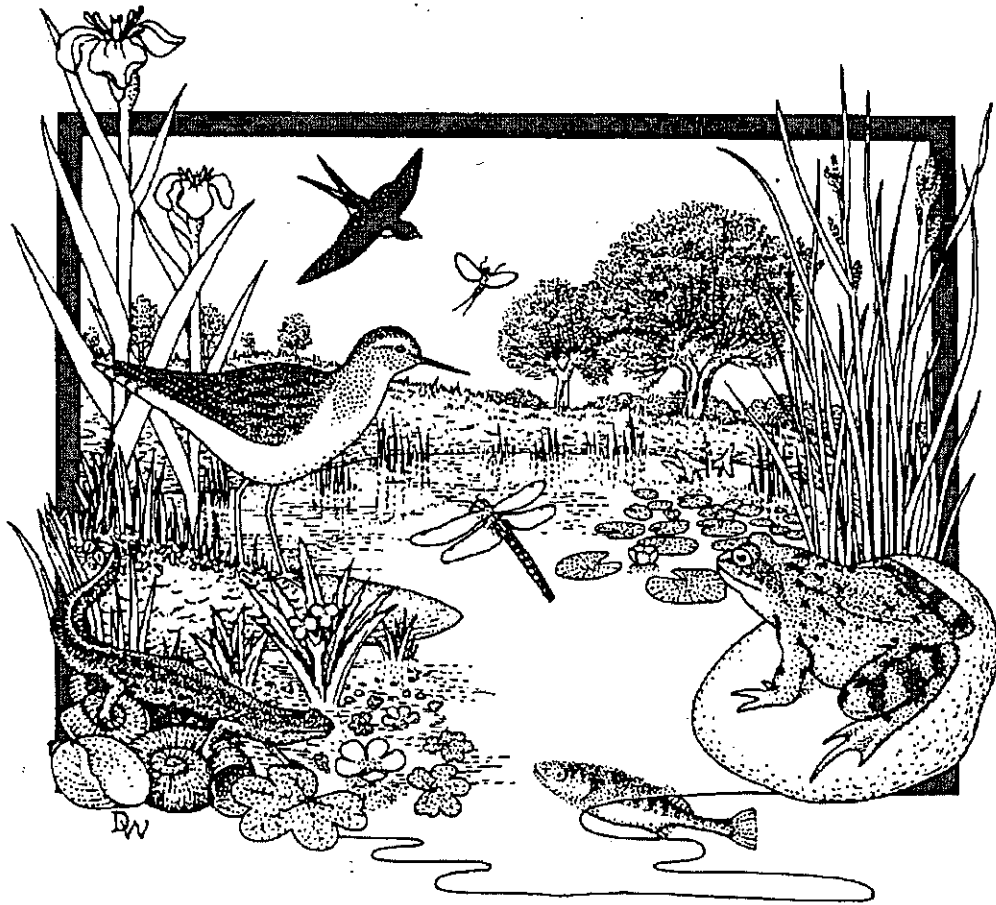


# Survey of the plants and aquatic macroinvertebrates in ponds on Stoke Common, Buckinghamshire



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## Summary of findings

This report describes the results of surveys of the wetland plants and aquatic macroinvertebrates of five starfruit ponds in Surrey and Buckinghamshire.

The survey results showed that all the five ponds supported high quality plant and invertebrate communities. A summary of the species-richness of the ponds, and the occurrence of uncommon plants and invertebrates, is given in Table 1.

In terms of their plant communities the ponds ranged in species richness from 22 – 32 species (excluding aliens) and all supported at least two local plant species. These results are similar to, or higher than, the average number of plant species expected from relatively unpolluted ponds in semi-natural areas.

The ponds also supported relatively rich aquatic macro-invertebrate communities, and all had at least one Nationally Scarce invertebrate species. Amongst the five ponds, however, Xxx Pond and Xxx ponds stood out as exceptional, both in their richness and the number of Nationally Scarce species recorded (see Table 1).

The ponds were not surveyed specifically for amphibians; however, their occurrence was noted if seen. A single female adult great crested newt and smooth newt were netted from the roadside temporary pond, together with hundreds of smooth/palmate newt larvae (*Triturus vulgaris* and/or *helveticus*). Approximately 20 newt larvae were also netted from the new extension of the Heath Pond.

**Table 1 Summary of plant and invertebrate data collected from the survey ponds**

	Pickeridge	Heath	Castor	Pollux	Total
<b>Plants</b>					
Total number of plant species	21	20	3	4	29
Number of local plant species	4	2	0	0	5
<b>Invertebrates</b>					
Number of invertebrate species	55	54	20	11	81
Number of local and Nationally Scarce invertebrate species	6	8	2	2	11
<b>Overall conservation value</b>	Very High	Very High	?	?	

# Contents

SUMMARY OF FINDINGS.....	2
<b>1. AIM OF THE REPORT.....</b>	<b>4</b>
<b>2. SITE LOCATION.....</b>	<b>4</b>
<b>3. METHODS.....</b>	<b>4</b>
<b>4. PICKERIDGE POND.....</b>	<b>5</b>
4.1 PLANT COMMUNITY.....	5
4.2 INVERTEBRATE COMMUNITY.....	6
4.3 AMPHIBIANS.....	7
<b>5. HEATH POND.....</b>	<b>8</b>
5.1 PLANT COMMUNITY.....	8
5.2 INVERTEBRATE COMMUNITY.....	9
5.3 AMPHIBIANS.....	9
<b>6. CASTOR AND POLLUX POOLS.....</b>	<b>10</b>
6.1 DESCRIPTION.....	10
6.2 PLANT COMMUNITY.....	10
6.3 INVERTEBRATE COMMUNITY.....	10
6.4 AMPHIBIANS.....	11
6.5 SUMMARY: OVERALL CONSERVATION VALUE.....	11
<b>7. REFERENCES.....</b>	<b>12</b>
APPENDICES.....	13
APPENDIX 1. SURVEY METHODS.....	14
APPENDIX 2. WETLAND PLANTS RECORDED IN THE SURVEY.....	16
APPENDIX 3A. MACROINVERTEBRATE SPECIES RECORDED FROM PICKERIDGE POND.....	17
APPENDIX 3A. MACROINVERTEBRATE SPECIES RECORDED FROM PICKERIDGE POND.....	18
APPENDIX 3B. MACROINVERTEBRATE SPECIES RECORDED FROM HEATH POND.....	19
APPENDIX 3B. HEATH POND CONTINUED.....	20
APPENDIX 3C. CASTOR POOL.....	21
APPENDIX 3D. POLLUX POOL.....	22
APPENDIX 4. COMPARISON WITH OTHER SITES.....	23

# Survey of the plants and aquatic macroinvertebrates in ponds from Stoke Common, Buckinghamshire

## 1. Aim of the report

This report describes the results of an ecological survey of ponds on Stoke Common, Buckinghamshire. The survey was carried out in order to provide information about the aquatic macroinvertebrate and wetland plant communities present in the ponds prior to the possible introduction of the rare plant starfruit (*Damasonium alisma*).

## 2. Site location

Stoke Common lies north-east of the village of Stoke Poges in Buckinghamshire (Vice County 24). Four ponds on the Common were surveyed for wetland plants and aquatic macroinvertebrates. These are listed in Table 2. The pond names given in Table 2 were allocated by Andy Mcveigh and colleagues (Buckinghamshire County Council) in the absence of official or local names being known for the ponds.

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**Table 2. Sites included in the survey**

<i>Pond name</i>	<i>Grid reference</i>	<i>Location</i>
Pickeridge Pond	SU984856	Temporary pond located next to the Common's northern boundary road.
Heath Pond	SU984854	Existing pond, recently dug out and extended.
Castor Pool	SU986855	New Pond: north of the pair i.e. nearest to road running along the northern boundary of the Common.
Pollux Pool	SU986854	New Pond: south of the pair i.e. furthest from road running along the northern boundary of the Common.

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## 3. Methods

The four ponds were surveyed on 17<sup>th</sup> August 2000 by Mericia Whitfield (invertebrate surveyor) and Penny Williams (plant surveyor). Plant surveys were undertaken using standard National Pond Survey methods (see Appendix 1). Invertebrate surveys for Pickeridge pond and Heath Pond were also undertaken using National Pond Survey methods (see Appendix 1). However, invertebrate data from the two new ponds created in 1999 were collected using a more rapid "bug hunt" method in which animals are searched for on site (rather than being returned to the laboratory for sorting). Approximately 40 minutes was spent collecting invertebrates at each of the two bug-hunt ponds.

## 4. Pickeridge pond

The Pickeridge pond is a moderately large waterbody approximately 1700 m<sup>2</sup> in area (0.17 ha), located adjacent to a minor road on the north-western edge of Stoke Common. The pond, which is seasonal, is bordered to the north by an overgrown hedge lying parallel with the road, and on its other sides by Stoke Common which is dominated by secondary woodland, gorse scrub and acid grassland.

The pond is shaded by trees overhanging its northern edges and, covering an island in the south-western corner of the pond. In total around 40% of the margin and 8% of the pond area was overhung by trees.

At the time of the survey the pond was relatively shallow, with an average water depth of 30 cm and silt depths of less than 1 cm. The pond water was clear.

### 4.1 Plant community

#### 4.1.1 Species present

A total of 21 plant species were recorded from Pickeridge Pond. This is a good total, which is similar to the average number of species recorded from unpolluted ponds in semi-natural areas in Britain (see Appendix 4).

Three of the plant species recorded at the pond can be considered to be rather uncommon at a national level (i.e. defined as "local"<sup>1</sup> in this report). These were floating club rush (*Eleogiton fluitans*), Shoreweed (*Littorella uniflora*), Yellow Water-lily (*Nuphar lutea*) and Water-purslane (*Lythrum portula*). These species are discussed briefly below.

**Floating club rush (*Eleogiton fluitans*):** In the pond *Eleogiton* was widespread, growing across much of the base of the pond and covering in total around 15% of the pond area. At a national level this is the most uncommon of the species found, having only been recorded from 310 10 x 10 km squares in Great Britain (Preston and Croft 1997). Not recorded since 1969 in the 10x10 km square.

**Shoreweed (*Littorella uniflora*):** Within the pond *Littorella* occurred commonly in patches particularly in the eastern half of the site, and covering in total around 5% of the pond area. Shoreweed has been recorded from 588 10 x 10 km squares in the Great Britain (Preston and Croft 1997), Mostly in the North and west of Britain. However it a very rare species in the county Andy Mcveigh (pers comm). Absent from most of central England.

**Water-purslane (*Lythrum portula*):** Water-purslane was widespread in the pond, covering around 15% of the total pond area. At a national level it has been recorded from 270 10 x 10 km squares in Great Britain (Preston and Croft 1997).

**Yellow Water-lily (*Nuphar lutea*):** Only one small patch was present in the pond. Since *Nuphar* is normally a species that is limited to major river and floodplain systems it is possible that the plant has been introduced to the pond. Nationally, yellow Water-lily can only just be considered to be an uncommon species having been recorded from 547 10 x 10 km squares in Great Britain (Preston and Croft 1997).

The only non native plant recorded in the pond was New Zealand pigmyweed (*Crassula helmsii*). This was growing in a small patch which grew sparsely, over an area of about 1 meter square, towards the eastern end of the pond.

~~Bulbous Rush (*Juncus bulbosus*),  
(*Sphagnum* sp.),~~

---

<sup>1</sup> 'Local' species are defined here as species which occur in less than about a quarter of all 10 x 10 km squares in the UK (i.e. less than 700 10 x 10 km squares).

Creeping Bent (*Agrostis stolonifera*),  
 Common Spike-rush (*Eleocharis palustris*),  
 American Willowherb (*Epilobium ciliatum*),  
 Common Marsh-bedstraw (*Galium palustre*),  
 Yellow Iris (*Iris pseudacorus*),  
 Sharp-flowered Rush (*Juncus acutiflorus*),  
 Compact Rush (*Juncus conglomeratus*),  
 Greater Bird's-foot-trefoil (*Lotus pedunculatus*),  
 Purple Moor-grass (*Molinia caerulea*),  
 Tormentil (*Potentilla erecta*),

#### 4.1.2 Plant community

The pond was well vegetated with 92% of the pond supporting plant cover of some sort.

Most of the central areas of the pond were dominated by a diverse mosaic of aquatic and marginal emergent plants including, floating flub-rush (*Eleogiton fluitans*), shoreweed (*Littorella uniflora*), water-purslane (*Lythrum portula*), lesser spearwort (*Ranunculus flammula*), velvet bent (*Agrostis canina*) and floating sweet-grass (*Glyceria fluitans*). The community in the north western corner of the pond provided a slight variation to this in that it also supported common spike rush (*Eleocharis palustris*), marsh speedwell (*Veronica scutellata*), yellow water-lily (*Nuphar lutea*).

The outer edge of the pond was locally fringed by rushes (*Juncus* species) and yellow flag (*Iris pseudacorus*), especially along the northern edge where the site is not grazed. Along the southern and western edges the site the upper pond margins are often more sparsely vegetated, particularly around the south western corner to the south of the island where about 40% of the upper bank remained bare, presumably as a result of recent scrub clearance and poaching.

Overall the pond flora was dominated by mesotrophic species.

#### 4.2 Invertebrate community

Pickeridge Pond had a very high quality invertebrate community that was species-rich and supported many uncommon taxa. In total, 55 invertebrate species were recorded from the pond. This is a very good total, particularly for a seasonal pond.

The total included four Nationally Scarce water beetle species, and two local species, one of which was the locally common ruddy darter dragonfly *Sympetrum sanguineum* (see Table 3). Most of the Scarce beetle species are relatively non-specific in their pond habitat requirements, ???the exception being .....?  
 t

 MERICIA TO ADD....

**Table 3. Uncommon invertebrate species recorded from Pickeridge Pond**

<b>Local species</b>	
Hydroporus memnonius	A diving beetle
Sympetrum sanguineum	Ruddy Darter dragonfly
<b>Nationally Scarce species</b>	
<i>Helochaeres punctatus</i>	A scavenger beetle
<i>Hydraena testacea</i>	A scavenger beetle
<i>Hydrobius fuscipes</i>	A scavenger beetle
<i>Hydrochus angustatus</i>	A scavenger beetle

**Table 4. Number of invertebrate species and uncommon species recorded from Pickeridge Pond**

	<i>Habitats sampled:</i>				<i>Total</i>
	Mossy bank	Grassy bank	Spike rush area	Other aquatics	
Number of species	26	23	31	21	<b>55</b>
Number of Nationally Scarce species	4	2	2	0	<b>4</b>
Number of Local species	1	1	1	2	<b>2</b>

Within the pond, four aquatic habitats were searched for invertebrate species. These were (i) shallow grasses at the edge of the pond (ii) marginal areas dominated by mosses (iii) The submerged areas which supported spike rush, and (iv) other submerged areas of vegetation (see Table 4). All of the habitats were rich in species, although the spike rush area was fractionally the richest. All habitats also contributed unique species to the site list (see Appendix 3a).

Mericia – any other comments on the fauna?

### **4.3 Amphibians**

An adult female great crested newt (*Triturus cristata*) was recorded amongst floating sweet grass (*Glyceria fluitans*) in water about 20 cm deep, mid way between the island and the bank in the north-west corner of the pond. One adult female smooth newt (*Triturus vulgaris*) was also recorded, together with many hundreds of tiny newt larvae (either smooth newt *T. vulgaris*, or palmate newt *T. helveticus*), which were recorded at a rate of about four individuals per net sweep throughout all areas of the pond.

## 5. Heath Pond

Heath Pond is a moderate-sized waterbody just under 2000 m<sup>2</sup> in area. It currently comprises two areas of rather different character: (i) a shallow seasonal area which partially extends under trees, and (ii) a new more permanent water area created in 1998/99.

The pond is surrounded by a mixture of wet heathland and wet woodland. The pond as a whole is moderately shaded by trees. The new extension is almost entirely unshaded, but about a third of the shallow marshy area extends northwards under a canopy of willow and birch woodland.

At the time of the survey (xx<sup>h</sup> August 2000) the shallow area of the pond was almost dry, with no surface water remaining. The new extension had a maximum water depth of 80 cm. Measurable Sediment depths were minimal in both areas of the site.

### 5.1 Plant community

#### 5.1.1 Species richness and rarity

Overall the pond had a rich plant community with a total of 20 plant species recorded from the site (listed in Appendix 2).

The species list included two species which can be regarded as local. These are:

**Floating club rush (*Eleogiton fluitans*):** Tiny plants of *Eleogiton* were seen around the northern and western edges of the pond, growing in dry ground in the upper bank. It is assumed that these plants have not been introduced, so the presumption must be that they have grown up from the seed bank. Presumably they occurred in the old pond before it was dug out, and the new habitat creation has re-exposed the buried seed. As noted in Section 3.1, at a national level *Eleogiton* is a relatively uncommon of the species, having been only recorded from 310 10 x 10 km squares in Great Britain (Preston and Croft 1997).

**Bladder Sedge (*Carex versicaria*):** Within the pond Bladder sedge occurred in a patch approximately 6 m<sup>2</sup> in area, located towards the south eastern edge of the pond. Nationally, bladder sedge has been recorded from only 284 10 x 10 km squares in Great Britain, and it is generally an uncommon plant in central and eastern England (Preston and Croft 1997).

#### 5.1.2 Plant community

The two areas of heath pond were floristically distinct.

The shallow marshy area was dominated by a varied mosaic of marginal emergent plant stands. Around 70% was densely vegetated. The remaining 30% was bare, particularly the area under the willow and birch. The vegetation was dominated by soft rush (*Juncus effusus*) and floating sweet-grass (*Glyceria fluitans*), which together occupied approximately 60% of the marsh area. The remaining 10% comprised a mosaic of mixed marginal emergents including: bulbous rush (*Juncus bulbosus*), velvet bent (*Agrostis canina*), bog moss, common spike-rush (*Eleocharis palustris*), bittersweet (*Solanum dulcamara*) and Bladder Sedge (*Carex versicaria*).

The new extension was sparsely vegetated with a total cover of less than 3%. However, despite the site's newness, a diverse wetland plant community was beginning to develop on the bare pond banks and in the shallow water at the very edge of the pond. This included some species that were common to the marsh area including: common spike-rush (*Eleocharis palustris*), soft rush (*Juncus effusus*), and floating sweet-grass (*Glyceria fluitans*). However, it also included species that were not recorded in the shallow marshy area including: bog pondweed (*Potamogeton polygonifolius*), water starwort species (*Callitriche hamulata/brutia*), floating club-rush (*Eleogiton fluitans*), floating club-rush (*Eleogiton fluitans*), greater pond-sedge (*Carex riparia*) and common marsh-bedstraw (*Galium palustre*).



## 5.2 Invertebrate community

Heath Pond had a very rich macroinvertebrate community with a total of 54 macroinvertebrate species recorded (listed in Appendix 3). This included eight Nationally Scarce taxa – an exceptional number (see Table 3). The richness and number of uncommon species that the pond has a very high quality invertebrate community.

In the survey the new extension and old marshy areas of the pond were sampled separately, however most time and effort (c80%) was spent sampling the new area. The existing marshy area has no surface water at the time it was sampled, and all species were retrieved by running the net through damp or sodden areas of vegetation. Bearing in mind the state of this area, the number of species recorded here (29) is remarkable. Some of the species found in the new section may also have recently moved into his area as water levels dropped in the marsh area.

The eight Nationally Scarce species recorded from the pond were all water beetles.....

Mericia to add

Also anything else you can think of

- The pond is completely dominated by bugs and beetles. With only one species of mayfly and X caddisfly/dragonfly. This largely reflects the habitats: the marsh area is dominated by beetles which thrive in the shallow grasses. The new extension, with its extensive open water area has a very rich water bug community with 14 species recorded, compared to only 3 species in the rapidly drying marsh area.

**Table 5. Nationally Scarce invertebrate species recorded from Heath Pond**

<i>Species</i>	<i>Invertebrate type</i>
<i>Dytiscus circumflexus</i>	A great diving beetle
<i>Helochares lividus</i>	A scavenger beetle
<i>Helochares punctatus</i>	A scavenger beetle
<i>Hydaticus seminiger</i>	A diving beetle
<i>Hydrochus angustatus</i>	A scavenger beetle
<i>Hydroglyphus geminus</i>	A diving beetle
<i>Peltodytes caesus</i>	A crawling water beetle
<i>Rhantus suturalis</i>	A diving beetle

**Table 6. Number of invertebrate species and uncommon species recorded from Heath Pond**

	<i>Marshy area</i>	<i>Habitats sampled: New extension</i>	<i>Total</i>
Number of species	29	43	54
Number of Nationally Scarce species	4	6	8

## 5.3 Amphibians

Five tiny newt larvae netted in the new extension. They were either *Triturus vulgaris* (smooth newt) or *T.helveticus* (palmate newt)

## 6. Castor and Pollux Pools

### 6.1 Description

Two new pools created in 1999. Both ponds are relatively small: Castor Pool (nearest to the northern boundary road) was about XXm<sup>2</sup>. Pollux Pool was c xxm<sup>2</sup>. Both ponds were located in wet acid heathland within 40 meters of each other. Both are largely unshaded although Castor has very slight marginal shade from a small willow growing on its south west bank.

Both ponds were almost dry at the time of sampling with only tiny pools (c 10% of the pond area), a few centimetres deep remaining at their deepest point.

### 6.2 Plant community

The ponds are just beginning to colonise and had relatively species poor communities. Castor Pool supported four plant species. Pollux Pool supported three species.

Both had bulbous rush (*Juncus bulbosus*) and tufted hair-grass *molinea caerulea*. In addition castor had two seedlings of common bulrush (*Typha latifolia*) and bog moss (*Sphagnum* species), and Pollux had velvet bent (*Agrostis canina*).

Castor Pool had 5% cover of *J. bulbosus* but little else, Pollux had very sparse vegetation cover (less than 2% total).

All species were common and widespread.

### 6.3 Invertebrate community

Note that the pond was only bug hunted for 40 minutes so that numbers cannot be directly compared with 3 minute survey.

Castor supported 20 invertebrate species. 11 species recorded from Pollux.

Not bad considering the fact that the ponds are new, seasonal, largely vegetation free and almost dry at the time of sampling. The fact that castor supported about twice as many species as Pollux probably reflects the presence of a greater (though still sparse) vegetation cover water.

The fact that they are collonising up relatively rapidly suggests a good species-pool in the surrounding area, and it is likely that they will develop well.

Both ponds supported one local species, the ruddy darter dragonfly *Sympetrum sanguineum*, and one Nationally Scarce species, the water beetle *Hydroglyphus geminus*... MW to add

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**Table 7. Uncommon invertebrate species recorded from Castor and Pollux Pools**

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<i>Species</i>	<i>Invertebrate type</i>	<i>Status</i>
<i>Sympetrum sanguineum</i>	Ruddy Darter dragonfly	Local
<i>Hydroglyphus geminus</i>	A diving beetle	Nationally Scarce

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**Table 8. Number of invertebrate species and uncommon species recorded Castor and**

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<b>Pollux Pools</b>		
	<i>Castor Pool</i>	<i>Pollux Pool</i>
Number of species	20	11
Number of Nationally Scarce species	1	1
Number of Local species	1	1

## **6.4 Amphibians**

No amphibians were found in either Castor or Pollux Pools.

## **6.5 Summary: overall conservation value**

Information about the number and rarity of plant and invertebrate species present in a pond can be used to give the pond a conservation rating (see Appendix 4).

The results of the current survey suggest that, for macrophytes, the pond should be considered to be at least of High conservation value (on a four-point scale from Very High to Low), on the basis of its rich plant community.

The Pond's invertebrate community was of Very High conservation value, both because of the exceptionally rich invertebrate assemblage, and because of the occurrence of four Nationally Scarce species.

## 7. References

- Preston, C.D. and Croft, J.M. (1997). *Aquatic plants in Britain and Ireland*. Harley Books, Colchester, Essex.
- Brooks, S. (1997). *Field guide to the dragonflies and damselflies of Great Britain and Ireland*. British Wildlife Publishing, Hook, Hampshire.
- Foster, G.N. (1987). *Atlas of British Water Beetles: Preliminary Edition—Part 5. Balfour-Browne Club Newsletter* 40.
- Foster, G.N. (1990). *Atlas of British Water Beetles: Preliminary Edition—Part 6. Balfour-Browne Club Newsletter* 48.
- Friday, L.E. (1988). *A key to the adults of British water beetles (AIDGAP-Key)*. *Field Studies Council Publication* 189.
- Nature Conservancy Council (1989). *Guidelines for Selection of Biological SSSIs*. NCC, Peterborough.
- Pond Action (1998). *A guide to the methods of the National Pond Survey*. Pond Action, Oxford.
- Rich, T.C.G. and Jermy, A.C. (1988) *Plant Crib 1988*. BSBI London.
- Rich, T.C.G. and Woodruff, E.R. (1990). *BSBI Monitoring Scheme 1987-1988*. NCC Chief Scientists Directorate, Report No. 1265. Nature Conservancy Council, Peterborough.
- Stewart, A., Pearman, D.A. and Preston, C.D. (1994). *Scarce Plants in Britain*. JNCC, Peterborough.
- Williams, P.J., Biggs, J., Barr, C.J., Cummins, C.P., Gillespie, M.K., Rich, T.C.G., Baker, A., Baker, J., Beesley, J., Corfield, A., Dobson, D., Culling, A.S., Fox, G., Howard, D.C., Luursema, K., Rich, M., Samson, D., Scott, W.A., White, R. and Whitfield, M. (1998). *Lowland Pond Survey 1996*. Department of the Environment, Transport and the Regions, London.
- Williams, P., Biggs, J., Whitfield, M., Throne, A., Bryant, S., Fox, G. and Nicolet, P. (1999). *The Pond Book. A guide to the management and creation of ponds*. The Ponds Conservation Trust, Oxford.

## **APPENDICES**

## Appendix 1. Survey methods

The methods used to survey the ponds followed the methods developed for the National Pond Survey, initiated by Pond Action in 1989. National Pond Survey methods have subsequently been used as the basis for many other regional and national surveys including DETR's Lowland Pond Survey 1996 (Williams *et al.*, 1998) and Pond Action's national survey of degraded ponds. A full copy of the methodology is given in Pond Action (1998). Modified extracts which describe the field sampling protocol are given below.

### Summary of pond survey procedure

The following list gives a broad outline of the information gathered at each pond.

- A description of the main physical features of the pond and its surroundings together with notes about the age, history and management of the pond.
- A list of the wetland plant species found within the outer boundary of the pond, together with estimates of the abundance of species or major vegetation stands which occupy more than 5% of the pond.
- A list of the species of macroinvertebrates recorded from the pond with estimates of their abundance.
- Notes on the presence of amphibians and fish.

The methods used for collecting biological data are outlined in more detail below.

### Recording wetland plants

The main aim of plant recording is to make a complete list of the *wetland plant species*<sup>2</sup> present within the *outer edge* of the pond<sup>3</sup>. Wetland plants are recorded by walking and wading around the margin and shallow water areas of the pond. In deep water aquatic plants are surveyed using a grapnel thrown from the bank and/or boat.

### Sampling aquatic macroinvertebrates

The main aim of invertebrate sampling is to obtain, within the sampling time, as complete a species list as possible for the pond.

The pond is sampled, using a hand net, for a total of three minutes (net-in-the-water time). During this time all of the major habitats in the pond are sampled. Examples of typical habitats are: stands of sedge; gravel- or muddy-bottomed shallows; areas overhung by willows, including water-bound tree-roots; stands of submerged aquatics; flooded marginal grasses and inflow areas. The average pond contains 5 or 6 habitats; however, there may be as few as 2, or as many as 10. Habitats are identified by an initial walk around the pond examining vegetation stands and other relevant features.

Invertebrate sampling is based on the following protocol:

- (i) The three-minute sampling time is divided equally between the number of habitats recorded: e.g. if there are six habitats, each will be sampled for a total of 30 seconds. Generally the sampling time will be further subdivided (especially where a habitat is extensive or covers several widely-separated areas of the pond) in order to represent each habitat adequately.

The three-minute sampling time refers only to 'net-in-the-water' time, and does not include time moving between habitats.

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<sup>2</sup> The term 'wetland plant species' refers to species defined as wetland plants on the National Pond Survey field recording sheet list. Terrestrial plant species are not recorded.

<sup>3</sup> The 'outer edge' of the pond is defined as the 'upper level at which water stands in winter'. In practice this line is usually readily distinguishable from the distribution of wetland plants or as a 'water mark' on surrounding trees or walls.

- (ii) Each habitat is netted vigorously to dislodge and collect animals. In stony or sandy ponds the substrates are kicked-up to disturb and capture inhabitants. The sample thus collected is placed in a bucket to be returned to the laboratory for sorting and identification.
- (iii) Finally an additional one-minute search is undertaken for animals which may have been missed by the 3-minute sample: for example, those which may be especially well camouflaged (e.g. dragonflies, caddis fly larvae, mayflies); or which may be firmly attached to the substrate or plants (e.g. limpets, flatworms, leeches, snails); or which are particularly hard to catch with a pond-net (e.g. whirligig beetles, pond skaters)
- (iv) All amphibians or fish caught in the course of sampling are noted on the field recording sheet and returned to the pond.

### Sorting and identifying macroinvertebrate samples

After return to the laboratory, macroinvertebrate samples are always sorted 'live' (not frozen or preserved), as soon as possible after collection (usually within three days).

In general, the aim of sorting is to remove from the sample, and identify to species-level, ALL individual invertebrates. In samples where one or two species are present in very large numbers (e.g. thousands of specimens), these species may be sub-sampled and numbers then extrapolated to the whole sample. However, all specimens which cannot be reliably identified in the sorting tray (i.e. those which require microscopic examination for species-level identification) are removed and preserved in alcohol (except for flatworms and leeches, which must be identified immediately). On average, sorting a pond sample to remove invertebrates takes approximately a day, but samples containing a considerable amount of silt, algae, duckweed or other vegetation may take considerably longer.

Species which were not immediately identifiable whilst sorting are identified using biological keys and a microscope with a magnification of at least x40. A list of keys used is given in Pond Action (1994). After identification, a species list for the site is compiled and the invertebrates are returned to a labelled bottle and archived.

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**Appendix Table 1.1. Macroinvertebrate taxa included in pond surveys**

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<i>Taxon</i>	<i>Identification level</i>	<i>Notes</i>
Tricladida	Species	Identified live
Gastropoda	Species	As adults
Bivalvia	Species	Inc. <i>Sphaerium</i> spp., but not <i>Pisidium</i> spp.
Crustacea (Malacostraca)	Species	As adults
Hirudinea	Species	Identified live
Ephemeroptera	Species	As larvae
Odonata	Species	As larvae
Megaloptera (inc. spongeflies)	Species	As larvae
Hemiptera	Species	As adults
Coleoptera	Species	As adults
Plecoptera	Species	As larvae
Lepidoptera	Species	As larvae
Trichoptera	Species	As larvae
Oligochaeta	Class	As adults
Diptera	Family	As larvae

Note: watermites, zooplankton and other micro-arthropods are not included in the survey.

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## Appendix 2. Wetland plants recorded in the survey

Scientific name <sup>1</sup>	English name	National status	Pickeridge Pond	Heath Pond old	Heath Pond new	all	Pollux Pool	Castor Pool
<b>Submerged species</b>								
<i>Callitriche hamulata/brutia</i>	Water Starwort species <sup>2</sup>				+	+		
<i>Eleogiton fluitans</i>	Floating Club-rush	Local	+		+	+		
<i>Juncus bulbosus</i>	Bulbous Rush	Common	+	+	+	+	+	+
<i>Littorella uniflora</i>	Shoreweed	Local	+					
<i>Sphagnum sp.</i>			+	+		+		+
<b>Floating species</b>								
<i>Lemna minor</i>	Common Duckweed	Common			+	+		
<i>Nuphar lutea</i>	Yellow Water-lily	Local	+					
<i>Potamogeton polygonifolius</i>	Bog Pondweed	Common			+	+		
<b>Emergent species</b>								
<i>Agrostis canina</i>	Velvet Bent	Common	+	+	+	+	+	
<i>Agrostis stolonifera</i>	Creeping Bent	Common	+		+	+		
<i>Carex flacca</i>	Glaucous Sedge	Common			+	+		
<i>Carex riparia</i>	Greater Pond-sedge	Common			+	+		
<i>Carex vesicaria</i>	Bladder Sedge	Local		+		+		
<i>Eleocharis palustris</i>	Common Spike-rush	Common	+	+	+	+		
<i>Epilobium ciliatum</i>	American Willowherb	Introduced	+					
<i>Galium palustre</i>	Common Marsh-bedstraw	Common	+		+	+		
<i>Glyceria fluitans</i>	Floating Sweet-grass	Common	+	+	+	+		
<i>Iris pseudacorus</i>	Yellow Iris	Common	+					
<i>Juncus acutiflorus</i>	Sharp-flowered Rush	Common	+	+		+		
<i>Juncus conglomeratus</i>	Compact Rush	Common	+	+		+		
<i>Juncus effusus</i>	Soft Rush	Common	+	+	+	+		+
<i>Lotus pedunculatus</i>	Greater Bird's-foot-trefoil	Common	+					
<i>Lythrum portula</i>	Water-purslane	Local	+					
<i>Molinia caerulea</i>	Purple Moor-grass	Common	+	+	+	+	+	
<i>Potentilla erecta</i>	Tormentil	Common	+					
<i>Ranunculus flammula</i>	Lesser Spearwort	Common	+		+	+		
<i>Solanum dulcamara</i>	Bittersweet	Common		+		+		
<i>Typha latifolia</i>	Bulrush	Common						+
<i>Veronica scutellata</i>	Marsh Speedwell	Common	+					
Number of Submerged species			4	2	3	4	1	2
Number of Floating species			1	0	2	2	0	0
Number of Emergent species			16	9	10	14	2	2
<b>TOTAL NUMBER OF SPECIES</b>			<b>21</b>	<b>11</b>	<b>15</b>	<b>20</b>	<b>3</b>	<b>4</b>

### Notes

1 'Local' species are defined here as species which occur in less than about a quarter of all 1 x 1 km squares in the UK (i.e. less than 7 1 x 1 km squares).

2 No fruits or were present to help differentiate between these species.



## Appendix 3a. Macroinvertebrate species recorded from Pickeridge Pond

Species	English name	National Status	Number of individuals recorded in each habitat				
			Mossy bank	Grassy bank	Spike rush area	Other aquatics	All
<b>Crustacea (Shrimps and slaters)</b>							
<i>Crangonyx pseudogracilis</i>	A freshwater shrimp	Common	310	105	61	250	726
<b>Ephemeroptera (Mayflies)</b>							
<i>Cloeon dipterum</i>	Pond Olive	Common	1		11	6	18
<b>Odonata (Dragonflies and damselflies)</b>							
<i>Pyrrhosoma nymphula</i>	Large Red Damselfly	Common	7	6	4	4	21
<i>Ischnura elegans</i>	Blue-tailed Damselfly	Common	4	1	232		237
<i>Coenagrion puella/pulchellum</i>	Azure/Variable Damselfly	Common		1	128	75	204
<i>Anax imperator</i>	Emperor Dragonfly	Common		1	18	1	20
<i>Sympetrum danae</i>	Black Darter	Common	1		2		3
<i>Sympetrum sanguineum</i>	Ruddy Darter	Local	5	3	29	4	41
<i>Sympetrum striolatum</i>	Common Darter	Common	9	2	41	5	57
<b>Hemiptera (Water bugs)</b>							
<i>Gerris lacustris</i>	A pond skater	Common	1	1	1		3
<i>Gerris odontogaster</i>	A pond skater	Common			5		5
<i>Nepa cinerea</i>	Water Scorpion	Common	1	1			2
<i>Notonecta glauca</i>	A greater water boatman	Common		4	25		29
<i>Notonecta obliqua</i>	A greater water boatman	Common			9		9
<i>Notonecta marmorea</i>	A greater water boatman	Common			1		1
<i>Plea leachi</i>	Lesser Backswimmer	Common				1	1
<i>Callicorixa praeusta</i>	A lesser water boatman	Common				2	2
<i>Corixa punctata</i>	A lesser water boatman	Common			7	5	12
<i>Hesperocorixa castanea</i>	A lesser water boatman	Common				1	1
<i>Hesperocorixa linnei</i>	A lesser water boatman	Common				1	1
<i>Hesperocorixa moesta</i>	A lesser water boatman	Common	3		5		8
<i>Hesperocorixa sahlbergi</i>	A lesser water boatman	Common				1	1
<i>Sigara falleni</i>	A lesser water boatman	Common				1	1
<b>Coleoptera (Water beetles)</b>							
<i>Acilius sulcatus</i>	A diving beetle	Common			1		1
<i>Agabus bipustulatus</i>	A diving beetle	Common	3	2	16		21
<i>Agabus sturmii</i>	A diving beetle	Common	2				2
<i>Anacaena limbata</i>	A scavenger beetle	Common	300	687			987
<i>Anacaena lutescens</i>	A scavenger beetle	Common		52			52
<i>Colymbetes fuscus</i>	A diving beetle	Common	3	3	15	14	35
<i>Haliplus lineatocollis</i>	A crawling water beetle	Common				1	1
<i>Helochaers punctatus</i>	A scavenger beetle	Nationally Scarce	27	9			36
<i>Hydraena testacea</i>	A scavenger beetle	Nationally Scarce	2				2
<i>Hydrobius fuscipes</i>	A scavenger beetle	Common	12	7	2		21
<i>Hydrochus angustatus</i>	A scavenger beetle	Nationally Scarce	2		2		4
<i>Hydroporus erythrocephalus</i>	A diving beetle	Common	2	1	1		4
<i>Hydroporus gyllenhalii</i>	A diving beetle	Common	49	3			52

## Appendix 3a. Macroinvertebrate species recorded from Pickeridge Pond

Species	English name	National Status	Number of individuals recorded in each habitat				
			Mossy bank	Grassy bank	Spike rush area	Other aquatics	All
<b>Crustacea (Shrimps and slaters)</b>							
<i>Hydroporus memnonius</i>	A diving beetle	Local				1	1
<i>Hydroporus palustris</i>	A diving beetle	Common	3	1	1		5
<i>Hydroporus planus</i>	A diving beetle	Common	2				2
<i>Hydroporus pubescens</i>	A diving beetle	Common	3				3
<i>Hydroporus umbrosus</i>	A diving beetle	Common	1				1
<i>Hygrobia hermanni</i>	Screech Beetle	Common			1		1
<i>Hyphydrus ovatus</i>	A diving beetle	Common			9		9
<i>Ilybius ater</i>	A diving beetle	Common			2		2
<i>Laccophilus minutus</i>	A diving beetle	Common	1	5	2		8
<i>Nebrioporus depressus</i>	A diving beetle	Common			1		1
<i>Noterus clavicornis</i>	A diving beetle	Common	1		2		3
<i>Ochthebius minimus</i>	A scavenger beetle	Common		2			2
<i>Rhantus exsoletus</i>	A diving beetle	Common			1		1
<b>Trichoptera (Caddisflies)</b>							
<i>Glyptotaelius pellucidus</i>	Mottled Sedge	Common				2	2
<i>Grammotaulius nigropunctatus</i>	A caddis fly	Common				2	2
<i>Limnephilus centralis</i>	A caddis fly	Common				10	10
<i>Limnephilus flavicornis</i>	A caddis fly	Common				5	5
<i>Limnephilus vittatus</i>	A caddis fly	Common		1			1
<b>Lepidoptera (Moths)</b>							
<i>Elophila nymphaeata</i>	Brown china-mark	Common		1	3		4
<b>NUMBER OF SPECIES</b>			<b>2 6</b>	<b>2 3</b>	<b>3 1</b>	<b>2 1</b>	<b>5 5</b>
<b>Other taxa not identified to species level:</b>							
Ceratopogonidae	Biting Midges		+			+	+
Chironomidae	Plumed Gnats, Non-biting Midges		+	+	+	+	+
Culicidae	Mosquitoes					+	+
Dixidae	Meniscus Midges		+		+		+
Oligochaeta	Segmented worms		+	+		+	+
Tipulidae	Crane-flies, Daddy-long-legs		+				+
Tabanidae	Horse-flies			+			+

## Appendix 3b. Macroinvertebrate species recorded from Heath Pond

Species	English name	National status	Marshy area	New extension	ALL
<b>Odonata (Dragonflies and damselflies)</b>					
<i>Pyrhosoma nymphula</i>	Large Red Damselfly	Common	4		4
<i>Ischnura elegans</i>	Blue-tailed Damselfly	Common		2	2
<i>Enallagma cyathigerum</i>	Common Blue Damselfly	Common	2		2
<i>Aeshna cyanea</i>	Common Hawker	Common	1		1
<i>Libellula depressa</i>	Broad-bodied Chaser	Common	2	3	5
<b>Hemiptera (Water bugs)</b>					
<i>Gerris lacustris</i>	A pond skater	Common	1	4	5
<i>Gerris odontogaster</i>	A pond skater	Common	1	1	2
<i>Gerris thoracicus</i>	A pond skater	Common		1	1
<i>Nepa cinerea</i>	Water Scorpion	Common		1	1
<i>Ilyocoris cimicoides</i>	A saucer bug	Common	2	1	3
<i>Notonecta glauca</i>	A greater water boatman	Common		10	10
<i>Notonecta marmorea</i>	A greater water boatman	Common		3	3
<i>Plea leachi</i>	Lesser Backswimmer	Common		9	9
<i>Corixa punctata</i>	A lesser water boatman	Common		30	30
<i>Sigara distincta</i>	A lesser water boatman	Common		9	9
<i>Sigara falleni</i>	A lesser water boatman	Common		12	12
<i>Sigara scotti</i>	A lesser water boatman	Common		1	1
<i>Sigara lateralis</i>	A lesser water boatman	Common		78	78
<i>Sigara nigrolineata</i>	A lesser water boatman	Common		11	11
<b>Coleoptera (Water beetles)</b>					
<i>Acilius sulcatus</i>	A diving beetle	Common		2	2
<i>Agabus bipustulatus</i>	A diving beetle	Common	355	10	365
<i>Agabus didymus</i>	A diving beetle	Common		2	2
<i>Agabus nebulosus</i>	A diving beetle	Common		11	11
<i>Agabus sturmii</i>	A diving beetle	Common	3	1	4 <sup>e</sup>
<i>Anacaena globulus</i>	A scavenger beetle	Common	5		5
<i>Anacaena limbata</i>	A scavenger beetle	Common	555	350	905
<i>Anacaena lutescens</i>	A scavenger beetle	Common	105	50	155
<i>Coelambus confluens</i>	A diving beetle	Common		8	8
<i>Coelambus impressopunctatus</i>	A diving beetle	Common	1		1
<i>Colymbetes fuscus</i>	A diving beetle	Common	5		5
<i>Dytiscus circumflexus</i>	A great diving beetle	Nationally Scarce		1	1
<i>Enochrus coarctatus</i>	A scavenger beetle	Common	2	2	4
<i>Helochaeres lividus</i>	A scavenger beetle	Nationally Scarce	5	4	9
<i>Helochaeres punctatus</i>	A scavenger beetle	Nationally Scarce	6		6
<i>Helophorus brevipalpis</i>	A scavenger beetle	Common	1	1	2
<i>Helophorus minutus</i>	A scavenger beetle	Common	1		1
<i>Hydaticus seminiger</i>	A diving beetle	Nationally Scarce	3	4	7
<i>Hydrobius fuscipes</i>	A scavenger beetle	Common	18	1	19

## Appendix 3b. Heath pond continued

Species	English name	National status	Marshy area	New extension	ALL
<i>Hydrobius fuscipes</i>	A scavenger beetle	Common	18	1	19
<i>Hydrochus angustatus</i>	A scavenger beetle	Nationally Scarce		6	6
<i>Hydroglyphus geminus</i>	A diving beetle	Nationally Scarce		2	2
<i>Hydroporus gyllenhalii</i>	A diving beetle	Common	9	48	57
<i>Hydroporus incognitus</i>	A diving beetle	Common	4		4
<i>Hydroporus palustris</i>	A diving beetle	Common	4	10	14
<i>Hydroporus pubescens</i>	A diving beetle	Common		3	3
<i>Hygrotus inaequalis</i>	A diving beetle	Common	6	4	10
<i>Hyphydrus ovatus</i>	A diving beetle	Common	1	5	6
<i>Laccophilus minutus</i>	A diving beetle	Common		18	18
<i>Nebrioporus depressus</i>	A diving beetle	Common		1	1
<i>Ochthebius minimus</i>	A scavenger beetle	Common	1		1
<i>Peltodytes caesus</i>	A crawling water beetle	Nationally Scarce		1	1
<i>Rhantus exsoletus</i>	A diving beetle	Common		3	3
<i>Rhantus suturalis</i>	A diving beetle	Nationally Scarce	1		1
<b>Tricoptera (Caddisflies)</b>					
<i>Athripsodes aterrimus</i>	A caddis fly	Common		2	2
<i>Limnephilus vittatus</i>	A caddis fly	Common	2	1	3
<b>Lepidoptera (Aquatic moths)</b>					
<i>Elophila nymphacata</i>	Brown china-mark	Common			
<b>NUMBER OF SPECIES</b>			<b>29</b>	<b>43</b>	<b>54</b>
<b>Additional taxa not recorded to species level:</b>					
Chaoboridae	Phantom midges			+	+
Chironomidae	Plumed Gnats, Non-biting Midges			+	+
Oligochaeta	Segmented worms			+	+
Tipulidae	Crane-flies, Daddy-long-legs			+	+

## Appendix 3c. Castor Pool

Species	English name	National status	Species recorded
<b>Ephemeroptera (Mayflies)</b>			
<i>Cloeon dipterum</i>	Pond Olive	Common	+
<b>Odonata (Dragonflies and damselflies)</b>			
<i>Pyrrhosoma nymphula</i>	Large Red Damselfly	Common	+
<i>Ischnura elegans</i>	Blue-tailed Damselfly	Common	+
<i>Aeshna cyanea</i>	Common Hawker	Common	+
<i>Libellula depressa</i>	Broad-bodied Chaser	Common	+
<i>Sympetrum sanguineum</i>	Ruddy Darter	Local	+
<i>Sympetrum striolatum</i>	Common Darter	Common	+
<b>Hemiptera (Water bugs)</b>			
<i>Gerris lacustris</i>	A pond skater	Common	+
<i>Gerris thoracicus</i>	A pond skater	Common	+
<i>Notonecta maculata</i>	A greater water boatman	Common	+
<i>Notonecta marmorea</i>	A greater water boatman	Common	+
<i>Corixa punctata</i>	A lesser water boatman	Common	+
<i>Sigara lateralis</i>	A lesser water boatman	Common	+
<i>Sigara nigrolineata</i>	A lesser water boatman	Common	+
<b>Coleoptera (Water beetles)</b>			
<i>Anacaena limbata</i>	A scavenger beetle	Common	+
<i>Anacaena lutescens</i>	A scavenger beetle	Common	+
<i>Colymbetes fuscus</i>	A diving beetle	Common	+
<i>Helophorus minutus</i>	A scavenger beetle	Common	+
<i>Hydroglyphus geminus</i>	A diving beetle	Nationally Scarce	+
<i>Hydroporus gyllenhalii</i>	A diving beetle	Common	+
<b>NUMBER OF SPECIES</b>			<b>20</b>
<b>Other taxa not recorded to species level:</b>			
Chaoboridae	Phantom midges		+
Ceratopogonidae	Biting Midges		+
Chironomidae	Plumed Gnats, Non-biting Midges		+

## Appendix 3d. Pollux Pool

Species	English name	National status	Species recorded
<b>Odonata (Dragonflies and damselflies)</b>			
<i>Libellula depressa</i>	Broad-bodied Chaser	Common	+
<i>Sympetrum sanguineum</i>	Ruddy Darter	Local	+
<i>Sympetrum striolatum</i>	Common Darter	Common	+
<b>Hemiptera (Water bugs)</b>			
<i>Notonecta maculata</i>	A greater water boatman	Common	+
<i>Notonecta marmorea</i>	A greater water boatman	Common	+
<i>Corixa punctata</i>	A lesser water boatman	Common	+
<i>Sigara lateralis</i>	A lesser water boatman	Common	+
<i>Sigara nigrolineata</i>	A lesser water boatman	Common	+
<i>Sigara limitata</i>	A lesser water boatman	Common	+
<b>Coleoptera (Water beetles)</b>			
<i>Agabus bipustulatus</i>	A diving beetle	Common	+
<i>Hydroglyphus geminus</i>	A diving beetle	Nationally Scarce	+
<b>NUMBER OF SPECIES</b>			<b>11</b>
<b>Other taxa not recorded to species level:</b>			
Chaoboridae	Phantom midges		+
Ceratopogonidae	Biting Midges		+
Chironomidae	Plumed Gnats, Non-biting Midges		+
Orthetrum species			+
Hydroporus species			+

## Appendix 4. Comparison with other sites

The following information gives a range of data about the conservation value of ponds in Britain. This information indicates the *typical* plant species richness of UK ponds based on standard surveys using National Pond Survey methods.

Note that National Pond Survey sites indicate the standard that ponds *should* reach in Britain when they are not exposed to damaging human impacts (e.g. water pollution, intensive land management, overstocking with fish, artificial feeding of waterfowl). The two wider countryside surveys show the typical state of ponds in the "ordinary countryside" where ponds are often exposed to a variety of factors which reduce their conservation value.

### Plant data

**Appendix Table 6.1. Number of plant species recorded from UK ponds**

		<i>Number of species:</i>		
		<i>Marginal plants</i>	<i>Aquatic plants</i>	<i>Total plants</i>
<b>National Pond Survey</b> (high quality ponds mostly located in nature reserves)	<i>Average</i>	18	5	<b>23</b>
	<i>Range</i>	(1-42)	(-14)	(1-46)
<b>Wider countryside ponds</b> (DETR Lowland Pond Survey)	<i>Average</i>	8	2	<b>1</b>
	<i>Range</i>	(-3)	(-1)	(-35)
<b>Wider countryside ponds</b> (ROPA Survey)	<i>Average</i>	11	3	<b>14</b>
	<i>Range</i>	(1-32)	(-11)	(1-38)

### Invertebrate data

**Appendix Table 6.2 Number of aquatic macroinvertebrate species recorded from other UK ponds**

		<i>Number of invertebrate species*</i>	
<b>National Pond Survey</b> (All ponds were high quality i.e. located in semi-natural areas).	<i>Average</i>	<b>32</b>	
	<i>Range</i>	(6-98)	
<b>Wider countryside ponds</b> (ROPA Survey)	<i>Average</i>	<b>26</b>	
	<i>Range</i>	(2-64)	

\*All results are from a single season 3 minute hand-net sample.