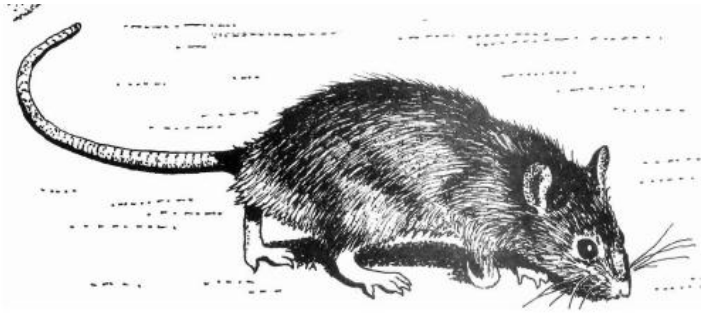
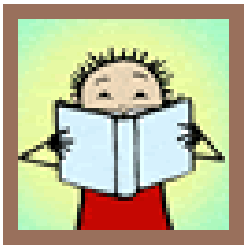
*BIOLOGY, LEGAL STATUS, CONTROL MATERIALS, AND DIRECTIONS FOR USE*

## Roof Rat

***Rattus ratus, Black Rat***

**Family: Muridae**

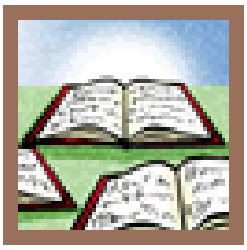




**Introduction:** The roof rat, like the Norway rat, is an introduced species in the United States. A third rat species, the Polynesian rat (*R. exulans*) is present in the Hawaiian Islands but not on the mainland United States. The Roof rat is commonly known as *Rattus rattus*, the black rat, and ship rat. Roof rats were common on early sailing ships which accounts for their distribution in the USA. Roof rats have a long history as carriers of plague.

**Identification:** Roof Rats (*Rattus rattus*), sometimes called black rats, are slightly smaller than Norway rats. Unlike Norway rats, their tails are longer than their heads and bodies combined. Roof rats are very agile climbers and usually live and nest above ground in shrubs, trees, and dense vegetation such as ivy. In buildings, they are most often found in enclosed or elevated spaces in attics, walls, false ceilings, and cabinets. The roof rat has a more limited geographical range than the Norway rat, preferring ocean-influenced, warmer climates. In areas where the roof rat occurs, the Norway rat may also be present. If you are unsure of the species, look for rats at night with a strong flashlight or trap a few. There are several key physical differences between the two species of rats. See Table 1.

| Table 1. Identifying Characteristics of Adult Rats. | | |
|---|---|---|
| **Characteristic** | **Roof rat** | **Norway rat** |
| general appearance | sleek, agile | Large, robust |
| color of belly | gray to white | mostly grayish |
| body weight | 5 to 10 ounces | 7 to 18 ounces |
| tail | extends at least to snout; black, fine scales | shorter than body; dark above; pale below; scales |
| head | muzzle pointed | muzzle blunt |
| ears | long enough to reach eyes I folded over | do not reach eyes |



**Legal Status:** Roof rats are classified as nongame mammals by the California Fish and Game Code. Nongame mammals which are found to be injuring growing crops or other property may be taken at any time or in any manner by the owner or tenant of the premises. They may also be taken by officers or employees of the department of Food and Agriculture or by federal or county officers or employees when acting in their official capacities pursuant to the provisions of the Food and Agricultural Code pertaining to pests.

**Damage:** Essentially the same as the Norway rat (see discussion in preceding section) from economic and public health standpoints.

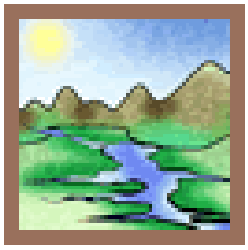
In some agricultural areas, roof rats cause significant damage and loss to tree crops e.g. citrus, avocados, walnuts, almonds, and other nuts. They often eat all the pulp from oranges while the fruit is still hanging from the tree, leaving only the empty rind. With lemons they may eat the rind and leave only the fruit. They may eat the bark and girdle smaller branches. In sugarcane fields they move into fields and eat the stalks. Roof rats may also eat seeds, or seedlings of plants. Vegetable, fruit, melon berry can also suffer minor damage.

Like the Norway rat the roof rat can transmit diseases to humans including murine typhus, leptospirosis, salmonellosis (food poisoning), rat bite fever, and plague. It is also capable of transmitting diseases to domestic animals and is implicated in the transference of ectoparasites as well.

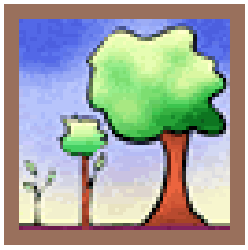
**Range:** Range: The "roof rat" whose coloration resembles that of the Norway rat, lives along the coast, in the interior valleys and in mountains to 5,000 feet. The

"black rat" is a color variant of this species. It is found mainly near salt water. Some sources separate the "roof rat" into two additional subdivisions, the Alexandrine rat and the fruit rat, based on characteristic coloration differences.

Black Rat

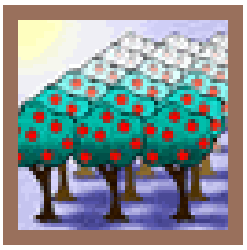


**Habitat:** Buildings, especially upper stories and attics, ships, warehouses, fields, stream banks, dense vines, palms and other trees.



**Biology:** Roof rats are smaller than Norway rats, and the tail is usually longer than the head and body combined. The roof rat is less aggressive and has been displaced by the Norway rat in some parts of the United States. The roof rat is a more agile climber than his larger cousin and it seems better able to establish in some rural habitats. The roof rat is more likely to choose enclosed spaces in attics, walls, and cabinets for nesting and cover. The roof rat is omnivorous but shows more preference for fruits and vegetables than does the Norway rat; both like cereals. The roof rat's home range is generally 100 to 150 feet.

The reproductive potential of roof rats is almost as high as that of Norway rats; an average of about 20 young per year are weaned by each female. Litter size averages six to eight young and an average of four to six litters are raised per year. The gestation period is about 22 days and the young may run about at three weeks of age. Sexual maturity is reached at three to five months and the average length of life is about one year. Like the Norway rat, much of the population dies out and is replaced in less than a year. Both rats breed year round.



**Damage Prevention and Control Methods**

**Rat Damage Indicators:** Droppings can be found along 'runways' in feeding areas, and near shelter. They may be as large as ¾ inch long, and ¼ inch wide. Fresh droppings are soft in texture.

Tracks can include footprints or tail marks, and can often be seen on dusty surfaces or mud. Rats can be tracked by placing a small amount of flour in a patch across a suspected runway area overnight. The presence of tracks indicates rodents.

Urine both wet and dry will fluoresce under ultraviolet light. Urine stains may occur along travelways or in feeding areas.

Runs or burrows can be found next to walls, along fences, next to buildings, under bushes or debris. Rats memorize pathways and use the same routes habitually.

Smudge marks (rub marks) can occur on beams, rafters, pipes, and walls due to oil and dirt rubbing off a rats fur as it frequently travels routes.

Gnawing is a basic rat activity. One way rats keep their paired incisor teeth worn down is by gnawing on hard surfaces. Size of entry holes differ from mice, rat entry holes are often 2 inches whereas mice are slightly smaller.

Rats can often be heard climbing in walls, gnawing, clawing, squeaking, and making fighting noises.

**Exclusion:** Physical barriers are an excellent way to prevent rats from gaining entry to structures where food and shelter are available.

Rats can be excluded by sealing all holes and openings larger than 1/2 inch. Use strong materials that will resist rodent gnawing; concrete mortar, galvanized sheet metal, steel wool, and heavy-gauge hardware cloth.

To prevent rodents from climbing or traveling along a particular route, install guards made of sheet metal or similar materials. Guards must be wide enough and positioned to keep rodents from reaching their outer margins by climbing or jumping.

Sheet metal band attached to a wall will prevent climbing by rodents. Rodent guards should be at least 12 inches to 18 inches wide. Inside buildings, such guards can prevent rats from climbing at corners. Guards also can be installed to prevent rodents from climbing the outside of buildings having rough exterior walls. When used in combination with hardware cloth or other suitable material, they can make a building essentially rodent-proof. This technique has been used to make corn cribs, barns, and other older buildings rat-proof.

**Habitat Modification:** Good sanitation is an excellent way to minimize any rat pest problems. The elimination of food and water through good warehouse sanitation can do much towards reducing rodent infestation. Proper garbage and refuse disposal containers along with an exterior sanitation program are also very helpful. Emphasis should be placed on the removal of as much harborage as is practical.

Dense shrubbery, vine-covered trees and fences, and vine ground cover all make ideal harborage for roof rats. Pruning and/or removal of certain ornamentals are often required to obtain a degree of lasting rat

control.

Poor sanitation is one of the basic reasons for the continued existence of moderate to high rat populations in urban and suburban areas. In agricultural environments, proper sanitation cannot always eliminate rat populations, but it can often prevent rats from flourishing in large numbers.

Sanitation involves good housekeeping, including proper storage and handling of food materials, feed and edible garbage. Warehouses, granaries and grain mills, silos, port facilities, and similar structures may provide excellent habitat for rats. Store bulk foods in rodent-proof containers or rooms. Stack sacked or boxed foods in orderly rows on pallets in a way that allows thorough inspection for evidence of rats. In such storage areas, keep stored materials away from walls. A 12-inch white band painted on the floor adjacent to the wall will aid in detecting rodent droppings and other rat sign. Sweep floors frequently to permit ready detection of fresh rat presence..

Pet foods often are a source of food for rats in and around homes. Keep all such materials stored and subsequently removed for disposal. Proper refuse storage containers are rat-and damage-resistant, and equipped with a tight-fitting lid. Racks or stands prevent corrosion or rusting of containers, reduce rat shelter under containers, and minimize the chance of containers being overturned.

Bulk storage containers for refuse, such as those used at apartments, businesses, and housing projects, should be similarly rodent-proof. Large metal refuse containers (dumpsters) sometimes have drain holes to facilitate cleaning. These drain holes should be fitted with a wire mesh screen or a removable plug; otherwise, the container becomes a large feeding station for rodents.

**Frightening:** Naturally rats are wary and frighten easily when they encounter unfamiliar sounds. However, most rodents, including rats, rapidly become accustomed to new sounds when heard repeatedly. Temporary success may be achieved, and rats may be repelled from an immediate area, but they will ultimately return and resume their normal activities.

Many commercially available devices produce ultrasonic sound to frighten, claiming it controls rodents. Research shows that rodents may be repelled temporarily from an immediate area, but will return and resume normal activities in the same way any new sound will affect the rodents. Ultrasonic devices are often expensive and their effectiveness is questionable. They are not recommended as a solution to rodent problems.

**Fumigants:** Not generally recommended for roof rats although under some circumstances, they will burrow. In these situations, fumigation could be effective.

**Repellents:** Not a recommended method of control.

**Toxicants:**

CDFA labels

2% Zinc Phosphide grain bait

0.005% Chlorophacinone grain bait

0.005% Diphacinone grain bait

0.005% Diphacinone Rodent Bait Block

**Toxicants (for Norway and Roof Rats):**

Anticoagulants -- % on bait for:

Spot baiting -- (Bait stations or stations, bait trays, and paraffin blocks):

0.005% (chlorophacinone, diphacinone) grain baits.

Zinc phosphide -- % on bait for:

Spot baiting -- 2.00% zinc phosphide grain bait.

Toxicants for controlling rats (rodents) are best classified into two groups: anticoagulants and non-anticoagulants.

Anticoagulants are the preferred material for controlling rats. They do not cause bait shyness, are easy to apply, and when used properly are relatively safe to use around humans, livestock, and pets.

Rats poisoned with anticoagulants die from internal bleeding; the result of the loss of the blood's clotting ability and damage to the capillaries. Most anticoagulants (except bromadiolone and brodifacoum) require multiple feedings over several days to cause death. Normally, low chronic doses are fatal. Feeding does not always have to be on consecutive days, where it is, death may occur as early as the third or fourth day. For optimal effect, several feedings should occur within a 10 day period no longer than 48 hours apart.

Where highly accepted baits fail:

- The period of bait exposure is to short, or bait has not been replenished.
- There are too few bait stations, or bait stations are too far apart.
- The control area for treatment is too small. This allows rats to transfer from untreated areas.
- Genetic resistance. This is likely the case if the same amount of bait is taken daily for several weeks.

Where anticoagulant baits are poorly accepted:

- Poor bait choice may be the reason, or bait is improperly formulated. Other food choices may

be preferred by the rats.

- Bait may be tainted e.g. moldy, rancid, or insect infested. Replace periodically.
- Improperly placed bait stations.

**Non Anticoagulants:**

There are four non-anticoagulant rodenticides registered by the EPA for control of roof rats: bromethalin, cholecalciferol (vitamin $D_3$), red squill, and zinc phosphide. However, only zinc phosphide is registered for agricultural use. All can be used for controlling anticoagulant-resistant populations of rats. Where rat numbers are large costs of baiting with non anticoagulants may reduce overall costs.

Bromethalin (Assault®, Vengeance®) is formulated in ready-to-use bait as a chronic rodenticide, applied so that rats will have the opportunity to feed on the bait one or more times over a period of one to several days. Because it is a slow-acting compared to zinc phosphide or red squill, bait shyness is not usually a problem, nor is prebaiting necessary to get good control in most situations.

Cholecalciferol (vitamin $D_3$, Quintox®) is similarly formulated in ready-to-use bait, serving as a chronic rodenticide. Death occurs 3 or 4 days after ingestion of a lethal dose. Because the toxicant is slow-acting, bait shyness is not reported to occur. It is claimed that rodents cease feeding once a lethal dose has been ingested.

Red squill is a selective and relatively safe toxicant for use only against Norway rats. It acts as an emetic, which provides some degree of protection to certain nontarget species that might accidentally consume the bait. Rats, which cannot vomit, are unable to rid themselves of the toxicant once it is consumed. In the past, one problem was the variation in the quality of the material, which is derived from a plant. Red squill must be stored in a sealed container, as moisture will cause it to loss potency. Use for more than a few days at a time may result in bait shyness.

Zinc phosphide is a dark gray powder, insoluble, that has been used extensively in the control of rodents. It is available in ready-to-use dry baits and also in concentrates to prepare fresh baits. Its strong garlic-like odor appears to be attractive to rodents that are not bait-shy.

**Baits:** Baits are produced as pellets, treated grain or meal. Sugar, to five percent by weight, is sometimes added to improve bait acceptance by both roof rats and Norway rats.

**Trapping:** Trapping can be an effective method of controlling rats, but it requires more skill and labor than most other methods. Trapping is recommended where poisons are inadvisable. It is the preferred method to try first in homes, garages, and other small structures where there may be only a few rats present.


Trapping has several advantages: 1) it does not rely on inherently hazardous rodenticides; 2) it permits the user to view success; and 3) it allows for disposal of the rat carcasses, thereby eliminating odor problems from decomposing carcasses which may remain when poisoning is done within buildings.

The simple, inexpensive, wood-based snap trap is available in most

hardware and farm supply stores. Traps should be baited with a small piece of hot dog, bacon, or nutmeat tied securely to the trigger. Peanut butter or marshmallows also may be used as bait. Baits that become stale lose their effectiveness.

Set traps close to walls, behind objects, in dark corners, and in places where roof rat activity is seen. This will usually be in attic areas, along fences and possibly in trees. Place the traps so that when rats follow their natural course of travel (usually close to a wall) they will pass directly over the trigger. Set traps so that the trigger is sensitive and will spring easily. When traps can be set in runways or in travel routes, effectiveness can be increased by enlarging the trigger. This can be done with a square of cardboard, metal, or screen wire that fits just inside the wire deadfall. Some commercial traps come with enlarged triggers. If trapping outside, take care so that birds and small animals cannot enter the traps.

Use enough traps to make the campaign short and decisive. Leaving traps unset until the bait has been taken at least once reduces the chance of rats escaping the trap and becoming trap-shy.

Other kinds of traps are also effective in catching rats. Wire-mesh cage traps such as the Tomahawk® and Havahart® can be used effectively to capture rats alive. Wire funnel-entrance traps have also been used for this purpose. These live catch traps do present the problem of disposing of the trapped animal. Fish and Game regulations prevent the release of live animals without a permit. Euthanize with $CO_2$.

Keep traps clean and in good working condition. When dirty, clean them in a hot detergent solution with a stiff brush. Human and dead-rat odors on traps are not known to reduce trapping success.

An alternative to traps are glue boards, which catch and hold rats attempting to cross them much the same way flypaper catches flies. Place glue boards wherever rats travel -- along walls, or in established pathways. Do not use glue boards where children, pets, or wildlife can contact them. Glue boards lose their effectiveness in dusty areas unless covered, and temperature extremes may affect the tackiness of some glue. They are considered less effective for capturing rats than for mice. You can purchase ready-to-use glue boards, or you can buy glue to make your own boards or traps. Dispose of live trapped rodents in a humane manner; euthanize live, trapped rodents by asphyxiation with carbon dioxide, or use a stick to kill them with a sharp blow to the base of the skull.

**Directions for Use** (with reference primarily to farms and other agricultural or field use)

Spot Baiting (except anticoagulant baits): Follow label instructions. Generally, place a teaspoon quantity of bait (in each active burrow or scatter small amounts of bait in protected places frequented by rats, but inaccessible to livestock, poultry, wildlife and children. Whenever practical, prebaiting several days before applying acute or one-shot toxic bait will achieve better control and will give an indication of how much toxic bait to put out. Prebaiting should always be conducted where natural food is abundant.

Bait should be picked up and disposed of upon completion of rodent control program. Do not retreat with zinc phosphide baits for at least three months.

**Anticoagulant Baits:**

NOTE: A single feeding of second generation anticoagulant baits may be lethal to rats. However, baits of first generation anticoagulants must be eaten over a period of several days to give adequate control.

Place 4 to 16 ounces of bait in bait box or shallow container, preferably in protected feeder stations. Place bait stations in dry locations such as in concealed places, in corners, or along walls where rats feed, drink or

frequent. Inspect stations daily and add bait as needed; increase the amount when bait in feeder is entirely consumed overnight. Replace moldy or old bait with fresh bait. An uninterrupted supply of bait should be maintained as long as any bait is taken which may be two to four weeks. For roof rats, put bait at ground floor and top floor or attic levels. For Norway rats put bait at or near ground level and at burrows and harborages.

Where a continuous source of infestation is present, permanent bait stations should be established and the bait replenished as needed. Bait should be picked up and disposed of upon completion of rodent control program.

**Paraffin bait blocks:** Cereal baits embedded in paraffin are used in, outdoor placement or other excessively damp locations where unprotected bait would spoil rapidly. The bait blocks are reasonably weatherproof, eliminating the need for bait stations.

Paraffin bait blocks have been found particularly valuable in orchard situations where the blocks can be fastened to a branch near the damage site. Be sure to secure them well so they don't fall and present a hazard to domestic animals.

As old blocks are eaten away, replace with new ones. Bait should be picked up and disposed of upon completion of rodent control program.

**Tracking Powder:** Toxic dusts or powders have been used for many years to control rats and mice. When rats walk over a patch of toxic powder, they pick some of it up on their feet and fur and later ingest it while grooming. Tracking powders are useful in controlling rats where food is plentiful and good bait acceptance is difficult to achieve. Rats are more likely to ingest a lethal amount of a poorly-accepted toxicant applied by this method than if it is mixed into a bait material. There is little likelihood of toxicant shyness developing when using tracking powders.

**Baiting Techniques:** All baits should be placed in travel ways or near rat burrows and harborage. Do not expect rats to go out of their way to find bait. Placing bait under cover may assist as rats will feel more secure while feeding. Bait placement for roof rats differs from Norway rats because the two species nest and find shelter in different areas. Roof rat bait should be placed in elevated locations such as in the crotch of a tree, on the top of a fence, or high in a vine. If bait is placed above ground level make sure it is securely fastened so that it will not fall where children or pets may find it.

**Bait Stations:** Bait stations or boxes limit poison bait exposure and accessibility to rats, thereby providing a safeguard for children, pets, and other animals. The stations should be large enough to accommodate several rats at a time, and should contain a self feeding hopper or bait compartment for holding bait. Each station should have two 21/5 inch openings for rats. Commercially available bait stations are available either for rats or mice, and generally come in designs of plastic or metal. Self constructed bait stations are usually made of wood, and are hinged for ease of access, and have a clasp for locking to make them tamper resistant. An alternative to wood is to use corrugated 4 inch drainage tubing for constructing a bait station.

All bait stations should be clearly labeled with the appropriate warnings. To ensure that bait station use indoors is truly tamper resistant, it should be secured to the wall, floor, rafter, or some other part of the structure so that it cannot be tipped over, spilling the bait. If used outdoors, away from a building, the bait station should be securely staked to the structure or well anchored in a tree. When used outdoors, a bait station provides the additional advantage of keeping bait dry in inclement weather as well as safeguarding

non target animals. When using bait stations, follow rodenticide labels carefully.

As with traps, bait stations must be placed where rodent sign is evident. Indoors, place them along walls, on rafters, within a cupboard, etc. Indoor baiting is not recommended as rodents may die in an inaccessible place, creating an unpleasant odor. Remember, roof rats may live inside a structure and travel out to feed in trees, vines and shrubs.

**Other:** Rats may have an initial aversion to some odors and tastes, but no repellents have been found to repel them for more than short time, if at all.

Predators such as owls, foxes, skunks, raccoons, opossums, and snakes do feed on rats, but because of the rats reproductive potential predators are not likely to keep rat numbers below damaging levels.

Sometimes cats and dogs are good rat catchers, but generally some rodents are clever enough to escape and thrive in their presence. In fact some studies suggest that owners of cats and dogs are more likely to have rodent problems, probably because of the availability of food i.e. pet food.

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