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More about water voles

Water vole biology

Swimming water vole

Andrew Parkinson

Identification

The water vole is a rodent and the largest of the British voles, weighing between 200 and 350 g. It has the typical 'rotund' appearance of a vole, i.e. a short, rounded muzzle, small indistinct ears and brownish or black fur which extends to cover the tail, which is about three-quarters of the body length. Despite its common name, it is not particularly well-adapted to an aquatic lifestyle – it lacks webbed feet and its fur is prone to water-logging after only a few minutes of immersion! Nevertheless, it is a competent swimmer and frequently relies on diving into the water with a distinctive 'plop' to escape danger.

Males are generally larger than females and have broader heads and muzzles. Otherwise, the sexes look very similar.

Diet

Water voles are herbivorous, feeding mainly on lush, waterside vegetation of grasses, sedges and rushes. In the winter months, the rhizomes, bulbs and roots of herbaceous plants and also the roots and bark of shrubs and trees form an important part of the diet.

Social behaviour

Water voles live in loose colonies of rarely more than 10 breeding individuals. In upland areas, these social groups may comprise only a single family unit of an

adult pair and two youngsters. Within this loose colonial social structure, the voles defend individual linear territories during the breeding season - each animal defending a territory of between 30 and 200 m of watercourse (the average is c.100 m). The males occupy territories that are roughly twice the size of the females', often overlapping those of adjacent females. Both sexes use their droppings in conjunction with their scent glands to mark these areas. Such accumulations of droppings are known as latrines.

Field signs

As water voles are often active by day you may be lucky enough to catch a glimpse of one. If so, remember that many Scottish animals have black fur rather than the brown colouration usually associated with this species. However, as with many mammals, you are more likely to encounter their field signs rather than see the beasts themselves.

Water vole burrow showing grazing round the edge

Rob Strachan

Each vole uses a series of burrows dug into the side of the watercourse. These tunnel systems include residential burrows, comprising many entrances, inter-connecting tunnels and nest chambers, and bolt holes consisting of short tunnels ending in a single chamber. The burrows are usually distinctive, being typically slightly wider than high and with a diameter of between 4-8 cm. They may cut horizontally into the bank or vertically down from the surface. In the latter case they are usually located within 3 m of the watercourse, but they may extend for up to 5 m from the bank top edge and, if recently occupied, are surrounded by characteristic grazed 'lawns'. There may also be droppings near the burrow entrances. Most nests occur underground, but in areas of fen or rush pasture, woven nests the size of footballs can sometimes be found amongst tussocks.

Water vole latrine

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The droppings are the most distinctive field sign and are usually deposited in latrines which are typically found at prominent points along the watercourse, such as on flat stones or on patches of bare earth along the margins. They are cylindrical with blunt ends, about 8-12 mm long and 4-5 mm wide and vary in colour from greenish (usually when fresh) to brown or black.

Amongst the bankside vegetation and generally within 3 m of the water's edge, runs may be visible as low tunnels pushed through the vegetation. These are 5-9 cm wide and often branch many times, some leading to the water, others linking burrow entrances.

Feeding stations can sometimes be found located along the vole's runs and haul-out platforms along the water's edge. Here neatly chopped food items can be found; commonly pieces of grass, sedge or rush up to 10 cm long with grooved teeth marks at the ends. Other signs to look out for are footprints in soft mud or peat. Water voles are not very active above ground during the winter months and so signs of their presence are usually only visible during the spring and summer. The best months for surveying are therefore May to September.

Often, even in the summer, the signs are not immediately obvious and it becomes necessary to part the bankside vegetation and have a very close look in order to spot concealed droppings or other evidence of the voles' presence.

Water vole feeding signs

Water vole tracks are very similar to those of the brown rat (*Rattus norvegicus*) so the presence of footprints alone is not a reliable method of confirming their presence. Familiarity with the field signs of the other Scottish riparian mammals, in particular mink and rats, is helpful.

Habitat requirements

The popular image of the water vole is of an animal inhabiting the lush, slow-flowing, meandering rivers in lowland Britain. However, the reality these days is rather different.

In lowland areas, water voles are most likely to be encountered in small slow-flowing or static burns, small backwaters, canals, ditch systems and overgrown field drains, sometimes in intensively-farmed and urban areas. Ideally such watercourses are less than 3 m wide and 1 m deep and do not show extreme fluctuations in water level. Water voles prefer sites with a bank profile that shows

a stepped or steep incline (bank angle greater than 35°) into which the vole can burrow and create nest chambers above the water table. To facilitate such burrowing activity the soil must be sufficiently soft to permit excavation. The amount of bankside and emergent vegetation cover is very important, with the best sites offering a continuous swathe of tall and luxuriant riparian plants. Sites excessively shaded by shrubs or trees (>20% bankside tree cover) are less favourable.

In the uplands, voles seem able to thrive, albeit in narrow moorland burns and barren peat hags on flat or gently sloping ground. Voles prefer soft ground so that they are usually found in areas with a thick layer of peat. Such conditions may be encountered near the headwaters of a river system or in the upper reaches of a glaciated valley where a small burn meanders across a high altitude marshy floodplain. Here conditions are often suitable for stands of the water vole's preferred food, i.e rushes and sedges, notably bog cotton (*Eriophorum* spp.). Climatically, these high altitude areas comprise some of the most extreme habitats in Britain and have a marked effect on all aspects of the water vole's existence, including reproductive capacity, which is substantially reduced as a result of the short breeding season.

Good upland habitat for water voles

Rob Strachan

Suitable water vole habitat is most likely to occur in the uplands in areas where the average gradient is no more than 3% and where extensive, thick deposits of peat are present.

The Atlas of British Mammals suggests that most of the Scottish Highlands is largely devoid of water voles. However, the species' apparent absence from large tracts of the uplands is more likely to reflect the lack of biological recording in these areas. The fact that water voles can be found at altitudes higher than 900 m has been known for many years. What perhaps may not have been appreciated is the potential importance of these populations and the possibility that they may be much more widespread than we think.

Irrespective of altitude, permanent water is essential during periods of low flow in summer, while sites that suffer total submersion during protracted periods of winter flooding are untenable.

Reproduction

Breeding may last from March to September, although in upland areas and the far north, it is usually shorter than this. Mating occurs during March or April and is followed by a gestation period of 20-30 days. In productive lowland river systems, females can exceptionally produce up to 5 litters each year, although 2-

3 is more usual. The size of each litter ranges from 2-6 with an average of 5. Smaller, single litters are more typical of upland-dwelling populations. The young are ready for independence after just 21-22 days and early-born young may breed in the autumn of their first year, although most reach sexual maturity after their first winter. Few individuals live more than two years in the wild.

Population dynamics

Although water voles live in distinct colonies, these individual groups cannot exist in isolation indefinitely. Voles habitually disperse later in the summer to form entirely new colonies nearby where the opportunity arises. It is not uncommon for colonies to go extinct as a result of chance events such as sudden extreme flooding or the occasional foray into the area by a transient mink. Provided there are other colonies close by, recolonisation can take place and life can continue. If not, the species is doomed to extinction in that area, leaving any surviving colonies even more isolated. This type of loose, but interdependent population structure is known as a metapopulation. It can be likened to a constellation of stars in the night sky, where the 'twinkling' effect is analogous to a cluster of water vole colonies, in which extinctions and recolonisations are continually taking place.

Many Scottish water voles are all black

Chris Strachan

Many species of rodent, for example lemmings and field voles, undergo regular fluctuations in population size over time (population cycles). Although this phenomenon has not be been scientifically demonstrated in water voles, there are some indications that it may occur to a limited extent. If this is so, it may account for some of the dramatic between-year population changes that have been reported in some studies. Longer-term population studies are needed to clarify this.

Water voles behaving like moles

In Britain, the water vole is usually regarded as an aquatic, burrow-dwelling rodent that spends much of its time above ground close to water. In parts of continental Europe, however, a different form of the same species lives a mole-like existence spending almost all of its time underground, in dry grasslands often well away from open water. This behaviour is rare in Britain, although this smaller form of the species is thought to have been widespread in Britain between the Mesolithic and Roman periods. Large colonies of these 'fossorial' water voles survive on several small islands in the Sound of Jura, where there is no permanent freshwater. Here they feed exclusively on underground roots and rhizomes. Colonies of fossorial water voles can also be found in the Glasgow area.

Scottish versus English water voles

Genetic studies of water voles in various parts of Britain have demonstrated that Scottish water voles have a completely different ancestry from their cousins south of the border. At the end of the last Ice Age, water voles from ice-free refugia in southern Europe recolonised Britain as the ice retreated. The voles that colonised England and Wales originated from south east Europe, whereas Scotland's voles are descended from migrants from northern Iberia. It is thought that the colonisation of Britain occurred in two waves initially from Iberia and latterly from the Balkans. The second wave of colonisers presumably displaced the existing occupants of England and Wales, but failed to displace their more northerly counterparts. Interestingly, the separation between these two groups appears to correspond roughly with the border with England.