Rats and mice and their control

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Before colonisation by the white man, Australia contained over 50 species of rats and mice. Although several of these native species have been known to breed to plague proportions they are normally slower breeders than the introduced species. Once settlement had been established on our shores it was only a matter of time before the introduction of more of these pests, occurred probably from the British Isles.

These, owing to their long association with man, had become omnivorous and therefore represented a greater menace to health and commerce than their native relatives. As far as is known to date, two species of rat and the common house mouse have been introduced into Western Australia. These are the only species existing in large numbers, and it is towards them that most control measures are directed.

The Norway or sewer rat, which originated in China spread to Great Britain in the early or middle 18th Century. It is usually found in the environs of cities and coastal ports and waterways.

It is in urban surroundings that it finds the most extraordinary number of different habitats in which to live and these include dwellings, backyards, refuse dumps,
shops, restaurants, hotels, offices, warehouses, granaries, etc. The sewer rat is found living in a variety of temperature conditions varying from warm in brickworks, etc., to the low temperatures of cold stores.

Although occurring in company with the slighter and more timid ship rat, there appears to be some competition between the two species. The sewer rat, although a reasonably good climber is less frequently found on ships, preferring to live under floors or in drains about dwellings and is often seen along the banks of the Swan River at night. It is a sturdily built animal with large strong feet, short ears and a short thick, coarsely-scaled tail which is shorter than the head and body combined.

An adult specimen commonly has a body weight of 1 lb. and a body length (exclusive of the tail) of about 11 in. Much larger specimens are frequently encountered.

THE ROOF RAT
(Rattus rattus.)

The ship rat or roof rat came originally from India, colonising Europe in the early Middle Ages and is identified by a slender tail which is invariably longer than the head and body. The large leafy ears and shorter, sleeker hair will usually distinguish this species from the sewer rat. Fully grown, this rat seldom weighs more than ½ lb. with a body length of from 8 to 10 in. Unlike the sewer rat this species is well-distributed throughout Australia, excepting possibly sub-desert and extremely inhospitable coastal regions, and occurs as a field, foliage and house-infesting animal. The roof rat is so-called because of its ability to climb and live in high localities such as grain silos and the top floors of warehouses. Its damage is primarily to food and it is the species most likely to introduce bubonic plague because of its ship-borne habits.

THE COMMON HOUSE MOUSE
(Mus musculus.)

The house mouse has been in Britain, Europe and Northern Asia since prehistoric times and, once introduced into Australia, it soon "took to the bush" and is now geographically widespread. Many people imagine that there are two different species, a house mouse and a field mouse, but they are one and the same animal. (The native species rarely attain plague proportions and have seldom been seen in large numbers in recent years). Although there is considerable size and colour variation in the house mouse they are easily distinguished from the mice-like indigenous species. In the introduced mouse (Mus musculus) a well-marked notch or ledge can be seen behind the tips of the upper teeth into which the lower teeth fit, the same notch not being visible in any of the allied native forms. The full-grown mouse seldom weighs more than 1 oz. and is 3 to 4 in. in head and body length with a tail of from 3 to 3½ in. long. The ears and eyes are small and the tail is scantily clad. The upper surface of the body is almost

![Fig. 2.—The Roof Rat. This species has a slender snout, large hairless ears and a long slender tail which is usually longer than the head and body combined](https://example.com/roof_rat.png)
uniformly grey-brown and the underparts buff-grey to whitish. Mice live in any structure they can enter which offers some protection and within range of food, and can pass through a hole $\frac{1}{4}$ in. square. Where food is plentiful the daily range of mice is quite small.

**BREEDING HABITS**

The average number of young per litter in the rat is ten, from six to 22 being a normal variation. From three to 12 litters can be produced in the one year. The young are blind at birth but rapidly develop and breed when three to four months old. The life-span of the rat is much longer than that of the mouse and varies between three and five years. As many as seven litters in seven months from a single pair have been recorded, the gestation period being only 21 to 25 days. The rat's tremendous reproduction potential—the progeny from one pair could, under the most favourable conditions, exceed 350,000,000 in three years—and its rapid development indicate the ability to recuperate quickly from any unusual depletion in numbers. Therefore the rat can increase to plague proportions quickly in favourable circumstances. It shows us too how persistent man's resistance must be to this pest if it is to be kept under control. In the U.S.A. the rat population has been estimated to approximate the human population.

The house mouse averages some five to six young per litter, the young being able to run about when only 21 days old and can breed at 42 days of age. Individual captive mice have produced 100 young per year. The species is relatively short-lived, most individuals probably not living longer than 12 months, hence the population "turnover" is very rapid.

**HEALTH HAZARDS**

Because of their close relationships to man and domestic animals and because of their scavenging habit, living on both filth and edible foods, it is not surprising that rats and mice play an extremely important part in the spread and dissemination of disease. Quite a number of their own diseases are transmissible to man and domestic animals. Mice sometimes carry Salmonella bacteria that can kill man and because of their greater penetration into buildings are probably as big a health hazard as their larger rat relations. Such diseases as bubonic plague, typhus fever, spirochetal jaundice, rat-bite fever, tularemia, trichinosis, rabies and food poisoning can be carried and spread by these pests.

**CONTROL METHODS**

The principal methods of controlling rats and mice are (1) exclusion (2) poisoned baits (3) poisonous gases or dusts (4) traps. Various other measures have been tried, but many are of little use. Exclusion is probably the real solution and all other methods will give only temporary relief.
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Exclusion.

Can only be effectively performed while a building is in construction, but much work towards this end can be carried out after construction in blocking holes and fitting mesh and metal sheeting around holes where pipes and conduits pass through walls, etc. Exclusion of rats and mice from premises means leaving no opening more than $\frac{3}{4}$ in. in width into a building or other enclosure and protecting all food supplies from these animals. Long and elaborate methods of proofing against these pests could be explained but would differ with conditions of the building and location of such areas.

Sound concrete floors with a thin L-shaped concrete foot on the foundation wall will prevent rats from burrowing into buildings. Doors and windows need to be tight-fitting and, if of timber, they should be sheathed along the ground level with 18-gauge galvanised sheet metal at least 12 in. high and reaching down within $\frac{3}{4}$ in. of the floor.

In practice, exclusion of rodents requires:

1. Concrete floors and exterior curtain walls around foundations.
2. Solid exterior walls with no holes or large cracks.
3. Elevation of small buildings 12 to 18 in. above ground.

(4) Screens over all openings, both at the ground level and above. These should be of $\frac{1}{4}$ or $\frac{3}{4}$ in. mesh, or metal grille.

(5) Cement or metal sheathing around all holes where pipes or conduits pass through walls.

(6) Tight-fitting doors and window screens.

Exclusion from Haystacks and Silos.

The exclusion of rats and mice from haystacks and silos should be carried out in exactly the same way as exclusion from a building. However, as haystacks are hardly ever built on concrete floors, other precautions become necessary. For many years some farmers have been building haystacks and storing grain up on platforms 18 in. high or enclosing them with a mouse-proof fence made of flat galvanised iron. This is made by taking 3 ft. wide sheets of iron, bending the top 6 in. outwards and downwards at an angle of 45°. The bottom 6 in. is bent outwards in a right angle and buried 6 in. into the ground. This gives a fence 18 in. high with top and bottom projections. Sheets should be overlapped at least 2 in. where jointing. Unless mice are already present in the produce when it is stored within a fence such as this, it will remain mouse-free indefinitely.

Harbourage.

Old machinery, rubbish heaps, timber piles, weed growth and general litter all
provide the shelter necessary for rats and mice to live and breed in. Bags of grain, timber and other goods should be neatly stacked to permit regular inspections and control measures. Garbage, if not burned immediately, should be stored in rat-proof metal bins until it can be destroyed. Mice can live on about $\frac{1}{4}$ oz. of food per day and rats on about 1 oz. Therefore it is necessary to clean up spillage and food material however small the quantity.

Poisoning.

The chief method of routine control by most pest control operators is the use of poison food or baits. The extent of the rat or mouse infestation should at first be determined by looking for droppings, body smears, footmarks, damage or burrows and then the whole area baited at the one time. Poisons may be bought ready mixed with bait materials or as concentrates which can be incorporated with wheat, rolled oats, fresh meat, fish, apples, carrots and other vegetables.

Commercially-prepared bait materials available in Western Australia include baits containing warfarin, strychnine, phosphorus, red squills and antu. Those containing warfarin are probably the best rat and mouse killers available at present and are sold under various trade names.
and all contain 0.025 per cent. warfarin. (Warfarin is also obtainable in concentrated form for mixing with any suitable carrier. This can be mixed with 20 times its own weight). Strychnine baits are obtainable in two concentrations 0.16 per cent. and 0.3 per cent. and are fairly successful in controlling mice but can usually only be used once as their rejection following a poisoning is very poor. Strychnine is normally objectionable to rats and therefore is rarely used in preference to the anti-coagulants (warfarin, etc.). Zinc phosphide is also available as a concentrate to mix with a selected bait material but has a strong odour and taste, and is not always successful. Free feeding is advisable for rat control with all baits other than those containing warfarin. Before selecting a baiting material to poison it is advisable to make tests with grain (whole or crushed), fruit, vegetables and other substances to see which is preferred. This applies particularly when poisoning rats, as their desire for food is often governed by the material upon which they have been feeding.

Poison bait can be placed in burrows and holes, infested areas under buildings or in crevices and cracks, about foundations and walls and on the floors and rafters along runways used by the rats and mice. To avoid excess spillage, bait placed on small sheets of paper or shallow tins will suffice. It is important however to distribute sufficient poison bait so that all rats and mice have access to one or more baiting stations. From 2 to 4 oz. of poisoned bait per station is usually sufficient for moderate rat and mice infestations provided the stations are regularly replenished, particularly if using materials containing warfarin. Rats and mice must feed on warfarin bait for a number of successive days before acquiring sufficient to produce death.

On farms, poison bait should be laid preferably under shelter, behind stacks, beneath flooring, in piles of timber or in old pipes, etc., whilst rafters and other high places near the tops of bag stacks should not be neglected.

Used as a poisonous dust, sodium fluorosilicate is spread on floors where rats and mice run. Some of the dust gets on to their hair and feet, proves irritating, and is licked off and swallowed. The rodents die in three to six days. This chemical must not be used where it might contaminate food or be swept up with grain for domestic animals.

Baits should at all times be placed in or on a container in a sheltered situation where there is the least possible danger to children and domestic animals. Anticoagulant poisons such as warfarin are relatively safe, as a single, even very large dose is not toxic.

No known kind of bait has proved effective under all circumstances and a change in the kind of poison bait from time to time is most desirable. The importance of measures designed to restrict the food of rats and mice should not be overlooked. Food shortage naturally reduces the number of rats and mice in any locality and tends to limit the rate of increase. Hungry rats are much more easily destroyed by traps and poisons.

Poison Baiting on the Farm.

As yet there is no really effective, cheap method of baiting rats and mice on a field scale. Field baiting has been done successfully in England and America but only on a very small scale. Baiting stations consisting of a container to hold the poisoned grain were established and after a successful “free feeding” period poison was introduced. As the feeding range of rats and mice is very limited, especially when food is plentiful, the number of stations required to cover a whole farm would be tremendous. If stock were excluded, a poison furrow could be used much the same as in rabbit poisoning, excepting that strychnine or warfarin would be the poisons of choice. If using warfarin, free feeding would not be necessary but the poison would have to be supplied for at least a week. A lot of furrow would be required to cover a property as the feeding range of the animals is restricted. The concentrated warfarin would be the most convenient way to purchase, as the farmer could then make up the bait as required. This concentrate is obtainable from local pest control operators.

Water poisoning during summer months is another possible way of reducing numbers of rats and mice on a farm, but this would also have to be applied through baiting stations and would be a costly and
laborious method. A water-soluble warfarin derivative would be the poison of choice.

**Fumigation.**

Many rats in burrows, or hidden in ships and buildings, in hay stacks, poultry sheds, store rooms and other enclosures, can be killed by means of poisonous gases where baiting and trapping may not be as equally effective. Baiting and trapping however should follow to remove rats and mice in the surrounding area. All the fumigants in use however are highly poisonous to man and domestic animals and suitable respirators should be worn.

Calcium cyanide can be used and is available in both dust and granular form. The dust is applied with a pump into burrows and holes, the entrances of which are afterwards closed. When using granular cyanide, place 1 tablespoon (1 oz.) of the material 6 to 8 in. inside the burrow with a long-handled spoon and block the entrance tightly, taking care that the cyanide is not covered.

Methyl bromide, one of the most penetrating and effective of the commercially available gases is used to kill rats at the rate of 4 oz. per 1,000 cubic feet. Special equipment is necessary however, in the way of a plastic sheet to cover the area to be treated. Carbon monoxide from an automobile or tractor exhaust may be forced through a hose into rat burrows. Unlike some other gases, carbon monoxide remains in a burrow for some time, not being absorbed by the soil or soil water, hence it has a long period of effectiveness. Chloropicrin ("Larvacide") is a volatile material with a very pungent smell and is used at the rate of 4 lb. per 1,000 square ft. of floor area.

**Fumigation of Haystacks and Silos.**

Poisoning in haystacks and silos has always been most difficult because of the abundance of feed available to the pests. If exclusion is not practical, then the only other way to deal with the problem is by the use of fumigation. Chloropicrin is most useful if the farmer wishes to carry out the work himself. The method consists of placing the liquid some few feet down into the haystack through a length of water pipe (or of breaking the ampoules in the stack through a length of pipe). The gas is heavier than air and will gradu-

![Fig. 6.—Two stages in the sheeting of a haystack preparatory to fumigation](image-url)
Some of the pest control operators have recently begun a fumigation service to landholders. Large plastic sheets are spread over the haystack or grain stack and fumigation carried out. Details of costs, etc., can be obtained from the operators concerned.

**Trapping.**

Trapping is the preferred method of control in homes and office buildings, because animals killed in this way may be easily removed, whereas poisoned rodents may die within walls or in other inaccessible places and create bad odours. Almost any traps will catch some rats, but long experience proves that the ordinary spring snap trap is best and cheapest. Results from trapping depend more on the numbers of traps used and on the way in which they are placed than on the type of traps used.

Human odour from the handling of traps will not keep rats and mice away from them. It is important, however, to keep traps in good working order so that they are relatively “hair-triggered.” For trapping house mice in buildings, place traps along the wall in regular runways with the trigger end towards the baseboard, at intervals of two to three feet, according to the infestation. Rolled oats are almost always effective but cheese is not.

Rats are considered somewhat “wiser” than mice, yet many can be taken with wooden snap traps. If traps are set and baited at once, some rats will be caught. However, better results will be had if the traps are placed and baited, but left unset for three to five nights before being baited and set. This overcomes the rat’s fear of new and strange objects. Rats that ignore an exposed trap will often be caught if a board or box is placed to shield the trap, leaving a space for them to enter and for the trap spring to operate.

A variety of baits, such as meat, vegetables and cereals should be used on successive traps for best results and bait should be changed regularly and not left on the trap when stale. Alternative attractive baits are cooked meat, bacon, fish, apple, melon, tomato, carrot and nut meats. Almost any food suitable for human consumption will appeal to the gluttonous appetite of rats and mice, so that there should be no lack of variety.

**REFERENCES**


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