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**Further Surveys to Elucidate the Distribution of the Fine-Lined Pea
Mussel *Pisidium tenuilineatum* Stelfox, 1918**

Technical Report

W1-054/TR



**ENVIRONMENT
AGENCY**

**Further surveys to elucidate the distribution of
the fine-lined pea mussel *Pisidium tenuilineatum*
Stelfox, 1918**

R&D Technical Report W1-054/TR

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This report is an integral part of the UK Biodiversity Action Plan for the fine lined pea mussel *Pisidium tenuilineatum*. It is to enable conservation staff and those managing water and land to be alerted to the presence of the species and preliminary guidance on its protection. The report is a foundation for research to determine the species' ecological requirements definitively as a basis for effective guidance on protecting the species.

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EXECUTIVE SUMMARY

The fine-lined pea mussel, *Pisidium tenuilineatum* is believed to be one of Britain's rarest freshwater molluscs. It is classified in the British Red Data Book as Category RDB3 Rare, and is included on the Biodiversity Action Plan (BAP) 'short-list' of Priority species.

The species is confined mainly to central southern England and sites along the Welsh borders, with the River Wharfe, Yorkshire representing a considerable outpost. There is some evidence of decline during this century, with no live post-1965 records from canal sites in the Midlands, including the type locality on the Grand Union Canal at Marsworth, Buckinghamshire. *Pisidium tenuilineatum* is regarded as a calciphile species, sensitive to water pollution.

As lead partner for freshwater molluscs on the UK BAP, the Environment Agency has initiated work to address the aims of the individual species' action plans. Further information is required to obtain a better understanding of the status and distribution of *Pisidium tenuilineatum* in England and Wales as a precursor to providing management guidance for protecting the species. This project - National R&D Project W1 - 054: has been funded jointly by the Environment Agency and English Nature. It was a component of the Agency's UK Biodiversity Plans umbrella project W1B(99)04.

The overall objective was to increase our knowledge of *P. tenuilineatum* in Britain so that the Environment Agency can ensure that sites where it is found are protected, and to enable them to begin to determine its ecological requirements in order to provide appropriate protection. The specific objectives were as follows:

- To undertake detailed surveys in rivers where there had been recent records from single sites and to complete surveys of sites on rivers where surveys had already begun:
- To survey sites where *P. tenuilineatum* was believed to be extinct, to confirm that the species no longer occurred there.
- To survey rivers where the species had not been recorded, but which were near and similar to rivers where it had been recorded, and to expand the area surveyed within the known range of the species.
- To investigate river systems west of the Hampshire Avon in Dorset and Devon up to the River Otter.
- To produce an R&D Technical Report in accordance with the Agency's guidelines to reporting.

On each river, sites were sampled at irregular intervals from upstream to downstream. Specimens of *Pisidium* were collected by sampling fine sediments at river margins, in areas of slower flow and amongst the base of aquatic weeds. In the laboratory, all of the specimens were picked from each sample, thoroughly dried, and separated into individual species and counted.

A total of 337 individual samples was collected from 40 separate waterbodies, of which 133 sites supported *Pisidium tenuilineatum*. The Thames catchment rivers were the most important for the species. It was recorded in 15 of the 19 rivers, and at 96 of the

158 individual sample sites. *Pisidium tenuilineatum* was recorded from the rivers Lyde, Windrush, Glyme, Coln, Cherwell, Thame, Churn, Leach and Pang for the first time.

The species was recorded in 8 of the 12 Hampshire Basin and south coast rivers, but was present in a lower proportion of the sample sites: 27 out of 117. The species was recorded for the first time in the Rivers Axe, Otter and Meon. It could not be found at Harting Pond, which suggests that it may have become extinct. In the Wye catchment rivers *P. tenuilineatum* was reconfirmed living in the Lugg and Monnow. It was absent from the Wye, Arrow and Frome, and could not be relocated at Aymestrey Pond. The species could not be found at any site in the three Midlands rivers sampled, the Ise, Nene and Great Ouse. The absence of any dead shells in the present survey, or confirmed live specimens since 1970, suggests strongly that the species has become extinct in these river catchments.

There was considerable variation in the distribution of *P. tenuilineatum* and all *Pisidium* species within each river. In some rivers, *P. tenuilineatum* was found at every site throughout the section sampled, in others it occurred only in the upper, middle or lower sections, and in the remainder the distribution was sporadic. There were also large differences in the abundance of *P. tenuilineatum* between rivers and between sites in individual rivers. At some sites in some rivers, *P. tenuilineatum* dominated the *Pisidium* fauna, although at most sites where it occurred, it usually comprised less than 10% of all individuals.

Pisidium tenuilineatum was found living a wide range of flow and sediment conditions but any correlation is difficult to establish as all *Pisidium* species are found most commonly in fine muddy sediments in quiet marginal areas, and these habitats were always targeted during sampling. Water quality is believed to be one of the most important factors in controlling the distribution of *P. tenuilineatum*. This survey has indicated that *P. tenuilineatum* may be tolerant of a wider range of water quality than was previously believed. However, without a more detailed analysis of existing data and substantial additional data from other rivers, it is not possible to establish the relationship between water quality and the presence/absence or abundance of *P. tenuilineatum*.

KEYWORDS: Fine-lined pea mussel, *Pisidium tenuilineatum*, UK Biodiversity Action Plan

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We are grateful to the Environment Agency for funding this project and especially to Dr John Murray-Bligh for his continued interest and support, to English Nature for additional financial contributions, and to Nicky Bailey and Jenny Lissaman for project management on behalf of the Environment Agency. We thank Bob Marshall (Environment Agency) for preparation of the distribution maps. Many Environment Agency biologists provided water quality data and facilitated access to some rivers. Finally, we thank all of the landowners who gave permission to sample rivers from their land.

1 INTRODUCTION

The fine-lined pea mussel, *Pisidium tenuilineatum* Stelfox, 1918 is believed to be one of Britain's rarest freshwater molluscs. It is classified in the British Red Data Book (Bratton 1991) as Category RDB3 Rare, and is included on the Biodiversity Action Plan (BAP) 'short-list' of Priority species (HMSO 1996).

Pisidium tenuilineatum is widely distributed across the western Palaearctic from the Mediterranean to southern Sweden and eastwards to Russia (Kuiper 1981; Wells & Chatfield 1992, 1995). It is believed to be rare throughout its European range (Wells & Chatfield 1992).

The British distribution of *Pisidium tenuilineatum* is shown by Kerney 1999. The species is confined mainly to central southern England and sites along the Welsh borders, with the River Wharfe, Yorkshire representing a considerable outpost. There is some evidence of decline during this century, with no live post-1965 records from canal sites in the Midlands, including the type locality on the Grand Union Canal at Marsworth, Buckinghamshire, although many of the sites had been searched (Kerney pers. comm.). Many other records are from the 1960s and 70s when intensive recording for the Conchological Society's non-marine Atlas project was underway.

Until the late 1990s, status of *P. tenuilineatum* was unclear. Whilst the absence of records in southern England since publication of the first distribution Atlas (Kerney 1976) suggested a decline in distribution of the species, there had been very little subsequent collection or recording of *Pisidium* faunas in that part of the country or elsewhere.

As lead partner for molluscs on the UK BAP, the Environment Agency has initiated and funded projects to address the aims of the individual species' action plans. In 1997/98 a survey was carried out funded by the Environment Agency R&D Project i640 on species management in aquatic habitats. The objective of this survey was to examine sites on selected rivers in central southern England from where *Pisidium tenuilineatum* had been most recently recorded, in order to determine whether the species was still extant at these locations and more widely. The results of this survey (Killeen 1998a) revealed an encouraging picture of the status and distribution of *P. tenuilineatum* in central southern England.

Additional Environmental Agency-funded surveys have been carried out to determine the distribution and abundance of *P. tenuilineatum* in the River Wharfe, Yorkshire (Killeen & Williams 1999) and in the River Mimram, Hertfordshire (Killeen 2001). The species was also recorded from the River Misbourne, Bucks in samples collected by the Environment Agency (Thames Region, Hatfield) (det. IJK).

A survey carried out as part of the ecological assessment to determine the impact of the proposed Abingdon Reservoir, revealed a population of *P. tenuilineatum* in the River Ock, Oxon, and very low numbers of individuals in the Thames between Abingdon and Dorchester (Killeen 1998b).

Early British accounts of the ecology of *P. tenuilineatum* suggested that, in Britain, it favours large rivers or canals, although there are two records from ponds in Sussex and Herefordshire. On the continent it is known various kinds of running and stagnant water; rivers, canals, streams, brooks and in the littoral zone of large lakes, mostly at altitudes less than 500m (Kuiper 1982). In Poland, Piechocki (1989), records that its characteristic habitats are small lowland rivers with fine bottom sediments, in which it is sometimes abundant. It is also known from limestone springs, and although there are no living examples of the species in similar British habitats it is known as a fossil from Post-glacial spring deposits in the Isle of Wight (Preece 1979) and Kent (Bratton 1991).

P. tenuilineatum is regarded as a calciphile species, sensitive to water pollution (Piechocki 1989).

Previous surveys, and general sampling of *Pisidium*, had indicated that, in Britain, *P. tenuilineatum* often occurred in low numbers, although this may in part, have been an artefact of collection due to its small size (usually less than 2mm in length). However, in a survey by Ham & Bass (1982) of nine rivers in central southern England, *P. tenuilineatum* was recorded from only three of the 124 sites sampled. More recently, examination by one of us (IJK) of 100 *Pisidium* samples (several thousand individuals) collected by the Environment Agency in Thames Region revealed only one live *P. tenuilineatum* (from the Thames at Buscot).

Further information is required to obtain a better understanding of the status and distribution of *Pisidium tenuilineatum* in England and Wales as a precursor to providing management guidance for protecting the species.

This project - National R&D Project W1 - 054: Further surveys to elucidate the distribution of the fine-lined pea mussel (*Pisidium tenuilineatum*) has been funded jointly by the Environment Agency and English Nature. It was a component of the Environment Agency's UK Biodiversity Plans umbrella project W1B(99)04.

2 OBJECTIVES

The overall objective was to increase our knowledge of *P. tenuilineatum* in Britain so that the Environment Agency can ensure that sites where it is found are protected, and to enable them to begin to determine its ecological requirements in order to provide appropriate protection.

The specific objectives were as follows:

Stage 1

- To undertake detailed surveys in rivers where there had been recent records from single sites and to complete surveys of sites on rivers where surveys had already begun:

Thames catchment

Rivers Kennet, Lambourn, Loddon, Whitewater, Thames upstream of Culham, and Evenlode.

Hampshire Basin and south coast

Rivers Avon, Itchen and Test, Frome and Piddle, Harting Pond

Wye catchment

Rivers Monnow and Lugg, Aymestrey Pond

- To survey sites where *P. tenuilineatum* was believed to be extinct, to confirm that the species no longer occurred there.

Midlands:

Rivers Ise, Nene and Great Ouse.

- To survey rivers where the species had not been recorded, but which were near and similar to rivers where it had been recorded, and to expand the area surveyed within the known range of the species.

Thames catchment

Rivers Lyde, Blackwater, Hart, Windrush, Glyme, Coln, Cherwell, Thame, Churn, Ray, Leach, Pang and Ampney Brook.

Hampshire Basin and south coast

Rivers Stour, Meon and Rother

Wye catchment

Rivers Wye, Arrow, Frome

Stage 2

- To investigate river systems west of the Hampshire Avon in Dorset and Devon up to the River Otter.

Rivers Axe, Brit, Otter and Yarty

Stage 3

- To produce a draft and final R&D Technical Report in accordance with the Agency's guidelines to reporting.

This report describes and discusses the surveys

3 METHODOLOGY

3.1 River and Site Selection

Selection of rivers to survey was based upon the above objectives. On each river, sites were sampled at irregular intervals from upstream to downstream. Wherever possible samples were taken where there was easy access such as road crossings or public footpath access from roads.

3.2 Recording Environmental Variables

At each site, the following data were collected and recorded onto field sheets:

- Conductivity (at 25°C) using a Grant YSI P1000 meter (by I.J. Killeen) or Hanna DiST WP3 meter (by M.J. Willing)
- Temperature
- River flow rate (swift, moderate, slow)
- Depth at sample point
- Water clarity
- Bank structure & gradient, bank vegetation
- Marginal aquatic plants, aquatic plants
- Substrate composition (at sample point), approximate percentage:
 - Clay/Silt - soft in texture, not abrasive when rubbed
 - Sand - < than coffee granule size, abrasive when rubbed
 - Gravel/pebbles - coffee granule to half fist size
 - Cobbles/boulders - > half fist size

3.3 *Pisidium* Sampling

Specimens of *Pisidium* can be collected by a wide range of sampling methods including netting, sweeping vegetation and kick sampling. The methods used for this study were designed solely to obtain significant numbers of *Pisidium* specimens. *Pisidium* species frequently live in high density from hundreds to even thousands per square metre of sediment, therefore the collection of an adequate number of specimens for this study was considered unlikely to harm the population. Whilst at least 100 living specimens of *Pisidium* spp. were sought, the sparsity of suitable habitat at some sites meant that this was not always possible. For safety reasons, and to gain access to suitable habitat, at some sites samples were collected by wading into the rivers in a drysuit.

Pisidium are most often found in fine sediments at river margins, in areas of slower flow and amongst the base of aquatic weeds. Sediment and suitable habitat was sampled using a robust, aluminium-framed pond net (handle and frame 2.4m in length, equipped with a 0.5mm nylon mesh bag). As *Pisidium* species live close to the surface of the substrate, they were collected by skimming the net across the top 2-3cm of sediment. Sampling to a greater depth resulted in the collection of large quantities of anoxic mud, more compacted substrate, or coarser sediments.

The filled sample net was agitated in the river to sieve out mud and silt. The material was then tipped into a large bowl or bucket. The sample was then passed over a 4mm

sieve to remove coarse gravel, twigs and leaves. The residue was then passed over a 0.5mm sieve and shaken in water to further remove as much mud and fine particles as possible. It often required some persistence to break down substrate such as clay pellets. The residue was then further reduced by gently swirling in water and decanting off any remaining organic detritus. The mollusc-rich concentrate was then inspected to see whether an adequate number had been obtained. Further sampling was carried out as required. The samples were then stored in labelled jars or self-seal polythene bags.

3.4 Laboratory Analysis

When possible, the samples were picked 'live' at the end of the day of collection or within 2 days of collection. In these circumstances the samples were kept in a refrigerator in a jar with a quantity (c. 0.5l) of their native water. Samples that were not examined within a few days were preserved in 70-80% alcohol (Industrial Methylated Spirit, IMS).

In both cases, the specimens of *Pisidium* were picked from the residues by examining small quantities in a petri dish under a binocular microscope at x6 to x10 magnification. The residues were covered with water to disperse the sample in the dish. The picked specimens were then placed on absorbent paper and allowed to dry. Samples containing very large numbers of *Pisidium* (>800 to 1000 individuals) were sub-divided.

Once all of the specimens had been picked from the sample and were thoroughly dried, they were separated into individual species and counted.

In some cases it was necessary to examine the internal hinge features, which required the two valves to be separated. For freshly collected specimens and those preserved in alcohol, the valves were opened and the animal removed by immersing in boiling water. Articulated specimens which were totally dry were opened by placing them in a warm solution of domestic bleach (50/50 with water). This dissolved the hinge ligament, periostracum and soft parts of the animal. The bleaching also whitened the shell, enabling features of the hinge line to be seen more clearly.

4 RESULTS

A summary of the environmental data for each site is shown in Appendix 1 with the sites on each river arranged from upstream to downstream order.

The numbers of *Pisidium* species recorded at each site are shown in Appendix 2.

4.1 Presence/Absence of *Pisidium tenuilineatum*

Figure 1 shows a map of all of the sampling sites with presence/absence of *P. tenuilineatum*. The maps for individual rivers or catchments are shown in Section 5.

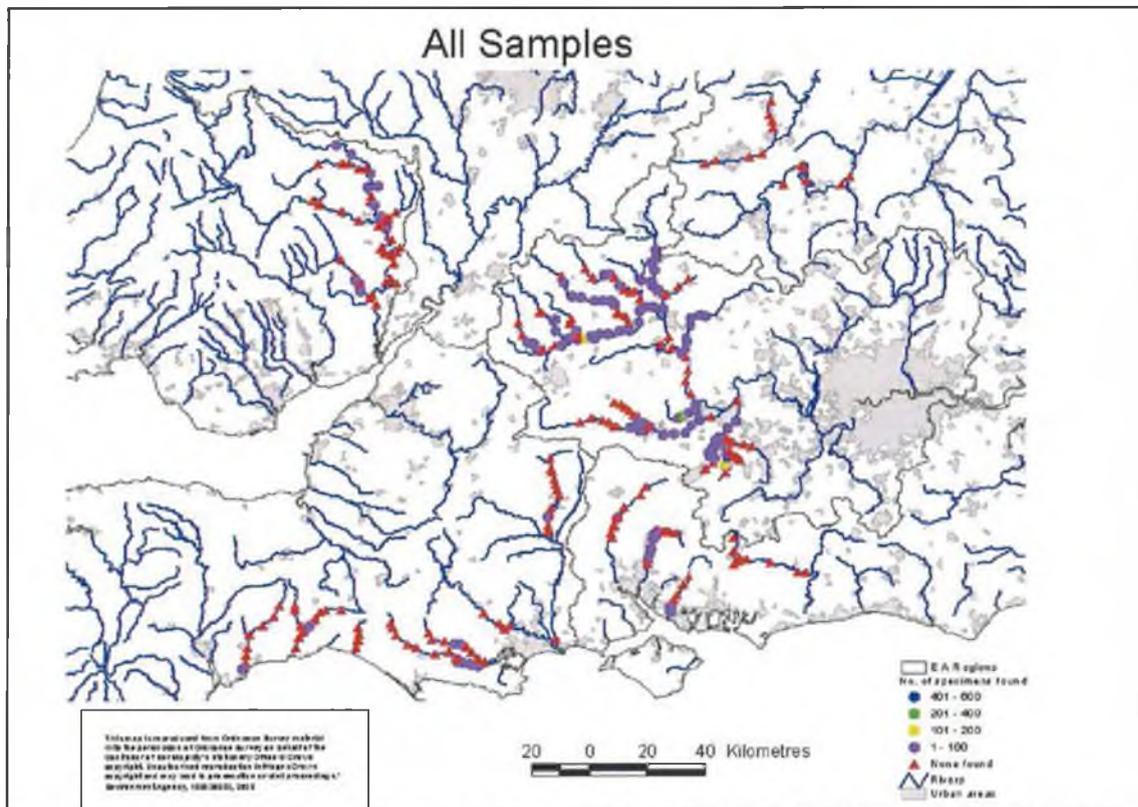


Figure 1: Location of all sites with presence/absence of *Pisidium tenuilineatum*

Table 1 gives a summary of the number and percentage of sites supporting *P. tenuilineatum* for each river on a catchment basis.

Table 1: Number and percentage of sites supporting *P. tenuilineatum* for each river

Catchment	No. of Rivers	No. of sites	No. of rivers with <i>P. ten</i>	No. of sites with <i>P. ten</i>
Thames	19	158	15	96 (60.8%)
Wye	6	49	2	11 (22.4%)
Midlands	3	13	0	0
Hants Basin & south coast	12	117	7	26 (22.2%)

Tables 2-5 show the number and percentage of sites supporting *P. tenuilineatum* for each river on an individual catchment basis. The tables are ordered in descending frequency of the percentage of sample sites with *P. tenuilineatum*.

The Thames catchment rivers are the most important for *P. tenuilineatum*. It was recorded in 15 of the 19 rivers, and at 96 of the 158 individual sample sites (Table 2). This was the first time that *P. tenuilineatum* was recorded from the rivers Lyde, Windrush, Glyme, Coln, Cherwell, Thame, Churn, Leach and Pang.

Table 2: Presence/absence summary for the River Thames Catchment

River	No. of sites	No. of sites with <i>P. tenuilineatum</i>	% of sites with <i>P. tenuilineatum</i>
Lyde	1	1	100
Cherwell	9	9	100
Thame	8	8	100
Pang	7	7	100
Whitewater	9	8	89
Loddon	14	12	86
Coln	7	5	71
Churn	6	4	67
Kennet	19	12	63
Thames	24	14	58
Windrush	13	7	54
Glyme	2	1	50
Lambourn	11	4	36
Evenlode	11	3	27
Leach	4	1	25
Hart	4	0	0
Blackwater	5	0	0
Ray (Oxon)	3	0	0
Ampney Brook	1	0	0
Totals:	158	96	

The species was recorded in 8 of the 12 Hampshire Basin and south coast rivers, but was present in a lower proportion of the sample sites: 27 out of 117 (Table 3). *P. tenuilineatum* was recorded for the first time in the Rivers Axe and Otter (representing a considerable westward extension of its known range on the south coast), and the River Meon. It could not be found at Harting Pond, which suggests that it may have become extinct.

In the Wye catchment rivers *P. tenuilineatum* was reconfirmed living in the Lugg and Monnow (Table 4). It was absent from the Wye, Arrow and Frome, and could not be relocated at Aymestrey Pond, suggesting it may have become extinct at that site. This result, along with that from Harting Pond indicates that *P. tenuilineatum* may have disappeared from its only two known pond sites in the country.

Table 3: Presence/absence summary for Hampshire Basin & south coast rivers

River	No. of sites	No. of sites with <i>P. tenuilineatum</i>	% of sites with <i>P. tenuilineatum</i>
Itchen	15	8	53
Frome	22	10	45
Meon	6	2	33
Axe	9	2	22
Piddle	10	2	20
Otter	8	1	12.5
Test	9	1	11
Avon	14	1	7
Brit	5	0	0
Yarty	4	0	0
Stour	4	0	0
Rother	11	0	0
Totals:	117	27	

Table 4: Presence/absence summary for the River Wye Catchment

River	No. of sites	No. of sites with <i>P. tenuilineatum</i>	% of sites with <i>P. tenuilineatum</i>
Lugg	10	8	80
Monnow	6	3	50
Wye	21	0	0
Arrow	6	0	0
Frome	3	0	0
Aymestrey Pond	3	0	0
Totals:	49	11	

Pisidium tenuilineatum could not be relocated at any site in the three Midlands rivers sampled, the Ise, Nene and Great Ouse (Table 5). The absence of any dead shells in the present survey, or confirmed live specimens since 1970, suggests strongly that the species has become extinct in these river catchments.

Table 5: Presence/absence summary for Midlands rivers

River	No. of sites	No. of sites with <i>P. tenuilineatum</i>
Ise	4	0
Nene	4	0
Great Ouse	5	0
Totals:	13	0

The rivers in which over 70% of sample sites supporting *P. tenuilineatum* must be considered as those with the most important populations, see Table 6.

Table 6: Categories of rivers based on % of sites supporting *P. tenuilineatum*

Rivers with <30% of sites with <i>P. tenuilineatum</i>	Rivers with 31-69% of sites with <i>P. tenuilineatum</i>	Rivers with >70% of sites with <i>P. tenuilineatum</i>
Avon	Meon	Churn
Test	Lambourn	Coln
Piddle	Frome	Lugg
Axe	Glyme	Loddon
Leach	Monnow	Whitewater
Evenlode	Itchen	Lyde
Otter	Windrush	Cherwell
	Thames	Thame
	Kennet	Pang

4.2 Distribution of *Pisidium tenuilineatum* Within Rivers

There was considerable variation in the distribution of *P. tenuilineatum* and all *Pisidium* species within each river (see Figures in the individual river accounts, Section 5).

In some rivers e.g. the Pang, Thame, and Cherwell, *P. tenuilineatum* was found at every site throughout the section sampled. In the Whitewater, Churn and Loddon, the species was absent from the furthest upstream sites, but occurred throughout the rest of the river. In the Thames it was absent from the upper end, occurred at every site from Hannington Bridge to Oxford, but not further downstream. Similarly, on the Windrush it was absent from the upper sections, present at every site from Great Rissington to Witney, but absent further downstream. In the Kennet, Coln, Frome and Itchen, for example, *P. tenuilineatum* first occurred in the middle sections but was then present at almost every downstream site. On the Lambourn, it was present only in the downstream reaches.

In other rivers the distribution was sporadic: Evenlode - few sites near upper end; Monnow - few sites near lower end; Axe and Meon - two sites near downstream end; Piddle - two sites upper middle; Leach, Avon and Test - one site only.

In some rivers, e.g. Thames and Windrush, *P. tenuilineatum* was not found downstream of large towns (Oxford and Witney respectively), suggesting that the water quality in the rivers below these towns may not be of high enough quality. Absences from upstream sections of rivers (e.g. Lambourn, Churn, Meon) may be a result of very low flows at some times of the year in these sections. In some rivers, the distribution may be affected by localised inputs from fish farms, sewage effluent or farm run-off. In others, there are no obvious reasons to account for the distribution of *P. tenuilineatum*. It may be a combination of factors which would require a much more detailed examination.

4.3 Abundance of *Pisidium tenuilineatum*

Table 7 shows the rivers supporting populations of *P. tenuilineatum* listed in two categories based on the species' abundance. Category A comprise rivers in which *P. tenuilineatum* was recorded at several sites and was present in some of those sites in proportions greater than 5% of all *Pisidium* individuals. Category B lists the rivers in which *P. tenuilineatum* was recorded, but was present only at a few sites and at abundance less than 5% of all individuals. The Frome, Piddle and Meon have been placed in Category B, but although they all had one site where *P. tenuilineatum* occurred at an abundance of between 5 and 10%, the species was otherwise found at few locations and/or in low abundance.

Table 7: Categorisation by abundance

Category A	Category B
Whitewater	Lyde
Loddon	Windrush
Kennet	Evenlode
Lambourn	Glyme
Coln	Leach
Thames	Monnow
Cherwell	Axe
Thame	Frome
Churn	Piddle
Pang	Avon
Lugg	Test
Itchen	Meon

There were considerable differences in the abundance of *P. tenuilineatum* between rivers and between sites in individual rivers (see tables and histograms in the individual river accounts, Section 5). At some sites in some rivers, *P. tenuilineatum* dominated the *Pisidium* fauna: for example, at Diplely on the Whitewater, it comprised 85% of all individuals. At single sites on the Kennet and Pang, *P. tenuilineatum* dominated the *Pisidium* fauna (74% and 65% respectively). However, such dominance was unusual, and at most sites where it occurred, it usually comprised less than 10% of all individuals.

In some rivers, *P. tenuilineatum* was recorded either at single sites or in low numbers. We cannot explain why this phenomenon should occur. If it was caused by localised pollution or the lack of suitable habitat, we would expect the species to occur at higher densities elsewhere on the rivers. However, whilst the abundance of *P. tenuilineatum* in some rivers is relatively low, this study indicated that it is not as rare as was previously believed.

There were very clear trends in the abundance of *P. tenuilineatum* from upstream to downstream in some rivers (e.g. Whitewater and Pang). In both rivers, the species was present only in low numbers in the upstream reaches, but then rapidly increased in abundance (up to 84%), and then gradually decreased in abundance downstream. This

suggests that environmental conditions in both of these rivers are highly favourable, but are at an optimum in the upper to middle reaches. Unfortunately, the detailed water quality information that is needed to verify this inference is, at present, unavailable. Both the Whitewater and Pang are relatively short (19 and 30 km respectively), clean, highly calcareous rivers, which allows the potentially subtle changes in distribution and abundance to be detected more easily. Most of the other rivers surveyed were longer, had a greater range of environmental conditions, were subject to more external influences, and had fewer clear trends in *P. tenuilineatum* abundance. A more closely-spaced series of sites, together with supporting water quality data and sediment analysis is probably necessary to detect trends in abundance and distribution.

4.4 *Pisidium* species Relationships

Boycott (1936) tabulated data on the distribution of *Pisidium* from 466 sites in Britain. For each of the 15 species he calculated the 'average number of companions': the average number of other species of *Pisidium* in habitats occupied by the species in question. His calculated value for *P. tenuilineatum* was 6.3. He then proposed a 'hierarchy of gentility' which ranges from *P. personatum* (a species which lives in poor habitats such as ephemeral ditches) at the bottom to *P. henslowanum* and *P. amnicum* "which insist on the best places with 4 or 5 other species", and *P. supinum*, *P. moitessierianum* and *P. tenuilineatum* "which are even more particular". Rather than inferring the suitability of the habitat by its size and water quality, Boycott effectively let the *Pisidium* species tell him which habitats were superior. In so doing, he reduced environmental variables down to a single one, 'average number of companions'. However, this does make the assumption that more *Pisidium* species equals a better quality habitat.

Bishop & Hewitt (1976) confirmed Boycott's data when they took quantitative data from 182 localities in eastern England. By performing chi-square tests for association between all pairs, they found a significant similarity to Boycott's hierarchy. For example, an association was detected between *P. nitidum*, *P. subtruncatum* and *P. henslowanum*, but not between *P. nitidum* and *P. supinum*. Unfortunately, their samples did not include *P. tenuilineatum*.

In this study, twelve other species of *Pisidium* were recorded in rivers which supported *P. tenuilineatum*, although *P. personatum* and *P. obtusale* were found only in the upper sections in generally ephemeral habitats. Of the ten remaining species, all were recorded with *P. tenuilineatum* in at least 1 site.

The histograms in Section 5 show the percentage abundance of each species at each site for each river, ordered from upstream to downstream. In many cases, there do not appear to be any obvious relationships between adjacent sites or from upstream to downstream. However, in others, there are apparent relationships and trends. In particular, at sites where *P. tenuilineatum* is relatively common, it is most usually associated with *P. casertanum* also in moderately high abundance. Also at these sites, *P. nitidum* is uncommon, and in several cases, absent. This is shown particularly well in the rivers Whitewater, Loddon, Kennet, Churn, Pang and Thame. There are very few sites where *P. tenuilineatum* occurs at all frequently with a moderate to high abundance of *P. supinum* (converse to Boycott's findings).

To determine whether these observed relationships are statistically robust, the data from the Thames catchment have been analysed using PRIMER software to produce dendrograms of Bray-Curtis similarity. Figure 2 shows the dendrogram based on presence/absence only and Figure 3 shows the dendrogram based on the percentage composition of each species per site.

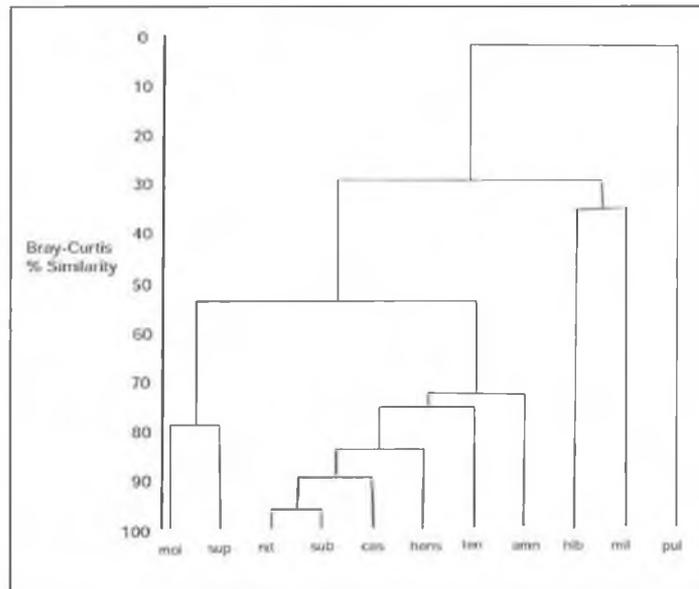


Figure 2: Bray-Curtis dendrogram based on *Pisidium* species presence/absence

Based on presence/absence, there are 3 principal groupings. The group comprising *P. milium*, *P. hibernicum* and *P. pulchellum* separate off at an early stage indicating very little similarity with the other 8 species. This is principally a function of the very low number of occurrences of these 3 species. The remaining 8 species show a 53% similarity, but then sub-divide into 2 groups: one with *P. supinum* and *P. moitessierianum* with 78% similarity, and second with *P. tenuilineatum*, *P. amnicum*, *P. henslowanum*, *P. casertanum*, *P. subtruncatum* and *P. nitidum* (at 72% similarity). The latter 2 species grouped at a similarity of 96%, confirming field data, which shows they are invariably associated.

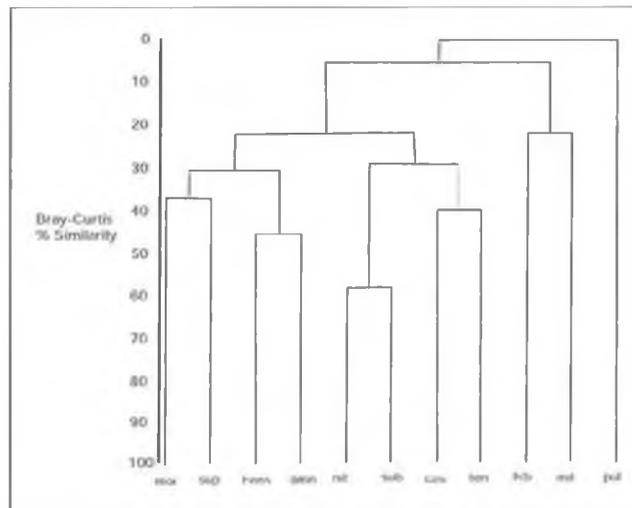


Figure 3: Bray-Curtis dendrogram based on *Pisidium* species abundance

Figure 3 shows the dendrogram based upon abundance. As with the presence/absence, *P. milium*, *P. hibernicum* and *P. pulchellum* are dissimilar to the other species. At a 30% similarity level the others divide into 2 principal groups. The first group comprises 2 pairs: *P. supinum* with *P. moitessierianum*, and *P. henslowanum* with *P. amnicum*. The second group also comprises 2 pairs of species: *P. nitidum* with *P. subtruncatum*, and *P. casertanum* with *P. tenuilineatum*.

Further statistical analyses that incorporate other variables such as water quality, sediment, or flow may reveal other relationships.

4.5 Habitat

Pisidium tenuilineatum was found living a wide range of flow and sediment conditions.

A significant number of the rivers were moderate to swift-flowing although the actual habitats sampled were in less high-energy conditions amongst, or in the lee of, marginal aquatic plants, downstream of constructions or obstructions, or in shallow embayments.

Any relationship between *P. tenuilineatum* and sediment type is difficult to establish as *Pisidium* species are found most commonly in fine muddy sediments, and these habitats were always targeted during sampling. In rivers where the substrate was predominantly sandy, such as the Evenlode, *P. tenuilineatum* was rare, although this may not necessarily be a function of substrate.

4.6 Water Quality

At present, we have only limited information on the relationship between *P. tenuilineatum* distribution and water quality. Studies by Kuiper (pers. comm.) and Piechocki (1989) on continental *Pisidium* populations which have shown that *P. tenuilineatum* is amongst the species least tolerant of pollution. Data from the River Wharfe, Yorkshire have shown that orthophosphate may be a limiting factor (Killeen & Williams 1999). *P. tenuilineatum* is restricted to a section of the upper Wharfe where orthophosphate (PO_4) concentrations are below 0.07mg/l and Total oxidised nitrogen

(Tox N = NO₃ + NO₂) below 1.3mg/l. In the River Mimram, Hertfordshire, water quality data showed a PO₄ level of 0.08mg/l which is close to that recorded at the *P. tenuilineatum* limit on the Yorkshire Wharfe, although the Tox N (5.02 mg/l) was significantly higher. The Mimram flows into the River Lee where *P. tenuilineatum* was present only in the immediate vicinity of the Mimram confluence. The concentrations of PO₄ (2.79mg/l) and Tox N (12.4mg/l) in the Lee were considerably higher than for the Mimram (or Wharfe) and were considered to be beyond the tolerance limit of *P. tenuilineatum*.

Environment Agency hydrochemical analyses (see Section 5) based on mean values from monthly monitoring samples taken over the period of the present survey were examined to determine whether these data provided clues for the apparently restricted distribution of *P. tenuilineatum*. The analyses cover the sections of each river sampled although not all of the sites coincided with those from the *Pisidium* survey. For some rivers, there were very few Environment Agency sample sites where the water quality was analysed, and some Regions do not carry out phosphate analysis. We were also been unable to obtain water quality data for some rivers.

Figures 4 to 6 show scattergrams of the abundance status of *P. tenuilineatum* versus Tox N and orthophosphate concentrations (including data from the Wharfe and Mimram). The abundance of *P. tenuilineatum* has been categorised into 4 groups:

- 1 = absent at the water quality sample site but present elsewhere in the river
- 2 = present but <5% of all *Pisidium* individuals
- 3 = 5-15%
- 4 = >15%

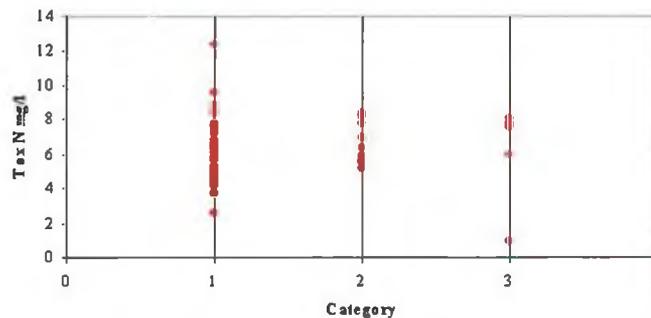


Figure 4: Variation of *P. tenuilineatum* abundance category with Tox N

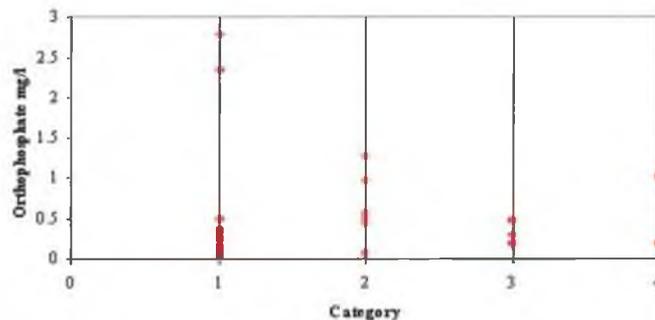


Figure 5: Variation of *P. tenuilineatum* abundance category with orthophosphate

Figures 4 and 5 show that *P. tenuilineatum* inhabits rivers with a very wide range of Tox N and orthophosphate concentrations although there are no clear trends. Tox N values range from 0.9 to 12.35mg/l although the maximum level at a site supporting *P. tenuilineatum* was 8.3mg/l. The majority of the sites with the species were in a Tox N range of 5.2 to 8.3mg/l. Orthophosphate concentrations ranged from 0.05 to 2.79mg/l, with a maximum level of 1.27mg/l at sites supporting *P. tenuilineatum*. There is, however, an indication of a trend whereby the species' abundance increases with a lowering of orthophosphate levels.

Figure 6 shows that in rivers in which *P. tenuilineatum* was living, the BOD (ATU) ranged from 1 (i.e. <1 - the detectable limit) to 2.25mg/l. However, at sites where *P. tenuilineatum* was living, the BOD ranged from <1 to 1.53mg/l. There is no evidence of a trend in the species' abundance within these BOD levels.

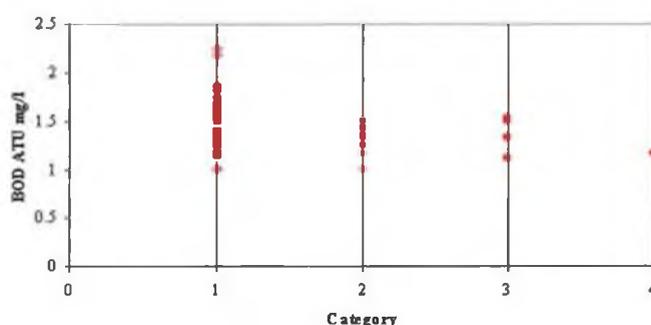


Figure 6: Variation of *P. tenuilineatum* abundance category with BOD

A wide range of conductivity was recorded at sites supporting *P. tenuilineatum* (see Appendix 1). These levels ranged from 381 μ s/cm on the River Lugg, to 738 μ s/cm on the River Thames. There does not appear to be any significant correlation between conductivity and the abundance of *P. tenuilineatum*. The species was not found at sites where conductivity was in the range 227 to 380 μ s/cm, or in the range 744 to 1017 μ s/cm.

Water quality may account for the apparent disappearance of *P. tenuilineatum* from the three rivers in the Midlands: the Ise, Nene and Great Ouse. The most recent data available was from spring and autumn 1995 (Table 8). Although there was considerable variation between individual monitoring sites and between spring and autumn, the water chemistry indicated that concentrations of Tox N, orthophosphate and BOD may all be higher than that tolerated by *P. tenuilineatum*. These are summarised below:

Table 8: Summary of water quality data from Midlands rivers

River	Tox N mg/l Max	Phosphate mg/l Max	BOD mg/l Max
Ise	12.5	1.02	4.13
Nene	12.0	3.45	1.9
Great Ouse	10.2	2.48	2.23

This survey indicates that *P. tenuilineatum* may be tolerant of a wider range of water quality than was previously believed. Maximum concentrations of Tox N and orthophosphate were considerably higher than those found in previous studies on the Rivers Wharfe and Mimram. However, without a more detailed analysis of existing data and additional data from other rivers, it is not possible to establish the relationship between water quality and the presence/absence or abundance of *P. tenuilineatum*. It is possible that interstitial chemistry of the sediment may be an important controlling factor, or that there may be a time lag between the increase in nutrients in a river and the negative effects on this species. If it takes some years before eutrophication from elevated phosphate and nitrate concentrations manifest themselves in a river, the tolerable concentrations of these chemicals may not be as high as they appear to be. Longer-term correlations of water quality and *P. tenuilineatum* population health will be required before the concentrations of river nutrients needed for sustainable populations can be confidently estimated. Similarly, the water quality in some rivers may be significantly better now than several years ago. Such rivers may now have quality of water which can support *P. tenuilineatum* but the species has not colonised or recolonised.

4.7 Repeatability of Method

Figure 7 shows the comparison of each *Pisidium* species % composition at sites sampled in both 2000 and 2001. Three sites were sampled on the River Loddon: at Lilymilt Farm and Loddon Court. The species' composition and their relative abundance were remarkably similar. At Arborfield, *P. supinum* was found in 2001 but not in 2000, and

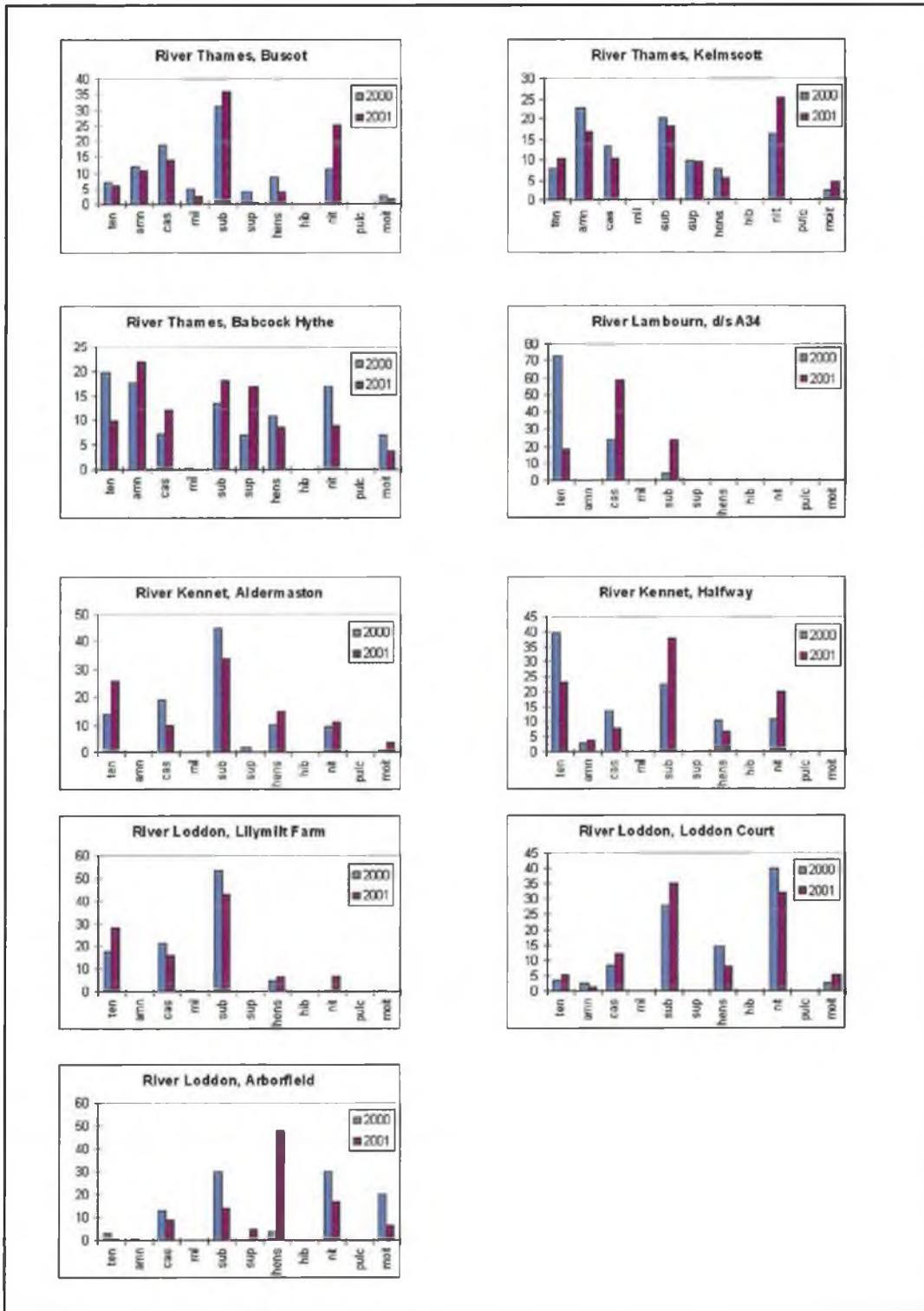


Figure 7: Comparison of each *Pisidium* species % composition at sites sampled in both 2000 and 2001

P. henslowanum occurred in greater abundance. However, these differences are not considered significant. The species' composition and their relative abundance were also very similar in both 2000 and 2001 at the three sample sites on the Thames and the two sites on the Kennet. At the single site on the Lambourn, the species' composition was the same in both years, but there were greater differences in their relative abundance.

The percentage of *P. tenuilineatum* dropped from 72 to 18%, whereas *P. casertanum* increased from 24 to 59%, and *P. subtruncatum* increased from 4 to 23%. On the Dorset Frome (see Section 5.33), the results from Holme Bridge in 2000 compared well with those from 2002. There were, however, greater differences at the Broompond Dairy site. *P. amnicum*, *P. tenuilineatum*, *P. milium* and *P. henslowanum* were all recorded in 2000 but not in 2001.

Overall, it is considered that the sampling method used for this survey gives results on the species' composition and relative abundance that is representative of the site. The results are likely to be more representative if an adequate-sized sample is collected (e.g. 200-500 specimens). Repeatability from year to year will, to some extent, depend upon the river dynamics, the stability of the sampling site and flood events. The sites with the greatest similarity between years supported the most stable environment, e.g. Buscot and Kelmscott on the Thames, and Lilymilt Farm on the Loddon which were sampled in shallow marginal bays. A site with less similar results between years such as that on the River Lambourn was at the margin of a fast-flowing, relatively straight section. On the River Frome, there were major flooding events between the two sampling episodes, and at Broompond dairy the habitat had been removed.

5 SUMMARIES OF RESULTS FOR INDIVIDUAL RIVERS

5.1 River Whitewater

5.1.1 General characters of river

Length:	19 km
Source:	Greywell
Confluence:	Joins River Blackwater, east of Riseley
Direction of flow:	South to north
Velocity:	Generally swift throughout, but with sections of moderate flow on the lower end
Geology:	Chalk
Substrate:	Mostly gravels, but the middle to upper section has Chalk cobble and areas of fine mud with chalk granules
Major towns:	None, but flows past the east of Hook
Land use:	Generally low intensity agriculture
Environment Agency	1 - above confluence with Blackwater
Monitoring sites:	

5.1.2 Previous records

Pisidium tenuilineatum was recorded from the Whitewater in 1966 at Bramshill (Conch. Soc.), and again in 1972 from the same 10km square. In 1998 the species was confirmed to still be present in the Whitewater, with individuals recorded at Mattingley and u/s of the Blackwater confluence (Killeen 1998a).

5.1.3 Results

No. of sampling sites	9
No. of sites with <i>Pisidium tenuilineatum</i>	8

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
190	Lodge Farm	SU734524	95	0	0
191	u/s A30	SU740545	146	24	16.4
136	d/s Whitewater Mill	SU737553	257	82	31.9
137	Diple Mill	SU743577	613	519	84.7
138	Mattingley	SU738584	446	95	21.3
139	Holdshott Farm	SU739602	631	3	0.48
135	Heckfield	SU738613	178	4	2.25
140	Riseley Mill	SU738623	74	1	1.35
141	u/s Blackwater	SU741634	286	1	0.35

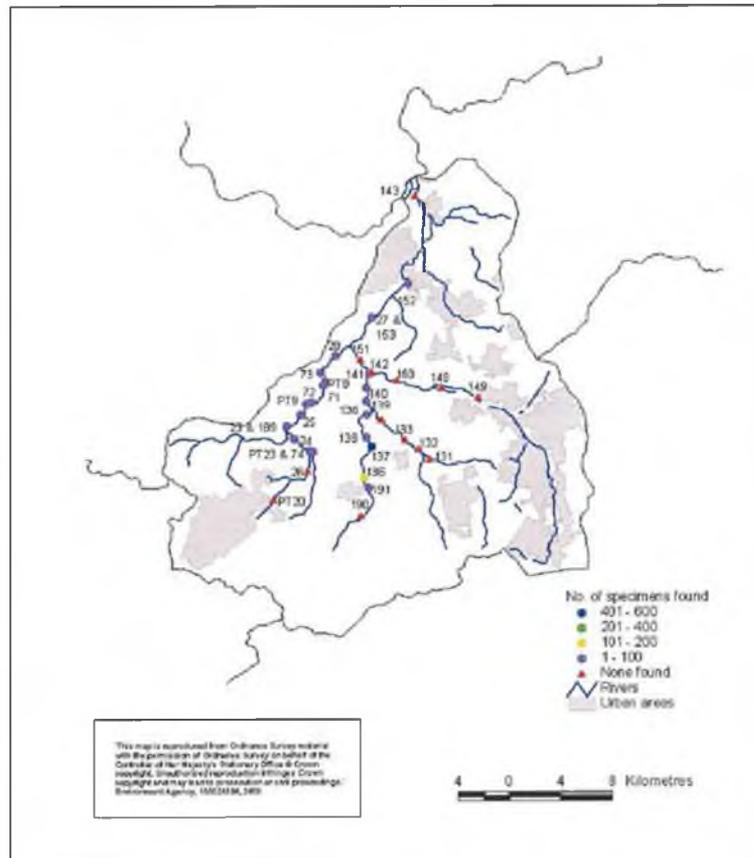


Figure 8: Sample locations in the R. Loddon catchment

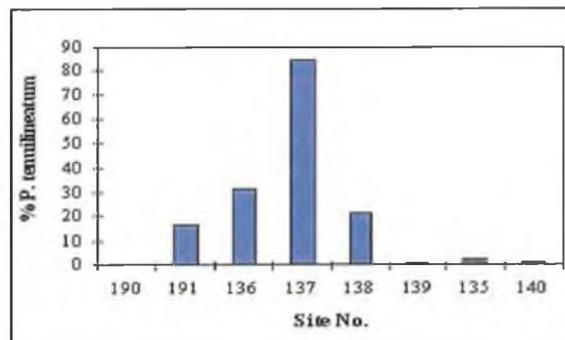


Figure 9: R. Whitewater – distribution and abundance of *P. tenuilineatum*

5.1.4 Water quality

Conductivity at sample sites: Range 549 to 602 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
above Blackwater	SU741634	15/01/98 to 09/12/02	58	1.43	n/a	0.047	0.559

5.1.5 Comments

The River Whitewater supports a very good population of *Pisidium tenuilineatum*. It was present at every site from upstream of the A30 roadbridge to the Blackwater confluence. The highest densities were found in the middle to upper sections, and at Diple, the species comprised 84.7% of all *Pisidium* specimens collected. This was the highest recorded at any site during this survey. Downstream of Mattingley the density of *P. tenuilineatum* dropped to <2.5% of all individuals.

Nine other species of *Pisidium* were recorded in the Whitewater (Figure 10). *P. casertanum* and *P. subtruncatum* were the common associates at the sites where *P. tenuilineatum* was most abundant. *P. milium* was present only in the two upstream sites. *P. amnicum* occurred in very low numbers throughout, whereas *P. hibernicum* was present in very low numbers only in the downstream sites. *P. henslowanum*, *P. supinum* and *P. moitessierianum* all occurred in the downstream sites, and increased in abundance as the river became larger and more slow-flowing. *P. nitidum* was present throughout, but was rare or absent at the sites supporting the highest numbers of *P. tenuilineatum*.

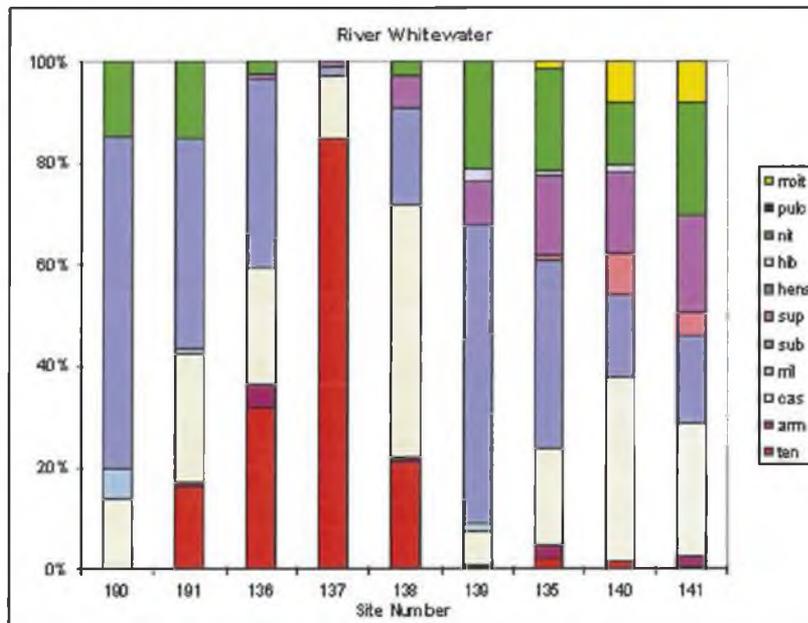


Figure 10: R. Whitewater – *Pisidium* species abundance at each site

5.2 River Hart

5.2.1 General characters of river

Length:	21 km
Source:	Farnborough
Confluence:	Joins the River Whitewater SW of Bramshill.
Direction of flow:	East/west to Elvetham, then northwest to confluence
Velocity:	Generally swift throughout its length
Geology:	Tertiary sands (Bagshot Beds).
Substrate:	Mostly sand and gravel
Major towns:	Farnborough at source, Fleet and Hartley Witney to south.
Land use:	Low intensity agriculture and forestry.
Environment Agency	1 - Lea Bridge, Hazely.
Monitoring sites:	

5.2.2 Previous records

Pisidium tenuilineatum had not been recorded from the Hart.

5.2.3 Results

No. of sampling sites	4
No. of sites with <i>Pisidium tenuilineatum</i>	0

See Figure 8 for location of sample sites. See Appendix 2 for results.

5.2.4 Water quality

Recorded conductivity at sample sites: Range 588 to 600 μ s/cm

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Lea Bridge, Hazely	SU748599	15/01/98 to 09/12/02	62	1.67	n/a	0.084	0.992

5.2.5 Comments

As the Hart rises on heathland soils it may be insufficiently calcareous to support *P. tenuilineatum*. Past and present water quality may also be a restricting factor.

Only six species of *Pisidium* were recorded with the percentage composition dominated by *P. casertanum*, *P. subtruncatum* and *P. nitidum* (Figure 11). *P. milium* and *P. henslowanum* occurred at 2 sites but in an abundance of <5% of all individuals. *P. hibernicum* comprised 10.1% of all individuals at the most downstream site.

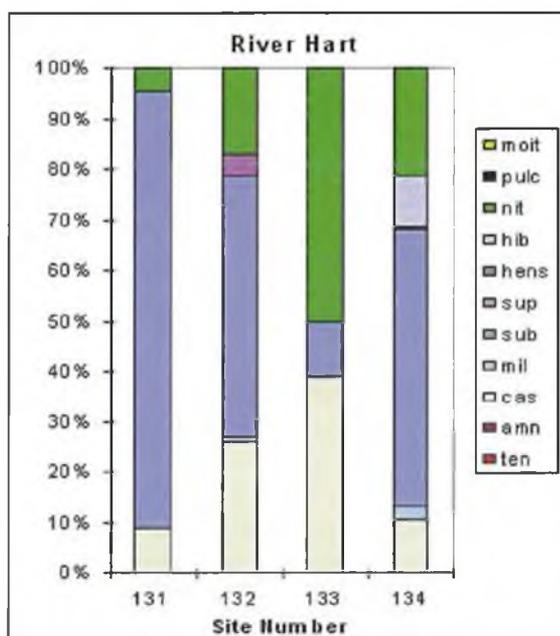


Figure 11: R. Hart – *Pisidium* species abundance at each site

5.3 River Blackwater

5.3.1 General characters of river

Length:	c. 36 km
Source:	Farnborough
Confluence:	Joins the River Loddon north of Swallowfield.
Direction of flow:	North-westerly
Velocity:	Mostly swift to moderate. Slow at downstream end.
Geology:	Tertiary sands
Substrate:	Sand and gravel in upper sections, clay towards lower end.
Major towns:	Farnborough, Camberley, Sandhurst and satellites
Land use:	Urban, gravel extraction, fish farms. Low intensity agriculture at downstream end.
Environment Agency Monitoring sites:	1 - gauging station at Swallowfield.

5.3.2 Previous records

Pisidium tenuilineatum had not been recorded from the Blackwater.

5.3.3 Results

No. of sampling sites	5
No. of sites with <i>Pisidium tenuilineatum</i>	0

See Figure 8 for location of sample sites. See Appendix 2 for results.

5.3.4 Water quality

Recorded conductivity at sample sites: Range 696 to 744 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Gauging stn, Swallowfield	SU729651	15/01/98 to 09/12/02	56	2.24	5.78	0.078	0.987

5.3.5 Comments

The absence of *P. tenuilineatum* is surprising in light of the species' presence in the Whitewater with which it is confluent, and also in the Loddon downstream of the Blackwater confluence. However, as with the Hart, it may be insufficiently calcareous. Chemical data shows relatively high levels of phosphate and nitrite, suggesting that the water has been, or is at present, of too low a quality.

The Blackwater supported 9 species of *Pisidium* of which *P. casertanum* and *P. subtruncatum* were dominant (Figure 12). *P. nitidum* occurred at levels between 5 and 22% of all individuals. Other species were generally uncommon and irregularly distributed. *P. moitessierianum* and *P. supinum* were found only at the furthest downstream site.

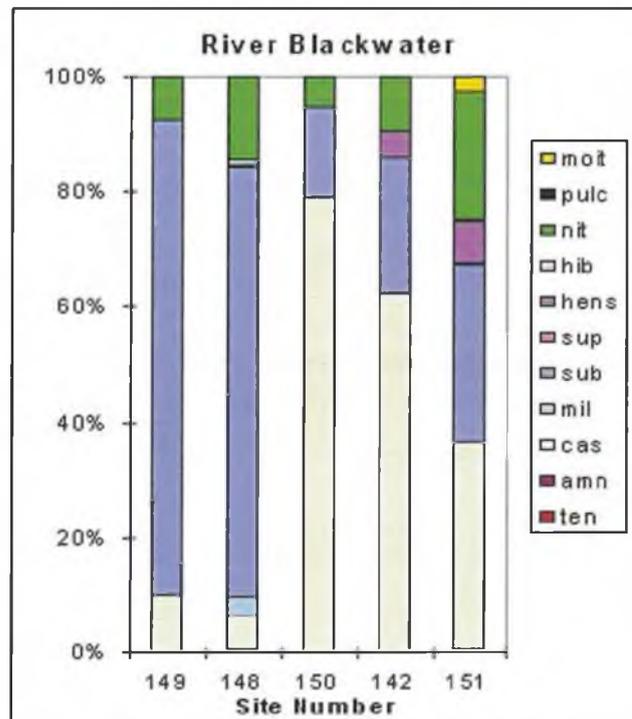


Figure 12: R. Blackwater – *Pisidium* species abundance at each site

5.4 River Loddon

5.4.1 General characters of river

Length:	45 km
Source:	Basingstoke
Confluence:	Joins the Thames at Wargrave.
Direction of flow:	Southwest to northeast.
Velocity:	Generally swift as far as Swallowfield, then it becomes more slow-flowing
Geology:	Chalk
Substrate:	Gravels and marginal calcareous ooze above Swallowfield, then clays and sands downstream
Major towns:	Basingstoke at source, greater Reading on lower end. Very few villages in between.
Land use:	Mixed agriculture to Arborfield, then urban and industrial
Environment Agency	4 - Wildmoor, Sherfield, u/s Blackwater, Arborfield.
Monitoring sites:	

5.4.2 Previous records

Pisidium tenuilineatum had been recorded at two sites on the Loddon, at Stratfield Saye Park in 1966 and at Loddon Court in 1972 (Conch. Soc.). In 1998 the species was confirmed to still be present in the Loddon, with individuals recorded at Lilymilt Farm, Stratfield Saye and Stanford End (Killeen 1998a). At these sites the species occurred in relatively high abundance, ranging from 11 to 23% of all *Pisidium* individuals.

5.4.3 Results

No. of sampling sites	14
No. of sites with <i>Pisidium tenuilineatum</i>	12

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
PT20	Pyott's Hill	SU667537	104	0	0
26	Wildmoor Farm	SU693558	92	0	0
PT23	Mill Farm, Hartley Wespay	SU697573	107	4	3.74
24	Sherfield Loddon A33	SU683583	86	26	30.2
23	Lilymilt Farm	SU677593	208	37	17.8
25	Stratfield Turgis	SU688602	38	9	23.7
PT9	Stratfield Saye	SU692611	139	32	23
72	Stratfield Saye Park	SU696612	77	4	5.33
71	Stratfield Saye Park	SU705625	134	11	8.21
PT8	Stanford End	SU707628	102	18	17.6
73	d/s Stanford End	SU703635	186	11	5.91
28	Loddon Court	SU715648	164	6	3.66
27	Arborfield	SU743677	268	8	2.99
152	Sindlesham	SU771703	891	10	1.12

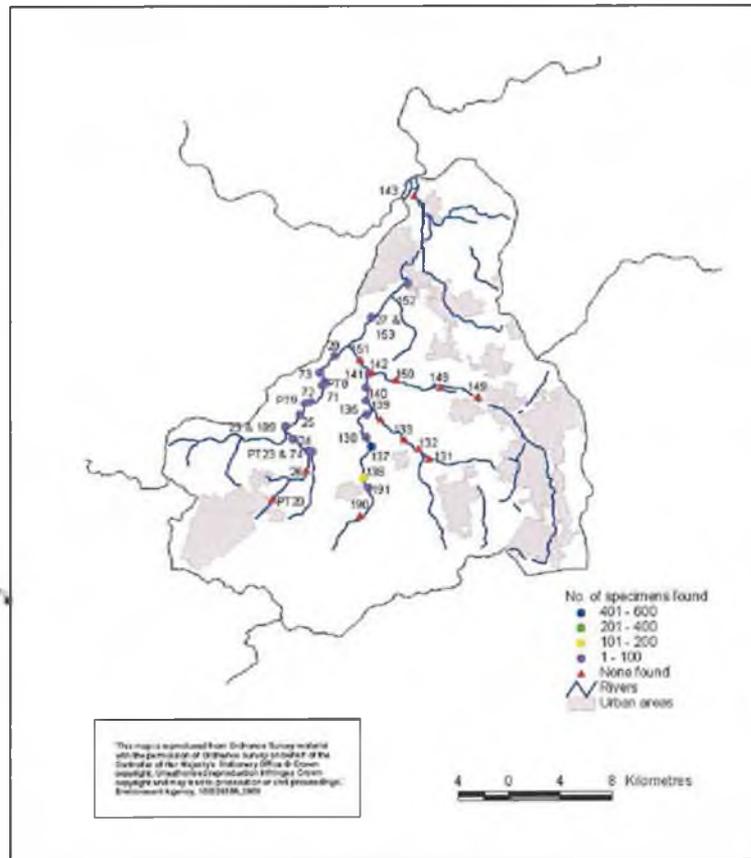


Figure 13: Sample locations in the R. Loddon catchment

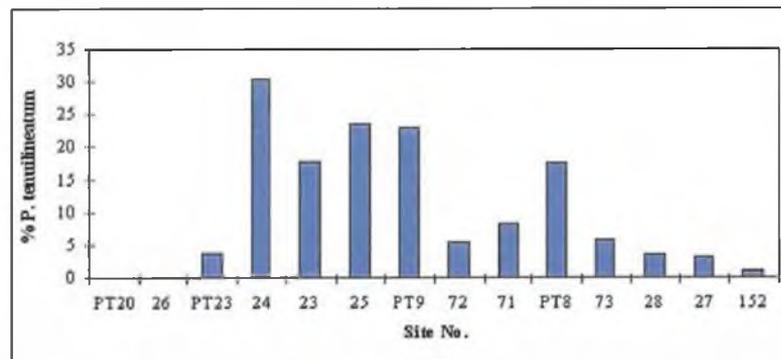


Figure 14: R. Loddon – distribution and abundance of *P. tenuilineatum* (excluding repeated sample sites)

5.4.4 Water quality

Recorded conductivity at sample sites: Range 666 to 722 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Wildmoor	SU68710 55280	07/01/99 to 30/11/00	24	1.18	8.41	0.046	2.35
Long Bridge, Sherfield	SU69560 54240	07/01/99 to 30/11/00	24	1.16	6.8	0.042	1.02
u/s Blackwater, King's Br	SU71510 64740	20/01/99 to 28/11/00	24	1.33	6.4	0.051	0.97
Arborfield Bridge	SU74370 67780	21/01/99 to 22/11/00	25	1.37	6.01	0.046	1.27

5.4.5 Comments

The Loddon supports a very good population of *P. tenuilineatum*. It was found at all sites from Hartley Wespay to Sindlesham. The greatest numbers were found in the upper section between Sherfield Loddon and Stratfield Saye, where the species comprised 18-30% of all *Pisidium* individuals. From Stanford End to Sindlesham, the abundance decreased gradually from 5.9% to 1.1%.

Eight other species of *Pisidium* were found in the Loddon (Figure 15). *P. subtruncatum* was the most abundant species throughout, generally comprising over 30% of the *Pisidium* individuals. *P. nitidum* occurred virtually throughout, but was most frequent in the upper and lower sections. In the middle section where *P. tenuilineatum* was most abundant, *P. nitidum* was rather uncommon or even absent. *P. milium* occurred only at the upstream end and *P. supinum* only at the furthest downstream site. From Stratfield Saye downstream the *Pisidium* species composition was much the same although there were no significant trends in individual species' abundance.

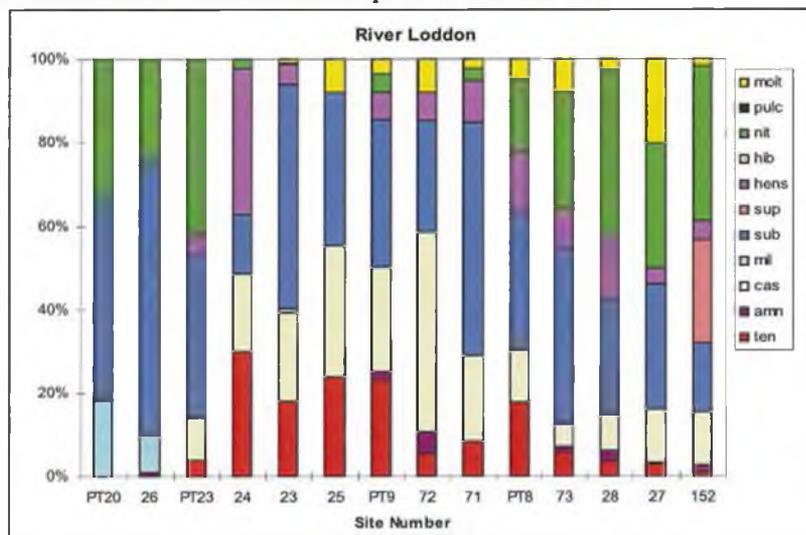


Figure 15: R. Loddon – *Pisidium* species abundance at each site (excluding repeated sample sites)

5.5 River Lyde

5.5.1 General characters of river

Length:	5.5 km
Source:	Mapledurwell
Confluence:	Joins the River Loddon 1km SW of Hartley Wespay
Direction of flow:	South to north
Velocity:	Swift to moderate
Geology:	Chalk
Substrate:	Gravels but with extensive areas of muddy, calcareous ooze
Major towns:	None
Land use:	Low intensity agriculture
Environment Agency	1 - Hartley Wespay
Monitoring sites:	

5.5.2 Previous records

Pisidium tenuilineatum had not been recorded from the Lyde.

5.5.3 Results

No. of sampling sites	1
No. of sites with <i>Pisidium tenuilineatum</i>	1

See Figure 13 for location of sample site

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
74	Hartley Wespay	SU695574	166	7	4.22

5.5.4 Water quality

Recorded conductivity at sample sites: 589 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Deanland Farm	SU6956 5424	07/01/99 to 06/12/00	25	1.26	5.21	0.05	0.05

5.5.5 Comments

P. tenuilineatum was present at the only sampling site, where it comprised 4.2% of all *Pisidium* individuals.

Five other *Pisidium* species were recorded of which *P. subtruncatum* (48% of individuals), and *P. casertaunum* (24.7%) were the most abundant.

5.6 River Kennet

5.6.1 General characters of river

Length:	98 km
Source:	Avebury
Confluence:	Joins River Thames at Reading.
Direction of flow:	West to east
Velocity:	Generally swift as far as Newbury, then moderate
Geology:	Chalk and alluvial floodplain
Substrate:	Gravels and marginal calcareous ooze above Newbury, then clays and sands downstream
Major towns:	Marlborough, Hungerford, Newbury, Thatcham,
Land use:	Low to moderate-intensity agriculture to Theale, then urban and industrial
Environment Agency	None for chemistry
Monitoring sites:	

The Kennet system comprises a complex network of channels and in places is linked into the Kennet and Avon Canal. At Theale, the flowing section is named Holy Brook.

5.6.2 Previous records

Pisidium tenuilineatum had been previously recorded from the Kennet at Ufton Bridge (Conch. Soc.) in 1972. There are also additional records from the Kennet and Avon Canal between Woolhampton and Theale between 1966 and 1972 (Conch. Soc.). A more recent survey (Killeen 1998a) revealed that *P. tenuilineatum* was still present in the river at Ufton Bridge in 1998, although only one live individual was collected. In 1999, a few live individuals were collected in the Kennet at Speen (IJK pers. obs.).

5.6.3 Results

No. of sampling sites	19
No. of sites with <i>Pisidium tenuilineatum</i>	12

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
1	Axford	SU234698	361	0	0
2	Ramsbury	SU272713	349	0	0
3	Chilton Foliat	SU314705	243	0	0
4	Leverton	SU333698	691	0	0
17	Denford	SU353683	350	0	0
18	ds Denford	SU358683	396	0	0
5A	Kintbury – u/s bridge	SU439669	235	5	2.13
5B	Kintbury – d/s bridge	SU445667	312	146	46.8
5C	Kintbury - small leat	SU452670	103	17	16.5
6	Halfway	SU406679	442	175	39.6
77	Sutton Estate	SU439669	136	1	0.74
76	Sutton Estate	SU445667	70	2	2.86

Results continued...

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
75	Sutton Estate	SU452670	119	16	13.4
19	Chamberhouse Farm	SU520656	156	14	8.97
20	Brimpton	SU556658	196	2	1.02
21	Aldermaston	SU595662	527	72	13.7
22	Ufton Bridge	SU617685	74	55	74.3
184	Theale (Holy Brook)	SU645706	542	12	2.21
185	Southcote (Holy Brook)	SU684714	126	0	0

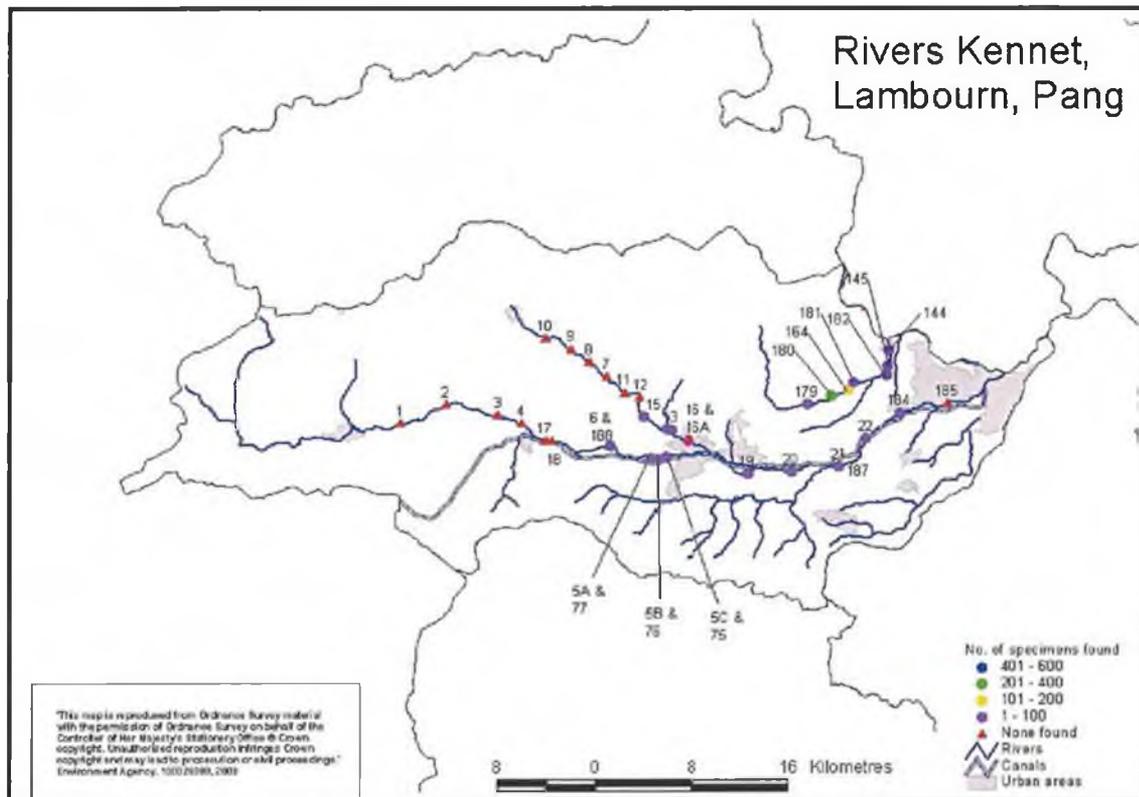


Figure 16: Sample locations in the R. Kennet catchment

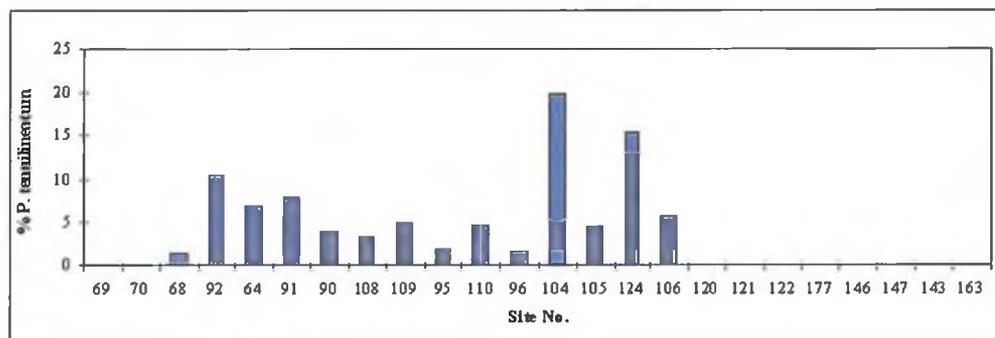


Figure 17: R. Kennet – distribution and abundance of *P. tenuilineatum* (excluding repeated sample sites)

5.6.4 Water quality

Recorded conductivity at sample sites: Range 566 to 654 $\mu\text{s}/\text{cm}$

There was not any Environment Agency chemical water quality available.

5.6.5 Comments

The River Kennet system supports a good population of *P. tenuilineatum*, which was found at 11 of the 17 sites on the main river, and at one of the two sites on Holy Brook. It could not be found at the sites upstream of Kintbury in spite of the abundance of apparently suitable habitat, but was present at every site downstream. The species' abundance varied considerably throughout the length of the river. From Kintbury through to Halfway (c. 3km) it occurred in abundances ranging from 17 to 47% of all *Pisidium* individuals. From Halfway through to Aldermaston (c. 20 km) it ranged in abundance from 0.7 to 13.7%, but at Ufton Bridge, a further 2 km downstream it was the dominant *Pisidium* species, comprising 74% of all individuals.

Ten other species of *Pisidium* were found in the Kennet (Figure 18). There are considerable differences in the species' distribution, composition and abundance throughout the system. Upstream of Kintbury the samples were dominated by *P. nitidum* whereas at the sites where *P. tenuilineatum* was most abundant, *P. nitidum* was either rare or absent. *P. pulchellum* was present only in two sites upstream of Kintbury whereas *P. hibernicum* was present only at 3 sites in the middle to lower section. *P. supinum* and *P. moitessierianum* first appeared upstream of Newbury but were sporadic in occurrence and generally present in low abundance. *P. casertanum* was present in moderate numbers in most samples downstream of Kintbury, but was largely absent upstream. *P. subtruncatum* and *P. henslowianum* were present more or less throughout.

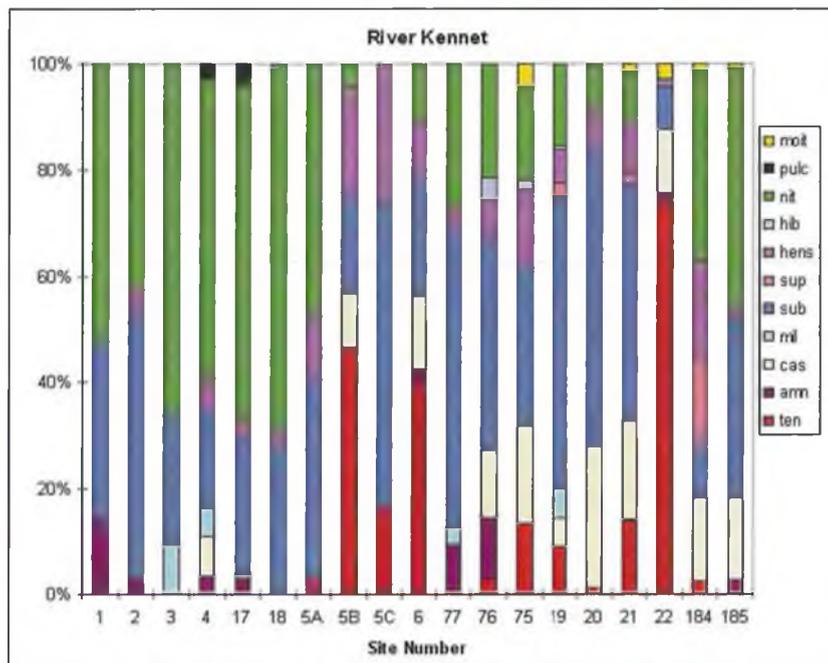


Figure 18: R. Kennet – *Pisidium* species abundance at each site (excluding repeated sample sites)

5.7 River Lambourn

5.7.1 General characters of river

Length:	26 km
Source:	Lambourn
Confluence:	Joins the River Kennet at Newbury
Direction of flow:	Northwest to southeast
Velocity:	Mostly swift throughout
Geology:	Chalk
Substrate:	Mostly gravels with areas of fine calcareous ooze
Major towns:	None until Donnington/Newbury, c. 23 km from source
Land use:	Low intensity agriculture
Environment Agency	None for water chemistry
Monitoring sites:	

5.7.2 Previous records

Pisidium tenuilineatum was not recorded in the Lambourn until 1998 when a few individuals were found at Bagnor (UK pers. obs.).

5.7.3 Results

No. of sampling sites	11
No. of sites with <i>Pisidium tenuilineatum</i>	4

See Figure 16 for location of sample sites

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
10	Eastbury	SU353768	15	0	0
9	Maidencourt Farm	SU374759	47	0	0
8	East Shefford	SU389748	623	0	0
7	Weston	SU403736	684	0	0
11	Easton	SU418723	418	0	0
12	Boxford	SU430719	151	0	0
15	Hunts Green	SU433703	194	4	2.06
13	Bagnor Bridge	SU453693	69	27	39.1
14	Bagnor d/s A34	SU456692	138	100	72.5
16	Shaw	SU470683	31	26	83.9
16A	Shaw -stream leat	SU472684	0	0	0

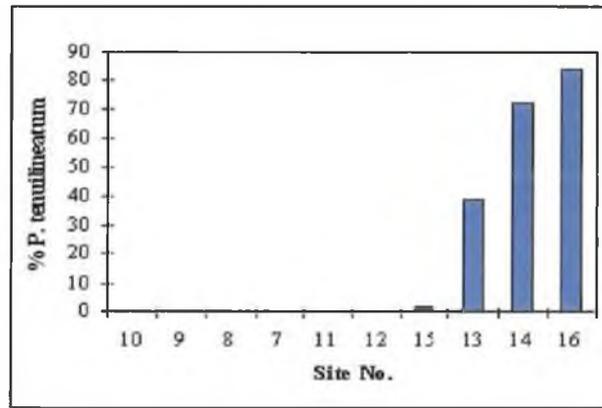


Figure 19: R. Lambourn – distribution and abundance of *P. tenuilineatum* (excluding repeated sample sites)

5.7.4 Water quality

Conductivity at sample sites: Range 532 to 560 $\mu\text{s}/\text{cm}$

There was not any Environment Agency chemical water quality available.

5.7.5 Comments

P. tenuilineatum was found only in the lower Lambourn. It was not found upstream of Hunt's Green (c. 19 km from source). From Hunt's Green, the species increased rapidly in abundance, becoming the dominant *Pisidium* species (39-84% of all individuals). The overall *Pisidium* species composition and abundance also changes considerably from source to confluence. The upper sites are dominated by *P. personatum* suggesting rather ephemeral conditions. Over 90% of the individual *Pisidium* in the middle and upper sections comprise *P. nitidum* and *P. subtruncatum*, with *P. milium* as the minor component (Figure 20). At the downstream sites dominated by *P. tenuilineatum*, the commonest associate is *P. casertanum*, with the other species being minor components or absent. *P. amnicum* is surprisingly absent from the Lambourn.

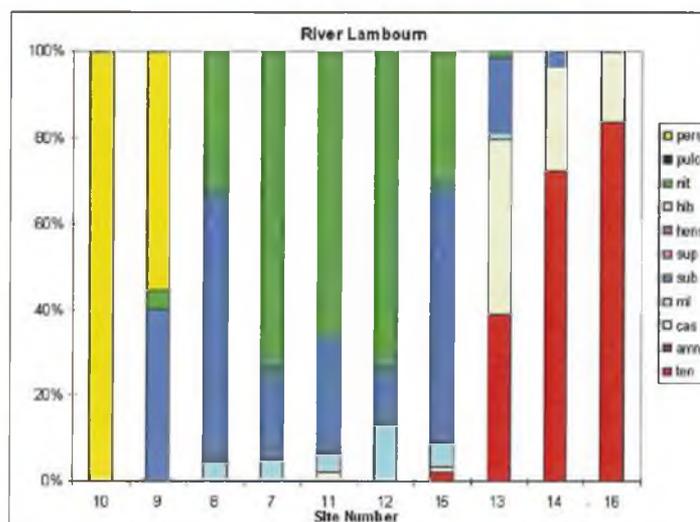


Figure 20: R. Lambourn – *Pisidium* species abundance at each site (excluding repeated sample sites)

5.8 River Windrush

5.8.1 General characters of river

Length:	c. 73 km
Source:	Gutting Power
Confluence:	Joins the River Thames at Newbridge, 3 km S of Standlake
Direction of flow:	Northwest to southeast
Velocity:	Mostly swift to moderate
Geology:	Jurassic limestone
Substrate:	Sand, gravel, limestone grit, occasional muddy ooze
Major towns:	Bourton-on-the-water, Burford, Witney
Land use:	Moderate to high intensity agriculture above Witney; urban, gravel extraction, industrial below Witney.
Environment Agency	1- Beard Mill
Monitoring sites:	

Downstream of Witney the river is split into two parallel channels.

5.8.2 Previous records

Pisidium tenuilineatum had not been recorded from the Windrush.

5.8.3 Results

No. of sampling sites	13
No. of sites with <i>Pisidium tenuilineatum</i>	7

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
56	Bourton on the Water	SP172201	199	0	0
57	New Bridge, Gt Rissington	SP179177	240	6	2.5
58	Little Barrington	SP206131	278	1	0.36
59	u/s Burford	SP238127	173	4	2.31
60	Swinbrook	SP282118	350	5	1.43
33	Cot Farm, Minster Lovell	SP314117	170	3	1.76
60A	Crawley	SP341118	101	1	0.99
32	u/s Witney	SP348107	406	11	2.71
31	d/s Ducklington (W channel)	SP368070	261	0	0
60B	Ducklington (E channel)	SP364079	166	0	0
30	NE of Hardwick (E channel)	SP389063	389	0	0
60C	Standlake (W channel)	SP398036	112	0	0
29	Standlake d/s Mill	SP405027	133	0	0

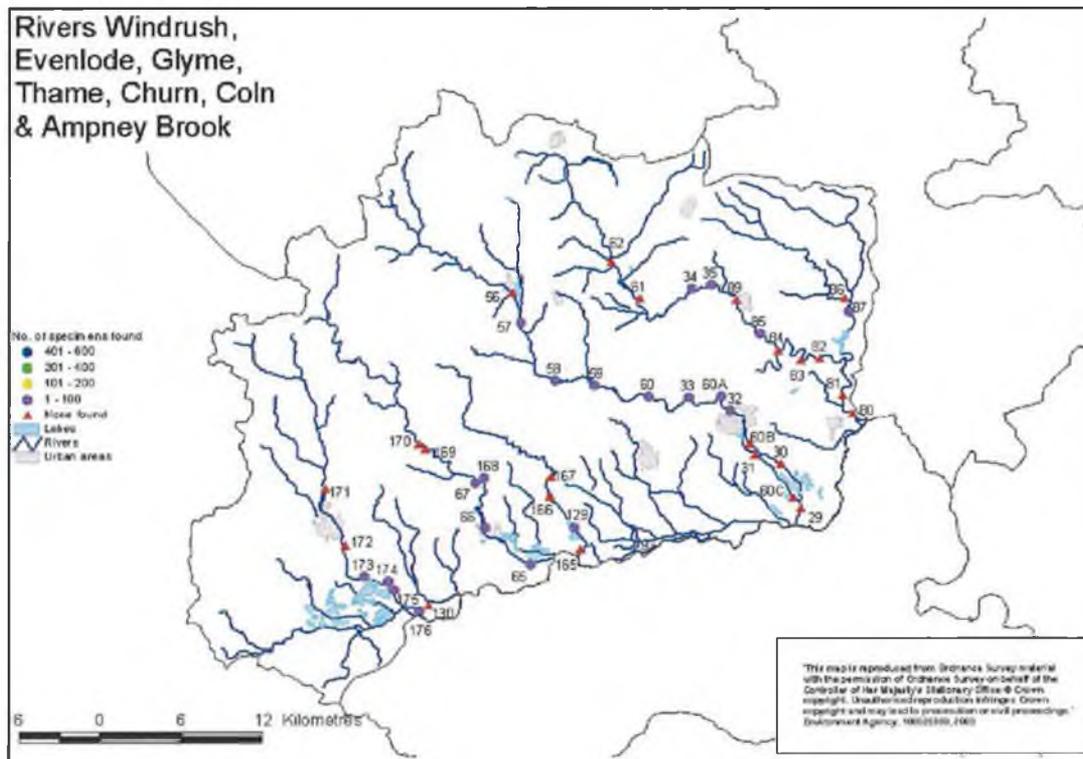


Figure 21: Sample locations in the western Thames catchment

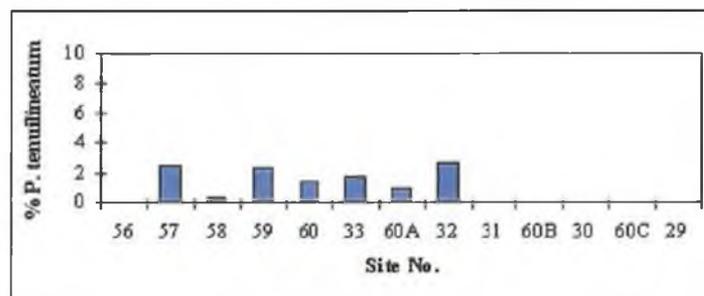


Figure 22: R. Windrush – distribution and abundance of *P. tenuilineatum*

5.8.4 Water quality

Recorded conductivity at sample sites: Range 549 to 602 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Beard Mill	SP39699 05521	01/1990 to 12/2002	120	1.09	7.67	n/a	0.043

5.8.5 Comments

P. tenuilineatum was found in the Windrush at every sample site between Great Rissington and just upstream of Witney. However, it was present only in low numbers, less than 2.7% of all individuals.

Seven other *Pisidium* species were recorded from the Windrush. There are some changes in species' composition and abundance from upstream to downstream (Figure 23). *P. subtruncatum* was the most abundant species throughout, usually comprising 40-60% of all individuals. *P. casertanum* was present in all (except the most upstream) sites but was more abundant upstream of Witney. *P. nitidum* occurred at every site, whereas *P. milium* and *P. hibernicum* were sporadic. *P. henslowianum* gradually increased in abundance downstream. As with *P. tenuilineatum*, there were no records of *P. amnicum* downstream of Witney.

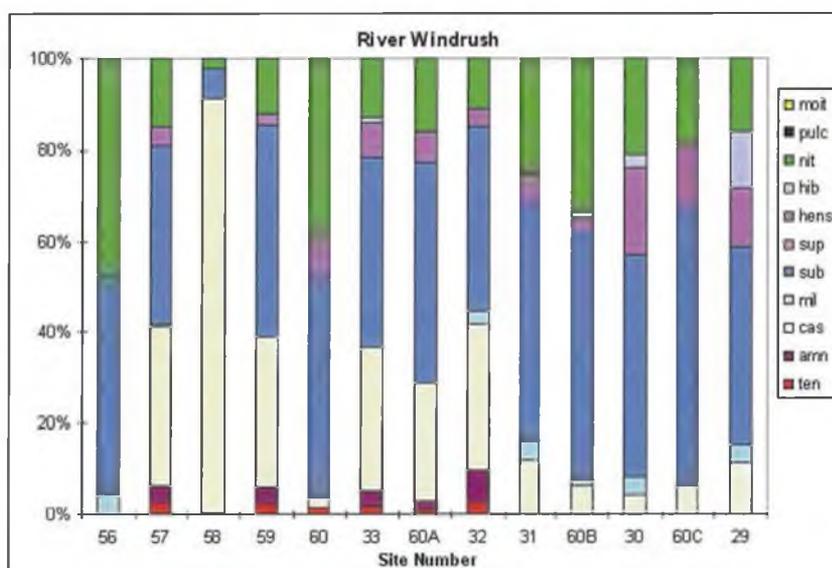


Figure 23: R. Windrush – *Pisidium* species abundance at each site

5.9 River Evenlode

5.9.1 General characters of river

Length:	46 km
Source:	Upstream of Evenlode
Confluence:	Joins the Thames downstream of Cassington
Direction of flow:	Northwest to southeast
Velocity:	Generally moderate to swift as far as Long Hanborough, then slower down to the confluence.
Geology:	Jurassic limestone
Substrate:	Mostly sands and clay
Major towns:	Shipton under Wychwood, Charlbury
Land use:	The river lies in a relatively steep sided valley to Long Hanborough in a relatively high intensity agricultural landscape.
Environment Agency Monitoring sites:	3 - Shipton under Wychwood, Below Ashford Br, B4449, Cassington

5.9.2 Previous records

Pisidium tenuilineatum had been recorded previously at on site on the Evenlode, at Chadlington in 1969 (Conch. Soc.). A single live individual was found at the same site in 1998 and dead valves were found at Finstock (Killeen 1998a).

5.9.3 Results

No. of sampling sites	11
No. of sites with <i>Pisidium tenuilineatum</i>	3

See Figure 21 for location of sample sites

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
62	Bledington	SP252226	124	0	0
61	Lyneham	SP275196	293	0	0
34	Chilson	SP316204	22	3	13.6
35	Chadlington	SP333207	189	8	4.23
89	Charlbury	SP353195	126	0	0
85	Fawler	SP372168	272	1	0.37
84	Ashford Mill Farm	SP386155	176	0	0
83	S of Combe	SP405147	197	0	0
82	Combe Station	SP420148	141	0	0
81	Purwell Farm	SP438119	276	0	0
80	Cassington	SP446104	173	0	0

5.10 River Glyme

5.10.1 General characters of river

Length:	c. 28 km
Source:	Heythrop
Confluence:	Joins the Evenlode at Bladon
Direction of flow:	North to south
Velocity:	Generally swift to Woodstock, then runs into lakes in Woodstock Park
Geology:	Jurassic limestone
Substrate:	Gravel and sand
Major towns:	Woodstock
Land use:	Moderate to high intensity agriculture
Environment Agency	1 - Wooton
Monitoring sites:	

5.10.2 Previous records

Pisidium tenuilineatum had not been recorded from the Glyme.

5.10.3 Results

No. of sampling sites	2
No. of sites with <i>Pisidium tenuilineatum</i>	1

See Figure 21 for location of sample sites

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
86	Wooton	SP440196	100	0	0
87	Stratford Bridge	SP443186	215	1	0.46

5.10.4 Water quality

Recorded conductivity at sample sites: Range 549 to 602 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Wooton	SP43900 19600	18/01/99 to 22/11/00	25	<1	10.96	0.032	0.045

5.10.5 Comments

A single specimen of *P. tenuilineatum* was recorded in the Glyme downstream of Stratford Bridge. Four other species of *Pisidium* were recorded at Wooton, with *P. nitidum* and *P. subtruncatum* comprising 94% of all individuals. The fauna was more diverse at Stratford Bridge with 6 other species recorded, although *P. nitidum* and *P. subtruncatum* were still dominant (76%).

5.11 River Coln

5.11.1 General characters of river

Length:	52 km
Source:	Near Brockhampton, east of Cheltenham
Confluence:	Joins the River Thames 1km SW of Lechlade
Direction of flow:	northwest to southeast
Velocity:	Generally swift throughout its length
Geology:	Jurassic limestone
Substrate:	Graevls, limestone chippings, some patches of calcareous ooze
Major towns:	Fairford (c. 45 km from source)
Land use:	Generally rural agricultural. Most of river is managed for angling interest.
Environment Agency	2 - Whelford, Roundhouse at Lechlade.
Monitoring sites:	

5.11.2 Previous records

Pisidium tenuilineatum had not been recorded from the Coln.

5.11.3 Results

No. of sampling sites	7
No. of sites with <i>Pisidium tenuilineatum</i>	5

See Figure 21 for location of sample sites

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
170	d/s Winsop	SP097079	29	0	0
169	Ablington	SP103075	35	0	0
67	Quenington	SP143048	250	39	15.6
168	Hathrop	SP150052	255	14	5.49
66	Fairford	SP151012	199	1	0.5
65	Dudgrove	SU187983	161	27	16.8
93	u/s confluence with Thames	SU283988	136	4	2.94

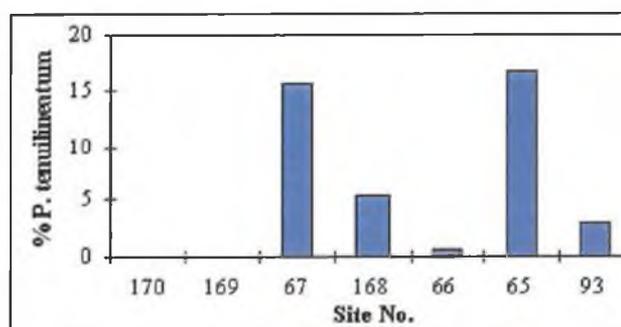


Figure 26: R. Coln – distribution and abundance of *P. tenuilineatum*

5.11.4 Water quality

Recorded conductivity at sample sites: Range 588 to 678 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Roadbridge, Whelford	SU1713 9920	07/01/99 to 22/11/00	23	<1	8.8	n/a	0.08
Roundhouse, Lechlade	SU2040 9880	07/01/99 to 22/11/00	24	1.17	8.19	0.026	0.076

5.11.5 Comments

P. tenuilineatum was present at all five sample stations from Quenington to the confluence with the Thames. There is no pattern of abundance in relation to distance from source, at the sites at Quenington and Dudgrove, *P. tenuilineatum* comprised 15.6 and 16.8% of all individual *Pisidium* respectively, whereas intermediate sites comprised 5.5 and 0.5% of individuals.

The Coln supported seven other species of *Pisidium* of which *P. subtruncatum* and *P. nitidum* occurred throughout and were the most abundant (Figure 27). *P. casertanum* and *P. milium* were both sporadic in distribution and were generally infrequent. *P. henslowianum* was frequent only at the site nearest the Thames confluence, and *P. moitessierianum* was found only at that site.

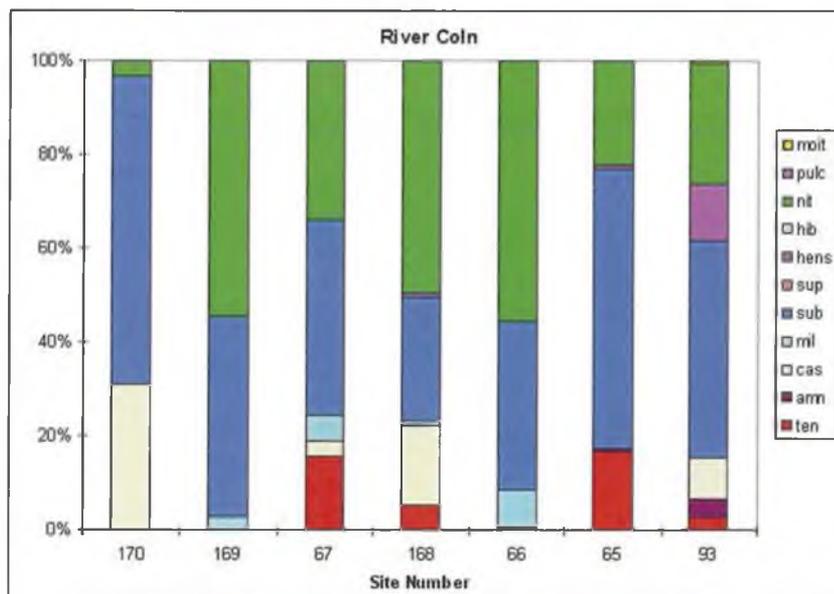


Figure 27: R. Coln – *Pisidium* species abundance at each site

5.12 River Thames

5.12.1 General characters of river

Length:	242 km to Teddington
Source:	Thames Head, west of Cirencester
Confluence:	Thames estuary
Direction of flow:	Broadly west to east
Velocity:	Swift to moderate as far as Lechlade, then slow
Geology:	Limestone Chalk, gravels, alluvial floodplain
Substrate:	Mostly mud and clay
Major towns:	Oxford, Abingdon, Reading
Land use:	Moderate to high intensity agriculture, urban, leisure
Environment Agency	2 - Castle Eaton, Godstow
Monitoring sites:	

5.12.2 Previous records

There are remarkably few records of *Pisidium tenuilineatum* from the Thames. It was recorded from Culham downstream of Abingdon in 1969 (Conch. Soc.) but it could not be found there in (or at Clifton Hampden) in 1998 (Killeen 1998a). The results from a different survey in 1998 yielded five specimens from 26 samples taken between Abingdon and Dorchester (Killeen 1998b). A specimen was also identified from an Environment Agency sample taken at Buscot in 1999 (Killeen pers. obs.).

5.12.3 Results

No. of sampling sites	24
No. of sites with <i>Pisidium tenuilineatum</i>	14

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
69	Cricklade	SU094943	379	0	0
70	Castle Eaton	SU146960	283	0	0
68	Hannington Bridge	SU173961	156	2	1.27
92	us Lechlade	SU206989	604	63	10.4
64	us Buscot	SU225984	847	58	6.85
91	Kelmscott	SU254987	759	60	7.91
90	SW of Radcot Bridge Farm	SU273993	469	19	4.05
108	Radcot Bridge	SU284993	555	19	3.43
109	d/s Radcot Lock	SP301001	419	21	5.02
95	Tadpole Bridge	SP332003	395	8	2.03
110	Shifford Lock	SP372013	402	19	4.75
96	Newbridge	SP403014	355	6	1.69
104	Babcock Hythe	SP436040	561	111	19.8
105	us Swinford Toll Bridge	SP440080	423	19	4.49
124	Evenlode confluence	SP457097	170	26	15.3
106	u/s Godstow	SP481096	585	34	5.81
120	Lower Radley	SU538991	311	0	0

Results continued....

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
121	Clifton Hampden	SU549956	570	0	0
122	Shillingford	SU593923	834	0	0
177	White Cross	SU606877	278	0	0
146	South Stoke	SU593837	386	0	0
147	Gatehampton	SU617794	500	0	0
143	Mapledurham	SU776771	578	0	0
163	Culham	SU512965	127	0	0

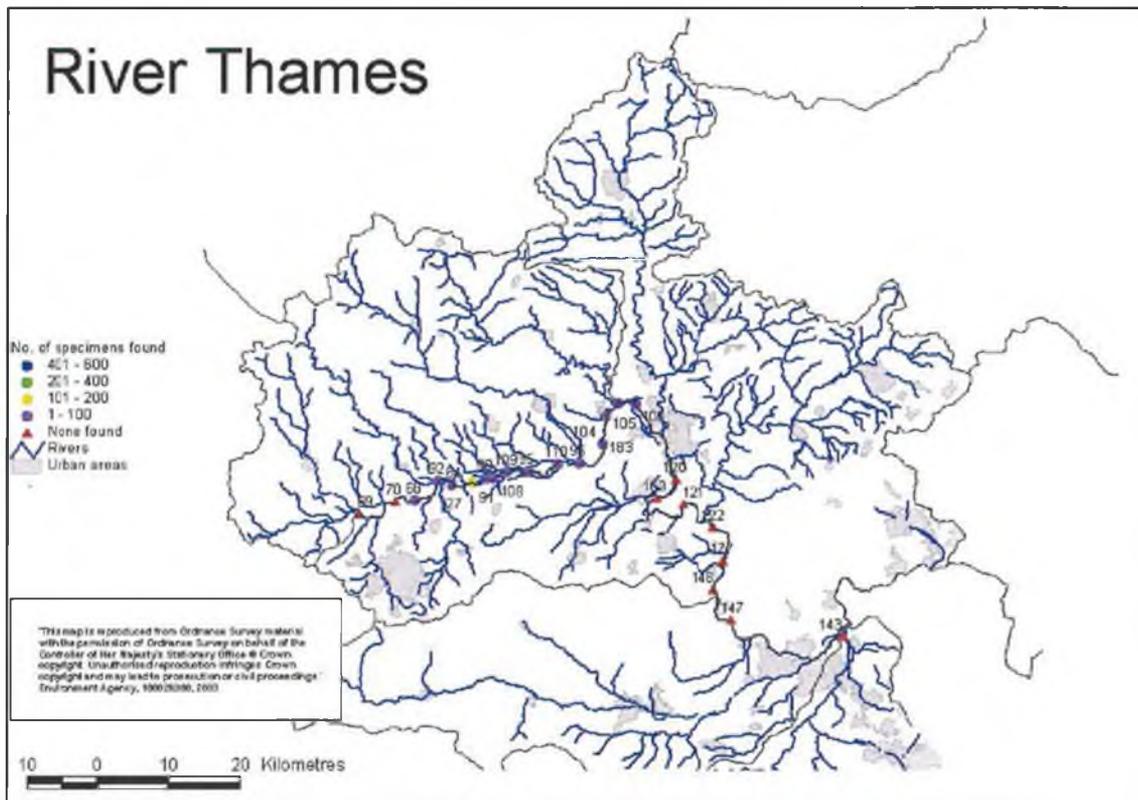


Figure 28: Sample locations in the R. Thames

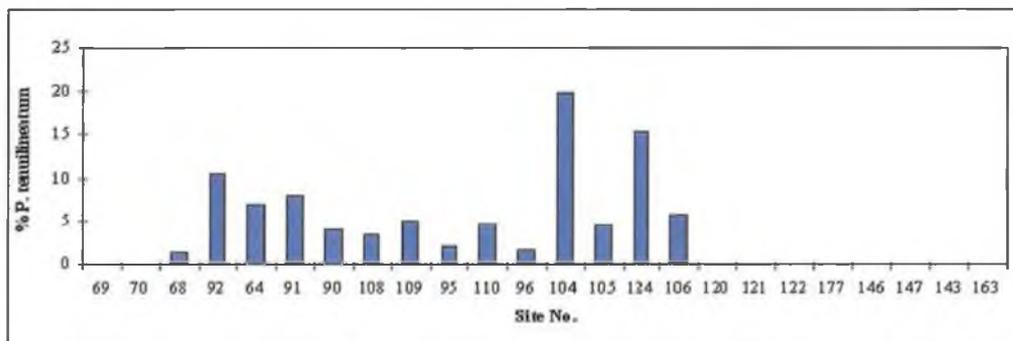


Figure 29: R. Thames – distribution and abundance of *P. tenuilineatum* (excluding repeated sample sites)

5.12.4 Water quality

Recorded conductivity at sample sites: Range 556 to 649 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Castle Eaton	SU14400 95700	26/01/99 to 21/11/00	17	1.35	7.21	n/a	0.27
Trout Inn, Godstow	SP48300 09200	26/01/99 to 21/11/00	22	1.12	7.57	0.031	0.29

5.12.5 Comments

P. tenuilineatum was recorded at every sample site between Hannington Bridge and Godstow. The absence from any sites downstream of Oxford suggests that there may be a change in water quality. The previous records of occasional specimens from the Thames between Abingdon and Dorchester suggests that they may merely represent adventives washed down from upstream or from the River Ock at Abingdon (which supports a good population of *P. tenuilineatum*). Within the populated section, *P. tenuilineatum* occurred at an abundance ranging from 1.3 to 19.8% of all individuals. However, there do not appear to be any significant trends in the species' abundance from upstream to downstream.

Eight other species of *Pisidium* were recorded, which with the exception of *P. milium*, all occurred at every site downstream from Buscot. There are general trends, e.g. *P. supinum* and *P. nitidum* increase in abundance downstream, whereas *P. casertanum* gradually declines, especially below Oxford (Figure 30). *P. amnicum* comprised a high proportion of the *Pisidium* specimens (particularly upstream of Oxford) with abundances ranging from 10 to 47% of all individuals. Downstream of Oxford, the proportion was generally less than 10%.

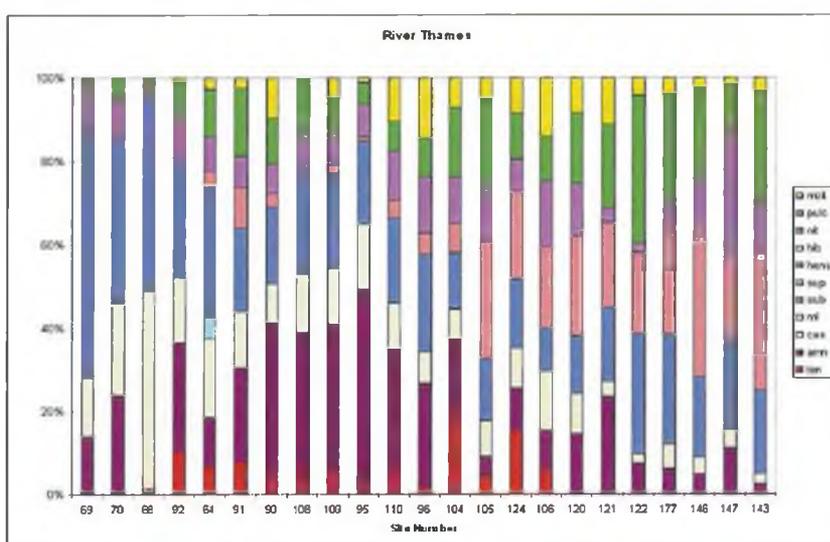


Figure 30: R. Thames – *Pisidium* species abundance at each site (excluding repeated sample sites)

5.13 River Cherwell

5.13.1 General characters of river

Length:	96 km
Source:	u/s Charwelton
Confluence:	Joins the River Thames at Oxford
Direction of flow:	North to south
Velocity:	Variable, the river has swift, moderate and slow sections throughout
Geology:	Jurassic limestone
Substrate:	Variable from gravels, limestone grit and mud depending on flow and density of macrophytes
Major towns:	Banbury, Kidlington, Oxford
Land use:	Moderate to high intensity agriculture
Environment Agency	3 - Somerton Bridge, Heyford Bridge, Gosford Br, Kidlington
Monitoring sites:	

Parts of the River Cherwell link into the Oxford Canal, with which it runs more-or-less parallel over much of its course.

5.13.2 Previous records

There does not appear to be any previous records of *Pisidium tenuilineatum* from the Cherwell.

5.13.3 Results

No. of sampling sites	9
No. of sites with <i>Pisidium tenuilineatum</i>	9

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
99	W of Somerton	SP495290	231	8	3.46
125	Upper Heyford	SP492263	347	13	3.75
100	Lower Heyford	SP478248	102	9	8.82
126	Northbrook	SP488223	290	17	5.86
101	Enslow	SP478184	417	29	6.95
88	Shipton on Cherwell	SP483166	171	2	1.17
102	Hampton Poyle	SP500152	239	9	3.77
103	Islip	SP522137	136	1	0.74
107	Marston	SP519087	260	1	0.38

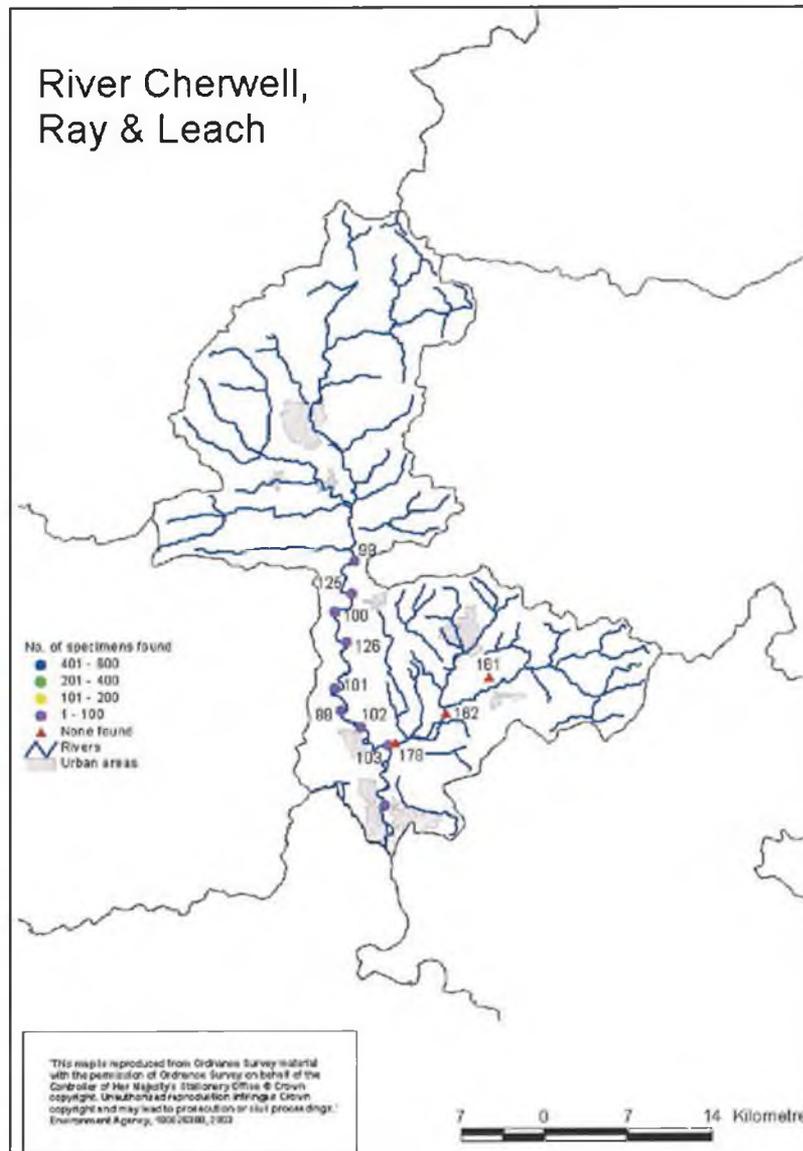


Figure 31: Sample locations in the R. Cherwell (+ Ray & Leach)

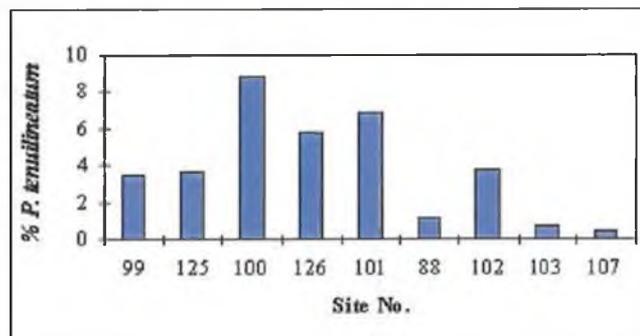


Figure 32: R. Cherwell – distribution and abundance of *P. tenuilineatum*

5.13.4 Water quality

Recorded conductivity at sample sites: Range 630 to 688 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Somerton Bridge	SP49500 29000	05/01/99 to 14/11/00	24	1.35	8.38	0.037	0.51
Heyford Bridge	SP47800 24800	05/01/99 to 14/11/00	24	1.5	8.13	0.037	0.48
Gosford Br, Kidlington	SP50400 13800	05/01/99 to 14/11/00	24	1.43	7.74	0.031	0.43

5.13.5 Comments

P. tenuilineatum was recorded at all nine sample sites but never in abundance greater than 8.8% of all *Pisidium* individuals. There is a general trend whereby the species increases in abundance from Somerton to Lower Heyford and then gradually decreases to Marston.

Nine other species of *Pisidium* were recorded but their distribution and abundance does not differ significantly over the length of river sampled (Figure 33).

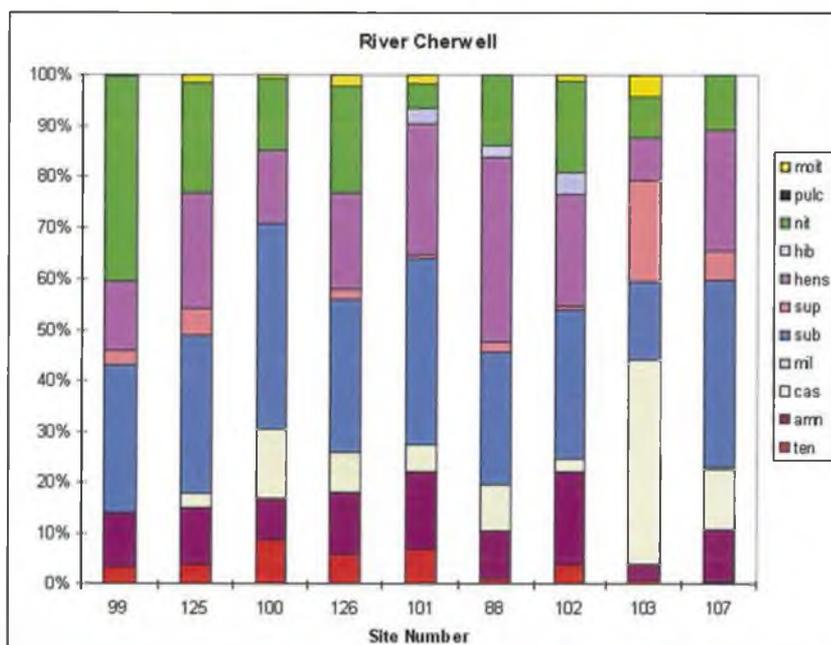


Figure 33: R. Cherwell – *Pisidium* species abundance at each site

5.14 River Churn

5.14.1 General characters of river

Length:	c. 37 km
Source:	Near Coberley, south of Cheltenham
Confluence:	Joins the River Thames at Cricklade
Direction of flow:	North/south to Cerney Wick, then southeast to confluence
Velocity:	Swift upstream of Cirencester, then moderate to swift to confluence
Geology:	Jurassic limestone
Substrate:	Limestone cobble & grit u/s Cirencester, then mostly sands and gravels
Major towns:	Cirencester
Land use:	Generally rural agricultural. Most of river is managed for angling interest.
Environment Agency	1 - Cerney Wick
Monitoring sites:	

5.14.2 Previous records

Pisidium tenuilineatum had not been recorded from the Churn.

5.14.3 Results

No. of sampling sites	6
No. of sites with <i>Pisidium tenuilineatum</i>	4

See Figure 21 for location of sample sites

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
171	Baunton	SP023043	223	0	0
172	Siddington	SU039998	102	0	0
173	South Cerney	SU054973	117	4	3.42
174	NW of Cerney Wick	SU073969	74	14	18.9
175	Cerney Wick	SU078962	126	34	27
176	Cricklade	SU098945	278	52	18.7



Figure 34: R. Churn – distribution and abundance of *P. tenuilineatum*

5.14.4 Water quality

Recorded conductivity at sample sites: Range 540 to 580 $\mu\text{s}/\text{cm}$

No Environment Agency chemical water quality data was available.

5.14.5 Comments

P. tenuilineatum was absent from the Churn upstream of Siddington, but present in every sample downstream. It was uncommon at South Cerney (3.42% of all individuals) but relatively abundant at the three downstream sites (abundance range: 18.7 to 27% of all individuals). The species was living in a range of environmental conditions from fast-flowing sections to almost ponded-up, densely-vegetated habitat at Cricklade.

Eight other species of *Pisidium* were recorded and which show clear changes in distribution and abundance from upstream to downstream (Figure 35). Both *P. subruncatum* and *P. nitidum* decreased in abundance downstream whereas *P. casertanum* and *P. henslowanum* increased. As with some other rivers, *P. nitidum* was rare or absent at the sites where *P. tenuilineatum* was most abundant. *P. hibernicum* and *P. moitessierianum* were found only at the furthest downstream site.

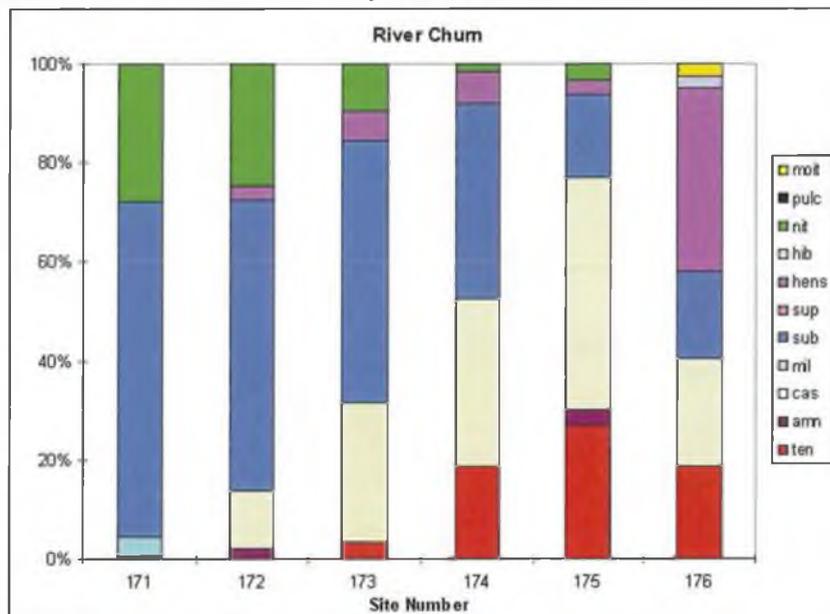


Figure 35: R. Churn – *Pisidium* species abundance at each site

5.15 River Thame

5.15.1 General characters of river

Length:	c. 76 km
Source:	South of Chedington, Buckinghamshire
Confluence:	Joins the Thames at Dorchester
Direction of flow:	Northeast to southwest
Velocity:	Very variable, generally moderate to swift, but some area with slow flow
Geology:	Mostly Jurassic substrata
Substrate:	Variable from gravels, limestone grit and mud depending on flow and density of macrophytes
Major towns:	Several villages
Land use:	Moderate to high intensity agriculture
Environment Agency	1 - Dorchester
Monitoring sites:	

5.15.2 Previous records

Pisidium tenuilineatum had not been recorded from the Thame.

5.15.3 Results

No. of sampling sites	8
No. of sites with <i>Pisidium tenuilineatum</i>	8

See Figure 21 for location of sample sites

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
160	Shabbington	SP668064	156	15	9.61
159	Draycott	SP647065	17	3	17.6
158	E of Wheatley	SP612054	109	5	4.59
157	Cuddeston Mill	SP612029	225	34	15.1
156	Chiselhampton	SU599987	269	8	2.97
123	Brookhampton	SU603976	53	7	13.2
155	Lower Grange	SU599956	79	1	1.27
154	Dorchester	SU580938	213	1	0.47

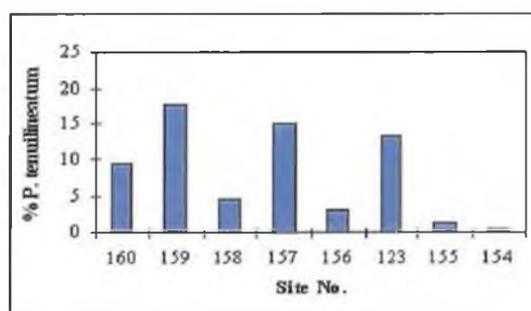


Figure 36: R. Thame – distribution and abundance of *P. tenuilineatum*

5.15.4 Water quality

Recorded conductivity at sample sites: Range 640 to 738 $\mu\text{s}/\text{cm}$

No Environment Agency chemical water quality data was available

5.15.5 Comments

Several sites on the Thames did not provide significant areas of suitable habitat, and therefore, good-sized samples of *Pisidium* could not always be obtained. However, *P. tenuilineatum* was recorded at every sample site. The species ranged in abundance from 0.47 to 17.6% of all *Pisidium* individuals, with some indication that it is more frequent in the middle and upper sections and less abundant on the downstream end. This does not appear to correlate directly with environmental factors as it was found living in a range of flows and substrates.

Seven other species of *Pisidium* were recorded, most of which were found over the entire sampled section of river (Figure 37). There are differences in individual species abundance but few clear patterns from upstream to downstream, with the exception of *P. nitidum*. This species was absent above Chiselhampton and gradually increased in abundance to a level of only 10.8% at Dorchester.

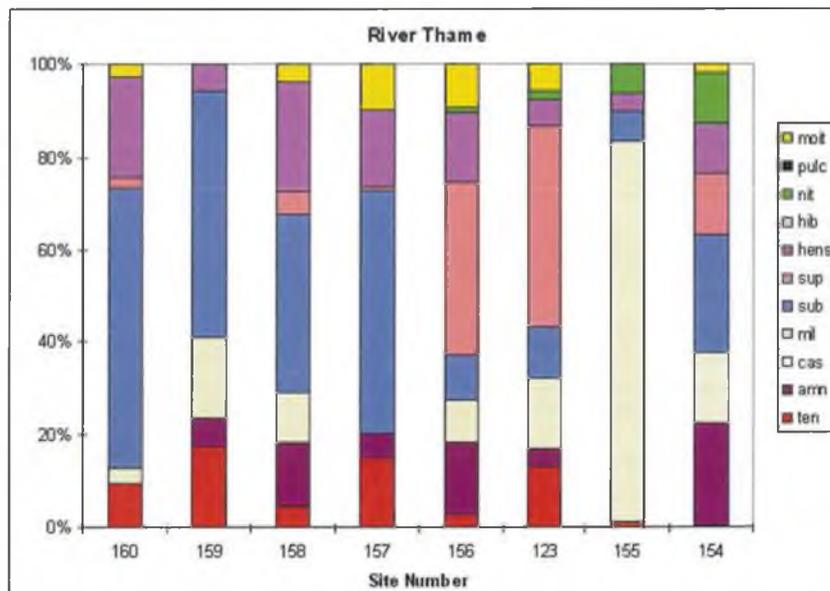


Figure 37: R. Thames – *Pisidium* species abundance at each site

5.16 River Ray (Oxon)

5.16.1 General characters of river

Length:	31.5 km
Source:	Near Marsh Gibbon
Confluence:	Joins the River Cherwell at Islip
Direction of flow:	Northeast to southwest
Velocity:	Variable, moderate to slow on lower sections
Geology:	Jurassic substrata
Substrate:	Sands and clay
Major towns:	None
Land use:	Intensive (mostly arable) agriculture. Much of river has been canalised and manipulated
Environment Agency	1 - B4027, Islip
Monitoring sites:	

5.16.2 Previous records

Pisidium tenuilineatum had not been recorded from the River Ray.

5.16.3 Results

No. of sampling sites	3
No. of sites with <i>Pisidium tenuilineatum</i>	0

See Figure 31 for location of sampling stations. See Appendix 2 for results.

5.16.4 Water quality

Conductivity at sample sites: Range 644 to 733 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
B4027, Islip	SP52700 13900	13/01/99 to 28/09/00	30	1.62	9.39	N/A	1.25

5.16.5 Comments

P. tenuilineatum was not recorded in the Ray, but six other species were found. *P. casertanum*, *P. milium*, *P. subtruncatum* and *P. nitidum* occurred throughout but their proportions varied down the river. *P. henslowanum* and *P. hibernicum* occurred only at the more downstream sites at Fencot and Islip.

5.17 River Leach

5.17.1 General characters of river

Length:	30.5 km
Source:	Hampnett
Confluence:	Joins the River Thames at Lechlade
Direction of flow:	North to south
Velocity:	Generally swift throughout, but ponded through Faringdon Mill
Geology:	Jurassic limestone
Substrate:	Mostly gravels, but extensive muddy areas in places
Major towns:	Several small villages
Land use:	Moderate to high intensity agriculture, gravel extraction on lower end
Environment Agency	1 - B4449, Lechlade
Monitoring sites:	

5.17.2 Previous records

Pisidium tenuilineatum had not been recorded from the Leach.

5.17.3 Results

No. of sampling sites 4
 No. of sites with *Pisidium tenuilineatum* 1

See Figure 31 for location of sampling stations

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
167	Eastleach	SP203053	36	0	0
166	Fyfield	SP202037	204	0	0
129	Little Faringdon Mill	SP222012	695	33	4.75
165	d/s Lechlade Mill	SU227995	284	0	0

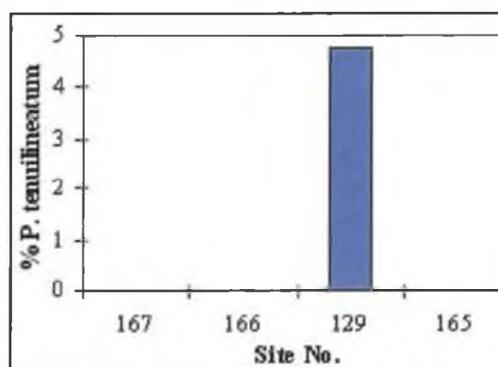


Figure 38: R. Leach – distribution and abundance of *P. tenuilineatum*

5.17.4 Water quality

Recorded conductivity at sample sites: Range 562 to 594 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
At B4449, Lechlade	SU22600 99100	07/01/99 to 22/11/00	24	1.13	12.35	0.035	0.14

5.17.5 Comments

P. tenuilineatum was found only at Little Farringdon Mill where it comprised 4.75% of all *Pisidium* individuals. The species absence at Fyfield is surprising as suitable muddy habitat was extensive, the water was crystal clear and there was a diverse macrophyte community including *Hippuris*.

Seven other species of *Pisidium* were recorded, with the highest diversity occurring at Little Farringdon Mill. The 2 upstream sites (Eastleach and Fyfield) supported only *P. subtruncatum*, *P. nitidum* and *P. milium* (Figure 39). The downstream site at Lechlade also included low numbers of *P. casertanum* and *P. hibernicum*. The Farringdon Mill site had all of the above plus *P. amnicum* and high numbers (36%) of *P. henslowianum*.

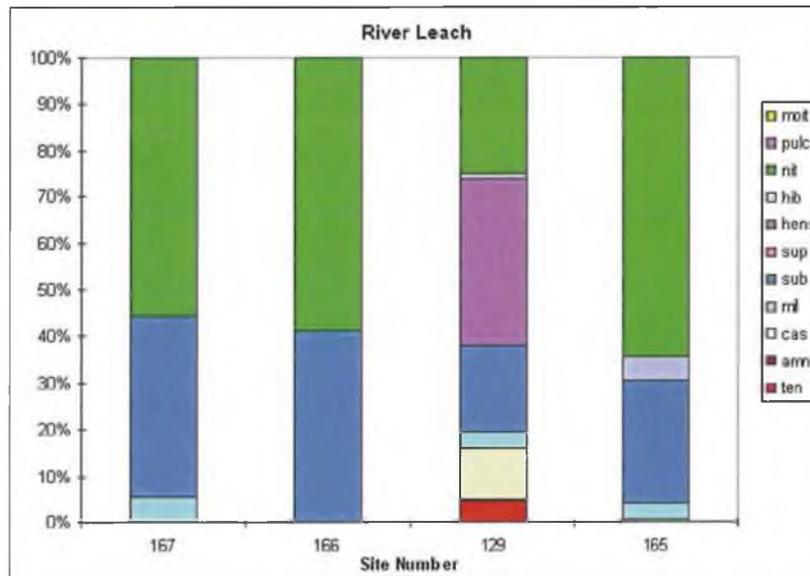


Figure 39: R. Leach – *Pisidium* species abundance at each site

5.18 River Pang

5.18.1 General characters of river

Length:	30 km
Source:	Upstream of Hampstead Norreys
Confluence:	Joins the River Thames at Pangbourne
Direction of flow:	North/south, then west/east, then south/north
Velocity:	Swift throughout
Geology:	Chalk
Substrate:	Gravels with extensive marginal muddy ooze in places
Major towns:	Pangbourne on downstream end
Land use:	Moderate intensity agriculture
Environment Agency	1- Pangbourne
Monitoring sites:	

5.18.2 Previous records

Pisidium tenuilineatum had not been recorded from the Pang.

5.18.3 Results

No. of sampling sites	7
No. of sites with <i>Pisidium tenuilineatum</i>	7

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
179	u/s Stanford Dingley	SU569713	67	4	5.97
180	d/s Rotten Row	SU589720	619	400	64.6
164	u/s Bradfield	SU602725	286	106	37.1
181	d/s Bradfield	SU607731	167	31	18.6
182	u/s Tidmarsh	SU634737	122	8	6.56
145	Tidmarsh	SU635745	248	13	5.24
144	u/s Pangbourne	SU636758	185	3	1.62

See Figure 16 for location of sampling stations

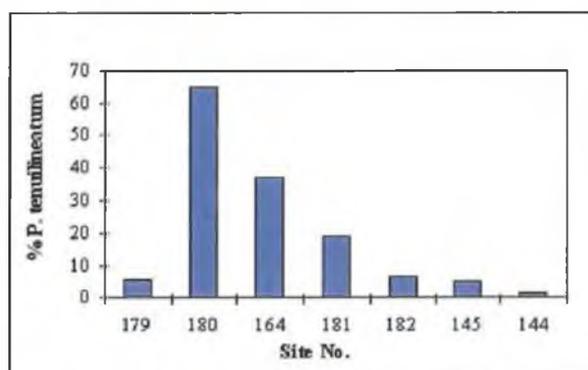


Figure 40: R. Pang – distribution and abundance of *P. tenuilineatum*

5.18.4 Water quality

Recorded conductivity at sample sites: Range 538 to 560 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Pangbourne	SU63482 76353	01/1990 to 12/2002	120	1.21	8.24	n/a	0.05

5.18.5 Comments

The River Pang supports one of the most important populations of *P. tenuilineatum* in the country. The species was recorded at every sample site in abundances ranging from 1.6 to 64.6% of all *Pisidium* individuals. The highest abundance (64.6%) was recorded at the site downstream of Rotten Row and then gradually decreased in abundance downstream. At the 2 sites where it was most abundant, the habitat was characterised by extensive muddy margins, crystal clear water and *Callitriche* as the principal macrophyte.

Seven other species of *Pisidium* were recorded and these exhibit a distinct change in the species' composition and abundance from upstream to downstream (Figure 41). *P. nitidum* was rare or absent in the upper sections but increased in abundance downstream, whereas *P. casertanum* decreased in abundance downstream. *P. milium* and *P. amnicum* also increased in abundance downstream, but *P. henslowianum* and *P. hibernicum* were present only at the furthest downstream site.

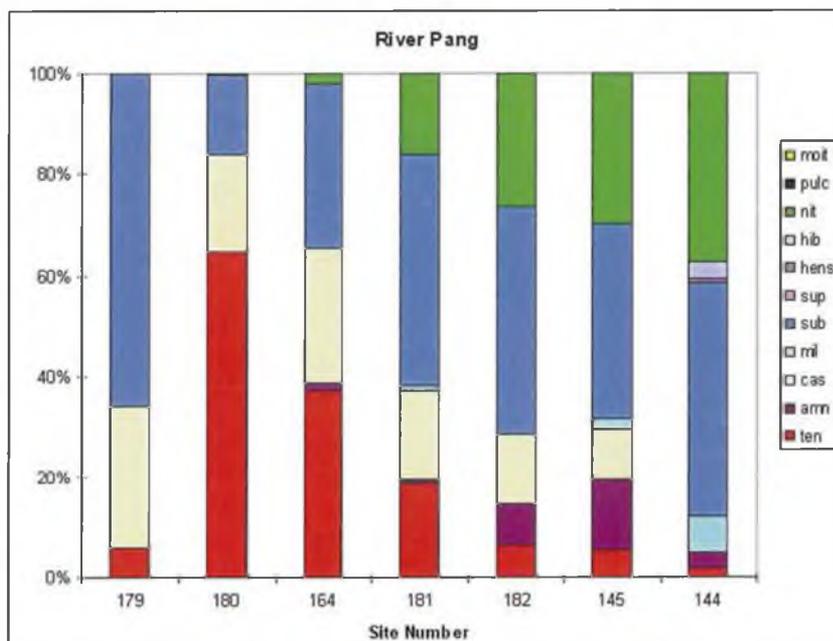


Figure 41: R. Pang – *Pisidium* species abundance at each site

5.19 Ampney Brook

5.19.1 General characters of river

Length:	12.5 km
Source:	North of Ampney Crucis
Confluence:	Joins the River Thames NE of Cricklade
Direction of flow:	North to south
Velocity:	Generally swift
Geology:	Jurassic limestone
Substrate:	Gravels and muddy sand
Major towns:	None
Land use:	Mostly arable agriculture
Environment Agency	1 - at Sheeppen Bridge, 1km from Thames confluence
Monitoring sites:	

5.19.2 Previous records

Pisidium tenuilineatum had not been recorded from Ampney Brook.

5.19.3 Results

No. of sampling sites	1
No. of sites with <i>Pisidium tenuilineatum</i>	0

See Figure 21 for location of sampling sites. See Appendix 2 for results

5.19.4 Water quality

Recorded conductivity at sample site: 658 $\mu\text{s}/\text{cm}$

No Environment Agency chemical water quality data was available

5.19.5 Comments

Three species of *Pisidium* were recorded: *P. subtruncatum* (the most abundant), *P. nitidum* and *P. casertanum*.

5.20 River Monnow

5.20.1 General characters of river

Length:	57 km
Source:	The Black Mountains, c. 5km S of Hay-on-Wye
Confluence:	Joins the Wye at Monmouth
Direction of flow:	Northwest to southeast
Velocity:	Relatively swift throughout
Geology:	Red sandstone
Substrate:	Sand, gravel, bedrock in places
Major towns:	Monmouth
Land use:	Low intensity agriculture
Environment Agency	2 within sample section: Tregate Bridge and Monmouth
Monitoring sites:	

5.20.2 Previous records

Pisidium tenuilineatum had been recorded on one previous occasion from the Monnow, at St Maughams in 1973 (Conch. Soc.).

5.20.3 Results

No. of sampling sites	6
No. of sites with <i>Pisidium tenuilineatum</i>	3

See Figure 45 for location of sampling sites

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
54	Kentchurch	SO412257	24	0	0
53	Skenfrith Bridge	SO460203	7	0	0
55	Llanrothel	SO464187	42	2	4.76
52	u/s Tregate Bridge	SO477175	26	1	3.85
51	d/s Tregate Bridge	SO478171	21	0	0
50	Rockfield	SO482151	49	1	2.04

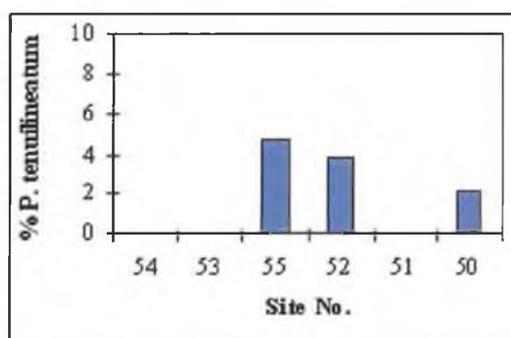


Figure 43: R. Monnow – distribution and abundance of *P. tenuilineatum*

5.20.4 Water quality

Recorded conductivity at sample sites: Range 478 to 490 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Tregate Bridge	SO477173	21/05/98 to 22/01/03	58	1.30	2.85	0.034	0.071
Monmouth	SO507122	21/05/98 to 22/01/03	58	1.39	2.90	0.035	0.066

5.20.5 Comments

Suitable habitat of fine marginal sediments was very difficult to locate on the Monnow and therefore relatively low numbers of *Pisidium* specimens were collected at each site. *P. tenuilineatum* was found at 3 of the six sample sites, but only in very low numbers (total 4 individuals). Three other *Pisidium* species were recorded with *P. subtruncatum* the most abundant.

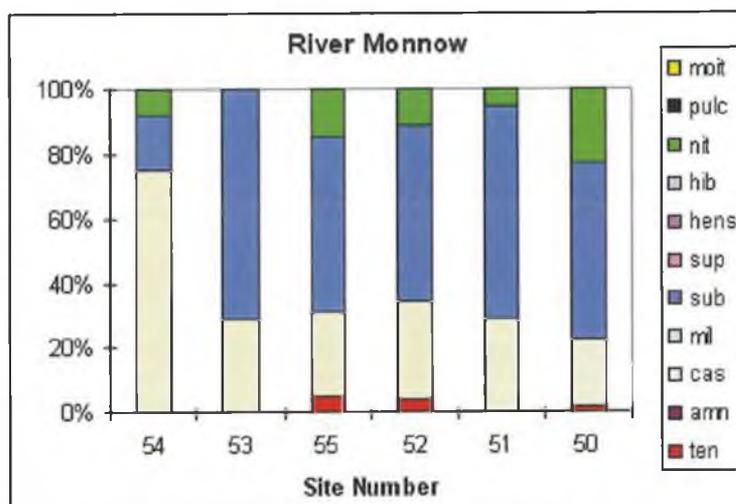


Figure 44: R. Monnow – *Pisidium* species abundance at each site

5.21 River Wye

5.21.1 General characters of river

Length:	c. 220 km to Redbrook
Source:	Plynlimon
Confluence:	Flows into the River Severn estuary at Chepstow
Direction of flow:	West to Hereford, then south to estuary
Velocity:	Variable from slow to swift
Geology:	Mostly red sandstone over sampled section
Substrate:	Sand, gravel and bedrock
Major towns:	Hay-on-Wye, Hereford, Ross-on-Wye, Monmouth
Land use:	Mostly arable and forestry
Environment Agency	Many – 5 selected to cover sample section (see table below)
Monitoring sites:	

5.21.2 Previous records

Pisidium tenuilineatum had not been recorded from the Wye.

5.21.3 Results

No. of sampling sites	22
No. of sites with <i>Pisidium tenuilineatum</i>	0

See Appendix 2 for results of *Pisidium* sampling.

5.21.4 Water quality

Recorded conductivity at sample sites: Range 226 to 340 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Bridge Sollars	SO413424	18/03/98 to 31/01/03	67	1.36	1.27	0.010	0.040
Hoarwithy Bridge	SO549295	20/05/98 to 28/11/02	55	1.39	2.72	0.022	0.065
Hole in the Wall	SO605284	20/05/98 to 31/01/03	59	1.29	2.71	0.020	0.057
Goodrich	SO580192	09/04/98 to 21/01/03	61	1.40	2.88	0.022	0.063
Redbrook	SO536982	09/04/08 to 21/01/03	118	1.44	3.23	0.023	0.070

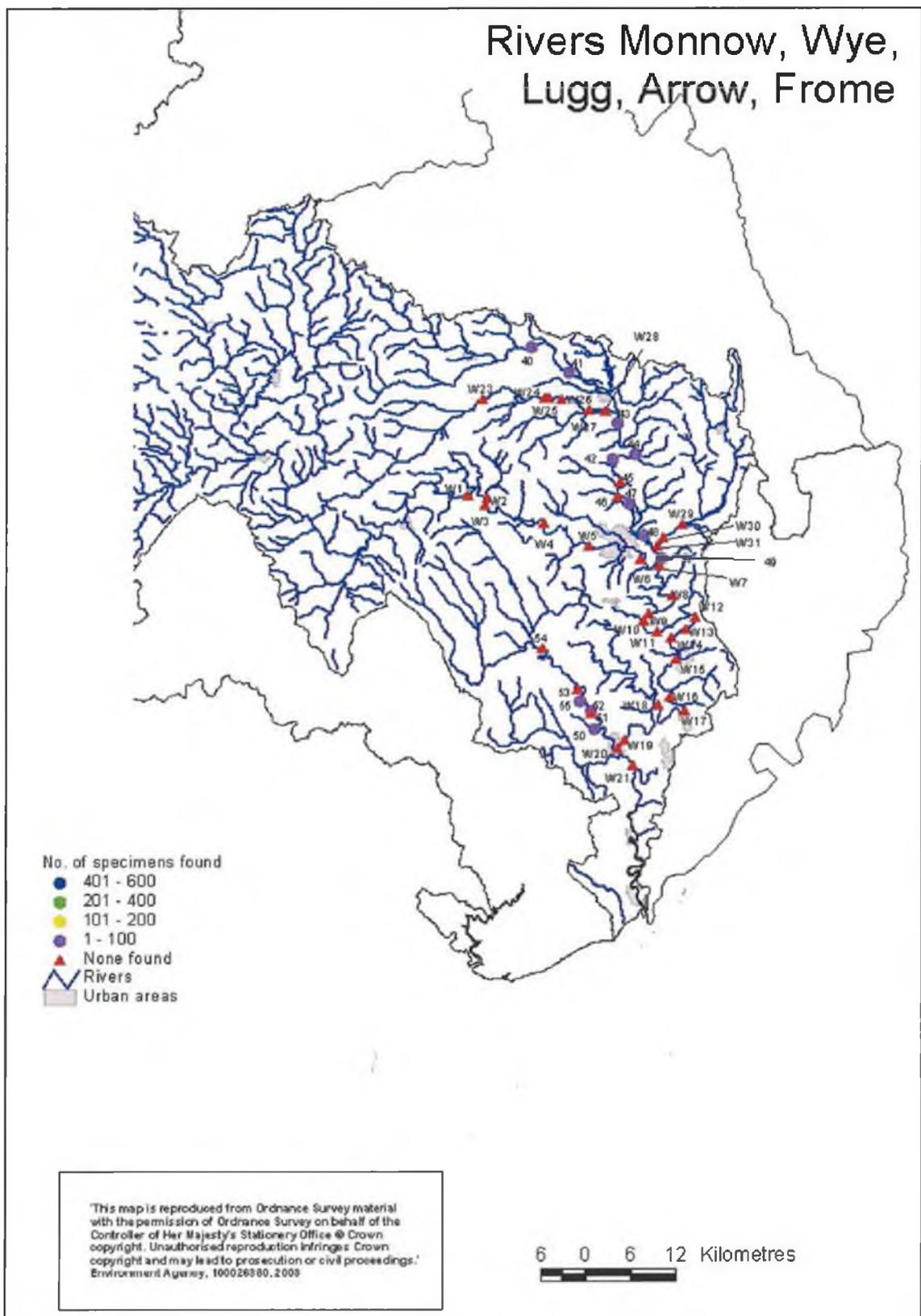


Figure 45: Sample locations in the River Wye catchment

5.21.5 Comments

Due to the high energy environment and the nature of the substrate in the Wye, there were very few areas with suitable habitat of marginal plants and fine sediments, and thus it was often difficult to obtain samples with over 100 individual *Pisidium* specimens. Even at sites with extensive muddy areas such as at Turner's Boat, which supports high numbers of the large unionid mussels, *Pisidium* were relatively uncommon.

P. tenuilineatum was not recorded. This may have been because of low alkalinity, and the instability of the environment.

Six species of *Pisidium* were recorded, of which, *P. subtruncatum*, *P. nitidum* and *P. amnicum* occurred throughout (Figure 46). *P. casertanum* was sporadic and generally in low abundance and *P. henslowanum* gradually increased in abundance downstream. *P. supinum* was recorded only at one location (Backney).

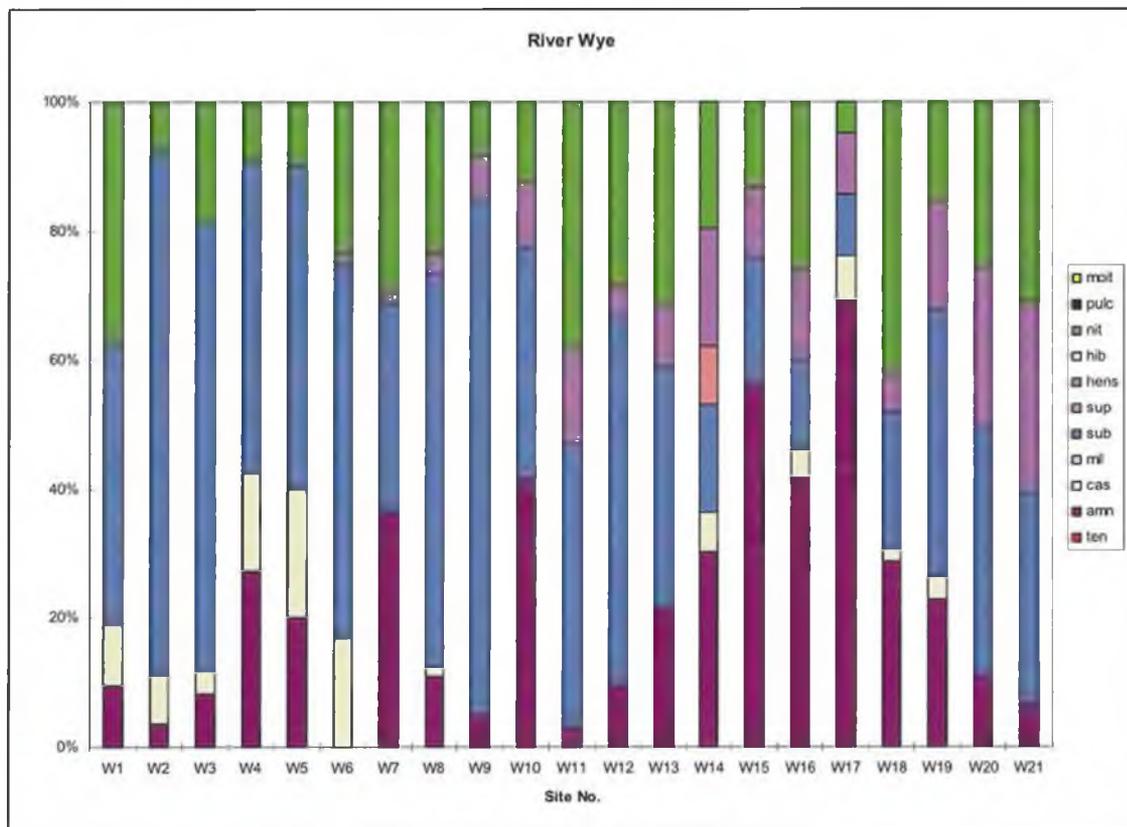


Figure 46: R. Wye – *Pisidium* species abundance at each site

5.22 River Lugg

5.22.1 General characters of river

Length:	83 km
Source:	Mountains west of Llangunllo
Confluence:	Joins River Wye at Mordiford, 3km E of Hereford
Direction of flow:	Eastwards to Leominster, then southwards to the confluence
Velocity:	Swift above Leominster, then moderate to swift downstream
Geology:	Mostly red sandstone
Substrate:	Mostly sandy or with clay
Major towns:	Presteigne, Leominster
Land use:	Low to high intensity agriculture, urban, light industry
Environment Agency	4 in sample section – see table below
Monitoring sites:	

5.22.2 Previous records

Pisidium tenuilineatum had been recorded on one previous occasion from the River Lugg, at Blackwardine in 1982 (Conch. Soc.).

5.22.3 Results

No. of sampling sites	10
No. of sites with <i>Pisidium tenuilineatum</i>	8

See Figure 45 for location of sampling sites

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
40	Upper Lye	SO398654	35	6	17.1
41	Kingsland	SO449621	20	1	5
42	Eaton Bridge (A44)	SO507507	235	53	22.6
43	u/s Ford	SO513554	125	2	1.6
44	Bodenham	SO537513	45	1	2.22
45	Marden	SO516476	95	0	0
46	Moreton Bridge	SO513457	131	0	0
47	Wergins Bridge	SO528448	376	5	1.33
48	Lugwardine	SO548406	225	6	1.33
49	u/s Wye confluence	SO571376	189	3	2.12

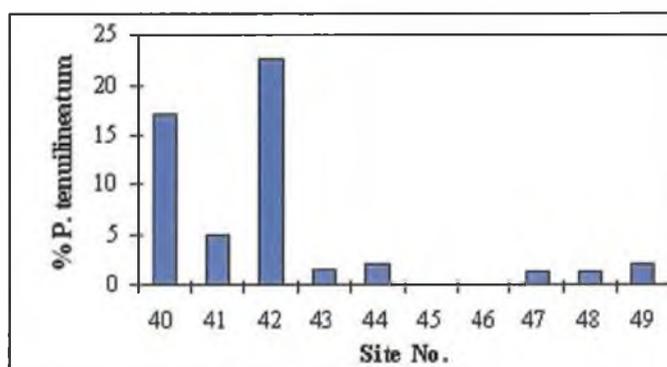


Figure 47: R. Lugg – distribution and abundance of *P. tenuilineatum*

5.22.4 Water quality

Conductivity at sample sites: Range 381 to 540 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Eaton Bridge	SO507585	26/03/98 to 29/01/03	63	1.19	5.12	0.017	0.058
Ford Bridge	SO510551	26/03/98 to 29/01/03	57	1.17	5.17	0.020	0.085
Wergins Bridge	SO529446	26/03/98 to 29/01/03	60	1.25	5.64	0.027	0.124
Lugwardine Bridge	SO546407	26/03/98 to 29/01/03	49	1.29	n/m	0.032	n/m

5.22.5 Comments

Suitable habitat with fine marginal sediments was absent or infrequent at several locations on the Lugg, and therefore, good-sized samples of *Pisidium* were not always easy to obtain. *P. tenuilineatum* was recorded at eight of the ten sample sites on the River Lugg. The highest numbers were found in the more upstream sites, particularly at Eaton Bridge, Leominster where the species comprised 22.6% of all *Pisidium* individuals. This site was unusual in that there was an extensive marginal shelf with *Sparganium* and fine sediments. Downstream of Eaton Bridge, the species occurred in lower abundance (less than 3% of all *Pisidium* individuals).

The overall *Pisidium* fauna had low diversity with only 5 other species being recorded, although there are no significant trends in species composition and abundance from upstream to downstream (Figure 48). *P. subtruncatum* and *P. nitidum* were the 2 dominant species throughout. *P. amnicum*, *P. casertanum* and *P. henslowanum* were sporadic in distribution and variable in abundance.

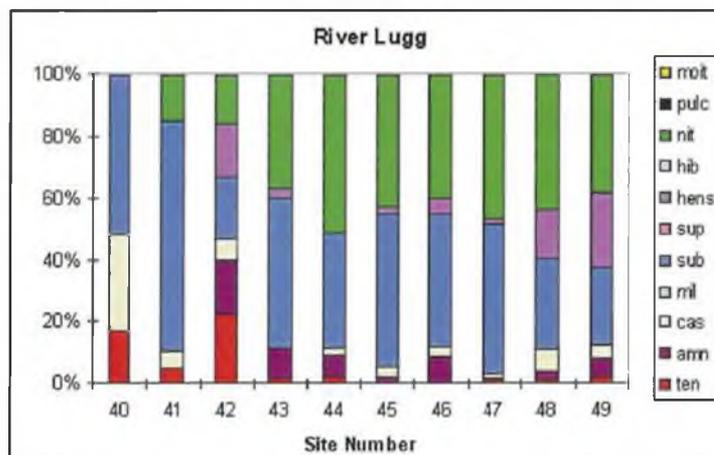


Figure 48: R. Lugg – *Pisidium* species abundance at each site

5.23 River Arrow

5.23.1 General characters of river

Length:	49 km
Source:	Mountains 5km W of Kington
Confluence:	Joins River Lugg SE of Leominster
Direction of flow:	West to east
Velocity:	Swift to Eardisland, then moderate
Geology:	Mostly red sandstone
Substrate:	Gravel and sand
Major towns:	Kington, Eardisland, and flows along southern edge of Leominster
Land use:	Moderate intensity agriculture
Environment Agency	2 in sample section – Eardisland and Broadward
Monitoring sites:	

5.23.2 Previous records

Pisidium tenuilineatum had not been recorded from the Arrow.

5.23.3 Results

No. of sampling sites	6
No. of sites with <i>Pisidium tenuilineatum</i>	0

See Figure 45 for location of sampling sites. See Appendix 2 for results of *Pisidium* sampling.

5.23.4 Water quality

Recorded conductivity at sample sites: Range 460 to 496 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Eardisland Bridge	SO420587	14/04/98 to 17/02/03	61	1.29	4.40	0.017	0.082
Broadward Bridge	SO498571	14/04/98 to 17/02/03	58	1.28	5.15	0.022	0.096

5.23.5 Comments

Six species of *Pisidium* were recorded from the River Arrow, of which *P. subtruncatum* was dominant throughout. *P. milium* was found only in the furthest upstream site. *P. henslowanum* first appeared at Arrow Green and increased in abundance downstream.

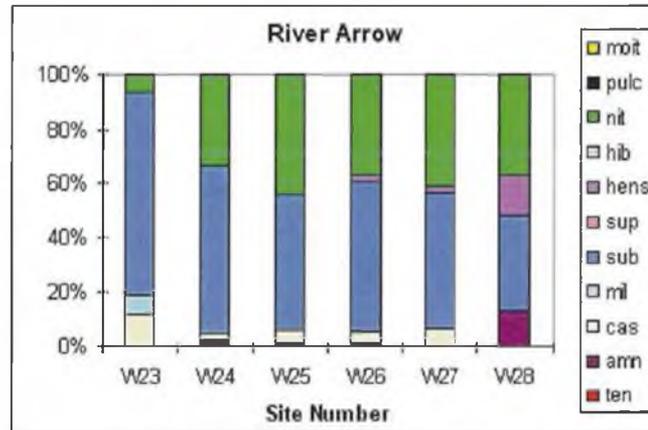


Figure 49: R. Arrow – *Pisidium* species abundance at each site

5.24 River Frome (River Lugg tributary)

5.24.1 General characters of river

Length:	35.5 km
Source:	Near Thornbury
Confluence:	Joins the River Lugg at Hampton Bishop
Direction of flow:	Northeast to southwest
Velocity:	Variable. Generally swift in open sections, but almost standing in densely vegetated sites.
Geology:	Mostly red sandstone
Substrate:	Gravel and sand
Major towns:	Bromyard
Land use:	Moderate to high intensity agriculture
Environment Agency	2 – Rowden Abbey, Longworth Bridge
Monitoring sites:	

5.24.2 Previous records

Pisidium tenuilineatum had not been recorded from the Frome.

5.24.3 Results

No. of sampling sites	3
No. of sites with <i>Pisidium tenuilineatum</i>	0

See Figure 45 for location of sampling sites. See Appendix 2 for results of *Pisidium* sampling.

5.24.4 Water quality

Recorded conductivity at sample sites: Range 464 to 506 $\mu\text{s/cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Rowden Abbey	SO6298 5662	07/03/98 to 07/03/03	59	1.51	6.55	0.040	0.14
Longworth Bridge	SO5655 3922	07/03/98 to 07/03/03	58	1.59	6.10	0.054	0.38

5.24.5 Comments

The Frome supports a low diversity of *Pisidium* species. Four species were recorded of which *P. subtruncatum* was dominant.

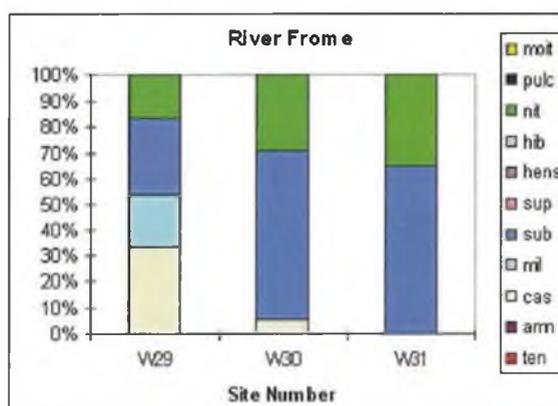


Figure 50: R. Frome – *Pisidium* species abundance at each site

5.25 Aymestrey Pond

5.25.1 General characters

The site comprises two ponds alongside the A4110 road north of the village of Aymestrey. The outflow stream enters the River Lugg c. 400m downstream in Aymestrey village. The upper pond is surrounded by woodland and has swampy margins with dense stands of *Equisetum*. The lower pond is more open and has stands of *Typha* and dense growths of *Elodea*. Both ponds have a substrate of fine mud and large quantities of organic detritus.

5.25.2 Previous records

The only record for *Pisidium tenuilineatum* in Aymestrey Pond is based on specimens found by Michael Kerney in 1973. These were the thin-shelled form.

5.25.3 Results

No. of sampling sites	3
No. of sites with <i>Pisidium tenuilineatum</i>	0

See Appendix 2 for results of *Pisidium* sampling.

5.25.4 Water quality

Recorded conductivity at sample sites: Range 440 to 472 $\mu\text{s}/\text{cm}$

5.25.5 Comments

P. tenuilineatum could not be found in Aymestrey Pond. Five other species of *Pisidium* were collected. The lower pond and outflow stream supported *P. milium*, *P. subtruncatum* and *P. nitidum*. *P. personatum* was present in low numbers in the lower pond, but was more common in the upper pond along with *P. obtusale*.

5.26 River Ise

5.26.1 General characters of river

Length:	c. 47 km
Source:	Clipston
Confluence:	Joins the River Nene at Wellingborough
Direction of flow:	West/east to Geddington, then south
Velocity:	Swift over sample section
Geology:	Jurassic clays
Substrate:	Sand and gravel
Major towns:	Desborough, Kettering, Wellingborough
Land use:	High intensity agriculture, urban, industry
Environment Agency	5 - Rushton, Barford, Geddington, Burton Latimer,
Monitoring sites:	Wellingborough

5.26.2 Previous records

Pisidium tenuilineatum was previously recorded (as dead shells only) from the River Ise near Finendon in 1979 (Conch. Soc.).

5.26.3 Results

No. of sampling sites	4
No. of sites with <i>Pisidium tenuilineatum</i>	0

See Appendix 2 for results of *Pisidium* sampling.

5.26.4 Water quality

Recorded conductivity at sample sites: Range 826 to 1017 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Rushton	SP840826	Spring/Aut 1995	2.0/2.67	9.0/4.27	-	0.12/0.21
Barford Br	SP860830	Spring/Aut 1995	1.0/2.2	8.9/4.27	-	0.08/0.24
Geddington	SP894828	Spring/Aut 1995	4.13/2.67	12.5/5.77	-	1.02/0.17
Burton Latimer	SP889748	Spring/Aut 1995	1.5/2.47	10.1/2.37	-	0.06/0.18
B571 bridge	SP907675	Spring/Aut 1995	1.3/2.13	11.4/3.6	-	0.07/0.60

5.26.5 Comments

Six species of *Pisidium* were recorded from the River Ise. *P. subtruncatum* and *P. nitidum* were the 2 most abundant species (Figure 51). Apart from a downstream increase in the abundance of *P. henslowanum*, there was no significant difference in species' composition and abundance between the 4 sample sites. Water quality would appear to be the reason for the absence of *P. tenuilineatum*.

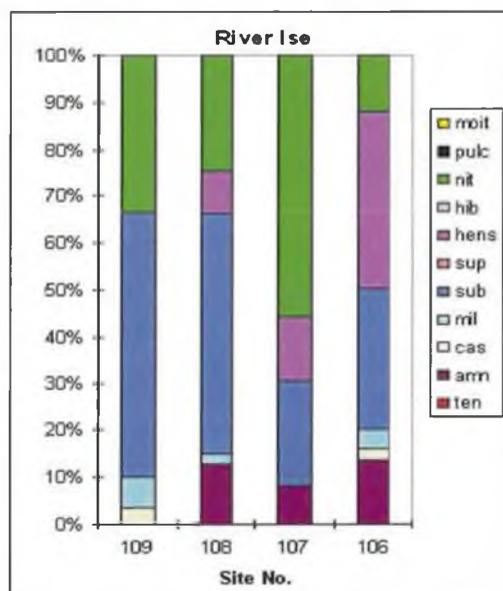


Figure 51: R. Ise – *Pisidium* species abundance at each site

5.27 River Nene

5.27.1 General characters of river

Length:	53 km to Wellingborough
Source:	SW of Daventry
Confluence:	The Wash
Direction of flow:	West/east to Wellingborough, then northeast
Velocity:	Variable, generally moderate, but swift and slow in places over sampled section
Geology:	Jurassic clays
Substrate:	Sand and gravel at the 2 upstream sample sites, mud at the 2 lower
Major towns:	Northampton, Wellingborough plus numerous villages
Land use:	High intensity agriculture, urban, industry
Environment Agency	5 – see Table below
Monitoring sites:	

5.27.2 Previous records

Pisidium tenuilineatum was previously recorded (as dead shells only) from the River Nene at Earls Barton and Kislingbury in 1969 (Conch. Soc.).

5.27.3 Results

No. of sampling sites	4
No. of sites with <i>Pisidium tenuilineatum</i>	0

See Appendix 2 for results of *Pisidium* sampling.

5.27.4 Water quality

Recorded conductivity at sample sites: Range 736 to 861 $\mu\text{s/cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Flore	SP645597	Spring/Aut 1995	1.9/1.13	8.5/6.07	-	0.32/1.85
Duston Mill	SP729597	Spring/Aut 1995	1.27/1.43	11.2/5.7	-	0.27/1.26
Billing Road	SP814611	Spring/Aut 1995	1.0/1.55	11.2/3.8	-	0.13/0.47
White Mills	SP858620	Spring/Aut 1995	1.0/1.5	11.4/8.0	-	0.31/3.45
Gt Doddington	SP876637	Spring/Aut 1995	1.0/1.65	12.0/8.6	-	0.34/3.0

5.27.5 Comments

Nine species of *Pisidium* were recorded from the River Nene, although there are no clear changes in species' composition or abundance from the upstream to the downstream sites (Figure 52). *P. henslowanum* and *P. subtruncatum* were the most

frequent. *P. hibernicum* was found only at one site, and a single individual of *P. pulchellum* was found at Earls Barton. This species is most often found in good quality water. As water quality would appear to be the reason for the absence of *P. tenuilineatum*, it is surprising that *P. pulchellum* was present.

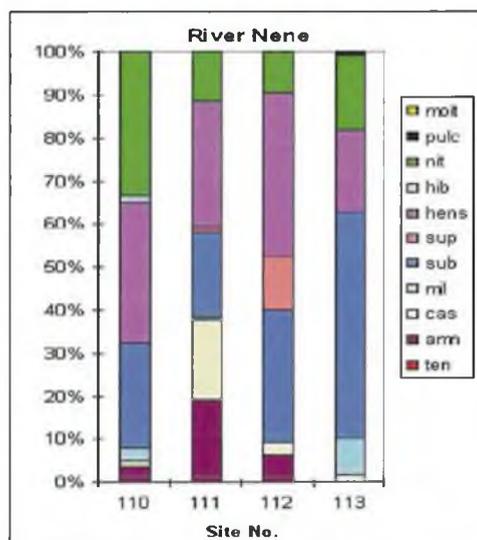


Figure 52: R. Nene – *Pisidium* species abundance at each site

5.28 River Great Ouse

5.28.1 General characters of river

Length:	132 km to Roxton
Source:	West of Brackley
Confluence:	The Wash
Direction of flow:	Southwest to northeast
Velocity:	Variable over sample area, with swift, moderate and slow sections
Geology:	Jurassic clays
Substrate:	Mud in slow sections, sand and gravel in faster sections
Major towns:	Buckingham, Milton Keynes, Olney, Bedford
Land use:	High intensity agriculture, urban, industry, navigation
Environment Agency	4 (in sample area) - Harrold Bridge, Kempston Mill, Castle
Monitoring sites:	Mill, Roxton Lock

5.28.2 Previous records

Pisidium tenuilineatum was previously recorded (as dead shells only) from the Ouse at Bromham in 1968 and at Radwell in 1984 (Conch. Soc.).

5.28.3 Results

No. of sampling sites 5
 No. of sites with *Pisidium tenuilineatum* 0

See Appendix 2 for results of *Pisidium* sampling.

5.28.4 Water quality

Recorded conductivity at sample sites: Range 831 to 983 μ s

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Harrold Bridge	SP955566	Spring/Aut 1995	1.33/1.23	10.2/5.77	-	0.33/2.4
Kempston Mill	TL024477	Spring/Aut 1995	1.75/1.57	10.2/4.83	-	0.34/2.17
Castle Mill	TL092509	Spring/Aut 1995	2.0/1.78	9.1/5.83	-	0.36/2.48
Roxton Lock	TL160535	Spring/Aut 1995	2.1/2.23	10.2/5.56	-	0.4/1.88

5.28.5 Comments

P. tenuilineatum was not found. Eight other species of *Pisidium* were recorded although there are no significant changes in species' composition and abundance from the upstream to the downstream sites (Figure 53). *P. subtruncatum* was generally the most abundant species and *P. hibernicum* was unusually frequent at 2 of the sites. Water quality would appear to be the reason for the absence of *P. tenuilineatum*.

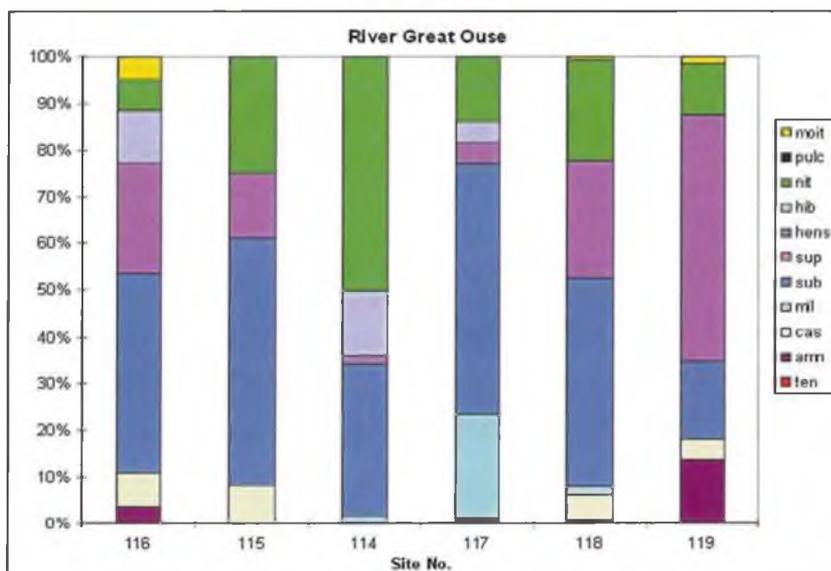


Figure 53: R. Great Ouse – *Pisidium* species abundance at each site

5.29 River Axe

5.29.1 General characters of river

Length:	53 km
Source:	Springs north-east of Beaminster
Confluence:	Sea at Seaton, E. Devon
Direction of flow:	Approximately east to west until Chard Junction, the swinging to a south-westerly flow
Velocity:	Variable, the river has swift, moderate and slow stretches; it is mostly at least moderate.
Geology:	Lias, greensand, gault and Keuper marl, sandstone and Bunter sandstone
Substrate:	Variable chiefly flint gravels, but silty-mud in slower stretches and some slower margins
Major towns:	Axminster, Seaton
Land use:	Mostly improved cattle pasture; some forestry
Environment Agency	No water quality data was obtained
Monitoring sites:	

5.29.2 Previous records

There do not appear to be any previous records of *Pisidium tenuilineatum* from the Axe.

5.29.3 Results

No. of sampling sites	9
No. of sites with <i>Pisidium tenuilineatum</i>	2

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
1 Ax	Clapton Mill	ST414054	141	0	0
2 Ax	Forde Abbey	ST363053	26	0	0
3 Ax	Chard Junction	ST343048	103	0	0
4 Ax	Broom Bridge	ST325025	329	0	0
5 Ax	Axe Bridge	ST323017	385	0	0
6 Ax	Weycroft	SY306998	224	1	0.45
7 Ax	Bow Bridge	SY290982	225	1	0.44
8 Ax	Woodhayne Farm	SY270961	388	0	0
9 Ax	Colyford	SY259925	377	0	0

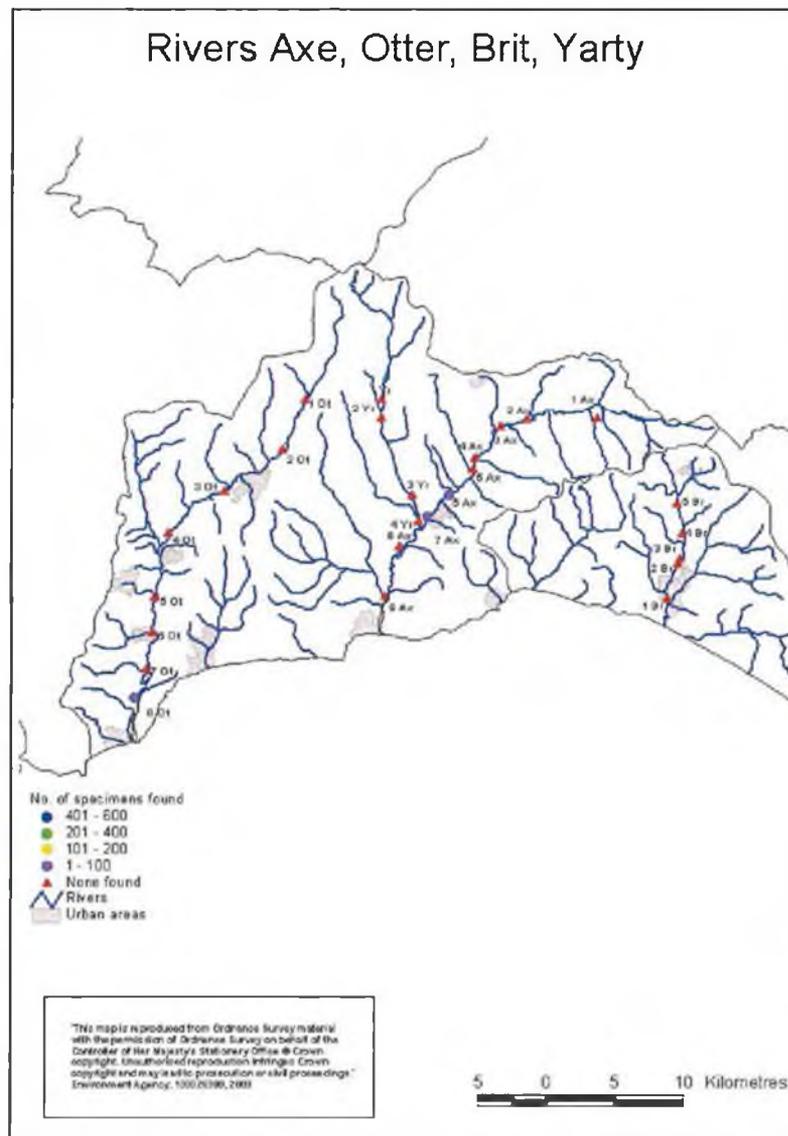


Figure 54: Sample locations in the Rivers Axe, Otter, Brit & Yarty

5.29.4 Water quality

Recorded conductivity at sample sites: Range 492 to 552 $\mu\text{s}/\text{cm}$

There was not any Environment Agency chemical water quality available.

5.29.5 Comments

P. tenuilineatum was recorded only as single individuals at two sample sites. Eight other species of *Pisidium* were recorded; their distribution and abundance does not follow any clear pattern. The fauna is dominated by three species, *P. nitidum*, *P. subtruncatum* and *P. amnicum* with *P. nitidum* most frequent in the faster flowing stretches. Unlike its the tributary, the River Yarty, substantial algal growth was not evident in the Axe during the survey.

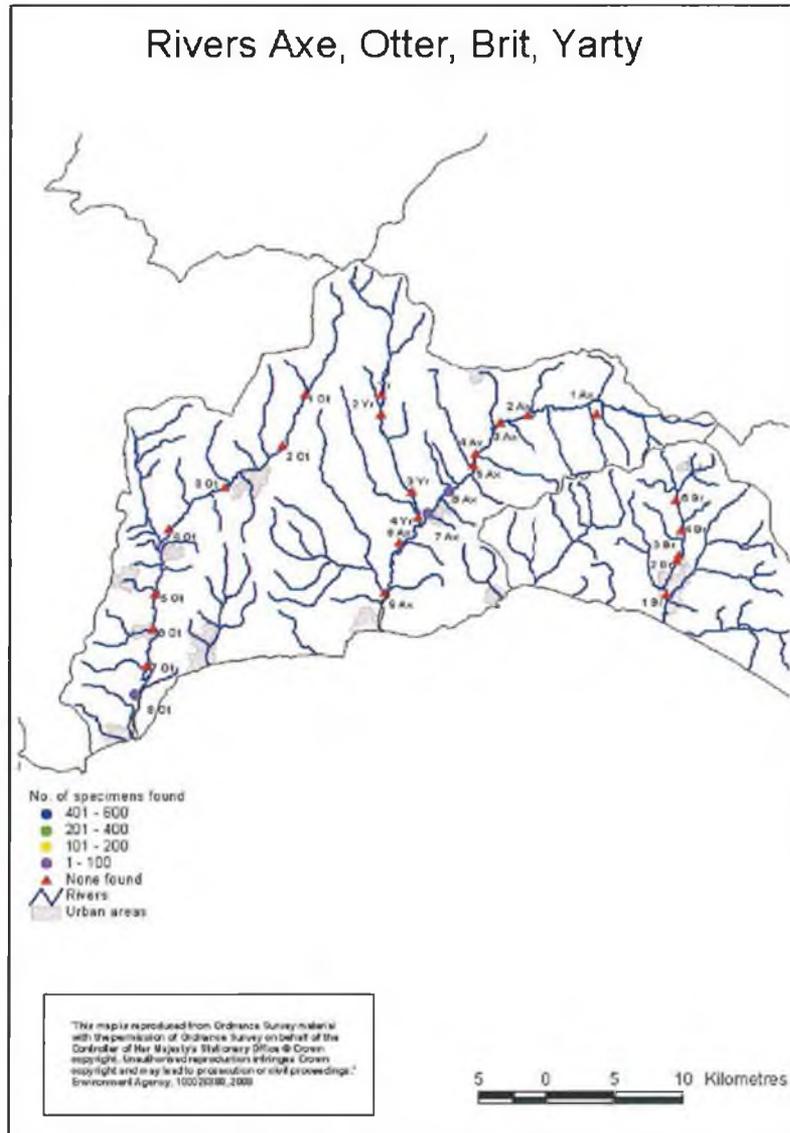


Figure 55: R. Axe – *Pisidium* species abundance at each site

5.30 River Brit

5.30.1 General characters of river

Length:	19.5 km
Source:	Near Beaminster
Confluence:	Sea at West Bay (immediately south of Bridport).
Direction of flow:	North to south
Velocity:	The river mostly varies between swift – moderate although is slow at and below Bridport
Geology:	Cornbrash & Inferior Oolite (Jurassic limestones); chalk near source.
Substrate:	Mostly flint gravels and sand above Bridport; muddy/silt from Bridport to West Bay.
Major towns:	Beaminster, Bridport
Land use:	Mostly improved cattle pasture; some forestry
Environment Agency	No water quality data was obtained
Monitoring sites:	

5.30.2 Previous records

There are no records for *Pisidium tenuilineatum* from the Brit.

5.30.3 Results

No. of sampling sites	5
No. of sites with <i>Pisidium tenuilineatum</i>	0

See Figure 54 for location of sample sites. See Appendix 2 for results of the *Pisidium* sampling.

5.30.4 Water quality

Recorded conductivity at sample sites: Range 544 to 577 $\mu\text{s}/\text{cm}$

There was not any Environment Agency chemical water quality available.

5.30.5 Comments

With the exception of site1, it was difficult to find more than small quantities of fine sediments in this river. This was the main reason why numbers of individual *Pisidium* were low. At sample site 5 the water was turbid and smelled of domestic sewage.

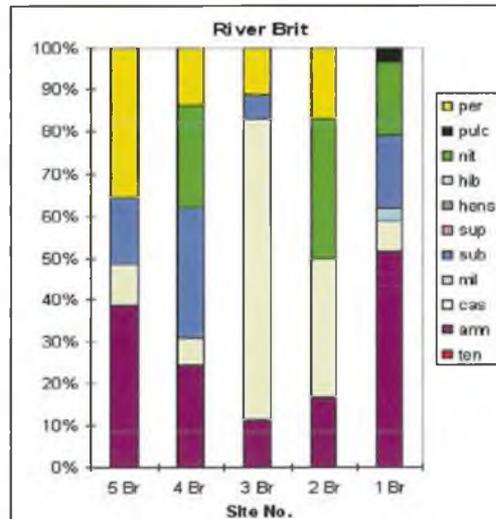


Figure 56: R. Brit – *Pisidium* species abundance at each site

5.31 River Otter

5.31.1 General characters of river

Length:	53 km
Source:	South Blackdown Hills near Birch Wood, Somerset
Confluence:	The sea at Budleigh Salterton, East Devon
Direction of flow:	South-west
Velocity:	Variable; swift to moderate
Geology:	Lias, Keuper marl, upper greensand and gault clay
Substrate:	Chiefly gravels and sand.
Major towns:	Honiton, Sidmouth
Land use:	Mostly improved cattle pasture
Environment Agency	No water quality data was obtained
Monitoring sites:	

5.31.2 Previous records

There do not appear to be any previous records of *Pisidium tenuilineatum* from the Otter.

5.31.3 Results

No. of sampling sites	8
No. of sites with <i>Pisidium tenuilineatum</i>	1

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
1 Ot	New Bridge	ST201068	29	0	0
2 Ot	Monkton	ST184031	15	0	0
3 Ot	Weston	ST143001	140	0	0
4 Ot	Woodford Barton	SY102971	21	0	0
5 Ot	Fluxton	SY092924	91	0	0
6 Ot	Bridge End	SY091898	148	0	0
7 Ot	Colaton Raleigh	SY086872	408	0	0
8 Ot	Otterton	SY078851	294	1	0.34

See Figure 54 for location of sample sites

5.31.4 Water quality

Recorded conductivity at sample sites: Range 227 to 449 $\mu\text{s}/\text{cm}$

There was not any Environment Agency chemical water quality available.

5.31.5 Comments

P. tenuilineatum was recorded as a single individual at one sample site. Six other species of *Pisidium* were recorded. The fauna was dominated by three species, *P. nitidum*, *P. subtruncatum* and *P. casertanum*. A constant feature of all sites except Site 8 was the presence of algal growth (both filamentous and *Enteromorpha* spp). In some sites it covered all submerged surfaces except in the fastest flowing water.

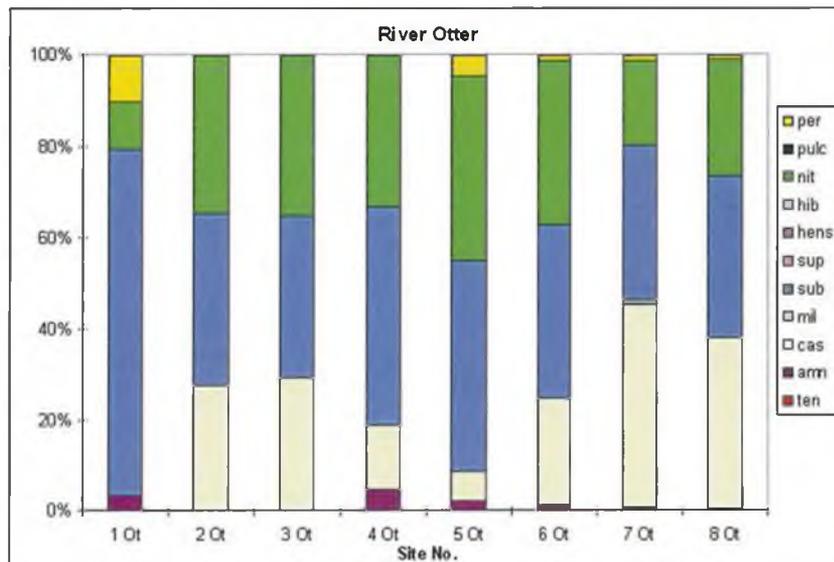


Figure 57: R. Otter – *Pisidium* species abundance at each site

5.32 River Yarty

5.32.1 General characters of river

Length:	19 km
Source:	Near Buckland St Mary, Somerset
Confluence:	Joins River Axe just below Axminster
Direction of flow:	South-east
Velocity:	Variable, the river has swift to moderate
Geology:	Lias, greensand, gault and Keuper marl, sandstone and Bunter sandstone
Substrate:	Chiefly sandstone gravels,
Major towns:	Axminster at confluence
Land use:	Mostly improved cattle pasture
Environment Agency	No water quality data was obtained
Monitoring sites:	

5.32.2 Previous records

There are no records of *Pisidium tenuilineatum* from the Yarty.

5.32.3 Results

No. of sampling sites	4
No. of sites with <i>Pisidium tenuilineatum</i>	0

See Figure 54 for location of sample sites. See Appendix 2 for results of the *Pisidium* sampling.

5.32.4 Water quality

Recorded conductivity at sample sites: Range 333 to 485 $\mu\text{s}/\text{cm}$

There was not any Environment Agency chemical water quality available.

5.32.5 Comments

There are no records for *Pisidium tenuilineatum* from the Yarty. At the sampling sites the river is almost devoid of aquatic vegetation except for a grey algal scum on many submerged objects. Except for Site 4 (at the lowest point on the river) is little fine marginal sediment.

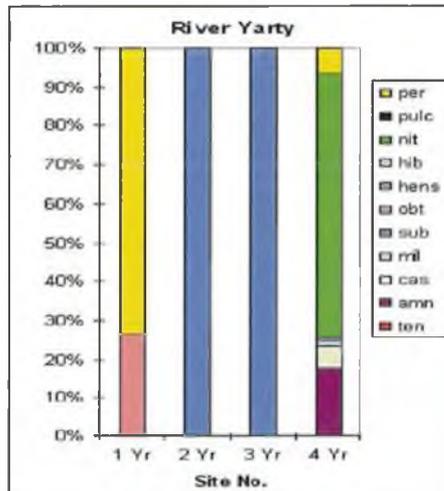


Figure 58: R. Yarty – *Pisidium* species abundance at each site

5.33 River Frome

5.33.1 General characters of river

Length:	75 km
Source:	Springs near Evershot, Dorset
Confluence:	Wareham, Poole Harbour
Direction of flow:	South then east
Velocity:	Variable, the river has swift to moderate
Geology:	Chiefly chalk
Substrate:	Variable from flint gravels in upper and middle reaches to mud and silt in lower reaches.
Major towns:	Maiden Newton, Dorchester, Wareham
Land use:	Mostly improved cattle pasture although some arable (cereals) in upper valley
Environment Agency Monitoring sites:	16 sites: details are given in the table below

5.33.2 Previous records

There do not appear to be any previous records of *Pisidium tenuilineatum* from the Frome.

5.33.3 Results

	2000 survey	2001 survey
No. of sampling sites	11	10
No. of sites with <i>Pisidium tenuilineatum</i>	2	7

2000 Whole River Survey

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
1 Fr	Sandhills	ST586005	14	0	0
2 Fr	Cattistock	SY591993	36	0	0
3 Fr	Little Cruxton	SY603967	223	0	0
4 Fr	Grimstone	SY643936	258	0	0
5 Fr	Dorchester	SY673923	50	0	0
6 Fr	Norton Mill Farm	SY738901	374	0	0
7 Fr	Pallingham Fishery	SY783912	155	0	0
8 Fr	Pallingham Farm	SY785909	316	0	0
9 Fr	Broompond Dairy	SY814884	448	7	1.56
10 Fr	Wool Bridge	SY844872	85	0	0
11 Fr	Holme Bridge	SY889864	298	7	2.34

2001 Lower River Survey

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
12 Fr	Broompond Dairy	SY813886	746	0	0
13 Fr	Broompond Dairy	SY814884	56	0	0
14 Fr	Winfrith	SY815877	335	0	0
15 Fr	Winfrith	SY817876	295	1	0.34
16 Fr	East Burton	SY832874	918	7	0.76
17 Fr	Bindon Abbey	SY859868	371	4	1.07
18 Fr	Stokeford	SY865866	172	3	1.74
19 Fr	East Stoke	SY874867	596	2	0.34
20 Fr	Rushton Farm	SY885863	357	2	0.56
21 Fr	Holme Bridge	SY889864	171	14	8.19

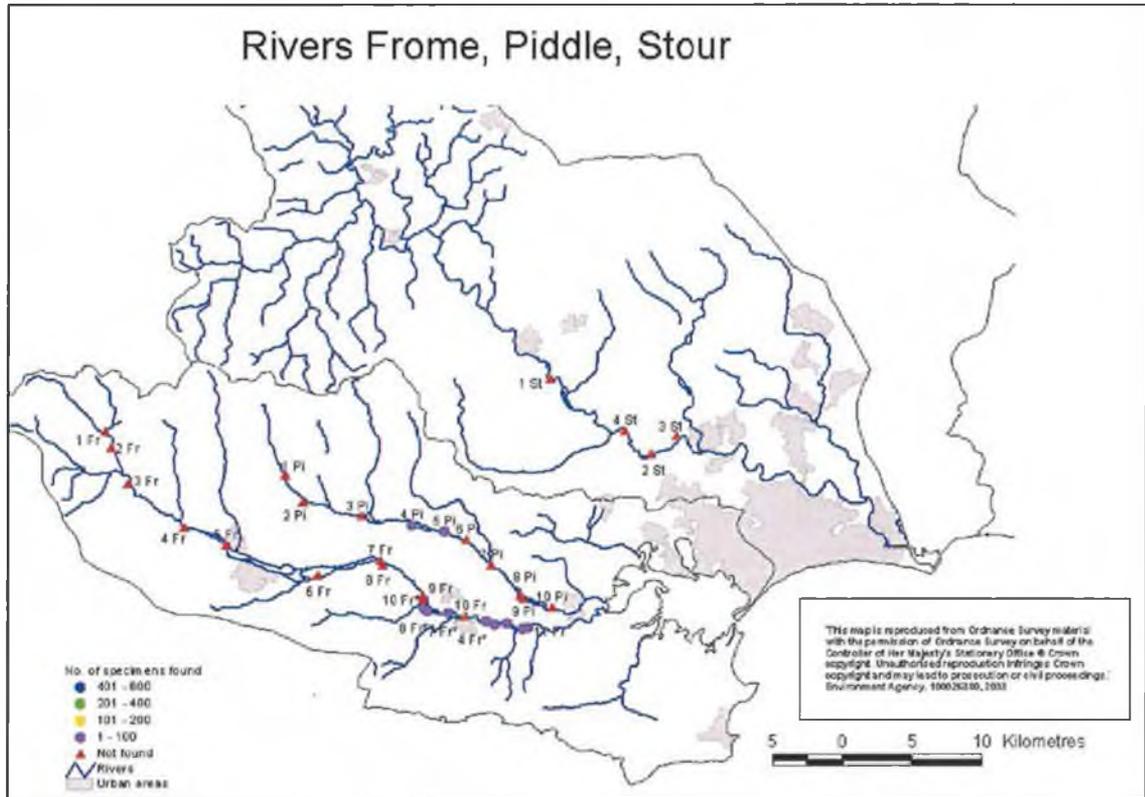


Figure 59: Sample locations in the R. Frome, Piddle & Stour

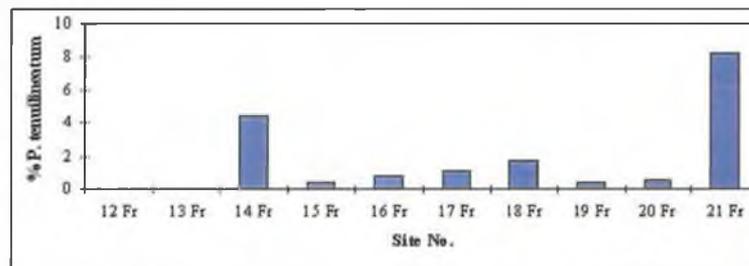


Figure 60: R. Frome— distribution and abundance of *P. tenuilineatum*

5.33.4 Water quality

2000 survey: Recorded conductivity at sample sites: Range 575 to 643 $\mu\text{s}/\text{cm}$

2001 survey: Recorded conductivity at sample sites: Range 353 to 576 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Holme Bridge	SY89050 86700	19/01/99 to 13/12/00	24	1.53	5.98	0.034	0.205
Environment Agency St Stoke	SY87200 87000	19/01/99 to 08/12/00	24	1.44	5.46	0.032	n/a
Wool Bridge	SY84400 87200	04/01/99 to 13/12/00	23	1.61	5.66	0.038	n/a
u/s Lytchett confluence	SY84000 87300	28/01/99 to 27/12/00	24	1.5	5.71	0.034	n/a
Winfrith EA	SY81800 87700	28/01/99 to 28/11/00	24	1.5	5.61	0.036	n/a
Moreton footbridge	SY80550 89550	19/01/99 to 08/12/00	25	1.43	5.9	0.029	n/a
d/s Golden Springs	SY79500 90500	25/01/99 to 21/12/00	23	1.52	5.95	0.028	n/a
Pallington	SY78500 91000	25/01/99 to 13/12/00	24	1.58	5.75	0.028	n/a
Brockhampton	SY72100 90500	04/01/99 to 21/12/00	24	1.85	5.68	0.037	n/a
u/s Dorchester STW Louds Mill	SY70800 90300	04/01/99 to 22/12/00	24	1.64	5.3	0.024	n/a
Greys Bridge Dorchester	SY70000 90850	04/01/99 to 21/12/00	24	1.81	5.25	0.025	n/a
Whitfield Lodge	SY68850 91500	07/03/00 to 27/12/00	12	1.68	5.34	0.027	n/a
Lower Burton	SY687909 1570	04/01/99 to 09/09/99	9	1.53	4.87	0.03	n/a
Notton	SY609319 5991	27/01/99 to 11/12/00	24	1.69	4.77	0.033	n/a
Maiden Newton	SY59561 97689	27/01/99 to 11/12/00	24	1.4	4.21	0.013	n/a
Sandhills	ST58495 00425	27/01/99 to 11/12/00	24	1.56	4.36	0.019	n/a

5.33.5 Comments

In 2000, *Pisidium tenuilineatum* was recorded only at two sites on the lower Frome below Morton at low abundances of 1.54% and 2.34%. The 2001 survey focussed upon the river between near Morton and downstream at Holme Bridge. The species was not found again at Broompond Dairy. This maybe due to the absence in 2001, of the fine marginal sediment bank, which was present in 2000. The 2001 samples show fairly low

total faunal % between Winfrith and Rushton Farm. The site at Holme Bridge, the furthest station downstream, produced the greatest proportion of *Pisidium tenuilineatum* with 8.19% of the *Pisidium* consisting of this species. This was considerably larger than the 2.34% *P. tenuilineatum* recorded at this site 14 months earlier. Ten other species of *Pisidium* were recorded on the Frome; the dominant species at most sites being *P. nitidum*. *P. henslowanum* is a species only recorded on the lower Frome below Morton. The species was found in greatest numbers at the lowest sites on the river.

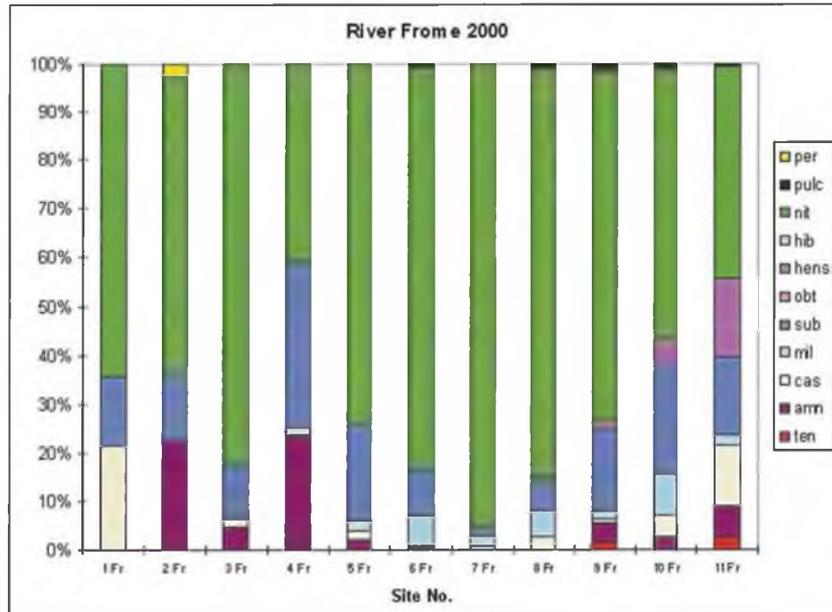


Figure 61: R. Frome – *Pisidium* species abundance at each site (2000 survey)

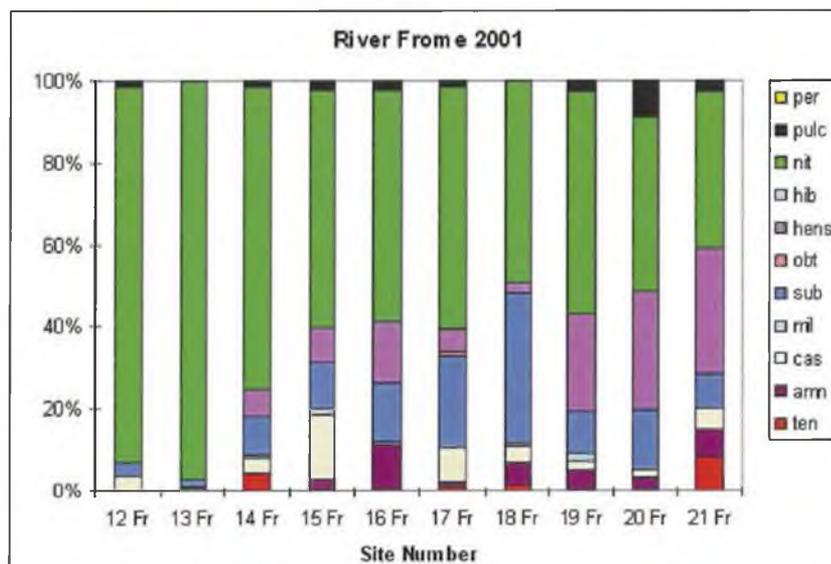


Figure 62: R. Frome – *Pisidium* species abundance at each site (2000 survey)

5.34 River Piddle

5.34.1 General characters of river

Length:	43 km
Source:	Near Alton Pancras
Confluence:	Wareham, Poole Harbour
Direction of flow:	South then east
Velocity:	Variable, the river has swift, moderate
Geology:	chalk
Substrate:	Variable from gravels, with some marginal silty mud
Major towns:	Puddletown, Wareham
Land use:	Mostly improved cattle pasture although some arable (cereals) in upper valley
Environment Agency Monitoring sites:	6 sites: details are given in the table below

5.34.2 Previous records

There do not appear to be any records of *Pisidium tenuilineatum* from the Piddle.

5.34.3 Results

See Figure 59 for location of sample sites

No. of sampling sites	10
No. of sites with <i>Pisidium tenuilineatum</i>	2

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
1 Pi	Piddlehinton	SY715973	75	0	0
2 Pi	Higher Waterston	SY728954	340	0	0
3 Pi	Athlehampton	SY770944	192	0	0
4 Pi	Affpuddle	SY806937	55	1	1.8
5 Pi	Throop	SY829933	55	4	7.27
6 Pi	Chamberlaynes's Farm	SY845927	351	0	0
7 Pi	Woodlands	SY863909	107	0	0
8 Pi	Trigon Farm	SY884887	21	0	0
9 Pi	Lower Trigon Farm	SY886885	1	0	0
10 Pi	Carey nr. Wareham	SY906878	23	0	0

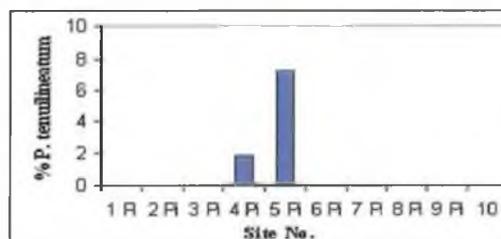


Figure 63: R. Piddle– distribution and abundance of *P. tenuilineatum*

5.34.4 Water quality

Recorded conductivity at sample sites: Range 530 to 650 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
d/s 8 Hatches fish farm	SY89330 88120	08/01/99 to 13/12/00	24	1.83	6.69	0.048	n/a
Hyde	SY86500 90500	08/01/99 to 27/11/00	23	1.26	7.27	0.023	n/a
Turnerspudde	SY83000 93300	15/01/99 to 22/12/00	24	1.33	7.73	0.017	n/a
Puddletown	SY75700 94700	15/01/99 to 15/12/00	24	1.16	7.75	0.019	n/a
Piddlehinton	SY71500 97200	15/01/99 to 15/12/00	24	1.35	6.33	0.018	n/a
Alton Pancras	ST70000 02400	15/01/99 to 15/12/00	24	2.25	7.57	0.014	n/a

5.34.5 Comments

P. tenuilineatum was only recorded on the Piddle at two sites in the middle reaches of the river (1.8% at 4 Pi; 7.27% at 5 Pi). According to one landowner spoken too during the survey, the upper Piddle suffered from very low water flows down to Athlehampton on at least two occasions since 1976. This may offer a possible explanation for the absence of *P. tenuilineatum* from some seemingly suitable sites on the upper Piddle. Despite apparently suitable clean, fine marginal sediments at sites 6 Pi and 7 Pi no *P. tenuilineatum* were recovered. The outflow stream from the fish farm at site 9 Pi was almost devoid of *Pisidium*. The dominant *Pisidium* species recorded during the survey are *Pisidium subtruncatum* and *P. nitidum*. Except at Site 1 Pi, *Pisidium amnicum* was only present in low numbers and was not recorded at the 3 lowest sites on the river.

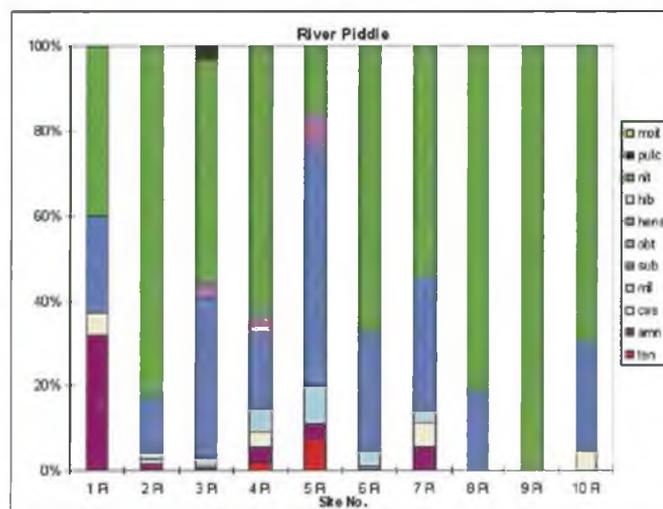


Figure 64: R. Piddle – *Pisidium* species abundance at each site

5.35 River Stour

5.35.1 General characters of river

Length:	97 km
Source:	Stourton
Confluence:	Christchurch, Hampshire
Direction of flow:	South-east
Velocity:	Variable moderate to slow
Geology:	Jurassic clays, chalk and tertiary strata
Substrate:	In survey sections of river: mud and silt
Major towns:	Blandford Forum, Ferndown, Christchurch
Land use:	Arable and improved cattle pasture
Environment Agency	No water quality data was obtained
Monitoring sites:	

5.35.2 Previous records

There are no records of *Pisidium tenuilineatum* from the Stour.

5.35.3 Results

See Figure 59 for location of sample sites. See Appendix 2 for results of the *Pisidium* sampling.

No. of sampling sites	4
No. of sites with <i>Pisidium tenuilineatum</i>	0

5.35.4 Water quality

Recorded conductivity at sample sites: Range 543 to 550 $\mu\text{s}/\text{cm}$
 There was not any Environment Agency chemical water quality available.

5.35.5 Comments

The *Pisidium* fauna in the middle Stour is dominated by *Pisidium nitidum*, *P. henslowanum* and *P. subtruncatum*.

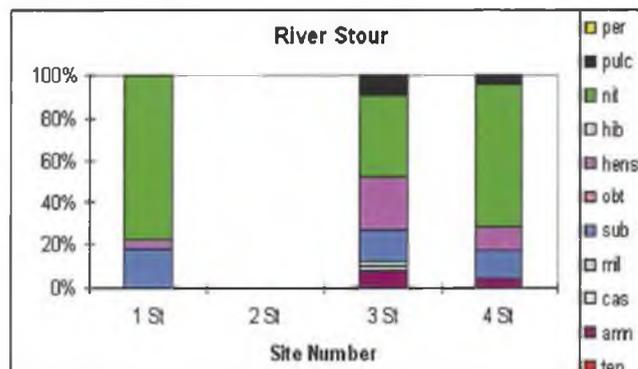


Figure 65: R. Stour – *Pisidium* species abundance at each site

5.36 River Avon

5.36.1 General characters of river

Length:	153 km
Source:	Near Pewsey, Wilts.
Confluence:	Sea at Christchurch, Hants.
Direction of flow:	North to south
Velocity:	Variable but mostly swift to moderate
Geology:	Chalk
Substrate:	Flint gravel except mud and silt in some slower stretches or in occasional marginal areas
Major towns:	Pewsey, Amesbury, Salisbury, Fordingbridge, Ringwood, Christchurch
Land use:	Arable and improved - unimproved cattle pasture, wetland grazing marshes, urban
Environment Agency Monitoring sites:	11 sites; see table below

5.36.2 Previous records

Ham and Bass (1982) record single individuals at three sites, one north of Salisbury, one in Salisbury and one south of Sopley Island near Christchurch. Killeen (1998a) also reports finds from three sites, two in or just south of Salisbury and a third slightly to the north of Ham and Bass's site at Sopley.

5.36.3 Results

No. of sampling sites	14
No. of sites with <i>Pisidium tenuilineatum</i>	1

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
7 Av	North Newton	SU133573	118	0	0
6 Av	Upavon	SU134540	203	0	0
5 Av	East Chisenbury	SU140528	154	0	0
4 Av	Fifield	SU147503	162	0	0
3 Av	Netheravon	SU150485	157	0	0
2 Av	Ablington	SU156466	140	0	0
1 Av	Durrington	SU165445	153	0	0
8 Av	Normanton	SU136406	73	0	0
10 Av	Great Durnford	SU133382	86	0	0
9 Av	Upper Woodford	SU125373	271	3	1.1
11 Av	Little Durnford Bridge	SU123342	295	0	0
12 Av	Avon Bridge	SU128330	252	0	0
13 Av	North Salisbury	SU126326	359	0	0
14 Av	Near Christchurch	SZ154953	189	0	0

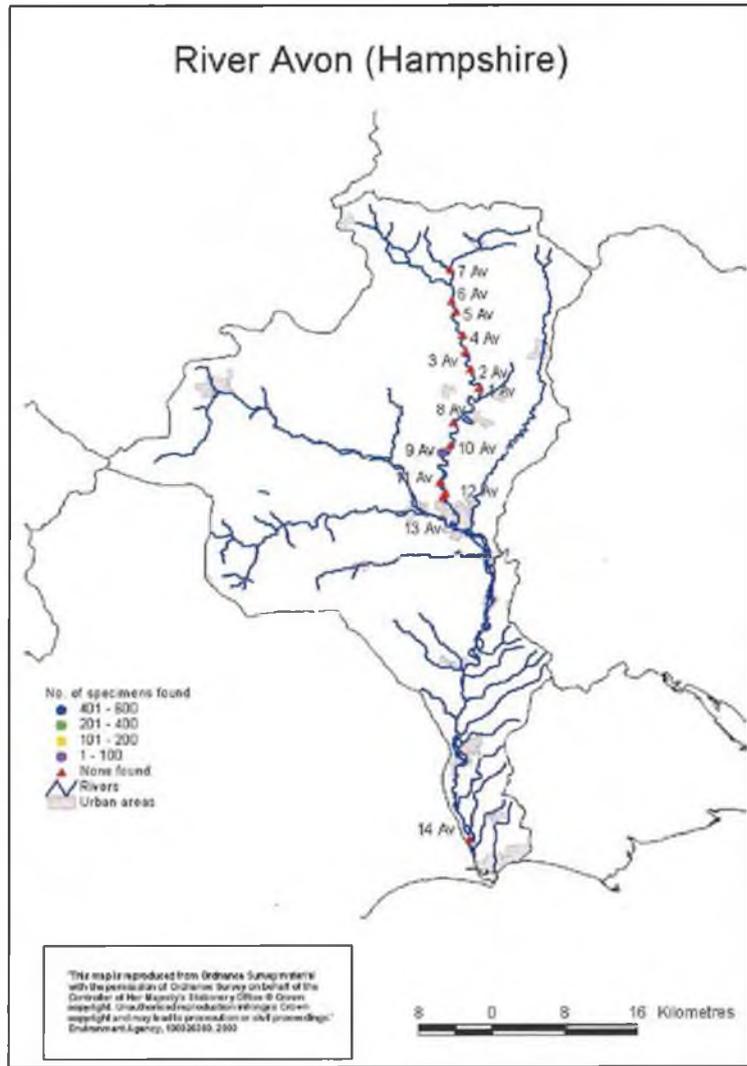


Figure 66: Sample locations in the R. Avon

5.36.4 Water quality

Recorded conductivity at sample sites: Range 553 to 671 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Knapp Mill	SZ15500 93700	26/01/99 to 22/12/00	48	1.51	5.62	0.038	0.25
Avon Causeway	SZ14940 97780	26/01/99 to 05/12/00	48	1.5	5.42	0.04	
Bulford A3028	SU16400 43700	06/01/99 to 12/12/00	24	1.4	6.04	0.027	
Swan Bridge Pewsey	SU16300 59700	06/01/99 to 12/12/00	24	1.74	8.41	0.041	
Netheravon d/s STW	SU15500 47900	06/01/99 to 12/12/00	28	1.38	6.49	0.034	
Sharcott	SU15200 59300	06/01/99 to 12/12/00	48	1.56	8.33	0.056	
u/s of Netheravon STW	SU15000 48500	18/01/99 to 12/12/00	24	1.36	6.49	0.035	
Amesbury	SU14900 41000	06/01/99 to 12/12/00	28	1.35	5.86	0.027	
Upavon	SU13300 56000	06/01/99 to 12/12/00	27	1.84	7.33	0.064	
STR Sub Castle	SU12900 33000	06/01/99 to 12/12/00	28	1.49	5.78	0.024	

5.36.5 Comments

With the exception of Site 10Av (a slow flowing, muddy stretch of river upstream of a mill) the *Pisidium* fauna was dominated by *Pisidium nitidum* and *Pisidium subtruncatum*. Fine sediments seemingly suitable for *Pisidium tenuilineatum* were present at several sites although *P. tenuilineatum* was only recorded at site 9 Av, the sampling only producing three specimens. Previous surveys have also produced only low numbers of *Pisidium tenuilineatum*. Thus Ham and Bass (1982) produced only single specimens of *P. tenuilineatum* from each of three samples from a total of 16 sites surveyed on the river. One of these (Avon Bridge, Site 12 Av) was also sampled on this survey, but no further *P. tenuilineatum* were recovered. In 1998 Killeen (Killeen, 1998a) also found the species in low numbers recording on 6 specimens from 3 of a total of 10 sampled on the river.

At all sites sampled on the Avon above Salisbury (all sites sampled except 14 Av) filamentous algal growth was evident in the river. At some sites (e.g. 2 Av) it blanketed submerged sediments and aquatic vegetation.

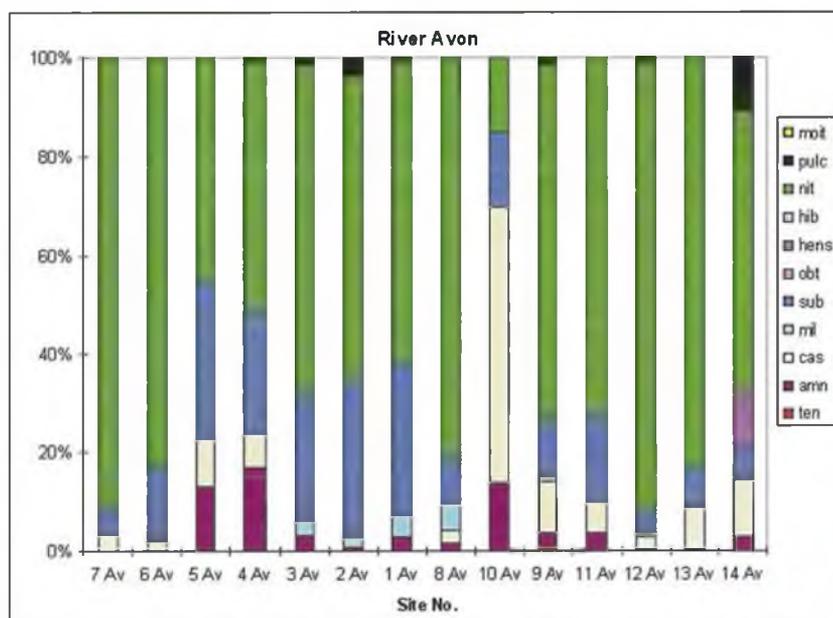


Figure 67: R. Avon – *Pisidium* species abundance at each site

5.37 River Itchen

5.37.1 General characters of river

Length:	41 km
Source:	Cheriton, Hants.
Confluence:	Meets Southampton Water at Southampton
Direction of flow:	Westerly and then near Winchester flows south
Velocity:	The river varies between swift and moderate
Geology:	Feed chiefly from chalk springs
Substrate:	Variable from flint gravels with occasional marginal bars of mud and silt
Major towns:	Alresford, Winchester, Eastleigh, Southampton
Land use:	Arable and improved - unimproved cattle pasture, wetland grazing marshes, urban
Environment Agency	No water quality data was obtained
Monitoring sites:	

5.37.2 Previous records

Kerney (in Bratton 1991) cites the presence of *Pisidium tenuilineatum* in the river at Winchester Meadows SSSI. Killeen (1998a) also confirmed populations of the species at three sites in central Winchester.

5.37.3 Results

No. of sampling sites 14
 No. of sites with *Pisidium tenuilineatum* 8

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
1 It	Ovington	SU563317	703	0	0
2 It	Avington	SU535325	414	0	0
3 It	Avington Lake	SU529323	429	0	0
7 It	Chilland	SU523326	1064	0	0
4 It	Abbotts Worthy (n. carrier)	SU502325	759	11	1.4
5 It	Abbotts Worthy (s. carrier)	SU501324	308	0	0
6 It	Abbotts Worthy Mill	SU498324	312	0	0
13 It	Abbotts Barton (e. carrier)	SU494312	449	55	12.2
14 It	Abbotts Barton (w. carrier)	SU490314	568	11	1.94
15 It	Hyde	SU486300	622	83	13.4
12 It	Winnal (Winchester)	SU487299	820	43	5.2
8 It	Tumbling Bay	SU477263	902	55	6.0
9 It	Shawford Mill	SU474249	428	42	9.8
10 It	Otterbourne Farm	SU469227	181	6	3.3
11 It	Highbridge	SU469214	682	0	0

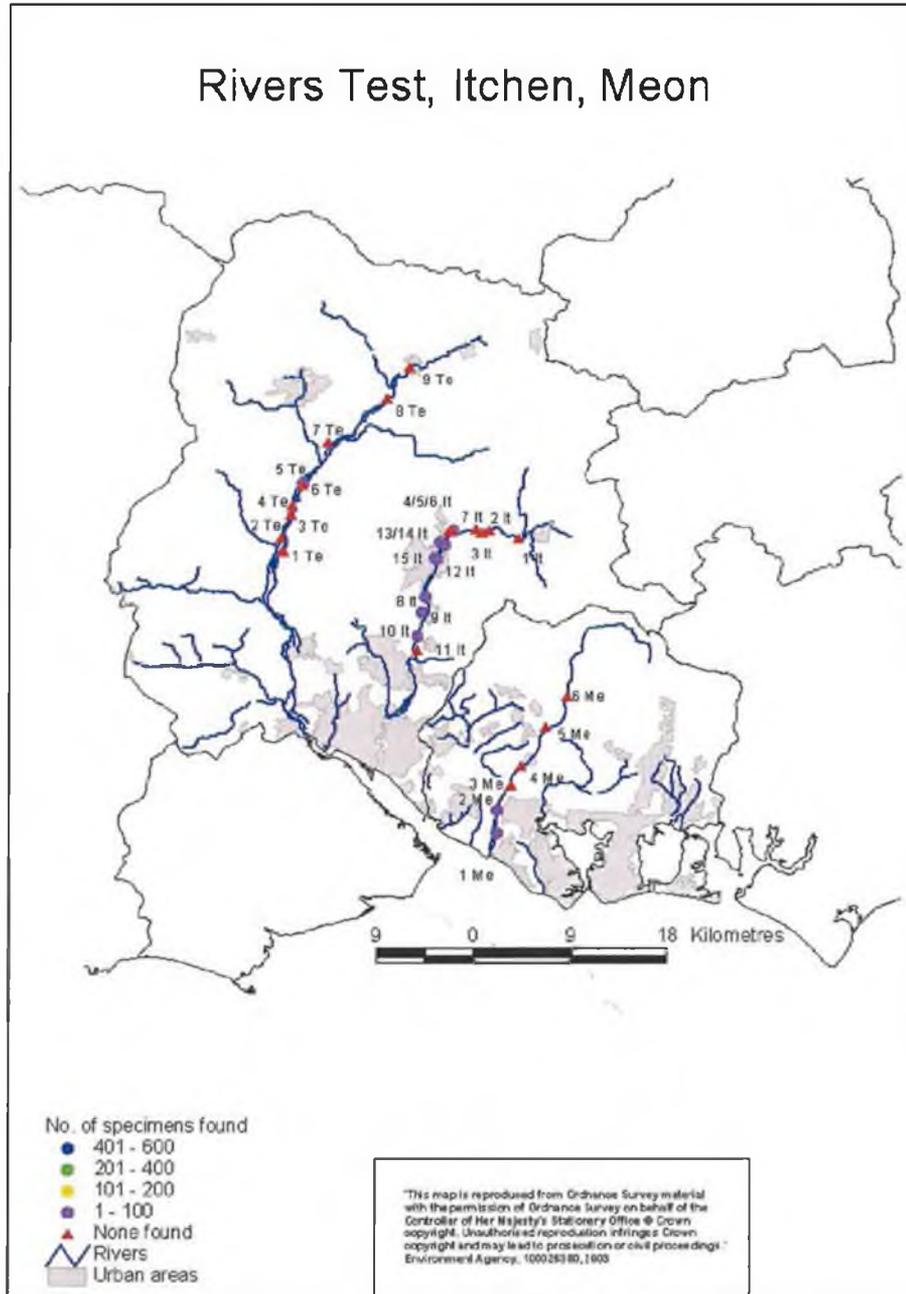


Figure 68: Sample locations in East Hampshire Basin rivers

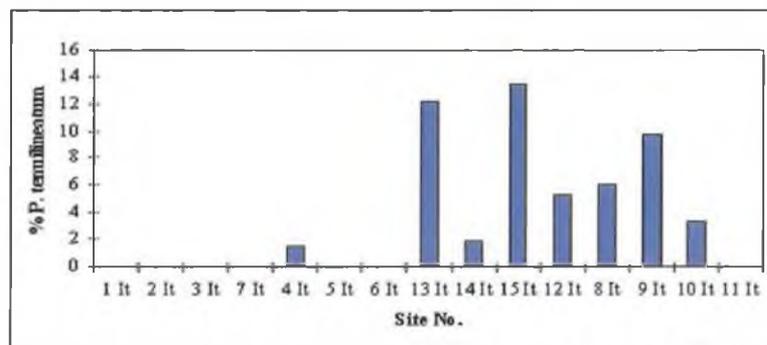


Figure 69: R. Itchen – distribution and abundance of *P. tenuilineatum*

5.37.4 Water quality

Recorded conductivity at sample sites: Range 506 to 578 $\mu\text{s}/\text{cm}$

There was not any Environment Agency chemical water quality available.

5.37.5 Comments

P. tenuilineatum was recorded at 8 of the 15 sites sampled. It was not found at any sites at or upstream of Chillland. Killeen (1998) also failed to locate the species upstream of this point. It maybe significant that the River Itchen has many watercress beds and also several fish farms above this point. At the time of survey, cress workers were observed scattering fertiliser granules on the cress beds just west of Alresford.

P. tenuilineatum was present at sites between Abbots Worthy (just upstream of Winnall Moors), Winchester and Otterbourne Farm, Otterbourne about 5-6km south of Winchester with two sites, 13It and 15It on the Winnall Moors carriers (north Winchester) producing 12.2% and 13.4% respectively. In his survey in 1998, Killeen also recovered 'strong' populations in Winchester (slightly further south of the Winnall samples) with *P. tenuilineatum* occurring up to 19% of the *Pisidium* fauna. At Shawford Mill (Site 9 It) *P. tenuilineatum* formed 9.8% of the *Pisidium* present. According to the mill owner the bank of fine sediment, which was sampled at this site was deposited during flooding less than six months before. This observation may suggest that *P. tenuilineatum* is capable of colonising newly formed, favourable habitats, relatively quickly. No *P. tenuilineatum* were found on this survey or by Killeen in 1998 at Highbridge (Site 11It), the furthest downstream sampling point on the river. The current survey and that undertaken by Killeen in 1998 reveal similar results with *P. tenuilineatum* appearing in the river just above Winchester, forming a significant component of *Pisidium* populations in the Winchester area and an absence of the species in the apparently suitable river silts at Highbridge.

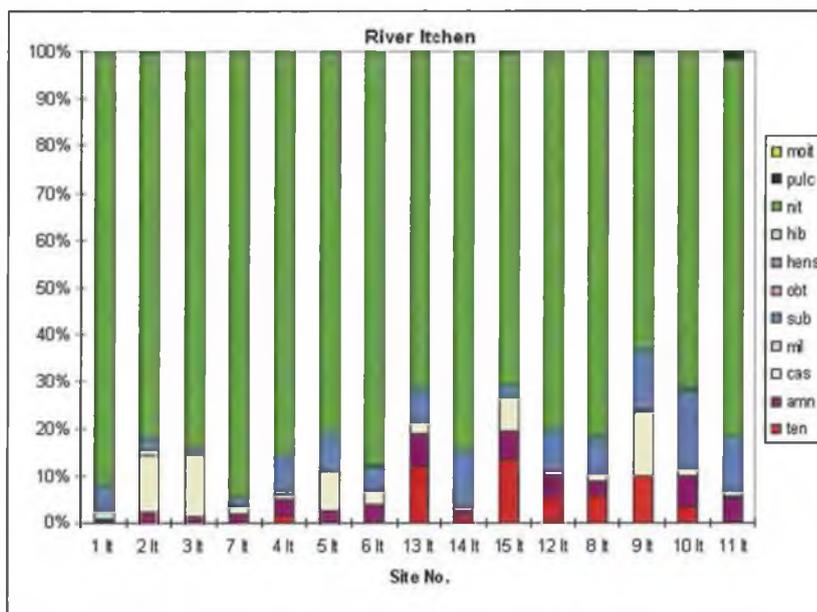


Figure 70: R. Itchen – *Pisidium* species abundance at each site

5.38 River Test

5.38.1 General characters of river

Length:	64 km
Source:	Overton, Hants
Confluence:	Meets Southampton Water at Southampton
Direction of flow:	South westerly and from near Andover due south
Velocity:	The river mostly has a swift to moderate
Geology:	River is fed by chalk springs
Substrate:	Variable from flint gravels with occasional marginal bars of mud and silt
Major towns:	Andover, Romsey, Southampton
Land use:	Arable and improved - unimproved cattle pasture, wetland grazing marshes, urban
Environment Agency	7 sites (details given in table below).
Monitoring sites:	

5.38.2 Previous records

There are a few previous records of *Pisidium tenuilineatum* from the River Test; at Timsbury near Romsey and Kimbridge immediately south of Mottisfont (both Conch. Soc., 1970. In 1998 Killeen (Killeen 1998c) found the species at 3 sites in the Test and one in the River Dun all at Mottisfont.

5.38.3 Results

See Figure 68 for sample locations

No. of sampling sites	9
No. of sites with <i>Pisidium tenuilineatum</i>	1

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
1 Te	Horsebridge	SU345305	404	0	0
2 Te	Houghton	SU343318	652	0	0
3 Te	North Houghton Farm	SU351339	310	0	0
4 Te	Stockbridge	SU353348	330	0	0
5 Te	Longstock	SU362369	615	15	2.43
6 Te	Nr Longstock	SU363367	325	0	0
7 Te	Wherwell	SU386406	189	0	0
8 Te	Longparish	SU441447	749	0	0
9 Te	Whitchurch	SU461477	199	0	0

5.38.4 Water quality

Recorded conductivity at sample sites: Range 556 to 585 μ s

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Town Mill, Whitchurch Environment Agency St Aston Common	SU46680 48070	12/01/99 to 12/12/00	25	1.41	6.31	0.025	n/a
Forton	SU42220 43610	12/01/99 to 23/11/00	24	1.29	6.24	0.014	n/a
Wherwell	SU39630 40820	12/01/99 to 12/12/00	51	1.24	6.81	0.016	n/a
u/s Andover STW	SU38190 39210	12/01/99 to 23/11/00	25	1.31	6.28	0.014	n/a
Mayfly Inn	SU38180 38970	12/01/99 to 23/11/00	25	1.29	7.24	0.032	n/a
Longstock at Leckford	SU36130 36810	12/01/99 to 12/12/00	25	1.26	7.01	0.023	n/a

5.38.5 Comments

P. tenuilineatum was only recorded at one site which was just off the main river at the confluence of a small tributary. In addition to *P. tenuilineatum* six other species were recorded. At all sites the *Pisidium* community was dominated by *Pisidium nitidum*. *Pisidium amnicum* was only found in the main river above Longstock and occurred most frequently at Site 5 Te, the only Site where *P. tenuilineatum* was recorded.

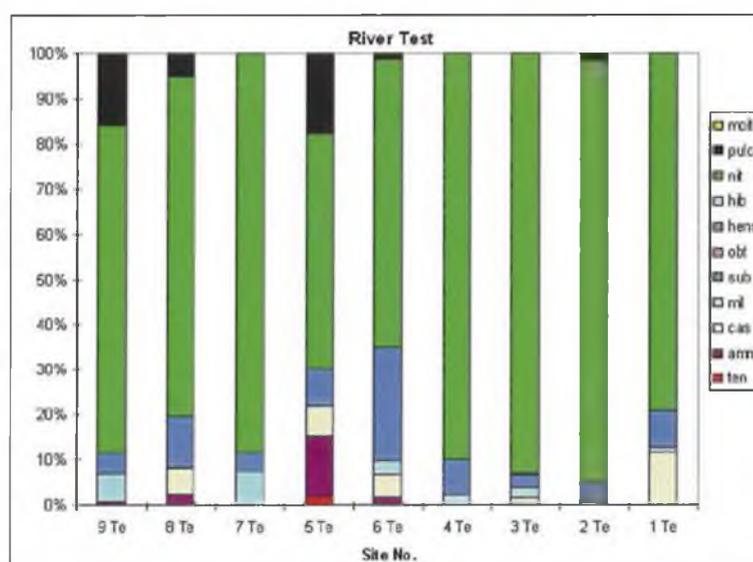


Figure 71: R. Test – *Pisidium* species abundance at each site

5.39 River Meon

5.39.1 General characters of river

Length:	34 km
Source:	East Meon
Confluence:	Enters the Solent south of Titchfield
Direction of flow:	From the source the river flows north-west but then turns to flow south-westwards near to West Meon
Velocity:	The river has swift flow for most of its length becoming moderate close to Titchfield.
Geology:	River is fed by chalk springs
Substrate:	For most of its course the river bed consists of flint gravel; only the lower reaches have significant areas of mud and silt.
Major towns:	Wickham, Fareham
Land use:	Arable and improved - unimproved cattle pasture, wetland grazing marshes (near Titchfield), urban
Environment Agency	No water quality data was obtained
Monitoring sites:	

5.39.2 Previous records

There are no previous records of *Pisidium tenuilineatum* from the Meon.

5.39.3 Results

See Figure 68 for sample locations

No. of sampling sites	6
No. of sites with <i>Pisidium tenuilineatum</i>	2

Site No.	Site	Grid Ref	Total <i>Pisidium</i>	No. <i>P. ten</i>	% <i>P. ten</i>
1 Me	Titchfield NNR	SU543045	54	1	1.8
2 Me	Titchfield Abbey	SU543065	19	1	5.2
3 Me	Gt Funtley Farm	SU556089	113	0	0
4 Me	Wickham	SU565106	57	0	0
5 Me	Mislingford	SU588142	58	0	0
6 Me	Soberton	SU608171	57	0	0

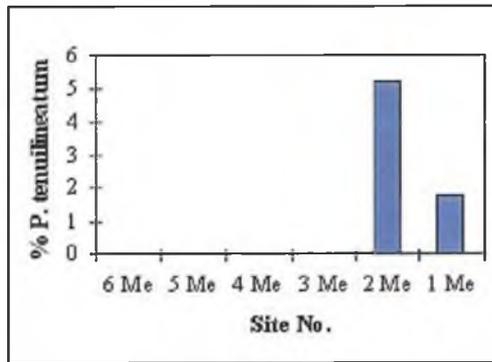


Figure 72: R. Meon – distribution and abundance of *P. tenuilineatum*

5.39.4 Water quality

Recorded conductivity at sample sites: Range 540 to 556 $\mu\text{s}/\text{cm}$

There was not any Environment Agency chemical water quality available.

5.39.5 Comments

P. tenuilineatum was recorded as single specimens from the lowest two sites surveyed (1Me and 2Me). A total of 7 species of *Pisidium* was recorded from the river. The *Pisidium* fauna in the four upstream samples (3-6Me) was dominated by *Pisidium nitidum*. In the samples containing *P. tenuilineatum* the proportion of *P. nitidum* is lower whilst that of *P. casertanum* is higher.

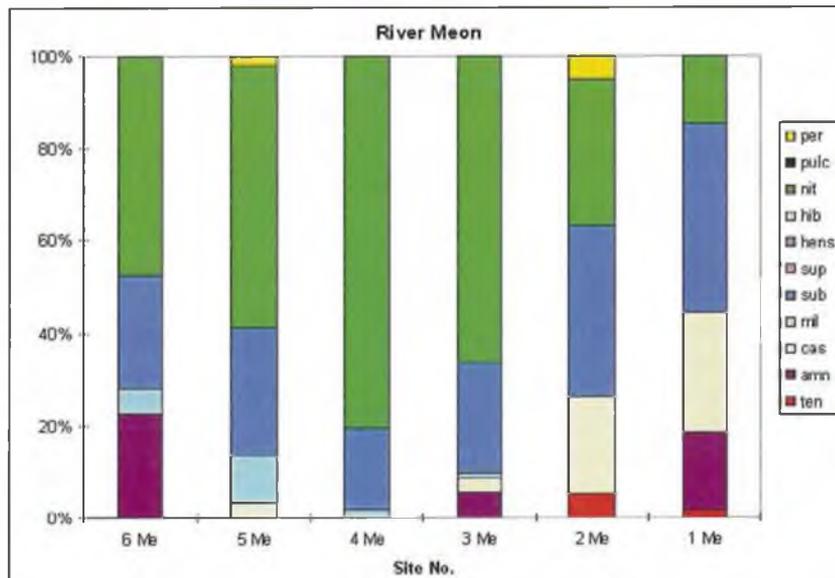


Figure 73: R. Meon – *Pisidium* species abundance at each site

5.40 River Rother and Harting Pond

5.40.1 General characters of river

Length:	52 km
Source:	The Rother rises near Selborne, Hampshire; Harting Pond at Old Ditcham, near South Harting (the outflow stream from Harting Pond enters the Rother near Rogate, West Sussex.
Confluence:	Joins the River Arun at Pulborough, West Sussex. Harting Pond is fed by a stream arising from springs.
Direction of flow:	The river flows south-eastwards to Petersfield and then eastwards until it joins the River Arun.
Velocity:	Variable, the river has swift to moderate flow
Geology:	The source and many tributaries arise on the chalk; inflow tributaries from the north flow from the lower greensand
Substrate:	Upper reaches have predominantly flint gravel but much of the river has a sandy bed; fine silt and mud is only occasional on some sheltered margins.
Major towns:	Liss, Petersfield, Midhurst
Land use:	Moderate to high intensity agriculture
Environment Agency	5 sites; see table below
Monitoring sites:	

5.40.2 Previous records

There are no previous records of *Pisidium tenuilineatum* from the River Rother but the species has recorded living in a small outflow stream just below Harting Pond in the late 1969 (Kerney 1970). Survey of the pond and outflow stream in 2000 failed to relocate the species.

5.40.3 Results

No. of sampling sites	11
No. of sites with <i>Pisidium tenuilineatum</i>	0

5.40.4 Water quality

Recorded conductivity at sample sites: Range 420 to 678 $\mu\text{s}/\text{cm}$

Environment Agency chemical water quality data (means):

Site	Grid Ref	Sample period	n	BOD mg/l	TON mg/l	Nitrite mg/l	Phosphate mg/l
Shopham Bridge	SU98450 18510	20/01/99 to 07/12/00	26	2.18	4.64	0.039	n/a
Mizzards Farm road bridge	SU80380 22750	06/01/99 to 29/11/00	25	1.57	3.78	0.027	n/a
Durford Bridge	SU78250 23300	06/01/99 to 29/11/00	26	1.86	5.09	0.041	n/a
B3006 road bridge at Liss	SU77650 27720	06/01/99 to 29/11/00	26	1.63	3.66	0.027	n/a
Princes Bridge Liss	SU77050 26820	06/01/99 to 29/11/00	26	1.69	4.71	0.031	n/a

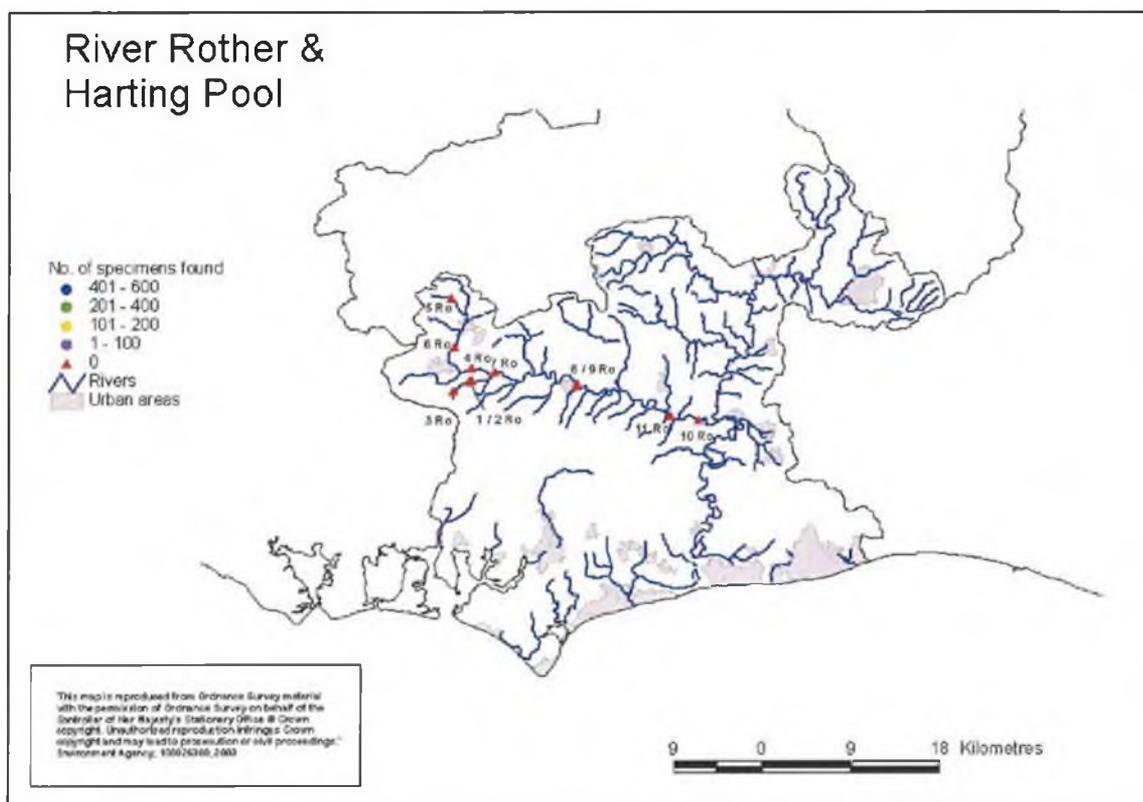


Figure 74: Sample locations in R. Rother and Harting Pond

5.40.5 Comments

The survey of Harting Pond and the outflow stream produced a *Pisidium* assemblage identical to that described for the site by Kerney (1970) except for the absence of *Pisidium tenuilineatum*. When Harting Pond was surveyed in July 2000 rafts of filamentous algae were floating on the surface of the pond suggesting that it might be suffering from nutrient enrichment.

Locating areas of fine muddy/silty sediments is difficult in the River Rother. The relatively low numbers of *Pisidium* found at sampling sites is, at least partially, due to

the small quantities of suitable fine sediment; much of the river bed consists of sand. Unlike many of the 'southern' rivers surveyed *Pisidium nitidum* occurs in low numbers in the Rother. From Midhurst downstream to Fittleworth, *Pisidium henslowianum* is a major component of the *Pisidium* community with *Pisidium supinum* appearing at sites 10 Ro and 11 Ro, the furthest downstream sampling stations.

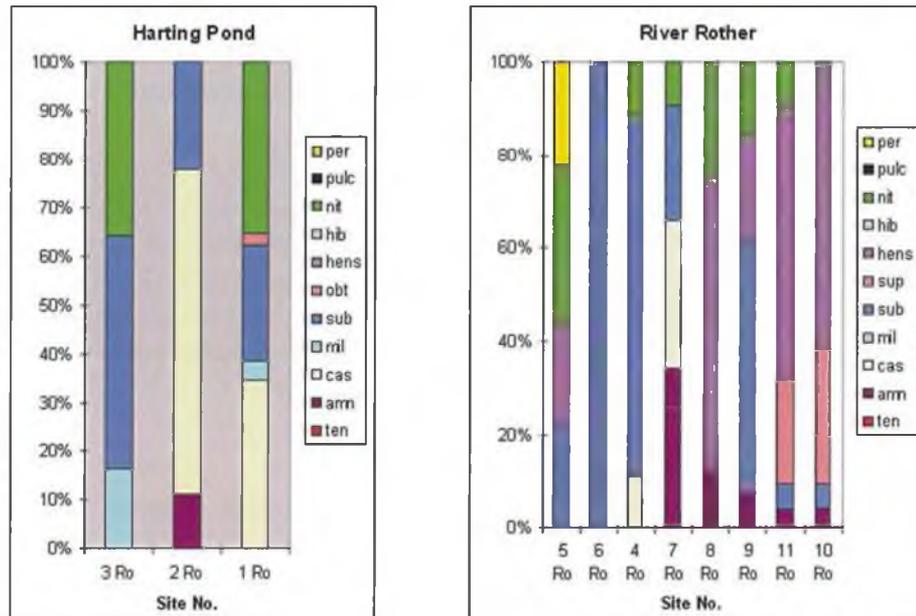


Figure 75: Harting Pond & R. Rother – *Pisidium* species abundance at each site

6 CONCLUSIONS

It is difficult to give a precise formula for the conservation of *Pisidium tenuilineatum* as many details of its ecology are unknown and the parameters of its environmental 'envelope' are unclear. However, following recent extensive surveys of its distribution in southern England, enough details are known about its habitat to allow a set of conservation guidelines and suggestions to be produced.

6.1 Water Quality Requirements of *Pisidium tenuilineatum*

There is plentiful circumstantial evidence to suggest that *P. tenuilineatum* requires clean water with low/moderate levels of dissolved nitrate and phosphate. Thus there are sections of rivers which have suitably hard water and areas of fine marginal sediments (mud/silt), but an absence of *P. tenuilineatum* (e.g. much of the River Itchen above Winchester and the upper River Avon north of Downton). In some locations, river sediments and aquatic vegetation were coated in filamentous algae and/or grey 'sewage fungus'. Sources of such plant nutrient input include:

- Agricultural fertilisers/animal slurry run-off;
- Treated (but not nitrate/phosphate 'scrubbed') sewage effluent;
- Fertiliser additions to water cress beds;
- Outflow waters from fish farms (containing faecal and excretory fish wastes and also food residues).

It would seem that all such sources of nutrient input to rivers need to be controlled and minimised in order to create favourable conditions for *P. tenuilineatum*.

6.2 Sediment Requirements of *Pisidium tenuilineatum*

Pisidium tenuilineatum is usually found living in fine sediments (mud/silt) that only deposit and remain where water flow velocity is low. In some slow flowing stretches of rivers (e.g. upstream of mill dams), fine sediments supporting *P. tenuilineatum* may be present across the entire width of the river channel. However, in most rivers, banks of fine sediment usually occur at the river margins. Fine sediment may accumulate downstream of beds of emergent marginal vegetation (e.g. *Phragmites*, *Sparganium*), below channel obstructions (e.g. alder or willow stumps) or in small sheltered bays and backwaters. In some rivers (e.g. stretches of the Kennet, upper Avon, Test and Itchen) the river margins may be artificially straightened and embanked with vertical corrugated metal sheeting or woven willow/chestnut hurdles. Such management prevents the accumulation of fine sediments by allowing fast water flow right up to the river edge.

To enhance the development and retention of suitable *P. tenuilineatum* sediments, river management should allow (or even actively encourage by planting) at least some clumps of marginal vegetation to remain so that bars of fine sediment can accumulate. The artificial deepening and embankment of river margins should be discouraged because they significantly reduce the chances of fine sediments, suitable for *P. tenuilineatum* populations, accumulating.

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KEYS TO APPENDICES

Appendix 1: Environmental data for each site

Keys:

Flow: S = slow or standing, M = moderate, F = fast

Depth: At sample location in metres

Width: Approximate width of river at sample location

Plants: Marginal and aquatic plants present at the sample location:-

Abbreviation	Plant	Abbreviation	Plant
Ac	<i>Acorus calamus</i>	My	<i>Myosotis scorpioides</i>
An	<i>Apium nodiferum</i>	Myr	<i>Myriophyllum</i> spp.
Bi	<i>Polygonum amphibium</i>	Nu	<i>Nuphar lutea</i>
C	<i>Callitriche</i> sp.	Pg	<i>Phragmites australis</i>
Cl	<i>Cladophora</i> sp.	Ph	<i>Phalaris arundinacea</i>
Cr	<i>Carex riparia</i>	Po	<i>Potamogeton</i> spp.
Ec	<i>Elodea canadensis</i>	Ra	<i>Ranunculus</i> spp.
El	<i>Elodea</i> sp.	Ro	<i>Rorippa nasturtium-aquaticum</i>
En	<i>Enteromorpha</i> sp.	Sa	<i>Sagittaria sagittifolia</i>
Font	<i>Fontinalis</i> sp.	Sc	<i>Schoenoplectus tabernaemontani</i>
Gf	<i>Glyceria fluitans</i>	Se	<i>Sparganium erectum</i>
Gm	<i>Glyceria maxima</i>	Sem	<i>Sparganium emersum</i>
Hi	<i>Hippuris vulgaris</i>	Sp	<i>Scrophularia nodosa</i>
Ir	<i>Iris pseudacorus</i>	Ty	<i>Typha latifolia</i>
Ma	<i>Mentha aquatica</i>		

Substrate: estimated % composition at sample location

Con: Recorded conductivity in microsiemens per centimetre (corrected to 25°C)

Appendix 2: Numbers of each *Pisidium* species recorded at each site

Keys:

ten: *Pisidium tenuilineatum*

amn: *Pisidium amnicum*

per: *Pisidium personatum*

obt: *Pisidium obtusale*

cas: *Pisidium casertanum*

mil: *Pisidium milium*

sub: *Pisidium subtruncatum*

sup: *Pisidium supinum*

hens: *Pisidium henslowanum*

hib: *Pisidium hibernicum*

nit: *Pisidium nitidum*

pulc: *Pisidium pulchellum*

moit: *Pisidium moitessierianum*

TOTAL: Total number of *Pisidium* specimens collected

APPENDIX 1: ENVIRONMENTAL DATA FOR EACH SITE

RIVER WHITEWATER												
SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con μ s/cm	Comments
								Silt %	Sand %	Gravel %		
190	Lodge Farm	SU734524	07/07/2001	F	<0.3	4	An Ra	75	25		567	
191	u/s A30	SU740545	07/07/2001	M-F	0.3-0.5	5	Se Gm C	80	10	10	578	
136	d/s Whitewater Mill	SU737553	20/06/2001	M-F	0.3-0.5	5	Se Gm An C Ra	95	5		549	
137	Diple Mill	SU743577	20/06/2001	S-M	0.2-0.4	8	C Cr Gm Nu	98	2		566	
138	Mattingley	SU738584	20/06/2001	M	0.3-0.5	7	Gm Ph C Ra	80	20		580	
139	Holdshott Farm	SU739602	20/06/2001	M-F	0.3-0.6	5	Gm Ph Ra	50	40	10	569	
135	Heckfield	SU738613	18/06/2001	M	0.3-0.5	9	C Ra Cr Gm Se	80	20		566	
140	Riseley Mill	SU738623	20/06/2001	M	0.8	10	Sem Nu	80	20		584	suitable habitat v sparse
141	u/s Blackwater	SU741634	20/06/2001	M	0.5->1	13	Se Gm Sem	75	25		602	

RIVER HART												
SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con μ s/cm	Comments
								Silt %	Sand %	Gravel %		
131	NE Elvetham Hall	SU787567	18/06/2001	M-F	0.45	1.5-2	Se Ty My C Ra Cl	75	25		588	
132	u/s Hartfordbridge	SU779575	18/06/2001	M-F	0.5	3	Se My Nu Sem Ra	95	5		596	
133	d/s Hartfordbridge	SU768582	18/06/2001	M-F	0.4-0.7	5	Cr Gm Se Sem Nu	80	20		590	
134	Hazeley	SU750598	18/06/2001	M-F	0.4-0.7	6	Cr Se Sem Ra Nu	70	25	5	600	

RIVER BLACKWATER												
SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con μ s/cm	Comments
								Silt %	Sand %	Gravel %		
149	d/s Sandhurst	SU825616	07/07/2001	F	0.2-0.5	6	An C Ra	30	60	10	696	
148	Eversley Cross	SU796623	07/07/2001	M	0.3->1	8	Gm Sem Nu Ra	80	20		725	
150	New Mill ford	SU762629	07/07/2001	M-F	0.4	6	Ra Cl	40	50	10	703	
142	u/s Whitewater	SU743635	20/06/2001	M	0.8->1.2	10	Cr Se Nu Sem	50	50		744	very little suitable habitat
151	Swallowfield	SU734645	07/07/2001	S	0.3-0.8	13	Cr Se Nu Sem	80	20		726	

APPENDIX 1: CONTINUED

RIVER LODDON												
SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Silt %	Substrate Sand %	Gravel %	Con µs/cm	Comments
PT20	Pyott's Hill	SU667537	18/11/1997	M	0.9	9	Cr	80	20		nm	
26	Wildmoor Farm	SU693558	22/03/2000	M-F	0.4-0.8	6	Cr Ty Gm Ma C Ra	80	20		698	
PT23	Mill Farm, Hartley W.	SU697573	18/11/1997	M-F	0.4-0.8	5	Cr C Ra	95	5		nm	
24	Sherfield Loddon A33	SU683583	22/03/2000	M-F	0.4	7	Cr An C Ra Cl	95	5		717	
23	Lilymilt Farm	SU677593	22/03/2000	M-F	<0.4	8	Cr An C Ma Ra Ec	95	5		722	area of fine mud in lee of ford
189	Lilymilt Farm - repeat	SU677593	21/07/2001	M-F	<0.4	8	Cr An C Ma Ra	95	5		nm	area of fine mud in lee of ford
25	Stratfield Turgis	SU688602	22/03/2000	F	0.6-0.8	7	Cr Gm Cl Ra C	90	10		710	fine sediments sparse
PT9	Stratfield Saye	SU692611	16/11/1997	S-M	1.3	10	Cr Gm Se C	98	2		nm	
72	Stratfield Saye Park	SU696612	05/06/2000	S-M	0.5-1.2	8	Gm Ty My Se Nu Ec Sem	95	5		708	
71	Stratfield Saye Park	SU705625	05/06/2000	F	0.3-0.5	9	Gm Ty Ma Se Ra C	95	5		699	
PT8	Stanford End	SU707628	16/11/1997	M-F	0.6	7	Cr Ra	80	20		nm	
73	d/s Stanford End	SU703635	05/06/2000	M	0.4-1.0	6	Se Gm Sem C	95	5		720	
28	Loddon Court	SU715648	06/05/2000	M-F	>0.8	10	Gm Se Sc	50	50		709	
190	Loddon Court - repeat	SU715648	21/07/2001	M-F	>0.8	10	Gm Se Sc	80	20		nm	
27	Arborfield	SU743677	06/05/2000	S	>1.6	17	Se Gm Ph Nu	70	30		688	
153	Arborfield - repeat	SU743677	07/07/2001	S	1.2-1.5	17	Se Gm Ph Nu	80	20		nm	
152	Sindlesham	SU771703	07/07/2001	S-M	0.4-0.8	15	Se Se	40	60		666	

RIVER LYDE												
SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Silt %	Substrate Sand %	Gravel %	Con µs/cm	Comments
74	Hartley Wespay	SU695574	05/06/2000	M-S	<0.5	5	Gm My Ra C An	95	5		589	

APPENDIX 1: CONTINUED

RIVER KENNET

SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con μ s/cm	Comments
								Silt %	Sand %	Gravel %		
1	Axford	SU234698	15/03/2000	M	0.4	8 - 12	Cr An C Ma Ra	80	20		620	
2	Ramsbury	SU272713	15/03/2000	M-S	0.4-0.6	8 - 12	Cr Ma C	80	20		614	just d/s of confluence of 2 channels
3	Chilton Foliat	SU314705	15/03/2000	S	0.4-0.6	c.12	Ra	90	10		580	
4	Leverton	SU333698	15/03/2000	S	0.4	7 - 10	Cr Ma C Ra	100			600	mill leat with dense Callitriche
17	Denford	SU353683	20/03/2000	M	<0.4	11	Cr C	80	20		574	just d/s of confluence of 2 channels
18	d/s Denford	SU358683	20/03/2000	S-M	<0.5	11-13	C	95	5		588	wide zone (3-4m) of marginal mud
5A	Kintbury - us bridge	SU439669	15/03/2000	M-F	0.4-0.6	12	Cr Ra C	40	40	20	574	
5B	Kintbury - ds bridge	SU445667	15/03/2000	M-F	<0.5	14	Ra C	70	20	10	570	
5C	Kintbury - small leat	SU452670	15/03/2000	S	0.5	2.5	Cr Gm C	95	5		598	
6	Halfway	SU406679	15/03/2000	M-F	0.4-0.8	13	Cr Ty An C Ra Sem	90	10		566	
188	Halfway - repeat	SU406679	18/07/2001	M-F	0.4-0.8	13	Cr C Ra Sem	90	10		nm	
77	Sutton Estate	SU439669	05/06/2000	M-F	0.4-0.9	9	Ph Se Gm Cr Ra Myr	95	5		nm	
76	Sutton Estate	SU445667	05/06/2000	M-S	0.25-0.8	11	Cr Gm Se Ra Myr	90	10		nm	
75	Sutton Estate	SU452670	05/06/2000	M-S	0.8->1.2	9.5	Gm Cr Ra	90	10		nm	
19	Chamberhouse Farm	SU520656	20/03/2000	M	c. 1.3	15	Gm Nu	90	10		604	fine sediments mostly in Gm swamp
20	Brimpton	SU556658	20/03/2000	M-F	0.3->1.2	11 - 13	An Gm Cr My Ra	50	50		566	marginal fine sediments v. sparse
21	Aldermaston	SU595662	22/03/2000	M-F	0.4-0.8	17-20	Ma Ra Sem	95	5		570	wide zone of marginal mud under trees
187	Aldermaston - repeat	SU595662	17/07/2001	M-F	0.4-0.8	17-20	Ma Ra Sem	95	5		n/m	wide zone of marginal mud under trees
22	Ufton Bridge	SU617685	22/03/2000	M	1-1.3	20	Cr Ma An Nu	95	5		589	at conf with small side channel
184	Theale (Holy Brook)	SU645706	17/07/2001	F	0.3	10	An Cl	80	20		632	mud accumulation d/s bridge
185	Southcote (Holy Brook)	SU684714	17/07/2001	M-S	0.6	12	Cr Cl	80	20		654	marginal fine sediments v. sparse

APPENDIX 1: CONTINUED

RIVER LAMBOURN												
SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Silt %	Substrate Sand %	Gravel %	Conductivity $\mu\text{s/cm}$	Comments
10	Eastbury	SU353768	16/03/2000	M	<0.35	3 - 3.5	An Ra Gf	95	5		560	ephemeral habitat with muddy sward margins
9	Maidencourt Farm	SU374759	16/03/2000	F	<0.5	3.5	Gm An Ra C	98	2		540	
8	East Shefford	SU389748	16/03/2000	M-F	<0.4	4.5 - 6	Cr Gm An Ma C Ra	95	5		532	Mud amongst Ranunculus
7	Weston	SU403736	16/03/2000	F	0.2-0.6	5 - 6	Gm C An Ra	>95	<5		546	
11	Easton	SU418723	16/03/2000	M-F	0.4	7	An Ra C	90	10		554	
12	Boxford	SU430719	16/03/2000	M-F	0.3-0.5	8	Cr An C Ra Azolla	95	5		534	
15	Hunts Green	SU433703	20/03/2000	M-F	0.3-0.4	8	Gm Cr An Ra C	95	5		560	
13	Bagnor Bridge	SU453693	20/03/2000	M-F	<0.4	6 - 7	Ph An Cr C Ra	90	10		549	more habitat than for site 14
14	Bagnor d/s A34	SU456692	20/03/2000	F	<0.4	8	An Cr Ra C	90	10		554	
186	Bagnor d/s A34	SU456692	18/07/2001	M-F	<0.4	8	An Cr Ra C An Cr Gm Pg Sem	90	10		558	
16	Shaw	SU470683	20/03/2000	F	>0.9	6	Ra C	95	5		588	
16A	Shaw - stream/leat	SU472684	20/03/2000	M	0.3	3	C An Cr	100			nm	

APPENDIX 1: CONTINUED

RIVER WINDRUSH

SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con $\mu\text{s/cm}$	Comments
								Silt %	Sand %	Gravel %		
56	Bourton on the Water New Bridge, Gt	SP172201	18/05/2000	F	0.4	5.5	Cr An Ra	60	40		607	
57	Rissington	SP179177	18/05/2000	F	0.3-0.7	8.5	Ph Pg Se Cr Ra	75	20	5	590	
58	Little Barrington	SP206131	18/05/2000	M	0.25	6	Gm Se Cr Ra	95	5		616	Marginal muddy shelves
59	us Burford	SP238127	18/05/2000	M-F	0.3->1	7	Cr Gm Ma Se My Ra	95	5		587	
60	Swinbrook	SP282118	18/05/2000	F	>0.8	8	Gm Se Ra	90	10		600	
33	Cot Farm, Minster Lovell	SP314117	12/05/2000	M-F	0.4	6	Gm My Ra	95	5		585	Mud amongst Glyceria on margins
60A	Crawley	SP341118	18/05/2000	M-F	0.3-0.7	7	Gm Ra	80	15	5	575	
32	u/s Witney d/s Ducklington (W channel)	SP348107	12/05/2000	M-F	0.25	7 - 8	Gm Ma Se Ra	95	5		585	Wide muddy shelf at margin
31	channel)	SP368070	12/05/2000	F	1.1	4 - 8	Gm Ra C Myr	95	5		630	
60B	Ducklington (E channel) NE of Hardwick (E channel)	SP364079	18/05/2000	M-F	0.6->1	6	Gm Ra C	90	10		592	
30	channel)	SP389063	12/05/2000	M-F	0.4	6	Gm Ph Pg Sem	95	5		600	
60C	Standlake (W channel)	SP398036	18/05/2000	M	0.5->1	7	Gm Cr Ra An	90	10		628	
29	Standlake d/s Mill	SP405027	12/05/2000	M-F	0.6->1	7 - 10	Gm Ty Ra Myr An	90	10		615	

RIVER EVENLODE

SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con $\mu\text{s/cm}$	Comments
								Silt %	Sand %	Gravel %		
62	Bledington	SP252226	18/05/2000	F	0.2-0.6	6	Ph Se Ra	30	70		679	
61	Lyncham	SP275196	18/05/2000	M-F	>0.9	4.5	Ph Se Ra	75	25		642	
34	Chilson	SP316204	12/05/2000	F	c. 1	7	Ph Sc Ra	?100*			663	* Clay ledges, Gravel in channel
35	Chadlington	SP333207	12/05/2000	M-F	0.3->1	7	Ph Se Sc Nu Ra	50	40	10	652	
89	Charlbury	SP353195	26/06/2000	F	<0.4	5	Se Gm Ra	7	75	20	678	very little suitable habitat
85	Fawler	SP372168	26/06/2000	M-F	0.2-0.6	6	SE Gm Sc Ra Nu So	10	85	5	650	very little suitable habitat
84	Ashford Mill Farm	SP386155	26/06/2000	M-F	0.25->1	5 - 6	SE Gm Sc Ra Nu	10	90		640	very little suitable habitat
83	S of Combe	SP405147	26/06/2000	M-F	0.5	5	Ph Gm Se Sc Ra Nu	15	75	10	664	very little suitable habitat
82	Combe Station	SP420148	26/06/2000	M-F	<0.6	6 - 9	Gm Se Ph Ra Sc	5	70	25	660	very little suitable habitat
81	Purwell Farm	SP438119	26/06/2000	S	>0.8	7	Gm Sc Se Nu Sem	25	75		654	
80	Cassington	SP446104	26/06/2000	M	>0.7	6	Gm Se Sem Sc Nu Cl	20	80		684	

APPENDIX 1: CONTINUED

RIVER GLYME

SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con $\mu\text{s/cm}$	Comments
								Silt %	Sand %	Gravel %		
86	Wootton	SP440196	26/06/2000	F	0.3	3	Gm C Cl	20	30	50	608	very little suitable habitat
87	Stratford Bridge	SP443186	26/06/2000	S-M	0.2-0.7	3 - 4	Gm Ra C Cl	40	60		598	lots filamentous algae

RIVER COLN

SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con $\mu\text{s/cm}$	Comments
								Silt %	Sand %	Gravel %		
170	d/s Winsop	SP097079	11/07/2001	M	0.4-0.7	3	Gm Cr Ra Cl	60	40		588	
169	Ablington	SP103075	11/07/2001	M-F	0.25	6	Gm Ra	80	10	10	604	walled banks
67	Quenington	SP143048	28/05/2000	F	<0.7	5	Cr Gm Se Ra C	90	10		598	banks managed for angling
168	Hathrop	SP150052	11/07/2001	M	0.25	5	Gm Cr Ph	98	2		614	marginal shelf
66	Fairford	SP151012	28/05/2000	F	<0.5	5 - 7	Cr Gm Se Ra C Ma	95	5		648	canalised section of river
65	Dudgrove	SU187983	28/05/2000	M-F	0.3-0.9	4 - 6	Se Gm Cr Sem Ra	75	25		633	
93	u/s Thames confluence	SU283988	27/06/2000	M	>0.7	8	Se Cr Nu	70	30		678	fine sediments sparse

APPENDIX 1: CONTINUED

RIVER THAMES												
SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con $\mu\text{s/cm}$	Comments
								Silt %	Sand %	Gravel %		
69	Cricklade	SU094943	28/05/2000	F	c. 1	8	Gm Se Ma	90	10		582	suitable habitat v sparse
70	Castle Eaton	SU146960	28/05/2000	F	>1	8 - 10	Gm Ph	90	10		580	suitable habitat v sparse
68	Hannington Bridge	SU173961	28/05/2000	F	>1.2	10 - 15	Ph Se Sc	80	20		556	River v high post-rain
92	u/s Lechlade	SU206989	27/06/2000	M	0.8	15	Se Gm Cl	95	5		588	
64	u/s Buscot	SU225984	28/05/2000	S-M	0.4	15 - 20	Se Gm Cl	98	2		578	Shallow shelf on outside of bend
127	u/s Buscot - repeat	SU225984	09/06/2001	S	0.4	15 - 20	Se Gm Cl	98	2		nm	Shallow shelf on outside of bend
91	Kelmscott	SU254987	27/06/2000	S	0.6	17	Se Ph Sc Ec Sem Nu	90	10		572	shallow shelf with cattle access
128	Kelmscott - repeat	SU254987	09/06/2001	S	0.5	17	Se Ph Sc Ec Sem Nu	95	5		nm	shallow shelf with cattle access
90	SW of Radcot Br Farm	SU273993	27/06/2000	S	0.7	14	Se Sc Sem Nu Cl Ec	80	20		586	shallows off boat ramp
108	Radcot Bridge	SU284993	30/06/2001	S	0.7	20	Se Sc Sem Nu Cl	90	10		590	
109	d/s Radcot Lock	SP301001	30/06/2001	S	>0.8	20	Se Sc Sem Nu Cl	90	10		577	
95	Tadpole Bridge	SP332003	27/06/2000	S	0.4-0.9	25	Se Sc Sem Nu Cl	95	5		579	
110	Shifford Lock	SP372013	30/06/2001	S	0.6->1	25	Se Sc Sem Nu Cl	90	10		588	
96	Newbridge	SP403014	27/06/2000	S	<0.3	c. 25	Cr Cl	100			603	extensive shallows
104	Babcock Hythe	SP436040	30/06/2000	S	0.5	18 - 20	Gm Se Sc Nu	90	10		622	small shallow bays
183	Babcock Hythe - repeat	SP436040	14/07/2001	S	0.5	18 - 20	Gm Se Sc Nu	90	10		nm	small shallow bays
105	u/s Swinford Toll Bridge	SP440080	30/06/2000	S	>0.6	20 - 25	Se Gm Pg Sc	80	20		598	small shallow bays
124	Evenlode confluence	SP457097	07/06/2001	S	>0.8	20 - 25	Nu Cl	95	5		nm	
106	u/s Godstow	SP481096	30/06/2000	S	>0.5	25 - 30	Sc Se	80	20		640	
120	Lower Radley	SU538991	06/06/2001	S	>0.6	30	Se Gm Sc Cl Ac	90	10		666	
121	Clifton Hampden	SU549956	06/06/2001	S	>0.4	30	Se Cr Ac Cl	80	20		649	
122	Shillingford	SU593923	06/06/2001	S	>0.6	30	Se Cr Sc Nu Cl	95	5		635	
177	White Cross	SU606877	12/07/2001	S	>0.7	40	Se Pg Cr Ac Nu Cl	95	5		622	
146	South Stoke	SU593837	06/07/2001	S	0.3	40	Gm Ac Cl	99	1		609	small shallow bays
147	Gatehampton	SU617794	06/07/2001	S	>0.7	50	Cl Nu	80	20		644	
143	Mapledurham	SU776771	06/07/2001	S	0.4	c. 50	Se Nu Cl & Ac	90	10		635	Sandier away from plants
163	Culham	SU512965	10/07/2001	S	>0.8	8 - 10	Se Sc Nu Cl	95	5		603	Thames backwater

APPENDIX 1: CONTINUED

RIVER CHERWELL												
SITE No.	SITE	GRID REF	DATE	Flow w	Depth (m)	Width (m)	Plants	Substrate			Con $\mu\text{s/cm}$	Comments
								Silt %	Sand %	Gravel %		
99	W of Somerton	SP495290	29/06/2000	S-M	0.6	3 - 6	Se Sc Sem Nu	75	25		630	
125	Upper Heyford	SP492263	08/06/2001	S-M	0.8->1.2	7	Se Sc Sem Nu	90	10		644	
100	Lower Heyford	SP478248	29/06/2000	M-F	0.6	5 - 9	Se Sc Nu Ra	10	30	60	688	
126	Northbrook	SP488223	08/06/2001	M	0.5-0.9	8	Se Sc Sem Nu Se Ph Sc Cr Sem Nu	75	20	5	633	
101	Enslow	SP478184	29/06/2000	S	0.8	4 - 6	Ec	60	30	10	654	
88	Shipton on Cherwell	SP483166	26/06/2000	M	0.3-0.7	8 - 9	Gm Se Sc Nu Ra Cl Ph Pg Se Ma My Sc	5	80	15	688	
102	Hampton Poyle	SP500152	29/06/2000	M	0.7	4 - 6	Nu	20	60	20	666	
103	Islip	SP522137	29/06/2000	M-F	<0.4	6 - 9	Se Pg Sc Cl	90	10		654	
107	Marston	SP519087	30/06/2000	S	0.3	18 - 20	sparse Gm	95	5		674	

RIVER THAME												
SITE No.	SITE	GRID REF	DATE	Flow w	Depth (m)	Width (m)	Plants	Substrate			Con $\mu\text{s/cm}$	Comments
								Silt %	Sand %	Gravel %		
160	Shabbington	SP668064	09/07/2001	M	0.25	4	Gm Nu	90	10		640	
159	Draycott	SP647065	09/07/2001	S	0.5	7	Se Gm Sc Myr Cl Nu	20	80		666	clay pellet substrate
158	E of Wheatley	SP612054	09/07/2001	S-M	0.4-0.6	7	Sc Gm Se My Nu Ec	25	70	5	644	
157	Cuddeston Mill	SP612029	09/07/2001	M	0.3-0.5	c. 5	Se Ph Sc My So Nu	80	20		724	
156	Chiselhampton	SU599987	09/07/2001	S-M	0.4	8	Gm Se Sc Nu Sem	50	40	10	708	bay amongst fallen trees
123	Brookhampton	SU603976	06/06/2001	M	0.4-0.7	7	Sc Nu Cl Sem	40	50	10	684	
155	Lower Grange	SU599956	09/07/2001	S-M	0.4->1	6	Se Sc Nu Cl	10	80	10	708	difficult to get a sample
154	Dorchester	SU580938	09/07/2001	S	0.5->1	7	Gm Se Ty Cl Ec Nu	40	50	10	738	

APPENDIX 1: CONTINUED

RIVER CHURN												
SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con μ s/cm	Comments
								Silt %	Sand %	Gravel %		
171	Baunton	SP023043	11/07/2001	F	0.1-0.4	3	Ph Se Gm Ra Cl	90	10		540	
172	Siddington	SU039998	11/07/2001	M-F	>0.4	6		80	20		560	v little suitable habitat
173	South Cerney	SU054973	11/07/2001	M-F	0.3->0.8	5	Ra Cr	70	20	10	566	
174	NW of Cerney Wick	SU073969	11/07/2001	M-F	0.2-0.5	6	Cr Ra C	70	20	10	559	
175	Cerney Wick	SU078962	11/07/2001	F	0.2-0.4	8	Ra An	60	20	20	555	
176	Cricklade	SU098945	11/07/2001	S-M	0.3->1	5	Se Cr Gm Sc Nu	80	20		580	

RIVER RAY (OXON)												
SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con μ s/cm	Comments
								Silt %	Sand %	Gravel %		
161	Lower Arncot	SP606193	09/07/2001	M-F	<0.4	0.3-0.5	Ph Cl	70	20	10	644	
162	Fencot	SP570163	09/07/2001	S-M	>0.5	8	Cr Se Gm Sc Nu Cl	95	5		722	
178	Islip	SP528139	12/07/2001	S	0.3->0.8	6 - 8	Gm Nu	95	5		733	

RIVER LEACH												
SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con μ s/cm	Comments
								Silt %	Sand %	Gravel %		
167	Eastleach	SP203053	11/07/2001	M-F	0.2-0.5	3 - 4	Se Gm Ph My Ma Ra C Myr	60	30	10	562	blanket algae in places
166	Fyfield	SP202037	11/07/2001	M-F	0.3-0.6	4.4.5	Gm So Se Ra C Hi	95	5		570	
129	Little Faringdon Mill	SP222012	09/06/2001	S	0.3	7	An C	95	5		562	
165	d/s Lechlade Mill	SU227995	11/07/2001	F	0.2-0.8	3.5	Ph Se Ra Cl	80	10	10	594	shaded habitat

APPENDIX 1: CONTINUED

RIVER PANG												
SITE No.	SITE	GRID REF	DATE	Flo w	Depth (m)	Width (m)	Plants	Silt %	Substrate Sand %	Gravel %	Con μ s/cm	Comments
179	u/s Stanford Dingley	SU569713	13/07/2001	F	<0.3	1.5	Se Ma My Ra	90	10		542	channel filled with Sparganium
180	d/s Rotten Row	SU589720	13/07/2001	M-F	0.15-0.4	6	Cr Gm C Ra	100			538	
164	u/s Bradfield	SU602725	10/07/2001	M	0.2-0.5	7	Cr C Ra	98	2		552	
181	d/s Bradfield	SU607731	13/07/2001	M	0.2-0.5	7	Cr C Ra	98	2		544	
182	u/s Tidmarsh	SU634737	13/07/2001	M-F	0.4-0.8	6	Se Ma My Ra C	95	5		560	
145	Tidmarsh	SU635745	06/07/2001	M-F	0.25->1	7	Ma My Gm Se Sem C Ra	>95	<5		555	
144	u/s Pangbourne	SU636758	06/07/2001	M-F	0.2->1	c. 7	Gm Ph Se Ma My An Ra C	>95	<5		nm	

AMPNEY BROOK												
SITE No.	SITE	GRID REF	DATE	Flo w	Depth (m)	Width (m)	Plants	Silt %	Substrate Sand %	Gravel %	Con μ s/cm	Comments
130	Sheeppen Bridge	SU105950	09/06/2001	M-F	0.25	3	Ra Ph	40	40	20	658	

RIVER MONNOW												
SITE No.	SITE	GRID REF	DATE	Flo w	Depth (m)	Width (m)	Plants	Silt %	Substrate Sand %	Gravel %	Con μ s/cm	Comments
54	Kentchurch	SO412257	17/05/2000	F	c. 0.6	12	Font	30	70		480	
53	Skenfrith Bridge	SO460203	17/05/2000	F	0.3-0.5	12	Se Ph		30	70	486	very little suitable habitat
55	Llanrothel	SO464187	17/05/2000	F	0.5	11	Se Ph	50	50		490	very little suitable habitat
52	u/s Tregate Bridge	SO477175	17/05/2000	F	0.4-0.5	17-20	Se Ph Cl Font	50	50		478	very little fine sediments
51	d/s Tregate Bridge	SO478171	17/05/2000	F	0.4-0.5	17-20	Se Ph Cl Font	50	50		489	very little fine sediments
50	Rockfield	SO482151	17/05/2000	M-F	0.3-1.3	8-11	Se Ph	50	50		488	high energy - v little suitable habitat

APPENDIX 1: CONTINUED

RIVER WYE												
SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con μ s/cm	Comments
								Silt %	Sand %	Gravel %		
W1	Turner's Boat	SO314459	04/07/2002	S-M	0.5	nm	Cl	100			244	backwater confluence
W2	u/s Bredwardine	SO339455	04/07/2002	F	0.2	nm		20	80		226	
W3	d/s Bredwardine Bridge	SO336446	04/07/2002	F	0.3	nm		20	80		228	
W4	Bridge Sollers	SO414423	04/07/2002	M-F	0.4	nm		20	80		240	
W5	Lower Breinton	SO475392	04/07/2002	M-F	0.4	nm		10	90		n/m	
W6	d/s Hereford	SO543374	04/07/2002	M	0.9	nm	Cr Ma Alisma	90	10		266	
W7	E of Holme Lacy	SO568367	04/07/2002	M-F	0.6	nm		40	60		254	
W8	u/s Capter Wood	SO585327	05/07/2002	M-F	0.3	nm		5	95		250	bedrock
W9	u/s Hoarwithy	SO554303	05/07/2002	M-F	0.6	nm	Se	40	60		256	
W10	d/s Hoarwithy Bridge	SO548293	05/07/2002	M-F	0.3	nm	Se	25	75		248	
W11	Sellack Boat	SO565280	05/07/2002	M-F	0.3	nm	Se	40	60		255	
W12	How Caple	SO616298	05/07/2002	M-F	0.4	nm		20	80		255	
W13	d/s Hole-in-the-Wall	SO603283	05/07/2002	M-F	0.5	nm	Se	40	60		260	
W14	Backney	SO584272	02/07/2002	M	0.3	nm	Cl	40	50	10	290	sandy shallows
W15	Ross-on-Wye	SO591243	02/07/2002	M	0.3	nm	Se Gm Cl	80	20		312	
W16	Stanesford Priory	SO582194	02/07/2002	M	0.3	nm		50	50		316	under trees
W17	u/s Lower Lydbrook	SO602175	05/07/2002	M-F	0.8	nm	Se, Nu	30	70		300	
W18	S of Goodrich	SO567183	02/07/2002	M-F	0.8	nm	Gm, Cl	75	25		318	
W19	Dixton	SO522136	02/07/2002	M	0.9	nm		90	10		312	
W20	Monmouth	SO512125	02/07/2002	M-F	0.9	nm	Ra	50	50		330	
W21	Redbrook	SO534103	02/07/2002	M-F	0.8	nm	Cl	30	70		340	

APPENDIX 1: CONTINUED

RIVER LUGG												
SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Silt %	Substrate Sand %	Gravel %	Con $\mu\text{s/cm}$	Comments
40	Upper Lye	SO398654	15/05/2000	F	<0.3	7	Ph Cl		10	90	381	very little fine sediment
41	Kingsland	SO449621	15/05/2000	F	0.2-0.3	6 to 8	Ph Ra		10	90	385	very little fine sediment
42	Eaton Bridge (A44)	SO507507	16/05/2000	M	0.2-0.6	8	Se Ra	95	5		461	marginal shelves with fine sediment
43	us Ford	SO513554	16/05/2000	S-M	0.3-0.4	6	Se Ra	60	40		466	sandy, but muddy amongst Sparganium
44	Bodenham	SO537513	16/05/2000	M-F	>1.1	7	Se Ra	75	25		486	sandy, but muddy amongst Sparganium
45	Marden	SO516476	16/05/2000	F	0.3-0.9	6	Se Ra	70	30		498	shelf with muddy sand & Sparganium
46	Moreton Bridge	SO513457	16/05/2000	M-F	0.6	10	Se	60	40		521	
47	Wergins Bridge	SO528448	16/05/2000	M	>1.3	11	Se	75	25		516	shelf with muddy sand & Sparganium
48	Lugwardine	SO548406	16/05/2000	M	c. 0.3	14	Se	75	25		523	shelf with muddy sand & Sparganium
49	u/s Wye confluence	SO571376	16/05/2000	M	>1.0	16	Se	70	30		540	

RIVER ARROW												
SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Silt %	Substrate Sand %	Gravel %	Con $\mu\text{s/cm}$	Comments
W23	Hunton Bridge	SO333586	06/07/2002	F	0.3	6	Cl	60	20	20	460	
W24	u/s Eardisland	SO415588	06/07/2002	F-M	0.3-0.5	10		80	20		494	
W25	Eardisland	SO420587	06/07/2002	F	0.3-0.5	8	Ma Cr Gm	60	30	10	479	
W26	Arrow Green	SO438586	06/07/2002	M	0.4-0.6	8	Se	60	40		468	
W27	Ivingtonbury	SO475571	06/07/2002	M	0.4-0.6	8	Se Cl	50	50		480	
W28	Broadward	SO497570	06/07/2002	M	0.4-0.9	8	Se Cl Sem	50	50		496	

APPENDIX 1: CONTINUED

RIVER FROME (RIVER LUGG TRIBUTARY)												
SITE No.	SITE	GRID REF	DATE	Flo w	Depth (m)	Width (m)	Plants	Silt %	Substrate Sand %	Gravel %	Con $\mu\text{s/cm}$	Comments
W29	N of Stoke Edith	SO599420	06/07/2002	S	<0.4	4	Se	95	5		476	
W30	Five Bridges	SO573403	06/07/2002	M-F	<0.4	5	Cr Se Cl	80	20		464	v little suitable habitat
W31	Larport	SO565392	06/07/2002	M-F	<0.4	4	none	70	20	10	506	v little suitable habitat

AYMESTREY POND												
SITE No.	SITE	GRID REF	DATE	Flo w	Depth (m)	Width (m)	Plants	Silt %	Substrate Sand %	Gravel %	Con $\mu\text{s/cm}$	Comments
37	outflow stream	SO52-46-	15/05/2000	M	0.2	1.5	Ec	98	2		440	
38	lower pond	As above	15/05/2000		c. 0.5	nm	Ty Ma Ec	98	2		460	masses of organic detritus
39	upper pond	As above	15/05/2000		0.2-0.5	nm	Ty Ec Eq	98	2		472	

RIVER ISE												
SITE No.	SITE	GRID REF	DATE	Flo w	Depth (m)	Width (m)	Plants	Silt %	Substrate Sand %	Gravel %	Con $\mu\text{s/cm}$	Comments
109	Warkton	SP890801	17/07/2000	F	<0.2	3	Ph Gm Se An C Cl	95	5		1017	
108	Weetabix factory	SP885753	17/07/2000	F	<0.4	3	Gm Se Ra Cl	15	70	15	826	plants very sparse
107	N of Finedon	SP896733	17/07/2000	F	0.3-0.5	4 to 6	Se Sc Cl Ra	40	50	10	832	
106	Finedon	SP900709	17/07/2000	M-F	>0.5	6	Se Sc Cl Ra	50	40	10	829	

RIVER NENE												
SITE No.	SITE	GRID REF	DATE	Flo w	Depth (m)	Width (m)	Plants	Silt %	Substrate Sand %	Gravel %	Con $\mu\text{s/cm}$	Comments
110	Nether Hayton	SP664589	17/07/2000	M	0.4-0.5	5 to 6	Se Gm Ph Ra Cl Ec	10	80	10	814	very little suitable habitat recent dredging, lots dead shells
111	Kislingbury	SP699598	17/07/2000	M-F	<0.7	8	Ph Se Sem Nu Sc Cl	<5	80	15-20	794	
112	W of Cogenhoe	SP815610	17/07/2000	S-M	>1.3	16	Se Nu Cl	90	10		736	just d/s of marina - smelly
113	Earls Barton	SP859620	17/07/2000	M	>0.7	18	Gm An Sem Nu Ec Cl	90	10		861	

APPENDIX 1: CONTINUED

RIVER GREAT OUSE

SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con $\mu\text{s/cm}$	Comments
								Silt %	Sand %	Gravel %		
116	Turvey	SP936515	18/07/2000	M	>1.0	16	Sc Se Sem Nu	90	10		888	
115	Felmersham	SP991579	18/07/2000	F	<0.7	11	Se Sc Ra Cl Ec	10	85	5	901	very little suitable habitat
114	Radwell	TL005572	18/07/2000	F	<0.7	11	Se Sc Ra Cl Ec	10	85	5	880	
117	Oakley	TL009529	18/07/2000	F	<0.5	20	Se Ph Gm Nu Sc Myr	75	25		831	
118	Great Barford	TL133514	18/07/2000	S	c. 0.5	30	Se Gm Nu Sem Ec Cl	90	10		979	recently dredged * clay pellets & org detritus, anoxic
119	Roxton	TL162539	18/07/2000	S-M	0.8	35	SE Gm Sc Nu Sem Cl	2100*			983	

RIVER AXE

SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con $\mu\text{s/cm}$	Comments
								Silt %	Sand %	Gravel %		
1 Ax	Clapton Mill	ST414054	29.6.02	S	1 - 1.5	4-5	-	20	60	20	495	
2 Ax	Forde Abbey	ST363053	29.6.02	S/M	0.5	5-8	Ra	10	70	10	519	
3 Ax	Chard Junction	ST343048	29.6.02	M/F	0.2 - 0.8	5-6	Ph Ra Se	80	20		513	
4 Ax	Broom Bridge	ST325025	29.6.02	S	0.2 - 1.2	12-15	Nu	100			552	
5 Ax	Axe Bridge	ST323017	29.6.02	S	0.1 - 0.2	10-15	Ph Sc Sp	100			526	
6 Ax	Weycroft	SY306998	29.6.02	S	0.1 - 0.2	12	Ph	100			nm	
7 Ax	Bow Bridge	SY290982	30.6.02	M/F	0.5	10-12	El Ph Ra Sc	70	20	10	492	
8 Ax	Woodhayne Farm	SY270961	30.6.02	M	0.6	10-13	Gm Ph Se	80	20		504	
9 Ax	Colyford	SY259925	30.6.02	S	0.1 - 1	13 - 15	El Ph Ra Se	90	10		504	

RIVER BRIT

SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con $\mu\text{s/cm}$	Comments
								Silt %	Sand %	Gravel %		
1 Br	Bridport	SY465923	16.8.01	S	2+	6	Se	100			554	
2 Br	Watford Bridge	SY473948	16.8.01	S	0.2 - 2	6 - 7	Cl	10	10	80	577	
3 Br	Watford Farm	SY474952	16.8.01	S	0.2 - 1	6-7		10	10	80	576	
4 Br	Camesworth	SY476970	16.8.01	M	0.3 - 0.8	3-4	Ra Se	20	20	60	nm	
5 Br	Netherbury	SY472992	16.8.01	S	0.5 - 2	5	Cl Ra	70	20	10	nm	Water smelt of domestic sewage

APPENDIX 1: CONTINUED

RIVER OTTER												
SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Silt %	Substrate Sand %	Gravel %	Conus/cm	Comments
1 Ot	New Bridge	ST201068	12.10.02	M	0.75	6	Ra Sp	20	60	20	227	Ra covered in 'sewage fungus'
2 Ot	Monkton	ST184031	12.10.02	M	0.5	6	Ph Se	20	60	20	230	Ra covered in 'sewage fungus'
3 Ot	Weston	ST143001	12.10.02	S	0.5	8	El Ph Se Ra	40	50	10	361	Ra covered in 'sewage fungus'
4 Ot	Woodford Barton	SY102971	12.10.02	M	0.5	10	El Gf Ph Ra	30	50	20	395	
5 Ot	Fluxton	SY092924	12.10.02	M	0.3	10	An En Cl Gf Ph Ra	60	30	10	411	Much algal growth
6 Ot	Bridge End	SY091898	12.10.02	M/F	0.5	10-15	An En Cl Gf Ra	50	40	10	411	masses of Enteromorpha stones covered in filamentous algae
7 Ot	Colaton Raleigh	SY086872	12.10.02	M	0.2 - 1	8-10	An En Cl Gf Ph Ra An El En Cl Gf Ph Ra	60	30	10	404	algae
8 Ot	Otterton	SY078851	12.10.02	M	0.2 - 1	8-10	Se	70	20	10	449	Less algae than previous sites

RIVER YARTY												
SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Silt %	Substrate Sand %	Gravel %	Conus/cm	Comments
1 Yr	Court Place	ST256068	28.6.02	M	0.3	6	'sewage fungus' on stones	10	70	20	333	No aquatic vegetation
2 Yr	Long Bridge	ST256054	28.6.02	S/M	0.5	6-8	'sewage fungus' on stones	10	50	40	341	No aquatic vegetation
3 Yr	Higher Westwater	SY279998	28.6.02	M	0.4	7 to 8	'sewage fungus' on stones, Gm Ph Se	10	50	40	485	No aquatic vegetation
4 Yr	Yarty Bridge	SY283979	28.6.02	S	0.2	8 to 10	Gm Ph Se	100			437	No aquatic vegetation

APPENDIX 1: CONTINUED

RIVER FROME

SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con $\mu\text{s/cm}$	Comments
								Silt %	Sand %	Gravel %		
1 Fr	Sandhills	ST586005	3.8.00	M	0.1 – 0.5	2	Cl Se	10	10	80	643	
2 Fr	Cattistock	SY591993	3.8.00	M/F	0.1 – 1	3 – 4	Cl Ra Se	50	40	20	626	
3 Fr	Little Cruxton	SY603967	3.8.00	M/F	0.5 – 1	8	Cl Ra	40	40	40	588	+sewage fungus on many aquatic plants
4 Fr	Grimstone	SY643936	3.8.00	M/F	1	10 – 13	Gf Myr Ph Ph Ra Se	60	40		575	
5 Fr	Dorchester	SY673923	3.8.00	F	0.8 – 1	10 – 15	Ph Ra Ro Se	60	40		583	
6 Fr	Norton Mill Farm	SY738901	3.8.00	M	0.6 – 1	8 – 12	An C El Ph Ra Ro Se	60	40		618	
7 Fr	Pallingham Fishery	SY783912	4.8.00	F	0.2 – 0.6	12 – 14	Gm Ph Ra	60	40		611	
8 Fr	Pallingham Farm	SY785909	4.8.00	M/F	0.2 – 0.8	12 – 14	Gm Ph Ra	90	10		613	
9 Fr	Broompond Dairy	SY814884	4.8.00	M/F	0.2 – 0.6	12	C Ma Ro Ra	90	10		596	
10 Fr	Wool Bridge	SY844872	4.8.00	F/M	0.6 – 1	20 – 25	Gm Ph Ro Ra Se	80	10	10	599	
11 Fr	Holme Bridge	SY889864	4.8.00	M	0.2 – 2	12 – 15	El Gf Mr Ph Po Ro R	100			575	
12 Fr	Broompond Dairy	SY813886	24.10.01	M/S	0.1 – 0.4	8 – 10	Ph Se My Ra	50	40	10	576	
13 Fr	Broompond Dairy	SY814884	24.10.01	M/S	0.5 – 1	10 –	Ra El	60	40	10	578	
14 Fr	Winfrith	SY815877	24.10.01	M/S	0.1 – 0.6	10 – 15	Ph Gm El	80	20		561	
15 Fr	Winfrith	SY817876	24.10.01	M/S	0.1 – 0.5	10 – 25	Sp Gm Ph Ty El	100			567	
16 Fr	East Burton	SY832874	24.10.01	S	0.2 – 1	10 – 20	Gm Ph Se El Ra	90	10		564	
17 Fr	Bindon Abbey	SY859868	24.10.01	M/S	0.2 – 0.8	10 – 15	Pg Ph Se Gm Ro	90	10		522	
18 Fr	Stokeford	SY865866	23.10.01	S	0.2 – 0.8	10 – 12	Pg Ph Gm El Po Myr	90	10		556	
19 Fr	East Stoke	SY874867	23.10.01	S/M	0.3 – 1.2	10 – 15	El Gm Mr Ph Po	90	10		533	
20 Fr	Rushton Farm	SY885863	23.10.01	M	0.1 – 1.2	10 – 17	Pg Ph Ro Se	90	10		359	
21 Fr	Holme Bridge	SY889864	23.10.01	M	0.1 – 1.2	10 – 15	El Gm Ph Se	80	20		353	

APPENDIX 1: CONTINUED

RIVER PIDDLE

SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con $\mu\text{s/cm}$	Comments
								Silt %	Sand %	Gravel %		
1 Pi	Piddlehinton	SY715973	1.8.00	M	0.2	2.5 - 3	Ir Gf Ro Ra C	25	25	50	581	
2 Pi	Higher Waterston	SY728954	1.8.00	M	0.4 - 0.5	1 - 1.5	Se Mr Ro Ph Ra Ma	60	40		530	2 channels
3 Pi	Athlehampton	SY770944	1.8.00	M	0.2 - 1.2	8 - 10	Se Ro Ra	30	50	20	650	
4 Pi	Affpuddle	SY806937	1.8.00	M/F	1	5-7	Ph Gf Bi Ra	30	50	20	625	
5 Pi	Throop	SY829933	1.8.00	M	0.2 - 1	5-8	Ph Ra	40	40	20	625	
6 Pi	Chamberlaynes's Farm	SY845927	2.8.00	M/F	0.2 - 1	8 - 10	Ro An Ma Ph Sp Se	60	20	20	625	
7 Pi	Woodlands	SY863909	2.8.00	M/F	0.2 - 1.2	8-10	My C Ra	60	20	20	619	
8 Pi	Trigon Farm	SY884887	2.8.00	S	1.3 - 1.4	8-9	Pg Ph Gf Se Ra	10	60	30	611	
9 Pi	Lower Trigon Farm	SY886885	2.8.00	M	0.1 - 0.5	3-4	Gf Se Ph Ap Nu	70	30		604	v organic silt - drain from fish farm
10 Pi	Carey nr. Wareham	SY906878	2.8.00	M	1 - 2	10-12	C Ra Sp An Ro Ma Se Gf Ra Ph Sc Gm	10	50	40	602	Channel very steep sided ?man made

RIVER STOUR

SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con $\mu\text{s/cm}$	Comments
								Silt %	Sand %	Gravel %		
1 St	Charlton Marshall	ST905042	22.10.01	M	0.5 - 2	20	Pg Se Ph	20	40	40	543	
2 St	Court Farm	SY977988	22.10.01	F	0.1 - 0.2	10-15			50	50	540	
3 St	Pamphill	ST995001	22.10.01	S/M	0.5 - 2	10-15	Ph El	90	10		539	
4 St	Sturminster Marshall Mill	ST958005	22.10.01	M	0.5 - 1.5	10-12	Sc Ra Gl Se	90	10		550	

APPENDIX 1: CONTINUED

RIVER AVON

SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con μ s/cm	Comments
								Silt %	Sand %	Gravel %		
1 Av	Durrington	SU165445	13.8.00	M	0.1 - 0.9	10	C Ra	10	20	70	615	
2 Av	Ablington	SU156466	13.8.00	M	0.9	10 - 12	Ma Gm Ph Se C El R	100			627	Filamentous algae
3 Av	Netheravon	SU150485	13.8.00	M/F	0.9 - 2	8 - 11	Ra C An Myr Po Sa	80	20		624	
4 Av	Fifield	SU147503	13.8.00	M/F	0.8	12 - 14	C Se Ph Ra Cl	20	40	40	620	
5 Av	East Chisenbury	SU140528	13.8.00	S	1.1 - 2	10	C Ra Cl	80	20		671	
6 Av	Upavon	SU134540	13.8.00	M	0.2 - 1	8 - 12	Ro Ph S C Ra Cl	100			654	filamentous algae
7 Av	North Newton	SU133573	14.8.00	F	0.9	5	Se Ra	5	15	80	661	
8 Av	Normanton	SU136406	14.8.00	M/F	0.4 - 1	12-14	C Gm Ra	10	20	70	568	
9 Av	Upper Woodford	SU125373	14.8.00	M/S	0.2 - 1	12-14	Se Ra	90	10		560	
10 Av	Great Durnford	SU133382	14.8.00	S	0.2 - 2	12 - 14	My Ro Ra Gf C El	100			553	margins with grey algal film
11 Av	Little Durnford Bridge	SU123342	14.8.00	S	0.2 - 2	10-12	Se Ro Gm Ma Nu Ra	100			571	
12 Av	Avon Bridge	SU128330	14.8.00	M	0.6	8-10	Ro Se Ph Ra	30	40	20	564	
13 Av	North Salisbury	SU126326	14.8.00	F	0.1 - 1	12-14	C Gm Ph	60	20	20	564	
14 Av	Nr. Christchurch	SZ154953	20.9.00	M	0.5	20 - 22	Ra C	80	20		nm	

APPENDIX 1: CONTINUED

RIVER ITCHEN

SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con $\mu\text{s/cm}$	Comments
								Silt %	Sand %	Gravel %		
1 It	Ovington	SU563317	25.8.02	M	0.1 – 0.6	15 - 25	Ty My Ra C An	80	20		564	
2 It	Avington	SU535325	25.8.02	S	0.3	12	Ro Gm	100			506	
3 It	Avington Lake	SU529323	25.8.02	S	0.1 – 0.4	40	Ro Gm Ph	100			506	
7 It	Chilland	SU523326	25.8.02	M	0.1 – 0.8	15 - 25	C An Ra Se Ro Gm	50	40	10	560	
4 It	Abbotts Worthy (N carrier)	SU502325	25.8.02	S	0.2 – 1.2	10	C Ra Cl Ty	80	20		526	Much algae
5 It	Abbotts Worthy (S carrier)	SU501324	25.8.02	M	0.3 – 1.2	10	C Gm	70	30		526	
6 It	Abbotts Worthy Mill	SU498324	25.8.02	M	0.1 – 0.7	10	Cl Ra C	60	40		530	
13 It	Abbotts Barton (E carrier)	SU494312	28.7.02	M	0.1 – 0.6	15	Ra C Gm Ph	90	10		nm	
14 It	Abbotts Barton (W carrier)	SU490314	28.7.02	M	0.1 - 1	8	C Ra	90	10		nm	
15 It	Hyde	SU486300	28.7.02	M/S	0.1 – 0.8	12	Ph	100			nm	
12 It	Winnal (Winchester)	SU487299	28.7.02	M	0.1 - 1	10	C Ra	90	10		nm	
8 It	Tumbling Bay	SU477263	26.8.02	M	0.1 – 1.2	10	An Ra C S Gm	60	40		574	
9 It	Shawdford Mill	SU474249	26.8.02	S	0.1 – 0.8	10	Se Gm	90	10		580	
10 It	Otterbourne Farm	SU469227	26.8.02	M	0.1 – 0.9	10	Se Gm Ra An C	80	20		574	
11 It	Highbridge	SU469214	26.8.02	S/M	0.1 - 2	12	Se Gm Ra An	90	10		578	

RIVER TEST

SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con $\mu\text{s/cm}$	Comments
								Silt %	Sand %	Gravel %		
9 Te	Whitchurch	SU461477	19.8.00	F	0.1 - 1	12	Ty Gm Ra C Ra Hi	10	20	70	556	
8 Te	Longparish	SU441447	19.8.00	S/M	0.1 - 1	10 – 12	Gm Ph Ra	100			556	
7 Te	Wherwell	SU386406	19.8.00	M/F	0.1 - 1	10 – 35	Ra C My	10	10	90	566	
5 Te	Longstock	SU362369	18.8.00	M	0.8	6 – 7	C	100			585	A small trib at its junction with Test
6 Te	Nr Longstock	SU363367	19.8.00	S	0.1 – 0.5	3 – 4	Se Ty Cl	100			nm	Small back channel
4 Te	Stockbridge	SU353348	18.8.00	M	0.8 – 1.2	30	Se Gf Ra C	60	20	20	573	
3 Te	North Houghton Farm	SU351339	18.8.00	M/F	0.8 – 1.25	30	Se Gf Ra C	40	30	20	573	
2 Te	Houghton	SU343318	18.8.00	M/F	0.5	20 – 25	Ty Se Gm Ph Ra C	50	40	10	575	
1 Te	Horsebridge	SU345305	18.8.00	M/F	0.6 - 1	12	Ph Pg Se Ra C My Sc	50	40	10	557	

APPENDIX 1: CONTINUED

RIVER MEON

SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con µs/cm	Comments
								Silt %	Sand %	Gravel %		
1 Me	Titchfield NNR	SU543045	12.8.01	S	1.5	3	Gm	100			549	
2 Me	Titchfield Abbey	SU543065	12.8.01	S	1 – 1.5	4	Ph Gm	100			541	
3 Me	Gt Funtley Farm	SU556089	12.8.01	M/F	0.1 – 1.2	5	Ph	80	20		547	
4 Me	Wickham	SU565106	12.8.01	F	0.8 – 1.2	4.5	Se	20	20	60	540	
5 Me	Mislingford	SU588142	12.8.01	F	0.5	8	Ph	20	20	60	546	
6 Me	Soberton	SU608171	12.8.01	M	0.5	4-6	Ra Ra Ro	60	20	20	556	

RIVER ROTHER & HARTING POND

SITE No.	SITE	GRID REF	DATE	Flow	Depth (m)	Width (m)	Plants	Substrate			Con µs/cm	Comments
								Silt %	Sand %	Gravel %		
3 Ro	Mill Dam, Old Ditcham	SU765210	29.7.00	S	0.6 - 1.5	30 – 40	Choked with Chara spp	100			515	
1 Ro	Harting Pond	SU781220	29.7.00	S	0.1 – 1.5	60 – 70	Ty Sc S Ph Cl	100			592	Floating mats of filamentous algae
2 Ro	Harting Pond (outflow stream)	SU783221	29.7.00	M	0.5	1 – 1.5	Se Ph Sp	20	60	20	665	
4 Ro	Maidenmarsh Bridge	SU783234	29.7.00	S	2	9 – 12	Ph Se Gm	30	60	20	472	
5 Ro	Greatham Mill	SU763305	29.7.00	M	0.3 – 0.6	1 – 3	Ro Sp	20	30	50	678	
6 Ro	Tankerdale Farm	SU766255	29.7.00	M	0.2 – 0.8	3	Ra Gm	20	40	40	420	
7 Ro	Habin Bridge	SU807229	29.7.00	M	0.1 - 1	12 – 15	Ph Po Se	20	80		501	
8 Ro	Midhurst	SU890218	17.6.00	S	1.5	10 – 12	-	50	50		nm	
9 Ro	Midhurst	SU890215	17.6.00	S	0.5 - 2	10 – 12	C Gf	10	90		nm	
10 Ro	Fittleworth	TQ014180	30.7.00	M	0.1 - 2	10 – 12	Ph Se Gm	40	60		477	
11 Ro	Shopham Bridge	SU985185	30.7.00	M/F	0.1-0.3	8 – 12	Ph Sc Se	40	60		479	

APPENDIX 2: NUMBERS OF EACH *PISIDIUM* SPECIES RECORDED AT EACH SITE

RIVER WHITEWATER

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
190	Lodge Farm	SU734524	07/07/2001			13	6	62				14			95
191	u/s A30	SU740545	07/07/2001	24	1	37	2	60				22			146
136	d/s Whitewater Mill	SU737553	20/06/2001	82	12	59		95		3		6			257
				51											
137	Dipley Mill	SU743577	20/06/2001	9	2	75		12		5					613
138	Mattingley	SU738584	20/06/2001	95	3	223		85		28		12			446
139	Holdshott Farm	SU739602	20/06/2001	3	3	42	8	372		53	17	133			631
135	Heckfield	SU738613	18/06/2001	4	4	34		66	2	28	2	36		2	178
140	Riseley Mill	SU738623	20/06/2001	1		27		12	6	12	1	9		6	74
141	u/s Blackwater	SU741634	20/06/2001	1	6	75		49	13	55		64		23	286

RIVER HART

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
131	NE Elvetham Hall	SU787567	18/06/2001	0	0	20	0	192	0	0	0	10			222
132	u/s Hartfordbridge	SU779575	18/06/2001	0	0	64	3	128	0	11	0	42			248
133	d/s Hartfordbridge	SU768582	18/06/2001			14		4				18			36
134	Hazeley	SU750598	18/06/2001	0	0	34	9	181	0	1	33	70			328

RIVER BLACKWATER

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
149	d/s Sandhurst	SU825616	07/07/2001			4		33				3			40
148	Eversley Cross	SU796623	07/07/2001		1	12	6	146		1	2	28			196
150	New Mill ford	SU762629	07/07/2001			15		3				1			19
142	u/s Whitewater	SU743635	20/06/2001			98		37		7		15			157
151	Swallowfield	SU734645	07/07/2001		3	176		149	1	36	1	108		13	487

APPENDIX 2: CONTINUED

RIVER LODDON

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
PT20	Pyott's Hill	SU667537	18/11/1997				19	50				35			104
26	Wildmoor Farm	SU693558	22/03/2000		1		8	61				22			92
PT23	Mill Farm, Hartley W.	SU697573	18/11/1997	4		11		42		5		45			107
24	Sherfield Loddon A33	SU683583	22/03/2000	26		16		12		30		2			86
23	Lilymilt Farm	SU677593	22/03/2000	37		45	2	111		10		1		2	208
189	Lilymilt Farm - repeat	SU677593	21/07/2001	46		26		70		10		11			163
25	Stratfield Turgis	SU688602	22/03/2000	9		12		14						3	38
PT9	Stratfield Saye	SU692611	16/11/1997	32	3	35		49		9		6		5	139
72	Startfield Saye Park	SU696612	05/06/2000	4	4	36		20		5				6	77
71	Startfield Saye Park	SU705625	05/06/2000	11		28		75		13		4		3	134
PT8	Stanford End	SU707628	16/11/1997	18		13		34		14		18		5	102
73	d/s Stanford End	SU703635	05/06/2000	11	2	10		79		17		52		15	186
28	Loddon Court	SU715648	06/05/2000	6	4	14		46		24		66		4	164
190	Loddon Court - repeat	SU715648	21/07/2001	12	3	27		78		18		71		12	222
27	Arborfield	SU743677	06/05/2000	8	1	34		81		10		80		54	268
153	Arborfield - repeat	SU743677	07/07/2001	4		40		62	22	212		75		28	443
152	Sindlesham	SU771703	07/07/2001	10	12	114		151	218	41		331		14	891

RIVER LYDE

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
74	Hartley Wespay	SU695574	05/06/2000	7	5	41	10	80				23			166

APPENDIX 2: CONTINUED

RIVER KENNET															
SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
1	Axford	SU234698	15/03/2000	0	49	0	0	123	0	0	0	189	0	0	361
2	Ramsbury	SU272713	15/03/2000	0	11	0	0	173	0	17	0	148	0	0	349
3	Chilton Foliat	SU314705	15/03/2000	0	0	0	23	59	0	0	0	161	0	0	243
4	Leverton	SU333698	15/03/2000	0	23	51	39	125	0	45	0	389	19	0	691
17	Denford	SU353683	20/03/2000	0	10	0	4	89	0	13	0	220	14	0	350
18	ds Denford	SU358683	20/03/2000	0	0	0	0	111	0	10	0	275	0	0	396
5A	Kintbury - us bridge	SU439669	15/03/2000	5	0	0	0	90	0	29	0	111	0	0	235
				14											
5B	Kintbury - ds bridge	SU445667	15/03/2000	6	0	31	0	58	0	64	0	13	0	0	312
5C	Kintbury - small leat	SU452670	15/03/2000	17	0	0	0	59	0	27	0	0	0	0	103
				17											
6	Halfway	SU406679	15/03/2000	5	13	61	0	99	0	46	0	48	0	0	442
188	Halfway - repeat	SU406679	18/07/2001	61	11	21		100		18		53			264
77	Sutton Estate	SU439669	05/06/2000	1	11	1	4	76	0	6	0	37	0	0	136
76	Sutton Estate	SU445667	05/06/2000	2	8	9	0	28	0	5	3	15	0	0	70
75	Sutton Estate	SU452670	05/06/2000	16	0	22	0	35	0	18	2	21	0	5	119
19	Chamberhouse Farm	SU520656	20/03/2000	14	0	8	9	86	4	10	1	24	0	0	156
20	Brimpton	SU556658	20/03/2000	2	0	53	0	109	0	15	0	17	0	0	196
21	Aldermaston	SU595662	22/03/2000	72	1	99	0	236	10	53	0	49	0	7	527
187	Aldermaston - repeat	SU595662	17/07/2001	91		35		119		53		39		13	350
22	Ufton Bridge	SU617685	22/03/2000	55	1	9	0	6	0	1	0	0	0	2	74
184	Theale	SU645706	17/07/2001	12		88		55	85	101		195		6	542
185	Southcote	SU684714	17/07/2001		3	20		42	1	2		57		1	126

APPENDIX 2: CONTINUED

RIVER LAMBOURN

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	pers	mil	sub	sup	hens	hib	nit	pule	TOTAL
10	Eastbury	SU353768	16/03/2000	0		0	15	0	0		0		0		15
9	Maidencourt Farm	SU374759	16/03/2000	0		0	26	0	19		0		2		47
8	East Shefford	SU389748	16/03/2000	0		0		28	389		0		201		623
7	Weston	SU403736	16/03/2000	0		0		36	144		0		504		684
11	Easton	SU418723	16/03/2000	0		9		19	111		0		278		418
12	Boxford	SU430719	16/03/2000	0	0	0		20	20		0		111		151
15	Hunts Green	SU433703	20/03/2000	4	0	3		11	116		0		60		194
13	Bagnor Bridge	SU453693	20/03/2000	27	0	28		1	12		0		1		69
14	Bagnor d/s A34	SU456692	20/03/2000	10 0	0	33		0	5		0		0		138
186	Bagnor d/s A34 - repeat	SU456692	18/07/2001	62	0	200		0	79		0		0		341
16	Shaw	SU470683	20/03/2000	26	0	5		0	0		0		0		31
16A	Shaw - stream/leat	SU472684	20/03/2000	0	0	X		X	X		X		X		

APPENDIX 2: CONTINUED

RIVER WINDRUSH

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
56	Bourton on the Water	SP172201	18/05/2000	0			9	95				95			199
57	New Bridge, Gt Rissington	SP179177	18/05/2000	6	9	84	1	94		10		36			240
58	Little Barrington	SP206131	18/05/2000	1		253		18				6			278
59	u/s Burford	SP238127	18/05/2000	4	6	57		81		4		21			173
60	Swinbrook	SP282118	18/05/2000	5		7		170		33		135			350
33	Cot Farm, Minster Lovell	SP314117	12/05/2000	3	6	53		71		13	2	22			170
60A	Crawley	SP341118	18/05/2000	1	2	26		49		7		16			101
32	u/s Witney	SP348107	12/05/2000	11	29	130	11	164		16		45			406
31	d/s Ducklington (W channel)	SP368070	12/05/2000			31	11	138		15	1	65			261
60B	Ducklington (E channel)	SP364079	18/05/2000			10	3	90		5	2	56			166
30	NE of Hardwick (E channel)	SP389063	12/05/2000			12	11	141		55	8	61			389
60C	Standlake (W channel)	SP398036	18/05/2000			7		68		16		21			112
29	Standlake d/s Mill	SP405027	12/05/2000			15	5	58		17	17	21			133

RIVER EVENLODE

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
62	Bledington	SP252226	18/05/2000		2	20		36				66			124
61	Lyneham	SP275196	18/05/2000		5	6		162		47		73			293
34	Chilson	SP316204	12/05/2000	3		3		9	4	2		1			22
35	Chadlington	SP333207	12/05/2000	8	10	18		98		8	2	45			189
89	Charlbury	SP353195	26/06/2000		2	18		61				45			126
85	Fawler	SP372168	26/06/2000	1	2	7		83	4	15		160			272
84	Ashford Mill Farm	SP386155	26/06/2000			21		78		6	3	68			176
83	S of Combe	SP405147	26/06/2000			3		103		10	7	74			197
82	Combe Station	SP420148	26/06/2000					55		17	3	65		1	141
81	Purwell Farm	SP438119	26/06/2000		71	3		58		27	6	111			276
80	Cassington	SP446104	26/06/2000		4		1	66		13	7	82			173

APPENDIX 2: CONTINUED

RIVER GLYME

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
86	Wootton	SP440196	26/06/2000			5	1	60				34			100
87	Stratford Bridge	SP443186	26/06/2000	1	11	31	4	121		5		42			215

RIVER COLN

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
170	d/s Winsop	SP097079	11/07/2001	0		9		19				1			29
169	Ablington	SP103075	11/07/2001	0			1	15				19			35
67	Quenington	SP143048	28/05/2000	39		8	14	104				85			250
168	Hathrop	SP150052	11/07/2001	14		43	2	68		1		127			255
66	Fairford	SP151012	28/05/2000	1			16	71				111			199
65	Dudgrove	SU187983	28/05/2000	27	1			96		1		36			161
93	u/s confluence with Thames	SU283988	27/06/2000	4	5	12		63		16		35		1	136

RIVER CHERWELL

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
99	W of Somerton	SP495290	29/06/2000	8	24			67	7	31		93		1	231
125	Upper Heyford	SP492263	08/06/2001	13	39	9		108	19	79		75		5	347
100	Lower Heyford	SP478248	29/06/2000	9	8	14		41		15		14		1	102
126	Northbrook	SP488223	08/06/2001	17	35	23		87	6	55		60		7	290
101	Enslow	SP478184	29/06/2000	29	63	22		153	3	107	12	21		7	417
88	Shipton on Cherwell	SP483166	26/06/2000	2	16	15		45	3	62	4	24			171
102	Hampton Poyle	SP500152	29/06/2000	9	44	6		70	1	53	10	43		3	239
103	Islip	SP522137	29/06/2000	1	4	55		21	27	11		11		6	136
107	Marston	SP519087	30/06/2000	1	27	31	1	95	15	62		28			260

APPENDIX 2: CONTINUED

RIVER THAMES

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
69	Cricklade	SU094943	28/05/2000	0	53	54	1	225		39		7			379
70	Castle Eaton	SU146960	28/05/2000	0	67	64		110		29		14			283
68	Hannington Bridge	SU173961	28/05/2000	2		75		72		5		3			156
92	u/s Lechlade	SU206989	27/06/2000	63	158	95		164		74		43		7	604
64	u/s Buscot	SU225984	28/05/2000	58	100	160	43	263	34	70		96		23	847
127	u/s Buscot - repeat	SU225984	09/06/2001	38	73	97	18	246	3	26		173		10	684
91	Kelmscott	SU254987	27/06/2000	60	173	100		154	73	58		122		19	759
128	Kelmscott - repeat	SU254987	09/06/2001	10 7	171	105		185	97	55		260		47	1027
90	SW of Radcot Bridge Farm	SU273993	27/06/2000	19	175	44		86	16	33		51		45	469
108	Radcot Bridge	SU284993	30/06/2001	19	198	77		138		49		73			555
109	d/s Radcot Lock	SP301001	30/06/2001	21	151	55		97	7	34		34		20	419
95	Tadpole Bridge	SP332003	27/06/2000	8	187	62		78	5	30		21		4	395
110	Shifford Lock	SP372013	30/06/2001	19	121	45		80	18	47		28		42	402
96	Newbridge	SP403014	27/06/2000	6	90	26		83	18	48		33		51	355
104	Babcock Hythe	SP436040	30/06/2000	11 1	99	40	2	75	39	61		95		39	561
183	Babcock Hythe - repeat	SP436040	14/07/2001	36	80	44		66	62	31		33		13	365
105	u/s Swinford Toll Bridge	SP440080	30/06/2000	19	20	35	1	64	118	54		91		21	423
124	Evenlode confluence	SP457097	07/06/2001	26	18	16		28	36	13		19		14	170
106	u/s Godstow	SP481096	30/06/2000	34	56	84		60	116	90		63		82	585
120	Lower Radley	SU538991	06/06/2001		45	30		43	75	39		53		26	311
121	Clifton Hampden	SU549956	06/06/2001	0	133	23		101	116	19		114		64	570
122	Shillingford	SU593923	06/06/2001	0	62	18		243	163	19		295		34	834
177	White Cross	SU606877	12/07/2001		17	16		74	70	19		71		11	278
146	South Stoke	SU593837	06/07/2001		19	15		76	135	48		84		9	386
147	Gatehampton	SU617794	06/07/2001		56	22		110	97	151		55		9	500
143	Mapledurham	SU776771	06/07/2001		15	13		115	192	72		152		19	578
163	Culham	SU512965	10/07/2001		39	5		24	10	39		8		2	127

APPENDIX 2: CONTINUED

RIVER THAME

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
160	Shabbington	SP668064	09/07/2001	15		5		95	3	34				4	156
159	Draycott	SP647065	09/07/2001	3	1	3		9		1					17
158	E of Wheatley	SP612054	09/07/2001	5	15	12		42	5	26				4	109
157	Cuddeston Mill	SP612029	09/07/2001	34	12			118	2	37				22	225
156	Chiselhampton	SU599987	09/07/2001	8	42	24		26	100	41		3		25	269
123	Brookhampton	SU603976	06/06/2001	7	2	8		6	23	3		1		3	53
155	Lower Grange	SU599956	09/07/2001	1		65		5		3		5			79
154	Dorchester	SU580938	09/07/2001	1	47	33		54	28	23		23		4	213

RIVER CHURN

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
171	Baunton	SP023043	11/07/2001		1		9	151				62			223
172	Siddington	SU039998	11/07/2001		2	12		60		3		25			102
173	South Cerney	SU054973	11/07/2001	4		33		62		7		11			117
174	NW of Cerney Wick	SU073969	11/07/2001	14		25		29		5		1			74
175	Cerney Wick	SU078962	11/07/2001	34	4	59		21		4		4			126
176	Cricklade	SU098945	11/07/2001	52		61		48		104	6			7	278

RIVER RAY

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
161	Lower Arcot	SP606193	09/07/2001			27	8	20				4			59
162	Fencot	SP570163	09/07/2001			22	19	120		5	18	16			200
178	Islip	SP528139	12/07/2001			7	7	92		14	5	43			168

APPENDIX 2: CONTINUED

RIVER LEACH

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
167	Eastleach	SP203053	11/07/2001				2	14				20			36
166	Fyfield	SP202037	11/07/2001					84				120			204
129	Little Faringdon Mill	SP222012	09/06/2001	33	1	77	25	127		252	7	173			695
165	d/s Lechlade Mill	SU227995	11/07/2001			2	9	76			14	183			284

RIVER PANG

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
179	u/s Stanford Dingley	SU569713	13/07/2001	4		19		44							67
180	d/s Rotten Row	SU589720	13/07/2001	40 0		119		99				1			619
164	u/s Bradfield	SU602725	10/07/2001	10 6	4	77		93				6			286
181	d/s Bradfield	SU607731	13/07/2001	31	1	30	2	76				27			167
182	u/s Tidmarsh	SU634737	13/07/2001	8	10	17		55				32			122
145	Tidmarsh	SU635745	06/07/2001	13	35	25	5	96				74			248
144	u/s Pangbourne	SU636758	06/07/2001	3	6		13	86		2	6	69			185

AMPNEY BROOK

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
130	Sheeppen Bridge	SU105950	09/06/2001			16		107				26			149

APPENDIX 2: CONTINUED

RIVER MONNOW

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
54	Kentchurch	SO412257	17/05/2000			18		4				2			24
53	Skenfrith Bridge	SO460203	17/05/2000			2		5							7
55	Llanrothel	SO464187	17/05/2000	2		11		23				6			42
52	u/s Tregate Bridge	SO477175	17/05/2000	1		8		14				3			26
51	d/s Tregate Bridge	SO478171	17/05/2000			6		14				1			21
50	Rockfield	SO482151	17/05/2000	1		10		27				11			49

RIVER WYE

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
W1	Turner's Boat	SO314459	04/07/2002		13	13		59		2		50			137
W2	u/s Bredwardine	SO339455	04/07/2002		1	2		22				2			27
W3	d/s Bredwardine Bridge	SO336446	04/07/2002		7	3		59				16			85
W4	Bridge Sollers	SO414423	04/07/2002		9	5		16				3			33
W5	Lower Breinton	SO475392	04/07/2002		8	8		20				4			40
W6	d/s Hereford	SO543374	04/07/2002			10		34		1		14			59
W7	E of Holme Lacy	SO568367	04/07/2002		53			47		2		43			145
W8	u/s Capter Wood	SO585327	05/07/2002		7	1		39		2		15			64
W9	u/s Hoarwithy	SO554303	05/07/2002		3			48		4		5			60
W10	d/s Hoarwithy Bridge	SO548293	05/07/2002		20			17		5		6			48
W11	Sellack Boat	SO565280	05/07/2002		4			56		19		49			128
W12	How Caple	SO616298	05/07/2002		4			24		2		12			42
W13	d/s Hole-in-the-Wall	SO603283	05/07/2002		19			33		8		28			88
W14	Backney	SO584272	02/07/2002		40	8		22	12	24		26			132
W15	Ross-on-Wye	SO591243	02/07/2002		114	1		39		22		27			203
W16	Stanesford Priory	SO582194	02/07/2002		48	5		16		16		30			115
W17	u/s Lower Lydbrook	SO602175	05/07/2002		58	6		8		8		4			84
W18	S of Goodrich	SO567183	02/07/2002		15	1		11		3		22			52
W19	Dixton	SO522136	02/07/2002		46	7		83		34		31			201
W20	Monmouth	SO512125	02/07/2002		15			53		33		35			136

W21 Redbrook SO534103 02/07/2002 4 20 18 19 61

APPENDIX 2: CONTINUED

RIVER LUGG

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
40	Upper Lye	SO398654	15/05/2000	6		11		18							35
41	Kingsland	SO449621	15/05/2000	1		1		15				3			20
42	Eaton Bridge (A44)	SO507507	16/05/2000	53	41	16		48		39		38			235
43	u/s Ford	SO513554	16/05/2000	2	12			61		4		46			125
44	Bodenham	SO537513	16/05/2000	1	3	1		17				23			45
45	Marden	SO516476	16/05/2000		2	3		47		2		41			95
46	Moreton Bridge	SO513457	16/05/2000		11	4		57		7		52			131
47	Wergins Bridge	SO528448	16/05/2000	5	2	3		183		7		176			376
48	Lugwardine	SO548406	16/05/2000	3	5	16		67		36		98			225
49	u/s Wye confluence	SO571376	16/05/2000	4	11	8		48		46		72			189

RIVER ARROW

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
W23	Hunton Bridge	SO333586	06/07/2002			2	1	12				1			16
W24	u/s Eardisland	SO415588	06/07/2002		1	1		26				14			42
W25	Eardisland	SO420587	06/07/2002		1	4		42				37			84
W26	Arrow Green	SO438586	06/07/2002		2	5		71		2		48			128
W27	Ivingtonbury	SO475571	06/07/2002			3		22		1		18			44
W28	Broadward	SO497570	06/07/2002		10			28		11		29			78

RIVER FROME (R. Lugg tributary)

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
W29	N of Stoke Edith	SO599420	06/07/2002			18	11	16				9			54
W30	Five Bridges	SO573403	06/07/2002			2		24				11			37
W31	Larport	SO565392	06/07/2002					33				18			51

APPENDIX 2: CONTINUED

AYMESTREY POND

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pers	obt	TOTAL
37	outflow stream	SO52-46-	15/05/2000				39	68				66			173
38	lower pond	As above	15/05/2000				56	68				88	9		221
39	upper pond	As above	15/05/2000				27	33				58	13	22	153

RIVER ISE

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
109	Warkton	SP890801	17/07/2000			3	6	51				30			90
108	Weetabix factory	SP885753	17/07/2000		11		2	44		8		21			86
107	N of Finedon	SP896733	17/07/2000		3			8		5		20			36
106	Finedon	SP900709	17/07/2000		37	7	11	83		103		33			274

RIVER NENE

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
110	Nether Hayton	SP664589	17/07/2000		4	2	3	29		38	2	39			117
111	Kislingbury	SP699598	17/07/2000		27	27	1	28	2	42		16			143
112	W of Cogenhoe	SP815610	17/07/2000		4	2		20	8	25		6			65
113	Earls Barton	SP859620	17/07/2000			2	11	70		25		23	1		132

RIVER GREAT OUSE

SITE No.	SITE	GRID REF	DATE	ten	amn	cas	mil	sub	sup	hens	hib	nit	pulc	moit	TOTAL
116	Turvey	SP936515	18/07/2000		6	12		71		39	19	11		8	166
115	Felmersham	SP991579	18/07/2000			3		19		5		9			36
114	Radwell	TL005572	18/07/2000				2	37		2	16	57			114
117	Oakley	TL009529	18/07/2000		2		38	91		8	7	24			170
118	Great Barford	TL133514	18/07/2000		1	7	2	54		31		26		1	122
119	Roxton	TL162539	18/07/2000		10	3		12		38		8		1	72

APPENDIX 2: CONTINUED

RIVER AXE

SITE No.	SITE	GRID REF	DATE	ten	amn	per	cas	mil	sub	sup	hens	hib	nit	pulc	TOTAL
1 Ax	Clapton Mill	ST414054	29.6.02		4		2	1	97				37		141
2 Ax	Forde Abbey	ST363053	29.6.02		3				7				16		26
3 Ax	Chard Junction	ST343048	29.6.02		14	1		1	41				46		103
4 Ax	Broom Bridge	ST325025	29.6.02		132		8		109				80		329
5 Ax	Axe Bridge	ST323017	29.6.02		209		6		97				73		385
6 Ax	Weycroft	SY306998	29.6.02	1	15	3	15	1	28		1		160		224
7 Ax	Bow Bridge	SY290982	30.6.02	1	29				73				122		225
8 Ax	Woodhayne Farm	SY270961	30.6.02		29				49				310		388
9 Ax	Colyford	SY259925	30.6.02		156	11	42	1	84		14		62	7	377

RIVER BRIT

SITE No.	SITE	GRID REF	DATE	ten	amn	per	cas	mil	sub	sup	hens	hib	nit	pulc	TOTAL
5 Br	Netherbury	SY472992	16.8.01		12	11	3		5						31
4 Br	Camesworth	SY476970	16.8.01		7	4	2		9				7		29
3 Br	Watford Farm	SY474952	16.8.01		2	2	13		1						18
2 Br	Watford Bridge	SY473948	16.8.01		1	1	2						2		6
1 Br	Bridport	SY465923	16.8.01		15		2	1	5				5	1	29

RIVER OTTER

SITE No.	SITE	GRID REF	DATE	ten	amn	per	obt	cas	mil	sub	hens	hib	nit	pulc	TOTAL
1 Ot	New Bridge	ST201068	12.10.02		1	3				22			3		29
2 Ot	Monkton	ST184031	12.10.02					4		6			5		15
3 Ot	Weston	ST143001	12.10.02					41		50			49		140
4 Ot	Woodford Barton	SY102971	12.10.02		1			3		10			7		21
5 Ot	Fluxton	SY092924	12.10.02		2	4		6		42			37		91
6 Ot	Bridge End	SY091898	12.10.02		2	2		35		56			53		148
7 Ot	Colaton Raleigh	SY086872	12.10.02		2	5		184	4	138			75		408
8 Ot	Otterton	SY078851	12.10.02			3		111		104			75		294

APPENDIX 2: CONTINUED

RIVER YARTY

SITE No.	SITE	GRID REF	DATE	ten	amn	per	obt	cas	mil	sub	hens	hib	nit	pulc	TOTAL
1 Yr	Court Place	ST256068	30.6.02			11	4								15
2 Yr	Long Bridge	ST256054	30.6.02							1					1
3 Yr	Higher Westwater	ST279998	30.6.02							12					12
4 Yr	Yarty Bridge	SY283979	30.6.02		16	6		5	1		1		61		90

RIVER FROME

SITE No.	SITE	GRID REF	DATE	ten	amn	per	obt	cas	mil	sub	hens	hib	nit	pulc	TOTAL
1 Fr	Sandhills	ST586005	3.8.00					3		2			9		14
2 Fr	Cattistock	SY591993	3.8.00		8	1				5			22		36
3 Fr	Little Cruxton	SY603967	3.8.00		10			4	1	24			184		223
4 Fr	Grimstone	SY643936	3.8.00		61				4	87		1	105		258
5 Fr	Dorchester	SY673923	3.8.00		1			1	1	10			37		50
6 Fr	Norton Mill Farm	SY738901	3.8.00		2				24	36			310	2	374
7 Fr	Pallingham Fishery	SY783912	4.8.00					1	3	3			148		155
8 Fr	Pallingham Farm	SY785909	4.8.00				1	8	18	20			266	3	316
9 Fr	Broompond Dairy	SY814884	4.8.00	7	18			3	7	76	8		322	7	448
10 Fr	Wool Bridge	SY844872	4.8.00		2			4	7	19	5		47	1	85
11 Fr	Holme Bridge	SY889864	4.8.00	7	19			38	6	48	48		130	2	298
12 Fr	Broompond Dairy	SY813886	24.10.01					6	2	15			723		746
13 Fr	Broompond Dairy	SY814884	24.10.01					2		2			51	1	56
14 Fr	Winfrith	SY815877	24.10.01	15				12	3	31	21		247	6	335
15 Fr	Winfrith	SY817876	24.10.01	1	8			46	4	34	24		172	6	295
16 Fr	East Burton	SY832874	24.10.01	7	96			9		131	139		515	21	918
17 Fr	Bindon Abbey	SY859868	24.10.01	4	4		2	31		84	21		219	6	371
18 Fr	Stokeford	SY865866	23.10.01	3	9			7	1	63	4		85		172
19 Fr	East Stoke	SY874867	23.10.01	2	29			14	10	61	142		323	15	596
20 Fr	Rushton Farm	SY885863	23.10.01	2	10			6		53	103		152	31	357
21 Fr	Holme Bridge	SY889864	23.10.01	14	12			8		15	52		66	4	171

APPENDIX 2: CONTINUED

RIVER PIDDLLE

SITE No.	SITE	GRID REF	DATE	ten	amn	per	obt	cas	mil	sub	hens	hib	nit	pulc	TOTAL
1 Pi	Piddlehinton	SY 715973	1.8.00		24			4		17			30		75
2 Pi	Higher Waterston	SY 728954	1.8.00		6			2	6	44			282		340
3 Pi	Athlehampton	SY 770944	1.8.00		1			1	4	72	6		102	6	192
4 Pi	Affpuddle	SY 806937	1.8.00	1	2		1	2	3	10	1		35		55
5 Pi	Throop	SY 829933	1.8.00	4	2				5	31	4		9		55
6 Pi	Chamberlaynes's Farm	SY 845927	2.8.00		1			2	12	101			235		351
7 Pi	Woodlands	SY 863909	2.8.00		6			6	3	34			58		107
8 Pi	Trigon Farm	SY 884887	2.8.00							4			17		21
9 Pi	Lower Trigon Farm	SY 886885	2.8.00										1		1
10 Pi	Carey nr. Wareham	SY 906878	2.8.00					1		6			16		23

RIVER STOUR (Dorset)

SITE No.	SITE	GRID REF	DATE	ten	amn	per	obt	cas	mil	sub	hens	hib	nit	pulc	TOTAL
1 St	Charlton Marshall	ST905042	22.10.01							4	1		17		22
2 St	Court Farm	SY977988	22.10.01		0										0
3 St	Pamphill	ST995001	22.10.01		52			11	15	84	161		228	55	606
4 St	Sturminster Marshall Mill	ST958005	22.10.01		11					38	30		187	11	277

APPENDIX 2: CONTINUED

RIVER AVON (Hants)

SITE No.	SITE	GRID REF	DATE	ten	amn	per	obt	cas	mil	sub	hens	hib	nit	pulc	TOTAL
7 Av	North Newton	SU 133573	14.8.00					4		6			108		118
6 Av	Upavon	SU 134540	13.8.00					4	1	29			169		203
5 Av	East Chisenbury	SU 140528	13.8.00		20			15		50			69		154
4 Av	Fifield	SU 147503	13.8.00		19			12		43			87	1	162
3 Av	Netheravon	SU 150485	13.8.00		5				5	41			104	2	157
2 Av	Ablington	SU 156466	13.8.00		1				3	45			86	5	140
1 Av	Durrington	SU 165445	13.8.00		4				7	48			93	1	153
8 Av	Normanton	SU 136406	14.8.00		1			2	4	7			59		73
10 Av	Great Durnford	SU 133382	14.8.00		12			48		13			13		86
9 Av	Upper Woodford	SU 125373	14.8.00	3	7		1	28	3	31			195	3	271
11 Av	Little Durnford Bridge	SU 123342	14.8.00		11			18		52			214		295
12 Av	Avon Bridge	SU 128330	14.8.00		1			6	3	11			229	2	252
13 Av	North Salisbury	SU 126326	14.8.00		1			30		28			300		359
14 Av	Near Christchurch	SZ 154953	20.9.00		5			22	1	13	20		108	20	189

APPENDIX 2: CONTINUED

RIVER ITCHEN

SITE No.	SITE	GRID REF	DATE	ten	amn	per	obt	cas	mil	sub	hens	hib	nit	pulc	TOTAL
1 It	Ovington	SU563317	25.8.02		2			2	15	39			645		703
2 It	Avington	SU535325	25.8.02		9			51	4	9			340	1	414
3 It	Avington Lake	SU529323	25.8.02		5			58		4			362		429
													100		
7 It	Chilland	SU523326	25.8.02		20			18		21			5		1064
4 It	Abbotts Worthy(n. carrier)	SU502325	25.8.02	11	28			8	6	58			648		759
5 It	Abbotts Worthy(s. carrier)	SU501324	25.8.02		8			26		24			250		308
6 It	Abbotts WorthyMill	SU498324	25.8.02		13		1	8	1	15			274		312
13 It	Abbotts Barton (e. carrier)	SU494312	28.7.02	55	30			10		33			321		449
14 It	Abbotts Barton (w. carrier)	SU490314	28.7.02	11	3			6		66			482		568
15 It	Hyde	SU486300	28.7.02	83	37			46		15			439	2	622
12 It	Winnal (Winchester)	SU487299	28.7.02	43	42			4		71			660		820
8 It	Tumbling Bay	SU477263	26.8.02	55	23		4	18		64			738		902
9 It	Shawford Mill	SU474249	26.8.02	42	1			58	2	56			265	4	428
10 It	Otterbourne Farm	SU469227	26.8.02	6	12		1	3		30			129		181
11 It	Highbridge	SU469214	26.8.02		36			4	8	76			548	10	682

RIVER TEST

SITE No.	SITE	GRID REF	DATE	ten	amn	per	obt	cas	mil	sub	hens	hib	nit	pulc	TOTAL
9 Te	Whitchurch	SU 461477	19.8.00		2				12	9			144	32	199
8 Te	Longparish	SU 441447	19.8.00		18			42	2	84			566	37	749
7 Te	Wherwell	SU 386406	19.8.00						14	8			167		189
5 Te	Longstock	SU 362369	18.8.00	15	98			46		64			379	13	615
6 Te	Nr Longstock	SU 363367	19.8.00		6			16	10	82			207	4	325
4 Te	Stockbridge	SU 353348	18.8.00						8	25			297		330
3 Te	North Houghton Farm	SU351339	18.8.00				1	5	7	9			288		310
2 Te	Houghton	SU343318	18.8.00						6	26			608	12	652
1 Te	Horsebridge	SU 345305	18.8.00					10	6	36			352		404

APPENDIX 2: CONTINUED

RIVER MEON

SITE No.	SITE	GRID REF	DATE	ten	amn	per	obt	cas	mil	sub	hens	hib	nit	pulc	TOTAL
6 Me	Soberton	SU608171	12.8.01		13				3	14			27		57
5 Me	Mislingford	SU588142	12.8.01			1		2	6	16			33		58
4 Me	Wickham	SU565106	12.8.01						1	10			46		57
3 Me	Gt Funtley Farm	SU556089	12.8.01		6			4	1	27			75		113
2 Me	Titchfield Abbey	SU543065	12.8.01	1		1		4		7			6		19
1 Me	Titchfield NNR	SU543045	12.8.01	1	9			14		22			8		54

RIVER ROTHER

SITE No.	SITE	GRID REF	DATE	ten	amn	per	obt	cas	mil	sub	sup	hens	hib	nit	TOTAL
3 Ro	Mill Dam, Old Ditcham	SU 765210	29.7.00						16	47				35	98
1 Ro	Harting Pond	SU 781220	29.7.00				6	92	10	64				94	266
2 Ro	Harting Pond (outflow stream)	SU 783221	29.7.00		1	3(D)		6		2					9
4 Ro	Maidenmarsh Bridge	SU 783234	29.7.00					1?		7				1	9
5 Ro	Greatham Mill	SU 763305	29.7.00			2				2		2		3	9
6 Ro	Tankerdale Farm	SU 766255	29.7.00							8					8
7 Ro	Habin Bridge	SU 807229	29.7.00		15			14		11				4	44
8 Ro	Midhurst	SU 890218	17.6.00		1							5		2	8
9 Ro	Midhurst	SU 890215	17.6.00		1					7		3		2	13
11 Ro	Shopham Bridge	SU 985185	30.7.00		2					3	12	31		5	53
10 Ro	Fittleworth	TQ 014180	30.7.00		4					5	27	58			94