 67-95- Ynys Eidiol	1.9	14	26	0	0	2
139	SN 57-73- Rhis Rhydd	1.9	8	15	0	0	1
123	SN 354166 Beacon Bog	1.8	11	20	0	0	0
128	SN 47-48- Nant Cledlyn	1.7	19	33	0	0	2
114	SN 133295 Gors Fawr	1.7	11	19	0	0	0
76	SH 65-60- Llyn Ogwen	1.7	6	10	0	0	0
127	SN 47-48- Nant Cledlyn	1.6	15	24	0	0	0
66	SH 579750 Llandegfan Common	1.3	12	15	0	0	0
83	SH 71-71- Bwlch y Ddeufaen	1.0	6	6	0	0	0

Shallow acid mires, most of high quality. Many are valley mires with *Hydroporus longicornis* (Nb) and some have deep *Sphagnum* pools with *Ilybius aenescens*. The site includes several Welsh pingo systems (127, 128, 129, 142) none of which has a fauna approaching the quality of the Norfolk pingos. *Hydroporus obsoletus* (Na) occurred below Holyhead Mountain and at Blaenau Ffestiniog (72).

Group 12 0111 - 8 + 1 sites			SQS	NOS	WET	RDB	Na	Nb
81	SH	793585 Llyn-y-parc	4.5	11	49	1	1	3
75	SH	64-54- Llyn Teyrn	4.0	6	24	0	0	1
84	SH	75-76- Sychnant	3.8	5	19	0	0	2
	SO	041467 Pant-y-Llyn	3.6	7	25	0	0	1
167	SO	040466 Pant-y-Llyn	3.1	19	59	0	0	5
180	SO	015574 Aberithon Turbary	2.6	10	26	0	0	3
117	SN	11-34- Brynberian	2.6	9	23	0	0	3
4	SH	219824 South Stack	2.2	11	24	0	0	2
55	SH	467850 Mynydd Bodafon	2.0	16	32	0	0	1

Acid mires associated with deep pools and lakes. The best lake is Llyn-y-parc, in which *Dytiscus lapponicus* (Na) and *Donacia obscura* (RDB 2) have each been taken on at least two occasions. There are apparently other sites for *D. lapponicus* in Wales but the collector died without revealing the localities. Llyn Teyrn was misclassified into Group 3 on the basis of short list including *Noterus clavicornis*. This site is the only one in the survey with *Agabus arcticus* and is best considered alongside other upland lakes with boreal species. A UWIST survey of Pant-y-Llyn in 1987 produced only four species in common with B. van Vondel's list of 1988 (167) and also two unusual species, *Limnebius papposus* (Nb), normally a fen drain species, and *Limnius volckmari*, normally a stream species though found in upland pools in the Highlands. Nevertheless the site was classified into the same group and was ranked alongside the other survey list for the same site.

Group 13 10 - 15 sites			SQS	NOS	WET	RDB	Na	Nb
69	SH	64-48- Blaenau Ffestiniog	2.4	5	12	0	0	1
191	SO	34-64- River Lugg, Combe	2.3	17	38	0	1	1
162	SN	84-82- Tarenig	2.2	5	11	0	0	1
100	SM	797314 Aberreiddy	2.1	8	17	0	0	0
155	SN	7--5-- River Tywi	2.0	5	10	0	0	1
63	SH	562744 Afon Cadnant	1.8	12	21	0	0	1
189	SO	27-61- Womaston	1.7	13	22	0	0	1
61	SH	50-69- Afon Braint	1.7	6	10	0	0	0
14	SH	385916 Afon Wygyr	1.5	14	21	0	0	0
86	SH	96-58- near Llyn Bran	1.5	6	9	0	0	0
103	SM	899128 Haverfordwest	1.5	4	6	0	0	0
116	SN	153205 Llanfallteg	1.4	5	7	0	0	0
160	SN	835554 Irfon Brook	1.3	10	13	0	0	0
92	SJ	151707 Ysceifiog	1.2	11	13	0	0	0
50	SH	47-72- Afon Cefni	1.0	5	5	0	0	0

Smaller streams with a limited fauna. The rarest species is *Hydraena rufipes* (Na - 191).

Group 14 11 - 18 sites			SQS	NOS	WET	RDB	Na	Nb
178	SO 18-40-	River Wye, Glasbury	6.8	8	54	1	2	0
140	SN 5--7--	Afon Ystwyth	5.2	6	47	1	1	0
176	SO 180392	River Wye, Glasbury	4.6	5	23	1	0	0
152	SN 61-80-	Afon Rheidol	3.5	21	73	1	0	0
230	SN 527483	River Grannell	3.3	4	13	0	0	1
149	SN 684628	River Teifi	3.2	5	16	0	0	1
220	SS 3--8--	Caldicot Level	2.8	12	34	0	0	1
165	SN 95-71-	River Wye	2.5	8	20	0	1	0
148	SN 671656	River Camddwr	2.5	6	15	0	1	0
121	SN 251400	River Cych	2.2	5	10	0	1	0
133	SN 574334	Afon Cothi	2.1	15	32	0	1	0
120	SN 269195	Afon Cynin	1.9	7	13	0	0	0
182	SO 12-71-	Camddwr River	1.8	21	38	0	0	3
109	SN 070150	Narberth	1.8	8	14	0	0	0
82	SH 793628	River Conway	1.7	17	29	0	0	0
170	SO 011517	Cilmery	1.6	7	11	0	0	0
97	SJ 254218	Tanat Feeder	1.4	5	7	0	0	0
196	SS 015977	Freshwater	1.1	7	8	0	0	0

Main rivers with riffle areas, some rooted vegetation (sometimes tree roots only) and gravel banks. *Bidessus minutissimus* (RDB 3) has recently been recorded from the Wye (178), the Ystwyth (140) and the Rheidol (152). There is one other modern record (for the Dee) and older records for the Conway and Tywi. A short distance downstream at Glasbury (176) Ormerod (1985) found *Stenelmis canaliculata* (RDB 2) new for Wales. *Deronectes latus* (133, 148), *Helophorus arvernicus* (140, 178), *Hydraena rufipes* (165, 178) and *Helichus substriatus* (121) (all Na) are characteristic of western streams and rivers. There is only one modern Welsh record for *Hydraena minutissima* (Nb - 230).

Midlands

The area surveyed (Fig. 1) corresponds to the recording vice-counties of Cheshire, Staffordshire, Derbyshire and Nottinghamshire (58, 39, 57 and 56 respectively). These do not exactly conform to the present administrative counties.

Two hundred and eight species lists were analysed, all based on visits from 1970 onwards. These lists include 142 species identified to taxa recognised today. An exception is *Anacaena limbata* s.l., now divided into *A. limbata* s.s. and *A. lutescens*. Both of these species occur in the area but the change has been too recent to permit checking of all the records in the lists, hence the need to record the aggregate of two species.

Red Data Book Species

No Red Data Book species in categories 1 and 2 have ever been reliably recorded from the area. *Haliphus mucronatus*, *H. variegatus*, *Hydrochus "elongatus"* and *Hydrophilus piceus* (all RDB 3) were recorded in the 19th Century. Despite the present lack of RDB species the fauna is rich in Notable species.

Ordination

Eigen-values for all four axes were high. The first axis ran from running to stagnant water. Twenty of the first 25 species on axis 1 were running water indicators. Also within this section of the axis was *Scarodytes halensis*, a pioneer species characteristic of recently cleared drains on the East Anglian fens but in the Midlands extending its range by occupying natural rivers and streams. These running water species did not include *Haliphus fluviatilis* and *Laccophilus hyalinus*, species that are usually characteristic of slow-flowing canals and rivers. Species ordination on the second axis indicated a gradient from stagnant fen to water over exposed substrate, *H. fluviatilis* and *L. hyalinus* here being grouped with some running water species as well as the pioneer species *S. halensis* and *Hydroglyphus pusillus*. The third axis could not be interpreted but it was notable that three *Gyrinus* species occupied one extremity of the ordination, indicating a gradient based on oxygen supply, their larvae being gill-breathers. The *Gyrinus* species in question are, however, also associated with large, permanent water bodies. None of the ordinations resulted in groupings of shade-tolerant species and there was no clear separation of temporary water indicators such as *Helophorus* species.

Eigen-values for DECORANA

Axis 1	Axis 2	Axis 3	Axis 4
0.489	0.386	0.285	0.253

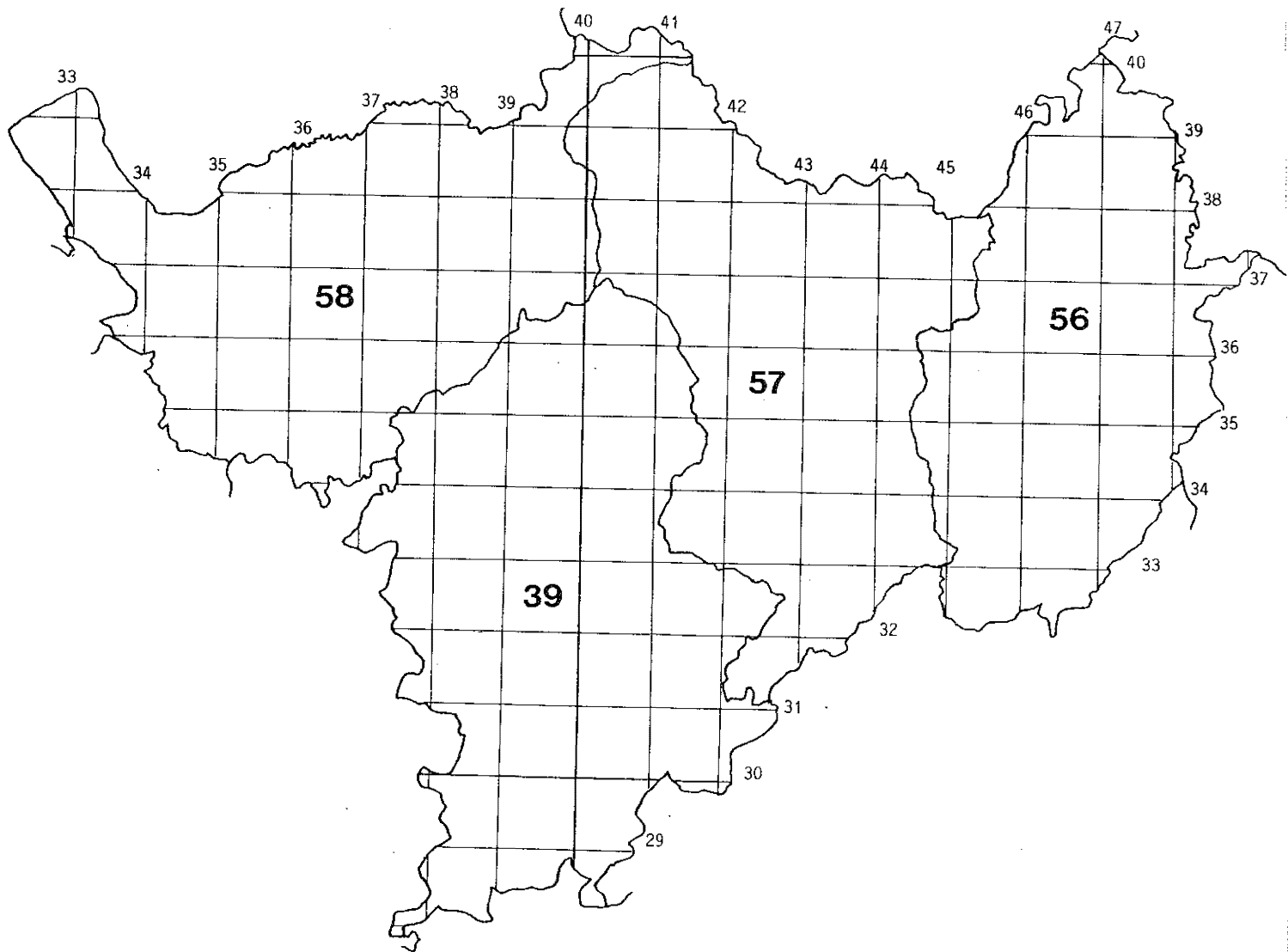


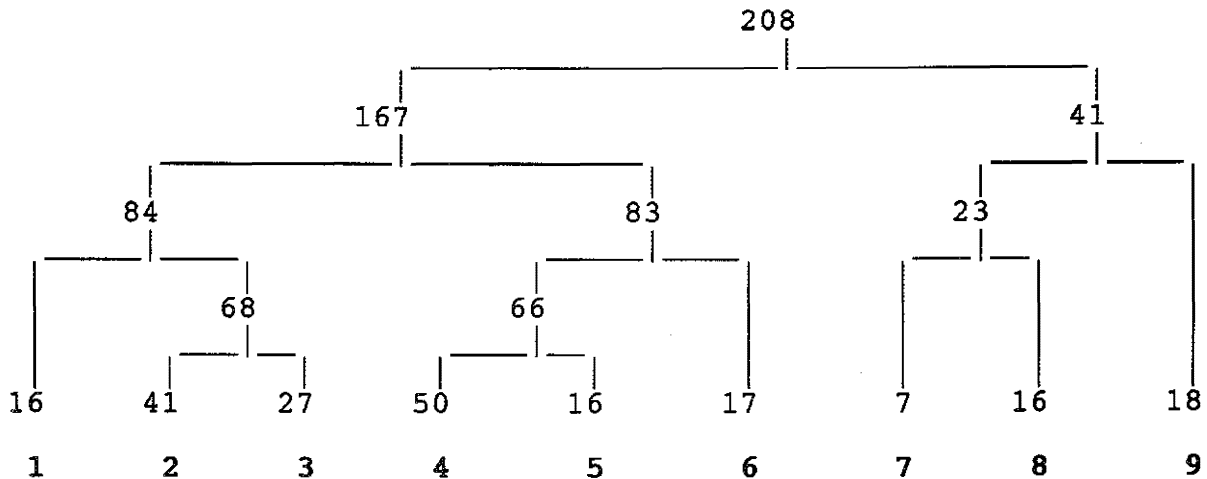
Figure 1. Survey area comprising the "Midlands". Vice-counties are Cheshire (58), Staffordshire (39), Derbyshire (57) and Nottinghamshire (56). Scale is provided by the 10 x 10 km squares of the National Grid.

Classification

Some of the lists were short and barely represented the extensive fauna undoubtedly present at many of the sites. Nevertheless the division into end-group assemblages that could be associated with certain habitat types proved straightforward though with some misclassifications. The dendrogram indicates one large group of 50 sites that should, with better data, be subdivided on the basis of shade and temporary status. The possibility of a clear split appears to be undermined by the fact that some woodland pools either are springfed or are associated with streams, the resulting presence of lotic water species "confusing" the classification. Thus the woodland sites supporting *Agabus melanarius* were not separated as one end-group as expected.

The area is characterised by the "meeting" of many northern and southern species at the respective extremities of their ranges. This has resulted in some unusual combinations within assemblages. Elmids appear to be rare in the main river systems, possibly because of present or past pollution.

TWINSPAN dendrogram for some Midland counties



General descriptions of habitats associated with water beetle assemblages in the Midlands.

- 1 permanent slow or stagnant open water
slow stretches of rivers, canals, meres, large ponds
- 2 permanent stagnant water, often acid ponds
- 3 richly vegetated stagnant water, often over marl or clay ponds
- 4 an assemblage dominated by temporary water species
puddles, marshes, reedbeds that dry out, shaded ponds sometimes
springfed or associated with streams
- 5 permanent stagnant water over bare substrate, possibly
enriched
gravel pits, quarry ponds
- 6 stagnant or slow water over peat
bog pools and some flushes
- 7 running, usually calcareous, water over clay or cobbles
lowland rivers and streams
- 8 running, usually base-poor, water over shingle
upland streams
- 9 temporary running water in flushes and ditches

Species frequency table for the Midlands

D = 20-40%; C = 41-60%; B = 61-80%; A > 80%.

	1	2	3	4	5	6	7	8	9
<i>Haliphus fluviatilis</i>	D								
<i>Haliphus immaculatus</i>		D							
<i>Laccobius bipunctatus</i>		C							
<i>Hyphydrus ovatus</i>	D	C							
<i>Hygrotus versicolor</i>	C								
<i>Haliphus flavicollis</i>	D								
<i>Haliphus ruficollis</i>		C	C						
<i>Laccophilus hyalinus</i>	D								
<i>Laccophilus minutus</i>	D	D	C		D				
<i>Potamonectes assimilis</i>	D								
<i>Hygrobia hermanni</i>			D						
<i>Noterus clavicornis</i>	D	C	D						
<i>Hygrotus inaequalis</i>		B	D						
<i>Hydroporus erythrocephalus</i>			D						
<i>Colymbetes fuscus</i>			C		B				
<i>Hydroporus palustris</i>	C	B	C	B	B	D			
<i>Agabus nebulosus</i>		D			D				
<i>Agabus sturmii</i>		C		D	C	D			
<i>Anacaena limbata s.l.</i>		D							
<i>Ilybius ater</i>					C				
<i>Hydrobius fuscipes</i>		C	D	C		C			
<i>Acilius sulcatus</i>			D		D				
<i>Hydroporus tessellatus</i>				D					
<i>Hydroporus morio</i>						D			
<i>Hydroporus obscurus</i>						D			
<i>Hydroporus tristis</i>						C			
<i>Helophorus aequalis</i>				C	D				
<i>Hydroporus incognitus</i>						D			
<i>Coelambus impressopunctatus</i>					D				
<i>Agabus bipustulatus</i>		B	C	B	B	A	C		D
<i>Hydroporus gyllenhalii</i>						B			
<i>Hydroporus planus</i>			D	C	C	C			D
<i>Gyrinus substriatus</i>					D	D			
<i>Hydroporus pubescens</i>				D		C			D
<i>Hydroporus melanarius</i>						D			
<i>Hydroporus nigrita</i>						D			
<i>Potamonectes elegans</i>	D							C	
<i>Stictotarsus 12-pustulatus</i>								D	
<i>Brychius elevatus</i>								D	
<i>Platambus maculatus</i>								B	D
<i>Scarodytes halensis</i>							D		
<i>Agabus didymus</i>							A	D	
<i>Agabus paludosus</i>							B	D	D
<i>Haliphus lineatocollis</i>							D	C	
<i>Ilybius fuliginosus</i>		D		D	D		A	C	
<i>Oreodytes sanmarkii</i>								D	D
<i>Agabus biguttatus</i>							B		
<i>Agabus guttatus</i>						D			B
<i>Agabus melanocornis</i>						D			
<i>Helophorus flavipes</i>						D			D
<i>Anacaena globulus</i>				D		B	D	D	A
<i>Hydroporus memnonius</i>						D			D
<i>Helophorus grandis</i>				D			D		D
<i>Limnebius truncatellus</i>				D					D
<i>Helophorus brevipalpis</i>	C	C	D	B			C	C	D

Groups and site scores for some Midland counties

Group 1 0000 - 16 sites	SQS	NOS	WET	Na	Nb
33 SJ 54-45- Quoisley Little Mere	3.6	8	29	1	1
32 SJ 546455 Quoisley Big Mere	2.9	7	20	0	1
202 SK 723980 Snow Sewer	2.8	8	22	0	0
181 SJ 512441 Nuthall	2.8	5	14	0	0
73 SJ 80-29- Cop Mere	2.8	5	14	0	0
28 SJ 40-70- Backford	2.6	5	13	0	0
82 SJ 83-81- Lindow Common	2.3	7	16	0	1
53 SJ 65561 R Weaver, Ways Green	2.3	7	16	0	0
56 SJ 6--6-- Trent and Mersey Canal	2.2	5	11	0	0
72 SJ 7--7-- Holford	2.1	7	15	0	0
155 SK 36-27 Swarkestone	2.0	14	28	0	1
138 SK 21-65- Conksbury Bridge	2.0	5	10	0	0
206 SK 8--5-- Newark	1.9	11	21	0	2
182 SJ 510656 New Houghton	1.8	10	18	0	0
170 SK 495278 R Soar, Kingston	1.3	4	10	0	0

The characteristic species of this assemblage are *Haliphus flavicollis* and *fluviatilis*, *Laccophilus hyalinus* and *minutus*, *Hygrotus versicolor* and *Potamonectes elegans*, all of which are associated with thin vegetation over bare substrate in deep, permanent water, either stagnant or slow-flowing. The Notable species are mainly characteristic of permanent, stagnant water (*Noterus crassicornis* Nb - 32, 33; *Ilybius fenestratus* Nb - 155, 173; *Gyrinus paykulli* (*bicolor*) Na - 33) but *Helophorus griseus* (Nb - 173, 206) is also found in temporary water in fen areas and *Hydroglyphus pusillus* (Nb - 206) is a pioneer species of which this is the only record in the survey.

Group 2 0010 - 41 sites				SQS	NOS	WET	Na	Nb
189	SK	792613	Cromwell	2.7	27	74	0	7
8	SJ	257853	Irby	2.7	24	65	0	1
10	SJ	25-88-	Saughall Massie	2.5	18	45	0	1
128	SK	25-27-	Egginton	2.5	8	29	0	0
180	SK	59-38-	Grantham Canal	2.5	6	15	0	0
141	SK	259614	Wensley	2.4	12	29	0	1
158	SK	388417	Morley Moor	2.3	29	67	0	3
204	SK	804457	Kilvington	2.3	10	23	0	2
36	SJ	569565	Spurstow Hall Farm	2.3	9	21	0	1
22	SJ	320804	Raby	2.3	6	14	0	1
84	SJ	90-24-	The Darling	2.2	21	46	0	1
162	SK	34-51-	Cromford Canal, Ambergate	2.2	9	20	0	0
19	SJ	37-54-	Capenhurst	2.2	5	11	0	0
42	SJ	557706	The Dead Lake	2.1	15	32	0	3
131	SK	25-31-	Hilton	2.1	20	41	0	1
167	SK	378668	Hockley	2.1	20	41	0	1
112	SK	17-61-	Long dale	2.0	7	7	0	1
68	SJ	72-60-	Ilse Pool, Elworth	2.0	9	9	0	0
142	SK	25-61-	Cambridge Wood	2.0	6	6	0	0
1	SJ	185878	Hilbre Island	1.9	13	25	0	2
15	SJ	25-90-	Moreton	1.9	14	27	0	0
16	SJ	280904	Bidston Marsh	1.9	14	27	0	0
4	SJ	23-84-	Caldy	1.9	12	23	0	0
146	SK	234757	Stoney Middleton	1.9	10	19	0	0
175	SK	44-74-	Polesbrook	1.8	12	21	0	0
201	SK	713959	North Carr	1.8	12	21	0	0
75	SJ	823474	Alsagers Bank	1.8	4	7	0	0
14	SJ	29-82-	Brimstage	1.7	11	19	0	1
126	SK	22-20-	Drakelow Wildfowl Reserve	1.7	24	40	0	0
184	SK	65-24-	Willoughby-on-the-Wolds	1.6	19	31	0	2
11	SJ	266886	Woodland Rd Park, Upton	1.6	8	13	0	0
185	SK	6--3--	Grantham Canal	1.6	5	8	0	0
172	SK	47-33-	Long Eaton	1.5	10	15	0	0
99	SK	00-88-	Watford Lodge, New Mills	1.5	6	8	0	0
127	SK	258286	Egginton	1.4	13	18	0	0
57	SJ	617796	Whitley	1.4	7	10	0	0
171	SK	46-31-	Sawley	1.3	16	21	0	0
135	SK	275593	Bonsall	1.2	11	13	0	0
78	SJ	889678	North Rode	1.2	6	7	0	0
34	SJ	558458	Marbury	1.1	7	8	0	0
9	SJ	25-88-	Greasby Brook	1.0	4	4	0	0

The commonest Notable species in this group are *Ilybius fenestratus* and *I. subaeneus* (both Nb), the presence of which indicates open water with rich vegetation. *I. fenestratus* is not considered capable of flight and in England it occurs in older artificial ponds and canals whereas *I. subaeneus* is a pioneer species. This group includes several old pond systems with a rich fen fauna. The only coastal brackish pond of the survey, on Hilbre Island (1), is included in this group as an under-represented assemblage with *Haliphus apicalis* (Nb) and *Dytiscus circumflexus* (Na).

Group 3 0011 - 27 sites					SQS	NOS	WET	Na	Nb
41	SJ	55-73-	Hatchmere		3.3	18	60	3	1
67	SJ	71-61-	Moston		3.2	5	16	0	0
18	SJ	31-76-	Ness woods		3.0	5	15	1	0
29	SJ	414701	Chester Zoo		3.0	9	27	0	2
47	SJ	678539	Wistaston		3.0	7	21	0	1
20	SJ	38-73-	Ellesmere Port		2.8	8	22	1	1
38	SJ	5767/8	Oak Mere		2.8	20	56	0	5
61	SJ	759476	Betley		2.6	8	21	0	2
13	SJ	29-80-	Thornton Hough		2.5	6	15	0	1
5	SJ	242858	Frankby Mere		2.2	9	20	0	2
21	SJ	31-80-	Raby		2.2	9	20	0	2
6	SJ	24-87-	Frankby		2.2	5	11	0	1
12	SJ	28-83-	Barnston		2.0	14	28	0	1
186	SK	61-69-	Budby South Forest		2.0	10	20	0	1
23	SJ	324805	Raby		2.0	4	8	0	1
64	SJ	733568	Crewe		2.0	8	10	0	0
58	SJ	650740	Northwich		2.0	5	10	0	0
71	SJ	732712	Shakerley Mere		2.0	4	8	0	0
80	SJ	835742	Chelford		1.8	5	9	0	0
37	SJ	58-56-	Haughton		1.7	7	12	0	0
26	SJ	452653	Christleton		1.6	5	8	0	0
7	SJ	253833	Dungeon Heswall		1.5	4	6	0	0
196	SK	797853	West Burton		1.4	9	13	0	1
114	SK	195605	Gratton Moor		1.4	19	27	0	0
111	SK	16-68-	Magpie Mine		1.2	7	8	0	0
104	SK	103492	Waterhouses		1.0	6	6	0	0
3	SJ	008870	Red Rocks		1.0	4	4	0	0

The ponds of this group range from shaded, natural meres to upland "dew ponds". These minerotrophic pools are characterised by the presence of the squeak beetle, *Hygrobia hermanni* (13, 29, 38, 41, 58, 67, 186, 196) and Notable species such as *Dytiscus circumcinctus* (Na - 18, 20, 41) and *Enochrus melanocephalus* (Nb - 6, 29, 186). The shaded pools also support *Hydaticus seminiger* (Nb - 29, 47, 61). The outstanding site, Hatchmere, has retained the "Atlantic" characteristic of an abundance of whirligig beetles including *Gyrinus aeratus* (Nb), *G. distinctus* (Na) and *G. paykulli* (Na).

This type of habitat is typically rich in species and many of the unshaded sites have been under-recorded.

Group 4 0100 - 50 sites		SQS	NOS	WET	Na	Nb
197 SK	798867 West Burton	2.5	14	35	1	1
200 SK	799871 West Burton	2.5	13	33	1	1
191 SK	792847 West Burton	2.3	18	42	0	2
205 SK	851556 Stapleford Wood	2.1	22	47	0	5
40 SJ	553729 near Hatchmere	2.1	7	15	0	2
161 SK	333519 Shining Cliff Woods	2.0	10	10	1	0
190 SK	72-77- Eaton Wood	2.0	9	9	0	1
208 SK	803857 West Burton	2.0	8	8	0	1
92 SK	005525 Coombes Valley	1.9	10	10	1	0
27 SJ	49-67- Duddon Brook, Tarvin	1.9	19	36	0	1
133 SK	257586 Blake Mere, Bonsall Moor	1.9	10	10	0	1
96 SK	02-28- Chartley Moss NNR	1.9	9	17	0	1
51 SJ	62-60- Wettenhall	1.9	8	15	0	0
136 SK	27-56- Via Gellia	1.7	21	35	0	1
157 SK	39-39- Breadsall Railway Cutting	1.7	11	19	0	1
109 SK	161514 Thorpe Pasture	1.7	7	12	0	1
198 SK	799855 West Burton	1.6	14	23	0	1
81 SJ	852575 Nether Alderley	1.6	5	8	0	0
169 SK	40-26- Donington Park	1.5	6	9	0	1
143 SK	261654 Rowsley Sidings	1.4	24	34	0	1
132 SK	25-46- Hulland Moss	1.4	11	15	0	0
194 SK	796853 West Burton	1.4	8	11	0	0
118 SK	19-73- Watershaw Rake	1.3	15	20	0	0
45 SJ	6--4-- Swanbach Mill	1.3	12	15	0	0
25 SJ	4--5-- Aldersey	1.3	12	15	0	0
89 SJ	97-71- Wildboardclough	1.3	11	14	0	0
178 SK	446813 Holbrook	1.3	11	14	0	0
17 SJ	30-83- Storeton	1.3	7	9	0	0
86 SJ	927657 Bosley	1.3	7	9	0	0
74 SJ	817480 Apedale	1.3	4	5	0	0
110 SK	156627 Blakemoor Pits	1.2	13	16	0	1
168 SK	373755 Brierley Wood	1.2	15	18	0	0
153 SK	292753 Ramsley Moor	1.2	15	18	0	0
60 SJ	7447/8 Betley	1.2	10	12	0	0
24 SJ	451565 Coddington	1.2	6	7	0	0
62 SJ	720565 Sydney	1.2	5	6	0	0
79 SJ	800718 Jodrell Bank	1.2	5	6	0	0
159 SK	309564 Cromford Canal	1.2	5	6	0	0
121 SK	100813 Perryfoot	1.1	15	17	0	0
116 SK	13-75- Monks Dale	1.1	14	15	0	0
144 SK	267617 Darley Bridge	1.1	8	9	0	0
59 SJ	767357 Ashley	1.1	7	8	0	0
106 SK	189456 Ashbourne	1.0	8	8	0	0
30 SJ	436747 Thornton Brook	1.0	6	6	0	0
91 SJ	933874 Ochrely Brook	1.0	6	6	0	0
117 SK	19-70- Thornbridge Hall	1.0	6	6	0	0
140 SK	226625 Harthill Moor	1.0	6	6	0	0
55 SJ	694667 Middlewich	1.0	5	5	0	0
77 SJ	823562 Rode Heath	1.0	4	4	0	0
108 SK	14-58- Biggin Dale	1.0	4	4	0	0

The Notable species of Group 4 are mainly *Agabus* species associated with temporary habitats:- *A. chalconatus* (Nb) unusually associated with fen ditches (191, 197, 200, 205), *A. melanarius* (Na - 92, 161), *A. uliginosus* (Na - 197, 200) and *A. unguicularis* (Nb - 40, 133).

Group 5 0101 - 16 sites		SQS	NOS	WET	Na	Nb
98 SK 04-72-	Grin Quarry	2.2	5	11	0	1
147 SK 266705	Emperor Lake	2.0	12	24	0	0
134 SK 26-57-	Bonsall	1.8	9	16	0	0
70 SJ 788658	Sandlow Green	1.8	5	9	0	0
88 SJ 92-70-	Sutton Reservoir	1.8	4	7	0	0
85 SJ 991528	Leek	1.7	6	10	0	0
50 SJ 610690	Whitegate	1.6	8	13	0	0
43 SJ 579760	Cliff Brook	1.6	5	8	0	0
123 SK 1--8--	Castleton	1.6	5	8	0	0
54 SJ 666699	Peakmill Brook	1.5	12	18	0	0
130 SK 249314	Hilton gravel pits	1.3	15	20	0	0
199 SK 799866	West Burton	1.2	13	16	0	0
49 SJ 6--5--	Rease Heath	1.2	10	12	0	0
76 SJ 813515	Bignall End	1.2	5	12	0	0
177 SK 41-38-	Hackenthorpe	1.2	9	11	0	0

The habitat range of this assemblage is similar to that of Group 1 but *Haliphus*, *Noterus*, *Laccophilus*, *Hygrotus* and *Potamonectes* spp. are almost absent and the fauna is dominated by larger species such as *Agabus bipustulatus*, *Ilybius ater* and *Colymbetes fuscus*. Where, as in some lakes in the Scottish Lowlands, we have historical evidence of a change from the Group 1 assemblage to Group 5, this has been associated with eutrophication, and possibly also industrial pollution. In the present case the impoverishment of the fauna may be associated with other factors such as altitude and remoteness. The only Notable species was *Stictonectes lepidus* (Nb - 98).

Group 6 011 - 17 sites		SQS	NOS	WET	Na	Nb
35 SJ 506596	Tattenshall	2.9	10	29	0	3
39 SJ 59-68-	Abbots Moss	2.7	7	19	0	1
95 SK 01-73-	Goyt Valley	2.4	7	17	0	1
97 SK 032448	Hawksmoor Reserve	2.2	10	22	1	1
151 SK 289724	Leash Fen	2.2	19	42	0	1
166 SK 334666	Stone Edge	2.2	19	42	0	1
48 SJ 69-50-	Wybunbury Moss	2.1	12	25	0	2
44 SJ 556273	Flax Mere	2.1	11	23	0	1
103 SK 0--9--	Snake Road	1.9	8	15	0	0
93 SK 009651	Goldsitch Moss	1.8	9	16	0	1
2 SJ 29-78-	Neston	1.8	5	9	0	1
125 SK 13-91-	Alport Dale	1.7	14	24	0	0
122 SK 11-87-	Edale	1.7	6	8	0	0
148 SK 275739	Bar Brook	1.6	14	22	0	1
176 SK 49-78-	Crabtree Wood	1.6	9	14	0	1
152 SK 289779	Bucka Big Moor	1.5	8	12	0	0
164 SK 3062/4	Matlock Moor	1.3	14	18	0	0

The present grouping is a continuum from mesotrophic fens with *Hygrotus decoratus* (Nb - 35), *Ilybius guttiger* (Nb - 35, 39, 48) and *Enochrus coarctatus* (Nb - 2, 35, 48) to peat pool complexes with *I. aenescens* (Nb - 93, 166) and *E. affinis* (Nb - 44). It also includes a few spring-fed areas with *Hydroporus ferrugineus* (Nb - 95, 97) and *Agabus melanarius* (Na - 97) and other peat flushes and streams supporting *Stictonectes lepidus* (Nb - 148, 151, 176). Leash Fen (151) is of interest in supporting both *S. lepidus* and *Agabus didymus*, an unusual combination also found in Group 8 of south-west England and Group 17 of the Weald, there characteristic of peaty streams that dry out in summer.

Group 7 100 - 7 sites			SQS	NOS	WET	Na	Nb
156	SK 380363	Chaddesden Bridge	4.3	4	13	0	2
65	SJ 735565	Fowle Brook	3.5	4	14	0	1
69	SJ 725647	Sandersons Brook	3.0	5	15	0	1
63	SJ 721573	Fowle Brook	2.4	8	19	0	1
66	SJ 755568	Daisy Bank Brook	2.2	6	13	0	1
187	SK 747433	Car Dyke	2.1	15	32	0	2
160	SK 334576	Lea Hall	1.7	6	10	0	0

This is a group of base-rich streams most of which support *Agabus biguttatus* (Nb - 63, 65, 66, 69, 156). *Haliphus laminatus* (Nb - 187) and *Scarodytes halensis* (Nb - 156, 187) occurred in a few sites. Group 7 is a specialised form of the main river assemblage of Group 8.

Group 8 101 - 16 sites			SQS	NOS	WET	Na	Nb
163	SK 37-55-	Wingfield Manor	2.4	8	19	0	1
188	SK 725523	Halloughton Dumble	2.3	9	21	0	2
129	SK 25-29-	Hilton	2.3	4	9	0	1
52	SJ 655625	Ash Brook	2.2	11	24	0	1
31	SJ 449711	R Gowy, Trafford Bridge	2.0	4	8	0	0
149	SK 277740	Bar Brook	1.9	11	21	0	1
105	SK 105345	River Dove	1.8	19	35	0	1
90	SJ 98-71-	Wildboarclough	1.8	4	7	0	1
203	SK 802457	Kilvington	1.8	6	11	0	0
139	SK 21-65-	River Lathkill	1.8	5	9	0	0
192	SK 792866	West Burton	1.8	4	7	0	0
150	SK 27-75-	Bar Brook, Baslow	1.7	6	8	0	1
179	SK 556265	Kingstone Bridge	1.7	6	8	0	0
195	SK 797847	West Burton	1.6	11	17	0	1
46	SJ 651536	R Weaver, Nantwich	1.4	7	10	0	0
101	SK 008958	R Etherow, Wooley Bridge	1.3	6	8	0	0

The Notable species are *Stictonectes lepidus* (Nb - 52, 149, 150), *Oreodytes davisii* (163), *Helophorus arvernensis* (Nb - 90, 105, 129) and *Hydraena nigrita* (Nb - 163).

Group 9 11 - 18 sites			SQS	NOS	WET	Na	Nb
102	SK 0--9--	Snake Inn	4.8	4	19	0	2
87	SJ 96-68-	Wildboarclough	2.6	7	18	0	1
183	SK 519789	Whitwell Wood	1.9	11	21	0	1
174	SK 42-76-	The Breck	1.7	11	19	0	2
193	SK 793862	West Burton	1.7	12	20	0	1
107	SK 13-54-	River Dove, Mill Dale	1.7	7	12	0	0
207	SK 801852	West Burton	1.6	10	16	0	1
120	SK 1--7--	R Wye near Millers Dale	1.5	6	9	0	1
165	SK 30-68-	Hipper Sick	1.5	15	23	0	0
119	SK 1--7--	Wormhill Springs	1.5	4	6	0	0
137	SK 20-66-	River Lathkill	1.5	4	6	0	0
100	SK 040895	Hollingworth Clough	1.4	7	10	0	0
145	SK 293681	Harland Sick	1.3	9	15	0	0
124	SK 11-99-	Black Clough	1.3	4	5	0	0
154	SK 258803	Burbage Brook	1.2	6	7	0	0
113	SK 18-65-	Lathkill Dale	1.1	10	11	0	0
115	SK 13-73-	Monks Dale	1.1	7	8	0	0
94	SK 01-72-	Upper Goyt Valley	1.0	4	4	0	0

These shallow running water assemblages, mainly of flushes and ditches, are characterised by ubiquitous species such as *Helophorus* spp., *Anacaena globulus*, *Limnebius truncatellus* and *Elmis aenea*. Notable species are mainly as in Groups 7 and 8 - *Scarodytes halensis* (Nb - 193), *Agabus biguttatus* (Nb - 87, 102, 183) and *Hydraena nigrita* (Nb - 174), but with *Stictonectes lepidus* being absent and with the addition of *Agabus chalconatus* (Nb - 193, 207) and *Ochthebius bicolon* (Nb - 120).

Lincolnshire & northern East Anglia

The area surveyed (Fig. 2) corresponds to the recording vice-counties of North and South Lincolnshire, Huntingdonshire, Cambridgeshire, West and East Norfolk (54, 53, 31, 29, 28 and 27 respectively), plus small parts of Northamptonshire (32) lying in the 100 Km grid squares TF and TL. These roughly correspond to the modern administrative counties of Lincolnshire, Cambridgeshire and Norfolk. 544 species lists were analysed. Some date back to 1966 but the majority were based on visits from 1977 onwards. David Bilton provided a large number of lists from Lincolnshire in 1985 and more than 300 lists were derived from a survey in 1986 and 1987. These lists include 231 species. The *Anacaena limbata* complex of *limbata* s.s. and *lutescens* was treated as one for the purposes of analysis.

Red Data Book Species

The area is unusual within Britain in supporting many Red Data Book species. Some are found in a range of habitats, e.g. *Agabus undulatus* in stagnant water and *Oulimnius major* in large water bodies. Such species generate high scores for sites in several end-groups but their status as RDB species is not in doubt. The RDB status of other species, e.g. *Helophorus dorsalis*, has been questioned. On the other hand the presence of some Na species, e.g. *Hydaticus transversalis*, *Dytiscus dimidiatus*, even if neither endangered nor vulnerable, should accord a site the same status as RDB 3 species. A few boreal species are relict in East Anglia. Some rate Nb status, e.g. *Hydroporus longicornis* (Scarning Fen) and others have no national status, e.g. *H. morio* (Dersingham Bog only), *H. obscurus* and *Agabus congener*.

Category 1 - *Haliphus furcatus*, *Bidessus unistriatus*.

Category 2 - *Hydroporus rufifrons*, *H. scalesianus*, *Agabus striolatus*, *A. undulatus*, *Hydraena palustris*, *Stenelmis canaliculata*.

Category 3 - *Haliphus mucronatus*, *H. variegatus*, *Hydroporus elongatulus*, *H. glabriusculus*, *Graptodytes bilineatus*, *Graphoderus cinereus*, *Hydrochus brevis*, *H. carinatus*, *H. elongatus*, *H. ignicollis*, *H. megaphallus*, *Helophorus dorsalis*, *H. longitarsis*, *Cercyon bifenestratus*, *Helochares obscurus*, *Enochrus isotae*, *Hydrophilus piceus*, *Dryops anglicanus*, *D. griseus*, *Oulimnius major*.

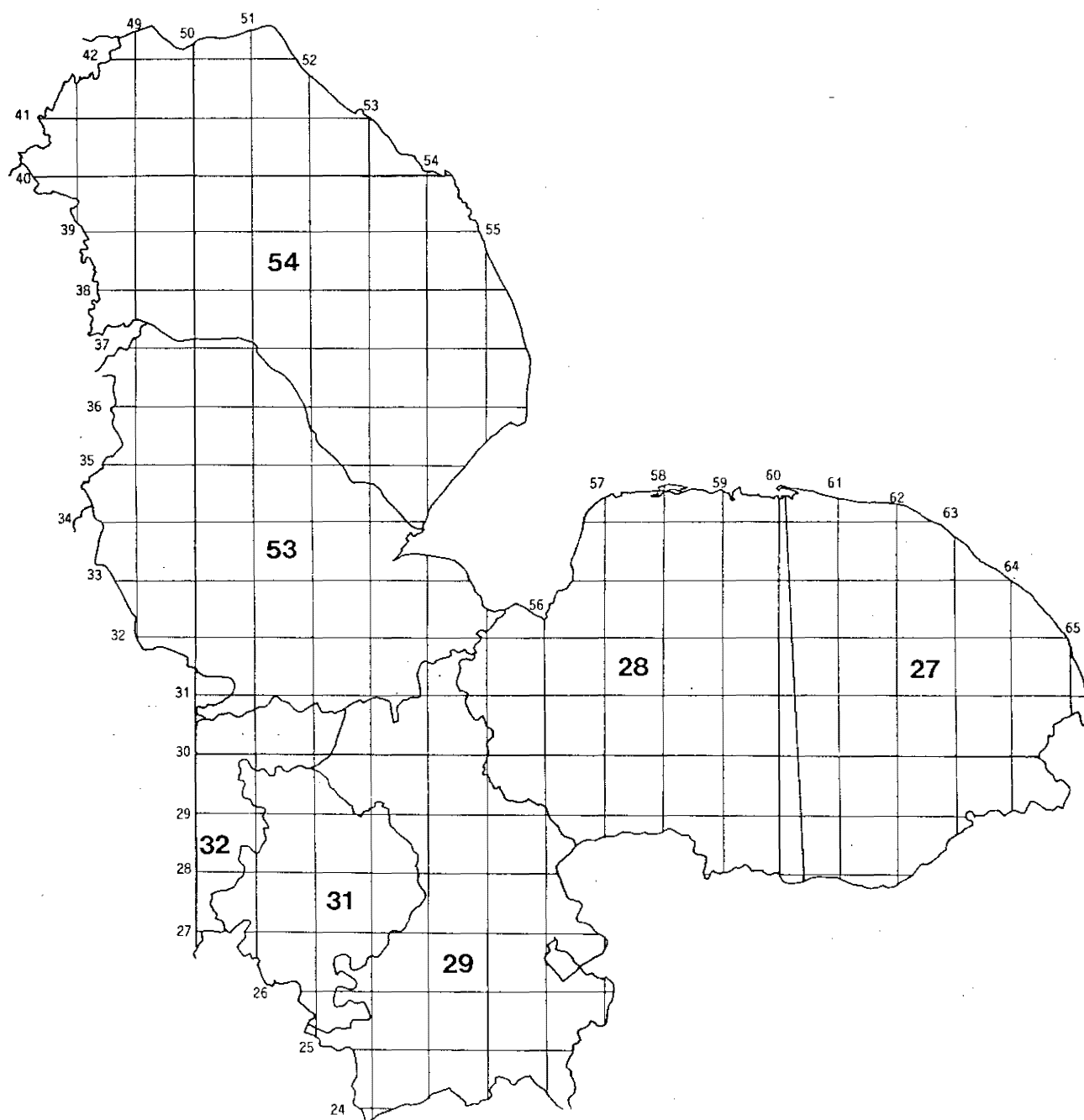


Figure 2. Survey area comprising Lincolnshire and northern East Anglia. Vice-counties are East Norfolk (27), West Norfolk (28), Cambridgeshire (29), Huntingdonshire (31), Northamptonshire (part - 32), South Lincolnshire (53), North Lincolnshire (54). Scale is provided by the 10 x 10 km squares of the National Grid.

Ordination

Eigen-values were higher with than without downweighting. Without downweighting axis 1 ran from running water species (elmids, *Oreodytes septentrionalis*, *Orectochilus villosus*, *Brychius elevatus*, *Platambus maculatus*) at one extreme to acid water species, some rare phytophagous species (*Plateumaris braccata*, *Donacia thalassina*, *Phytobius comari*) and a few temporary water species (*Haliphus furcatus*, *Hydroporus rufifrons*) at the other. Axis 2 ran from halophil species to species of permanent, base-rich water (*Haliphus laminatus*, *H. lineolatus*, *H. obliquus*, *Dytiscus dimidiatus*). The third axis ran from acid water species (including those of shaded streams) to species of permanent, brackish water.

Axes 1 and 3 with downweighting had the same type of ordination as without. Axis 2 ran from shallow running water species (not elmids) to species of permanent, slow-running water.

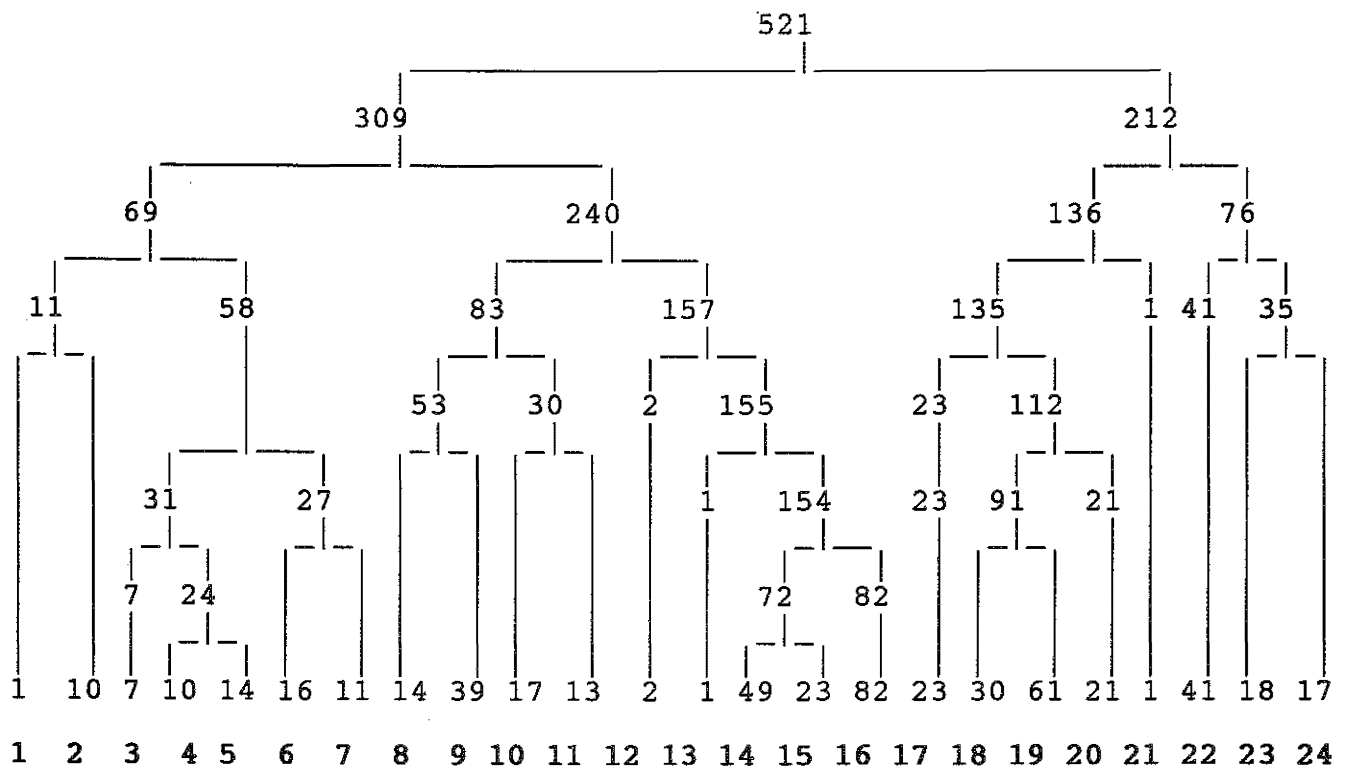
Eigen-values for DECORANA of 547 species lists

	Axis 1	Axis 2	Axis 3	Axis 4
Without downweighting	0.441	0.307	0.242	0.165
With downweighting	0.326	0.218	0.136	0.112

Classification

Analysis was originally based on 544 lists of five or more species. This failed to produce interpretable classification of some ditch and pond assemblages. Such problems can arise when very limited species lists are in use or when *Helophorus brevipalpis* features as an indicator species. *H. brevipalpis* is one of the commonest British insects in flight and frequently, but randomly, occurs in habitats other than temporarily flooded mud on which it breeds. With omission of this species and retention of the five species limit analysis was repeated on 521 lists involving 229 species and obtained a more satisfactory classification to level 8. For example, the only cliff seepage pools list and lists from two brackish creeks were separately split from the central major grouping of ditches and ponds. Also TWINSPAN "recognised" the best pingo and Broadland fen carr communities as one end-group subdivided from the species-rich but less natural degraded pingos, meres, marl ponds and Broadland swamps.

TWINSpan dendrogram for Lincolnshire and northern East Anglia



Summary of habitat characteristics for water beetle assemblages in Lincolnshire and northern East Anglia

No.	Number in group	Habitat type(s)
1	1	special stream assemblage
2	10	ditches and puddles
3	7	acid ponds
4	10	muddy areas with temporary water
5	14	shaded, temporary pools and puddles
6	16	muddy areas mostly with brackish influence
7	11	open meadow pools, mainly coastal
8	14	temporary pools in rushes, sedge fen or fen carr
9	39	rich ponds with part open substratum, part with dense emergent vegetation, some associated with acid flushes
10	17	slightly degraded fens relative to Group 11
11	13	the richest and most natural fens
12	2	brackish creeks
13	1	cliff pools
14	49	small streams and muddy areas in ditches and ponds
15	23	poor quality ponds, mostly brackish
16	82	fluctuating margins of slower, managed ditches or ditches that dry out
17	23	richest of artificial stagnant and slow water
18	30	open quarry ponds and sluggish streams
19	61	IDB drains, some with occasional brackish water
20	21	large permanent, open water pools and ditches on fen peat or litter
21	1	new brackish pond
22	41	large drains and canalised rivers
23	18	small, open streams
24	17	limestone rivers

Species frequency table for Lincolnshire and northern East Anglia. D = 21-40%, C = 41-60%, B = 61-80%, A > 80%. Entries in lower case indicate groups with less than five sites.

Hydroporus nigrita	D	D		D		D			
Chaetarthria seminulum				D		C		a	
Hydraena riparia	a			D	C	A			D
Suphrodytes dorsalis		D			C	C			
Cercyon convexiusculus				D	D	D	B		
Enochrus isotae					B	C			
Hygrotus decoratus					B	C			
Hydroporus glabriusculus						D			
Hydroporus scalesianus						D			
Laccornis oblongus						C			
Agabus labiatus					D	D			
Agabus unguicularis					D	B			
Ilybius guttatus					D	A			
Rhantus frontalis					B				
Hydaticus seminiger					D	C			
Dytiscus semisulcatus						C			
Hydrochus brevis					D	C			
Hydrochus carinatus					D	D			
Hydrochus ignicollis						D			
Helophorus granularis						D			
Helophorus nanus					C	D			
Helophorus strigifrons						B			
Cercyon sternalis					C	D			
Helochares obscurus						D			
Enochrus ochropterus						D			
Enochrus quadripunctatus					B	D			
Hydraena palustris					D	D			
Limnebius aluta						D			
Dryops anglicanus						D			
Dryops griseus						D	D		
Hydroporus neglectus		D		B		D	D		
Hydroporus striola				D	D	B	B		
Hydroporus umbrosus				C		C	C		
Agabus striolatus				D		D			
Agabus uliginosus						D	D		
Coelostoma orbiculare						C			
Cercyon tristis						D			
Hydraena britteni						D			
Agabus congener				D					
Helophorus flavipes				D					
Hydroporus gyllenhalii		A		B		B			
Hydroporus melanarius		D							
Hydroporus tristis		C		D		C			
Agabus melanocornis		D		D		D	D		
Acilius canaliculatus		D							
Helochares punctatus		C				D			
Enochrus affinis		D							
Hydroporus memnonius		D	C	B	D	B	C	D	A
Hydroporus angustatus						D	B	B	A
Copelatus haemorrhoidalis						D	D	C	A
Enochrus coerctatus							C	D	
Cymbiodyta marginella						C	C	B	B
Coelambus impressopunctatus				C		D	A	A	
Rhantus exsoletus						C	B		D
Acilius sulcatus		D					D		

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
<i>Noterus crassicornis</i>										D	B													
<i>Rhantus grapii</i>										C	C						D							
<i>Hydaticus transversalis</i>											D													
<i>Hydraena testacea</i>											C													
<i>Cercyon ustulatus</i>											D													
<i>Enochrus testaceus</i>										D	A	B					D	C						
<i>Hydroporus incognitus</i>			B					C			C													
<i>Hydroporus pubescens</i>			A	B		C	C	C	D	D	B						D							
<i>Agabus chalconatus</i>			C								D													
<i>Hydraena nigrita</i>	a																							
<i>Agabus sturmii</i>			C		C			C	C	C	A			D		D	C	D		D				
<i>Ilybius quadriguttatus</i>					D				D	D	B						B							
<i>Haliphus mucronatus</i>																					a			
<i>Coelambus parallelogrammus</i>																					a			
<i>Dytiscus marginalis</i>		D									B						C							
<i>Enochrus bicolor</i>												a												
<i>Heterocerus obsoletus</i>												c												
<i>Ochthebius viridis</i>												c												
<i>Graptodytes granularis</i>								D	D	C	B						D							
<i>Haliphus fulvus</i>											D						D							
<i>Hydroporus erythrocephalus</i>			D					D	D	B	A					B		D						
<i>Agabus undulatus</i>										D	D													
<i>Rhantus suturalis</i>											D													
<i>Berosus luridus</i>											D													
<i>Noterus clavicornis</i>									D	B	B						D	C		D				
<i>Hygrobia hermanni</i>											D						D							
<i>Hydroporus planus</i>			C	C	C	D	C	A		C	B	A			D	B		A		D				
<i>Hydroporus tessellatus</i>	a		D	C	C	C	D	D			C				C	D	D	C						
<i>Agabus bipustulatus</i>			C	A	B	B	C	A	B	B	A	A			B	C	C	A	D	C	C			
<i>Ochthebius dilatatus</i>												c	a											
<i>Ilybius ater</i>									D	C	A						C			D				
<i>Colymbetes fuscus</i>					D		C	D	C	B	A				D	D	A	D	D	D				
<i>Helophorus griseus</i>											C										a			
<i>Anacaena limbata s.l.</i>		D	D		D	C		A	B	B	A			D			C	C		C				
<i>Laccobius bipunctatus</i>									A	C	A			D		D	B	B		D			D	
<i>Limnebius papposus</i>					C				D	B	C					D	D	D						
<i>Porhydrus lineatus</i>										C	C									D				
<i>Helophorus minutus</i>								D		C	C						D							
<i>Agabus nebulosus</i>						C				D	D										a			
<i>Helophorus obscurus</i>	a		C					D		D	C													
<i>Helophorus aequalis</i>								D			D													
<i>Helophorus grandis</i>		A					D				C						D							
<i>Ochthebius minimus</i>					B		C	B	A	A	c				C	D	B	D	C		D	D		
<i>Limnebius nitidus</i>																	D							
<i>Anacaena globulus</i>		B	B	C	A	D	D	C	B	C	A			B	D	C	B	C					C	
<i>Agabus biguttatus</i>	a																							
<i>Hydrobius fuscipes</i>		C	C		D	A	B	B	C	A	A					C	B	C	D	D				
<i>Helophorus fulgidicollis</i>																					a			
<i>Ochthebius marinus</i>											a													
<i>Haliphus wehnckei</i>										D							D	D						
<i>Hygrotis inaequalis</i>							D		C	A	A	c				C	A	A	B	B		D		
<i>Laccobius biguttatus</i>										C							C	C	C					
<i>Dryops luridus</i>																	D	D						
<i>Hydroporus palustris</i>			C	D	D	A	B	D	B	A	A			B	B	A	A	B	B	B		C	D	
<i>Haliphus ruficollis</i>			D						C	A	A			D	D	B	A	C	B	B		C	D	
<i>Gyrinus substriatus</i>			D				D			C					D		C			D				
<i>Laccobius sinuatus</i>										D		a					D							
<i>Haliphus lineatocollis</i>			D	B	D				D	B	c			B	B	B	A	B	A	C		C	B	A
<i>Scarodytes halensis</i>																	D						D	

Group 3 000100 - 7 sites				SQS	NOS	WET	RDB	Na	Nb
426	SK	868984	Brazier's Pond	3.9	14	55	0	1	2
427	SK	86-98-	Armstrong's Pond	3.3	17	56	0	1	0
423	SK	831969	Laughton Common	2.6	25	66	0	0	6
517	TF	68-21-	Roydon Common	2.3	27	70	0	0	3
23	TF	683297	Dersingham Bog	2.1	11	23	0	0	2
113	TF	686224	Roydon Common	1.6	10	16	0	0	1
114	TF	665286	Sandringham Warren	1.2	6	7	0	0	0

Acid ponds on sand with acidophil species such as *Enochrus affinis* (Nb - 423, 426). *Acilius canaliculatus* (Na) occurred in Brazier's Pond and Armstrong's Pond (part of a LSHNTC Reserve).

Group 4 0001010 - 10 sites				SQS	NOS	WET	RDB	Na	Nb
263	TF	125013	Castor	1.3	6	8	0	0	0
232	TL	216799	Walton Hill	1.2	6	7	0	0	0
158	TL	101953	Water Newton	1.2	5	6	0	0	0
185	TL	174872	Ermine Lodge	1.1	7	8	0	0	0
233	TL	238817	Great Raveley	1.1	7	8	0	0	0
175	TF	547002	Upwell Fen	1.0	10	10	0	0	0
182	TL	197881	Holme	1.0	7	7	0	0	0
250	TF	451038	Waldersea House	1.0	7	7	0	0	0
292	TF	315052	Corner Farm	1.0	6	6	0	0	0
276	TL	202809	Monks Wood	1.0	5	5	0	0	0

Poor quality ditches and dry mud occasionally receiving water.

Group 5 0001011 - 14 sites				SQS	NOS	WET	RDB	Na	Nb
546	TG	31-16-	Hoveton Great Broad	2.6	5	13	0	0	0
303	TL	231840	Woodwalton Fen	2.2	5	11	0	0	1
589	TL	219975	Drysides Gullet	1.6	7	11	0	0	1
269	TL	423873	Hollyhouse Farm	1.5	12	18	0	0	0
481	TF	10-68-	Potterhanworth Fen	1.5	8	12	0	0	0
599	TL	45-47-	Thriplow Meadows	1.4	12	17	0	0	1
55	TF	045232	Grimsthorpe	1.4	11	15	0	0	1
255	TL	492920	Cranmore Lots	1.4	10	14	0	0	0
228	TF	160013	Bretton	1.3	9	12	0	0	1
278	TL	243848	Ramsey Heights	1.2	6	7	0	0	0
428	SK	85-98-	Scotton Common	1.1	11	12	0	0	0
542	TG	17-21-	Buxton Heath	1.1	9	10	0	0	0
307	TL	240880	Herne Common	1.0	6	6	0	0	0
301	TL	233843	Woodwalton Fen	1.0	5	5	0	0	0

Poor quality, temporary, shaded pools and puddles, often in otherwise rich fen areas.

Group 6 000110 - 16 sites				SQS	NOS	WET	RDB	Na	Nb
109	TF	598211	Clenchwarton	2.2	17	38	1	0	2
576	TL	04-99-	Bedford Purlieus	1.9	16	30	1	0	1
412	SK	803871	West Burton	2.9	10	29	0	1	1
474	TF	126128	Langtoft Fen	2.6	10	26	0	0	3
89	TF	371170	Leedsgate Bridge	1.9	8	15	0	0	3
644	TM	36-99-	Chedgrave	1.7	7	12	0	0	1
165	TF	256036	Causeway Farm	1.7	6	10	0	0	1
464	TF	086427	Willoughby	1.6	11	17	0	0	1
295	TF	353040	Grange Farm	1.6	9	14	0	0	1
294	TF	338035	Thorney Toll	1.6	8	13	0	0	1
170	TL	330983	Kingsland	1.5	13	20	0	0	2
156	TF	248137	Crowland Falls	1.4	10	14	0	0	2
215	TF	503007	Three Holes	1.4	10	14	0	0	1
106	TF	562197	Terrington St. Clements	1.4	7	10	0	0	1
510	TF	564605	Skegness	1.4	12	17	0	0	0
580	TL	16-82-	Aversley Wood	1.2	15	18	0	0	0

Muddy areas of ditches, often with a few brackish water species. Clenchwarton supported *Graptodytes bilineatus* (RDB 3) and Bedford Purlieus had *Helophorus dorsalis* (RDB 3).

Group 7 000111 - 11 sites				SQS	NOS	WET	RDB	Na	Nb
434	SK	90-79-	Till Bridge Lane	1.9	23	44	1	0	2
305	TL	232846	Woodwalton Fen	3.1	8	25	0	1	0
530	TF	83-31-	Wicken Pond	2.3	7	16	0	1	0
446	SE	90-24-	Whitton	1.7	23	40	0	0	5
522	TF	699437	Holme next the Sea	1.6	8	13	0	0	1
410	SK	801870	West Burton	1.4	16	23	0	0	1
251	TF	447030	Waldersea Hall	1.3	14	18	0	0	1
176	TF	579033	Wash Farm	1.3	12	15	0	0	0
424	SK	842976	Laughton	1.2	16	19	0	0	0
289	TL	289992	Nene Washes	1.2	6	7	0	0	0
411	SK	802857	West Burton	1.1	7	8	0	0	0
Open meadow pools, the best with <i>Haliphus mucronatus</i> (RDB 3).									

Group 8 00100 - 14 sites				SQS	NOS	WET	RDB	Na	Nb
554	TG	325245	Smallburgh Fen	5.8	21	122	2	2	1
559	TG	381235	Sutton Broad	5.9	12	71	2	0	2
548	TG	331173	Woodbastwick	6.0	8	48	1	0	1
560	TG	3--2--	Barton Broad	4.3	19	82	1	1	3
612	TL	5--7--	Wicken Fen	3.7	22	82	1	2	4
647	SE	77-03-	Epworth Turbary	3.6	36	129	1	1	7
518	TF	68-29-	Dersingham Bog	3.5	29	102	2	0	7
551	TG	36-18-	Ludham	3.4	7	24	0	1	1
646	SE	757037	Epworth Turbary	2.6	23	59	0	0	5
425	SK	84-99-	Laughton Meres	2.3	21	48	0	1	3
429	SK	86-99-	Scotton Common	2.3	15	34	0	0	1
10	TF	195110	Stargate Farm	2.0	10	20	0	1	1
535	TF	992102	Lolly Moor	1.9	13	25	0	1	0
574	TG	494202	Winterton Dunes	1.6	19	30	0	0	1

A series of temporary sedge fen and fen carr habitats, a high proportion of which support RDB species (RDB 2 *Hydroporus rufifrons* at 647; *H. scalesianus* at 559; *Agabus striolatus* at 548, 554, 560. RDB 3 *Hydrochus brevis* at 559; *Cercyon bifeneistratus* at 518; *Enochrus isotae* at 518; *Dryops anglicanus* at 554, 612).

This group includes Dersingham Bog, the only East Anglian site for the boreal species *Hydroporus morio*.

Group 9 00101 - 39 sites					SQS	NOS	WET	RDB	Na	Nb
635	TL	90-95-	Tottington Hall	STA	4.4	25	109	2	1	5
549	TG	34-16-	Woodbastwick		4.4	13	57	1	0	1
300	TL	234847	Woodwalton Fen		3.1	19	59	1	1	1
556	TG	340269	Honing Common		3.0	22	65	1	0	3
153	TF	162137	Sixscore Farm		2.5	23	58	1	0	5
171	TF	261097	Empsons Farm		2.4	20	48	1	1	1
533	TF	944017	Caudlesprings		2.4	30	71	1	0	5
629	TL	89-95-	"Reed Fen"	STA	3.3	26	86	0	3	4
179	TL	212882	Holme Fen		2.5	19	48	0	2	2
633	TL	94-84-	Bridgham		2.5	8	20	0	1	1
572	TG	46-23-	Horsey		2.5	35	86	0	2	5
553	TG	395134	Upton Broad Fen		2.4	10	24	0	0	2
536	TF	982123	Scarning Fen		2.3	16	37	0	0	2
433	SK	944685	Swanholme Lakes		2.3	22	50	0	0	2
177	TL	198892	Holme Fen		2.1	15	32	0	0	4
473	TF	194034	Norwood Farm		2.0	16	32	0	1	2
33	TG	129191	Thurby Fen		2.0	23	45	0	0	5
20	TF	227137	Eldreths Farm		2.0	16	32	0	0	4
487	TF	22-63-	Moor Farm		1.9	40	77	0	0	5
526	TF	522290	Anmer Minque		1.9	13	25	0	0	2
550	TG	35-15-	Ranworth Broad		1.9	15	28	0	0	1
538	TG	08-37-	Holt Lowes		1.8	31	55	0	0	6
21	TF	220188	Poplar Farm		1.8	18	32	0	0	2
200	TF	436042	Jew House Farm		1.7	15	25	0	1	1
467	TF	073755	Langworth		1.7	21	35	0	0	4
463	TF	086427	Willoughby		1.7	20	34	0	0	3
304	TL	232845	Woodwalton Fen		1.7	13	22	0	0	1
22	TF	698157	East Winch Farm		1.7	10	17	0	0	1
460	TF	08-07-	Tallington		1.7	12	20	0	0	1
201	TL	198894	Holme Fen		1.6	16	25	0	0	2
190	TL	167970	Orton Mere		1.6	11	18	0	0	2
514	TF	557750	Wolla Bank		1.6	14	23	0	0	0
422	SK	88-84-	Stow		1.5	32	49	0	0	2
627	TL	887952	Sturston STA		1.5	11	16	0	0	1
454	TA	01-23-	Barton Far Ings		1.5	11	16	0	0	1
154	TF	163138	Sixscore Farm		1.4	18	25	0	0	1
543	TG	10-39-	Selbrigg Pond		1.4	11	15	0	0	0
408	SK	800866	West Burton		1.3	10	13	0	0	0
296	TL	183911	Hod Fen		1.1	7	8	0	0	0

Ponds and ditches with open substrates and patches of dense emergent vegetation, some associated with acid pools and flushes in old fen areas. RDB species are:- RDB 2 *Hydroporus elongatulus* at 635, *Agabus striolatus* at 548, *A. undulatus* at 171; RDB 3 *Hydrochus carinatus* at 300, *H. ignicollis* at 153, *Enochrus isotae* at 533 and 635. Scarning Fen is the only known East Anglian site for *Hydroporus longicornis* (Nb). Several of the ponds in this and the following group lie in the Stanford Training Area (STA).

Group 10 00110 - 17 sites					SQS	NOS	WET	RDB	Na	Nb
626	TL	884952	Sturston STA		5.9	45	264	7	1	8
633	TL	98-86-	East Harling		5.1	65	329	7	5	16
620	TL	861923	Bagmore Pit STA		4.6	68	314	7	4	14
621	TL	863963	Robin's Lodge STA		4.9	27	131	4	0	7
525	TF	730175	Lamb's & Gayton Thorpe		3.8	61	232	3	2	17
638	TL	94-93-	Great Hockham		3.9	36	142	3	2	5
631	TL	90-88-	Ringmere		4.5	34	154	2	2	9
641	TM	04-91-	Old Buckenham Fen		3.6	35	126	2	2	7
624	TL	871959	Hopton Point STA		2.8	35	98	2	2	4
622	TL	87-95-	Warren Marsh STA		3.1	35	108	2	0	6
519	TF	650335	Snettisham Beach		3.5	37	130	1	4	8
618	TL	878892	Fowlmere		2.8	34	95	1	2	3
625	TL	883952	Sturston STA		2.8	36	99	1	1	6
608	TL	579688	Little Fen		2.4	37	89	1	0	8
630	TL	898955	Tottington Hall STA		2.5	17	43	0	1	4
567	TG	4--2--	Hickling		2.4	38	90	0	2	7
575	TG	42-21-	Hickling		1.9	36	69	0	1	7

Group 10 sites appear to represent a degraded form of Group 11 sites, with pingo pools in pasture, ancient marling ponds, fluctuating meres and some extensive reedbed systems. These rich fen sites are characterised by a slightly depleted and modified relict fen fauna.

RDB species are:- RDB 1 *Bidessus unistriatus* at 626; RDB 2 *Hydroporus elongatulus* at 638, *H. scalesianus* at 620, *Graptodytes bilineatus* at 519, *Agabus undulatus* at 608, 620, 622, 626, *Hydraena palustris* at 620, 621, 633, 641; RDB 3 *Hydroporus elongatulus* at 638, *H. glabriusculus* at 525, 633, 626, *Hydrochus brevis* at 620, 633, 638, 641, *H. carinatus* at 525, 620, 621, 624, 626, 633, *H. ignicollis* at 626, *Enochrus isotae* at 525, 618, 620, 621, 622, 624, 625, 626, 631, 633, *Dryops anglicanus* at 620, *D. griseus* at 621, 626, 631 and 633.

Group 11 00111 - 13 sites	SQS	NOS	WET	RDB	Na	Nb
637 TL 93-96- Thompson Common	5.5	97	533	11	8	20
524 TF 73-16- East Walton Common	5.3	92	483	11	5	22
558 TG 36-21- Catfield Great Fen	4.9	92	447	10	7	19
523 TF 76-00- Foulton Common	4.8	81	389	9	3	20
588 TL 2--8-- Woodwalton Fen	3.6	100	361	6	6	28
566 TG 404213 Myhills Marsh	4.0	47	189	4	0	9
587 TL 24-84- Ramsey Heights	2.7	60	160	4	1	13
547 TG 33-16- Woodbastwick	3.5	41	145	2	1	9
611 TL 5--7-- Wicken Fen brick pits	2.8	51	143	2	2	7
557 TG 345255 Dilham Broad Fen	2.4	32	76	2	0	3
639 TM 04-79- Lopham Fen	2.8	58	163	1	3	8
615 TL 64-69- Chippenham Fen	2.5	49	125	1	1	9
565 TG 42-18- Potter Heigham	1.6	36	59	0	0	2

This group includes the most important relict fen sites in Britain, some of which are important internationally. They occur in Breckland pingo systems, the Broads and the "Cambridgeshire" fens. They include the last known sites for species now considered extinct in Britain (*Graphoderus bilineatus* at Catfield Great Fen and *Rhantus aberratus* at Potter Heigham).

RDB species are:- RDB 1 *Hydrochus furcatus* at 524, *Bidessus unistriatus* at 558; RDB 2 *Hydroporus scalesianus* at 524, 558, 566, 637, *Agabus striolatus* at 547, 558, 566, *A. undulatus* at 523, 588, 611, 637, *Hydraena palustris* at 524, 558, 611; RDB 3 *Haliphus mucronatus* at 524, 588, *H. variegatus* at 523, *Hydroporus elongatulus* at 637, *H. glabriusculus* at 523, 524, 637, *Graphoderus cinereus* at 558, *Hydrochus brevis* at 523, 524, 547, 557, 558, 566, 637, *H. carinatus* at 523, 524, 587, 588, 637, *H. elongatus* at 587, 588, *H. ignicollis* at 524, 558, 637, *H. megaphallus* [a newly described species recently split from the RDB 3 *H. brevis*] at 558, 639, *Helophorus longitarsis* at 557 (only known East Anglian site), *Helochares obscurus* at 587, 588, 566, 637, *Enochrus isotae* at 523, 524, 558, 587, 588, 615, 637, *Dryops angicanus* at 523, 524, 558, 637, *D. griseus* at 523, 524, 637. Catfield Great Fen and Thompson Common are the only known sites in East Anglia for *Gyrinus suffriani* (Na, possibly more appropriately RDB 3).

Group 12 0100 - 2 sites	SQS	NOS	WET	RDB	Na	Nb
157 TF 4--2-- Gedney Drove End	2.0	6	12	0	0	3
139 TF 461302 Gedney Drove End	1.6	5	8	0	0	2

Tidal creeks with *Enochrus bicolor* and *Ochthebius* spp.

Group 13 01010 - 1 site	SQS	NOS	WET	RDB	Na	Nb
544 TG 25-40- Overstrands	2.8	5	14	0	0	1

Only example of fauna of landslip pools, with a few species associated with mud (*Ochthebius dilatatus*) or running water (*Hydroporus discretus*), or both (*Laccobius sinuatus*).

Group 14 0101100 - 49 sites				SQS	NOS	WET	RDB	Na	Nb
204	TL	249919	Farceett Fen	3.3	8	26	1	0	1
420	SK	87-83-	Willingham	1.9	23	44	1	0	1
5	TF	137149	Langtoft Fen	2.6	12	31	0	0	3
606	TL	520590	Little Wilbraham Fen	2.3	15	34	0	1	1
47	TF	126282	Car Dyke	2.2	13	28	0	0	3
162	TL	146882	Caldecote	2.0	10	20	0	0	2
161	TL	122882	Billing Brook	2.0	6	12	0	0	2
645	SE	73-02-	Epworth Turbary	2.0	8	16	0	0	1
414	SK	805856	West Burton	1.8	16	29	0	0	1
230	TF	155036	Marholm Crossing	1.8	14	25	0	0	1
461	TF	0--4--	Sleaford	1.8	12	21	0	0	1
159	TL	119907	Billing Brook	1.8	5	9	0	0	1
528	TF	866280	Tatterford Common	1.7	13	22	0	0	1
39	TF	110114	Greatford Cut	1.7	12	20	0	0	1
407	SK	89-71-	North Harby	1.6	21	33	0	0	3
77	TF	108343	Billingborough	1.6	10	16	0	0	1
520	TF	650336	Wolferton Creek	1.6	7	27	0	0	1
468	TF	07-75-	Barlings	1.5	20	30	0	0	1
130	TF	613114	Watlington	1.5	19	28	0	0	1
404	SK	86-66-	Eagle Hall	1.5	14	21	0	0	1
26	TF	645146	Setchley	1.5	14	21	0	0	1
136	TF	439130	Fitton End	1.5	11	16	0	0	1
183	TL	201893	Holme Fen lake	1.5	8	12	0	0	1
46	TF	075267	Glebe Farm	1.5	10	15	0	0	0
281	TF	160086	North Fen	1.5	8	12	0	0	0
415	SK	806854	West Burton	1.4	10	14	0	0	0
453	TA	011228	Barton Blow Well	1.4	8	11	0	0	0
417	SK	85-83-	Marton	1.4	7	10	0	0	0
118	TF	690219	Roydon	1.3	7	9	0	0	0
137	TF	437133	Fitton End	1.2	6	7	0	0	1
18	TF	302183	Moulton Chapel	1.2	6	7	0	0	0
148	TF	327230	Moulton	1.2	6	7	0	0	0
262	TL	129985	Castor	1.2	6	7	0	0	0
240	TL	382967	West Fen Farm	1.2	5	6	0	0	0
241	TL	103866	Hemington House	1.2	5	6	0	0	0
229	TF	150024	Marholm	1.1	9	10	0	0	0
252	TF	413006	Guy's Moor	1.1	9	10	0	0	0
199	TF	477080	Oxburgh Hall	1.1	8	9	0	0	0
243	TL	120801	Winwick	1.1	7	8	0	0	0
279	TL	243849	Ramsey Heights	1.0	9	9	0	0	0
231	TF	138048	Woodcroft Castle	1.0	8	8	0	0	0
254	TL	420914	Nixhall Farm	1.0	8	8	0	0	0
208	TF	533041	Outwell	1.0	7	7	0	0	0
465	TF	08-52-	Dorrington	1.0	6	6	0	0	0
598	TL	312815	Pingle Wood	1.0	6	6	0	0	0
261	TL	330840	Tick Fen	1.0	6	6	0	0	0
43	TF	072177	Toft	1.0	6	6	0	0	0
116	TF	675254	Whalley Farm	1.0	5	5	0	0	0
247	TL	527977	Neatmoor Hall Farm	1.0	5	5	0	0	0

Small streams and recently cleared muddy areas in ditches or ponds often with *Scarodytes halensis*, *Agabus chalconatus* or *Laccobius sinuatus* (all Nb). *Agabus biguttatus* (Nb) was abundant at 461. *Ilybius fenestratus* (Nb) occurred in the Holme Fen lake (26). RDB species were *Agabus undulatus* (RDB 2) at 204 and *Haliphus mucronatus* (RDB 3) at 420.

Group 15 0101101 - 23 sites				SQS	NOS	WET	RDB	Na	Nb
529	TF	825326	Syderstone	2.0	8	16	0	0	1
604	TL	439869	Byall Farm	2.0	6	12	0	0	2
449	SE	948212	Sandhills Quarry	1.7	7	12	0	0	2
486	TF	22-62-	Kirby Moor	1.6	11	18	0	0	1
506	TF	442968	Donna Nook	1.5	15	22	0	0	4
447	SE	93-23-	Winteringham	1.4	8	11	0	0	1
413	SK	804871	West Burton	1.3	13	17	0	0	1
448	SE	94-22-	Humber Bank	1.3	6	8	0	0	1
140	TF	450398	Oldershaw Farm	1.2	5	6	0	0	1
147	TF	348278	Little Common	1.2	5	6	0	0	1
451	SE	982208	Old River Ancholme	1.2	6	7	0	0	0
108	TF	511225	Wingland Grange	1.1	13	14	0	0	2
274	TL	354835	Warboys High Fen	1.1	11	12	0	0	0
181	TL	199861	Conington Fen	1.1	7	8	0	0	0
172	TF	327089	New South Eau	1.0	9	9	0	0	0
291	TF	314052	Corner Farm	1.0	9	9	0	0	0
418	SK	86-83-	Sandebus Farm	1.0	6	6	0	0	0
173	TF	383078	Parsons Drove	1.0	6	6	0	0	0
195	TL	224949	Kings Delph Farm	1.0	6	6	0	0	0
259	TL	456884	Newghant Farm	1.0	6	6	0	0	0
260	TL	400819	Stocking Farm	1.0	6	6	0	0	0
288	TL	281995	Nene Washes	1.0	6	6	0	0	0
151	TF	359387	Frampton Marsh	1.0	5	5	0	0	0
Poor quality ponds and ditches, many brackish.									

Group 16 010111 - 82 sites				SQS	NOS	WET	RDB	Na	Nb
84	TF	125168	River Glen borrow pits	2.7	9	24	1	0	0
163	TL	273986	Nene Washes	2.1	15	32	1	0	0
104	TF	297109	Dowsdale Bank	2.4	13	31	0	1	2
95	TF	387164	Cole House	2.2	6	13	0	0	2
93	TF	417208	Old Gate	2.0	14	28	0	1	2
209	TF	511060	Hollyend	2.0	14	28	0	0	3
101	TF	488263	Guy's Head	1.9	7	13	0	1	1
184	TL	201893	Holme Lode Farm	1.9	14	26	0	0	2
86	TF	189236	Pinchbeck South Fen	1.9	19	36	0	0	1
87	TF	391119	North Level Main Drain	1.9	8	15	0	0	1
28	TF	298143	Moulton East Fen	1.8	19	34	0	1	4
212	TF	553087	Marshland Fen	1.8	16	28	0	1	3
112	TF	552149	Aylmer Hall	1.7	9	15	0	0	2
123	TF	497156	Walpole St. Peter	1.7	7	12	0	0	2
80	TF	175379	Helpringham Fen	1.7	13	22	0	0	1
505	TF	43-89-	Saltfleetby	1.7	15	20	0	0	1
53	TF	142229	Dyke Fen	1.6	19	31	0	0	2
91	TF	427186	Parsonage Farm	1.6	11	18	0	0	2
210	TF	524085	Rands Drain	1.6	12	19	0	0	2
545	TG	33-06-	Strumpshaw Marsh	1.6	9	14	0	0	1
6	TF	128191	Bourne South Fen	1.6	7	11	0	0	1
144	TF	346212	Barrington House	1.6	5	8	0	0	1
90	TF	408152	Oak Tree Farm	1.6	8	13	0	0	0
138	TF	401119	Blacklane Farm	1.5	19	29	0	0	2
66	TF	222282	Gosberton Cheal	1.5	15	23	0	0	2
96	TF	281369	Sutterton	1.5	8	12	0	0	1
122	TF	543158	White House Farm	1.5	6	9	0	0	1
166	TF	245003	Poplar Farm	1.5	8	12	0	0	1
169	TF	273071	Hangman's Corner	1.5	6	9	0	0	1
54	TF	118207	Bourne North Fen	1.5	11	16	0	0	0
194	TF	149128	Elm Farm	1.4	18	26	0	0	1
117	TF	700229	Reydon	1.4	11	15	0	0	1
483	TF	200079	Borough Fen	1.4	10	14	0	0	1
103	TF	344326	Hare & Hounds	1.4	9	13	0	0	1

				SQS	NOS	WET	RDB	Na	Nb
146	TF	201390	Bicker Fen	1.4	9	13	0	0	1
234	TL	194888	Denton Fen	1.4	12	17	0	0	0
248	TL	179985	Thorpe Meadows	1.4	13	18	0	0	0
249	TL	177985	Thorpe Meadows	1.4	8	11	0	0	0
594	TL	39-40-	Earith	1.4	8	11	0	0	0
188	TL	208881	Holme	1.3	13	17	0	0	1
99	TF	326384	Frampton	1.3	12	15	0	0	1
174	TF	382068	Hiptoft Farm	1.3	10	13	0	0	1
34	TF	191216	Pinchbeck Common	1.3	16	20	0	0	0
186	TL	229879	New Decoy Farm	1.3	12	15	0	0	0
302	TL	233842	Woodwalton Fen	1.3	10	13	0	0	0
124	TF	668179	Middleton	1.3	6	8	0	0	0
115	TF	635246	North Wootton	1.2	12	14	0	0	0
167	TF	233058	Flood Farm	1.2	10	12	0	0	0
119	TF	627220	Kings Lynn	1.2	9	11	0	0	0
168	TF	285060	Morris fen	1.2	6	7	0	0	0
67	TF	269295	Surfleet	1.2	6	7	0	0	0
297	TF	237849	Lotting Fen	1.2	6	7	0	0	0
94	TF	490109	Walton Highway	1.2	5	6	0	0	0
19	TF	213149	Deeping St. Nicholas	1.1	9	10	0	0	1
68	TF	238242	Spalding	1.1	12	13	0	0	0
110	TF	594132	Fritton Hall	1.1	10	11	0	0	0
266	TL	565949	Hilgay Fen	1.1	10	11	0	0	0
207	TL	290865	Stocking Fen	1.1	9	10	0	0	0
92	TF	432197	South Holland	1.1	8	9	0	0	0
132	TF	573172	Tilney All Saints	1.1	7	8	0	0	0
267	TL	542936	Suspension Bridge	1.0	12	12	0	0	0
452	TA	00-13-	Worlaby	1.0	11	11	0	0	0
285	TL	224996	Flag Fen	1.0	10	10	0	0	0
192	TL	482802	Burnt Hill	1.0	9	9	0	0	0
271	TL	372910	Ranson Moor	1.0	9	9	0	0	0
290	TL	284991	Nene Washes	1.0	8	8	0	0	0
245	TL	482970	Christchurch	1.0	8	8	0	0	0
246	TL	495954	Upwell Fen	1.0	8	8	0	0	0
97	TF	280376	Fishmere End	1.0	8	8	0	0	0
129	TF	615175	Kings Lynn	1.0	7	7	0	0	0
223	TL	513882	Headfen	1.0	7	7	0	0	0
299	TL	235850	Lotting Fen	1.0	6	6	0	0	0
272	TL	373897	Dyke Moor	1.0	6	6	0	0	0
286	TL	277987	Nene Washes	1.0	6	6	0	0	0
193	TL	481802	Burnt Hill	1.0	6	6	0	0	0
25	TF	639145	Setchley	1.0	6	6	0	0	0
121	TF	352142	The Poplars	1.0	6	6	0	0	0
27	TF	287143	Moulton West Fen	1.0	5	5	0	0	0
131	TF	655117	Wormegay	1.0	5	5	0	0	0
133	TF	538148	Terrington St. John	1.0	5	5	0	0	0
142	TF	413127	Gorefield	1.0	5	5	0	0	0
239	TF	370968	West Fen	1.0	5	5	0	0	0

A community associated with the fluctuating margins of slower, regularly maintained drains or smaller ditches that dry out. *Agabus undulatus* (RDB 2) occurred at 84 and 163.

Group 17 01100 - 23 + 1 sites					SQS	NOS	WET	RDB	Na	Nb
607	TL	55-65-	Reach*		2.8	37	104	3	0	6
36	TF	159136	Cross Drain		2.8	55	152	2	0	10
552	TG	398135	Upton Marsh		3.0	62	183	2	3	13
579	TL	1--7--	Monks Wood*		2.5	49	123	2	1	8
436	SK	94-74-	Burton		2.9	23	67	1	0	5
152	TF	158139	Cross Drain		2.7	25	68	1	0	1
613	TL	5--7--	Wicken Fen		2.5	51	128	1	1	9
563	TG	40-13-	Upton Marsh		2.5	32	81	1	2	2
501	TF	49-61-	Old River Lymn		2.1	35	74	1	0	1
507	TF	55-58-	Gibraltar Point		1.9	46	87	1	2	10
609	TL	5--6--	Quy Fen*		2.4	41	98	0	0	7
700	TF	159136	Cross Drain		2.3	28	65	0	0	4
597	TL	38-76-	Earith		2.3	21	48	0	0	2
472	TF	118016	Castor Hanglands*		2.1	31	64	0	0	2
610	TL	5--6--	Quy Fen*		2.0	28	57	0	0	4
79	TF	161390	Helpingham Fen		1.9	22	42	0	0	3
51	TF	133245	Hacconby Fen		1.9	23	43	0	0	2
437	SK	90-85-	Turpin Farm		1.8	55	101	0	0	5
636	TL	92-91-	Brickkiln Covert		1.8	27	48	0	0	5
435	SK	90-79-	Till Bridge Lane		1.8	38	67	0	0	3
564	TG	423188	Potter Heigham		1.8	35	63	0	0	4
500	TF	48-61-	Old River Lymn		1.7	35	61	0	0	2
600	TL	4--5--	Cambridge Rifle Butts*		1.6	27	43	0	0	5
83	TF	190312	Cow Bridge		1.5	21	32	0	0	0

This community is the richest associated with artificial or recently disturbed habitats, main drains in grazing fen, old gravel pits, old coprolite pits (Quy Fen), decoy ponds, brick pits, rifle butts, disused sections of rivers now canalized, and coastal lagoons. Several sites in this end-group have not been examined since the early 1970's (*) and may have deteriorated. The requirement appears to be deep, base-rich water with rich emergent vegetation. The group includes the best grazing fen in Norfolk (Upton Marsh) with several large species of beetle (four spp. of *Dytiscus* and *Hydrophilus piceus*) and the Cross Drain, an Internal Drainage Board (IDB) drain running through arable land but probably maintained in quality by groundwater rising at the edge of the remaining peatland of Deeping Fen. It should be noted that the Cross Drain's SQS was lower after mechanical cutting in 1986 (152) than three weeks before (36), lower again in 1987 (700) and, when revisited in 1988 after deepening to receive River Welland water for irrigation was classified (476) into Group 18. RDB species are:- RDB 2 *Agabus undulatus* in the Cross Drain (36, 152) and Wicken Fen 613; RDB 3 *Haliphus mucronatus* at 507, 607, *H. variegatus* at 607, *Hydrochus brevis* at 552, *H. carinatus* at 436, 579, *H. elongatus* at 607, *H. ignicollis* at 36, *Helophorus dorsalis* at 579, *Hydrophilus piceus* at Upton Marsh (552, 563), *Oulimnius major* at 501. Monks Wood (579) is the only modern site for *Ochthebius pusillus* (Na) in the survey area.

Group 18 0110100 - 30 sites					SQS	NOS	WET	RDB	Na	Nb
590	TL	223902	Whittlesey Mere		3.4	12	41	1	0	1
205	TL	249919	Farcett Fen		2.8	17	47	1	0	3
216	TL	431819	Mepal Fen		2.1	22	45	1	0	3
484	TF	214028	Dogsthorpe		2.8	25	71	1	2	10
584	TL	1--9--	Orton Mere		2.9	27	77	1	2	5
508	TF	501615	Old River Lymn		2.2	19	42	1	0	1
603	TL	4--8--	South Forty Foot Drain		2.1	27	57	1	0	3
643	TM	22-92-	Fritton Ponds		2.7	19	71	0	0	4
515	TF	52-86-	Sandilands		2.6	18	46	0	1	5
476	TF	16-13-	Cross Drain		2.2	26	56	0	0	2
555	TG	339280	River Ant, East Rushton		2.1	29	60	0	0	3
3	TF	148128	Langtoft Fen		2.1	18	38	0	0	2
456	TA	0--2--	Barton		2.0	26	51	0	1	1
257	TL	474866	Purlys Bridge		2.0	16	32	0	0	2
479	TF	14-53-	North Kyme		2.0	29	57	0	0	4
531	TF	8--4--	Holkham		1.9	26	49	0	0	5
539	TG	05-44-	Cley Marshes		1.8	26	46	0	0	5
561	TG	398270	Hempstead Marshes		1.8	20	35	0	0	3
516	TF	670136	Blackborough		1.8	16	29	0	0	3
577	TL	05-98-	Old Sulehay Quarry		1.7	24	40	0	0	2
596	TL	369788	Somersham		1.7	16	27	0	0	1
37	TL	149128	West Fen Farm		1.7	11	19	0	0	1
439	SK	94-86-	Fillingham Broad		1.7	6	10	0	0	1
443	SE	91-04-	Messingham		1.7	7	12	0	0	0
582	TL	15-97-	Ferry Meadows		1.6	14	22	0	0	2
534	TF	945026	Carbrooke Fen		1.6	24	37	0	0	1
38	TF	139144	White House Farm		1.6	11	17	0	0	0
541	TG	19-07-	Earlham		1.5	23	35	0	0	2
640	TM	025913	Eccles Road		1.5	12	18	0	0	1
405	SK	85-72-	Thorney		1.4	14	19	0	0	1

Mainly quarry ponds and sluggish drains. RDB species were:- RDB 2 *Agabus undulatus* at 205, 216, 590; RDB 3 *Hydrochus carinatus* at 584, *Helophorus dorsalis* at 484, *Oulimnius major* at 508 and 603. *Gyrinus aeratus* (Nb), a rare species in East Anglia occurred at 555 and *Hydronomus alismatis* (Nb), also rarely recorded, at 216.

Group 19 0110101 - 61 sites				SQS	NOS	WET	RDB	Na	Nb
191	TL	266962	Whittlesey	2.7	11	30	1	0	2
187	TL	233881	New Decoy Farm	2.3	13	30	1	0	0
532	TF	8--4--	Holkham Lake	2.7	6	16	0	1	0
105	TF	314103	Pear Tree House	2.4	26	61	0	0	4
569	TG	457213	Hundred Stream	2.0	28	56	0	1	5
270	TL	449917	Sixteen Foot Drain	2.0	13	26	0	1	0
100	TF	518103	Trafford House	2.0	11	22	0	0	4
490	TF	34-58-	Stickford	2.0	14	28	0	0	2
30	TF	333137	Holbeach Drove	1.9	14	27	0	1	1
128	TF	610147	Wiggenhall St. Peter	1.9	21	39	0	0	3
570	TG	46-20-	Somerton	1.9	16	31	0	0	2
509	TF	534617	Croft Marsh	1.8	25	44	0	1	3
213	TF	584050	Common Lode	1.8	20	35	0	1	2
178	TL	218900	Whittlesea Mere	1.8	11	20	0	1	0
88	TF	372197	Gedney Fen	1.8	21	37	0	0	4
224	TL	501853	Pymore	1.8	17	31	0	0	2
221	TL	539890	Westlands	1.8	16	29	0	0	2
219	TL	569898	Rack Fen	1.8	21	37	0	0	2
237	TF	190068	Moor Farm	1.8	19	34	0	0	1
477	TF	14-49-	Ewerbywaithe Common	1.8	17	30	0	0	1
455	TA	02-23-	Barton clay pits	1.8	6	11	0	0	1
244	TL	480969	Sixteen Foot Drain	1.7	15	25	0	1	0
135	TF	501130	Walton Highway	1.7	11	19	0	0	3
450	SE	982208	South Ferriby	1.7	7	8	0	0	1
409	SK	801865	West Burton	1.7	7	8	0	0	0
540	TG	07-44-	Salthouse Marshes	1.6	24	38	0	0	5
211	TF	552089	Marshland Fen	1.6	24	39	0	0	4
499	TF	47-61-	Old River Lymn	1.6	16	25	0	0	2
111	TF	577120	Magdelin Bridge	1.6	14	23	0	0	2
150	TF	329356	Slade House	1.6	12	19	0	0	2
17	TF	324196	Millgate House	1.6	7	11	0	0	2
24	TF	632248	North Wootton	1.6	18	29	0	0	1
40	TL	263931	Pondersbridge	1.6	16	25	0	0	1
98	TF	269399	Blackjack	1.6	5	8	0	0	1
614	TL	57-84-	Padnal Fen	1.5	20	29	0	0	1
236	TF	190054	Newborough	1.5	13	19	0	0	1
253	TL	434934	Hook	1.5	13	20	0	0	0
196	TL	262928	Pondersbridge	1.5	11	16	0	0	0
416	SK	84-80-	Marton	1.5	8	12	0	0	0
214	TF	603012	Sluice Common	1.4	15	21	0	0	2
120	TF	340121	Gedney Hill	1.4	18	26	0	0	1
226	TL	167969	Orton Mere	1.4	14	20	0	0	1
258	TL	475865	Old Bedford River	1.4	17	23	0	0	0
298	TL	235850	Great Raveley Drain	1.4	12	17	0	0	0
134	TF	544110	Subscription Bridge	1.3	9	12	0	0	2
72	TF	285263	Shepherd's Farm	1.3	12	16	0	0	1
495	TF	43-57-	Fodder Dyke	1.3	16	21	0	0	0
256	TL	487881	Purles Bridge	1.3	15	20	0	0	0
218	TL	599818	Prickwillow	1.3	13	17	0	0	0
573	TG	48-20-	Winterton	1.3	9	12	0	0	0
273	TL	378856	Acre Fen	1.3	6	8	0	0	0
217	TL	430819	Mepal Fen	1.2	17	21	0	0	0
52	TF	155238	Morton Fen	1.2	14	17	0	0	0
206	TL	270871	River Nene's old course	1.2	13	16	0	0	0
268	TL	540910	Dairy House Farm	1.2	13	16	0	0	0
145	TF	207388	Hammond Beck	1.2	12	14	0	0	0
235	TF	199032	Newborough	1.2	11	13	0	0	0
63	TF	019101	River Gwash	1.2	6	7	0	0	0
635	TL	915946	Thompson Lake	1.1	8	8	0	0	0
15	TF	252196	The Poplars	1.0	5	5	0	0	0
143	TF	307206	Engine Bank	1.0	5	5	0	0	0

This community is mainly associated with IDB drains including some occasionally receiving tidal water and characterised by occurrence of *Haliphus apicalis* (Nb) and occasionally *Agabus conspersus* (Nb); also includes some permanent lagoons and artificial lakes such as Thompson Lake, overlying (and destroying) part of a pingo system. The only RDB species was *Agabus undulatus* (RDB 2) at 187 and 191.

Group 20 011011 - 21 sites				SQS	NOS	WET	RDB	Na	Nb
628	TL	887959	West Mere	6.2	10	62	2	0	0
513	TF	556749	Wolla Bank	2.5	27	67	1	1	2
648	SE	77-11-	Crowle	3.6	8	29	0	0	2
568	TG	45-21-	Horse	2.5	8	20	0	1	2
619	TL	82-90-	Lynford	2.5	15	37	0	0	2
578	TL	186632	Little Paxton	2.1	29	60	0	0	5
512	TF	55-73-	Chapel Clay Pit	2.0	17	34	0	1	3
562	TG	4--0--	Halvergate	2.0	19	37	0	0	3
198	TL	198959	Old Fletton	1.9	20	38	0	1	1
306	TL	232849	Woodwalton Fen	1.9	10	19	0	1	0
480	TF	14-53-	North Kyme	1.8	19	34	0	0	1
442	SE	91-03-	Messingham	1.8	18	33	0	0	1
496	TF	46-57-	Friskney Decoy Wood	1.7	21	35	0	0	2
155	TF	148183	The Chasm	1.7	16	27	0	0	1
616	TL	80-87-	Santon Downham	1.6	10	16	0	0	1
85	TF	142176	Baston Fen	1.6	9	14	0	0	0
571	TG	46-21-	Somerton	1.5	15	23	0	0	3
284	TL	237999	Flag Fen	1.2	12	14	0	0	1
264	TF	117017	Castor Hanglands	1.1	14	16	0	0	0
293	TF	339038	Thorney Toll	1.1	8	9	0	0	0
287	TL	282994	Nene Washes	1.1	8	9	0	0	0

A group of open water habitats, the best being West Mere, a fluctuating mere with *Bidessus unistriatus* (RDB 1) and *Agabus undulatus* (RDB 2). Other sites are artificial and the common factor appears to be fen peat or reedbed litter. Wolla Bank is a clay pit with *Oulimnius major* (RDB 3) and *Gyrinus paykulli* (Na).

Group 21 0111 - 1 site				SQS	NOS	WET	RDB	Na	Nb
527	TF	71-44-	Holme	3.4	7	24	1	0	3

Newly created brackish pools with *Haliphus mucronatus* (RDB 3) and halophil spp. (*Coelambus parallelogrammus*, *Helophorus fulgidicollis* - Nb).

Group 22 10 - 41 sites					SQS	NOS	WET	RDB	Na	Nb
32	TF	165191	Counter Drain		2.7	18	48	1	1	1
48	TF	161292	South Forty Foot Drain		2.8	13	36	1	0	1
8	TF	176173	North Drove Drain		2.3	11	26	1	0	1
432	SK	91-62-	River Witham		2.2	17	38	1	0	2
502	TF	499617	Old River Lymn		2.1	22	46	1	0	1
444	SE	97-17-	New River Ancholme		3.5	6	21	0	1	0
189	TL	165969	Orton Station		2.6	9	23	0	0	2
7	TF	166193	Counter Drain		2.5	14	21	0	1	1
601	TL	483708	Mitchell Hill Common		2.4	8	19	0	0	0
591	TL	384467	Meldreth		2.3	14	32	0	0	3
406	SK	88-73-	Wigsley		2.3	15	20	0	0	1
585	TL	184961	Fletton		2.3	6	8	0	0	0
504	TF	49-72-	Willoughby High Drain		2.2	15	33	0	0	0
605	TL	445909	Sixteen Foot Drain		2.1	17	35	0	1	0
11	TF	219101	River Welland		2.1	9	19	0	1	0
400	SK	83-36-	Grantham Canal		2.1	8	9	0	0	1
126	TF	670135	River Nar		1.9	13	25	0	0	1
471	TF	01-94-	New River Ancholme		1.9	14	26	0	0	1
421	SK	87-84-	River Till		1.8	11	20	0	0	0
69	TF	248222	River Welland		1.8	10	18	0	0	0
65	TF	208251	River Glen		1.8	6	11	0	0	0
225	TL	327880	Forty Foot Drain		1.7	16	27	0	1	0
242	TL	131847	Glatton Folly		1.7	7	8	0	0	0
583	TL	16-97-	River Nene		1.6	15	24	0	0	2
35	TF	181169	Deeping Fen		1.6	11	17	0	0	1
29	TF	657212	Gaywood River		1.6	8	13	0	0	1
431	SK	90-59-	River Witham		1.6	13	21	0	0	0
82	TF	154330	Billingborough Fen		1.6	11	18	0	0	0
31	TF	175172	Tongue End Farm		1.6	10	16	0	0	0
70	TF	251231	River Welland		1.6	8	13	0	0	0
127	TF	669137	Blackborough		1.5	14	21	0	0	1
282	TF	157072	Maxey Cut		1.5	6	9	0	0	1
74	TF	219209	South Drove Drain		1.5	18	27	0	0	0
280	TF	164090	River Welland		1.5	6	9	0	0	0
220	TL	579878	Great River Ouse		1.3	17	22	0	0	0
238	TF	307012	Harriman's Farm		1.3	15	19	0	0	0
602	TL	433760	Gall Fen		1.3	10	13	0	0	0
265	TL	588960	Station Farm		1.3	8	10	0	0	0
511	TF	564685	Ingoldmells		1.3	8	10	0	0	0
222	TL	526911	Butcher's Hill Farm		1.1	7	8	0	0	0
164	TL	268922	River Nene		1.0	9	9	0	0	0

Large drains and canalised rivers with a hard bottom frequently occupied by *Oulimnius* spp. *O. tuberculatus* was the commonest species but *O. major* (RDB 3) occurred at 8, 32, 48, 502, and 504, *O. rivularis* (Na) at 7, 11, 32, 225, 444, and 605, and *O. troglodytes* (Nb) at 32 and 48.

Group 23 110 - 18 sites				SQS	NOS	WET	RDB	Na	Nb
617	TL	84-87-	Thetford	3.9	7	27	1	0	1
64	TF	060199	Scobblethorpe	2.8	6	17	1	0	1
197	TF	095112	Greatford Cut	2.0	15	30	1	0	1
586	TL	244575	Abbotsley Brook	2.2	13	28	0	0	1
438	SK	92-85-	Fillingham Grange	2.0	31	63	0	1	5
75	TF	115306	Dowsby	2.0	6	12	0	0	1
203	TF	123067	Nunton Lodge Farm	1.9	11	21	0	0	1
492	TF	38-88-	Grimoldby	1.9	7	13	0	0	1
62	TF	038138	River Glen	1.9	9	17	0	0	0
469	TF	03-84-	Spridlington	1.9	8	15	0	0	0
50	TF	100249	Morton	1.8	8	14	0	0	1
478	TF	101553	Springwell Brook	1.7	24	40	0	0	3
41	TF	050130	River Glen	1.6	7	11	0	0	0
57	TF	020289	Irnham	1.5	11	16	0	0	0
59	TF	010201	River Glen	1.5	6	0	0	0	0
402	SK	89-43-	River Witham	1.4	11	31	0	0	0
466	TF	099553	Springwell Brook	1.3	16	21	0	0	0
403	SK	89-58-	River Witham	1.2	5	6	0	0	0

Open streams of which the best is a spring area with *Enochrus isotae* (RDB 3). *Oulimnius major* occurred at 64 and 197. The only modern East Anglian site for *Hydroporus obsoletus* (Na) is 438.

Group 24 111 - 17 sites				SQS	NOS	WET	RDB	Na	Nb
581	TL	10-97-	River Nene	2.8	11	31	1	0	0
498	TF	40-67-	River Lymn	3.4	14	48	0	0	3
488	TF	23-74-	River Bain	3.3	12	40	0	0	2
440	SK	99-94-	Black Dyke	3.2	13	41	0	0	2
44	TF	108150	River Glen	3.1	12	37	0	0	2
482	TF	14-77-	Wragby	3.0	10	30	0	0	1
42	TF	049126	River Glen	2.8	12	34	0	0	2
489	TF	23-83-	River Bain	2.4	10	24	0	0	1
593	TL	384489	River Cam, Barrington	2.3	6	14	0	0	1
419	SK	86-88-	River Till	1.9	10	19	0	0	1
227	TL	166972	River Nene	1.5	6	9	0	0	0
537	TG	0--3--	River Glaven	1.3	9	12	0	0	0
60	TF	021171	River Glen	1.3	8	10	0	0	0
81	TF	148332	Billingham Fen	1.3	8	10	0	0	0
283	TF	150072	Maxey Cut	1.2	6	7	0	0	0
202	TF	121086	Maxey	1.2	5	6	0	0	0
459	TA	25-01-	Waithe Beck	1.2	5	6	0	0	0

This is a species-poor community of fast limestone and chalk streams. The River Nene at Water Newton (581) is a site for *Stenelmis canaliculata* (RDB 2) but otherwise has little interest; this species is almost certain to be found elsewhere in East Anglia in deep water. The top four sites in rank order of SQS had *Riolus subviolaceus* (Nb) and the top six *R. cupreus* (Nb).

South-West and Southern England

This area covered the mainland of the peninsula with the recording vice-counties (1-5) of West and East Cornwall, South and North Devon, "South" Somerset excluding any part of the Somerset Levels, and also Dorset, the Isle of Wight (one site only), South and North Hampshire (9-12). Lists were available for 172 sites.

Red Data Book Species

South-west and southern England

Eleven of the 179 species recorded:

Category 1 - *Graphoderus zonatus*, *Paracymus aeneus*;

Category 2 - *Graptodytes flavipes*, *Agabus brunneus*, *Helophorus laticollis*;

Category 3 - *Haliphus variegatus*, *Hydrovatus clypealis*, *Graptodytes bilineatus*, *Graphoderus cinereus* (not in TWINSpan), *Hydrochus nitidicollis*, *Hydraena pygmaea*.

Ordination

DECORANA was undertaken without downweighting of species. The omission of *Helophorus brevipalpis* improved the ordination of species and sites. This species is one of the commonest flying insects in Britain; it is frequently found in the "wrong habitat" and its use in classifying sites could be misleading. The ordination of species and sites on axis 1 indicated a gradient from running water to saltpans with their characteristic species. The extremities of axis 2 were occupied by species of open stagnant water over mud and those of intermittent, calcareous water. The third axis indicated a further gradient, from calcareous running water to acid running water.

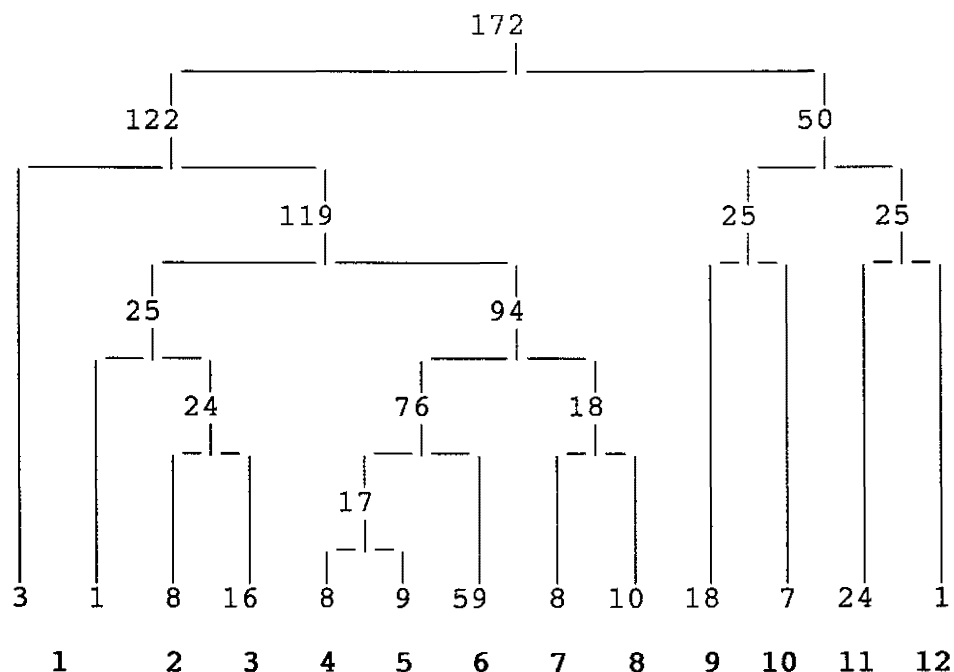
Eigen-values for DECORANA

Axis 1	Axis 2	Axis 3	Axis 4
0.669	0.362	0.240	0.213

Classification

The removal of the very common species *Helophorus brevipalpis* improved the major splits and reassigned some under-represented sites to form one heterogeneous group (Group 2 01010). Two end-groups for a small number of brackish water sites were merged as Group 1. The important end-group 01101 (Group 6) with 59 sites could be split into five, within which was one group of temporary ditches and one site split off because of collector bias towards one genus; however two of the main sub-groups were so similar in their species frequency that the large end-group was retained. The remainder of the classification proved the sensitivity of TWINSpan in identifying the combination of *Stictonectes lepidus* and *Agabus didymus* in Group 8 and in coping with the phenomenon of species that live both in brackish water and heathland pools (*Helophorus alternans* and *Ochthebius viridis*).

TWINSPAN dendrogram for south-west and southern England



Species frequency table for south-west England.

This shows the frequencies of species in end-groups (D = 21-40%, C = 41-60%, B = 61-80%, A = 81-100%). Species order is given as in TWINSPAN. Entries in lower case indicate habitat groups with less than five sites.

	1	2	3	4	5	6	7	8	9	10	11	12
<i>Hydrovatus clypealis</i>	d	-	-	-	-	-	-	-	-	-	-	-
<i>Ochthebius viridis</i>	c	-	-	-	-	-	-	-	-	-	-	-
<i>Enochrus bicolor</i>	b	-	-	-	-	-	-	-	-	-	-	-
<i>Heterocerus obsoletus</i>	d	-	-	-	-	-	-	-	-	-	-	-
<i>Paracymus aeneus</i>	d	-	-	-	-	-	-	-	-	-	-	-
<i>Ochthebius marinus</i>	a	-	-	-	-	-	-	-	-	-	-	-
<i>Ochthebius punctatus</i>	c	-	-	-	-	-	-	-	-	-	-	-
<i>Agabus conspersus</i>	c	-	-	-	-	-	-	-	-	-	-	-
<i>Helophorus fulgidicollis</i>	c	-	-	-	-	-	-	-	-	-	-	-
<i>Cymbiodyta marginella</i>	d	-	-	-	-	-	-	-	-	-	-	-
<i>Ochthebius dilatatus</i>	d	-	D	-	-	-	-	-	-	-	-	-
<i>Dytiscus circumflexus</i>	d	-	-	-	-	-	-	-	-	-	-	-
<i>Gyrinus caspius</i>	d	D	-	-	-	-	-	-	-	-	-	-
<i>Peltodytes caesus</i>	d	-	-	-	-	-	-	-	-	-	-	-
<i>Ochthebius minimus</i>	-	D	C	D	-	-	-	-	-	-	-	-
<i>Hydroporus angustatus</i>	-	-	-	C	D	-	-	-	-	-	-	-
<i>Hygrotus inaequalis</i>	-	B	B	A	B	-	-	-	-	-	-	-
<i>Berosus affinis</i>	d	-	-	-	D	-	-	-	-	-	-	-
<i>Noterus clavicornis</i>	-	D	C	B	D	-	-	-	-	-	-	-
<i>Coelambus impressopunctatus</i>	-	D	-	D	-	-	-	-	-	-	-	-
<i>Hyphydrus ovatus</i>	-	C	C	C	C	-	-	-	-	-	-	-
<i>Hydroporus planus</i>	d	D	B	B	C	-	-	-	-	-	-	-
<i>Laccobius bipunctatus</i>	-	-	C	-	C	-	-	-	-	-	-	-
<i>Hydraena testacea</i>	-	-	D	D	-	-	-	-	-	-	-	-
<i>Agabus nebulosus</i>	-	D	-	D	D	-	-	-	-	-	-	-
<i>Agabus sturmi</i>	-	-	B	D	D	-	-	-	-	-	-	-
<i>Dytiscus marginalis</i>	d	D	-	B	D	-	-	-	-	-	-	-
<i>Colymbetes fuscus</i>	-	D	C	C	B	-	-	-	-	-	-	-
<i>Hygrobia hermanni</i>	d	D	-	B	D	-	-	-	-	-	-	-
<i>Laccophilus minutus</i>	-	D	D	A	C	-	-	-	-	-	-	-

	1	2	3	4	5	6	7	8	9	10	11	12
Coelambus confluens	d	-	-	-	D	-	-	-	-	-	-	-
Copelatus haemorrhoidalis	-	D	D	A	-	-	-	-	-	-	-	-
Berosus signaticollis	-	D	-	D	-	-	-	-	-	-	-	-
Hydrobius fuscipes	-	D	B	A	C	D	-	-	-	-	-	-
Hydroporus striola	-	-	-	D	-	-	-	-	-	-	-	-
Rhantus grapii	-	-	-	C	-	-	-	-	-	-	-	-
Helophorus aequalis	-	-	D	D	C	-	-	-	-	-	-	-
Graptodytes granularis	-	-	-	D	-	-	-	-	-	-	-	-
Ilybius ater	-	-	-	D	C	-	-	-	-	-	-	-
Helophorus alternans	-	-	-	D	-	-	-	-	-	-	-	-
Haliphus heydeni	-	-	-	D	D	-	-	-	-	-	-	-
Acilius sulcatus	-	-	-	D	C	-	-	-	-	-	-	-
Hydroporus erythrocephalus	-	-	D	B	-	D	-	-	-	-	-	-
Hydroporus pubescens	-	-	C	A	B	B	A	C	-	-	-	-
Hydroporus gyllenhalii	-	-	-	A	D	C	C	-	-	-	-	-
Stictonectes lepidus	-	-	-	-	D	-	-	B	-	-	-	-
Enochrus fuscipennis	-	-	-	-	-	-	D	-	-	-	-	-
Rhantus suturalis	-	-	-	B	D	-	-	-	-	-	-	-
Coelostoma orbiculare	-	-	-	C	D	-	-	-	-	-	-	-
Paracymus scutellaris	-	-	-	B	D	-	D	-	-	-	-	-
Chaetarthria seminulum	-	-	-	-	D	-	-	-	-	-	-	-
Haliphus confinis	-	-	-	D	-	-	-	-	-	-	-	-
Dryops luridus	-	-	-	D	D	-	-	-	-	-	-	-
Agabus labiatus	-	-	-	D	-	-	-	-	-	-	-	-
Dryops striatellus	-	-	-	D	-	-	-	-	-	-	-	-
Haliphus fulvus	-	-	-	D	B	-	-	-	-	-	-	-
Enochrus affinis	-	-	-	D	D	-	-	-	-	-	-	-
Graptodytes flavipes	-	-	-	C	D	-	-	-	-	-	-	-
Hydroporus obscurus	-	-	-	D	-	D	D	-	-	-	-	-
Agabus melanocornis	-	-	-	B	D	C	-	-	-	-	-	-
Helochares punctatus	-	-	-	A	D	C	D	-	-	-	-	-
Hydroporus umbrosus	-	-	-	D	-	-	-	-	-	-	-	-
Agabus affinis	-	-	-	C	-	-	-	-	-	-	-	-
Ilybius aenescens	-	-	-	D	-	-	-	-	-	-	-	-
Ilybius guttiger	-	-	-	D	-	-	-	-	-	-	-	-
Agabus bipustulatus	d	B	B	A	A	A	B	B	D	-	-	-
Ilybius fuliginosus	-	D	-	D	B	D	-	C	-	-	-	-
Anacaena limbata s.l.	-	-	B	B	B	B	D	-	-	-	-	-
Hydroporus incognitus	-	-	-	D	-	-	-	-	-	-	-	-
Hydroporus memnonius	-	-	-	D	C	D	-	-	-	-	-	-
Dytiscus semisulcatus	-	-	-	C	D	-	-	-	-	-	-	-
Helophorus flavipes	-	-	-	A	B	C	A	-	-	-	-	a
Anacaena globulus	-	-	D	B	C	C	-	D	-	-	-	-
Hydroporus nigrita	-	-	-	D	-	D	A	D	-	-	-	-
Hydroporus tristis	-	-	-	C	-	D	-	-	-	-	-	-
Hydrochus angustatus	-	-	-	D	D	D	-	-	-	-	-	-
Laccobius atratus	-	-	-	D	-	-	B	-	-	-	-	-
Laccobius atrocephalus	-	-	-	C	C	-	-	-	D	-	-	-
Limnebius truncatellus	-	-	D	B	D	D	B	D	B	D	-	-
Hydroporus discretus	-	-	-	-	-	-	-	-	-	-	-	a
Hydroporus tessellatus	d	-	D	C	C	-	-	-	D	D	-	-
Agabus didymus	-	D	-	D	-	-	-	A	-	-	-	a
Gyrinus substriatus	-	B	D	B	B	D	-	B	D	C	-	-
Hydroglyphus pusillus	-	-	-	-	D	-	-	-	-	-	-	-
Agabus guttatus	-	-	-	-	-	-	B	D	-	-	-	-
Hydroporus palustris	-	C	B	B	B	D	-	D	-	D	-	-
Haliphus ruficollis	-	-	C	A	B	-	-	-	-	D	-	-
Helophorus minutus	d	D	C	D	C	-	-	-	-	-	-	-
Laccophilus hyalinus	-	-	C	-	-	-	-	-	-	-	-	-

	1	2	3	4	5	6	7	8	9	10	11	12
<i>Graptodytes pictus</i>	-	-	D	-	-	-	-	-	-	-	-	-
<i>Helophorus grandis</i>	d	-	B	B	D	-	-	-	-	-	-	-
<i>Helophorus obscurus</i>	-	-	D	D	-	-	-	-	-	-	-	-
<i>Haliplus lineatocollis</i>	-	C	B	D	B	D	-	-	D	A	D	-
<i>Haliplus fluviatilis</i>	-	-	D	-	-	-	-	-	-	A	-	-
<i>Haliplus flavicollis</i>	-	-	-	-	C	-	-	-	-	-	-	-
<i>Agabus paludosus</i>	-	-	-	-	D	-	-	-	-	-	-	a
<i>Hydraena riparia</i>	-	-	D	D	-	-	-	-	C	-	-	-
<i>Deronectes latus</i>	-	-	-	-	-	-	-	-	D	-	-	-
<i>Oreodytes septentrionalis</i>	-	-	-	-	-	-	-	-	D	-	-	-
<i>Hydraena gracilis</i>	-	-	-	-	-	-	-	-	A	-	-	-
<i>Esolus parallelepipedus</i>	-	-	-	-	-	-	-	-	D	-	-	-
<i>Gyrinus urinator</i>	-	-	-	-	-	-	-	-	C	C	-	-
<i>Stictotarsus 12-pustulatus</i>	-	-	-	-	D	-	-	-	B	B	-	-
<i>Platambus maculatus</i>	-	-	-	-	-	-	-	-	C	-	D	-
<i>Elmis aenea</i>	-	-	-	-	-	-	D	D	A	A	A	a
<i>Oreodytes sanmarki</i>	-	-	-	-	-	-	-	-	B	-	B	-
<i>Limnius volckmari</i>	-	-	-	-	-	-	-	-	B	-	A	-
<i>Oulimnius tuberculatus</i>	-	-	-	-	-	-	-	-	C	-	C	a
<i>Potamonectes elegans</i>	-	-	-	-	-	-	-	-	D	C	C	-
<i>Brychius elevatus</i>	-	-	-	-	-	-	-	-	-	-	C	-
<i>Oreoctochilus villosus</i>	-	-	-	-	-	-	-	-	-	-	B	-
<i>Riolus subviolaceus</i>	-	-	-	-	-	-	-	-	-	-	C	-
<i>Hydroporus ferrugineus</i>	-	-	-	-	-	-	-	-	-	-	-	a
<i>Hydroporus marginatus</i>	-	-	-	-	-	-	-	-	-	-	-	a
<i>Agabus biguttatus</i>	-	-	-	-	-	-	-	-	-	-	-	a

Groups and site scores for South-West and Southern England

Group 1 00 + 0100 - 4 sites	SQS	NOS	WET	RDB	Na	Nb
172 SZ 6--8-- Bembridge	7.0	6	42	1	1	3
169 SZ 352952 Lymington	4.0	6	24	1	0	4
20 ST 2--4-- Steart	2.4	9	22	0	0	6
137 SY 6--8-- Herbury	1.6	11	18	0	1	3

Brackish muddy pools of which the best, the only site included from the Isle of Wight, is the only modern site known for *Paracymus aeneus* (RDB 1). The RDB species from Lymington is *Hydrovatus clypealis* (RDB 3). A brackish ditch at Steart with several halophil species, none of them specially rare, was merged with this group rather than being treated as a separate group.

Group 2 01010 - 8 + 1 sites	SQS	NOS	WET	RDB	Na	Nb
79 SW 5--4-- Gwithian stream	3.9	15	59	1	0	1
134 SY 5--8-- Cogden Beach	2.1	28	60	1	1	3
170 SZ 3--9-- Setley Plain	2.4	8	19	0	2	1
73 SU 7--5-- Basingstoke Canal	2.0	7	14	0	0	1
163 SZ 149977 Sopley Meadows	1.4	15	21	0	0	2
78 SW 5--3-- Phillack Towans	1.4	11	15	0	0	0
92 SW 8--3-- Swanpool	1.3	6	8	0	0	0
SX 8--4-- Slapton Ley	1.2	10	12	0	0	0
7 SS 443298 Northam Burrows	1.1	7	8	0	0	0

This end-group is mainly for coastal habitats with little saline influence but an under-represented habitat in a canal is placed here as is a New Forest heathland pool surveyed by a "selective" coleopterist whose records have been used only in combination with those of others in the rest of the survey. The records for these sites have presumably caused the misclassification of a sample from water meadows beside the R Avon. This is clearly a very unsatisfactory end-group but it contains two important sites, the stream at Gwithian with *Agabus brunneus* (RDB 2) and the pool on Cogden Beach with *Graptodytes bilineatus* (RDB 3). Slapton Ley data (Lamont, 1986) run to this end-group, giving another example of a coastal, but non-brackish, pool.

Group 3 01011 - 16 sites					SQS	NOS	WET	RDB	Na	Nb
22	ST	315350	Bridgwater pits		2.3	49	113	0	2	11
74	SU	7--5--	Bartley Heath		2.1	34	70	0	1	4
9	SS	4--3--	Braunton Burrows		1.6	41	66	0	0	4
171	SZ	353951	Lymington lagoon		1.5	22	32	0	1	5
6	SS	43-29-	Westward Ho!		1.5	22	33	0	1	3
149	SY	874865	East Stoke		1.5	29	42	0	0	3
19	ST	26-45-	Wall Common		1.4	28	40	0	0	5
131	SX	96-87-	Exminster Marshes		1.4	26	36	0	0	2
132	SY	306901	Axmouth-Lyme Regis		1.4	27	38	0	0	1
15	ST	046140	Leonard Moor		1.4	25	36	0	0	1
21	ST	308294	Bridgwater Canal		1.4	8	11	0	0	0
24	ST	82-12-	East Farm pond		1.3	23	30	0	0	2
26	ST	82-12-	East Farm pond		1.3	10	13	0	0	1
25	ST	82-12-	East Farm pond		1.2	10	12	0	0	1
128	SX	834752	Stover Lake		1.2	10	12	0	0	0
27	ST	82-12-	East Farm pond		1.0	6	6	0	0	0

These are mostly permanent and man-made ponds over clay. Those on the Axmouth-Lyme Regis NNR are natural, being formed in a landslip area (Armitage, 1982). None of the site lists included RDB species but the Bridgwater pits, now partly underneath a viaduct for the M5, once supported *Haliphus furcatus* (RDB 1) and still contain many fen species including *Hygrotus decoratus* (Nb). The sites rank easily with the Bridgwater pits followed by Braunton Burrows and Bartley Heath.

Group 4 011000 - 8 + 5 sites					SQS	NOS	WET	RDB	Na	Nb
55	SU	305034	Balmer Lawn		2.9	35	103	3	1	7
167	SZ	256997	Sway pits		3.3	59	193	2	2	12
		SZ 0--8--	Studland NNR		3.4	5	6	188	2	14
168	SZ	2--9--	Widden Bottom		3.2	28	89	1	2	6
	SU	7--3--	Woolmer Bog B		3.0	5	3	161	1	11
72	SU	7--3--	Woolmer Bog A		3.0	52	156	1	1	10
	SZ	0--8--	mires, Studland		2.9	5	1	152	0	13
	SZ	0--8--	Little Sea, Studland		2.8	1	8	51	1	3
47	SU	3--0--	Hatchet Pond		2.6	39	102	1	3	6
	SZ	0--8--	Fire ponds, Studland		2.5	1	7	43	1	3
102	SX	0--6--	Red Moor		2.2	42	93	1	1	8
87	SW	73-21-	Goonhilly B		2.0	38	76	1	1	4
86	SW	7--1--	Goonhilly A		1.8	26	46	0	0	6

A group of sites of high conservation value, comprising open, stagnant, acid, permanent pools of which the best are surrounded by temporary marsh, streams and smaller pools. The Balmer Lawn horse pond is important because of the occurrence of *Haliphus variegatus* (RDB 3) and *Graptodytes flavipes* (RDB 2), plus the aquatic weevil *Bagous brevis* (RDB 1). The Sway pits, with *Hydrovatus clypealis* (RDB 3), *Graptodytes flavipes* and *Helophorus laticollis* (RDB 2) rank highest on all criteria except presence of RDB 1 species. Woolmer Bog is the only British site for *Graphoderus zonatus* (RDB 1) but is substantially degraded (Beebee, 1987). Widden Bottom, with *Agabus brunneus* (RDB 2), can be considered as an extension of the Sway pits area. The remaining sites must still have at least regional importance, in particular Red Moor as an example of old tin workings in a primary fen and bog site; it is the only site in the south-west from which *Dytiscus dimidiatus* (Na) has been reported, and the large pond supports *Hydrochus nitidicollis* (RDB 3). The Goonhilly Downs ponds and the Hatchet Pond contain *Graptodytes flavipes*, a species selected for RDB status as representative of the endangered fauna of heath wetlands.

Lists from three different habitats on Studland NNR, the mires and peat pools, the recently constructed fire ponds and the Little Sea, were not included in the original analysis. All clearly belong to this group. The fire ponds are the only known modern location for *Graphoderus cinereus* (RDB 3) in the area and *Hydrovatus clypealis* (RDB 3) is common in rafts of vegetation around the edge of the Little Sea. Combining all records for Studland results in a status intermediate between the best New Forest sites and Woolmer Bog. "Woolmer Bog A" data were included in the original analysis. It is noteworthy that a complete survey of the area in 1986 and 1987 - "Woolmer Bog B" - did not change its status.

Group 5 011001 - 9 sites		SQS	NOS	WET	RDB	Na	Nb
159 SY 9--8--	Stoborough	2.2	41	88	1	0	7
80 SW 69-19-	Lizard Downs	2.2	20	43	1	0	1
56 SU 308034	Balmer Lawn	1.5	12	18	1	0	2
50 SU 338037	Denny Inclosure	2.0	43	85	0	2	6
37 SU 26-08-	Oberwater	1.9	39	73	0	0	8
166 SZ 202981	Poors Common	1.9	22	42	0	0	6
141 SY 7--8--	Tadnoll	1.5	26	40	0	0	3
8 SS 4--3--	Braunton Burrows	1.4	23	32	0	0	2
158 SY 93-86-	Ridge	1.3	17	22	0	0	2

Mainly sluggish acid streams in areas of peat, man-made dune ponds (site 8) and ball clay workings (159), mostly with a rich fauna but with few species of special interest, the RDB species being in all three sites *Graptodytes flavipes* (RDB 2).

Group 6 01101 - 59 sites		SQS	NOS	WET	RDB	Na	Nb
54 SU 316075	Iron Hills	4.7	18	84	2	1	2
46 SU 22-18-	Hamptworth	7.6	5	38	1	0	1
52 SU 333072	Beaulieu R	3.4	7	24	1	0	1
85 SW 73-19-	Croft Pascoe	2.9	14	41	1	0	2
49 SU 327075	Matley Heath	2.9	13	38	1	0	1
124 SX 7--8--	Leighon Lakes	2.8	27	76	1	0	5
81 SW 6--1--	Lizard B	2.7	14	40	1	1	1
157 SY 9--8--	Morden Bog A	2.6	31	80	1	0	10
160 SY 9--9--	Decoy Heath B	2.6	17	44	1	0	4
154 SY 892905	Trigon	2.5	25	62	1	0	5
53 SU 334062	Denny Wood	2.2	19	41	1	0	0
156 SY 944865	Hartland Moor A	3.6	18	65	0	1	4
45 SU 21-16-	Deadman Hill	3.0	10	30	0	1	2
164 SZ 11-96-	Hurn	3.0	10	30	0	0	6
146 SY 8--8--	Winfrith Heath	2.8	30	85	0	1	3
48 SU 336076	Matley Bog B	2.4	17	40	0	0	4
41 SU 268028	Oberwater B	2.3	9	21	0	1	2
40 SU 206045	Oberwater A	2.1	10	21	0	0	3
35 SU 173090	Rockford Common	2.1	14	30	0	0	2
129 SX 821763	Bovey Heath B	2.0	22	44	0	0	5
30 SU 070041	Holt Heath	2.0	17	34	0	0	2
120 SX 6--7--	Walla Brook B	1.9	25	48	0	0	4
122 SX 76-77-	Haytor quarry B	1.9	22	41	0	0	3
104 SX 1--7--	Redhill	1.9	15	29	0	0	3
161 SY 9--9--	Morden Bog B	1.9	21	39	0	0	2
64 SU 44-63-	Woolton Hill	1.9	8	15	0	0	1
34 SU 13-01-	Linford	1.8	10	18	0	0	4
99 SW 9--6--	Belowda	1.8	13	23	0	0	2
39 SU 276065	Highland Water	1.8	5	9	0	0	1
143 SY 790873	Tadnoll Bog B	1.7	26	43	0	0	4
103 SX 039617	Conce Moor	1.7	18	31	0	0	3
31 SU 080016	Ferndown	1.7	9	15	0	0	1

			SQS	NOS	WET	RDB	Na	Nb
145	SY	8--8--	R Frome	1.7	15	26	0	0
151	SY	8--9--	Throop Heath	1.7	6	10	0	0
14	ST	07-04-	Crammer Barton	1.6	16	25	0	2
152	SY	8--9--	Rimsmoor Pond	1.6	8	13	0	2
107	SX	113959	De Lank R	1.5	20	29	0	3
162	SZ	093994	Parley Common	1.5	13	20	0	2
76	SW	3--2--	Lands End	1.5	11	16	0	2
96	SW	9--5--	Goonamarth	1.5	11	16	0	2
2	SS	27-14-	Trentworthy	1.5	24	35	0	1
100	SX	0--5--	Fowey	1.5	15	23	0	1
36	SU	260065	Knightwood A	1.5	10	15	0	1
115	SX	575596	Smallhanger	1.5	8	12	0	1
136	SY	5--9--	Toller Porcorum	1.5	8	12	0	0
89	SW	7--4--	Tresamble	1.4	10	14	0	2
98	SW	9--6--	Goss Moor	1.4	16	23	0	1
108	SX	2--7--	Lower Langdon	1.4	8	11	0	0
148	SY	871868	East Stoke	1.4	7	10	0	0
42	SU	24-07-	Mark Ash	1.3	12	16	0	1
165	SZ	195978	Bransgrove	1.3	9	12	0	1
51	SU	320049	Parkhill	1.3	8	10	0	1
91	SW	769572	Penale	1.3	16	20	0	0
16	ST	192167	Leigh Hill	1.2	9	11	0	1
77	SW	3--2--	Escalls	1.2	11	13	0	0
38	SU	253059	Knightwood B	1.1	7	8	0	1
38	SY	6--8--	Langton Herring	1.0	10	10	0	0
33	SU	0--3--	Wylze	1.0	7	7	0	0
75	SU	807329	Linchborough Pk	1.0	7	7	0	0

RDB 2 species in this group were *Agabus brunneus* (46), *Helophorus laticollis* (54), and *Graptodytes flavipes* (49, 52, 53, 54, 81, 85, 154, 157, 160). The wet heath species *Hydroporus cantabricus* (Na), known in Britain only from Dorset, is a candidate for the Red Data Book but its status was not clear at the time of RDB species selection. Its presence accounts for the high score of Hartland Moor and Winfrith Heath.

This group covers the main heathland community, the most typical of which have an abundance of hydrophilids such as *Hydrochus angustatus*, *Paracymus scutellaris*, *Laccobius atratus* and *Helochares punctatus* (all Nb). It could have been divided into five end-groups of 5, 11, 23, 19 and one sites, thus taking out habitats such as slow water and temporary ditches, but the two largest end-groups in such a classification would have been indistinguishable so this further subdivision was considered to be invalid.

Group 7 01110 - 8 sites				SQS	NOS	WET	RDB	Na	Nb
117	SX	5--8--	Watervale, Lydford	2.1	11	23	0	0	3
123	SX	73-77-	Bonehill Down	1.9	15	29	0	0	2
118	SX	6--7--	Clapper Bridge	1.7	15	25	0	0	2
10	SS	76-43-	Brendon Two Gates	1.6	11	17	0	0	2
119	SX	6--7--	Challacombe Down	1.5	13	20	0	0	3
12	SS	848420	Chetsford Water	1.5	8	12	0	0	1
3	SS	24-26-	stream, Titchnerry	1.5	6	9	0	0	0
43	SU	224125	Dockens Water	1.2	13	15	0	0	0

Muddy flushes with Nb hydrophilid species (*Hydrochus angustatus*, *Paracymus scutellaris*, *Laccobius atratus*, *L. atrocephalus*, *Helochares punctatus* and *Chaetarthria seminulum*).

Group 8 01111 - 10 sites				SQS	NOS	WET	RDB	Na	Nb
150	SY	8--8--	Tadnoll Brook	2.4	7	17	0	0	2
105	SX	1--8--	Roughtor Moor	2.1	14	30	0	0	2
116	SX	556648	pool, Cadover Bridge	2.1	8	17	0	0	2
95	SW	8--5--	stream, Newlyn	2.0	7	14	0	0	1
101	SX	0--5--	clay pit, Carbis	1.9	9	17	0	0	1
83	SW	6--4--	pond, Nancekuke	1.6	14	22	0	0	2
140	SY	6--9--	Winterbourne Abbas	1.6	5	8	0	0	0
155	SY	9--8--	R Piddle	1.5	14	21	0	0	2
44	SU	26-16-	Nomansland	1.5	8	12	0	0	1
84	SW	6--4--	stream, Cambrose	1.5	6	9	0	0	0

Muddy or peaty streams that dry down to permanent pools in the summer; also man-made habitats providing the same conditions. This community is characterised by *Stictonectes lepidus* (Nb) and *Agabus didymus*.

Group 9 100 - 18 sites				SQS	NOS	WET	RDB	Na	Nb
130	SX	84-81-	R Teign, Crocombe	3.5	26	92	1	3	6
88	SW	7--4--	R Kenwyn, Truro	2.9	8	23	1	0	1
94	SW	8--5--	stream, Truthan	3.3	7	23	0	1	1
97	SW	9--6--	stream, Tregamere	3.3	6	20	0	1	1
90	SW	7--4--	stream, Langarth	2.7	9	24	0	1	1
125	SX	7--8--	Becka Brook	2.3	12	27	0	1	2
106	SX	1--9--	R Ottery	2.3	8	18	0	0	1
93	SW	8--4--	stream, Shortlanesend	2.3	7	16	0	0	1
114	SX	3--8--	R Carey, Boldford	2.2	11	24	0	1	1
113	SX	3--6--	R Lynher, Herod Dam	2.1	7	15	0	0	1
126	SX	70-84-	R Bovey, Lettaford	2.0	16	32	0	1	1
111	SX	2--9--	R Ottery, Canworthy	2.0	11	22	0	0	1
5	SS	35-16-	R Torridge	1.6	29	46	0	0	3
11	SS	8--1--	Witheridge Moor	1.5	17	25	0	0	2
121	SX	714472	R Avon, Loddiswell	1.5	11	16	0	0	0
110	SX	2--8--	Penpont Water	1.4	5	7	0	0	0
13	SS	93-07-	R Exe	1.3	17	22	0	0	0
109	SX	2--8--	R Ottery, Hellescott	1.3	9	12	0	0	0

The River Teign (130) was clearly outstanding with *Hydrochus nitidicollis* (RDB 3) in a muddy gravel bed near to the more characteristic habitat of this group, shaded running water over a rocky substrate, *Deronectes latus* (Na) and *Gyrinus urinator* (Nb) were commonly in association. Many sites had some of the rarer *Hydraena* species including *H. pygmaea* (RDB 3) (90).

Group 10 101 - 7 sites				SQS	NOS	WET	RDB	Na	Nb
112	SX	3--5--	R Seaton, Bake Wood	2.8	5	14	0	0	1
82	SW	6--1--	stream, Mullion Cove	2.1	7	15	0	0	1
1	SS	2--0--	Bude canal	1.8	11	20	0	0	1
127	SX	813628	R Hems, Littlehempton	1.3	6	8	0	0	0
133	SY	4--8--	R Bride, Burton Bredstock	1.1	9	10	0	0	0
18	ST	214253	R Tone, Taunton	1.1	7	8	0	0	0
17	ST	155223	R Tone, Nynehead	1.0	6	6	0	0	0

Unshaded rivers, the only rare species being *Gyrinus urinator* (Nb).

Group 11 110 - 24 sites		SQS	NOS	WET	RDB	Na	Nb
142	SY 7--8-- Tadnoll Brook	2.6	43	69	0	0	1
58	SU 338278 R Test	2.3	8	18	0	0	2
69	SU 563317 R Itchen, Ovington	2.3	7	16	0	0	1
32	SU 0--1-- stream, Gussage	2.2	13	28	0	1	1
71	SU 612201 R Meon, Meonstoke	2.2	6	13	0	0	1
147	SY 872869 R Frome, East Stoke	2.2	5	11	0	0	1
57	SU 332264 R Test, Mottisfont	2.1	11	23	0	0	2
59	SU 397408 R Test, Wherwell	2.1	7	15	0	0	1
67	SU 589141 R Meon, Mislignford	2.0	8	16	0	0	2
62	SU 470233 R Itchen, Twyford	2.0	9	18	0	0	1
153	SY 858924 Bere Stream	2.0	8	16	0	0	1
61	SU 465173 R Itchen, Eastleigh	1.8	10	18	0	0	1
66	SU 553086 R Meon, Great Funtley	1.8	10	18	0	0	1
63	SU 487487 R Test, Freefolk Priors	1.8	6	11	0	0	0
139	SY 6--9-- R Frome, Bradford Peverell	1.8	5	9	0	0	0
28	ST 939065 R Tarrant	1.7	6	10	0	0	1
68	SU 580296 R Itchen, Cheriton Hill	1.7	6	10	0	0	1
135	SY 5--8-- R Bride	1.7	6	10	0	0	1
144	SY 7--9-- R Frome, Woodsford	1.6	7	11	0	0	0
65	SU 539045 R Meon, Crofton House	1.4	15	21	0	0	0
23	ST 470087 R Parrett	1.3	12	16	0	0	0
4	SS 3--0-- R Deer, Winscott	1.3	6	8	0	0	0
60	SU 447156 R Itchen, Swaythling	1.3	6	8	0	0	0
70	SU 524505 R Test, Quidhampton	1.2	5	6	0	0	0

Chalk streams and rivers, mainly permanent, the main rare species being *Riolus subviolaceus* (Nb).

Group 12 111 - 1 site		SQS	NOS	WET	RDB	Na	Nb
29	ST 9--1-- Gussage	2.7	10	27	0	1	2

An intermittent chalk stream with the full range of characteristic species.

The Weald

The recording vice-counties of West and East Sussex, East and West Kent and Surrey (13-17 respectively) constitute the Weald but with some land in West Sussex and Surrey lying outside its geological boundary. 395 lists were available from the area, those for repeated visits to the same parts of the coastal levels being kept separate for the purposes of analysis.

Red Data Book Species

Eighteen of the 205 species recorded:

Category 1 - *Bagous brevis* (not in TWINSPAN);

Category 2 - *Laccophilus obsoletus*, *Graptodytes flavipes*;

Category 3 - *Haliphus mucronatus*, *H. variegatus*, *H. varius*, *Hydrovatus clypealis*, *Coelambus nigrolineatus*, *Graptodytes bilineatus*, *Hydrochus elongatus*, *H. ignicollis*, *Helophorus longitarsis*, *Cercyon bifenestratus*, *C. granarius*, *Laccobius simulatrix*, *Enochrus isotae*, *Hydrophilus piceus*, *Berosus spinosus*, *Hydraena pygmaea*, *Limnebius crinifer*, *Heterocerus hispidulus* (not in TWINSPAN), *Scirtes orbicularis*.

Ordination

DECORANA was undertaken without downweighting of species. The ordination of species and sites on axis 1 indicated a gradient from shaded running water to tidal pools with their characteristic species. The extremities of axis 2 were occupied by the chalk stream fauna and that of shaded, base-poor running water of the Hastings Beds (cf. axis 3 of South-West and Southern England).

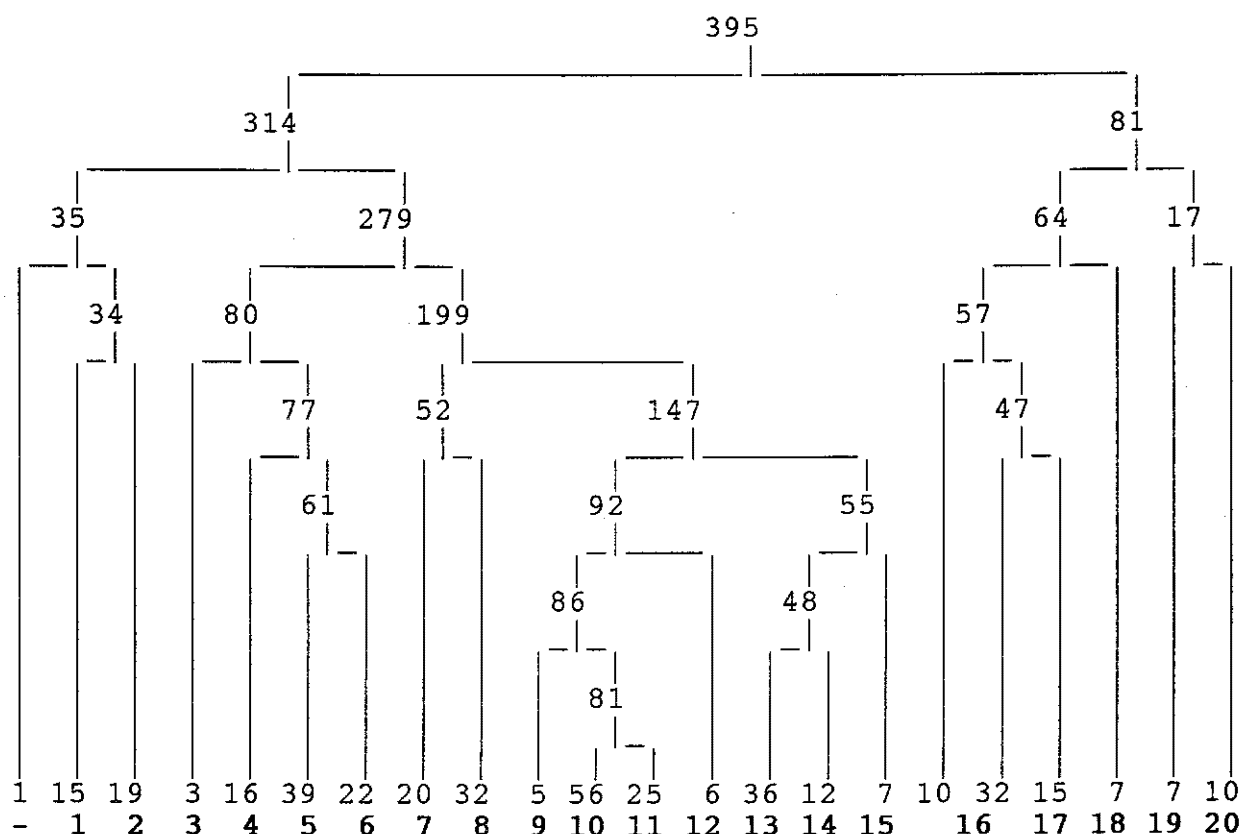
Eigen-values for DECORANA

Axis 1	Axis 2	Axis 3	Axis 4
0.447	0.375	0.228	0.188

Classification

It was necessary to run TWINSpan to level 8. This produced 22 end-groups for different types of running water, for brackish water, for coastal and hinterland ditch systems, for reservoirs and puddles. A species-poor part of a winterbourne was split off at level 3 but this did not justify the establishment of a group. It was reassuring to note the clear separation of the Surrey heath meres as one group. Two end-groups, one from level 4 and one from level 5, appeared to derive from species-poor and species-rich lists of the same community type. They were merged into one group associated with woodland pools. The remaining subdivision at level 5 was kept as Group 17, a distinct and important group of valley mires. The classification was therefore based on 20 groups.

TWINSpan dendrogram for the Weald



Species frequency table for the Weald

This shows the frequencies of species in end-groups (D = 21-40%, C = 41-60%, B = 61-80%, A = 81-100%). Species order is given as in TWINSpan. Entries in lower case indicate habitat groups with less than five sites.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
<i>Haliphus lineatocollis</i>	C	B	a	C	B	C	B	B	-	-	-	-	D	C	D	-	-	-	-	-
<i>Potamonectes elegans</i>	D	C	-	-	-	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Agabus didymus</i>	-	D	-	-	-	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Haliphus fluviatilis</i>	-	C	-	-	D	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Laccophilus hyalinus</i>	-	C	-	D	D	C	D	C	-	-	-	-	-	D	-	-	-	-	-	-
<i>Stictotarsus 12-pustulatus</i>	-	C	-	-	-	D	-	-	-	-	-	-	-	D	-	-	-	-	-	-
<i>Gyrinus urinator</i>	-	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Orectochilus villosus</i>	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Ochthebius bicolon</i>	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Limnius volckmari</i>	-	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Laccobius bipunctatus</i>	-	D	-	-	-	-	B	B	-	D	D	-	D	D	-	-	-	-	D	-
<i>Ochthebius minimus</i>	-	-	d	D	D	-	B	B	-	D	-	D	D	-	-	-	-	-	-	-
<i>Limnebius nitidus</i>	-	-	-	-	-	-	D	D	-	-	-	-	-	-	-	-	-	-	-	-
<i>Agabus nebulosus</i>	-	-	-	D	-	-	D	-	-	-	-	-	-	-	D	-	-	-	-	-
<i>Helochares lividus</i>	-	-	-	D	-	-	B	B	C	-	-	-	-	-	-	-	-	-	-	-
<i>Ochthebius viridis</i>	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Anacaena bipustulata</i>	-	-	-	-	D	-	C	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Laccobius minutus</i>	-	-	-	D	-	-	D	D	-	-	-	-	-	-	-	-	-	-	-	-
<i>Noterus clavicornis</i>	-	-	d	C	B	D	A	A	-	C	D	-	-	D	-	-	-	-	-	-
<i>Hyphydrus ovatus</i>	-	-	-	-	B	D	C	A	-	B	D	B	-	D	-	-	-	-	-	-
<i>Hygrotus inaequalis</i>	-	-	-	C	B	D	A	A	-	C	C	-	-	B	-	-	-	-	-	-
<i>Haliphus ruficollis</i>	-	-	-	C	C	C	A	A	-	B	C	-	-	C	-	-	-	-	-	-
<i>Laccophilus minutus</i>	-	-	-	C	C	-	B	A	-	D	D	-	-	D	D	-	-	-	-	-
<i>Haliphus flavicollis</i>	-	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-	-	-	-	-
<i>Coelambus confluens</i>	-	-	-	D	-	-	-	-	-	-	-	-	-	-	D	-	-	-	-	-
<i>Laccobius biguttatus</i>	-	-	d	C	C	-	C	C	-	-	-	-	-	-	-	-	-	-	-	-
<i>Hygrobia hermanni</i>	-	-	d	-	D	-	C	C	-	-	-	-	-	D	-	-	-	-	-	-
<i>Noterus crassicornis</i>	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Graptodytes pictus</i>	-	-	-	-	C	D	D	C	-	-	-	-	-	-	-	-	-	-	-	-
<i>Porhydrus lineatus</i>	-	-	-	-	D	-	B	B	D	-	-	-	-	D	-	-	-	-	-	-
<i>Gyrinus marinus</i>	-	-	-	-	-	-	D	D	-	-	-	-	-	-	-	-	-	-	-	-
<i>Enochrus halophilus</i>	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Peltodytes caesus</i>	-	-	-	-	-	-	D	D	-	-	-	-	-	-	-	-	-	-	-	-
<i>Haliphus apicalis</i>	-	-	-	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Haliphus immaculatus</i>	-	-	-	D	D	D	B	D	-	-	-	-	-	-	-	-	-	-	-	-
<i>Berosus affinis</i>	-	-	-	C	-	-	C	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Ochthebius marinus</i>	-	-	b	D	-	-	C	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Ochthebius nanus</i>	-	-	-	-	D	-	D	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Hygrotus versicolor</i>	-	-	-	-	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Ochthebius punctatus</i>	-	-	d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Coelambus parallelogrammus</i>	-	-	a	D	-	-	C	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Agabus conspersus</i>	-	-	a	D	-	-	C	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Enochrus melanocephalus</i>	-	-	-	C	-	-	C	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Berosus spinosus</i>	-	-	d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Enochrus bicolor</i>	-	-	a	-	-	-	C	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Rhantus frontalis</i>	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Enochrus testaceus</i>	-	-	-	-	D	-	B	C	-	D	-	-	-	-	-	-	-	-	-	-
<i>Coelambus impressopunctatus</i>	-	-	-	-	-	-	C	-	-	-	D	-	-	-	-	-	-	-	-	-
<i>Dytiscus circumflexus</i>	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Gyrinus caspius</i>	-	-	-	-	-	-	C	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Helophorus alternans</i>	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Limnoxenus niger</i>	-	-	-	-	-	-	B	-	-	-	-	-	-	-	-	-	-	-	-	-

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
<i>Ochthebius dilatatus</i>	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Hydrovatus clypealis</i>	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Hydrophilus piceus</i>	-	-	-	-	-	-	C	D	-	-	-	-	-	-	-	-	-	-	-	-
<i>Rhantus suturalis</i>	-	-	d	-	-	-	C	C	-	-	-	-	-	-	-	-	-	-	-	-
<i>Ilybius quadriguttatus</i>	-	-	-	-	-	-	-	-	-	-	D	D	-	-	-	-	-	-	-	-
<i>Cymbiodyta marginella</i>	-	-	-	-	-	-	C	C	-	D	C	-	-	D	-	-	-	-	-	-
<i>Hydroporus obscurus</i>	-	-	-	-	-	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-
<i>Hydroporus tristis</i>	-	-	-	-	-	-	-	-	-	-	-	B	-	-	-	-	-	-	-	-
<i>Rhantus suturellus</i>	-	-	-	-	-	-	-	-	-	-	-	C	-	-	-	-	-	-	-	-
<i>Rhantus exsoletus</i>	-	-	-	-	-	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-
<i>Rhantus grapii</i>	-	-	-	-	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-	-
<i>Hydaticus seminiger</i>	-	-	-	-	-	-	-	D	-	-	-	D	-	-	-	-	-	-	-	-
<i>Copelatus haemorrhoidalis</i>	-	-	-	-	-	-	D	C	-	D	B	C	-	C	-	-	-	D	-	-
<i>Ilybius ater</i>	-	-	-	-	-	-	B	C	-	C	C	-	-	-	-	-	-	-	-	-
<i>Enochrus coarctatus</i>	-	-	-	-	-	-	D	C	-	C	C	-	-	-	-	-	-	-	-	-
<i>Hydroporus erythrocephalus</i>	-	-	-	-	-	-	C	C	-	C	B	B	-	-	-	-	-	-	-	-
<i>Colymbetes fuscus</i>	-	-	-	-	-	-	B	C	-	C	D	D	-	D	C	-	-	-	-	-
<i>Acilius sulcatus</i>	-	-	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-	-	-	-
<i>Suphrodytes dorsalis</i>	-	-	-	-	-	-	-	D	-	D	C	-	-	-	-	-	-	-	-	-
<i>Enochrus ochropterus</i>	-	-	-	-	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-	-
<i>Hydroporus angustatus</i>	-	-	-	-	-	-	C	C	-	C	B	-	D	C	-	-	-	-	-	-
<i>Agabus sturmii</i>	-	-	-	-	-	-	B	B	C	B	B	D	D	-	-	-	-	-	-	-
<i>Dytiscus marginalis</i>	-	-	-	-	-	-	C	C	C	-	-	D	-	-	-	-	-	-	-	-
<i>Graptodytes granularis</i>	-	-	-	-	-	-	-	-	-	-	-	C	-	-	-	-	-	-	-	-
<i>Dytiscus semisulcatus</i>	-	-	-	-	-	-	D	-	-	-	-	C	-	-	-	-	-	-	-	-
<i>Ilybius fuliginosus</i>	-	-	-	-	-	-	C	C	-	D	D	-	D	-	-	-	-	-	-	-
<i>Gyrinus substriatus</i>	-	-	-	-	-	-	C	D	-	-	-	-	-	C	-	-	-	-	D	-
<i>Helophorus brevipalpis</i>	D	-	d	C	D	D	B	B	-	D	C	-	C	C	C	D	D	-	D	-
<i>Helophorus minutus</i>	-	-	-	-	-	-	C	D	-	-	D	-	-	C	B	-	D	-	-	-
<i>Haliphus heydeni</i>	-	-	-	-	-	-	-	-	-	D	D	-	-	-	-	-	-	-	-	-
<i>Brychius elevatus</i>	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Elmis aenea</i>	D	-	c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	-
<i>Oulimnius tuberculatus</i>	-	-	c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	D	-
<i>Hydroporus palustris</i>	-	-	-	D	B	C	A	A	D	B	A	D	B	A	C	D	C	-	-	-
<i>Hydroporus tessellatus</i>	-	-	-	-	-	-	D	C	D	D	-	-	D	-	-	D	-	-	-	-
<i>Helophorus aequalis</i>	-	-	-	-	-	-	C	-	-	-	D	-	D	D	-	-	D	-	-	-
<i>Hydrobius fuscipes</i>	-	-	-	D	D	-	A	B	-	B	B	C	D	A	-	C	B	D	-	-
<i>Anacaena limbata s.l.</i>	-	-	-	-	-	-	B	B	D	B	A	B	B	C	-	C	A	D	-	-
<i>Hydroporus planus</i>	-	-	-	D	-	-	A	C	-	-	B	-	D	-	C	C	C	-	-	-
<i>Hydraena riparia</i>	D	D	-	-	-	-	-	D	-	D	C	-	C	-	D	-	-	-	C	-
<i>Hydroporus striola</i>	-	-	-	-	-	-	-	-	-	-	D	-	-	-	-	D	-	-	-	-
<i>Hydroporus umbrosus</i>	-	-	-	-	-	-	-	-	-	-	-	A	-	-	-	-	-	-	-	-
<i>Ilybius guttiger</i>	-	-	-	-	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-	-
<i>Helochares punctatus</i>	-	-	-	-	-	-	-	-	-	-	D	B	-	-	-	-	-	D	-	-
<i>Hydroporus pubescens</i>	-	-	-	-	-	-	D	C	-	D	B	-	D	C	C	B	B	C	-	-
<i>Agabus bipustulatus</i>	-	-	d	-	-	-	A	A	B	B	A	C	B	C	B	A	A	-	D	-
<i>Helophorus grandis</i>	-	-	-	-	-	-	D	D	-	-	D	-	-	D	B	-	C	-	-	-
<i>Hydroporus incognitus</i>	-	-	-	-	-	-	-	-	-	-	D	-	D	-	-	C	D	-	D	-
<i>Anacaena globulus</i>	D	-	-	-	-	-	D	D	-	D	C	D	D	C	-	B	A	-	A	B
<i>Limnebius truncatellus</i>	D	-	-	-	-	-	-	-	-	D	C	-	C	-	-	C	B	-	D	-
<i>Agabus paludosus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	D	-
<i>Helophorus obscurus</i>	-	-	-	-	-	-	D	-	-	-	C	-	D	C	C	C	C	-	-	-
<i>Laccobius atrocephalus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Hydraena nigrita</i>	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Platambus maculatus</i>	C	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	-
<i>Hydraena gracilis</i>	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	-
<i>Hydroporus discretus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	D	D	D	-	C
<i>Hydroporus gyllenhalii</i>	-	-	-	-	-	-	-	-	-	-	C	A	-	-	-	D	C	A	-	-
<i>Hydroporus melanarius</i>	-	-	-	-	-	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Agabus melanocornis	-	-	-	-	-	-	-	-	-	-	D	C	-	-	-	-	D	B	-	-
Hydroporus neglectus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	D	-	-
Helophorus flavipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	-	-	-
Hydroporus memnonius	-	-	-	-	-	-	-	-	-	-	C	-	D	-	-	B	D	C	-	-
Hydroporus nigrita	-	-	-	-	-	-	-	-	-	-	D	-	-	-	-	B	B	C	-	-
Agabus chalconatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	D	-	D	-	-
Hydroporus ferrugineus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	D	-	D	C
Hydroporus longulus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	-	D	-
Agabus guttatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	D	B	-	C	B
Stictonectes lepidus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	D	-	-	-

Groups and site scores for the Weald

Group 1 0010 - 15 sites

	SQS	NOS	WET	RDB	Na	Nb
360 TQ 7--2-- R Rother, Etchingham	4.2	6	25	0	1	3
387 SU 872435 R Wey, Tilford	3.2	5	16	0	0	1
343 TQ 744177 R Line	2.8	4	11	0	0	1
351 TQ 732225 Glottenham Stream	2.7	7	19	0	1	1
310 TQ 65-15 Christian's R, Bodle Street	2.2	22	49	0	2	5
363 TQ 8--0-- Hastings Cliffs	2.2	5	11	0	0	2
356 TQ 740240 R Rother	2.1	19	40	0	1	3
27 TQ 668331 Hook R	2.0	5	10	0	0	1
214 TQ 374348 R Medway, Mill Place	1.7	10	17	0	0	1
297 TQ 558321 The Gill	1.7	10	17	0	0	1
320 TQ 603254 R Rother	1.7	7	12	0	0	1
347 TQ 713237 Robertsbridge Stream	1.6	7	11	0	0	1
359 TQ 772243 R Rother, Bodiam	1.5	6	9	0	0	1
233 TQ 452213 R Ouse, Shortbridge	1.3	7	9	0	0	0
8 TQ 460401 Kent Water	1.2	5	6	0	0	0

Faster rivers, often in shade, with muddy banks and species characteristic of fluctuating water-lines.

Group 2 0011 - 19 sites

	SQS	NOS	WET	RDB	Na	Nb
220 TQ 4--1-- R Ouse, Ringmer	3.6	8	29	0	0	4
15 TQ 54-45- R Medway, Ensfield Br	2.6	11	29	0	1	2
5 TQ 49-46- R Eden, Chiddingstone	2.3	9	21	0	0	3
74 TQ 83-27- R Rother, Newenden	2.3	7	16	0	0	1
148 TR 03-39- East Stour	1.9	11	21	0	0	1
210 TQ 3--3-- stream, Turners Hill	1.8	6	11	0	0	2
100 TQ 86-44- R Sherway, Smarden	1.8	5	9	0	0	0
37 TQ 605470 R Medway, Tonbridge	1.7	6	10	0	0	0
288 TQ 50-39- R Medway, Ashurst	1.6	11	18	0	0	1
129 TQ 957461 Great Stour	1.6	9	14	0	0	0
369 TQ 834269 R Rother, Newenden	1.4	8	11	0	0	0
130 TQ 928474 Great Stour	1.3	4	5	0	0	0
95 TQ 814420 stream, Sinkhurst Green	1.3	3	4	0	0	0
154 TR 013407 East Stour, S. Willesborough	1.2	10	12	0	0	0
80 TQ 821384 stream, Biddenden	1.2	5	6	0	0	0
160 TR 150353 stream, Hythe	1.0	6	6	0	0	0
33 TQ 63-48- stream, Golden Green	1.0	5	5	0	0	0

Slower rivers with less fluctuation, mostly not shaded.

Group 3 0100 - 3 sites

	SQS	NOS	WET	RDB	Na	Nb
395 TV 515977 Cuckmere Haven	2.5	6	15	1	2	3
184 TR 340597 Bloody Point	1.8	5	9	0	0	2
378 TQ 921165 Winchelsea	1.6	10	16	0	0	5

Tidal pools, the best site supporting *Berosus spinosus* (RDB 3).

Group 4 01010 - 16 sites						SQS	NOS	WET	RDB	Na	Nb
149	TR	03-43-	gravel pit,	Ashford		2.6	17	44	1	0	4
110	TQ	95-23-	White Kemp	Sewer		2.5	24	61	1	0	4
135	TR	0--1--	ditches,	Denge		4.0	3	12	0	0	3
107	TQ	8--7--	grazing fen,	Chetney Marshes		2.5	14	35	0	1	3
134	TQ	9--6--	Elmley	Marshes		2.3	26	60	0	1	9
190	TR	3--6--	White House	Drove		2.2	12	26	0	0	3
394	TV	5--9--	oxbow pools,	Exceat Saltings		2.1	34	72	0	1	13
138	TR	05-18-	gravel pit,	Lydd		2.0	15	30	0	1	3
180	TR	225654	Chislet	Marshes		2.0	7	14	0	0	2
157	TR	0--6--	Swale	NNR		2.0	7	14	0	0	1
396	TV	518993	pond,	Exceat Bridge		1.8	5	9	0	0	2
159	TR	009690	Capel	Fleet		1.7	6	10	0	0	2
382	TQ	93-20-	gravel pit,	Northpoint Beach		1.6	14	23	0	0	4
136	TR	004191	Jury's	Gap Sewer		1.5	20	30	0	0	3
62	TQ	734591	gravel pit,	Aylesford		1.4	9	13	0	0	2
18	TQ	5--5--	gravel pits,	Sevenoaks		1.4	10	14	0	0	1

A combination of gravel pit ponds and main drains on grazing fen, all being unshaded and having high conductivities (not necessarily brackish), muddy substrate and limited vegetation. The best site was the first from which *Coelambus nigrolineatus* (RDB 3) was recorded in Britain. *Hydrochus ignicollis* (RDB 3) occurred in the White Kemp Sewer.

Group 5 010110 - 39 sites			SQS	NOS	WET	RDB	Na	Nb
377	TQ	917188 ditches, Rye Harbour LNR	3.1	14	44	2	0	1
137	TR	047184 Lydd	2.7	20	54	1	2	2
345	TQ	798195 Powdermill Reservoir West	2.7	15	41	1	1	1
140	TR	0--2-- Romney Marsh	4.0	6	24	0	2	2
164	TR	10-55- gravel pit, Chartham	2.6	11	28	0	1	3
186	TR	305596 Goshall	2.3	6	14	0	0	1
375	TQ	90-17- Winchelsea	2.2	19	42	0	0	3
67	TQ	70-60- gravel pits, New Hythe	2.1	15	31	0	0	4
262	TQ	526002 Westdean	1.9	32	60	0	0	7
172	TR	2--6-- Stourmouth Valley	1.9	9	17	0	0	2
170	TR	2--6-- Goldstone Drove	1.8	24	43	0	0	5
176	TR	28-63- Docker Hill	1.8	17	30	0	0	3
187	TR	310597 Goshall Stream	1.8	15	27	0	0	2
189	TR	313612 Richborough Stream	1.8	12	22	0	0	2
169	TR	2--6-- Preston Valley	1.8	12	21	0	0	1
193	TR	308634 Minster	1.8	12	21	0	0	1
178	TR	2--6-- Coxon's Hill	1.8	8	14	0	0	1
368	TQ	895139 Royal Military Canal	1.7	21	35	0	0	4
163	TR	1--5-- Canterbury	1.7	11	19	0	0	1
191	TR	314608 Richborough	1.7	9	15	0	0	1
109	TQ	94-28- channel, Stone Ferry	1.6	19	31	0	1	1
151	TR	0--4-- claypit, Naccolt	1.6	12	19	0	0	1
173	TR	2--6-- Plucks Gutter	1.6	11	17	0	0	1
112	TQ	953287 Royal Military Canal	1.6	11	17	0	0	0
72	TQ	87-28- Reading Sewer	1.5	25	38	0	0	2
125	TQ	958325 pond, Shirley Farm	1.5	14	21	0	0	1
174	TR	2--6-- Sarre Penn	1.4	11	15	0	0	0
179	TR	224664 Snake Drove	1.5	4	6	0	0	0
36	TQ	67-48- pond, East Peckham	1.5	4	5	0	0	0
73	TQ	83-28- Hexden Channel	1.3	14	18	0	0	1
335	TQ	766082 Glyne Gap	1.3	17	22	0	0	0
188	TR	344585 New Cut (North Stream)	1.3	12	16	0	0	0
177	TR	291636 Sherrifs Court	1.3	7	9	0	0	0
358	TQ	755220 pond, Park Farm	1.3	6	8	0	0	0
185	TR	343588 New Downs Farm	1.3	4	5	0	0	0
4	TQ	46-48- pond, Four Elms	1.3	3	4	0	0	0
91	TQ	896311 pond, Dumbourne Farm	1.2	9	11	0	0	0
118	TQ	981268 Romney Marsh	1.2	6	7	0	0	0
266	TQ	540019 dew pond, Lullington Heath	1.2	6	7	0	0	0

Slow ditches and ponds on coastal levels or in river valleys with little brackish influence, unshaded and with plenty of emergent vegetation and mud. The majority of sites were in East Kent or in the eastern extremity of Sussex. Most were of low species-quality. The top sites supported some RDB 3 species, *Haliphus variegatus* (137 and 377), *Hydrochus ignicollis* (345) and *Hydrophilus piceus* (377).

Group 6 010111 - 22 sites			SQS	NOS	WET	RDB	Na	Nb
364	TQ	802198 Powdermill Reservoir East	4.6	10	46	1	0	0
168	TR	208567 Nail Bourne	3.1	9	28	1	1	1
84	TQ	859385 pond, Biddenden	3.3	3	10	0	1	0
162	TR	172425 Nail Bourne	2.5	11	27	0	1	2
66	TQ	738593 pond, Pratling Street	2.4	5	12	0	0	0
60	TQ	728487 Chainhurst	2.0	7	14	0	0	1
97	TQ	823444 R Beult	2.0	7	14	0	0	1
123	TQ	93-32- Cradlebridge Sewer	1.9	8	15	0	0	1
55	TQ	763480 R Beult, Stilebridge	1.8	14	25	0	0	3
171	TR	2--6-- Newnham Valley	1.7	18	31	0	0	1
71	TQ	89-29- Reading Sewer	1.7	9	15	0	0	1
50	TQ	79-36- pond, Sissinghurst	1.6	16	25	0	0	1
331	TQ	677337 Bewlbridge Reservoir	1.6	11	17	0	0	1
259	TQ	494363 Ball's Green	1.5	10	15	0	0	1
355	TQ	736244 stream, Robertsbridge	1.5	10	15	0	0	0
35	TQ	67-48- R Medway, East Peckham	1.5	4	6	0	0	0
328	TQ	696226 Swan Lake, Socknersh	1.4	5	7	0	0	0
143	TR	0--3-- Romney Marsh	1.3	8	10	0	0	0
175	TR	2--6-- Chitty	1.3	4	5	0	0	0
2	TQ	492473 Bough Beech Reservoir	1.2	13	16	0	0	1
263	TQ	521063 Berwick Station	1.2	11	13	0	0	0
316	TQ	687142 Ashburnham Place lake	1.2	6	7	0	0	0

Some slow drains and rivers and artificial ponds, none with brackish influence. Powdermill Reservoir is the second British site for *Halipus varius* (RDB 3), and *Cercyon granarius* (RDB 3) occurred in the Nail Bourne.

Group 7 01100 - 20 sites			SQS	NOS	WET	RDB	Na	Nb
113	TQ	9--2-- Romney & Walland Marshes	2.8	53	150	3	2	9
379	TQ	939179 shingle pits, Nook Beach	2.8	45	125	3	4	8
111	TQ	95-23- Guldeford Level North	2.7	46	122	3	2	6
381	TQ	97-18- pond, Silversands	2.5	65	164	3	2	16
69	TQ	7--7-- grazing fen, Cliffe Marshes	2.7	50	133	2	1	11
383	TQ	93-21- ditches, Guldeford Levels	2.4	62	146	2	1	15
219	TQ	443022 pond, Newhaven	2.1	36	77	2	1	9
114	TQ	96-26- Fairfield	2.0	49	100	2	2	5
106	TQ	8--7-- grazing fen, Allhallows	2.6	25	62	1	1	5
117	TQ	98-23- Walland Marsh	2.4	37	87	1	2	8
380	TQ	960195 Camber Levels	2.4	24	57	1	2	3
374	TQ	90-15- Pett Level	2.3	49	113	1	2	11
217	TQ	441022 pond, Newhaven	2.1	23	48	1	1	4
70	TQ	7--7-- grazing fen, Higham Marshes	2.1	31	64	1	0	6
115	TQ	97-25- Brookland (not SSSI)	2.0	40	79	1	2	8
121	TQ	9--3-- The Dowels	1.9	48	91	1	2	5
183	TR	3--5-- Deal	2.0	30	60	0	1	6
393	TR	00-19- Walland Marsh	1.7	35	58	0	1	8
302	TQ	641024 shingle pits, The Crumbles	1.5	36	53	0	0	8
181	TR	37-50- pond, Walmer	1.2	9	11	0	0	2

Group 7 represents the most important community on the coastal marshes, found mainly in undisturbed ditches and ponds with rich vegetation over exposed substrate and with some brackish influence. Most sites are in the Romney Marsh area. All of the RDB species are in category 3: - *Halipus variegatus* (381), *Hydrovatus clypealis* (111, 113, 374, 379, 383), *Graptodytes bilineatus* (111, 113, 380, 381), *Hydrochus elongatus* (70), *H. ignicollis* (114), *Cercyon bifenestratus* (69, 379), *Hydrophilus piceus* (69, 106, 111, 113, 114, 115, 117, 121, 217, 219, 381, 383), *Berosus spinosus* (219), and *Heterocerus hispidulus* (379). The highest ranking site was at one time the only Wealden locality for *Bidessus unistriatus* (RDB 2) but this species has not been recorded there since 1947.

Group 8 01101 - 32 sites			SQS	NOS	WET	RDB	Na	Nb
305	TQ 6--0--	Pevensey Levels	2.8	80	227	5	5	14
215	TQ 4--0--	North End, Lewes Levels	2.5	57	143	4	0	3
218	TQ 4--0--	ditches, Southease	2.6	39	100	2	3	7
384	TQ 947208	gravel pits, Moneypenny Farm	2.5	30	76	2	1	3
327	TQ 685203	Brightling Park	2.3	48	111	2	0	10
303	TQ 65-05-	Mountney Level	2.2	45	100	2	1	6
349	TQ 727220	swimming pool, Darvell	2.2	48	106	2	0	8
304	TQ 6--0--	Hooe Level	2.3	43	97	1	3	6
75	TQ 894297	grazing fen, Small Hythe	2.3	23	52	1	0	7
334	TQ 704073	Hooe Level	1.9	26	49	1	1	1
90	TQ 894300	pond, Smallhythe Place	1.8	19	35	1	0	1
192	TR 3--6--	Ash Levels	2.0	24	47	0	0	6
306	TQ 6--1--	Pevensey Levels	1.9	49	92	0	1	9
313	TQ 677118	Boreham Street	1.9	41	79	0	1	7
370	TQ 835267	Rother Level	1.9	39	72	0	0	5
309	TQ 627106	Herstmonceux	1.8	33	58	0	1	5
301	TQ 628083	Horse Eye Level	1.8	25	45	0	1	3
367	TQ 89-14-	ditches, Pett Level	1.6	30	47	0	0	5
373	TQ 90-14-	Pett Level	1.6	30	47	0	0	5
269	TQ 58-04-	Shepham Farm	1.6	35	57	0	0	4
365	TQ 824186	Brede	1.6	14	23	0	0	2
116	TQ 9--2--	arable fen, Walland	1.5	26	40	0	0	4
224	TQ 435137	Upper Wellingham Farm	1.5	25	38	0	0	2
276	TQ 588166	Marle Green	1.5	15	22	0	0	2
223	TQ 44-16-	Iron R, Isfield	1.5	29	43	0	0	1
300	TQ 614025	Hampden Park	1.4	28	40	0	0	4
307	TQ 613100	Whelpley Level	1.4	22	30	0	0	3
161	TR 136356	pond, Pedlinge	1.4	14	20	0	0	2
194	TQ 0--1--	Amberley Wild Brooks	1.4	29	41	0	0	1
122	TQ 93-32-	ditches, Shirley Moor	1.4	24	33	0	0	1
132	TQ 907402	pond, Bethersden	1.4	15	21	0	0	1
348	TQ 726267	Burgh Hill	1.3	22	29	0	0	2

A community of rich fen ditches and ponds characteristic of the hinterland of the coastal levels and including most of the lists from Lewes and Pevensey but very few from the eastern levels. The RDB 2 species are *Laccophilus obsoletus* (215) and *Graptodytes flavipes* (218). RDB 3 species are *Haliphus mucronatus* (215 and 218), *H. varius* (327 - the first British site), *Hydrovatus clypealis* (215, 305, 327 and 384), *Graphoderus cinereus* (303), *Hydrochus elongatus* (305), *H. ignicollis* (305 and 349), *Cercyon granarius* (75), *Laccobius simulatrix* (349 - the only British site), *Hydrophilus piceus* (90, 215, 303, 304, 305, 334 and 384) and *Scirtes orbicularis* (305).

Group 9 0111000 - 5 sites			SQS	NOS	WET	RDB	Na	Nb
350	TQ 728231	pond, Darvell	1.7	11	19	0	0	2
397	TV 550982	Friston	1.6	5	8	0	0	1
81	TQ 827398	ponds, Biddenden	1.6	7	11	0	0	0
141	TR 044249	ditch, Old Romney	1.4	7	10	0	0	1
85	TQ 861393	pond, Biddenden	1.0	5	5	0	0	0

A species-poor community associated with small, deep artificial ponds.

Group 10 01110010 - 56 sites

		SQS	NOS	WET	RDB	Na	Nb
226	TQ 4--2-- Piltown Pond	2.2	43	94	2	0	7
145	TR 06-31- ditch, Newchurch	2.1	12	25	1	0	1
58	TQ 78-46- pond, Cross-at-Hand	1.9	16	30	0	0	5
336	TQ 708159 pond, Steven's Crouch	1.8	25	44	0	0	4
7	TQ 473482 pond, Four Elms	1.8	13	23	0	0	1
88	TQ 885377 pond, High Halden	1.8	12	22	0	0	1
371	TQ 864228 Flatropers Wood	1.7	28	48	0	0	7
245	TQ 446328 The Ridge Pond	1.7	26	39	0	0	4
235	TQ 459215 Shortbridge	1.7	15	26	0	0	4
212	TQ 33-35- pond, Turners Hill	1.7	19	32	0	0	3
272	TQ 528195 pond, Blackboys	1.7	16	27	0	0	3
61	TQ 715449 pond, Collier Street	1.7	15	25	0	0	3
289	TQ 506397 pond, Willett's Farm	1.7	15	25	0	0	2
131	TQ 92-40- pond, Bethersden	1.7	17	29	0	0	1
150	TR 060423 pond, Hinxhill	1.6	19	30	0	0	1
248	TQ 453348 pond, Parrock	1.6	11	17	0	0	1
147	TR 089317 ditch, Burmarsh	1.6	10	16	0	0	0
279	TQ 517225 lake, Shepherd's Hill	1.5	22	32	0	0	4
357	TQ 745255 pond, Salehurst	1.5	22	33	0	0	3
315	TQ 682155 Potts Green	1.5	21	32	0	0	3
268	TQ 561087 pond, Milton Hide	1.5	28	43	0	0	2
265	TQ 526086 pond, Chalvington	1.5	26	39	0	0	1
206	TQ 386065 pond, Swanborough Hill	1.5	20	30	0	0	1
76	TQ 805330 pond, Benenden	1.5	12	18	0	0	1
139	TR 056220 ditch, Lydd	1.5	8	12	0	0	0
28	TQ 655359 pond, Hook Green	1.4	22	30	0	0	3
296	TQ 556322 Rotherfield Waterworks	1.4	21	29	0	0	3
312	TQ 669198 pond, Hook's Green	1.4	21	29	0	0	3
102	TQ 884405 pond, Smarden	1.4	20	28	0	0	3
59	TQ 762445 pond, Marden	1.4	23	31	0	0	2
376	TQ 90-17- ditch, Winchelsea	1.4	21	30	0	0	2
282	TQ 544274 Grove Farm	1.4	19	27	0	0	2
321	TQ 62-29- ponds, Riseden	1.4	16	22	0	0	2
264	TQ 522087 pond, Chalvington	1.4	24	34	0	0	1
216	TQ 428054 gault pit, Southease	1.4	16	22	0	0	1
158	TR 087606 ponds, Blean	1.4	8	11	0	0	1
203	TQ 287329 pond, Mount Pleasant	1.4	14	19	0	0	0
308	TQ 615146 pond, Cowbeech	1.3	19	24	0	0	2
318	TQ 694170 Foxearth Wood	1.3	12	15	0	0	2
295	TQ 554350 Meadow Bank	1.3	8	10	0	0	1
64	TQ 77-58- pond, Maidstone	1.3	8	10	0	0	0
38	TQ 681479 pond, Beltring	1.3	6	8	0	0	0
285	TQ 583257 pond, Clayton's Farm	1.2	24	29	0	0	3
273	TQ 530167 East Hoathly	1.2	20	24	0	0	1
277	TQ 593161 Marle Green	1.2	16	19	0	0	1
326	TQ 669240 pond, Bateman's	1.2	13	16	0	0	1
86	TQ 862381 ponds, Biddenden	1.2	10	12	0	0	1
354	TQ 736237 ditches, Robertsbridge	1.2	18	21	0	0	0
120	TQ 90-38- ponds, Bethersden	1.2	9	11	0	0	0
324	TQ 656272 Stonegate Station	1.2	9	11	0	0	0
124	TQ 934304 ditch, Appledore	1.2	6	7	0	0	0
202	TQ 275331 pond, Tilgate Forest	1.2	6	7	0	0	0
284	TQ 563262 pond, Holmstall	1.1	11	12	0	0	0
231	TQ 445243 Down Street	1.1	9	10	0	0	0
57	TQ 782467 R Beult	1.1	8	9	0	0	0

The Wealden clay pond community, associated with part shade and marshy vegetation. The two highest ranking sites are heathland ponds less acid than those in Group 11. No RDB species are characteristic of the group. *Graptodytes flavipes* (RDB 2) and *Graphoderus cinereus* (RDB 3) occur on Great Bookham Common,

Hydrovatus clypealis and *Enochrus isotae* (both RDB 3) in the Piltown Pond and one ditch (145) had *Hydrophilus piceus* (RDB 3).

Group 11 01110011 - 25 sites		SQS	NOS	WET	RDB	Na	Nb
127	TQ 982355 pond, Longrope Wood	2.6	46	119	2	1	11
200	TQ 127636 Black Pond	2.7	40	106	1	0	10
391	SU 993634 Chobham Common	2.5	60	151	1	0	17
197	TQ 004720 Langham Pond	1.7	46	77	1	0	6
236	TQ 47-25- Furnace Wood	2.2	32	71	0	0	7
99	TQ 86-44- ponds, Smarden	2.1	22	45	0	0	5
12	TQ 545386 pond, Broomlands	2.1	21	44	0	0	6
1	TQ 4--4-- pond, Mowshurst	2.0	30	61	0	0	6
252	TQ 468334 Ashdown Forest	1.9	14	26	0	0	4
89	TQ 893383 ponds, High Halden	1.9	21	39	0	0	3
20	TQ 682382 pond, Pittsgate Cross	1.8	20	35	0	0	3
9	TQ 484680 pond, St. Mary Cray	1.8	5	9	0	0	1
253	TQ 48-32- pond, 500 Acre Wood	1.7	24	41	0	0	5
346	TQ 708288 pond, Pashley Manor	1.7	23	38	0	0	4
207	TQ 3--1-- pond, Markstake Common	1.6	14	23	0	0	4
332	TQ 685383 Cottage Shaw	1.6	15	24	0	0	1
333	TQ 7--0-- Bulverhythe Marshes	1.5	40	59	0	1	3
208	TQ 383206 pond, Chailey Common	1.5	34	52	0	0	2
101	TQ 863465 pond, Gratty Green	1.5	20	29	0	0	2
229	TQ 437287 pond, Mill wood	1.4	25	35	0	0	1
26	TQ 643339 ponds, Buckland Hill	1.3	22	28	0	0	2
260	TQ 497365 pond, Withyam Station	1.3	19	24	0	0	0
255	TQ 488362 pond, Withyam	1.2	26	30	0	0	1
339	TQ 735190 pond, Crowhurst Wood	1.2	17	21	0	0	1
13	TQ 57-49- pond, Hildenborough	1.2	10	12	0	0	0

This community is mainly associated with *Sphagnum* carpets and other vegetation rafts. The exemplars lie outwith the main concentration of such sites and they support RDB 3 species, Longrope Wood with *Hydrovatus clypealis* and *Limnebius crinifer*, the Black Pond at Esher with *Graphoderus cinereus*, the Gracious Ponds on Chobham Common with *Enochrus isotae*, and the Langham Pond with *Hydrochus elongatus*. These sites all lie in relict wetland areas whereas the Central Weald sites, the best three of which (12, 99 and 236) have been destroyed, were formed in artificial clay ponds.

Group 12 011101 - 6 sites		SQS	NOS	WET	RDB	Na	Nb
196	TQ 080583 Ockham Common	2.9	18	52	0	0	3
195	TQ 069589 Teal Pond, Wisley Common	2.5	12	30	0	0	3
205	TQ 2--7-- Wimbledon Common	2.5	8	20	0	0	1
390	SU 90-40- Thursley Common	2.1	27	57	0	0	3
385	SU 820297 Forest Mere	1.9	13	24	0	0	1
389	SU 899415 Thursley Common Moat	1.8	13	23	0	0	1

Acid, unshaded, permanent ponds on the Surrey heaths characterised by the presence of larger Dytiscidae.

Group 13 0111100 - 36 sites				SQS	NOS	WET	RDB	Na	Nb
366	TQ	859109	landslip pools, Fairlight	2.2	15	23	1	0	4
221	TQ	433148	R Ouse, Barcombe House	1.8	15	27	0	1	1
56	TQ	795456	R Beult	1.8	14	25	0	0	3
227	TQ	42-29-	Braberry Hatch	1.7	27	46	0	0	3
142	TR	00-21-	Little Scotney	1.7	6	10	0	0	2
87	TQ	863354	stream, Sandpit Wood	1.6	9	14	0	0	0
98	TQ	84-43-	R Beult	1.6	8	13	0	0	0
234	TQ	452257	Prickett's Lane	1.4	25	34	0	0	2
44	TQ	70-39-	pond, Lewis Heath	1.4	15	21	0	0	2
83	TQ	85-31-	pond, Rolvenden Layne	1.4	9	13	0	0	2
314	TQ	67-13-	Hugletts Stream	1.4	21	30	0	0	1
166	TR	1--6--	Bab's Oak Wood	1.4	10	14	0	0	1
242	TQ	413340	Tylehurst	1.3	16	21	0	0	3
283	TQ	547261	Stonehurst Farm	1.3	8	10	0	0	2
249	TQ	454333	Coleman's Hatch	1.3	18	24	0	0	1
93	TQ	800460	puddle, Headcorn	1.3	14	18	0	0	0
65	TQ	70-52-	stream, Tutsham	1.3	12	15	0	0	0
275	TQ	538176	Possingworth Park	1.3	11	14	0	0	0
34	TQ	62-46-	Tudeley	1.3	4	5	0	0	0
17	TQ	564513	cattle trough, Shipbourne	1.3	3	4	0	0	0
16	TQ	57-51-	pond, Shipbourne	1.2	5	6	0	0	1
352	TQ	732232	stream, Darvell	1.2	21	26	0	0	0
14	TQ	59-42-	pond, Southborough	1.2	14	17	0	0	0
353	TQ	732264	Silver Hill	1.2	13	15	0	0	0
325	TQ	657256	landslide, Southover	1.1	9	10	0	0	1
6	TQ	401479	stream, Caterfield Bridge	1.1	16	18	0	0	0
341	TQ	743128	Catsfield Place	1.1	15	16	0	0	0
247	TQ	448345	Parrock	1.1	11	12	0	0	0
340	TQ	7--1--	Powdermill Stream	1.1	11	12	0	0	0
291	TQ	536317	puddle, Limekiln Wood	1.1	10	11	0	0	0
342	TQ	763133	Pyes Farm	1.1	8	9	0	0	0
256	TQ	488379	Highfields Park	1.0	9	9	0	0	0
258	TQ	493374	St. Quentin Stud	1.0	7	7	0	0	0
257	TQ	492357	Hawkins Bridge	1.0	6	6	0	0	0
79	TQ	81-36-	pond, Hemsted Forest	1.0	5	5	0	0	0
105	TQ	89-50-	pond, Chilston Park	1.0	4	4	0	0	0
Temporary pools over silt and mud, sometimes in the edges of streams.									

Group 14 0111101 - 12 sites				SQS	NOS	WET	RDB	Na	Nb
43	TQ	68-73-	Shorne Marshes	2.1	23	48	0	1	5
182	TR	3--5--	Finglesham	2.1	18	38	0	1	2
68	TQ	7--6--	Wouldham Marshes	1.6	16	25	0	0	2
146	TR	01-39-	South Willesborough	1.5	25	37	1	0	3
32	TQ	677478	ditches, Beltring	1.5	10	15	0	0	0
361	TQ	78-25-	Bodiam Castle Moat	1.4	26	37	0	0	2
153	TR	00-40-	South Willesborough	1.4	17	23	0	0	1
108	TQ	9--2--	dyke, Snargate	1.3	6	8	0	0	0
53	TQ	7--3--	ponds, Cranbrook	1.2	12	14	0	0	0
42	TQ	69-59-	sandpit, Leybourne	1.2	9	11	0	0	0
152	TR	012407	South Willesborough	1.1	12	13	0	0	0
96	TQ	82-43-	pond, Headcorn	1.0	9	9	0	0	0

The fauna is mainly associated with deep, regularly cleared, drains on grazing fen. *Scirtes orbicularis* (RDB 3) occurred at South Willesborough but is possibly over-rated and is not included in the quality score evaluation. The best sites were the Shorne Marshes with *Ochthebius exaratus* (Na) and Finglesham with *Gyrinus paykulli* (Na).

Group 15 011111 - 7 sites				SQS	NOS	WET	RDB	Na	Nb
133	TQ	91-69-	King Ferry Bridge	3.2	5	16	1	0	2
94	TQ	80-48-	pond, Sutton Valence	2.9	10	29	1	0	1
225	TQ	468128	Colbrands	1.2	12	14	0	0	0
156	TR	0--6--	pond, Faversham	1.1	10	11	0	0	1
211	TQ	35-34-	Holstein Wood	1.1	10	11	0	0	0
82	TQ	83-32-	pond, Hole Park	1.0	8	8	0	0	0
155	TR	0--5--	pond, Challock Forest	1.0	5	5	0	0	0

Large temporary ponds, often with *Coelambus confluens* (Nb). The best sites are at King Ferry Bridge with *Hydrophilus piceus* (RDB 3) and a pond at Sutton Valence surveyed one year after its construction, which contained *Helophorus longitarsis* (Na), a species that could be described as a "relict pioneer".

Group 16 1000 + 10010 - 42 sites				SQS	NOS	WET	RDB	Na	Nb
198	TQ	1--4--	woodland pool, Leith Hill	2.7	6	16	0	1	1
246	TQ	448326	Hillside	2.3	6	14	0	1	0
228	TQ	435290	flush, Ashdown Forest	2.3	6	14	0	0	2
204	TQ	2--3--	woodland bog, Tilgate Forest	2.2	15	33	0	1	2
78	TQ	81-36-	ruts, Hemsted Forest	2.1	9	19	0	0	2
23	TQ	636386	puddles, Dundle Wood	2.1	7	15	0	0	1
280	TQ	518263	bog, Burnt Oak	2.0	23	46	0	0	4
270	TQ	511147	transition mire, Vert Wood	1.9	22	41	0	0	4
278	TQ	51-21-	marsh, Shawford	1.8	16	28	0	0	2
22	TQ	608381	flush, Palmers Green	1.8	5	9	0	0	0
165	TQ	1--6--	Blean Woods	1.8	4	7	0	0	1
251	TQ	468333	Hurstland Farm	1.7	19	33	0	0	5
213	TQ	322346	Mount Noddy	1.7	15	26	0	0	2
388	SU	880429	woodland bog, Stockbridge	1.7	23	39	0	0	1
317	TQ	69-19-	Cackle Street	1.7	13	22	0	0	1
119	TQ	906362	ruts, Pond Wood	1.7	6	10	0	0	1
49	TQ	791396	ruts, Brewers Wood	1.6	13	21	0	0	1
337	TQ	70-16-	Creep Wood	1.5	15	22	0	0	1
338	TQ	711182	bog, Netherfield	1.5	18	27	0	0	1
77	TQ	81-31-	ruts, Moor Wood	1.5	13	19	0	0	1
230	TQ	437288	Mill Wood	1.5	15	22	0	0	0
293	TQ	54-36-	woodland pool, Bohemia	1.4	12	17	0	0	1
386	SU	823298	bog, Forest Mere	1.4	10	14	0	0	0
126	TQ	98-34-	puddles, Faggs Wood	1.3	16	20	0	0	1
29	TQ	652365	oxbow, Bayham Abbey	1.3	14	18	0	0	1
271	TQ	51-14-	ruts, Rowland Wood	1.3	13	17	0	0	1
92	TQ	8--4--	ditches, East Sutton	1.3	12	15	0	0	1
281	TQ	539249	woodland pool, Stonehurst	1.3	11	14	0	0	1
274	TQ	531168	Barham Park	1.3	15	19	0	0	0
52	TQ	74-38-	ruts, Old Park Wood	1.3	8	10	0	0	0
209	TQ	384218	Chailey Common North	1.2	13	16	0	0	1
311	TQ	650196	Earl's Down	1.2	9	11	0	0	0
30	TQ	613415	pond, Pembury Woods	1.2	6	7	0	0	0
222	TQ	404178	Balneath Wood	1.2	6	7	0	0	0
41	TQ	60-50-	ruts, Shipbourne Forest	1.2	5	6	0	0	0
261	TQ	513069	withypit, Selmeston	1.1	11	12	0	0	0
362	TQ	703313	field puddles, Downash	1.1	10	11	0	0	0
21	TQ	607384	ruts, High Wood	1.1	7	8	0	0	0
51	TQ	798388	ruts, Sissinghurst	1.1	7	8	0	0	0
344	TQ	79-14-	puddles, Beaufort Park	1.0	10	10	0	0	0
267	TQ	561071	Abbotts Wood	1.0	7	7	0	0	0
290	TQ	526336	ruts, Orznash House	1.0	6	6	0	0	0

Temporary ponds, puddles and ruts in woodland, often spring-fed. The best of the spring-fed pools support *Agabus melanarius* (Na) whereas *Hydroporus neglectus* and *A. chalconatus* (both Nb) are the characteristic rare species of the stagnant pools.

Group 17 10011 - 15 sites				SQS	NOS	WET	RDB	Na	Nb
243	TQ	415331	Hindleap Warren	2.5	22	55	0	1	2
292	TQ	54-30-	Old Lodge Warren	2.4	26	63	0	0	3
329	TQ	60-37-	Court Lodge Warren	2.3	36	84	0	1	6
298	TQ	58-32-	Nap Wood	2.0	22	43	0	0	3
240	TQ	406329	Hindleap Warren	1.9	14	26	0	1	1
237	TQ	48-29-	New Pond Cottages	1.8	12	21	0	0	2
232	TQ	45-29-	Ashdown Forest	1.7	23	38	0	0	1
286	TQ	5--3--	Eridge Old Park	1.6	32	50	0	0	6
201	TQ	1--7--	Richmond Park	1.6	11	18	0	0	3
238	TQ	485295	Ashdown Forest	1.5	13	20	0	0	2
299	TQ	580327	Saxonbury Hill	1.5	8	12	0	0	0
241	TQ	41-31-	Press Ridge Warren	1.4	19	26	0	0	2
250	TQ	456325	Kidd's Hill	1.4	15	21	0	0	2
244	TQ	42-31-	Wych Cross	1.3	12	16	0	0	1
287	TQ	50-33-	Lye Green	1.0	7	7	0	0	0

The Hastings Beds valley mires community, the Richmond Park list being a mixture of species from a degraded area. The group includes "stream ponds" on Ashdown Forest, pools in stream beds occupied by *Stictonectes lepidus* (Nb).

Group 18 101 - 7 sites				SQS	NOS	WET	RDB	Na	Nb
19	TQ	579555	Ightham	3.3	3	10	0	0	1
10	TQ	44-70-	Chislehurst Common	3.0	4	12	0	0	1
47	TQ	714341	Combwell Wood	2.6	9	23	0	0	2
128	TQ	96-46-	Hothfield Common	1.8	9	16	0	0	2
11	TQ	57-39-	Rusthall Common	1.7	10	17	0	1	1
239	TQ	406320	Ashdown Forest	1.6	8	17	0	0	0
103	TQ	802539	Sissinghurst	1.3	3	4	0	0	0

Very shallow acid ponds without groundwater supply.

Group 19 110 - 7 sites				SQS	NOS	WET	RDB	Na	Nb
294	TQ	554348	Steel Bridge	2.3	6	14	0	1	0
48	TQ	720346	Bedgebury Pinetum	1.9	8	15	0	0	1
319	TQ	697115	Ninfield	1.7	6	10	0	0	2
322	TQ	65-26-	R Rother, Witherenden	1.6	18	28	0	1	0
323	TQ	653204	Forge Wood	1.6	7	11	0	0	0
45	TQ	763362	Angley Wood	1.4	7	10	0	0	1
31	TQ	620415	Pembury Woods	1.1	7	8	0	0	0

Shaded streams on Hastings Beds, the best site being the only modern one for *Deronectes latus* (Na) in south-east England.

Group 20 111 - 10 sites				SQS	NOS	WET	RDB	Na	Nb
254	TQ	48-32-	seepage line, Wood Eaves	3.2	5	16	0	0	2
372	TQ	878237	well, Peasmarsh	2.8	6	17	0	0	4
25	TQ	694347	rut, Kilndown Wood	2.5	2	5	0	0	1
39	TQ	686427	puddle, Brenchley	2.0	3	6	0	0	1
24	TQ	68-33-	stream, Chingley Wood	1.8	12	22	0	0	3
46	TQ	76-36-	trickles, Angley Wood	1.8	5	9	0	0	1
63	TQ	778582	stream, Boxley	1.5	2	3	0	0	0
3	TQ	411483	stream, Staffhurst Wood	1.3	8	10	0	0	1
144	TR	042351	ditch, Priory Wood	1.3	3	4	0	0	0
104	TQ	816559	stream, Bearsted	1.0	2	2	0	0	0

Shaded seepage and wells on Hastings Beds, *Hydroporus ferrugineus* (Nb) being a characteristic species.

Appendix 1. Species-quality scores assigned to species in data analysis from Lincolnshire and northern East Anglia (column EA) and Wales and the Midlands (column WM).

These are the values in use in May 1989. The Red Data Book and Nationally Notable statuses are given. A few Na/Nb listings differ (*) from those of Ball (1986) and mainly reflect changes in knowledge since the publication of that document.

	Status	EA	WM
<i>Brychius elevatus</i>		2	4
<i>Peltodytes caesus</i>	Nb	4	8
<i>Haliphus apicalis</i>	Nb	4	4
<i>confinis</i>		2	4
<i>flavicollis</i>		4	4
<i>fluviatilis</i>		1	2
<i>fulvus</i>		4	4
<i>furcatus</i>	RDB1	32	32
<i>heydeni</i>	Nb	2	4
<i>immaculatus</i>		2	2
<i>laminatus</i>	Nb	4	8
<i>lineatocollis</i>		1	1
<i>lineolatus</i>		4	4
<i>mucronatus</i>	RDB3	8	8
<i>obliquus</i>		4	4
<i>ruficollis</i>		1	1
<i>variegatus</i>	RDB3	16	32
<i>wehnckeii</i>		2	2
<i>Hygrobia hermanni</i>		2	4
<i>Noterus clavicornis</i>		2	4
<i>crassicornis</i>	Nb	4	8
<i>Laccophilus hyalinus</i>		2	4
<i>minutus</i>		1	2
<i>ponticus</i>	RDB2	32	32
<i>Hydrovatus clypealis</i>	RDB3	16	16
<i>Hyphydrus ovatus</i>		1	2
<i>Hydroglyphus geminus</i>	Nb	2	4
<i>Bidessus minutissimus</i>	RDB3	32	32
<i>unistriatus</i>	RDB1	32	32
<i>Hygrotus decoratus</i>	Nb	4	8
<i>inaequalis</i>		1	1
<i>quinquelineatus</i>	Nb	16	8
<i>versicolor</i>		2	4
<i>Coelambus confluens</i>	Nb	2	2
<i>impressopunctatus</i>		2	2
<i>novemlineatus</i>	Nb	16	8
<i>parallelogrammus</i>	Nb	2	4
<i>Hydroporus angustatus</i>		1	2
<i>discretus</i>		2	2
<i>elongatulus</i>	RDB3	32	32
<i>erythrocephalus</i>		2	2
<i>ferrugineus</i>	Nb	4	4
<i>glabriusculus</i>	RDB3	32	32
<i>gyllenhalii</i>		1	1
<i>incognitus</i>		2	2
<i>longicornis</i>	Nb	16	8

	Status	EA	WM
Hydroporus longulus		4	4
marginatus	Na	8	16
melanarius		4	4
memnonius (matt female form)		1	1
memnonius (shining female form)		8	4
morio		8	4
neglectus	Nb	8	8
nigrita		1	1
obscurus		4	4
obsoletus	Na	8	8
palustris		1	1
planus		1	1
pubescens		1	1
rufifrons	RDB2	32	16
scalesianus	RDB2	32	32
striola		2	2
tessellatus		1	2
tristis		4	4
umbrosus		4	2
Suphrodytes dorsalis		2	4
Stictonectes lepidus	Nb	4	4
Graptodytes bilineatus	RDB3	16	16
flavipes	RDB2	16	16
granularis	Nb	4	8
pictus		2	4
Porhydrus lineatus		2	4
Deronectes latus	Na	8	8
Potamonectes assimilis		8	4
depressus depressus	Nb	16	8
depressus elegans		1	1
griseostriatus	Nb	16	8
Stictotarsus duodecimpustulatus		2	2
Oreodytes davisii		16	8
sanmarkii		2	2
septentrionalis		2	2
Scarodytes halensis	Nb	4	4
Laccornis oblongus	Na	8	8
Platambus maculatus		2	2
Copelatus haemorrhoidalis		2	4
Agabus affinis		4	2
arcticus		16	8
biguttatus	Nb	4	4
bipustulatus		1	1
chalconatus	Nb	4	4
congener		8	4
conspersus	Nb	2	4
didymus		4	4
guttatus		2	2
labiatus	Nb	8	8
melanarius	Na	8	8
melanocornis		2	2
nebulosus		1	1
paludosus		1	1
striolatus	RDB2	32	32

	Status	EA	WM
Agabus sturmii		1	1
uliginosus	Na	16	16
undulatus	RDB2	16	16
unguicularis	Nb	8	4
Ilybius aenescens	Nb	4	4
ater		2	2
fenestratus	Nb	4	4
fuliginosus		1	1
guttiger	Nb	4	4
quadriguttatus		4	8
subaeneus	Nb	8	4
Rhantus bistriatus (= suturellus)		8	8
exsoletus		4	4
frontalis	Nb	4	16
grapii	Nb	8	8
suturalis	Nb	2	4
Colymbetes fuscus		1	1
Hydaticus seminiger	Nb	4	8
transversalis	Na	8	16
Acilius canaliculatus	Na*	32	16
sulcatus		4	4
Graphoderus bilineatus	RDB1	32	32
cinereus	RDB3	16	16
Dytiscus circumcinctus	Na	8	8
circumflexus	Nb	4	8
dimidiatus	Na	8	8
lapponicus	Na	16	16
marginalis		1	1
semisulcatus		2	2
Gyrinus aeratus	Nb	8	8
caspius		2	4
distinctus	Na	8	8
marinus		1	2
minutus	Nb	8	8
paykulli (bicolor)	Na	8	8
substriatus		1	1
suffriani	Na	8	16
urinator	Nb	8	16
Orectochilus villosus		4	4
Georissus crenulatus	Na	4	4
Spercheus emarginatus	RDB1	32	32
Hydrochus angustatus	Nb	4	8
brevis	RDB3	16	16
carinatus	RDB3	16	16
elongatus	RDB3	8	16
ignicollis	RDB3	16	16
megaphallus	RDB3	16	32
nitidicollis	RDB3	16	16
Helophorus aequalis		1	1
alternans	Na	4	8
arvernicus	Nb	8	4
brevipalpis		1	1
dorsalis	RDB3	8	8
flavipes		1	1

	Status	EA	WM
Helophorus fulgidicollis	Nb	2	2
grandis		1	1
granularis		4	4
griseus	Nb	4	4
longitarsis	RDB3	16	16
minutus		1	2
nanus	Na	4	8
nubilus		2	2
obscurus		1	1
strigifrons	Nb	8	8
tuberculatus	RDB3	16	16
Coelostoma orbiculare		8	4
Megasternum obscurum		2	2
Cercyon bifenestratus	RDB3	8	8
convexusculus	Nb	4	4
depressus	Nb	4	4
granarius	RDB3	8	16
impressus		1	1
lateralis		2	2
littoralis		2	2
lugubris	Nb	4	4
marinus		2	2
melanocephalus		1	1
sternalis	Nb	8	8
tristis	Nb	4	4
ustulatus	Nb	4	4
Paracymus scutellaris	Nb	4	4
Hydrobius fuscipes		1	1
Limnoxenus niger	Na	8	16
Anacaena bipustulata	Nb	4	8
globulus		1	1
limbata		2	2
lutescens		2	2
Laccobius atratus	Nb	4	8
atrocephalus	Nb	4	4
biguttatus		2	2
bipunctatus		1	1
minutus		2	2
sinuatus	Nb	8	8
striatulus		2	2
Helochares lividus	Nb	2	4
obscurus	RDB3	8	8
punctatus	Nb	2	4
Enochrus affinis	Nb	4	4
bicolor	Nb	4	4
coarctatus	Nb	2	2
fuscipennis		8	4
halophilus	Na*	4	8
isotae	RDB3	16	16
melanocephalus	Nb	4	4
ochropterus	Nb	8	8
quadripunctatus	Na*	8	16
testaceus		2	4
Cymbiodyta marginella		2	4

	Status	EA	WM
Chaetarthria seminulum	Nb	2	2
Hydrochara caraboides	RDB1	16	32
Hydrophilus piceus	RDB3	8	16
Berosus affinis	Nb	4	8
luridus	Nb	4	8
signaticollis	Nb	4	8
spinosus	RDB3	4	8
Ochthebius auriculatus	Nb	4	4
bicolon	Nb	4	4
dilatatus		2	2
exsculptus	Nb	16	8
marinus	Nb	1	1
minimus		1	1
nanus	Nb	4	8
poweri	RDB3	16	16
punctatus	Na	8	8
pusillus	Na	8	8
subinteger lejolisii	Nb	4	2
viridis	Nb	2	4
Hydraena britteni		8	4
gracilis		1	1
minutissima	Nb	8	8
nigrita	Nb	4	4
palustris	RDB2	16	32
pulchella	Na	8	8
pygmaea	RDB3	16	16
riparia		1	1
rufipes	Na	8	8
testacea	Nb	4	8
Limnebius aluta	Na	8	16
nitidus	Nb	4	4
papposus	Nb	4	8
truncatellus		1	1
Elmis aenea		1	1
Esolus parallelepipedus		2	2
Limnius volckmarii		2	2
Normandia nitens	RDB2	16	16
Oulimnius major	RDB3	8	8
rivularis	Na	8	8
troglodytes	Nb	4	4
tuberculatus		2	2
Riolus cupreus	Nb	16	8
subviolaceus	Nb	8	4
Stenelmis canaliculatus	RDB2	16	16
Helichus substriatus	Na	8	8
Dryops anglicanus	RDB3	16	16
auriculatus	Nb	4	4
ernesti		2	2
griseus	RDB3	32	32
luridus		1	1
nitidulus	Na	8	8
similaris	Na	8	8
striatellus	Na	8	8

	Status	EA	WM
Heterocerus fenestratus		2	2
flexuosus		4	8
hispidulus	RDB3	8	16
obsoletus		2	2
Donacia aquatica	Na	16	8
bicolora	Nb	16	8
cinerea	Nb	16	16
clavipes	Nb	4	4
crassipes	Na	8	8
dentata	Na	16	16
impressa	Na	16	8
marginata		2	4
obscura	RDB2	16	8
semicuprea		4	8
simplex		2	4
sparganii	Na	16	16
thalassina	Na	16	16
versicolorea		4	8
vulgaris		4	4
Plateumaris affinis	Nb	8	8
braccata	Na	16	16
discolor		8	4
sericea		2	2
Prasocuris phellandrii		2	2
junci		4	4
Tanysphyrus lemnae		8	8
Eubrychius velutus	Nb	8	8
Litodactylus leucogaster	Nb	4	4
Phytobius canaliculatus	Na	8	8
quadricornis	Na	8	8
quadrinodosus	RDB3	16	16
quadrituberculatus		4	4
Gymnetron beccabungae	Na	16	16
veronicae	Nb	8	8
Poophagus sisymbrii		4	4
Hydronomus alismatis	Nb	4	8
Bagous spp		8	8

UK NATURE SERIES

1. Classification and ranking of water beetle communities.
G.N. Foster and M.D. Eyre.
2. A review of the scarcer hemiptera of Great Britain.
P. Kirby.

Forthcoming titles

- The ecology and conservation of European owls.
C.A. Galbraith, I. Taylor and S. Percival.
- The ecology and conservation of lapwings.
G. Turner and C.A. Galbraith.
- A review of the scarce and threatened Coleoptera of Great Britain vol.1.
P. Hyman.
- A review of the scarcer and threatened Coleptera of Great Briatin vol.2.
P. Hyman.
- A review of the scarce and threatened flies of Great Britain vol.2.
S. Falk.
- Vegetated shingle structures of Great Britain.
P. Sneddon and R.E. Randall