



THE
Mammal
SOCIETY

Shrew News

RESULTS OF THE MAMMAL SOCIETY'S WATER SHREW SURVEY

SPRING 2006

Illustration by Tamzin Hackett



Wild
specimen



Background to the survey

The Eurasian water shrew, *Neomys fodiens*, is one of Britain's least known mammals due to its small size, elusive nature and sporadic and patchy occurrence. Concerned that they were undergoing a decline in numbers and occurrence as a result of pollution, pesticide use and habitat loss, The Mammal Society initiated the first national Water Shrew Survey to determine their distribution and habitat occurrence. The survey was carried out over 4 survey seasons in 2004 and 2005:

Survey season

Survey Season 1	April 1st – April 30th 2004
Survey Season 2	July 1st – September 30th 2004
Survey Season 3	December 1st – April 30th 2005
Survey Season 4	July 1st – September 30th 2005

Bait tube method

The bait tube method was selected for the national survey. Short lengths of plastic waste pipe were baited with casters (or mealworms) and were placed in vegetation along the banks of freshwater habitats for 2 weeks. Small mammals are attracted to the bait in the tubes and, while feeding on the bait, deposit scats (droppings). Any scats found during the survey were returned to The Mammal Society, where they were examined under the microscope for the remains of aquatic invertebrates. The water shrew is the only small mammal species which feeds regularly on aquatic invertebrates. The presence of these prey remains, coupled with an assessment of the size, shape and colour of the scats, is indicative of water shrew presence. Habitat information was also collected at each site to allow us to determine the habitat occurrence of the species. All of the information you collected (including data from sites where no water shrews were found) was used to produce the results, which are presented in the following pages.

Thank you for taking part in The Mammal Society's Water Shrew Survey. The survey would not have been possible without your help. This newsletter shows you how the information you collected has contributed to the first national data set on water shrew distribution and habitat occurrence. Since the field work for the survey was completed in September 2005, the results have been analysed and a final report submitted to The Environment Agency who helped to fund the project. A summary of the survey findings is presented in the following pages.

Thanks to you the survey has been a real success. I really hope you enjoyed taking part and that we can work together on future surveys.

Best wishes,

Dr Phoebe Carter, pcarter@mammal.org.uk

Volunteers and sites

Since the Water Shrew Survey was first advertised, 1382 people registered an interest in taking part and were sent a survey pack. 506 of you actually undertook the survey and returned information. 82.4% were based in England with only 9.6% and 8.0% based in Scotland and Wales, respectively.

Survey Season	No. of volunteers	No. of sites surveyed	No. of positive sites	% of volunteers finding 1 or more positive sites	% of positive sites
Survey Season 1	149	299	38	22.8%	12.7%
Survey Season 2	248	791	142	36.3%	18.0%
Survey Season 3	143	541	70	25.9%	12.9%
Survey Season 4	161	528	137	36.0%	25.9%
Mean (\pm S.E.)	175.0 \pm 24.5	539.8 \pm 100.5	96.8 \pm 22.9	31.3%	17.4%



Volunteer setting bait tube

In total you surveyed 2159 sites, finding evidence of water shrews at 17.4% of these. A consistently greater percentage of positive sites were found in the summer survey seasons, and consequently the percentage of you finding evidence of water shrews was also greatest in the summer. This finding is likely to reflect the fact that, like common and pygmy shrews, water shrews breed between April and September resulting in their populations reaching their maximum at this time.

The particularly high percentage of water shrews recorded in Survey Season 4 (25.9%) could be the result of natural annual fluctuations in population size or could be linked to the fact that during that period (July-September 2005) there

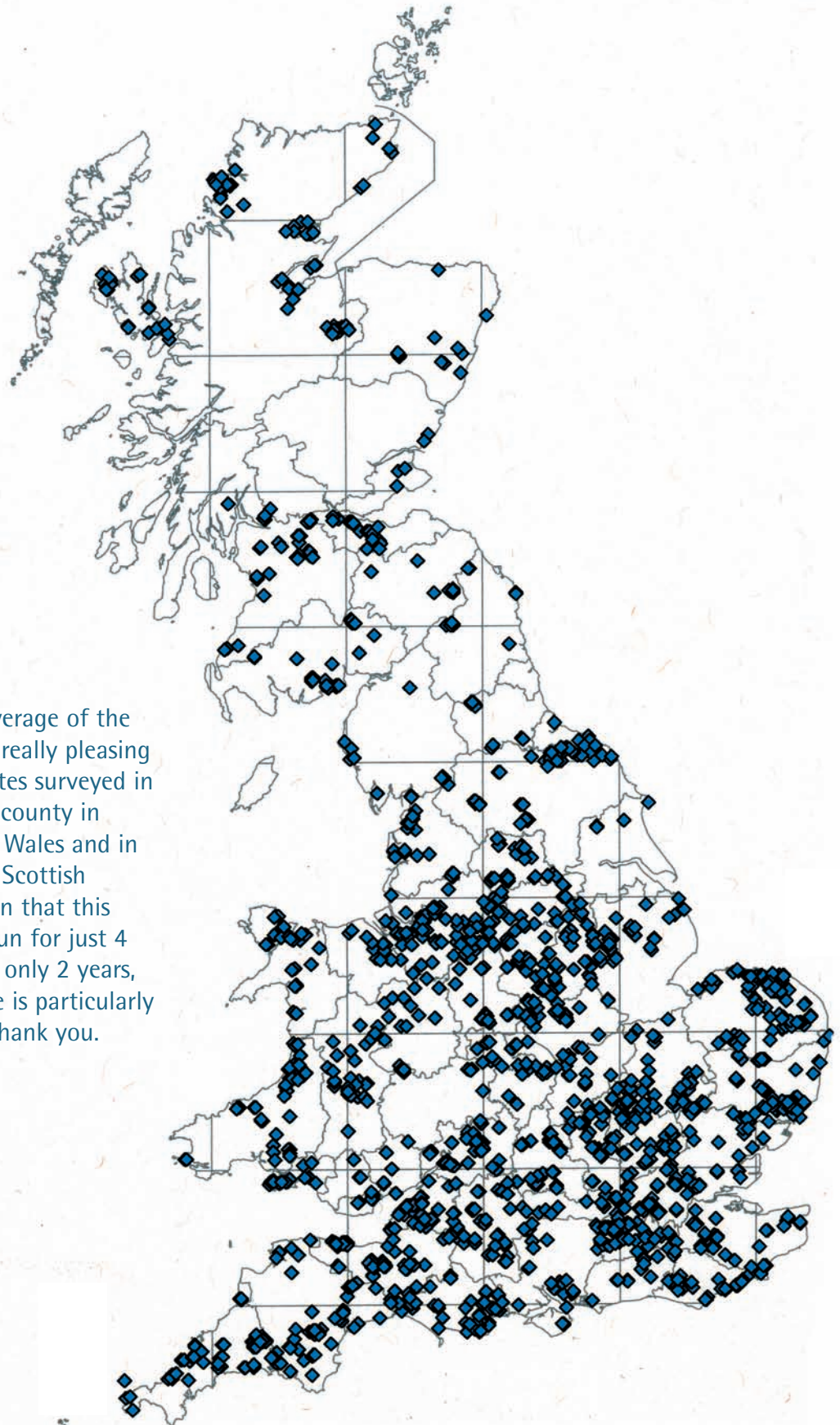
was considerably less rainfall (comparing mean monthly rainfall as recorded by the Met Office) than during the other three survey seasons. This may have resulted in fewer tubes being flooded and a greater retention of water shrew scats.

Water Shrew Distribution

Before this survey, the most current distribution map for water shrews was produced by H. E. Arnold for the *Atlas of Mammals in Britain* (Arnold, 1993). This map was created from 117 records collected prior to 1959 and 654 records collected between 1960 and 1993. The majority of these records were sightings of live or dead individuals and while it is likely that these records would be accurate, there is always an element of error when identifications are based on sightings alone. The distribution map that you have helped to create in this survey is unique in that all the records have come from detailed analysis of scat samples which means that the generation of “false positive” records is highly unlikely. We collected an average of 194 water shrew records per year; approximately a hundred-fold increase on the average number recorded and collated between 1960-1993.

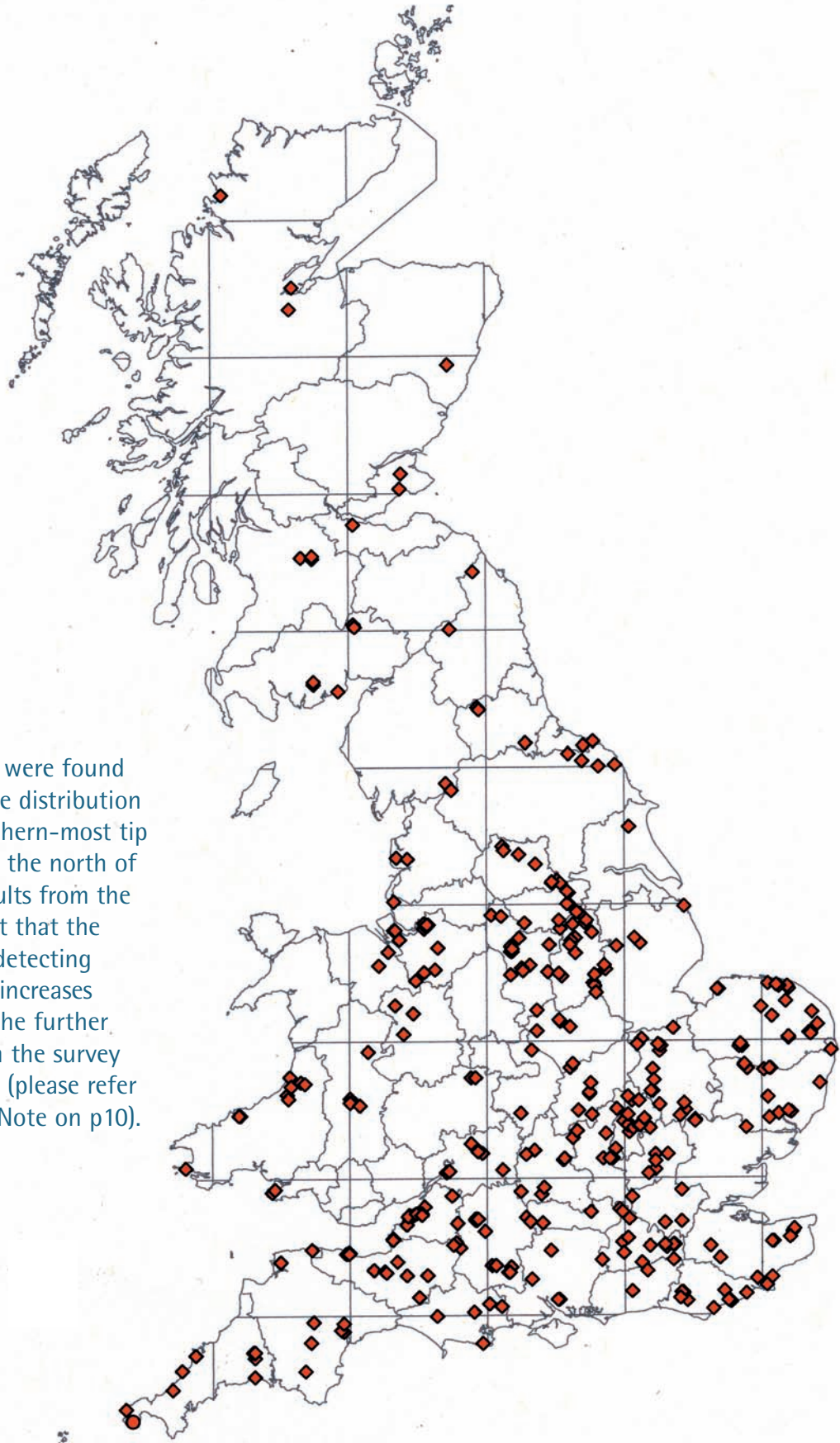
Map of all sites

The wide coverage of the country was really pleasing with some sites surveyed in nearly every county in England and Wales and in many of the Scottish regions. Given that this survey was run for just 4 seasons over only 2 years, this coverage is particularly impressive. Thank you.



Positive sites

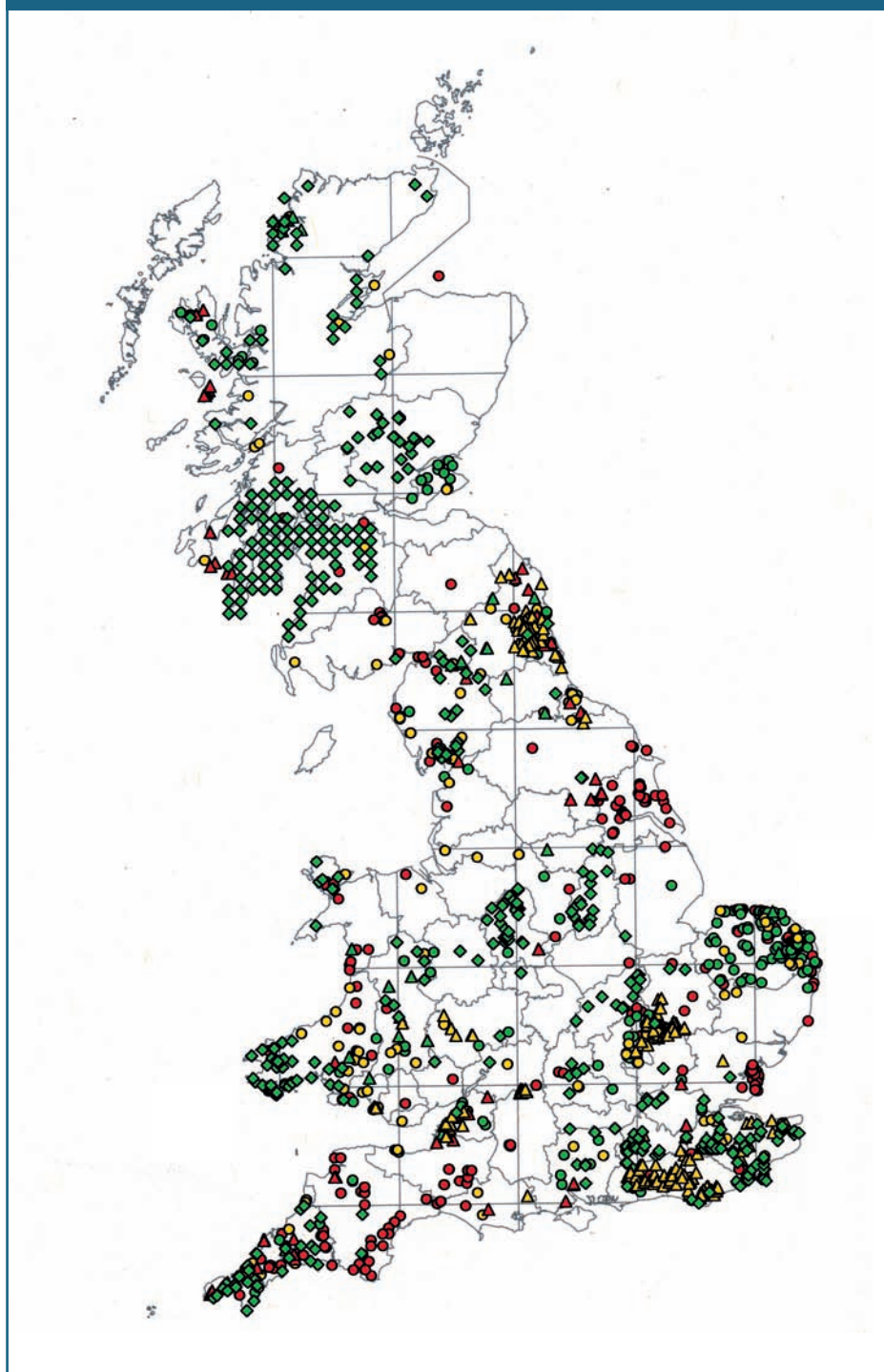
Water shrews were found to have a wide distribution from the southern-most tip of England to the north of Scotland. Results from the survey suggest that the likelihood of detecting water shrews increases significantly the further east in Britain the survey site is located (please refer to Statistical Note on p10).



Historical water shrew records

As the national water shrew survey was the first of its kind it seemed sensible for us to act as a base for historical water shrew records and to maintain the most current database on water shrew distribution. We asked you to submit any water shrew records from 1993 onwards, with the method of identification if known. Records were also provided from The Mammal Society's National Owl Pellet Survey, from some Wildlife Trusts that had carried out their own surveys in previous years and from some County Mammal Recorders and Local Record Centres. While being the most up-to-date map, it is by no means complete. We will continue to collect water shrew records for the foreseeable future, so please continue to submit them.

From 1993 to present day



Key to source of records:

- Owl pellets
- Live sightings
- Dead specimen
- ▲ Live-trapping
- ▲ Cat kill
- ▲ Bait tube method
- ◆ Other method or unknown source

The Environmental Records Centre for Cornwall and the Isles of Scilly, the Thames Valley Environmental Records Centre and the Highland Biological Recording Group (via the NBN) all provided us with water shrew records.

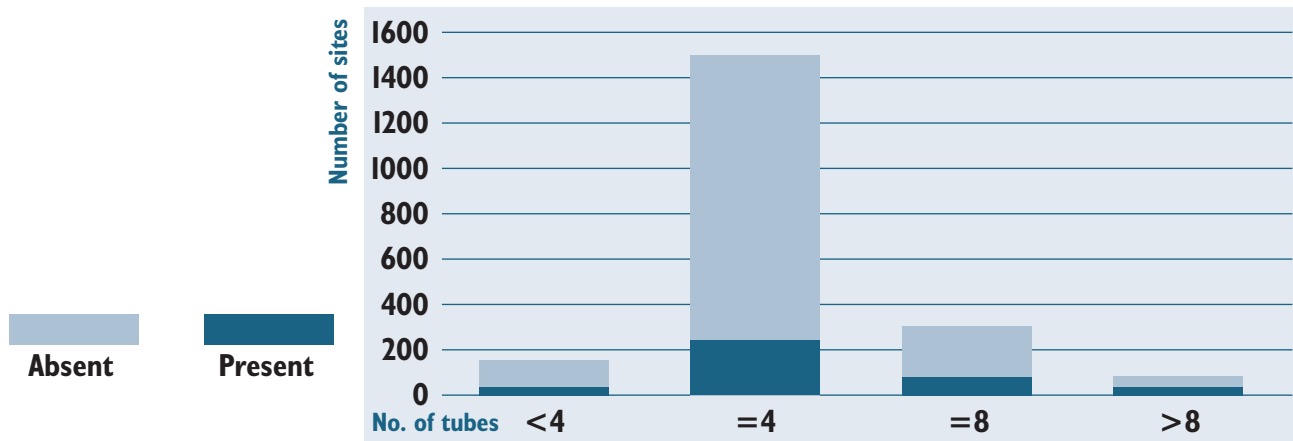
Methodological factors

The term "Absent" is used in the following pages to describe sites where no water shrews were found. This is a descriptive term only, as there is no way of knowing if water shrews were really absent from these sites or if they were just not recorded during the time frame of the survey.

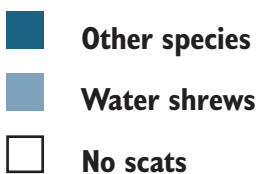
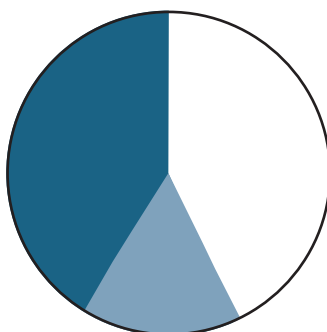
Bait and number of tubes used at a site

Until the survey had started we were unaware of the difficulties associated with obtaining casters in certain parts of the country and at certain times of year. Casters were used as bait at 93% of sites, with dried mealworms used at the remaining 7%.

We suggested that you used 4 bait tubes at each of your sites, but that you could use as many as you liked provided the number was recorded on the Field Form. Records showed that 4 bait tubes were used at the majority of sites and that this was a sufficient number for detecting the presence of water shrews.



Scat samples



We had a good return of water shrew scats and scats from "Other" small mammal species (e.g. common and pygmy shrews, rodents). However, a relatively large proportion of sites produced no scats of any sort. Although this was frustrating given the effort you put in to surveying each site, the information from these sites was still of great value to the survey and much appreciated.

Possible explanations for no scats being found at a site are:

1. Bait tubes that are not securely fixed in place are difficult for small mammals to access.
2. Small mammal numbers could have been low in the habitat where the tubes were placed.
3. Small mammals may have removed the bait and taken it to their nests to feed thus not lingering long enough to produce and deposit scats.
4. Scats can be washed from tubes by heavy rain and spating rivers; can be concealed by silt that gets washed into tubes during flood events, or knocked out of the tubes by the activities of small mammals.
5. Squashed or fragmented scats can look like soil particles and can be easily overlooked when collecting and returning samples.

As with all survey methodologies the bait tube method does not have a 100% success rate. It nonetheless remains the best method for a national survey of water shrews, being less time-consuming and less labour intensive than other methods such as live-trapping. Perhaps most importantly small mammals are free to enter and leave the tubes at will and thus animal welfare is paramount.

Habitat occurrence

The information you collected at each of your sites has provided us with the first information on the habitat occurrence of water shrews on a national scale. The findings show that water shrews appear to be ubiquitous and ecologically flexible, utilising a range of habitats with a broad range of characteristics.

Habitat type

You surveyed a wide variety of habitats and found water shrews in most of the habitat types investigated:

Habitat type	Total no. sites surveyed	No. of positive sites	% positive sites
River	410	65	15.6
Stream	666	114	17.2
Canal	78	24	30.8
Pond/Lake	420	77	18.3
Ditch	245	49	20.0
Bog	15	0	0
Fen / Marsh	35	9	25.7
Reedbed	41	7	17.1
Cressbed	2	0	0
Other	89	21	23.6

As well as being found in sites with fast-flowing water, with which they are commonly associated, water shrews were also recorded in many habitats with static and slow-flowing water, such as canals, ponds, lakes and ditches. Previous records from such habitats are scarce and the findings from this survey suggest that these habitats should not be overlooked when surveying for water shrews in the future.

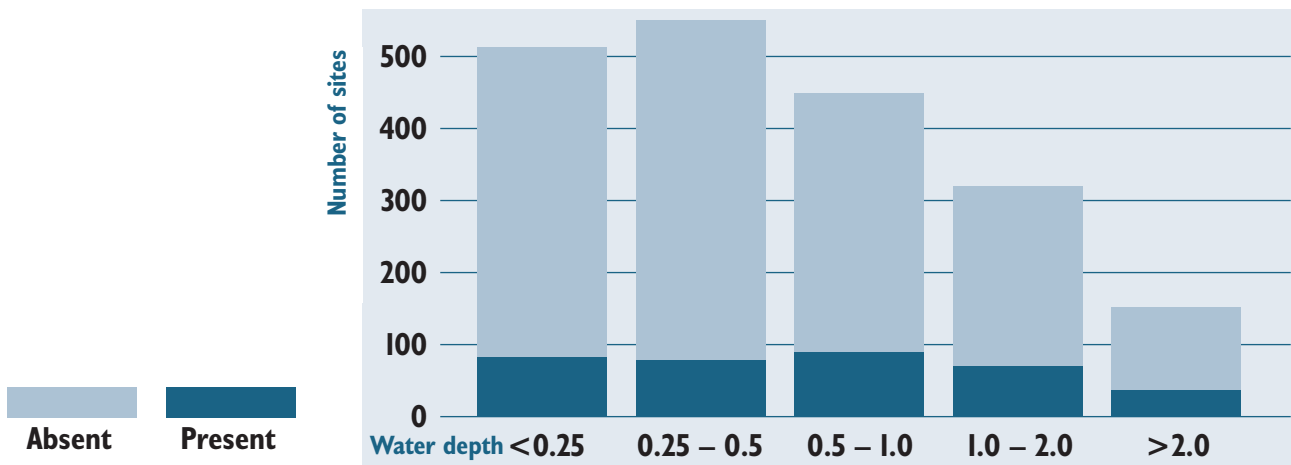
Habitat where water shrews were recorded

Photo by Angela Gall



You found water shrews in sites with water depths as shallow as $<0.25\text{m}$ and in sites where the depth was greater than 2.0m .

There was no association between their occurrence and the width of the water body. They were found where the water width was $<1.0\text{m}$ and where it exceeded 10.0m (see graph below).



Bank characteristics

The agility of water shrews and their ability to use steep banks can be seen in this photograph of a wild water shrew using a nearly vertical rocky bank to descend into the water

The versatile nature of water shrews was also evident in their lack of statistically significant association with any features of the surrounding bank. You found them in sites with earth banks and in sites with rocky banks; they were undeterred by steep bank inclines and occupied sites with bank heights of $<1.0\text{m}$, $1.0\text{-}2.0\text{m}$ and $>2.0\text{m}$.

Photo by Dr Steve Furness



Aquatic vegetation

You found evidence of water shrews in sites devoid of aquatic vegetation and in sites where aquatic vegetation was both present and dense. There was no statistically significant association with any particular level of vegetation cover, further highlighting the adaptable nature of this species.

Terrestrial vegetation

Your records also showed that water shrews were found in a range of sites with differing types and amounts of terrestrial vegetation cover.



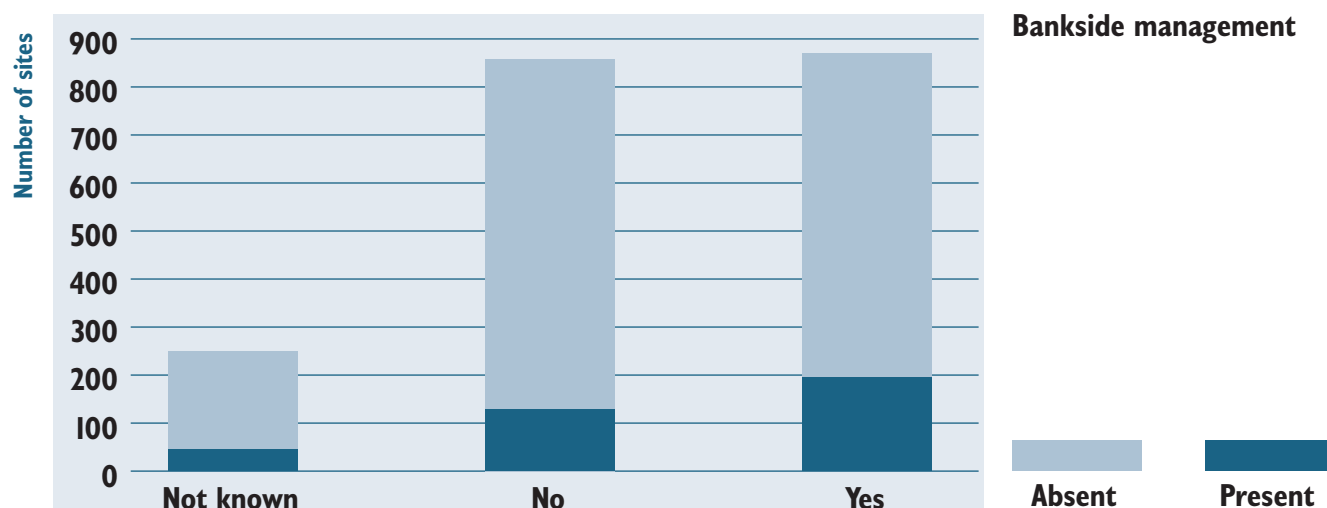
Photo by Jon Trill

Terrestrial vegetation	Absent	Present	Dense
Trees	22.9	17.4	14.5
Shrubs	15.1	19.6	17.2
Herbs	9.3	16.3	23.3
Grasses	12.7	17.5	20.5

Analysis of the data revealed that there was a statistically greater chance of finding water shrews in sites where herb cover was dense.

Habitat management

You were asked to record if any form of management of bankside vegetation was carried out at your sites. At just over 200 sites, you were unsure of whether any management was carried out and you choose to tick the "Not Known" category. Of the remaining sites where the level of management was known, 21.9% of sites with occasional or frequent management were positive for water shrews and 14.0% of sites with no form of management were found to be positive for water shrews. There was however, no statistically significant association between bankside management and the occurrence of water shrews.



Human activity and adjacent land use

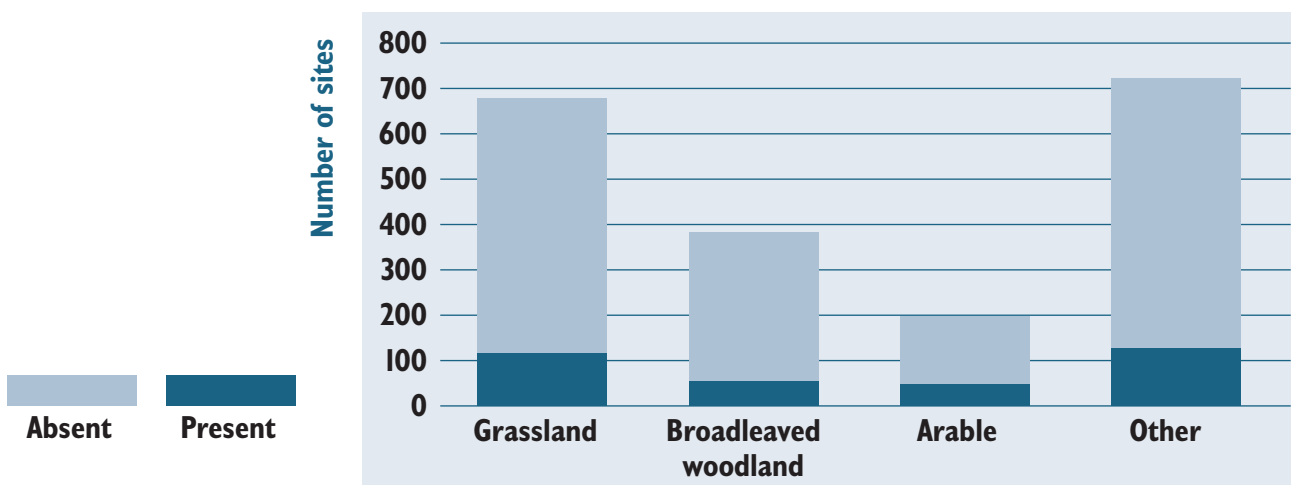
Angling, boating and walking did not appear to have a negative impact on the occurrence of water shrews with 19% of positive sites being used for at least one of these pursuits. They were even recorded in some unexpected locations in close proximity to human activity:

Adjacent land use to the site	Number of records of water shrews
Urban	3
Garden	7
Sports/Amenity ground	3
Fish farm	2
Saltmarsh	1
M5 motorway (within 150m)	1
Scrapyard	1

Garden pond where water shrews have been recorded



Photo by Dr Steve Furness



Although found in some unusual locations, water shrews were more commonly found in sites where the adjacent land use was arable land (25% of positive sites), broadleaved woodland (20% of positive sites) and grassland (17% of positive sites).

Water quality

Water quality can affect water shrews directly and indirectly. Pollutants can be ingested during grooming, while factors such as Biochemical Oxygen Demand (BOD), phosphates and nitrates can affect them indirectly by acting on their invertebrate prey. Using the grid references you provided and water quality data provided by the Environment Agency we were able to investigate the effect of BOD, nitrates, phosphates and pH on water shrew distribution.

Our findings showed that a statistically greater proportion of water shrews was associated with low BOD, low nitrate levels and a pH of between 7.0-8.0.

Statistical note

The survey has shown that easting, herb cover, BOD, nitrates and pH have a significant influence on water shrew occurrence. However, caution should be taken when interpreting these results as the predictive abilities of the statistical models used in this study were very low. This means that easting, herb cover, BOD, nitrates and pH have only a small overall impact on water shrew occurrence, and that there are other factors (e.g. other habitat or water quality factors; prey availability etc), as yet unidentified, that exert a greater influence on where water shrews are found. The lack of strong statistically significant association with any habitat or water quality variable also emphasises the ubiquitous nature of this species.

BOD is used as a measure of the level of organic pollution in water. The greater the BOD level, the more rapidly oxygen is depleted from the water and the poorer the diversity of oxygen-dependent plants and animals

Water shrew feeding on earthworm

Photo by Martin Smith



Future work

This national Water Shrew Survey has been a great success, producing the first data-set on the distribution and habitat occurrence of water shrews in Britain. In order to assess fully the conservation needs of water shrews, we now need to determine and monitor their population size. The Mammal Society intends to modify the bait tube protocol so that an index of abundance can be determined, and then use this method to monitor water shrews as part of a national Small Mammal Monitoring Scheme which will be implemented in the near future. We will be looking for volunteers to take part in this survey so please keep an eye on our website (www.mammal.org.uk).

Water Shrew Report

The information that has been presented in this newsletter is only a summary of the survey results. The full report on the Water Shrew Survey, *Distribution and habitat occurrence of water shrews in Great Britain* (Carter & Churchfield, 2006), is available to download on our website (www.mammal.org.uk) and on the Environment Agency website (www.environment-agency.gov.uk).

Water Shrew Conservation Handbook

Work is currently underway on a Water Shrew Conservation Handbook. The handbook will include information on the biology and ecology of the water shrew, the methods that can be used to survey for them and what measures we can take to encourage and maintain their populations. The handbook will be available for purchase later this year.

Thanks

I would like to thank you all for your help on behalf of myself, The Mammal Society, Sara Churchfield and Britain's water shrews!

Photo by Dr Steve Furness



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The Mammal Society is the only organisation solely dedicated to the study and conservation of all British mammals. To find out more about membership of The Mammal Society, details of your Local Mammal Group, the books we sell and our surveys and monitoring projects please telephone 020 7350 2200 or visit www.mammal.org.uk.

The Mammal Society would like to thank RTE Thames Water and the People's Trust for Endangered Species for helping to fund the production of this newsletter.



We are also very grateful to the Environment Agency for helping to fund the Water Shrew Survey

