

CHAPTER 22

THE ECOLOGY OF OUR SAVANNA LANDS

22. 1. OUR SAVANNA'S COMMUNITY DESCRIPTION

22. 1. 1. What and Where are Our Savanna Lands

Savannas are areas where grasses, particularly a certain kind of grass, *Miscanthus floridulus*, covers the landscape. *Miscanthus* is commonly called “swordgrass”. By definition, savannas commonly have scattered trees as well.

Our Commonwealth's savannas do not conform with the usual image of a savanna ecosystem (such as one might see on a video of the African Continent's expansive savanna lands). Our savannas occur on more steeply sloping land than “regular” savannas. Also, our savannas lack large roaming mammals. Yet ours are indeed savannas.

Savannas make up 17 percent of Saipan, 1 percent of Tinian, and about 2 percent on Luta. Additionally, there are swordgrass savannas growing on the peaks of several of our northernmost islands. Here they predominate on the unconsolidated ash and cinders.

Our northernmost islands' savannas have the interesting nature of not being stressed frequently by human-set fires. The fact that they persist in these uninhabited islands somewhat draws into question the common argument/assumption as to why our southernmost islands continue to have savanna lands, it being commonly believed that these ecosystems are human-caused.

22. 1. 2. Savanna Soils

Three soil types are the predominate cause of the formation of our savannas. These are our Akina soils, our Agfayan soils, and our Laolao soils. The breadth of our grasslands can be extended by burning.

These three soil types are strongly acidic in nature. While the Laolao soils have some calcium, the Agfayan and Akina soils are low to very low in this essential plant nutrient. Most limestone-type plants need rich supplies of calcium, and this is one reason only a few particular plants can grow on the savanna.



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The savanna soils are also rich in aluminum and iron. The oxidizing of these earth metals accounts for the reddish color of the savanna's 'dirt' particles.

Botanists believe it's probable that trees once grew on our pre-settlement savanna areas. Reforestation experiments on Guam show, however, that even with great effort many species of trees now grow poorly on the current savanna lands, at least those planted onto the Akina soils. The main reason seems to be (as suggested above) the low content of calcium and the high content of soluble aluminum in these soils.



Fire perpetuates the presence of the savanna at the expense of the forest.

22. 1. 3. Fire and Savannas

Fire perpetuates the presence of the savanna at the expense of the forest. It is believed that even the calcium-poor Akina soils would probably develop a forested vegetation type over many generations if only fires did not continuously kill invading shrub and tree seedlings.

Such natural rehabilitation would require that our forest seed-dispersing fruit doves and fruit bats have healthy populations. Today, human intervention for such reforestation is required. Some efforts towards this have recently begun.

There are large areas of 'Chinen soils' south of Mount Tapotchau on Saipan that are in swordgrass savanna. The Chinen soil type develops over limestone, instead of volcanic rock, where the Akina and Laolao soils develop. These areas frequently burn during the dry season. If fires did not occur, this location could very likely revert back to forest.

Fires do not usually occur in our mature native and secondary forests, this is mostly due to the lack of dry burnable material on the ground. Live TANGANTANGAN trees are particularly resistant to burning.

22. 1. 4. The Severe Erosion Problem and the "Badlands" Designation

There is a severe erosion problem on the Akina soils of Saipan and Rota. Because of the generally steep slopes and poor plant cover, soil **slumping** (a type of mass movement) occurs.

Recent slumps can be seen as an area of exposed red soil, often with a curving arc to its backside, and a downslope bulge of earth just below. The resulting **badland** is slow to become revegetated naturally and is subject to intense erosion. Wildfires contribute to this problem by destroying the soil-holding plant cover.



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22. 1. 5. Land Rehabilitation Efforts (Lau Lau Bay)

The USDA Natural Resources Conservation Service (NRCS), our Division of Environmental Quality (DEQ), and other cooperating CNMI agencies and private land owners are presently working hard to re-establish forests on some of our badland soils. At the time of this book's writing, a pilot project is underway on Saipan in the Lau Lau Bay watershed area. On Luta, extensive plantings of trees to hold badland soils within the Talakaya Watershed lands have been undertaken. This project is being led by the Luta DLNR Forestry Division.

Cooperating land owners and volunteers are strategically planting an acid soil tolerant, nitrogen-fixing tree called *Acacia auriculiformis*, (*Acacia auri's* for short). These trees are started as seedlings in a nearby nursery area.

The conservationists plant the seedlings, leaving an appropriate inter-tree distance. Their goal is to have full canopy coverage once the trees mature. When established, the new forest should be fire resistant and will help reduce soil erosion from the site. This would improve the overall watershed and provide better wildlife habitat. The downslope coral reefs of Lau Lau Bay will be better protected as well.

22. 2. WILDLAND FIRES AND DEER HUNTING

22. 2. 1. The Coming of Our Dry Season and Our Concurrent “Fire” Season

One of our contributing writers waxed poetically, “The clear, dry days of April and May somehow intensify our islands’ natural beauty—the lagoon appears bluer, sands along the beach shine in blinding whiteness, and our verdant hills can be seen in every detail.”

He went on to write, “However, this view is sometimes marred by black smoke billowing up from our savannas, causing the skies over our villages to become hazy. The dry grass burns easily, and the fires may continue for a day or two.”

22. 2. 2. Local Cause of Fires; Arsonist/Hunters

A few of our April and May fires start accidentally -- a lighted cigarette is carelessly tossed into the grass, or a rubbish fire gets out of control. But all too often, we know these fires are deliberately set by deer hunters. Their plan is to burn off a large area in order to clear away the old grass and encourage new grass to grow.

A few weeks after the area is burned, underground portions of the grass plants send up tender, young shoots that are relished by deer.

Besides being easier to digest, the new shoots are high in protein and other nutrients that the deer like. An added advantage to hunters is that the deer are much easier to see and shoot in burned over areas than in tall grass or nearby forests.

22. 2. 3. Deer Habitat and Fire Ecology

But this type of “habitat improvement” yields only short term benefits. Deer are primarily forest-dwelling animals. They need the protection that forest cover provides.

Deer can find most of their food in the forest, browsing on a wide variety of leaves and twigs. Grass fires may provide a flush of new forage for deer, but in a short time the swordgrass again becomes coarse and unpalatable. Grassland by itself is poor habitat for deer. A mixture of forest, grassland, and small forest clearings is best for them.

Fires actually pose a long term threat to deer by changing their needed forest habitat. Grasslands are easily made and maintained by fires. Grasses are adapted to frequent burning while our forests



Conservationists plant seedlings in the Lau Lau Bay watershed area. Once established, the new forest should be fire resistant and should help reduce soil erosion from the site.



Grass fires may provide a flush of new forage for deer, but in a short time the swordgrass again becomes coarse and unpalatable.



Grass fires provide no long term benefits for deer or any of our wildlife. Help keep our islands green and beautiful by preventing fires.



By definition, trees are a necessary part of a savanna's flora. None of the trees that live on our savannas are represented exclusively there, as they all grow elsewhere as well.

are not. Each grass fire also burns the edge of the forest. Little by little, each year, more habitat is lost for deer and other forest animals, including our local birds and coconut crabs.

Grass quickly invades the burned forest, providing fuel for the next fire. In other parts of the world, vast areas of forest have been lost in this way. Foresters are convinced that if the burning were to stop, trees would slowly re-invade the grassland and a new forest would gradually appear.

22. 2. 4. Burn Permits and Arson Enforcement

The practice of setting grass fires to attract deer is both short-sighted and selfish. It should be stopped. Grass fires provide no long term benefits for deer or any of our wildlife.

To control wildland fires, the CNMI Fire Division of our Department of Public Safety enforces a burn permit program. If you have to burn something, do it in the rainy season if you can. Be especially careful during El Niño years or other drought periods.

Always get a burn permit. They are inexpensive. To get a permit you must show how you will control the fire you intend to set.

Report poachers and arsonists to the police, to the Division of Fish and Wildlife, and to the Fire Division's arson investigators. Starting fires in the grasslands is illegal and punishable by fines up to \$1,000 and/or two years imprisonment.

Penalties for criminal arson can be very severe. If people are injured or killed as a result of the fire, or if significant property damage occurs, arsonists can face severe and additional criminal charges far beyond that of just starting a fire without a permit. Arsonists are also liable to private lawsuits for injuries and damage that their fire may have caused.

22. 3. SAVANNA-ADAPTED SPECIES

22. 3. 1. Introduction

To survive in the savanna, plants must be well adapted to dryness and disturbance. By definition, trees are a necessary part of a savanna's flora. None of the trees that live on our savannas are represented exclusively there. They all grow elsewhere as well.

The conservation plantings of *Acacia auri's* was already mentioned. Our other acacia, *Acacia formosa*, also grows on the savanna. Many of these trees were originally planted during the Japanese period. They were meant to be used as lumber trees for railroad ties. There are even some plantings of coconut groves at savanna edges, dating back to the German period.

Another common savanna tree is the Ironwood or Australian "pine", *Casuarina equisetifolia*. See its description in the Strand chapter, Ch. 16.

A common strand shrub is the coastal half-flower *Scaevola sevicea* (Nanaso). It also inhabits our savanna lands. The dry conditions and high level of disturbance of our coastal strands is similar to the ecology of our savannas. This is the reason that several sea coast plants do well in the savanna.

Animals which frequent the savanna include grasshoppers and other insects. The Nightingale Reed Warbler likes to visit the savanna's edge, often feeding on these grasshoppers.

Overhead one usually sees the Island Swiftlet, *Aerodramus vanikorensis* (Aero = air, dramus = performer), another island endemic and likewise an endangered species. These catch flying gnats, mosquitoes, and other insects in great abundance. In Chamorro it is YAYAGUAK and in Carolinian it is LEGH'KIYANK. The best place on Saipan to watch the Island Swiftlet is from the overlook on top of Mt. Tapotchau.

22. 3. 2. *Miscanthus floridulus*

Miscanthus floridulus is in the *Family Graminae*. Its common names include swordgrass, TUPUN-NETI and ASANG. This is a tall bunch grass covering the open hills of our savannas. It is our most common and characteristic savanna plant.

The leaf blades of *Miscanthus* vary in color with the seasons and local moisture conditions. The color ranges from a bright, light green to a dull, light brown straw color. The edges of the leaves are razor-sharp due to microscopically small saw-toothed edges. These can easily cut bare skin rubbed across them.

Swordgrass grows rather tall, to a height of 2 or even 3 meters. These grasses grow in clumps, often so close together that it is difficult to push through them.

This grass, like the other plants of the savanna, are adapted to burning. Even when the clumps are burned thoroughly the base is still capable of sending up new shoots.

22. 3. 3. *Heteropogon contortus*

Heteropogon contortus is in the *Family Graminae*. This savanna grass is abundant in our northernmost islands. It commonly grows on volcanic soils of warm tropical areas. It is indigenous, meaning the species was here when the first Chamorros arrived to our islands.

Its common name is 'tanglehead'. This is indicated by the trivial epithet name of "contortus". *Heteropogon* has somewhat bluish leaf blades. In ancient Hawaii it was used for roof thatch.

22. 3. 4. *Gleichenia linearis*

Gleichenia linearis is a fern of the plant *Family Gleicheniaceae*. This is a sprawling terrestrial fern, indigenous to our islands. It is pantropical in distribution. These are wiry ferns with long rhizomes that have bristle-like hairs.

Gleichenia plants are formed with repeatedly-forking branches. The blades are green on the top surface and white below. Round sori occur in the midstem. These are more numerous near the frond base.

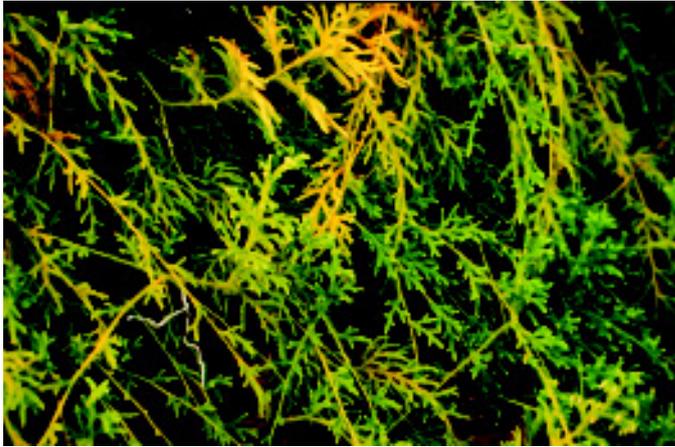
This is a savanna species. It tolerates poor soil, intense sunlight and low rainfall. *Gleichenia* often forms mats on erosion scars. It is very common.



The Island Swiftlet, Aerodramus vanikorensis, catches flying gnats, mosquitoes, and other insects in great abundance.



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Lycopodium cernuum sprawls like a fuzzy vine, growing its tree-like shoots from underground rhizome structures.



Blechnum orientale has distinctive reduced leaflets that extend almost to the soil.

22. 3. 5. *Lycopodium cernuum*

Lycopodium cernuum is in the plant Family *Lycopodiaceae*. It is a **club moss**. Club mosses are ancient plants that evolved before the dinosaur period. In fact, many of the dinosaurs probably ate several types of club mosses. Some of the club mosses living back then, grew as tall as today's trees. The shoots of many of our present day club mosses resemble little Christmas trees and *Lycopodium cernuum* is no different.

L. cernuum sprawls like a fuzzy vine, growing its tree-like shoots from underground rhizome structures. It grows best on clay soils. Like other club mosses it has true roots, stems, and leaves. Also like other club mosses, it lacks flowers and their sexual reproduction-associated structures.

The roots are rather thick, whitish, and not numerous. The leaves of this species are only 2-3 millimeters long. They are scale-like and overlap the stems. When the plant grows in the shade, it is extremely green and fairly delicate.

This plant is found in the savannas and tolerates full sun and drought. It is common under such difficult circumstances, but does not transplant well.

22. 3. 6. *Blechnum orientale*

Blechnum orientale is in the Family *Polypodiaceae*. This rather robust, stiff fern is indigenous to the CNMI and other areas of Micronesia. As the species name "orientale" tells us, its home range includes tropical Asia and the Pacific. It forms a rather erect *rosette* in clay soils. The semi-circular, reduced leaflets that extend almost to the soil are very distinctive.

Old fronds are **persistent** and become tough and silvery. Persistent means they stay on the plant even after they die. This savanna fern is particularly common at the edges of erosion areas and along stream gullies.

Often it perches precariously on a tiny hill that it has held in place while the clay around it eroded. In spite of its survival in such inhospitable sites, this fern does not thrive in cultivation. It is probably best appreciated in its sunny, bare savanna home.

22. 3. 7. *Lindsaea ensifolia*

Lindsaea ensifolia is in the Family *Polypodiaceae*. It is a small fern indigenous to our islands. It is also pantropical in distribution. The frond is erect, growing from an underground, dark, creeping rhizome. Sori are borne near or on the longer mature **pinna** (fern leaflet) margins.

Lindsaea ensifolia is a terrestrial fern of our savanna. It can be found in clumps growing at the bases of grasses, against other plants, or next to rocks. It is one of the first plants to regrow after a fire, and is most noticeable under such circumstances. *Lindsaea* is very common in all savannas, but is often overlooked.

22. 3. 8. *Pityrogramma calomelanos*

Pityrogramma calomelanos is also in the plant Family *Polypodiaceae*. This delicate-looking fern has glossy dark **stipes** (the stalk of a fern frond)

and silvery waxy powder on one side of the frond. It is a native of the American tropics. It has made a satisfactory place for itself in the CNMI's clay soils.

It is commonly called the silverback fern. It has fronds that have narrowly triangular blades. Because the silvery wax is so distinctive, the **sporangia**, spore-bearing structures appear to be specks of pepper without much of a pattern. The silver color is much more distinctive on young fronds and may be sparse or absent on older blades.

This species is a savanna fern of stream banks and gullies, and on other open sites that hold moisture. Like other ferns adapted to such rigorous habitats, this species does not thrive in cultivation.

22. 3. 9. *Spathoglottis plicata*

Spathoglottis plicata is in the plant *Family Orchidaceae*. Its common name is the Philippine Ground Orchid. This almost ever-blooming herb can be seen in sun and shade along roadsides and on the savannas. It is not at all unusual as an epiphyte. It is variable in size and color.

The flowers are 2-3 centimeters wide, rose-lavender in color but ranging to pale lavender and even white. The individual flowers are not long-lived, however, they are produced in high numbers. This gives these plants an almost ever-blooming look.

22. 3. 10. *Pandanus tectorius*

Pandanus tectorius is in the plant *Family Pandanaceae*. In Chamorro it is called KAFU or FATSAL. In Carolinian it is FASHIL WAL. A second species, *Pandanus dubius* is also locally common.

Pandanus tectorius is a small to medium sized tree. It has thin, forking trunks and aerial or prop roots. Its leaves are long with a glossy green surface. The margins and the midrib bear short curved teeth (serrations). The fruits are large, weighing around two kilograms.

Pandanus tectorius grows on limestone plateaus and clay hills. It can be propagated by its seeds. The leaves are used in weaving mats and baskets. The orange pulp of the fruits is barely edible, since it is too high in calcium oxalate. *Pandanus dubius*, however, is commonly eaten.

The seeds are difficult to remove from the thick, hard wall. Consequently, the ripe fruits are much eaten by fruit bats and rats, but usually not by humans.

22. 4. OUR SAVANNA (ISLAND) RODENTS

22. 4. 1. Introduction

During a recent field trip to the savannas of Mt. Atchugao, Saipan, NMC's BI 201 Natural History class met three federal scientists conducting their field work for the US Geological Survey's Biological Resources Division. The scientists were all *mammalogists*, biologists who specialize in the study of mammals. They were actively capturing and marking, then later recapturing savanna rodents and insectivores. They did this to estimate the various species' then current populations.



Pityrogramma calomelanos has glossy dark stipes and silvery waxy powder on one side of the frond & is commonly called the silverback fern.



Spathoglottis plicata is an almost ever-blooming herb which can be seen in sun and shade along roadsides and on the savannas.



Pandanus tectorius is a small to medium sized tree with thin, forking trunks and aerial or prop roots.

Their aim was to detect and monitor the possible invasion of the dreaded brown treesnake, *Boiga irregularis*, by indirectly observing a change in the populations of our islands' rodents and insectivores. These are known to be favorite prey of adult treesnakes. Juvenile brown treesnakes only feed on lizards. While rodents and insectivores exist in all of our island's habitats, because we haven't characterized these noteworthy life forms thus far, we do so here. Read more about brown treesnake control in Chapter 28.

Rodents and insectivores are classified in the Subphylum Vertebrata, indicating they have backbones. They are in the Class Mammalia, indicating that they have hair and are placental, bearing live young. They have mammary glands and feed their young with milk. The Order Rodentia includes squirrels, porcupines, and mouse-like creatures, including mice and rats. The Order Insectivora includes hedgehogs, moles, shrews, and a number of other small mammals.

The vast majority of our islands' small mammals are rats. It's believed that the CNMI currently has four different rat species. Throughout the world there are 56 known species of rats. Each is *omnivorous*. Many live near humans. They are incredibly opportunistic survivors, this despite all human efforts to eradicate them. Rats are considered significant pests worldwide. Here in the CNMI, they are pointed to as probable hosts, spreading the dreaded disease 'leptospirosis'. Read more on this in our Public Health chapter.



The Asian musk shrew, commonly found in households are nocturnal, highly active and highly adaptable creatures.

Efforts to control rats often include poisoned bait. This is done because rats taste most all of the food they come across and they lack the ability to vomit this poisoned food once they've eaten it. An innovative project to exclude them from farms without poisons, using a low to ground electrified fence, is just getting underway on Saipan. The method was once tested successfully on Rota.

Rats and mice significantly affect human food production. It is estimated that between one fifth and one third of human food produced is probably eaten, spoiled, or otherwise destroyed by rodents. Ironically, certain albino rats are kept as pets. These are considered clean, intelligent, playful, social animals. They may even have a sense of humor.

22. 4. 2. Our Asian Musk Shrew

The Asian musk shrew, *Suncus murinus*, is in the Order Insectivora, *Family Soricidae*. It originates from the Indian subcontinent, ranging from southern Asia and Afghanistan to the Malay Archipelago and southern Japan. Also referred to as the Asian house shrew, this species has been introduced to numerous islands in the Pacific. Musk shrews are associated with forest and savanna environments, but are also commonly found in households. Shrews are nocturnal. They are highly active and highly adaptable creatures. Shrews generally live between one and two years of age in the wild.

Suncus weigh from 23 to 145 grams and grow to a length of 100 to 150 millimeters, including the tail. Males are larger than females. They vary widely in color, size, and weight. They appear mouse-like, but with a quite long and pointed nose. The fur color varies,

ranging from some individuals appearing light gray to others which are black. The males have a large, well-developed scent gland, from which is derived the strong, musky odor, for which they received their common name.

Suncus murinus is mainly insectivorous. Eighty-two percent of their diet consists of insects and mammals. Asian musk shrews are also known to be opportunistic feeders. In most areas, they feed, to some extent on plant material, and also tend to eat a wide variety of invertebrates and human food items. As mentioned, shrews are nocturnal and feed mostly at night in forests, cultivated fields, and human populated areas. Like many other shrews, this species has a high metabolic rate, and requires multiple feeding periods.

Nesting occurs wherever possible. In the forest/agricultural habitat, these shrews gather leaves and any other nesting material available, then find a hidden area in which to build the nest. In a house or business, they nest in dark hidden areas. They use any type of loose material they can find for nest construction. Both parents gather nesting material. The young do not leave the nest until they are seventy-five percent grown. As mammals, the female provides the offspring with milk.

22. 4. 3. Our House Mouse

Our house mouse, *Mus musculus*, is in the *Family Muridae*. It is originally from Asia but has spread itself worldwide, hitchhiking with humans along the way. House mice generally live in close association with humans--in houses, barns, granaries, etc. They also occupy cultivated fields, fencerows, and wooded areas, but they seldom stray far from buildings. *Mus musculus* makes underground burrows consisting of a complex network of tunnels, several chambers for nesting and food storage, and three or four exits.

House mice range from 65 to 95 mm long from the tip of their nose to the end of their body; their tails are 60 to 105 mm long. Their fur ranges in color from light brown to black, and they generally have white or buff bellies. House mice have long tails that have very little fur. Their tails have circular rows of scales. They range from 12 to 30 grams in weight.

Mice tend to live for about twelve to eighteen months in the wild and they breed prolifically. They construct nests from rags, paper, or other soft substances and line them with finer shredded material. Litters consist of 3-12 (generally 5 or 6) offspring, which are born naked and blind. They are fully furred after 10 days, open their eyes at 14 days, and are weaned at 3 weeks. Mice reach sexual maturity at 5-7 weeks.

Mice are generally nocturnal. They are omnivorous. In the wild, they eat many kinds of plant matter, such as seeds, fleshy roots, leaves and stems. Insects and meat (carrion) may be taken when available. In human habitation, *Mus musculus* consumes any human food that is accessible as well as glue, soap, and other household materials. House mice are important prey for many small predators. They serve as live bait in the numerous modified minnow traps our Division of Fish and Wildlife deploys at our ports to lure and capture brown treesnakes.



Our house mouse, originally from Asia, is generally nocturnal and eats many kinds of plant matter, such as seeds, fleshy roots, leaves and stems.

22. 4. 4. Our Polynesian Rat

Polynesian rats (*Rattus exulans*), *Family Muridae*, are found from South-east Asia and New Guinea through the Pacific. Common names include the Polynesian rat, the Pacific rat, and the Small spiny rice-field rat. They've spread to several thousands islands in the western and central Pacific, chiefly through the colonizing efforts of the Polynesian people. It's understood that these rats were carried on the large sea-going canoes as a food item, along with pigs, dogs, and jungle cocks. They were probably introduced by ancient Chamorros for the same reason, this according to some anthropologists.

Mature Polynesian rats grow to 11-15 centimeters from the tip of the nose to the base of the tail. Average weight is between 40 and 80 grams. These rats are dark brown, with grey undersides. They are darker above than below. The tail has fine, prominent, scaly rings. The tail is about the same length as the head and body combined. A useful feature to distinguish this rat from other species is a dark outer edge on the upper side of the hind foot near the ankle while the rest of the foot is pale.



Norway rats are mostly nocturnal or active at dusk and are excellent foragers, eating just about any type of food.

Rattus exulans can live in a variety of habitats including grassland, scrub and forests, provided it has adequate food supplies and shelter. It is not a good swimmer, but is able to climb trees for food. Other habitats include those created by humans, such as houses, granaries, and cultivated lands.

Females have an average of 4 litters per year with an average of 4 young per litter. Their lifespan is up to one year in the wild.

Polynesian rats are an opportunistic species. In the absence of other rodents, they exploit a variety of habitats, ranging from rainforests to grasslands. *R. exulans* is able to tolerate different climatic regimes, and are able to persist for long periods at low densities. Like most rats, *Rattus exulans* is nocturnal. They eat a variety of foods, including broad leaf plants, grasses, seeds, fruits, and animal matter. They prefer fleshy fruits such as guava, passion fruit, and thimbleberry. Their favorite food is sugar cane. Polynesian rats that live on the edges of sugar cane fields are known to consume sugar cane as 70% of their diet. To acquire the other additional proteins, they eat earthworms, spiders, cicadas, insects, and eggs of ground nesting worms.

R. exulans are major agricultural pests throughout Southeast Asia and the Pacific region. Crops damaged by this species include root crops, cacao, pineapple, coconut, sugarcane, corn, and rice. Monitor lizards were originally introduced here to the Marianas to help control the Polynesian rat.

22. 4. 5. Our Norway Rat

Norway rats, *Rattus norvegicus*, are classified within the *Family Muridae*. They are originally native to Northern China, but have been spread worldwide by ocean sailing ships. They may have been accidentally introduced to our islands by the Spanish or other Europeans, or by Americans. They are also widely known as 'brown rats'.

Norway rats occupy a variety of habitats including garbage dumps, sewers, open fields and woodlands, basements, and nearly anywhere else that food and shelter might be found. Anywhere that humans

are located, *R. norvegicus* will likely follow. Mostly nocturnal or active at dusk, Norway rats go about digging burrows, foraging for food, and preparing nests during these hours. Often, these rats take up residence in areas near water. They are excellent swimmers. Norwegian rats are often referred to as "water rats."

R. norvegicus is brownish gray above and grayish below. It has a scaly tail which grows slightly less than the total body length. It has small eyes and prominent ears. On average, these rats reach nearly 400 millimeters nose-to-tail, and weigh between 140 to 500 grams. Males are usually larger than females.

In natural populations, these rats are covered with coarse, brown fur (sometimes splotched with black or white hairs) on their dorsal surface, which usually lightens to a gray or tan color nearing the underside. The ears and tail are bald. As mentioned, the length of the tail is shorter than the length of the body. Norway rats can be easily mistaken for black rats (see below); however, the temporal ridges of the Norway rat are straight, whereas those of the black rat are curved. Tail lengths are also identity clues.

Males usually reach sexual maturity at 3 months and females at 4. In the wild they live upwards of two years. An average female is capable of giving birth to as many as 60 young each year. After a short gestation period of 22 to 24 days, the litter of approximately 8 pups is born. The young are very small and underdeveloped.

Norway rats are excellent foragers. Using their sense of smell and touch, they are able to survive quite easily, given that there is a steady supply of any type of food. In metropolitan areas, they survive mainly on discarded human food, and anything else that can be eaten. Some Norway rats living near the sea have been observed catching fish with their paws. Also preyed upon by Norway rats are chicks, mice, birds, and small lizards. They have even been known to attack infant human beings.

Norway rats are incredible pests to human populations. The species plays hosts to a wide array of diseases, including Trichia, Typhus, and the Plague. These rats also carry bacteria in their saliva that can infect those bitten and cause a sickness known as Rat Bite Fever. Norway rats cause billions of dollars of damages per year in the destruction of crops and food stores.

22. 4. 6. Our Black Rat

Our black rat, *Rattus rattus*, *Family Muridae*, is found on all continents of the earth except Antarctica. They are brownish or grayish above, with underparts grayish to whitish, but not white. They have a scaly, sparsely haired tail that is uniformly dark. The tail is longer than half of the animal's total length.

Although the species is believed to be native to India and possibly other Indo-Malayan countries, it has been introduced through human travel overseas to all continents. They were probably introduced to our islands during Spanish times. *Rattus rattus* is most common in coastal areas because it is a rodent that flourishes in areas inhabited by humans as well as on large ships. For this reason, these animals are often called "ship rats". Some other common names for this species include house rat, black rat, and roof rat.



The Black rat generally feeds on fruit, grain, cereals, and other vegetation. They are omnivores, however, and will eat insects or other invertebrates if necessary.

Rattus rattus is medium sized with relatively large ears. As mentioned, the tail is always longer than the body. Individuals weigh between 70 and 300 grams, and grow between 16 and 22 centimeters in length. Males are longer and heavier than females. The skull and nasal bones are relatively narrow. One of the main ways to differentiate between *R. rattus* and *R. norvegicus* is that *R. rattus* has a finer covering of hair, a lighter skull, and a slightly differently shaped upper first molar.

R. rattus is primarily nocturnal. It builds nests for their young out of sticks and leaves, and sometimes locates nests in burrows. It is generally found in any area that can support its mainly vegetarian diet. Because *R. rattus* is an agile climber, it often lives in high places, such as top floors of buildings in populated areas or trees in forested areas. Black rats tend to live for about one year in the wild.

Black rats exhibit many destructive behaviors. These animals strip bark off of trees, contaminate human food sources, and are overall pests. *Rattus rattus* generally feeds on fruit, grain, cereals, and other vegetation. It is an omnivore, however, and will feed on insects or other invertebrates if necessary. It consumes about 15 g/day of food and 15 mL/day of water. Because it consumes and destroys the food source during feeding, it can cause devastating damage to farms and livestock. Not only does it gnaw through many materials but it ruins more than that by excreting on the remains of its foraging efforts. This species is famous for its role in spreading the bubonic plague that took millions of lives in the middle ages. The fleas that live on these rats carry a number of diseases that can seriously harm humans, livestock, and other animals.



The Oriental house Rat are common in disturbed lowland and montane forest up to 1,800 meters. It is omnivorous, feeding on all manner of farmyard waste and food scraps.

22. 4. 7. Our Oriental House Rat

The Asian or Oriental house rat is classified as *Rattus tanezumi*, also within *Family Muridae*. It lives in eastern Asia and the Western Pacific. The species is common in the Philippine Islands as well as other parts of Southeast Asia. *R. tanezumi* has a head-body length of up to 22 centimeters and a tail length, likewise of up to 22 centimeters. It sports a weight of up to 200 grams. Oriental rats inhabit urban and agricultural areas. They are common in disturbed lowland and montane forest up to 1,800 meters. The species was formerly included with the species *Rattus rattus*, but was recently separated from it by taxonomists.

A supremely adaptable species, the Asian house rat is found in many natural and man-made habitats, including agricultural and wholly urban areas. It is omnivorous, feeding on all manner of farmyard waste and food scraps. It is a fast runner, can climb well and can jump up to 50 cm. The fur on the dorsal side is olive-brown, and the ventral side generally lighter. The tail is very dark grey. The ears are large and the eyes jet black. Juveniles have a relatively larger head and smaller body.

As mentioned, the species is closely related to the European house rat, *Rattus rattus*, but recent studies suggest it is a separate species.