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## Physical and Biological Control of Rats (Rodentia: Muridae): A Short Review

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### Abstract

Controlling rats are essential to save quality food and small farm birds. Rats carry lots of micro-organisms as well as pathogenic bacteria. It spreads murine typhus and flea. Specifically, dried-fish is a popular dish of Bangladeshi people, so it is needed to save this food item from the rats. Additionally, there are many renowned pigeon houses in Bangladesh. Each year many pigeon breeders lose significant number of pigeons due to rat-infested incidents. To use poison for killing rats is not scientifically sound method. Only physical and biological method can be the best solution. Rats have high value in nature for ecological balance because many animals eat rats as their food.

**Keywords:** Rat, dried-fish market, traditional method, trap, biological control

### 1. Introduction

Rats are cosmopolitan species. Brown rats (*Rattus norvegicus*) and roof rats (*Rattus rattus*) are among the most common mammals worldwide (Kiyokawa *et al.*, 2021). Rat-related diseases are plague, salmonellosis, rat tapeworm, lymphocytic choriomeningitis, murine typhoid, etc. It has large amount of litter size so they can easily reproduce themselves within a short period. In dried-fish market of

Bangladesh, the shop-owners use some organic dust for controlling rats (Islam and Kabir, 2019). Rodents have importance in the diet of selected crop predators (Verwilghen, 2015; Labuschagne *et al.*, 2016). Since, it damages lots of crops of the farmers but it is possible to maintain them by using traps, cleanliness of the area, and finally biological control is effective for them. Rats are important to treat

human drugs within their body. Due to high reproductive potentiality, they could provide remarkable result within a short period of time. Plant dispersion and pollination both are increased due to the availability of rats. In ecological chain owl, eagle, kite, hawk, vulture, dog, jackal, and fox eat a large volume of rats from the crop fields. In crop science, rats can be used as laboratory animal. Riverine and fertile land of Bangladesh are suitable for foraging many rats. Rat flea and murine typhus (bacterial disease) are serious to human, so we should increase our knowledge for controlling them instead of killing (Tables 2-4). There is no doubt that rats are an essential biological agent to the nature. Rats not only affect human health but also cause significant economic losses by damaging crops, stored food, as well as dried-fish products which are an important source of protein in Bangladesh. Their presence in marketplaces and storage facilities increases contamination risk, leading to food spoilage and potential transmission of pathogens. Traditional methods such as chemical rodenticides can be effective in the short term, but they often pose environmental hazards, affect non-target species, and can lead to the development of rodenticide resistance. Therefore, there is a growing need for integrated, eco-friendly strategies that combine habitat management, physical trapping, and biological control agents to regulate rat populations (Tables 2-4). The objective of this study is to control rats instead of killing from the dried-fish market, loft, and some general shops at Saidpur, Bangladesh.

### 1.1 Noticed fields

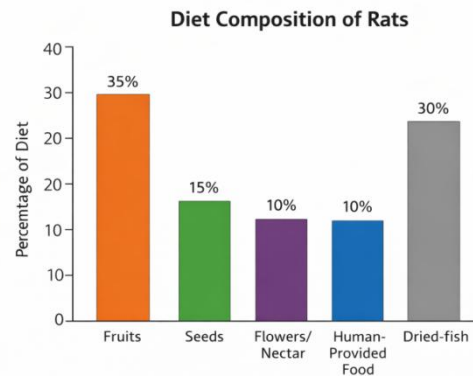
**Lucky Enterprise and adjacent dried-fish markets:** The study was conducted in Saidpur town, located in the Nilphamari District of northern Bangladesh. Saidpur is a major commercial hub with extensive marketplaces and agricultural activity. The dried-fish market in Saidpur is the second largest in Bangladesh after Chittagong. Riazul Islam (Riju) was the owner of the remarkable dried-fish shop 'Lucky Enterprise' at this Saidpur town. Numerous shops are storing large quantities of food items, making it highly susceptible to rat infestation.

**Pigeon lofts:** Pigeon lofts were included due to reports of rat-related predation on squab and contamination of food. Leftover food items in pigeon house always attract rats (Black or roof rats, *Rattus rattus* (Plate 1). Rats are vector for spreading micro-organisms, so for their presence, squab can be affected to diseases and sometimes they eat small squab (Plate 1).

**In homestead:** Since dwelling houses or homes are mostly clean but in kitchen sometimes house mouse (*Mus musculus*) could visit (Plate 2).

#### Characteristics of rats and their food items

Rats have good immunity and adaptation power, so they can survive in an adverse condition easily. Some rats are found on trees, bank of the river, shops, dried-fish shop, etc. They are very clever and dried-fish are their most favorite food item. Both sexes are active at night. On the roof and near the sewerage (mud hole) they live and give birth. In rainy season, due to damp weather dried-fish can be rotten, so rats come easily. Rats are carnivorous, so it needs animal protein and ultimately this shop or store-room is prone to attract rats.



**Figure 1.** Column graph showing diet composition of rats (Rodentia: Muridae) in dried-fish markets and pigeon lofts of Saidpur, Bangladesh (n = 360 observations). Dried-fish and fruits are the dominant dietary items, followed by seeds, flowers/nectar, and human-provided food.

### Common rat species in Bangladesh

There are many rat species in Bangladesh but black rat (*Rattus rattus*) is very common everywhere (Plate 1) (Table 1). It has black body and measured from 12.75 to 18.25 cm long. Rats are very dirty creature, so naturally it carries huge micro-organisms. In home, house mouse (*Mus musculus*) was very common (Plate 2). In addition to black rats and house mice, other species such as brown rats (*Rattus norvegicus*) and lesser bandicoot rats (*Bandicota bengalensis*) are also present in Bangladesh. Brown rats are typically found in sewage, agricultural fields and burrows, while bandicoot rats prefer crop fields and rural settlements. Rats serve as prey for a variety of predators, including owls, kites, hawks and domestic cats, linking them to the broader food web. However, their close association with human settlements makes them vectors for zoonotic diseases, such as murine typhus and leptospirosis. Understanding the behaviour, habitat preference, and seasonal activity of different rat species is essential for developing effective management and control strategies that minimize both economic losses and health risks. Rat has 1 year longevity on average.

**Table 1.** Major pest rat species (Family: Muridae) and their characteristics

Rats	Habitat type	Major impacts
Black rat, <i>Rattus rattus</i>	Roofs, trees, storage facilities	Damages stored grains, contaminates food
Brown rat, <i>Rattus norvegicus</i>	Sewage, burrows, agricultural fields	Crop loss, structural damage
Lesser bandicoot rat, <i>Bandicota bengalensis</i>	Crop fields, rural settlements	Severe agricultural pest in South Asia
House mouse, <i>Mus musculus</i>	Houses, warehouses	Food contamination, minor structural damage



**Plate 1.** Black rats in pigeon house

**Plate 2.** House mouse at home

Shop keepers used rat catching traps. In local market, there are lots of wooden or plastic traps for catching rats (Plate 2). Farmer can use cage type live trap and tin made snap trap for controlling rodents with paddy grain and bread as bait (Hasanuzzaman *et al.*, 2009). Physical control involves mechanical and environmental strategies that directly reduce rodent populations without chemicals. A study was carried out on the effect of toxic bait on the movement and home range activities of telemetered *Rattus rattus* in Orange County, California (Recht *et al.*, 1988).

**Rat controlling measures**

There are huge methods for controlling rats but the most effective and eco-friendly methods are physical and biological methods (Table 2).

**Physical method**

**Table 2.** Physical control methods used in rat (Muridae) management

Control method	Description	Advantages	Limitations
Trapping	Use of snap traps, live cage traps, and glue boards	Immediate population reduction; chemical-free; suitable for indoor use	Labour-intensive; less effective in large infestations
Proofing and exclusion	Sealing entry points, installing wire mesh, rodent-proof storage	Preventive; sustainable; reduces reinfestation	Requires structural modification and initial cost
Habitat modification	Sanitation, waste management, vegetation clearance	Long-term suppression; reduces carrying capacity	Requires continuous maintenance

**Biological method**

Crop damage can be occurred not only rats but also insect pest. The introduction of barn owls to Hawaii for rodent control in the 1960s was ineffective. Indian mongoose (*Herpestes javanicus*) survives in some areas on a diet mainly of rats (Baldwin *et al.*, 1952; Kami, 1964) but its introduction failed to achieve the desired result of reducing rat population. In both the West Indies and Hawaii,

mongooses preyed ground-nesting bird eggs and young instead of rats (Ebenhard, 1988). Some spices especially paprika, neem leaf, and turmeric powder are used to control rats. Foods were mixed with these elements then rats do not come to eat these. To control rats, pet or stray cats and dogs could help on this burning issue. Black kites are more effective in crop fields for controlling rats (Plate 3).

**Table 3.** Biological control strategies for sustainable rat management

Biological Method	Agent/Example	Mechanism of action	Advantages	Limitations
Predator enhancement	<i>Tyto alba</i> (barn owl); <i>Felis catus</i> (domestic cat)	Natural predation reduces rodent population	Environmentally friendly; sustainable	Insufficient for severe infestations
Pathogen-based control	Rodent-specific bacteria/viruses	Disease-induced mortality	Potential species specificity	Safety and ecological concerns
Fertility control	Immunocontraceptives, chemosterilants	Suppresses reproduction	Humane; long-term regulation	Limited field-scale application



**Plate 3.** Black kites (*Milvus migrans govinda*) are waiting in the field for rats

birds of prey and rodenticides with hunting perches and rodenticides (Ronen *et al.*, 2025). Rodent management programs near areas of predicted activity of rats are more likely to intercept (Corrigan, 2011).

**Summary for the physical and biological method**

Combined method of physical and biological is more effective for controlling rats everywhere. A comparative study focused by using

**Table 4.** Controlling methods with their comments

Methods	Comments
Physical method	Traps; Ultrasound; Cleanliness; Seal the entrance; Take preparation before cold and after heavy rain; Active months are January-February and November-December; Pack dried-fish or other food especially at night; Educate staff about rats (biology, behaviour, habitat, management)

Biological method	Herbal materials (onion, garlic, bay leaves, cloves, lavender, Eucalyptus, peppermint, basil, turmeric, paprika, neem, tobacco); Domestic animals (cat, dog, lab rat); Wild animals (snake, owl, hawk, kite, eagle, crow, jackal, fox, mongoose); Small pet in shop
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### Integrated approach

An integrated pest management (IPM) approach that combines physical and biological control methods provides a sustainable and environmentally sound strategy for managing rat population. This approach emphasizes regular monitoring, habitat sanitation, structural proofing and strategic trapping alongside the encouragement of natural predators such as the Barn owl (*Tyto alba*). By reducing food availability, eliminating shelter, sealing entry points and enhancing predator presence through measures like nest box installation, rat populations can be effectively suppressed without heavy dependence on chemical rodenticides. Such integration not only minimizes environmental contamination and non-target risks but also supports long-term ecological balance and resistance prevention.

### Conclusions

Since rats are wildlife but it has notorious bad effect on our crops as well as dried-fish. Rats can reproduce all the year round if their food, water, and shelter will be available. The present study suggests that the activity of rats in dried-fish market is not worsening to kill them. The month December and January were focused remarkable months for their availability. Physical and biological control are the best for them to keep continue ecological balance. Moreover, integrating physical and biological control measures within an Integrated Pest Management (IPM) framework is highly recommended. Simple interventions such as regular trapping, proofing storage areas, maintaining cleanliness, and encouraging natural predators like barn owls and domestic cats can effectively suppress rat populations. Herbal deterrents, including neem, turmeric, and dried spices, provide an additional non-toxic method for reducing rodent visits. By combining these strategies, rat populations can be managed sustainably without over-reliance on chemical rodenticides, thereby protecting both human food resources and maintaining ecological balance.

### References

1. Baldwin, P. H., Schwartz, C. W., Schwartz, E. R. 1952. Life history and economic status of the mongoose in Hawaii. *Journal of Mammalogy* 33: 335-356.
2. Corrigan, R. M. 2011. *Rats and Mice*. In: *The Mallis Handbook of Pest Control* (eds. Mallis, A., Moreland, D., & Hedges, S. A.), pp. 11-119. GIE Publications, USA.
3. Ebenhard, T. 1988. Introduced birds and mammals and their ecological effects. *Swedish Wildlife Research* 13: 1-107.
4. Hasanuzzaman, A. T. M., Alam, M. S., Bazzaz, M. M. 2009. Comparative efficiency of some indigenous traps to capture rats in the wheat field of Bangladesh. *Journal of Agriculture and Rural Development* 7(1&2): 121-125.
5. Islam, M. N. and Kabir, M. A. 2019. Application of organic preservatives for sustainable storage of dried fishes. *International Journal of Fisheries and Aquatic Studies* 7(3): 40-43.

6. Kami, H. T. 1964. Foods of the mongoose in the Hamakua District, Hawaii. *Zoonoses Research* 3(3): 165-170.
7. Kiyokawa, Y., Koizumi, R., Yamada, R., Hijikata, M., Kimura, G., Tanaka, K. D., Takeuchi, Y., Tanikawa, T. 2021. Records of rat control campaigns in a food market with the largest seafood trading volume worldwide. *Urban Ecosystems* 1-11.
8. Labuschagne, L., Swanepoel, L. H., Taylor, P. J., Belmain, S. R., Keith, M. 2016. Are avian predators effective biological control agents for rodent pest management in agricultural systems? *Biological Control* 101: 94-102.
9. Recht, M. A., Geck, R., Challet, G. L., & Webb, J. P. 1988. The effect of habitat management and toxic bait placement on the movement and home range activities of telemetered *Rattus rattus* in Orange County, California. *Bulletin of the Society for Vector Ecology* 13(2): 248-279.
10. Ronen, N., Brook, A., Charter, M. 2025. Assessing birds of prey as biological pest control: A comparative study with hunting perches and rodenticides on rodent activity and crop health. *Biology (Basel)* 14(9): 1108.
11. Verwilghen, A., Rabillard, M.-A., Chaval, Y., Rieffel, D., Sinaga, M. H. *et al.* 2015. Relative age determination of *Rattus tiomanicus* using allometric measurements. *Mammalia* 79 (1): 81-90.