

CHAPTER 19

OUR COMMONWEALTH FORESTS

19. 1. OUR FOREST COMMUNITY; AN INTRODUCTION

We begin the study of our forested communities with a reflection on their uniqueness. These forests are our ecological heritage, rich both in **indigenous species** and in more recently-arrived **introduced species** that adopted our forests as their home.

Our forests have been here for more than 40 million years. Each **endemic** life form within them likely evolved here and is found nowhere else in nature.

In our southernmost islands' limestone regions, limestone forests are considered the **climax vegetation** type. In our northernmost volcanic islands and remnant volcanic regions elsewhere, different types of climax species predominate.

Each forest is a complex community of living things surrounded by, and related intimately to, nonliving things. Its living parts are plants and animals. Its ultimate source of energy is the sun. Its nonliving parts include air and water.

The forest soil is both living and nonliving. It consists of animals and plants, some of them microscopic, as well as rock particles and the dead tissues of plants and animals.

Within the forest the larger tree species such as JOGA and UMUMU grow as scattered individuals, and the smaller trees, shrubs, ferns, and mosses fill in around and beneath them. A typical limestone forest has a closed canopy and is characterized by relatively few **understory species**.

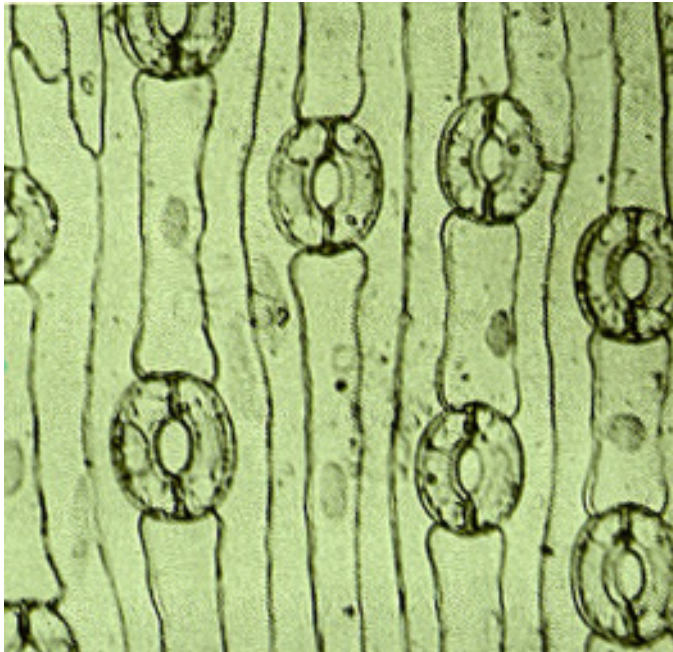
Larger trees have **buttresses** to support their trunks. Often they provide homes to many **epiphytes** in their upper branches. The animal life, the **forest fauna**, roams upon the ground and in and amongst the branches and **canopy** tops seeking out food, water, shelter, and mating opportunities. It is a dynamic ecosystem that is ours alone to discover and enjoy.



Each forest is a complex community of living things surrounded by, and related intimately to, nonliving things.



Trees grow by photosynthesis, during which millions of green leaves use each sunlit hour to produce stores of food.



During photosynthesis plants absorb large volumes of carbon dioxide (CO_2) directly from the air through small openings on the underside of leaves called stomates.

Many plants, the **forest flora**, grow in our forests, but the most conspicuous are the trees. For this reason a botanist will often name forest communities after the trees that most commonly grow in them.

We speak of TANGANTANGAN (*Leucaena*) forests or UMUMU (*Pisonia*) forests; Ironwood (*Casuarina*) forests, or Screwpine (*Pandanus*) forests. If we want to observe the forest community intelligently, we must know something about trees. If we ask several people “what is a tree?”, we would likely get several different answers.

For our purposes here, a tree is defined as a **woody plant**, twelve feet or more tall, having a main stem (excepting the figs) and a more or less distinct crown of leaves.

19. 2. FORESTS AND PHOTOSYNTHESIS

Trees grow by **photosynthesis**. It is the most important activity within the forest. Photosynthesis occurs year round. Millions of green leaves use each sunlit hour to produce stores of food. This occurs at a fantastic rate.

Some of the food then goes into making the flowers, fruits, and seeds of the current year. Some is used in the growth of new tissues in the trunks, branches and stems. Some is absorbed by the new buds that will form next season’s flowers. A good deal flows into making and nourishing the roots and twigs.

Plants not only produce enough food to meet their own needs, but they also produce enough to feed the forest animals, fungi and bacteria and other microorganisms.

During photosynthesis plants absorb large volumes of carbon dioxide (CO_2) directly from the air. This is accomplished through small openings on the underside of leaves called **stomates**.

Trees are a major source of oxygen (O_2), a by-product of photosynthesis. As sugar (**glucose**) is formed from water and carbon dioxide, oxygen from the water molecule is released into the air, again passing through the stomates. From the plant’s perspective, oxygen is only a waste product of the conversion of water and carbon dioxide to sugar (glucose).

For woody plants like trees, small openings in their bark called **lenticels** are also locations for gas exchange. During the gas exchange through the lenticels and stomates, large volumes of water vapor are also released into the air in a process called **transpiration**.

Throughout the forest, throughout the year, water is continuously absorbed through tree root systems, moved up the stem, and transpired out to the surrounding air.

Since nearly all plants and animals, including people, depend on oxygen to live, the earth’s supply would soon be exhausted if the plants, particularly those of our oceans and forests, did not continually replenish it. Green plants are, therefore, the foundation upon which the rest of life is built. They are the source of both the foods we eat and the oxygen we breathe.

19. 3. FOREST LAYERS

A forest may contain several layers of vegetation, each supporting different kinds of animals. At the top is the *canopy*. Beneath it is the *understory*, then the *shrub layer*, the *herb layer* and finally the *forest floor*.

19. 3. 1. The Canopy

The leafy crowns of our Commonwealth forests' tallest trees make up the *canopy*. In some forests, these tall trees are widely spaced and the canopy is open. Much of the sunlight reaches through to the layers below. In other forests, the tall trees grow close together, their branches interweave, forming a closed canopy like a huge tent that shuts out the sunlight.

Whether much of the canopy is open or closed affects what types of plants and animals flourish within the forests' lower layers. Most of our older remnant limestone forests have closed canopies. Our secondary tangantangan-predominant forests have closed canopies but they are shorter in height than our older forests.

Much of the forests' food is produced in the canopy. This is where the sunlight is most intense and where most of the green leaves are. Photosynthesis is carried on most vigorously at the top of the forest. The lower levels, branches, trunks, and roots are where the food accumulates.

During a storm, the topmost branches of the canopy may be lashed by the wind so fiercely that, seen from an airplane, the forest resembles a storm-tossed ocean. Yet, at the same time, in light storms, the shrubs on the ground may be only gently swaying. Typhoon strength winds, however, speed down through the canopy, bringing havoc all the way down to the forest floor.

In the canopy, thousands of species of leaf-eating or sap-sucking beetles, bugs, caterpillars, aphids, and a host of others, make their home. Spiders and dozens of kinds of predatory insects are abundant here as well.

The canopy is not so dense that air and rain cannot penetrate it. It is thick enough, however, to reduce the intensities of the sun and most storms. Because of the canopy's protection, few more serene habitats can be found on earth than the interior of a dense forest.

19. 3. 2. The Understory

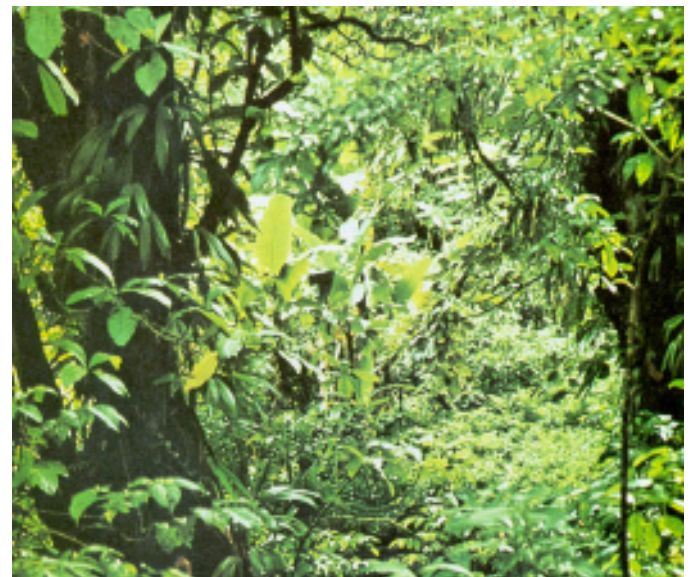
Smaller trees make up the *understory*. They may be young trees that are the same kind as those that form the canopy. Some of these will eventually take their place among their elders. However, many die before finding the opening they need.

Some trees, however, may belong exclusively to the understory life, trees such as our PAIPAI and GULOS trees, which only grow to a medium height at maturity.

Many birds spend most of their lives in the understory. Songbirds in particular tend to find the understory just the right height for nesting. The canopy protects them from most stormy weather regimes, yet they are far enough above the forest floor to avoid earth-bound hunters such as adult monitor lizards and boonie dogs.



The leafy crowns of our Commonwealth forests' tallest trees make up the canopy.



Smaller trees make up the understory. They may be young trees that are the same kind as those that form the canopy.

19. 3. 3. The Shrub Layer

Shrubs are multi-stemmed woody plants that do not grow to tree heights. They grow from just below the understory on down to the herb layer. There are many types of shrub-sized plants in our forests. Examples include AGATELANG (*Eugenia palumbis*), IXORA (*Ixora triantha*), and LEMONDICHINA (*Triphasia trifolia*). Shrubs especially flourish at forest edges and along cliffs where they can capture more sunlight.



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19. 3. 4. The Herb Layer

The herb layer is represented by **herbaceous plants** of many sorts. Examples include *Asplenium nidus* and *Polypodium scolopendria*. **Herbs** are herein defined as any small green plant that has soft, rather than woody stems. Most wildflowers, grasses, and ferns are herbs.

These make up the herb layer in our forest along with other organisms that grow close to the ground, such as mosses, as well as mushrooms and other fungi. The exact nature of the herb layer is governed by various factors such as location, kind of soil, and amount of moisture.

Few forests have canopies so dense that no direct sunlight comes through. Beams of sunlight fall through the openings in the canopy, forming ‘sunflecks’ on the forest floor. These ‘sunflecks’ have a great importance in the growth of the herb layer.

These sunlit patches move across the floor as the sun moves across the sky. Any plant in their path receives a “bath” of sunlight far more intense than the light received during the rest of the day. In a few minutes, such a plant may absorb more light for photosynthesis than it otherwise gets in many hours.

Much of the interesting life of the forest is found in the habitat of the herb layer. Shrews, insects, toads, lizards and skinks, and even birds such as White-throated ground doves and Rufous fantails skirt among the forest floor, displaying and feeding.

19. 4. FOREST FLOOR AND DECOMPOSITION

The forest floor is the wastebasket for all the layers above it. There is a steady rain of dead leaves, petals, fruits, seeds, twigs, limbs, whole tree trunks, fur, shedded reptile skin layers, animal carcasses and animal feces.

All of this material goes into the composition of the forest floor, which consists not only of this years’ fall, but of the fall from previous years which has not yet decomposed. This layer of decomposing matter absorbs a large quantity of water and retains much of it even during the dry season.

If you were to scoop up a handful of this material, called **forest litter** or **humus**, at first you would see little life in it, perhaps only an earthworm or a few black or red ants. As you look more closely, you will begin to see smaller creatures, mites, and tiny spiders.

A magnifying glass will open new worlds to you—**pseudoscorpions**, more mites, spiders, tiny insects,—you did not know existed. The real surprise comes when you use a microscope. Now your view is



The herb layer is made up of small green plants with soft stems as well as mosses and fungi.

crowded with strange little plant and animal forms. Indeed, most of the life of the forest floor is microscopic.

Some tree seeds may live dormant on our forest floor for years or even decades. This *seed bank* is important because when our forests are disturbed by typhoons, fire, or human activity, these seeds are stimulated by heat and moisture to germinate. How a forest regenerates is determined by the nature of the disturbance and the combination of seeds in its seed bank, along with the input of seeds blown in or carried to the forest by bats and birds.

The plants and animals in one acre of forest litter may outnumber the entire human population of the earth by a million or more to one! This mass of life attacks the forest's litter in many ways, releasing the wealth of energy and basic chemical substances that are trapped in the decaying materials.

Gradually, these substances are broken down, recombined, moved about. Earthworms, burrowing animals, insect larvae, and other creatures tunnel continuously through the humus, gradually mixing it with the mineral matter of the topsoil beneath.

Our forest decomposers include millipedes, earthworms, mites, springtails, fungi, and microscopic bacteria. These all live on dead material and cause its mechanical and chemical breakdown, or **decomposition**.

The work of these decomposers might seem insignificant. Without it, however, life in the forest, and for that matter, life in the world would be impossible. The reason is simple. All living things are constructed from certain basic chemical elements, such as carbon, hydrogen, oxygen, nitrogen, iron, and calcium.

There is only a limited supply of these elements in the world. What if the dead bodies of plants and animals, together with the wastes given off by living plants and animals, accumulated indefinitely? Essential nutrients and organic chemical energy would be all tied up in an unusable form, withdrawn from use and/or circulation so to speak.

These wastes do not accumulate, however. They are ground up, chewed, dissolved, digested, and thus broken down into reusable forms again by the billions of **decomposers**.

It is noteworthy that every organism—every tree, shrub, insect, bird, and mammal—in our forests today is thus made of elements that once were parts of other living things. Our bodies contain “secondhand” materials that have been used many, many times before, and they will be used many times again in the future.

19. 5. ENVIRONMENTAL CONDITIONS

19. 5. 1. Geology and Soils

Limestone forests grow on areas of uplifted or raised limestone. Large areas of raised limestone forest occur in the southernmost islands of the Commonwealth. Limestone forests once dominated Rota, Aguiguan, Tinian, and Saipan.



If you look closely at forest litter, you will begin to see smaller creatures, mites, tiny spiders and pseudoscorpions such as the one shown here.



Forest decomposers all live on dead material and cause its mechanical and chemical breakdown, or decomposition.

These islands are geologically older than our Northern Islands and have had large amounts of limestone reef material deposited onto their original volcanic cores. The limestone forest was the main vegetation type growing on our islands before people ever arrived.

You will recall that limestone, in the form of coral reefs, was originally laid down above and next to our islands' eroding volcanic base. Our southernmost islands were later up-lifted, or raised by faulting.

The present sea level is a relatively "normal" one relative to the flow and ebb of sea level changes. At times our island was more flooded and at other times it was left much higher and drier than at present.

Years of limestone deposition, geologic uplift, and erosive weathering have together formed the porous limestone covering of our southernmost islands. Woody plants that grow on this limestone form our limestone forests.

From afar, most forested areas can be seen to still retain the steep cliffs with **spurs and grooves** and the wave height **bioerosional notch** indicating their oceanic origin. These are integrated ecological communities that required a very long time to form.

As we recall, the limestone substrate is very porous. Water tends to percolate down from the surface rapidly. For this reason, few to no streams, rivers, or standing waters are present on our southernmost islands wherever a limestone base predominates.

The soil is considered transitory. Nutrients are carried down into the rock with each rain. Soils here are **lateritic**, meaning they are high in aluminum and iron and low in nutrients and silica. They are also mostly thin, in many places not more than a few centimeters thick.

After being raised, three important processes act to change our limestone's land surfaces. Weathering of the rock occurs to produce a soil. This is followed by erosion, which tends to remove all loose material. Finally, solution processes occur, which pit the surface of the rock and produce the extreme roughness seen in many places.

Two strikingly different ground surfaces have been produced, depending upon which of these processes had been dominant in an area.

In areas where erosion dominated, a relatively smooth surface was formed, usually with a thin layer of reddish or brownish soil. In areas where solution processes predominated, a dissected, often fantastically rough, hard limestone surface exists. In the latter type, soil exists only in cavities and crevices. (See our soils chapter (Ch. 26) to learn more about our local soil types.)

Large areas of the first ground type are found where there are broad flat **terraces**, level or only gently sloping land. The second type occurs on cliffs, bluffs, near the edges of terraces, and on certain areas of comparatively level terraces.



Years of limestone deposition, geologic uplift, and erosive weathering have together formed the porous limestone covering of our islands.

19. 5. 2. Rocky Strand or Limestone Forest?

Ecologically the vegetation on elevated limestone is a modified strand type. The boundaries between the two (strand vs. forest) are difficult to determine. Traveling inland from the salty air strand, salinity levels of the forest air decrease to almost zero, except on sea cliffs and similar locations exposed to sea spray.

One kind of limestone forest, **halophytic-xerophytic scrub**, consists of extremely small, stunted plants that can survive dry, sunny areas where salt spray and winds are particularly damaging. This scrub type of plant life is often found on cliffs, with some of the deep forest plants growing there only in dwarfed form. Near the edges of terraces, a strip of dense scrub grows.

19. 5. 3. Effect of Moisture and Epiphytes

The species composition of the limestone forest varies with habitat conditions and with the amount of rainfall. **Epiphytes**, especially ferns, are common. Epiphytes are plants that grow on the top or on the sides of other plants. Many smaller ferns and non-showy orchids are found on our larger tree trunks and branches. **Bryophytes** (mosses and liverworts) and algae also grow in abundance.

The higher you climb on Micronesian islands, the more species of epiphytes you will likely find on the branches. Recall that higher levels of annual rain and moisture are present in the higher elevations. Forests located on the Rota Sabana, Mt. Tapotchau, or Mt. Lassu are occasionally shrouded in clouds and mist. Such low clouds are called “fog”. The peak volcanic forests on our northernmost islands are even more fog-engulfed.

19. 5. 4. Typhoon Cropping

Typhoons prune or crop our trees so that the vegetation is stunted, especially in exposed areas. Limestone forests are easily damaged. Disturbed, **secondary communities** establish themselves when a limestone forest has been greatly damaged or destroyed.

In the Marianas, trees seldom exceed 30 meters in height. By comparison, some trees exceeding 120 meters grow in Australia and North America. Here in our islands, branches growing higher than the cliff-protected canopy levels are often broken off by the full force of typhoon winds.

Some ecologists write that because of their frequent typhoon-cropping, our limestone forests should not be considered a ‘climax forest’ type, but just one step shy of it.

19. 5. 5. Mycorrhizal Associations

Roots are needed to anchor trees but they must also tap into the nutrients before these **leach** downward and are lost through the ground water. A specialized system of root fungi called **mycorrhizae** (mike-oh-rise-a) often develops within and around forest trees.

The mycorrhizae work to transport nutrients from decaying vegetation into the living plant roots. When two organisms such as these live in close conjunction with each other, we call this a **sym-biotic biological association**.



Epiphytes, plants that grow on the top or on the sides of other plants, are common in limestone forests.



Typhoons prune or crop our trees so that the vegetation is stunted, especially in exposed areas.

The network of mycorrhizal associations are as important to the living forest community as the canopy. Instead of sunlight, nutrients are captured. Think of the mycorrhizal network as an inverted forest canopy.

19. 6. EXTENT OF DISTRIBUTION

It is estimated that about 41% of Rota, 19% of Saipan, and 13% of Tinian are still in native forest (here including both seashore strand forests and inland limestone forests).

The forests of Rota are the best examples of our native forests, while the forests of Saipan and Tinian show the greatest effects of agricultural clearing, wartime, and other human activities.

Native limestone forests are very limited and much disturbed on Saipan. A few areas of native forest remain in scattered pockets on the Banadero cliffs, the Kagman Peninsula, on a small plateau and peninsula near Mt. Tapotchau, and on small plateau terraces along the east coast. Native forest mixed with secondary vegetation occurs along the Cross Island Road.

The only limestone forest remaining on Tinian occurs on the steep cliffs. Limestone forests grow around cliffs along the Kastiyu and Pina plateaus in Southeast Tinian. A remnant forest occurs about Mt. Lassu. A small forest occurs along cliffs to the southeast of the Lassu site.

Unlike Saipan and Tinian, Rota has much of its native forests still intact. Likewise, plots of Japanese-era agriculture along Rota's northern coast, abandoned after the war, have grown back to a condition much like the original native forests.

19. 7. DISTURBANCES AND SECONDARY FORESTS

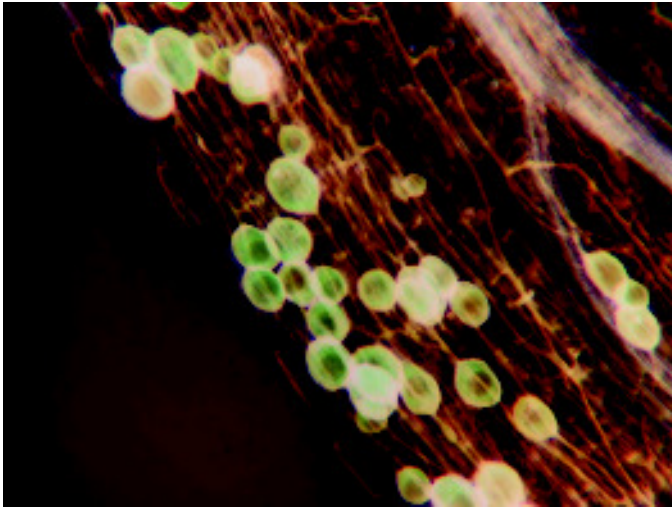
As discussed in Ch.18, the usual initial result of clearing and disturbance is the appearance of thick growths of herbaceous weeds. Later, taller plants grow, shading out most of the herbs.

Many of our native forests have been altered by past agricultural and wartime activities, bulldozing, and replacement by introduced tree species such as TANGANTANGAN (*Leucaena sp.*), SOSUGI (*Acacia spp.*) and KALASKAS (*Albizia sp.*).

During their colonial period on each of the southernmost islands, Japanese farmers cleared every available hectare of land which had sufficient soil for agriculture. Over a thirty year period, the entire area of the level-terrace type of limestone forest surface was converted from forest to farmland (sugar plantation).

In many areas, SOSUGI and KALASKAS trees have formed solid stands, either singly or together. These have quickly taken over sizable areas, forming tall **secondary forests**. As mentioned, the original, highly developed limestone forests were mostly destroyed to give way to the former sugar plantations.

Enough remains to show that these flat areas had tall, closed-canopy forests or agroforests, largely dominated by enormous wild breadfruit, banyan, and ifil trees. Virtually all of today's remaining native limestone forests grow on soils that were considered unsuitable for farming.



A specialized system of root fungi called mycorrhizae (mike-oh-rise-a) often develops within and around forest plants.



Unlike Saipan and Tinian, Rota still has much of its prewar disturbance forests still intact.

It is important to note that before the arrival of humans, the herbs and trees of our islands were all indigenous species. The forests here at the time of human contact were 'native' to our archipelago.

The first Chamorro settlers brought new, useful vegetable and tree species with them. Our second indigenous population, the Carolinians, did likewise. Some of these species became successfully established.

Using traditional Pacific agroforestry practices, agricultural clearings were planted with trees such as coconut and breadfruit. Many areas were tended so that they grew entirely into agroforests. Nowadays, these agroforests typically have a canopy, shrub, and herb layer, and are ecologically similar to our previous native forests in many ways.

Such agroforests can still be visited, especially today on the island of Rota. These forests include species introduced by Spanish, Filipino, Japanese, and other peoples of both western and eastern origin.

[Ed. note: For those who live on Saipan and Tinian, by all means, get yourself (and your family if possible) to Rota. Make guide arrangements and take at least a couple of good long forest hikes. You will not regret it. It is one of our Commonwealth's finest and most affordable ecotourism experiences.]

19. 8. SOME EXAMPLES OF OUR FOREST FLORA SPECIES

19. 8. 1. Introduction

Our forest flora or plant life is very diverse and each plant is well adapted to its ecological habitat. Remember that, over the long run, habitat conditions here in our islands often include long dry season droughts and super-typhoon strength winds.

Canopy and understory trees, **lianas**, ferns, and animals of all sorts have found a home here over the many years of our island's existence. Some began their life forms here, evolving into a new species from ancestors which arrived ages ago.

Others are more recent arrivals brought from other islands or from both old and new world continents. Most are species which can be found in other Micronesian islands and across the tropics. Each now makes our forests their home as well.

19. 8. 2. *Asplenium nidus* - Bird's Nest Fern

Asplenium nidus in Chamorro is called GALAK DANKULO, meaning large fern. The English common name is Bird's Nest Fern and the Carolinian name is SCHÉËLLUGH. This fern has large, glossy, dark green fronds (fern leaves). It has a wide, stiff, black mid-rib.

Each frond may grow as long as 1 meter. They develop in the shape of a rose with the fronds sequentially extending out from the center in a spiral. This allows the plant to trap leaves and other debris. This produces a large ball of material that holds water and nutrients. From below, *Asplenium* can easily look like a big bird's nest.



In many areas, Kalaskas trees have formed solid stands, either singly or together.



Our forest flora or plant life is very diverse and each plant is well adapted to its ecological habitat.



Asplenium nidus has large, glossy, dark green fronds (fern leaves) and a wide, stiff, black mid-rib.



Guamia mariannae is a small, compact understory tree of the limestone forest with leaves that grow singly in an alternating pattern up the stem. The leaves are rounded at their base and pointed at their tips.



Cynometra ramiflora is a small to medium, somewhat shrubby understory tree with compound leaves of four leaflets, two each of different sizes growing directly opposite of each other.

Asplenium grows on all the islands in the Marianas, from Uracas to Guam. It often lives as an epiphyte on branches of large forest trees. It can also grow on the ground or on large rocks. The largest specimens grow in deep forest areas.

Asplenium transplants easily and will grow in the shade. *Asplenium* is often used to decorate fiestas and the stages of organized events. The frond and root are used in medicinal preparations.

19. 8. 3. *Guamia mariannae* - PAIPAI

Guamia is a small, compact understory tree of the limestone forest. It is in the Custard Apple plant family and is related to Sweetsop. *Guamia* is an endemic plant, named for its original discovery location on Guam. It grows naturally only here in the Mariana Islands. In Carolinian it is called PEIPEI.

Its spearpoint-shaped leaves grow singly in an alternating pattern up the stem. The leaves are rounded at their base and pointed at their tips. They become dark green, glossy and stiff when they are mature. When young, *Guamia*'s leaves are pale pink or cream in color and hang limply.

The flowers have thick yellowish petals and are triangular in shape. The fruits are hard and somewhat cylindrical. Unripe fruits are yellow to red and mature to a brown color.

Guamia can be grown from seeds although seedlings are readily available for transplanting over much of the limestone forest floor. *Guamia* could be an attractive addition to lands that contain stony limestone. It does not grow very large and would probably be best planted in groups.

19. 8. 4. *Cynometra ramiflora* - GULOS

Cynometra is a small to medium, somewhat shrubby understory tree. It is a member of the Legume plant family and is related to the common garden pea. *Cynometra* has compound leaves of four leaflets, two each of different sizes growing directly opposite each other. Like *Guamia*, the young leaves are often soft, limp, and pink or white. Flowers are dull white to whitish brown.

The fruits are brown pods about 4 centimeters long that resemble a small grenade with irregular edges and grooves with rounded edges. They generally contain one seed. *Cynometra* can be propagated by seed and is found on limestone and along stream banks.

The fruits are eaten by the Marianas fruit bat, and the almond-like seeds are also eaten by humans. This small tree dominates undisturbed forested limestone terraces on Saipan, Tinian, and Aguiguan. In January the new, pale pink leaflets are often abundant enough to give our forests a pink tone.

19. 8. 5. *Morinda citrifolia* - Indian Mulberry

Morinda citrifolia in Chamorro is called LADA and in Carolinian it is called LEEL. This is a small tree growing to about 10 - 12 meters. It is in the Madder Plant family and is related to both *Coffee* and *Gardenia* plants. Its crown is bushy but not widely spreading. *Morinda* grows as an understory tree. The dark green glossy leaves have crinkly edges.

The flowers are white and form a five pointed star. The fruit begins maturing as the first flowers are pollinated, so that later flowers appear on the developing fruit. *Morinda* fruits are fleshy and green, maturing to a yellowish white. They have a texture like gelatin.

Inside the lumpy fruit are stony sections, each containing one seed. Each seed has an air chamber and will sprout even after a long time in sea water. Ocean currents are a major distributing agent for this species.

Morinda is the source of “canary wood.” The roots, flowers, and bark are sources for various dyes. The roots produce a yellow dye and the bark and flowers, a red dye. Immature fruits are used in curry (India) and are boiled as ingredients in many medicinal remedies, including the popular “Noni Juice”.

Mature fruits are edible, but the taste and smell supposedly resemble bad cheese. The fruits can be squeezed and the juice is used as eye drops for sore eyes.



Morinda citrifolia is a small tree growing to about 10 - 12 meters with dark green glossy leaves with crinkly edges.

19. 8. 6. *Leucaena leucocephala* - TANGANTANGAN

Leucaena leucocephala in Chamorro is called TANGANTANGAN. It is a small scraggly tree growing to a height of 8 to 10 meters. *Leucaena* is a member of the Legume plant family. Its scientific name ‘*leucocephala*’ means “white head.” This is the color of the globe-shaped flower heads.

The species of *Leucaena* that dominates our islands is actually a foreign tree originally coming from Latin America. There is a native species of *Leucaena* as well, *Leucaena insularum var. guamensis*. The local name TANGANTANGAN is common to both. In Carolinian it is called TONGANTONGAN.

The fruits are flat pods that are green, maturing to a reddish brown. Seeds are numerous, oval, flat and glossy brown. *Leucaena* is easily propagated by the abundant seeds. It does best on limestone areas.

Biologists feel that *Leucaena* would be of minor importance if not for the massive land clearings done for the planting of sugar cane and other crops during colonial times. Now it is a forest dominant over many of our islands.

Why haven't the taller native forest species overgrown and shaded out this “understory” species? Some ecologists point to our Commonwealth's general decline of fruit bats, deer, and other potential seed distributors as reasons why *Leucaena* persists as a canopy tree.

All parts of the *Leucaena* contain **mimosine**, which is toxic, and causes hair to fall out. Cooking inactivates this toxin. Cattle seem to be immune to mimosine. Their digestive systems apparently “detoxify” it.

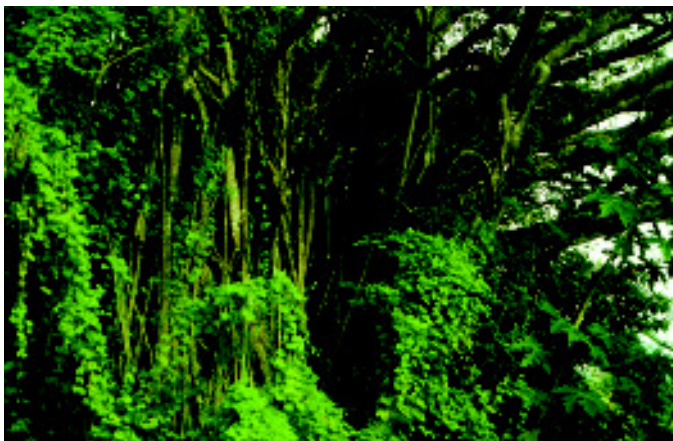
Leucaena can be used as a living hedge, for firewood, for charcoal, as food for cattle, and as temporary poles for agriculture use. The seeds have been used for beads or for novelty jewelry. In some areas, it is considered a noxious weed, but here in the Marianas, *Leucaena* is considered to be quite useful.



Leucaena leucocephala is a small scraggly tree growing to a height of 8 to 10 meters. *Leucaena* is a member of the legume Plant family. Its scientific name ‘*leucocephala*’ means “white head” which is the color of the globe-shaped flower heads.



Albizia lebbbeck is a medium to large tree, 12 - 15 meters in height with a spreading crown and a light gray trunk. Its flowers are yellow or yellow-green and grow in the shape of a cheerleader's pom-pom.



Ficus prolixa is a medium to large tree growing up to 20 meters in height with a gray trunk and many aerial roots that emerge from the trunk and branches.

19. 8. 7. *Albizia lebbbeck* - White Monkeypod

Albizia is a medium to large tree, 12 - 15 meters in height. It is in the Legume Plant family. It has a spreading crown and a light gray trunk. In Chamorro it is called TRONGKON KALASKAS and in Carolinian it is called SCHEPIL KALASKAS.

Its flowers are yellow or yellow-green and grow in the shape of a cheerleader's pom-pom. The fruits are broad leathery pods that show the interior outline of the seeds on both sides.

The pods remain on the tree for a long time; the seeds in the pods rattling in the wind. The constant clacking of the pods and their shape have caused some botanists (rather mean ones we might add) to dub this the "mother-in-law's tongue" plant.

Albizia, originally from tropical Asia, the Caribbean, and Africa, is now naturalized here in the CNMI. It is fast growing and makes a good shade tree. It is used for timber and its wood is moderately heavy but difficult to work with.

It prefers good soil, yet is salt tolerant and grows on beaches as well. White monkeypod is tolerant of moderate winds, but has a shallow root system and is liable to topple in strong typhoons. It is best grown in widely spaced groups of three or more.

19. 8. 8. *Ficus prolixa* - Strangler Fig or Banyan Tree

In Chamorro the strangler fig is known as the NUNU tree. In Carolinian it is called GHILIAU. *Ficus prolixa* is a medium to large tree growing up to 20 meters in height. These trees are members of the Mulberry Plant Family and are actually related to the Breadfruit tree. It has a gray trunk and many aerial roots that emerge from the trunk and branches.

The **figs** are a favorite food source of native birds and fruit bats. *Ficus prolixa* often begins life as an epiphyte which then sends roots down the host to the ground. The seeds, often dropped by birds or bats, sprout on the bark of the branches of the host tree.

Often it grows faster than the host, overtops and shades out the host tree, killing it, not by "strangling," but by depriving it of light.

Ficus prolixa leaves are green with a prominent, yellowish midrib. Inside is a milky sap. *Ficus* trees can be propagated by seeds, by cuttings, and by **air layering**.

Members of the *Ficus* genus (Figs) are found in tropical and warm regions world wide and include more than 800 species. One particularly famous *Ficus* species is the one that the prophet Buddha reportedly received enlightenment while sitting beneath one day.

Fig trees are peculiar in many ways; one is that the flowers are always contained within an undeveloped fruit, or *fig*, and are not visible to a human observer. Pollination is accomplished by specialized wasp-like insects that bore through the fig.

The wood is useless but the milky sap is an astringent and can be used to stop bleeding. *Ficus prolixa* trees figure prominently in-

land legends as the dwelling places of the ‘taotaomonas’ or spirits of the dead and are never cut down or harmed.

Because of its unusual rooting and “strangling” habits and its cultural ties, the *Ficus prolixa* tree was selected several years ago by the CNMI Arbor Committee to be the ‘banner tree’ for its tree awareness campaign.

19. 8. 9. *Artocarpus mariannensis*- Seeded Breadfruit

Artocarpus mariannensis in Chamorro is called DUKDUK. In Carolinian it is MEIYAS. This is our seeded breadfruit tree. *Artocarpus* is a medium to large tree growing to 20 meters high. It has a gray trunk and buttressed roots. *Artocarpus mariannensis* has strong ascending branches and a spreading crown.

Unlike the seedless breadfruit, the seeded breadfruit is an endemic tree which likely evolved here. This is reflected in the specific epithet “mariannensis.” The two trees can be distinguished by their leaves. The seedless type, *Artocarpus incisus* (LEMAI), has many deep grooves in its leaf margins. *Artocarpus mariannensis* has only a couple of grooves that do not extend very far inwards.

Artocarpus mariannensis can also be identified by the presence of seeds within the breadfruits. These are brown when mature and number from 3 to 15 per fruit. The seeds are rich in oil and can be roasted and eaten.

Artocarpus mariannensis grows well on limestone. It tolerates sun and forest shade, but does not withstand salt spray.

19. 8. 10. *Intsia bijuga* - IFIT

Intsia, or IFIT in Chamorro, IIFIL in Carolinian, is a slow growing, medium to large tree, which can reach 25 meters high. It is a member of the Legume family. Because of our typhoons, however, it seldom grows taller than 12 meters.

The leaves are compound with four leaflets, two each growing directly opposite each other. The fruits are thick, ridged, leathery pods. It has a gray bark and dark red wood.

Intsia can easily be propagated by seeds and many of these sprout directly below the parent plant. Tolerant of salt spray, IFIT grows both as a strand plant as well as in the limestone forest.

Intsia is considered a handsome tree with attractive flowers, but its greatest value is as a timber source.

The dark red wood is durable and old wood is nearly black. The heartwood is very hard, heavy, and inelastic. It can be highly polished. This wood is resistant to termites and becomes even harder after it is cut.

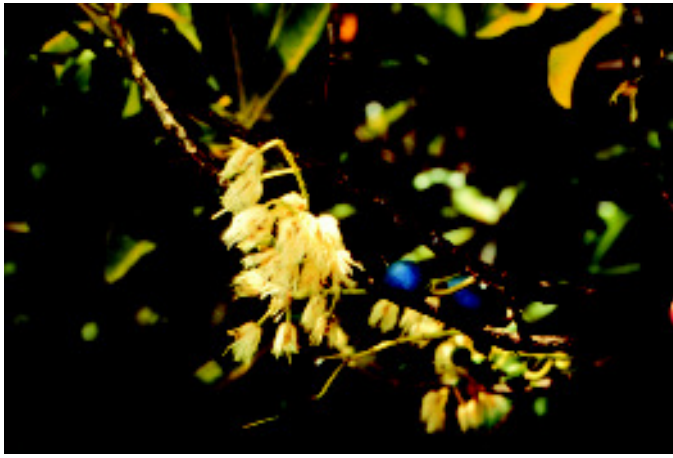
Intsia wood has been used for beams, window frames, doors, house posts, flooring and furniture, and for carved objects such as clocks, board games, bookcases, and lamp bases. It is an extremely useful species. Efforts should be made to plant specimens in all suitable locations.



Artocarpus sp. is a medium to large tree growing to 20 meters high with a gray trunk and buttressed roots.



Intsia bijuga is a slow growing, medium to large tree, which can reach 25 meters high. Because of our typhoons, however, it seldom grows taller than 12 meters.



Elaeocarpus joga is a large tree with a spreading crown with fruits that are round like marbles and are deep blue in appearance. The blue color actually results from skylight refraction and there is no blue pigment involved.



Pisonia grandis can be a very large tree, but here in the Mariana Islands it is often "pruned" by typhoons to produce a short, stocky tree with many branches. Its weak limbs are easily broken by high winds.

19. 8. 11. *Elaeocarpus joga* - YOGA

Elaeocarpus is a large tree with a spreading crown. It is often pruned by storms so that it seldom attains a height of more than 15 meters. It is in the Basswood Plant family and is related to plants that produce jute fibers. *Elaeocarpus* is indigenous to our Marianas, growing on limestone in open areas and in forests. In Carolinian it is called GHUMAR.

The trunk is smooth, dark, and often buttressed. The branches are reddish to gray. These grow in a rounded tier shape.

The leaves are shiny and green, turning to a red before falling. The flowers are white and feathery. Most of them develop at one time, after the leaves have fallen, thus making for a great display. The flowers finish in about 7 days.

The fruits are round like marbles and are deep blue in appearance. The blue color actually results from skylight refraction and there is no blue pigment involved.

Many seeds are produced each year, but do not sprout when planted. Because they are a favorite bird food, especially for pigeon-sized birds such as fruit doves or ground doves, it is likely that passage through the digestive tract of such birds is necessary for seed viability. The stomach acids must wear away a portion of the hard outside seed coat.

Elaeocarpus wood is not very durable, though it has been used to make oars. The entire tree is quite handsome. *Elaeocarpus* holds epiphytes such as ferns and orchids in abundance. It should be used more as an ornamental in parks and gardens.

19. 8. 12. *Pisonia grandis* - UMUMU

Pisonia, or UMUMU in Chamorro, can be a very large tree, but here in the Mariana Islands it is often "pruned" by typhoons to produce a short, stocky tree with many branches. Its weak limbs are easily broken by high winds. The trees then regrow repeatedly from their massive trunks. *Pisonia* is in the Four o'clock plant family and is related to the *Bougainvillea*. In Carolinian it is called MWÉEGH.

Pisonia bark is distinctive and the wood is quite soft. The branches are irregular and twisted. The leaves are pale green and slightly heart shaped at their bases. These are often eaten by insects. Flowering is not common. The flowers have greenish to whitish petals and sepals.

Pisonia can be propagated by seeds or by rooting branch cuttings. The sticky fruits are dispersed by birds. It is a common nest tree and a limestone forest dominant. Because it is a preferred nest tree, *Pisonia* forests on coral atolls are often associated with **guano** deposits.

19. 8. 13. *Serianthes nelsonii* - TRONGKON GUAFI

Our *Serianthes*, or TRONGKON GUAFI in Chamorro, is on the International List of Rare and Endangered Species. This species is naturally found only on Guam and Rota. It is a medium to large tree growing to 20 meters. Its branches spread as they ascend, producing a moderately broad crown.

The midribs of the green leaves have rusty-colored hairs on them and from a distance the leafy parts of the tree look rusty brown. It has been found growing on limestone and in ravines. *Serianthes* is in the Legume Plant family.

It is considered to be a handsome tree by the fortunate few who have seen it and the wood is good for timber. The authors strongly recommend that it be planted extensively to increase its survival chances.

19. 9. SOME EXAMPLES OF OUR FOREST FAUNA SPECIES

The limestone forest is the common habitat of a number of forest animals, some endemic to our islands. The monitor lizard lives here and the Micronesian gecko, currently being considered for endangered species status. So too does our native coconut crab, the introduced Sambar deer, and many feral goats and pigs.

Over the forest canopy flies a species of the flying fox, another island endemic, the Marianas Fruit Bat. This animal, along with certain fruit-eating birds, carries out the important ecological role of seed distribution.

Our fruit bat unfortunately has become a rarity due to overhunting. This has resulted in decreased seed distribution and lowered forest biodiversity.

19. 9. 1. Our Coconut Crab

The coconut crab is very popular at fiestas because it is so good to eat. They can grow as big as three feet across measured with their dangerous claws outspread. Most, however, are captured by crab hunters before they get very big. Its scientific name is *Birgus latro*. In Chamorro it is AYUYU and in Carolinian it is YÁFF.

Coconut crabs begin their life in the ocean. Adult females lay their eggs in the water by the seashore edge. The tiny crabs float around for a few months as part of the plankton and then come ashore, climb inside a seashell, and crawl up on the beach. At this time they look very much like hermit crabs. Soon the coconut crabs leave their seashell and depend on their own hard shell for protection.

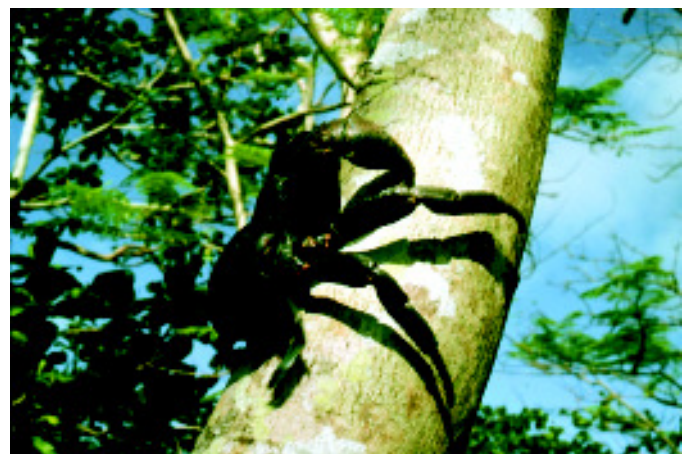
Coconut crabs dig a hole in which they hide during the day. At night they come out to look for food. They will eat almost anything including fruits, plants, rotten wood, and soil. Their favorite food, of course, is the coconut. Using their strong claws, they tear away the tough coconut husk and then, somehow, crack the nut inside.

Full grown coconut crabs have no natural enemies other than human beings. Young crabs may be eaten by some of the predators that human beings have brought to the islands such as the rat, the pig, and the monitor lizard.

In some places, people have eaten all the coconut crabs. On Saipan and Guam, giant coconut crabs are now rare and even small ones are becoming harder to find.



Serianthes nelsonii is on the International List of Rare and Endangered Species. This species is naturally found only on Guam and Rota. It is a medium to large tree growing to 20 meters. Its branches spread as they ascend producing a moderately broad crown.



The coconut crab, *Birgus latro*, can grow as big as three feet across measured with their dangerous claws outspread. Most, however, are captured by crab hunters before they get very big.

19. 9. 2. Our Micronesian Gecko

Geckos are in the *Family Gekkonidae*. Like all lizards, geckos have scales covering their heads and bodies, have legs and a tail, which is easily separable, and move by running or crawling.



The Micronesian Gecko, Perochirus ateles, is a relatively large one, growing to seven centimeters in length. Like all lizards, geckos have scales covering their heads and bodies, have legs and a tail, which is easily separable, and move by running or crawling.

The Micronesian Gecko, *Perochirus ateles*, is a relatively large one, growing to seven centimeters in length. Its name in Carolinian is LIPEIPAAAY. In Chamorro it is ACHIAK. Geckos make up a widespread and successful group of lizards. They are especially numerous in tropical regions of the world.

The Micronesian Gecko's innermost digits on its hands and feet are reduced in size, so that only 4 toes are conspicuous. Its inner finger is very tiny and is lacking a claw. This gecko has a flattened tail with angular-fringed edges of scales running along sides of tail. The bases of its toes have webbing between. Its belly may have a few to many black flecks.

Several geckos that live in our islands are fairly widespread. They inhabit many islands of the Pacific Ocean. The Micronesian Gecko is a member of a group of lizards that lives only in the Western Pacific region (Federated States of Micronesia, Marianas, and Belau). All other geckos found here have much wider geographic distributions.

Geckos differ from other lizards by having a relatively fine skin with a velvety texture covering the body. Geckos lack other lizards' more enlarged, plate-like scales on the head and body. Gecko scales are very small.

Geckos have well-developed eyes, but they lack eyelids. They see well at night and have vertically elongated pupils much like a cat's eye.

Gecko species here in the Northern Marianas are either fully nocturnal or they are predominantly active at twilight. Some geckos may be active in the daytime, but this is primarily inside buildings, in dense shade, or other subdued lighting.

The undersides of the toes and fingers of all lizards are covered by specialized scales. The toes of geckos are usually widened. This allows for an increased surface area of the toe to be in contact with the substrate.

Geckos typically lay two eggs with hard calcareous shells. Such eggs helped geckos become dispersed by ocean currents and from accidental transport by both early and modern movements of humans.

The durability of the eggs and their resistance to **desiccation** (being completely dried out) is an important factor in allowing geckos to colonize new islands.

To get to new islands, the eggs may be hidden in logs or other vegetation that is transported by ocean currents. Some question exists as to which of the geckos may have arrived with human traffic to our islands. All species studied and known at present show signs of having been here for long periods of time (centuries if not thousands of years).



Several geckos that live in our islands are fairly widespread. They inhabit many islands of the Pacific Ocean.

Several populations of our local geckos are entirely female! Individuals of these species, (not the Micronesian gecko), fertilize their own eggs by means of **parthenogenesis**. This is an unusual biological reproductive process, shared in the insect world by aphids.

19. 9. 3. Our Monitor Lizard

This handsomely spotted lizard, *Varanus indicus*, is often called an iguana, but there are no true iguanas in our part of the world. The monitor lizard has a pattern of yellow or white dots on a dark green background which blends in perfectly with jungle leaves. In Chamorro it is HILITAI and in Carolinian it is GHÓOLUUF.

Monitors have been in Micronesia for a long time. They are very well adapted to island living. They can run with considerable speed, climb trees, dig holes, and swim. A three-foot long monitor is about average size. Deep in the jungle they can grow up to 4½ feet in length.

These reptiles will eat almost anything that they can catch, including insects, snails, smaller lizards, rats, crabs, birds, and bird eggs. They can even catch fish in the water. Monitor lizards dig a hole under a rock or tree for a nesting den. In this hole, the female will lay eggs about the size of a chicken's egg. Monitor eggs, however, have soft, leather-like shells.

Baby monitors make good pets as they are easy to feed. Keeping adults is problematic since they are strong and escape most cage structures. Tying them by the tail is cruel since this cuts their circulation and causes tissue damage. Study them briefly and then release all adults to the wild.

19. 9. 4. Our Bridled White Eye

These tiny yellow green birds get their name from the white ring around their eyes and the small line or "bridle" extending from it. They are very common in our native and secondary forests. A sub-species of the bridled white eye, considered endangered, lives on Rota.

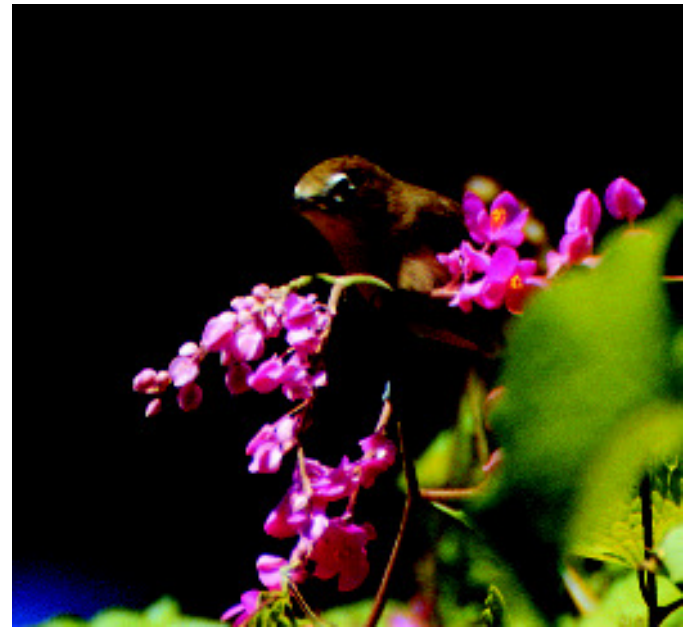
Before the arrival of the Eurasian tree sparrow, the Saipan bridled white eyes were also very common in the villages of Garapan and Chalan Kanoa. The scientific name for the bridled white eye is *Zosterops conspicillata* and the Chamorro name is NOSA. The Carolinian name is LITCHOUGH.

These birds are hard to see since they are very active, darting quickly from place to place. Their colors help them to blend in with the green leaves. They fly in small groups and stay very high up on trees. They mainly eat insects, some berries, and small fruits.

The bridled white eye's nests are shaped like a hanging basket. They are made mostly of grasses, held together with spider webs. The inside is lined with hair or small roots. When they nest, females lay two to four blue eggs. Both parents sit on the eggs and help with the babies. Baby white eyes can fly in as little as twelve days after hatching.



Varanus indicus has a pattern of yellow or white dots on a dark green background which blends in perfectly with jungle leaves.



Zosterops conspicillata are hard to see since they are very active, darting quickly from place to place. Their colors help them to blend in with the green leaves.



Ptilinopus roseicapilla is sometimes heard, but seldom seen in our limestone forest because its mostly green feathers blend with the leaves of trees.

19. 9. 5. Our Marianas Fruit Dove

The Marianas fruit dove is sometimes heard, but seldom seen in our limestone forest because its mostly green feathers blend with the leaves of trees. They have a beautiful cooing call. They also sport beautiful body coloration with a purple cap, yellow and orange breast, and a bright yellow tail band.

Fruit doves eat flowers and fruits such as figs and papaya. Their scientific name is *Ptilinopus roseicapilla*. The Chamorro name is PALUMAN TOTOT. In Carolinian it is MWEE'MWE.

Nesting close to the ground in the fork of a tree, the fruit dove lays only one egg in a somewhat flimsy nest. Like all doves, the babies are fed a milky substance produced in the lining of the parents' throat sack or "crop". The babies are later fed partially digested fruit.

The Marianas fruit dove is the Commonwealth bird, a natural symbol of our islands.

19. 9. 6. Our White Throated Ground Dove

The white-throated ground dove can be recognized by its low moaning cry which you may hear early in the morning or late afternoon. Males have a chocolate brown body and wings. They get their name from their white heads and breasts. Females are shades of brown with no white.

Males and females look so different that the Chamorro name for the female is PALUMAN FACHI and for the male PALUMAN APAKA, indicating they were believed to be two kinds of birds.

The scientific name for the species is *Gallicolumba xanthonura*. In Carolinian it is called APOOKA.

These birds are aggressive and two males will fight by attacking the head and neck of the other bird. Sometimes they fall through the trees. After they have regained their dignity, the males prance about flapping their wings and puffing out their chests. They may fight again until one male wins a waiting female.

White-throated ground doves eat small berries, fruit, seeds, and flowers. They eat while perched in the branches of a tree. Both males and females help to build a nest high in a tall tree where parents incubate the eggs.

Like the introduced Philippine turtle dove and our native Marianas fruit dove, young white-throated ground doves are fed "pigeon's milk" until they are almost as large as their parents.



Gallicolumba xanthonura gets its name from its white head and breast. Females are shades of brown with no white.

19. 9. 7. Our Rufous Fantail

The rufous fantail gets its name from its red-brown feathers and the habit of spreading its tail like a fan. Two Chamorro names for it are NAABAK and CHICHIRIKA. In Carolinian it is called LITEGHI PAR. Scientists refer to it as *Rhipidura rufifrons*.

When two male fantails meet, they challenge each other by jumping from branch to branch and flashing their tails. A male fantail will also show off for a female bird much the same way.

Rufous fantails can be heard in the deep jungle singing beautiful songs with descending notes. The songs help keep families together, but also warn strange fantails to stay away.

Fantails spend most of the day pecking bugs off fallen leaves on the forest floor or flying out suddenly to grab an insect in mid-air. Small whiskers on the sides of its bill help direct the insects into its mouth.

A pair of fantails will build a small nest made of grasses, *Casuarina* needles, and spider web, about ten feet off the ground. They glue the nest together with spit. The two eggs are cared for by both parents who will often raise two families a year. The babies are born naked, but are fully feathered and can fly in only 15 days.

The Chamorro name NAABAK refers to 'getting lost'. The story is told that when one is lost in the woods, do not follow a NAABAK as it will not lead you out, but instead will take you further and further into the forest.

19. 9. 8. Our Cardinal Honeyeater

This bird is one of the Commonwealth's prettiest songbirds. Its song consists of a melodious series of notes sung only at dawn. It calls other cardinal honeyeaters with a two note whistle. Its scientific name is *Myzomela cardinalis*. Its Chamorro name is EGIGI. In Carolinian it is LIGHEKKEY YANG. Another common name is the Micronesian Honeyeater.

Honeyeaters are very active when eating nectar from *Hibiscus* or other flowering plants. They hop about rapidly and may visit 20 to 30 flowers in one minute. Their long, curved bill helps them reach the sweet nectar. This species also eats insects that become trapped down inside the flowers.

Cardinal honeyeaters build tiny cup-shaped nests. These are made out of grasses, roots, and ironwood needles, glued together with spiderwebs. They usually lay two off-white colored eggs spotted with brown once each year. Male honeyeaters defend a nesting and feeding area for their family. A flash of bright red may be all you see as an angry male chases an intruder away with a loud scolding call.

19. 9. 9. Our Micronesian Starling

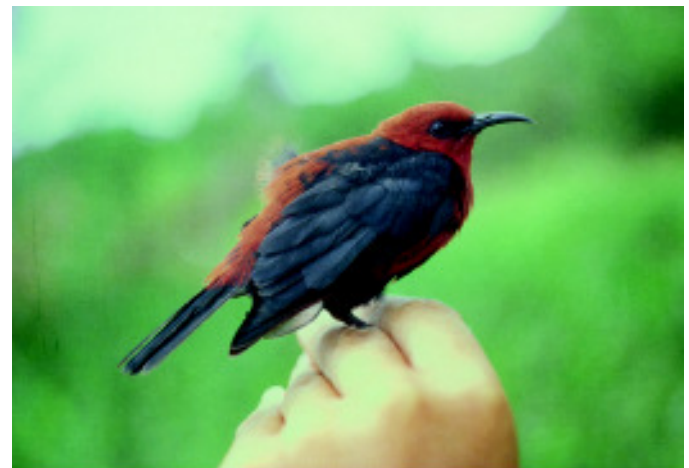
The Micronesian starling is a noisy, social bird. These birds are a different species from the European starlings which were introduced into the United States, and which often make pests of themselves.

Our local species is found only here and in other parts of Micronesia and causes no damage to crops or buildings. Its scientific name is *Aplonis opaca* and its Chamorro name is SALI. In Carolinian it is called MWII.

These black birds live in groups and are **cavity nesters**. This means they nest in hollowed out areas in coconut palms or other trees. Sometimes starlings will build their nests in holes on limestone cliffs or in old telephone poles.



Rhipidura rufifrons (The rufous fantail) gets its English name from its red-brown feathers and the habit of spreading its tail like a fan.



Myzomela cardinalis is one of the Commonwealth's prettiest songbirds. Its song consists of a melodious series of notes sung only at dawn. It calls other cardinal honeyeaters with a two note whistle.



Aplonis opaca is a noisy, social bird. These birds are a different species from the European starlings which were introduced into the United States, and which often make pests of themselves.



Corvus kubaryi is the most intelligent of the CNMI's birds. It used to be found in most areas on Guam and Rota but is now endangered, and likely is soon to become extinct on Guam.

Micronesian starlings eat fruit, seeds, and insects. When nesting, females lay up to four greenish eggs and both parents sit on the nest. Baby Micronesian starlings are naked, blind, and helpless when born. One parent stays with the babies while the other parent brings food to the nest.

Young starlings have brown eyes and gray streaks on their breasts. As they become older, their eyes turn golden and their beautiful shiny black feathers start to grow.

19. 9. 10. Our Mariana Crow

The Mariana crow is the most intelligent of the CNMI's birds. It used to be found in most areas on Guam and Rota. Farmers of the past used to shoot this crow because they thought that it raided corn fields and ate baby chickens.

Now it is endangered, and likely is soon to become extinct on Guam. Only the Rota population survives. There are too few of them to do any damage to farms.

These crows fly in groups for long distances. The scientific name is *Corvus kubaryi* and the Chamorro name is AGA. Mariana crows closely guard their territories and will chase and scold you or other birds with a loud "Rah" squawk. Crows can imitate the calls of other birds. They are social birds and groom each other, pecking off insects.

The crow is an **omnivore**, which means it eats both plants and animals including insects, lizards, flowers, and dry leaves. Crows use their beaks to hammer small chunks of bark from trees to eat. Kingfishers and starlings chase away crows because crows sometimes eat their eggs.

Mariana crows on Rota nest high in the trees where they build crude nests from branches. Both parents help build the nest and sit on the eggs. Baby crows follow their parents, watching them closely and copying what they do. When they are hungry, they squawk and beg to be fed.

Since this is a special crow that lives on Rota and Guam and nowhere else in the world, it could become extinct without protection. Efforts are currently underway by island leaders to provide this.

19. 9. 11. Our Tinian Monarch

The Tinian monarch (*Monarcha takatsukasae*) is endemic (found nowhere else) to Tinian. In Chamorro it is CHICHIRIKAN TINIAN and in Carolinian it is LITEIGHIPARIL TCHULUYOL.

This species was the main incentive for a USFWS study on Tinian island in 1994 and 1995. At the time of this book's writing it is federally listed as "threatened." The USFWS hoped to learn if this listing was necessary. It is presently being considered to be "de-listed."

While it had evidently adapted to the non-native tangantangan forests left after World War II, its endemic status could have made it dangerously vulnerable to predation and disease.

Moreover, the species showed a preference for native forests, although such habitat was found on only five percent of this island. Nevertheless, the study showed an increase in the population from over 39,000 in 1982 to more than 52,000 in 1994.

Various techniques were used to obtain biological data on the Tinian monarch. These included searches for and monitoring of nests, and applying color bandings after first catching the birds in mist nets. They also included the monitoring of designated study plots by regularly making observations at stations throughout the plots.

Like Mariana crows, Tinian monarchs exhibit a preference for native tree species for nesting. Other traits, however, reveal the range of characteristics that are found among different species. Monarch nesting activity, for example, appears to intensify with rainfall. For the crows, however, peak nesting activity occurs during our dry season. While monarch home ranges overlap considerably, those of crows tend not to. Monarchs tolerate other monarchs more so than crows do other crows.

19. 9. 12. Our Golden White Eye

Another one-island endemic bird species of our Commonwealth is the Golden White-Eye, or *Cleptornis marchei*. In Chamorro this bird is called CANARIO and in Carolinian it is GHANÓORIYO.

It is found only on Saipan. Here it occupies forests of all kinds. Golden white-eyes, unlike bridled white-eyes, are territorial. This species forages (searches for food) in both native limestone forest and newer tangantangan (*Leucaena leucocephala*) growth. In a 1997-98 study of another local bird, the nightingale reed warbler, a golden white-eye was clearly observed preying on the nestlings of the reed warbler.

This characteristic may demonstrate the birds' ability to survive in habitats altered by people or typhoon damage. Aggressiveness between this species and others present shows that they probably compete for the same available food resources.

19. 9. 13. Our Sambar Deer

The CNMI's deer, known as BENADO in Chamorro, were first shipped to the CNMI about 200 years ago. They quickly spread over the islands. At one time, there were so many deer they were a problem. The scientific name is *Cervus unicolor*. In Carolinian they are called MALÓOSCH.

Male deer are called "bucks". Bucks average about 90 pounds and can weigh as much as 200 pounds. Females, or "does," are somewhat smaller.

Bucks grow pointed antlers which they use to fight other bucks for the attention of does. The antlers fall off at the end of the breeding season and the buck has to grow new ones each year. The does have one "fawn," or baby, each year.

Deer are mostly found in the forest where they eat a variety of bushes and grass. Bucks make a barking sound while does and fawns have a squeaky whining call. Deer are sometimes easier to hear than to see in the forest.



Monarcha takatsukasae is endemic (found nowhere else) to Tinian. Like Mariana crows, Tinian monarchs exhibit a preference for native tree species for nesting.



Cleptornis marchei is found only on Saipan. Here it occupies forests of all kinds.



The CNMI's deer, known as benado in Chamorro, were first shipped to the CNMI about 200 years ago.



Pteropus mariannus (the Marianas fruit bat) lives only in the Marianas Islands. There are fruit bats (also called "Flying Foxes") in other areas, but our local species is only found here.



At one time huge flocks of bats filled the evening sky at our southernmost islands but now there are only a few hundred left. They are more abundant on our northernmost islands.

Deer are protected by law and may be hunted only during the legal hunting season. A hunting license is required. Some people still hunt deer all year long using spotlights at night. This is against the law and very bad for the deer population. Deer are not nearly as plentiful in the CNMI as they once were.

19. 9. 14. Our Marianas Fruit Bat

The CNMI's fruit bat, FANIHI in Chamorro, is a rare species and is presently being considered for 'threatened status' listing under the US Endangered Species Act. It is already listed as a protected species under CNMI law.

At one time huge flocks of bats filled the evening sky at our southernmost islands but now there are only a few hundred left. They are more abundant on our northernmost islands

The Marianas fruit bat lives only here in the Marianas Islands. There are fruit bats (also called "Flying Foxes") in other areas, but our local species is only found here. The scientific name is *Pteropus mariannus*. In Carolinian it is called PAISCHEÉY.

Fruit bats roost in trees. They live together in groups or colonies. They have good eyesight and are most active during the early morning and evening hours. These graceful flyers eat guavas, sweetsop, bananas, pandanus fruit, breadfruit, banyan fruit, papayas, and many other fruits and blossoms.

Fruit bats are mammals. A newborn bat is called a 'nany' and each pair has only one nany a year. The young bat clings to its mother and nurses her for milk until it is old enough to find food on its own.

Bats live deep in the limestone forest where there is a lot of fruit and where they will be left alone by people. Since most of the CNMI's native forests have been disturbed, there is not much room left for our bats.

Another problem is that bats are considered good to eat by some older people. This is very understandable since, after all, the hunting and eating of fruit bats was a traditional custom for the people of our islands for hundreds of years.

Unfortunately the introduction of hunting with a shotgun or a semi-automatic .22 caliber rifle—as opposed to using our island traditional sling stones—along with the rapid growth of our island's human populations, caused our fruit bat populations to dramatically decline. Now they are threatened with extinction. This is particularly true on our most populated islands of Rota, Tinian, and Saipan.

Fruit bats in the CNMI are completely protected by Commonwealth law and may not be hunted or chased. Sadly, too many are being shot illegally (**poaching**). They are then eaten by those who either do not know or do not care whether our younger generations will be able to see any bats in the future.

How can we insure that our fruit bats will continue to be a resource for both us and our children in the future? At the present time there is only one answer—legally enforced protection from hunting. We must stop the poaching and severely punish those who violate our laws.

After carefully studying the issue, our wildlife biologists and the agency staff of our Division of Fish and Wildlife have determined that in order for the species to survive, presently we must sacrifice our elder's traditional diet. This is so that our indigenous fruit bat populations can have the chance to recover to the numbers that used to be here.

As mentioned, at the time of this book's writing, this species is being considered to be placed on the U.S. Endangered Species list. Doing so would increase the level of legally enforceable protection afforded to our island's indigenous bat populations.

The downside of federal listing is that it would then become much more difficult to legally open a hunting season should we eventually be successful in our local efforts to conserve present fruit bat



Fruit bats roost in trees and eat guavas, sweetsop, bananas, pandanus fruit, breadfruit, banyan fruit, papayas, and many other fruits and blossoms.



Get involved. Find out from your island's Fish and Wildlife Division leaders how you can help protect our remaining fruit bat populations on Rota, Tinian, and Saipan.

Cubam, 1919-1.



Ch. Thompson scult.

Angelica del concerto.

È una figlia d'umanità.