

VOLES AND FIELD MICE

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Figure 1. Bank Vole, *Clethrionomys glareolus*, on bramble

Awareness of the small mammals that people the land is a perceptual habit that is easy to acquire. It is a habit that amply rewards those who develop it, for small mammals are to be

found almost everywhere and they include some of the most interesting and attractive members of the fauna. There can hardly be an acre of land, with enough vegetation to provide

them with cover, be it meadowland, woodland, heathland, marshland or duneland; lowland, upland or highland; town garden or remote countryside, that does not carry its population of mice and shrews. To learn to perceive them is more a matter of ear than of eye, for often it is a slight rustle in the dry grass or leaves on a still day that brings the eye to bear on the place whence it came. The observer must be quite still, for they are quick to notice movement and will retreat out of sight, or freeze, but a few minutes stillness and silence reassures them. They will then go upon their business and can be observed at close quarters.

APPEARANCE AND HABITS

There are in Britain six kinds of native mice, of which this leaflet is concerned with three, the short-tailed vole (*Microtus*), the bank vole (*Clethrionomys*) and the long-tailed field mouse (*Apodemus*). The others are the water vole (*Arvicola*), the harvest mouse (*Micromys*) and the dormouse (*Muscardinus*). The house mouse (*Mus*), the brown and the black rats (*Rattus*), although so plentiful and widely distributed throughout Britain, are not native but were introduced long ago by man. Three recent introductions, the fat dormouse (*Glis*), the coypu (*Myocaster*) and the muskrat (*Ondatra*) must be added to these for completeness, because they established themselves as members of our wild fauna, though the last-named has since been exterminated. All these are rodents, as are also the squirrels. The shrews, though often called shrew-mice, are not gnawing animals but are insectivores, as a glance at their teeth will show.

Although the long-tailed field mouse is found in Ireland none of the voles occurs there, probably because they reached Britain from the east somewhat later, after Ireland had been cut off. Otherwise all three occur throughout England, Scotland and Wales as well as on most of the islands around the coast. All three exhibit many distinct geographical races, which have been given sub-specific rank and in some cases even specific rank. Careful study of the living races and of fossils of these animals suggests that they reached Britain in successive

waves from Europe and spread westwards as far as they could go. As Ireland and the lesser islands became cut off successively from the mainland of Britain, the later comers were unable to reach them. The various stocks isolated on the islands, such as the Skomer vole (*Clethrionomys glareolus skomerensis*) and the Orkney vole (*Microtus orcadensis orcadensis*), thus are descendants of the earlier arrivals that have in time evolved characters of their own. The later comers, being more successful varieties than their predecessors, have tended to push these westward and northward or to replace them altogether on the mainland. The various sub-species differ from each other in size, coloration, tooth pattern, skull configuration and sometimes in habits and disposition, but in most cases the differences are slight and the races are difficult to distinguish. Only one sub-species of bank vole is distinguishable on the mainland of Britain, though there are several on islands. The short-tailed vole of the mainland and some of the islands is regarded as a species (*Microtus agrestis*) distinct from the island varieties of the Orkney vole, and is itself divisible into Scottish and English as well as some island sub-species. The long-tailed field mouse (*Apodemus sylvaticus*) has island sub-species, but on the mainland the yellow-necked field mouse (*Apodemus flavicollis*) (Figure 5) exists side by side with it, though whether it can be regarded justifiably as a distinct species is doubtful. Thus the great complexity of varieties of all these three kinds of mice is due in part to successive invasions of distinct forms and in part to the independent evolution of isolated communities.

The teeth are among the most characteristic features of these animals. There are two upper and two lower incisors, which are chisel-like gnawing teeth, in the front of the jaws. Their long curved bases fit into deep sockets and they grow continually, so that what is worn away at the top is replaced by growth from the bottom. The bottom of the tooth is not constricted to form a root, the pulp cavity being open. Canines and premolars are absent, the cheek teeth consisting of three molars above and below. There are no milk-incisors, so none of

the teeth are replaced during life. The molars of the short-tailed vole are rootless and continuously growing, so that they do not become worn down. The molars of the bank vole and long-tailed field mouse develop roots and cease to grow in the adult, so that they do become worn down in old age.

The voles are distinguished by their short blunt snouts and short ears, giving the head a rounded appearance, and their comparatively short tails. The short-tailed vole has ears so short as to be almost hidden in the fur, and a very short tail about one-third the length of the head and body. The typical mainland form is greyish brown in colour. The bank vole has longer ears which show above the fur, a somewhat longer tail, about half the length of the head and body, and a reddish or russet-brown colour above. They are grey, buff or nearly white below. The long-tailed field mouse has a pointed snout, large ears and eyes, large hind legs and feet and a very long tail, as long as the head and body. Typical adult examples are yellow-brown above, becoming yellower at the sides, and pure white below with a yellow-brown breast spot sometimes joining the darker-coloured upper parts to form a collar. Young examples are often greyer and less readily distinguished by colour from the house mouse, though the larger eyes, ears, hind feet and long tail are quite distinctive when specimens of both species are available for comparison.

The field mouse has an interesting escape mechanism in that when caught by its long and conspicuous tail, the skin readily breaks and pulls off, while the mouse escapes without it. The skinless portion of the tail soon withers away and the stump heals, leaving the mouse apparently none the worse, though it is unable to regenerate a new tail, as would a lizard. The writer, trapping field mice with 'nipper' traps, has taken the skin of the tail in one trap and, on the same night in another trap only a few yards away, the mouse to which it belonged. Though the escape mechanism worked admirably, the mouse did not learn by the experience! This tail character, however, provides an infallible means of distinguishing

field from house mice, for a slight pull will remove the skin from the tail of the former but not from that of the latter.

Short-tailed Vole (Figure 2)

The short-tailed vole, *Microtus agrestis*, is essentially a grassland animal, making its runs amongst the roots of the grass on which it lives. Hence, it tends to prefer more open country, meadow, park and arable land and particularly the rank, tussocky grass of young plantations, wasteland and unkept graveyards. Its shallow runs and burrows amongst and beneath the grass roots form an elaborate criss-cross system of tunnels, here and there expanded to form domed chambers or 'parlours' to which it conveys little piles of succulent grass stems cut into convenient lengths, to be eaten there at leisure. It requires only a brief search in almost any patch of rank grass to discover a tunnel; by carefully following and opening this up the whole system can be disclosed. The condition of the neat little piles of fodder in the 'parlours', and the state of the droppings, will show whether it is in current use and will provide a clue to the density of the population. The domed nests made of dry grass may be on the surface of the ground or in a hollow, and here the young are born and nursed. The animals are not at all shy of man and can be observed at close quarters, in suitable cover, but they dislike being exposed to the sky, from whence come hawks and owls. In the writer's experience, they are tame and docile, not biting if handled gently. They are more truly herbivorous than the bank voles or long-tailed field mice and, though predominantly diurnal, they spend a large part of their time both by day and night collecting or eating grass stems. They are, however, by no means unwilling to turn carnivorous on occasion and will devour the body of another vole with avidity. Charles Darwin states that they eat the combs of bumble-bees, and Barrett-Hamilton adds that they destroy the pupae of the larch sawfly (*Pristiphora erichsonii*).

The short-tailed vole has an extended breeding season lasting from the middle of March to the end of September or even into October.



Figure 2. Short-tailed Vole or Field Vole, *Microtus agrestis*

The males are fecund for at least a month before breeding begins, which it does quite suddenly; all the females becoming fertile nearly simultaneously. The average size of litter is five. During the breeding season many females become pregnant immediately after giving birth, thus suckling one litter while they are gestating another. Occasionally, some females breed during the winter months. Young females born early in the season breed before it ends, but those born late in the season do not breed until the following spring. Although it is improbable that any survive two winters, the rate of reproduction is high and is adequate to achieve a very rapid increase in numbers under favourable conditions.

Short-tailed voles exhibit cycles of abundance, numbers gradually building up to a peak every few years, when they may even attain plague proportions, and then suddenly declining to a minimum. These plagues are due to multiplication of the animals in the areas affected, not to immigration, and they are ended by the death, not the departure, of the majority. Population densities per acre may vary from less than fifty in the trough of a cycle to over five hundred at the peak. In Britain the cycles are somewhat irregular and do not appear to be synchronous over large areas. Moreover, they appear to be independent of the population cycles of the other small mammals, so that in any given region at one time *one* species, at another time *a different*

species, may be predominant. Taking into account the extent of its habitats, which exceed in area those favoured by bank voles and long-tailed field mice, it must rank on balance as the commonest of the three. The house mouse, although achieving a far denser population locally, in built-up areas, stack yards, etc., could scarcely compete with an animal that is common in practically all grassland. The field vole's nearest rival in numbers probably is the common shrew.

The commonest member of our vertebrate fauna and palatable to carnivorous animals, the short-tailed vole provides an item of food for many predators; cats, dogs, foxes, stoats, weasels, hawks, owls, snakes, etc. It is the

principal food of the short-eared owl, and these birds tend to congregate and to breed where voles are plentiful.

Bank Vole (Figure 1)

The favourite habitats of bank voles, *Clethrionomys glareolus*, are hedgerows, banks, brakes or briars, coppices and woods, preferably with undergrowth. Bank voles will also live in rough, tussocky grass though they do not like the open fields. Thus, on the one hand, their habitats overlap with the short-tailed vole and, on the other, they can live happily in much more wooded and overgrown country. They make shallow burrows and runs and they will form regular highways, both above and below ground, along a bank or loose wall; highways



Figure 3. Field Vole, *Microtus agrestis*, and young

that are used by shrews and long-tailed field mice, as well as by the voles. Their nests are made of chopped dry grass, sometimes lined with moss, wool, or feathers, placed usually on the ground or in a shallow depression, on occasion built above the ground on the foundation of an old bird's nest, or underground in a chamber of the burrow. Bank voles are good climbers and better jumpers than the short-tailed voles. They are also more omnivorous, eating berries, fruit and such animal material as comes their way. They will climb bushes and small trees in search of berries or nuts and may be observed running about the branches many feet from the ground, though they do not climb large trees. They are, in the writer's experience, more pugnacious than short-tailed voles, even more ready to fight amongst themselves, and cannibalistic. They will invariably eat much of the body of another vole, and their appetite is so great that they can eat the greater part of another mouse their own size in 24 hours.

The breeding season of the bank vole extends from the middle of April until the beginning of October, during which period females may rear four or even five litters. Females which become pregnant immediately after giving birth to a litter continue to suckle. Under these circumstances pregnancy is prolonged for a few days as in other mice, though the young when born are not more advanced in development. This enables the previous litter to be weaned at the normal age. The average size of a litter is four. In other respects the reproductive pattern and life cycle resembles that of the short-tailed vole.

Bank voles exhibit cycles of abundance though they seldom reach the plague proportions of the field voles. They can be very destructive in gardens, young plantations, etc., taking bulbs, berries, fruit and buds, climbing bushes to obtain these by nibbling them off and allowing them to fall to the ground. Like the short-tailed vole, they are a favourite prey of many predators.

Long-tailed Field Mouse (Figure 4)

The long-tailed field mouse is a much more active animal than either of the voles. It can

jump splendidly with its powerful hind feet. It is also a good digger, and when not searching for food it lives normally below ground in its extensive burrows. A nest of chopped grass is made in a chamber of the burrow and here the animal sleeps as well as rears its young. This mouse is more nocturnal in its habits than either of the voles, though it can often be seen out feeding during the day. Living in burrows, it is more dependent on the suitability of the soil for burrowing than the voles, and so tends to be distributed in colonies where the ground is favourable. Like the other mice, it does not wander very far from its home and is essentially a sedentary animal. It has been shown that a foraging expedition rarely takes it outside a radius of 100 yards.

This animal, like the bank vole, prefers gardens, woods, hedgerows and overgrown land to the open fields. It will, however, live in grassland where the cover is thick and in winter it will graze down winter corn crops where they adjoin woods, often coming some distance into the open to do so. It eats roots, berries, nuts, fruit, seeds, insects, the bodies of mice, birds, etc., but crocus and other bulbs, beans and green peas are particular favourites. It has been known to raid beehives for honey and hatcheries for salmon eggs. It often climbs bushes and small trees to obtain its food. The writer has observed it climbing in rosemary bushes to cut off the young shoots at the ends of the branches, allowing them to fall to the ground and then running down to feed upon them under cover of the bush. He has also known them to nip off tomatoes in a glass-house, cutting the stem about half an inch from the fruit. It can be a serious horticultural pest and can do much damage in nurseries. In autumn, it will enter houses in search of food, though it does not become established there, nor does it infest corn stacks.

The long-tailed field mouse breeds from March to October. The average number of young in a litter is five, and the animal normally becomes pregnant again as soon as a litter is born. Young animals born early in the season breed before it ends. It appears improbable that any live beyond the end of the breeding



Figure 4. Long-tailed Field Mouse, *Apodemus sylvaticus*

season following that in which they were born. Thus, the field mouse is quite as prolific as the voles and, like them, exhibits cyclic variation in numbers, although it does not attain numbers sufficient to constitute serious plagues. Certainly, at times it can be excessively common and some observers state that it is a commoner animal even than the short-tailed field mouse. Like the voles, it is a favourite prey of many predators and is probably the principal food of most owls other than the short-eared owl. It is also eaten by many other birds and mammals as well as by snakes.

The nest of the long-tailed field mouse is the chosen home of a beetle (*Leptinus testaceus*) which, particularly in the spring, may often be found in the fur of newly-trapped specimens.

ECONOMIC DAMAGE AND CONTROL

In considering the damage done by voles and wood mice we must remember that these animals are all long-established natives, which may be found in and around practically every wood and plantation in the country. Any harm they may do is generally so slight that it escapes observation; but from time to time they increase locally to enormous numbers and so outrun, for the time being, their available food supplies. At such times they turn to forest trees and can do grave damage to young forest crops. The field vole appears to be nearly always the main culprit in these plagues. The characteristic forms of damage are outlined below.



Figure 5. Yellow-necked Field Mouse, *Apodemus flavicollis*

Basal Attacks

If a tree is completely girdled right at the base, recovery is unlikely. But even in the most serious plantation attacks a high proportion of trees recover, in one of these three ways:

- (a) Where girdling is incomplete, the main stem heals over, quite rapidly, by the formation of callus tissue and fresh bast and bark.
- (b) Where the leader is completely girdled and so killed, growth is often resumed by one or more side branches; this may result in a bushy plant, or a tree with a crooked base; but it is surprising how often a straight tree arises from such an unpromising start.
- (c) A fresh leading shoot may be produced from an epicormic bud below the level of the attack; this occurs even in conifers, and is very frequent in Sitka spruce.

In all these instances, the tree concerned suffers a severe setback in growth; the crop appears patchy and uneven for many years, and there must be a considerable loss of timber increment. A good deal of beating up or replacement of losses is often needed, but it is seldom necessary to replant large areas. Typical damage, of various degrees, to different tree species, is shown in Figure 6.

High Barking

Another form of damage, the barking or girdling of taller saplings higher up the stem, commonly from three to six feet above ground level, has been shown, by trapping experiments, to be largely the work of the bank vole, which is much more ready to climb and to leave the cover of the herbage than is the field vole. Often the damage begins at a side branch, on which the vole apparently rests when it starts to feed. If the stem is completely

girdled it is killed, though growth may be resumed from a branch lower down. If it be only partially girdled, recovery is usual, though the tree suffers a severe setback.

High barking is very spasmodic in occurrence, affecting as a rule only an occasional tree or group of trees. It is sometimes severe for a year or two, and may then not be observed for several seasons. Unfortunately, the voles seem to have a preference for unusual trees, and will often attack rarities specially planted for ornament. But on the whole this kind of damage is not of much economic significance.

Destruction of Tree Seed

All kinds of mice and voles readily eat tree seed, and the long-tailed field mouse, which is the commonest kind in woods of seed-bearing age, is particularly industrious in seeking it out. Large quantities of tree seed are doubtless consumed by these small rodents, and this must adversely affect the prospects of natural regeneration of tree crops. But it is difficult to assess the economic effect of this, as mice are only one of many perils to which tree seeds and seedlings are subject. Beech seed, and also beech seedlings, have been observed to suffer severely from attacks by mice and voles.

Where forest tree seed is used to establish a crop by direct sowing on woodland or heathland, both the quantities available and the method of distribution favour attack by voles and mice. Mice also attack and consume seed sown in the normal way in forest nurseries, and experiments have shown that higher yields are sometimes secured where the beds are protected with mouse netting. But on the whole nursery seed losses are light, probably because the mice are unwilling to expose themselves to the risk of attack by owls or kestrels when crossing the bare soil of seedbeds.

Where seed is stratified for storage, it is always advisable to protect it with small-mesh ($\frac{3}{8}$ inch) wire netting. See Forestry Commission Leaflet 33, on *Collection and Storage of Ash, Sycamore and Maple Seed*. (H M S O. 1s. *By post* 1s. 3d.).

Food Preferences

A common feature of many vole attacks is an apparent preference for one or more kinds of tree. But, strange to say, trees rejected at one time or place are eagerly sought out at another, and the voles are quite capricious in their likes and dislikes, both in the wilds and when studied in captivity. No kind of forest tree enjoys general immunity to attack by mice or voles, so it is not possible to reduce damage by planting unpalatable kinds. The beech has been noted as a tree particularly liable to attack.

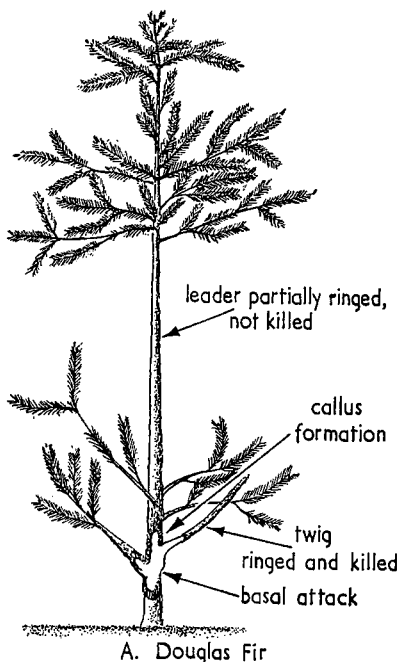
Control Factors

The control of voles in woodlands and young plantations presents difficulties of an economic rather than a practical character, for when plagues occur their numbers become so enormous that it is difficult to reduce them at any reasonable cost.

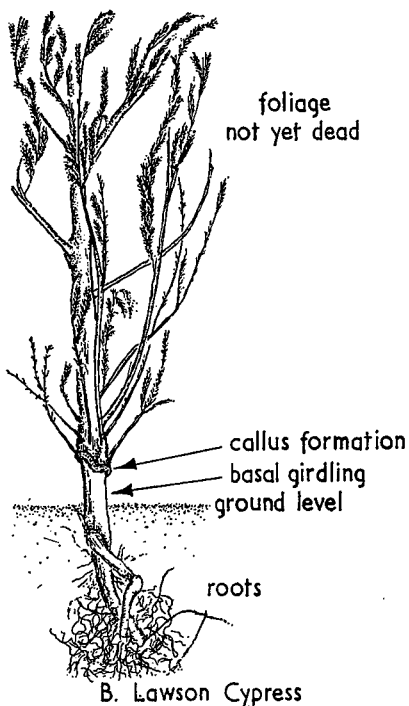
Predators. Voles and their helpless young are subject to attack by a large number of birds, mammals, and even reptiles, including owls, hawks, crows, foxes, stoats, wild cats, badgers, hedgehogs, adders and grass snakes. During vole plagues, the numbers of predators seen on the infested area commonly increase. This increase is most obvious with the birds, which are the most readily observed and mobile. It is not known how far these increases help to check the vole population, and when the plague ceases the numbers of predators commonly fall again. Probably the predators are more effective in keeping the general level of voles low, at times when no plague is building up. They may lessen the incidence of plagues, but do little to diminish them once they arise.

Disease. Voles and mice are subject to epidemics of infectious disease caused by various internal organisms, and the collapse of plagues often results from, or coincides with, such outbreaks. But no practical method is known whereby such diseases could be used to stop plagues arising.

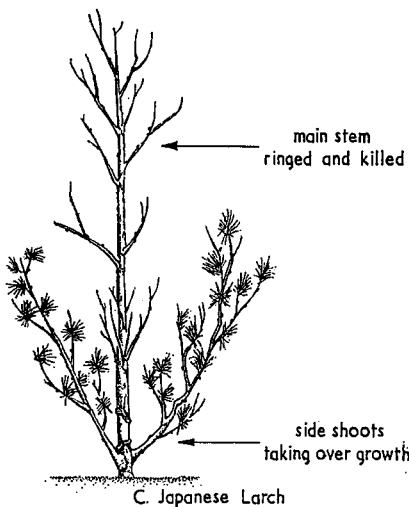
Trapping. Voles and field mice are easy to trap, but—except perhaps for the protection of specimen trees—the method is not considered



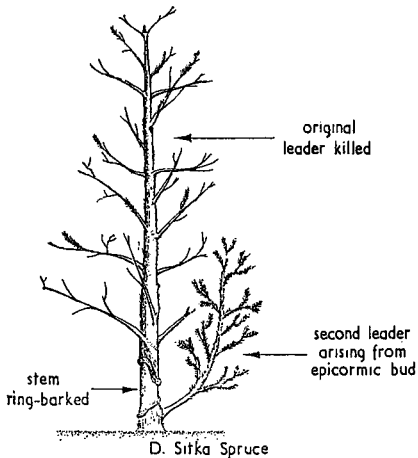
A. Douglas Fir



B. Lawson Cypress



C. Japanese Larch



D. Sitka Spruce

Figure 6. Examples of basal attacks by voles on young forest trees. The tree in (B) will be completely killed, those in (A), (C) and (D) show various forms of recovery.



Figure 7. Barn Owl carrying its prey—a Field Vole

a practical one, owing to the large amount of labour involved. The ordinary break-back trap is the type most commonly used; it is best set in the runs which the voles make through the herbage.

Poisoning. Poisoning with the usual rodent poisons, such as warfarin and zinc phosphide, is possible; but the techniques have proved laborious and expensive on a large scale in afforestation areas; they can, however, be applied to the protection of valuable specimen trees. The methods employed are similar to those followed for domestic rats and mice, but it is necessary to protect the poisoned bait from the weather, and also to prevent it being taken by game birds, dogs, or other livestock; a simple way to do this is to set it in

an ordinary circular drain pipe or 'tile'. Details of poisons, baits, and methods will be found in the Ministry of Agriculture Bulletin No. 181, *Control of Rats and Mice*. (HMSO 4s. 0d. *By post* 4s. 6d.).

Netting. Individual specimen trees, and beds of valuable seedlings, may be protected by guards of fine-mesh ($\frac{3}{8}$ inch) wire netting.

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