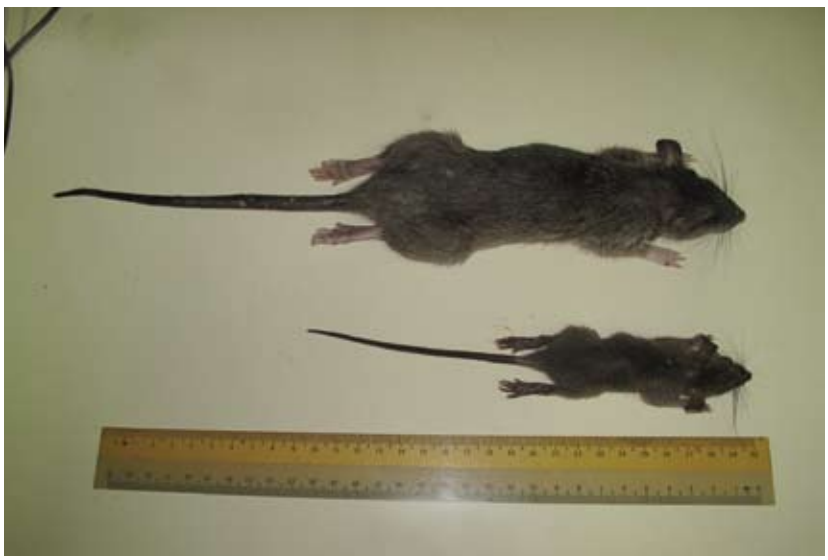
The house rodents and house shrew in Malaysia and Southeast Asia

Rats, mice and shrews are among the uninvited guests that thrive in human environments. They damage property, including stored food products, and can carry disease. Whether we like it or not, they will continue to live with us, so let's get to know what they are.

By Lim Boo Liat

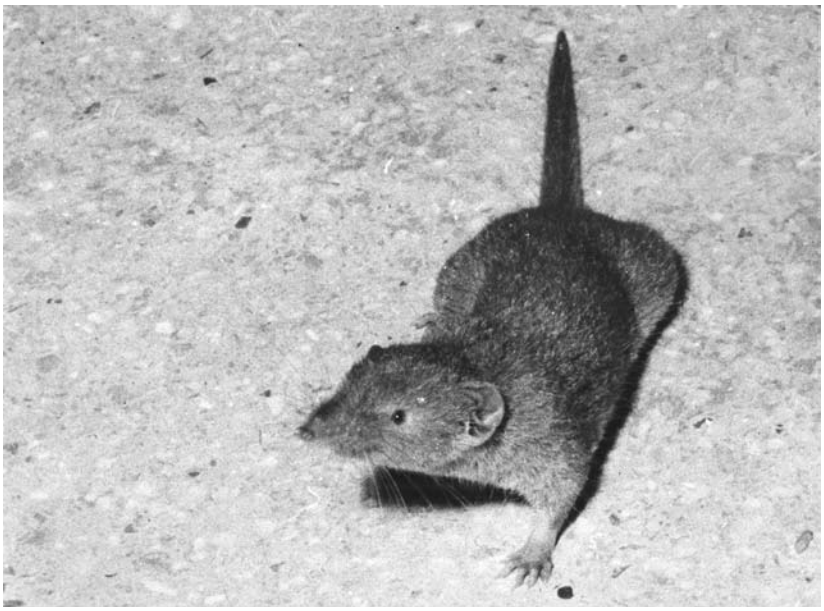
Rodents are gnawing animals of the order Rodentia, represented by four families in Peninsular Malaysia: *Muridae* (mice and rats), *Rhizomidae* (bamboo rats), *Sciuridae* (tree and ground squirrels) and *Hystricidae* (porcupines). The characteristic feature of rodents is the arrangement of their teeth. The incisors have developed into chisels, two in the upper jaw and two in the lower, used to gnaw away hard seed coats and nut shells so as to reach the soft kernel within. The nut shells are inedible, and to prevent them being swallowed, the canine teeth are missing, leaving a gap (the 'diastema') into which the sides of the lips are folded so as to close off the front of the mouth completely.



The common house rate (above) and house mouse (below)

Among the four families of rodents, rats and mice of the family *Muridae* have the highest species diversity, with 27 species so far described in Peninsular Malaysia. Most members of this family live in the forest, and will not live in houses even when given a chance. Those rodents that feed in rubbish dumps and in houses consist of three species of rats, and one species of house mouse. Sharing the same habitat is a rodentlike animal—the house shrew. These animals are considered as pests or vermin, doing considerable damage to stored rice and other stored food products , and sometimes also damaging crops in the field.

The rats that are commonly seen darting swiftly during the night and also at times during daylight hours in the markets, food courts, coffee shops, street stalls, in houses and kitchens, and along surrounding drainage systems in towns, belong to two species i.e. the common houserat (*Rattus rattus diardii*) and the Norway rat (*Rattus norvegicus*).



The house shrew

The common house rat *(Rattus rattus diardii)* is a form of the widespread rat species called *Rattus rattus*. The first form to be described was the black form found in Northern Europe, commonly called the 'black rat' in books, although in fact most examples, even in Europe, are brown. In Malaysia this rat is represented by a brown form with a dull greyish brown belly. It is a medium-sized rat with the head and body (HB) between 110 and 200 mm in length and a darkish tail which is as long as or slightly shorter than the HB length. It is predominately an indoor rat, dwelling in store-rooms, attics and other secluded places and living on the food that is available indoors.

In poorly-constructed houses, the attic is a refuge for all kinds of animals such as rats, birds, bats and snakes and it serves as a common platform for predator/prey encounters. It is not uncommon for such houses to be visited by the common civet or Musang Pulut *(Paradoxurus hermaphroditus)*—in most cases a female with a few juveniles, or a female nursing new born puppies. The rats would horde together hoping to predate on the puppies and would be repelled by the parent Musang, which is a larger animal. Such encounters create a loud drumming commotion that can often be heard at night.

Distribution and status: The house rat is widespread throughout Malaysia and is common in all Southeast Asian countries. It differs in number of chromosomes from the form of *Rattus rattus* that is native to India.

Ecology and habitat: Nocturnal, terrestrial and omnivorous, feeding on garbage and household waste, plant and animal matters. It is primarily associated with human habitations, preferring indoor environments. It contaminates food through urination in store houses, provision shops and homes. Those that cannot find indoor accommodation will build their burrows in rubbish dumps and road sides and thrive on garbage and food waste. In areas where plots of rice, orchards and vegetables are situated adjacent to households, it is not unusual to find this rat as an opportunistic pest in the absence of the field rodent species, Though it spends most of its time on the ground, this rat is also a good climber.

The Norway rat (*Rattus norvegicus*) is also widespread but is more abundant in colder climates. It probably originated as a field rat of the Siberian steppes whence it became

Field habitat of the common house rat

domesticated, eventually invading Europe and spreading all over the world. The albino rat, used as an experimental model throughout the world, was derived from this wild stock.

It is a large rat with HB length 150-250 mm which is about twice the size of the common house rat. It differs from the latter species by size and colour: the belly is greyish and the tail short and bi-coloured (darker above and whitish underneath). In Malaysia it is a burrowing house pest, living under the floor or in rubbish dumps. The short tail limits its ability to climb high structures, thus confining its activities to the ground.

In Malaysia, the Norway rat is primarily found to seaport areas. My experience of sourcing this rat for biomedical studies in Selangor was from Port Swettenham (now Port Klang) during the period from late 1948 to 1965. This rat at the moment is the predominant rat indoors and outdoors in the port.

The Norway rat is also found in the town of Klang (Kelang) five miles south of the port, but there, it is a secondary species because the dominance of the common house rat. During the 1960's and 1970's, industries were booming and small and large townships were progressively constructed stretching from Klang to Petaling Jaya. Though the Institute of Medical Research (in which I was employed), was not involved in the trapping of rats there, we collaborated with the Municipality of Petaling Jaya to secure the animals in their rat-catching programme periodically, and found small numbers of the Norway rat in their catches. By the 1980's Kuala Lumpur had developed into "Greater Kuala Lumpur" with industries and more townships adjoining Petaling Jaya, and *Rattus norvegicus* had become quite common in Kuala Lumpur city. In my visits to some of the villages within the city, I found that roadkills and other killed specimens thrown on road sides were mostly of the Norway rat.

This rat, once confined to seaport areas, is now well-established as a town and city species due to linear industrialization, with human activity providing ample food and shelter and encouraging propagation.

Distribution and status: Worldwide in distribution, the Norway rat, also known as "seaport or sewage rat" has spread from its normal niche in seaports to inland towns and cities. In most European countries, this species

A rubbish dump that provides food for rats

is also adapted to the field environment, causing extensive damage to field crops.

Ecology and habitat: Nocturnal and terrestrial. It builds large burrow systems, thrives in rubbish dumps outdoors, and under the floor in store houses indoors. It has a habit of gnawing electrical wiring, damaging underground wiring and street lighting and causing electrical fire in buildings and houses. In some parts of Malaysia (Sabah, Sarawak, Pulau Langkawi) and a few Southeast Asian countries (Indonesia. Philippines, Myanmar), it occurs in rice fields adjacent to human habitations. It is not as agile as the house rat, but is a good swimmer.

The Burmese rat (*Rattus exulans*), has a less extensive distribution, from Burma to Java, the Philippines, Japan, Hawaii and the Pacific islands. It possibly originated in the Philippines, and was carried about in ships and in the canoes of the early voyagers between the Malay Archipelago and the islands of the Pacific. Certainly, it was carried by the Polynesians in their extensive sea voyages, and in this way reached most of the Pacific Islands, including New Zealand.

The Burmese rat is distinguished by a slimly built body (HB length 90-140 mm), and is uniformly greyish. It is about half the size of the common house rat. In Malaysia, this species was once common in houses, but never in abundance. It is rather timid and not able to compete with the very aggressive and more abundant common house rat.

This reminds me of a biomedical study in a rice field plot of about an acre in size, in Sarawak, in 1965. This plot was next to a village of twelve Dayak households. We were trapping the rice-field rat (*Rattus argentiventer*) for vectors of scrub typhus. With the help of the Dayak farmers we managed to trap out more than 100 individuals within three nights. In the following three nights 45 common house rats and only five rice field rats were captured. In the last three nights the Burmese rat appeared, with seven individuals trapped. This sequence appears to be a consequence of the hierarchical and territorial behavior of the species in relation to each other. The Burmese rat's inability to compete with bigger rats makes it a vagabond, wandering opportunistically to seek an environment free of its larger competitors, which would explain why it was the last to appear and get caught in the traps.

Habitat of the house mouse, in a drawer

Distribution and status: The Burmese rat is present throughout Southeast Asia as well as in the Pacific regions. It is probably the most successful island colonizer of any rodent species.

Ecology and Habitat: Nocturnal and terrestrial. The diet of animals caught in houses includes household waste and insects while that of field-caught specimens consists of plant materials such as roots of grasses and seeds of plants, and plenty of insects. In Malaysia it occurs sporadically in all habitat-types, from grassland (*Imperata cyclindrica*) scrub, cultivated areas, disturbed and secondary forests, primary forest at all elevations up to 1800m high, and in towns and cities and surrounding islands. The species is more prevalent in the east coast of Peninsular Malaysia and East Malaysia (Sabah & Sarawak) but it invades ricefields only in exceptional years. Elsewhere, in Indonesia, Philippines, Myanmar and Thailand, this species is one of the rodent pests in ricefields. In the Pacific regions it is a major pest of many agricultural crops. In Malaysia, the species is generally of minor importance at present, but has the capacity of becoming a major pest.

The house mouse (*Musmuscalus*), which possibly originated from a mouse of open grassland in Central Asia and Northern India is now cosmopolitan as a house pest. In Malaysia this species is strictly a house resident. It is the smallest rodent, under 80 mm in length with a very thin dark tail, otherwise uniformly brownish in colour. In houses, it lives in bedroom and kitchen cabinets, table drawers and in store rooms. It nibbles at clothing and eats the food in food cabinets. Like the Norway rat, this little mouse has been domesticated; the white mouse in animal houses in research institutions originated from this wild stock.

Distribution and status: Widespread throughout Malaysia and Southeast Asia.

Ecology and Habitat: Nocturnal and semi-arboreal. The house mouse is restricted to houses and human habitations. Its diet include food available in houses, and insects. A very agile and active animal.

The house shrew (*Suncus murinus*) is neither a rat or a mouse. It is a small insectivore under the order Insectivora. It is about 1 ½ times larger than the house mouse. It is recognizable by its longish pointed nose, and uniformly greyish colour. The species probably originated in India, and is now widespread throughout East Asia and across the islands of the Pacific. In the Malaysian region this animal is domestic and only lives around houses.

The house shrew feeds largely on insects and it frequents houses at dusk in search of cockroaches, crickets and insects that are attracted to lights. Besides insects, it also scrounges for food residues such as rice, meat and vegetable matter in the kitchen. From time to time it emits a high pitched whistling chirp almost like the clinking of two coins together. To some Chinese old folks, the whistling chirp is a good omen of prosperity, thus this shrew has also been called the "money rat". However, the shrew has a bad habit of defecating frequently, and the watery greenish faeces stains the floors of houses.

The shrew has an odouring scent (pleasant to some nostrils but unpleasant to most). When it is disturbed, the odorous musk gets much stronger and is used as a defensive weapon. In my experience, when the shrew is present in a house, the common house rat is absent.

Distribution and status: The houseshrew is widespread throughout Malaysia and all Southeast Asian countries.

Ecology and habitat: Nocturnal and terrestrial. The house shrew is associated with human habitations in or near houses. Occasional individuals can be found in grassland. Feeds primarily on insects.

Reproductive capacity

All the domiciled rats are prolific breeders, with mammary glands bearing tits ranging from eight to twelve in number. The Norway rat has 12 tits as compared to 10 in the common house rat and house mouse, 8 in the Burmese rat and 6 in the house shrew. Studies by Harrison J. L. in 1950 found that the average number of young produced was 8 for the two large rats, 6 for the Burmese rat and 4 for the house shrew.

The young of the rats and mouse mature within three months and by the fourth month the animals are reproductive. Generally an equal sex ratio of male and female rats is encountered. Taking into consideration that 50% of the young perish due to predation and accidental death, one pair of mature rats will produce two pairs of breeding offspring in four months. Including the original pair, that would make three pairs in four months. At the end of the second cycle (in eight months) there would be nine pairs. At the end of the first year (three cycles) there would be 27 pairs. At the end of two years there would be over 900 pairs! This is how rats can quickly overrun a city if there is no control. The life span for the domiciled rats is generally between 12 to 18 months.

Uses in folk medicine

In some ethnic communities, the new born suckling rat or mouse (13 days old) is believed to cure certain ailments such as asthma and body tumor and for 'blood cleansing'. I witnessed the case of a young girl during the Japanese Occupation of Malaysia (1941 – 1945) in Kelang who had a sizeable neck tumor and was healed after swallowing four batches of four sucklings each time, within a period of two weeks. The medical use of suckling rats or mice is still practiced particularly for treatment of asthmatic cases.

Rodent-borne diseases

Rodent-borne diseases are classified amongst the zoonotic diseases as "an infection or an

infectious disease transmissible under natural conditions from vertebrate animals to man". In Malaysia, all the four rodent species and the house shrew play a role as reservoir hosts for some of the diseases of man. Some of the common diseases encountered that have received attention are leptospirosis (spirochaetal disease), scrub and murine typhus (ricketsial diseases), angiostrongyliasis, schistomiasis, hymenolepsiasis, echinostomiasis and trichninellosis (helminthic diseases), haemorrhagic fever with renal syndrome, hantar virus and rat-bite fever (virus diseases). Among them, the most dangerous killer diseases are schistosomiasis and plague which are now absent in Malaysia, but are endemic in Indonesia with the same rodent reservoir hosts as in Malaysia. Humans infected with these two diseases from the endemic areas can act as carrier hosts and may reintroduce these diseases to Malaysia.

In the Southeast Asian countries (Malaysia, Singapore, Thailand, Laos, Vietnam, Cambodia, Myanmar, Indonesia, Philippines, Brunei) the house rat (*Rattus rattus diardii*), and the Norway rat (*Rattus norvegicus*) are major household and industrial pests in urban and suburban areas. The Burmese rat (*Rattus exulans*) is an intermittent visitor. The house mouse (*Mus musculus)* can be considered as a minor household pest. The houseshrew is a minor household pest but it contributes to the suppression of insect pests in households and surroundings.

The house rat, Norway rat and the Burmese rat can adapt to field conditions and have the potential to become serious pests in rice fields and plantations alongside the rice-field rat (*Rattus argentiventer*) and the wood rat (*Rattus tiomanicus*).

The domiciled rodent species are dependent on manmade habitats. So long as humans continue providing convenient habitats where food is readily available, the pest species can proliferate, and these pests are prolific in their reproductive capacity.

KEY FOR IDENTIFICATION OF HOUSE RODENTS AND HOUSE SHREW

1. The snout long and pointed.
   Colour uniformly greyish, Mammary tits 6……house shrew (*Suncus murinus*).

   - The snout not longish. Mammary tits 8, 10 or 12……..2

2. Tail bicolored, dark above and lighter below and shorter than HB length. Large sized rat; HB 150-250 mm, HF 38-45 mm. Wt 160-300 g. Colour greyish brown-black, with grey belly. Mammary tits 12 ……Norway rat (*Ratt us norvegicus*).

   - Tail uniformly dark, about as long as the HB length…….....3

3. Tiny-sized mouse; HB 50-80 mm, HF 14-17 mm, Wt 718 g. Colour uniformly brownish. Tail longer than HB length.
Mammary tits 10……. house mouse (*Mus musculus*).

- Larger-sized rat; HB over 90 mm, HF over 20 mm…….4

4. Larger sized; HB 110-200 mm, HF 33-37 mm, Wt 140-180 g. Colour variable: with dull brown back and light greyish-brown belly, to reddish-brown, often with paler or darker patches.
Mammary tits 10……..……..common house rat (*Rattus rattus diardii*).

- Smaller sized; HB 90-140 mm, HF 20-26 mm, Wt 2045 g. Colour: grey to greyish-brown back and grey belly.
Mammary tits 8 ……Burmese rat (*Rattus exulans*).

Abbreviations: HB= Head & body; HF= Hindfoot; Wt= Weight.

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