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A SURVEY OF THE AQUATIC MACROINVERTEBRATES OF THE BUCKINGHAM STREAM, NORFOLK

A REPORT TO ALCONBURY ENVIRONMENTAL CONSULTANTS

POND ACTION

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MARCH 1991

CONTENTS PAGE

SUMMARY

This report describes the results of surveys of three sections of the Buckingham stream, Norfolk.

In this survey the stream is shown to support a community which is fairly rich in macroinvertebrates (61 species) including 1 widespread but local species. The BMWP scores for the sections of the stream (183, 186 and 149 for sections 1,2,3 respectively) suggest that the stream is not organically enriched. The three sections of the stream had very similar macroinvertebrate communities.

With a relatively high number of species including one widespread but local species, the macroinvertebrate community of the stream should be regarded as being of moderate value to nature conservation.

1. INTRODUCTION

This report describes the results of surveys of the aquatic macroinvertebrates of three sections of the ????????, Norfolk.

Section 1	TM 025927
Section 2	TM 027923
Section 3	TM 023917

The survey had two main objectives:

i) To produce as complete as possible a species list for the three sections of the steam, within the time available.

ii)To gain an impression of the present water quality in the stream.

The survey results were used to assess the conservation value of the macroinvertebrate communities of the streams

2. METHODS

Survey work was undertaken on 18th March 1991.

Three 50m reaches of each stream were selected for survey

Width and depth of the streams were measured with a tape. Widths were recorded as an average of 10 readings, one reading taken every 5m. Average water depth was recorded from 10 transects, with depth measurements taken at 1/4, 1/2 and 3/4 of the stream width.

Composition of the bottom substrate was assessed by eye and classified using the Wentworth scale as adapted by the Institute of Freshwater Ecology for use with the RIVPACS rediction and classifcation programme.

Aquatic macroinvertebrates were collected from this reaches by sweep netting in vegetation or by kick sampling of stony substrata using a standard pondnet (Freshwater Biological Association pattern, 1mm square mesh).

For the production of the BMWP score, the total sampling time of three minutes was divided such that the amount of time spent sampling in any microhabitat was proportional to the area which that microhabitat occupied. In addition to the three minute timed sample, some time was spent on site looking for species likely to be undersampled with the area dependent timed sampling method.

Check additional search

The three minute timed sample was sorted in the laboratory. The sample was sorted thoroughly in order to give a complete species list. All species which could not readily be identified were removed and preserved in 70% industrial methylated spirits (IMS) before identification.

The non time dependent sampling was sorted in the field, species being identified on site or returned to the laboratory in IMS.

The aquatic macroinvertebrate groups recorded are listed in Table 1 (over page). A list of the keys and guides used in identification of macroinvertebrates is given in Section 4 (see page XX).

2.3 Assessment of the conservation value of the macroinvertebrate communities in the streams

The conservation value of the aquatic macroinvertebrate communities was assessed using the criteria described in Table 2 (see page XX).

Note In this report the assessment of the conservation value of the macroinvertebrate communities has been made using data from a single season. Collecting in two or three different seasons of the year (ie spring, summer and autumn) usually results in the recording of 30-50% more species than are found in a single season. It is possible that, amongst these new species, further uncommon species could be recorded.

TABLE 1 GROUPS OF MACROINVERTEBRATES RECORDED IN THE BUCKINGHAM STREAM, NORFOLK

GROUPS IDENTIFIED TO SPECIES LEVEL

Tricladida	(Flatworms)
Hirudinea	(Leeches)
Gastropoda	(Snails and limpets)
Bivalvia (excluding Pisidium spp.)	(Bivalves)
Malacostraca	(Shrimps and slaters)
Ephemeroptera	(Mayflies)
Odonata	(Dragonflies and damselflies)
Heteroptera	(Water bugs)
Plecoptera	(Stoneflies)
Megaloptera	(Alderflies)
Trichoptera	(Caddis-flies)
***Coleoptera**	(Water beetles)

*Adults from the following families of Coleoptera were recorded: Gyrinidae, Haliplidae, Dytiscidae, Elmidae, Hydraenidae, Hydrophilidae, Noteridae.

TABLE 2. SYSTEM USED FOR ASSESSING THE NATURE CONSERVATION VALUE OF AQUATIC MACROINVERTEBRATE COMMUNITIES

CONSERVATION VALUE	DESCRIPTION OF COMMUNITY
VERY HIGH	Supporting a rich community of macroinvertebrate species, including local species and/or rare (ie Red Data Book) species. Note that some sites with rare species may be relatively species-poor. Sites in this category are likely either to be Sites of Special Scientific Interest in their own right, or within larger SSSI's.
HIGH	Supporting a rich community of common macroinvertebrate species. A small number of local species present. No rare species. Could include sites on SSSI's or sites of local nature conservation value.
MODERATE/LOW	Supporting only common macroinvertebrate species. No rare or uncommon species.

Within the two higher categories individal sites can be ranked on the basis of numbers of rare and uncommon species, provided that a constant amount of effort in sampling has been made.

3. THE AQUATIC MACROINVERTEBRATE COMMUNITIES OF THE TWO STREAMS

A list of the species found in the two streams is given in the Appendix.

3.1 Section 1: detailed description

3.1.1 General description

Section 1 has an average width of 2.80m (bank to bank) and 2.78m (waters edge to waters edge) and an averge depth of 0.15m with a range of 0.08 to 0.23m. The substratum was composed of silt/clay 14%, sand 35%, gravel/pebbles 60% and cobbles/boulders 1%. The flow was 33cm/s.

The left and right hand banks were edged with macrophytes (mainly Callitriche and Epilobium sp.). The shading was moderate. Stony runs, riffles, small pools and the marginal macrophytes formed the main microhabitats available for macroinvertebrates.

3.1.2 Macroinvertebrates

49 species of macroinvertebrates were recorded. The macroinvertebrate fauna was dominated numerically by the freshwater shrimp, Gammarus pulex, the mayfly, Baetis rhodani and the riffle beetle Elmis aenea.

The BMWP score for this section of the stream is high (183), indicating an above average number of families in the community. The ASPT for the section (5.23) is indicative of good water quality.

The groups Gastropoda, Trichoptera and Coleoptera are the best represented in the macroinvertebrate community (ca. two thirds of the total number of species). The Ephemeroptera are noticably poorly represented (2 species).

3.2 Section 2: detailed description

3.2.1 General description

Section 2 has an average width of 3.40m (bank to bank) and 3.32m (waters edge to waters edge) and an averge depth of 0.22m with a range of 0.10 to 0.30m. The substratum was composed of silt/clay 4%, sand 20%, gravel/pebbles 75% and cobbles/boulders 1%. The flow

was 25cm/s.

The left and right hand banks had trailing tree roots in several places. The shading was heavy. The surrounding land use was secondary deciduous woodland. Stony runs, riffles, small pools, tree roots and large amounts of leaf litter formed the main microhabitats available for macroinvertebrates.

3.2.2 Macroinvertebrates

51 species of macroinvertebrates were recorded. The macronvertebrate fauna was dominated by the freshwater shrimp Gammarus pulex, the mayfly, Baetis rhodani, the leptocerid caddis Athripsodes cinereus and the riffle beetle Elmis aenea.

The BMWP score for this section is high (183), indicating a greater than average number of macroinvertebrate families. The ASPT for the section (5.22) indicates that the water quality is high.

The macroinvertebrate community of this section of the stream is very similar to that of section 1, with the Gastropoda, Trichoptera and Coleoptera being the best represented groups. The number of Ephemeroptera recorded is also low, though a single specimen of the baetid Centroptilum luteolum was recorded.

3.3 Section 3: detailed description

3.3.1 General description

Section 3 has an average width of 3.53m (bank to bank) and 3.33m (waters edge to waters edge) and an averge depth of 0.14m with a range of 0.06 to 0.22m. The substratum was composed of silt/clay 4%, sand 20%, gravel/pebbles 75% and cobbles/boulders 1%. The flow was 29cm/s.

The left and right hand banks had trailing tree roots in several places. The shading was heavy on the left hand bank and moderate on the right hand bank. The surrounding land use was secondary deciduous woodland with some improved grassland on the right hand bank. Stony runs, riffles, tree roots and small amounts of leaf litter formed the main microhabitats available for macroinvertebrates.

3.3.2 Macroinvertebrates

38 species of macroinvertebrate were recorded including the widespread but local species (Wallcae I.D et al 1990) Adicella reducta. Two species, the freshwater shrimp Gammarus pulex and the mayfly Baetis rhodani numerically dominated the macronvertebrate fauna.

The BMWP score for this section was the lowest for all of the sections, though still relatively high for a stream of this size. The ASPT for the section (5.32) was simlar to that of the other sections of steam, indicating a similarly high water quality. The lower numbers of species and famlies in this section of the stream probably reflects the lesser amount of habitat (leaf litter, stands of plants) than was present in the other two sections.

Once again the groups best represented in the macroinvertebrate community were the Gastropoda, Trichoptera and Cloeoptera.

4. REFERENCES

Brindle,A. and Smith, K.G.V. (1978). The immature stages of flies. In A Dipterist's Handbook, ed. Stubbs,A. and Chandler,P. The Amateur Entomologist, 15.

Edington, J.M. and Hildrew, A.G. (1981). Caseless caddis larvae of the British Isles. Freshwater Biological Association Scientific Publication No. 43.

Elliott,J.M. (1977). A key to the larvae and adults of British freshwater Megaloptera and Neuroptera. Freshwater Biol. Assoc. Pulication No. 35.

Elliott,J.M., Humpesch,U.H. and Macan,T.T. (1988). Larvae of the British Ephemeroptera: a key with ecological notes. FW. Biol. Assoc. Pub. No.49.

Elliott,J.M. and Mann,K.H. (1979). A Key to the British Freshwater Leeches. Freshwater Biol. Assoc. Publication No. 40.

Elliott,J.M., O'Connor,J.P. and O'Connor,M.A. (1979). A key to the larvae of Sialidae (Insecta: Megaloptera). Freshwater Biology, 9, 511-514.

Ellis,A.E. (1978). British Freshwater Bivalve Mollusca. Synopses of the British Fauna, No. 11. The Linnean Society of London. Academic Press, London.

Friday,L.E. (1988). A Key to the Adults of the British Water Beetles. (AIDGAP Key). Field Studies Council Publication 189.

Gledhill,T., Sutcliffe,D.W. and Williams,W.D. (1976). A revised key to the British Species of Crustacea: Malacostraca occurring in Fresh Water. Freshwater Biol. Assoc. Publication No. 32.

Hynes, H.B.N. (1977). Adults and nymphs of British Stoneflies, a key. Freshwater Biological AssociationScientific Publication No. 17.

Macan,T.T.(1977) A key to the British Fresh- and Brackish Water Species of Gastropods (4th ed.). Freshwater Biol. Assoc. Sci. Publication No.13.

Reynoldson, T.B. (1978). A Key to the British Species of Freshwater Triclads (2nd ed.). Freshwater Biol. Assoc. Scient. Publication No. 23.

Savage, A.A (1990) ??????????

Wallace, I.D, Wallace, B. and Philipson G.N. (1990). A key to the case-bearing caddis larvae of Britain and Ireland. Freshwater Biol. Assoc. Scient. Publication No.51.

APPENDIX X MACROINVERTEBRATES RECORDED IN THE THREE SECTIONS OF THE BUCKINGHAM STREAM, NORFOLK

	SECTION 1	SECTION 2	SECTION 3	SECTIONS 2 to 3
TRICLADIDA				
Planariidae				
Polycelis nigra	+	+	-	
Dendrocoelidae				
Dendrocoelum lacteum	-	-	+	
HIRUDINEA				
Glossiphoniidae				
Glossiphonia complanata	+	+	+	
Helobdella stagnalis	+	+	+	
Theromyzon tessulatum	-	+	-	
Erpobdellidae				
Erpobdella octoculata	+	+	+	
GASTROPODA				
Ancylidae				
Ancylus fluviatilis	+	+	+	
Valvatidae				
Valvata cristata	+	+	+	
Valvata piscinalis	+	+	-	
Hydrobiidae				
Bithynia tentaculata	+	+	-	
Lymnaeidae				
Lymnaea peregra	+	+	-	

Lymnaea truncatula	+	+	-
Physidae			
Physa fontinalis	+	-	-
Planorbidae			
Anisus vortex	+	+	+
Armiger crista	-	-	+
Bathyomphalus contortus	+	+	+
Gyraulus albus	+	+	+
Planorbis planorbis	-	+	-
BIVALVIA			
Unionidae			
Anodonta cygnea	-	+	-
Sphaeriidae			
Sphaerium corneum	+	+	+
MALACOSTRACA			
Gammaridae			
Gammarus pulex	+	+	+
Asellidae			
Asellus aquaticus	+	+	+
PLECOPTERA			
Nemouridae			
Nemoura avicularis	-	+	+
Nemoura cinerea	+	+	+
EPHEMEROPTERA			
Leptophlebiidae			
Habrophlebia fusca	+	+	+
Ephemeridae			

Ephemera danica	-	-	-	+
Caenidae				
Caenis luctuosa/macrura	+	+	+	
Baetidae				
Baetis rhodani	+	+	+	
Centroptilum luteolum	-	+	-	
HEMIPTERA				
Veliidae				
Velia caprai	-	+	-	
Hydrometridae				
Hydrometra stagnorum	+	+	-	
Corixidae				
Hesperocorixa sahlbergi	-	+	+	
Sigara dorsalis	+	-	-	
MEGALOPTERA				
Sialidae				
Sialis lutaria	+	+	+	
TRICHOPTERA				
Beraeidae				
Beraeodes minutus	+	+	-	
Leptoceridae				
Adicella reducta	-	-	+	
Athripsodes aterrimus	+	+	-	
Athripsodes cinereus	+	+	+	
Goeridae				
Goera pilosa	+	+	+	

Sericostomatidae				
Agapetus fuscipes	+	+	+	
Polycentropodidae				
Plectrocnemia conspersa	-	+	+	
Plectrocnemia geniculata	+	-	-	
Limnephilidae				
Anabolia nervosa	-	+	-	
Glyphotaelius pellucidus	-	+	+	
Halesus radiatus	-	+	+	
Limnephilus extricatus	+	-	-	
Limnephilus lunatus	+	+	+	
Hydropsychidae				
Hydropsyche angustipennis	+	-	-	
Hydropsyche instabilis	-	-	-	+
Hydropsyche siltalai	+	+	+	
COLEOPTERA				
Haliplidae				
Haliplus lineatocollis	+	+	-	
Dytiscidae (and **Noteridae**)				
Platambus maculatus	+	+	+	
Potamonectes depressus elegans	+	+	+	
Stictotarsus duodecimpustulatus	+	-	-	
Gyrinidae				
Gyrinus substriatus	-	+	-	
Hydrophilidae (and **Hydraenidae**)				
Anacaena bipustulata	+	-	-	
Anacaena globulus	-	-	-	+
Ochthebius minimus	+	-	+	

Elmidae

Elmis aenea	+	+	+
Limnius volckmari	+	+	+
Oulimnius tuberculatus	+	+	+

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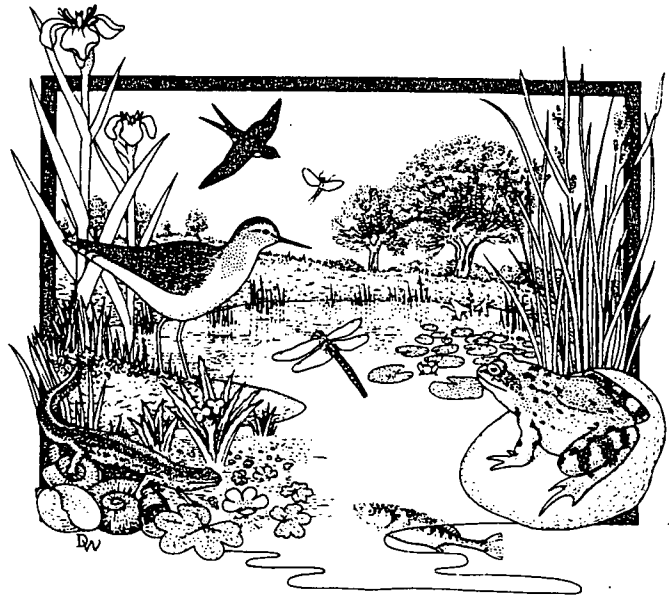

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Pond Action is supported by

Oxford Polytechnic
The Hamlet Partnership

The World Wide Fund for Nature (WWF UK)
Oxford Environmental Services and Ecoscan

WWF

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TABLES

SUMMARY

This report describes the results of a survey of three sections of the Buckingham Stream, near Snetterton in Norfolk.

The survey showed that the stream supported a community which was fairly rich in macroinvertebrates (61 species) and included 1 widespread but local species. The three sections of the stream had very similar macroinvertebrate communities. The BMWP scores and ASPT's for the three sections of the stream (183:5.23, 186:5.22 and 149:5.32 for Sections 1, 2 and 3 respectively) suggest that water quality in the stream was good.

The macroinvertebrate community included a relatively large number of common species and one widespread but local species. This suggests that the community of the stream should be regarded as being of moderate/high nature conservation value.

The local species recorded was a leptocerid caddis fly Adicella reducta. Leptocerids are generally regarded as being indicative of good water quality within the BMWP system, but we are not aware of any specific information on the water quality requirements of A.reducta.

1. INTRODUCTION

This report describes the results of a survey of the aquatic macroinvertebrates of three sections of the Buckingham Stream, near Snetterton in Norfolk.

Section 1	TM 025927
Section 2	TM 027923
Section 3	TM 023917

The objective of the survey was to make a preliminary assessment (with one season of sampling) of the conservation value of the macroinvertebrate community of the Buckingham Stream.

2. METHODS

Survey work was undertaken on 18th March 1991.

Three 50m sections of the stream were selected for survey.

The width and depth of the stream was measured in each section. Widths were recorded as an average of 10 readings, with one reading taken every 5m. Average water depth was recorded from 10 transects, with depth measurements taken at 1/4, 1/2 and 3/4 of the stream width.

The composition of the bottom substrate was assessed by eye and classified using the Wentworth scale as adapted by the Institute of Freshwater Ecology for use with the River Invertebrate Classification and Prediction System (RIVPACS).

Aquatic macroinvertebrates were collected from each of the three sections by sweep netting in vegetation or by kick sampling of stony substrata using a standard pondnet (Freshwater Biological Association pattern, 1mm square mesh).

Sampling was undertaken following the standard RIVPACS procedure with additional time spent searching for species likely to be missed in the timed sample. A standard RIVPACS 3-minute sample was collected in each section, the three minutes being divided so that the amount of time spent sampling in any microhabitat was proportional to the area which that microhabitat occupied in the section. In addition to the three minute timed sample, 1 hour was spent searching for additional taxa in each of the three 50m sections. 1 hour was also spent searching between Sections 1 and 2 and between Sections 2 and 3.

The three minute timed sample was sorted in the laboratory. The sample was sorted thoroughly in order to give a complete species list. All species which could not readily be identified were removed and preserved in 70% industrial methylated spirits (IMS) before identification.

All material collected during the additional search was sorted in the field, species being identified on site or returned to the laboratory in IMS.

The aquatic macroinvertebrate groups which were included in the survey are listed in Table 1 (over page). A list of the keys and guides used in identification of macroinvertebrates is given in Section 4 (see page 11).

2.3 Assessment of the conservation value of the macroinvertebrate communities in the streams

The conservation value of the aquatic macroinvertebrate communities was assessed using the criteria described in Table 2 (see page 7).

Note In this report the assessment of the conservation value of the macroinvertebrate communities has been made using data from a

single season. Collecting in two or three different seasons of the year (ie spring, summer and autumn) usually results in the recording of 30-50% more species than are found in a single season. It is possible that, amongst these new species, further uncommon species could be recorded.

TABLE 1 GROUPS OF MACROINVERTEBRATES RECORDED IN THE BUCKINGHAM STREAM, NORFOLK

GROUPS IDENTIFIED TO SPECIES LEVEL

Tricladida	(Flatworms)
Hirudinea	(Leeches)
Gastropoda	(Snails and limpets)
Bivalvia (excluding Pisidium spp.)	(Bivalves)
Malacostraca	(Shrimps and slaters)
Ephemeroptera	(Mayflies)
Odonata	(Dragonflies and damselflies)
Heteroptera	(Water bugs)
Plecoptera	(Stoneflies)
Megaloptera	(Alderflies)
Trichoptera	(Caddis-flies)
***Coleoptera**	(Water beetles)

*Adults from the following families of Coleoptera were recorded: Gyrinidae, Haliplidae, Dytiscidae, Elmidae, Hydraenidae, Hydrophilidae, Noteridae.

TABLE 2. SYSTEM USED FOR ASSESSING THE NATURE CONSERVATION VALUE OF AQUATIC MACROINVERTEBRATE COMMUNITIES

CONSERVATION VALUE	DESCRIPTION OF COMMUNITY
VERY HIGH	Supporting a rich community of macroinvertebrate species, including local species and/or rare (ie Red Data Book) species. Note that some sites with rare species may be relatively species-poor.
HIGH	Supporting a rich community of common macroinvertebrate species. A small number of local species present. No rare species.
MODERATE/LOW	Supporting only common macroinvertebrate species. No rare or uncommon species.

Within the two higher categories individual sites can be ranked on the basis of numbers of rare and uncommon species, provided that a constant amount of effort in sampling has been made.

3. THE AQUATIC MACROINVERTEBRATE COMMUNITIES OF THE TWO STREAMS

A list of the species found in the two streams is given in the Appendix.

3.1 Section 1: detailed description

3.1.1 General description

Section 1 had an average width of 2.80m (bank to bank) and 2.78m (water's edge to water's edge) and an average depth of 0.15m with a range of 0.08m to 0.23m. The substratum was composed of silt/clay 14%, sand 35%, gravel/pebbles 60% and cobbles/boulders 1%. The flow was 33cm/s.

Both banks were edged with macrophytes (mainly Callitriche and Epilobium sp.). The shading was moderate. Stony runs, riffles, small pools and the marginal macrophytes formed the main microhabitats available for macroinvertebrates.

3.1.2 Macroinvertebrates

49 species of macroinvertebrates were recorded. The macroinvertebrate fauna was dominated numerically by the freshwater shrimp, Gammarus pulex, the mayfly, Baetis rhodani and the riffle beetle Elmis aenea.

The BMWP score for this section of the stream was high (183), indicating an above average number of families in the community. The ASPT for the section (5.23) was indicative of good water quality.

The groups Gastropoda, Trichoptera and Coleoptera are the best represented in the macroinvertebrate community (ca. two thirds of the total number of species). The Ephemeroptera are noticeably poorly represented (2 species).

3.2 Section 2: detailed description

3.2.1 General description

Section 2 had an average width of 3.40m (bank to bank) and 3.32m (waters edge to waters edge) and an average depth of 0.22m with a range of 0.10 to 0.30m. The substratum was composed of silt/clay 4%, sand 20%, gravel/pebbles 75% and cobbles/boulders 1%. The flow was 25cm/s.

Both banks had trailing tree roots in several places. The shading was heavy. Stony runs, riffles, small pools, tree roots and large amounts of leaf litter formed the main microhabitats available for macroinvertebrates.

3.2.2 Macroinvertebrates

51 species of macroinvertebrates were recorded. The macroinvertebrate fauna was dominated by the freshwater shrimp Gammarus pulex, the mayfly, Baetis rhodani, the leptocerid caddis Athripsodes cinereus and the riffle beetle Elmis aenea.

The BMWP score for this section was high (183), indicating a greater than average number of macroinvertebrate families. The ASPT for the section (5.22) indicates that the water quality was good.

The macroinvertebrate community of this section of the stream was very similar to that of Section 1, with the Gastropoda, Trichoptera and Coleoptera being the best represented groups. The number of species of Ephemeroptera recorded was low, though a single specimen of the baetid Centroptilum luteolum was recorded.

3.3 Section 3: detailed description

3.3.1 General description

Section 3 had an average width of 3.53m (bank to bank) and 3.33m (waters edge to waters edge) and an average depth of 0.14m with a range of 0.06 to 0.22m. The substratum was composed of silt/clay 4%, sand 20%, gravel/pebbles 75% and cobbles/boulders 1%. The flow was 29cm/s.

Both banks had trailing tree roots in several places. The shading was heavy on the left bank and moderate on the right bank. Stony runs, riffles, tree roots and small amounts of leaf litter formed the main microhabitats available for macroinvertebrates.

3.3.2 Macroinvertebrates

38 species of macroinvertebrate were recorded including the widespread but local species Adicella reducta (Wallace et al 1990). Two species, the freshwater shrimp Gammarus pulex and the mayfly Baetis rhodani, dominated the fauna numerically.

The BMWP score for this section was the lowest of the three sections (149), though still relatively high for a stream of this size. The ASPT for the section (5.32) was similar to that of the other sections of steam, indicating a similarly high water quality. The lower numbers of species and families in this section of the stream probably reflected the fact that the stream supported a smaller variety of habitats (eg less leaf litter, fewer stands of plants) than the other two sections.

Once again the groups best represented in the macroinvertebrate community were the Gastropoda, Trichoptera and Coleoptera.

3.4 Species recorded in other areas of the stream

Additional searches between Sections 1 and 2 and Sections 2 and 3 revealed few additional species (see Appendix 1).

3.5 Assessment of the conservation value of the Buckingham Stream

The macroinvertebrate community of the Buckingham Stream included a relatively large number of common species and one widespread but local species. This suggests that the community should be regarded as being of moderate/high nature conservation value (see Table 2).

One local species was recorded, the leptocerid caddis fly Adicella reducta. Leptocerids are generally regarded as being indicative of good water quality within the BMWP system. However, we are not aware of any specific information on the water quality requirements of A.reducta.

4. REFERENCES

Brindle,A. and Smith, K.G.V. (1978). The immature stages of flies. In A Dipterist's Handbook, ed. Stubbs,A. and Chandler,P. The Amateur Entomologist, 15.

Edington, J.M. and Hildrew, A.G. (1981). Caseless caddis larvae of the British Isles. Freshwater Biological Association Scientific Publication No. 43.

Elliott,J.M. (1977). A key to the larvae and adults of British freshwater Megaloptera and Neuroptera. Freshwater Biol. Assoc. Pulication No. 35.

Elliott,J.M., Humpesch,U.H. and Macan,T.T. (1988). Larvae of the British Ephemeroptera: a key with ecological notes. FW. Biol. Assoc. Pub. No.49.

Elliott,J.M. and Mann,K.H. (1979). A Key to the British Freshwater Leeches. Freshwater Biol. Assoc. Publication No. 40.

Elliott,J.M., O'Connor,J.P. and O'Connor,M.A. (1979). A key to the larvae of Sialidae (Insecta: Megaloptera). Freshwater Biology, 9, 511-514.

Ellis,A.E. (1978). British Freshwater Bivalve Mollusca. Synopses of the British Fauna, No. 11. The Linnean Society of London. Academic Press, London.

Friday,L.E. (1988). A Key to the Adults of the British Water Beetles. (AIDGAP Key). Field Studies Council Publication 189.

Gledhill,T., Sutcliffe,D.W. and Williams,W.D. (1976). A revised key to the British Species of Crustacea: Malacostraca occurring in Fresh Water. Freshwater Biol. Assoc. Publication No. 32.

Hynes, H.B.N. (1977). Adults and nymphs of British Stoneflies, a key. Freshwater Biological AssociationScientific Publication No. 17.

Macan,T.T.(1977) A key to the British Fresh- and Brackish Water Species of Gastropods (4th ed.). Freshwater Biol. Assoc. Sci. Publication No.13.

Reynoldson, T.B. (1978). A Key to the British Species of Freshwater Triclads (2nd ed.). Freshwater Biol. Assoc. Scient. Publication No. 23.

Savage, A.A (1989). dults of the British aquatic Hemiptera Heteroptera: A key with ecological notes. Freshwater Biol. Assoc. Scient. Publication No. 50.

Wallace, I.D, Wallace, B. and Philipson G.N. (1990). A key to the case-bearing caddis larvae of Britain and Ireland. Freshwater Biol. Assoc. Scient. Publication No.51.

APPENDIX MACROINVERTEBRATES RECORDED IN THE BUCKINGHAM STREAM, NEAR SNETTERTON, NORFOLK

	SECTION 1	SECTION 2	SECTION 3
TRICLADIDA			
Planariidae			
Polycelis nigra	+	+	-
Dendrocoelidae			
Dendrocoelum lacteum	-	-	+
HIRUDINEA			
Glossiphoniidae			
Glossiphonia complanata	+	+	+
Helobdella stagnalis	+	+	+
Theromyzon tessulatum	-	+	-
Erpobdellidae			
Erpobdella octoculata	+	+	+
GASTROPODA			
Ancylidae			
Ancylus fluviatilis	+	+	+
Valvatidae			
Valvata cristata	+	+	+
Valvata piscinalis	+	+	-
Hydrobiidae			
Bithynia tentaculata	+	+	-

APPENDIX (cont). **MACROINVERTEBRATES RECORDED IN THE BUCKINGHAM STREAM, NEAR SNETTERTON, NORFOLK**

	SECTION 1	SECTION 2	SECTION 3
Lymnaeidae			
Lymnaea peregra	+	+	-
Lymnaea truncatula	+	+	-
Physidae			
Physa fontinalis	+	-	-
Planorbidae			
Anisus vortex	+	+	+
Armiger crista	-	-	+
Bathyomphalus contortus	+	+	+
Gyraulus albus	+	+	+
Planorbis planorbis	-	+	-
BIVALVIA			
Unionidae			
Anodonta cygnea	-	+	-
Sphaeriidae			
Sphaerium corneum	+	+	+
MALACOSTRACA			
Gammaridae			
Gammarus pulex	+	+	+
Asellidae			
Asellus aquaticus	+	+	+

APPENDIX (cont). MACROINVERTEBRATES RECORDED IN THE BUCKINGHAM STREAM, NEAR SNETTERTON, NORFOLK

	SECTION 1	SECTION 2	SECTION 3
PLECOPTERA			
Nemouridae			
Nemoura avicularis	-	+	+
Nemoura cinerea	+	+	+
EPHEMEROPTERA			
Leptophlebiidae			
Habrophlebia fusca	+	+	+
Caenidae			
Caenis luctuosa/macrura	+	+	+
Baetidae			
Baetis rhodani	+	+	+
Centroptilum luteolum	-	+	-
HEMIPTERA			
Veliidae			
Velia caprai	-	+	-
Hydrometridae			
Hydrometra stagnorum	+	+	-
Corixidae			
Hesperocorixa sahlbergi	-	+	+
Sigara dorsalis	+	-	-
MEGALOPTERA			
Sialidae			
Sialis lutaria	+	+	+

APPENDIX (cont). **MACROINVERTEBRATES RECORDED IN THE BUCKINGHAM STREAM, NEAR SNETTERTON, NORFOLK**

	SECTION 1	SECTION 2	SECTION 3
TRICHOPTERA			
Beraeidae			
Beraeodes minutus	+	+	-
Leptoceridae			
Adicella reducta	-	-	+
Athripsodes aterrimus	+	+	-
Athripsodes cinereus	+	+	+
Goeridae			
Goera pilosa	+	+	+
Glossosomatidae			
Agapetus fuscipes	+	+	+
Polycentropodidae			
Plectrocnemia conspersa	-	+	+
Plectrocnemia geniculata	+	-	-
Limnephilidae			
Anabolia nervosa	-	+	-
Glyphotaelius pellucidus	-	+	+
Halesus radiatus	-	+	+
Limnephilus extricatus	+	-	-
Limnephilus lunatus	+	+	+
Hydropsychidae			
Hydropsyche angustipennis	+	-	-
Hydropsyche siltalai	+	+	+

APPENDIX (cont). **MACROINVERTEBRATES RECORDED IN THE BUCKINGHAM STREAM, NEAR SNETTERTON, NORFOLK**

	SECTION 1	SECTION 2	SECTION 3
COLEOPTERA			
Haliplidae			
Haliplus lineatocollis	+	+	-
Dytiscidae (and **Noteridae**)			
Platambus maculatus	+	+	+
Potamonectes depressus elegans	+	+	+
Stictotarsus duodecimpustulatus	+	-	-
Gyrinidae			
Gyrinus substriatus	-	+	-
Hydrophilidae (and **Hydraenidae**)			
Anacaena bipustulata	+	-	-
Ochthebius minimus	+	-	+
Elmidae			
Elmis aenea	+	+	+
Limnius volckmari	+	+	+
Oulimnius tuberculatus	+	+	+

ADDITIONAL SEARCHES BETWEEN SECTIONS 1/2 AND SECTIONS 2/3

Ephemerida
Ephemera danica

Hydropsychidae
Hydropsyche instabilis

Hydrophilidae (and **Hydraenidae**)
Anacaena globulus