

CHAPTER 17

OUR MANGROVES; MUDFLATS; AND MIGRATORY SHOREBIRDS

17. 1. OUR MANGROVE FOREST TIDAL ESTUARY

17. 1. 1. Introduction

The **mangrove** forest, or “mangrove swamp” as it is sometimes called, is not typically a strand community in the usual sense of the word. Remember that a ‘strand’ is a biological community living along a narrow area of the coast influenced by salt spray.

Mangrove trees often do not occupy only a narrow band. In many tropical areas, mangroves can extend for miles, both inland and outwards into the sea. They are, however, always greatly affected by salt.

Mangroves live in areas where the coastal tides bring salty seawater in and amongst these trees’ roots. Mangrove trees are significant land builders and land conservers. This is particularly important on small islands.

Mangroves grow in muddy, reef-protected areas that periodically get inundated by sea water. We call such near-shore, tide-influenced, seawater-and-freshwater-mixing communities, **estuaries**.

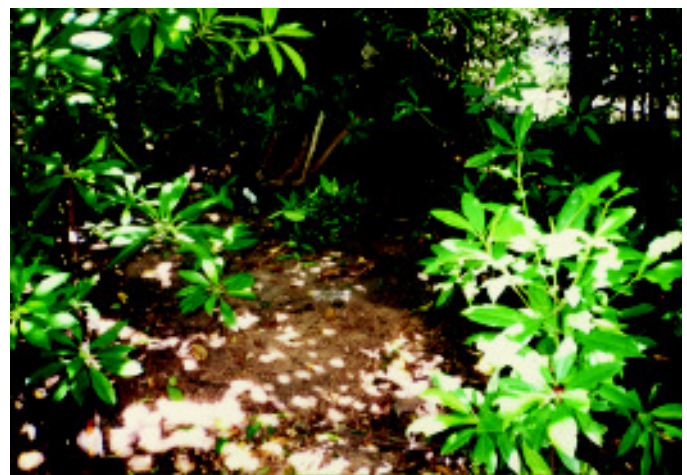
At two places in the CNMI, small, but ecologically important mangrove forests grow in coastal estuaries. Both of these are on the western side of the island of Saipan. These small mangrove forests are located in northern Garapan and southern Tanapag. They are just to the south and just to the north of the Saipan harbor facilities.

Even though mangroves are represented here only to a small extent, they are important for us to learn about. Beginning in Guam to the south and then Chuuk, Pohnpei, Kusaie, and other Micronesian islands, they make up more and more of the ecological environment. Belau has very extensive mangrove swamps; as do Yap, the Marshalls, and many South Pacific island nations.

The general appearance of a mangrove area is that of a dense broad-leaved evergreen forest. The mangrove leaves tend to be dark green, leathery and medium-sized. Cover from the air is complete, and mosquitoes are often abundant. Undergrowth is sparse.



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Mangroves are a widespread natural vegetation type growing only in the tropics. They live throughout the tropical world wherever there are low, muddy seashores, quiet bays, river beds, deltas, or estuaries.

Mangroves are important ‘nursery grounds’ for coastal fisheries. Baby fish hide among the mangrove roots. The constant leaf fall provides nutrients for abundant bacteria and zooplankton and phytoplankton growth. These life forms serve as food for the small fish fry.

Several types of worms, molluscs, and crabs also live here. During high tides, predatory reef fish move in to feed.

The two most characteristic genera of trees of the mangrove forest are *Bruguiera* and *Rhizophora*. The CNMI currently has only *Bruguiera* trees. In other areas of the Pacific, another tropical estuarine plant, the *Nypa* palm, often grows in association with the mangroves. For some reason, *Nypa* palms do not occur in the CNMI.

Considerable areas of mangroves and *Nypa* palms grow around all the high islands in Belau and the Caroline Islands. Our neighbor to the south, Guam, has mangroves growing in abundance around its southern streams and shores.

One possible reason for the relatively few mangrove species growing here, as compared to Yap, Chuuk, and other Micronesian areas, is that mangroves are native to the equatorial tropics. Saipan is possibly at the northernmost extent of their latitude range.

17. 1. 2. Overcoming the Muddy Inter-tidal Zone’s Limiting Factors

How can mangrove trees, seemingly dry land woody plants, live among our muddy intertidal waters? Why does salt water not kill them, as it kills almost every other woody plant? How can their roots survive in the sea?

Mangrove species have developed different techniques to solve the two major problems of living during flowing tides and in seawater. One problem is that saltwater gets in its tissues. The second is the need to supply fresh oxygen to its submerged roots’ cells.

Mangroves have special adaptations that allow them to overcome these limiting factors and to thrive in their harsh habitat. They are tolerant of sea water, and may even require it for growth. Some have breathing roots, or “**pneumatophores**,” which assist them in obtaining oxygen for their underground root cells.

Our type of mangrove, *Bruguiera*, has “**prop roots**” which help to anchor them into the mud. Prop roots are downward growing roots coming off the main tree trunks.

Bruguiera also has pneumatophores, knobby upgrown root structures. These grow to a level just above the high tide mark. As men-



Some mangroves have breathing roots, or “pneumatophores,” which assist them in obtaining oxygen for their underground root cells. Also seen in this picture are the “prop roots” which are used for support.

tioned, the pneumatophores assist them in obtaining oxygen for their underground root cells.

Additionally, most mangrove species have modified seeds that germinate while still on the plant. From each seed, a large torpedo-shaped structure (mostly root) is produced. The new mangrove seedlings grow these structures, called **radicles**, even before they drop from the parent tree. Sometimes the radicles have long stems with several leaves already growing from them.

The radicles hang suspended from a branch until they reach a certain growth stage. Then, depending on the tide, they either drop into the mud below, or into the tidal waters.

If the tide is out and if the tree branch is tall enough, the radicles plunge into the soft mud. A new tree then begins to grow right next to the original parent tree.

Should the tide be high, though, the radicle will float out to sea with the current. There it may possibly colonize another muddy intertidal area and begin the development of a new mangrove forest.

To handle the problem of salt influx into the roots, the various mangrove-adapted plants have developed different ways of extruding salt molecules. Some concentrate salts in their leaves and slough the leaves off regularly. Others have special salt pores.

The ability of these woody flowering plants, to grow where no others can, baffles even **foresters** (biologists who specialize in the study of trees). It puts many other scientists in awe of the feat as well.

17. 2. MANGROVE FOREST-ASSOCIATED PLANTS

17. 2. 1. *Bruguiera*

Bruguiera gymnorhiza is in the *Family Rhizophoraceae*. Its English common names are black mangrove and many-petaled mangrove. In Chamorro, it is either MANGLEN LAHI or MANGLEN MACHU. In Carolinian it is SCHIIYA.

This is a small tree of our mangrove swamps. It has dark green, leathery leaves and pneumatophores. The leaves of our *Bruguiera* have special salt pores on their top surface that extrude salt crystals.

Bruguiera fruit is about 2 centimeters long, and germinates while still on the branch. This produces a long green-brown radicle, which grows to about 20 centimeters.

On our local species, the radicle is attached to the tree's branch-ending **calyx**, which is bright red. The red, leathery calyx is flower-shaped and is often mistaken for a flower.

From the calyx, the radicle drops when mature, down to the mud below. As mentioned, often a new young shoot has already begun to develop even before the radicles drop.



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Pluchea indica, Family Compositae, is a richly branched shrub with pale green, toothed leaves and pinkish to rose-purple flowers.



Hibiscus tiliaceus, Family Malvaceae, is a small tree with low spreading branches, smooth gray bark and heart-shaped leaves which are covered with small, downy hair. The flowers are bright yellow in the early morning, turning to dark reddish purple in the evening.

17. 2. 2. *Pluchea*

Pluchea indica is in the *Family Compositae*. Its common name is pluchea. This is a richly branched shrub with pale green, toothed leaves.

The flowers are pinkish to rose-purple. *Pluchea* is native from India through Malaysia and South China to the Pacific. *Pluchea* grows near many of the wet areas along our shoreline, but is especially abundant on the sides of our mangrove forests.

17. 2. 3. *Hibiscus tiliaceus* [This species is additionally described in our wetlands chapter (Ch. 21)]

Hibiscus tiliaceus is in the *Family Malvaceae*. Its common names include PAGO, GHÜLUFÉ, and beach hibiscus. This is a small tree with low spreading branches and smooth gray bark. Yes, it is a close relative of the common Red Hibiscus used in landscaping.

The wide heart-shaped leaves are covered with small, downy hair. The flowers are large and conspicuous. They are bright yellow in the early morning, turning to dark reddish purple before dropping off in the evening.

Hibiscus tiliaceus is easily confused with *Thespesia populnea* which often grows with it along our shorelines. Ecology students should learn to 'differentiate' them (be able to tell them apart). Its leaves are shaped almost the same and its flowers are very similar. They even change color just as *Hibiscus tiliaceus*' leaves do. *Thespesia* leaves, however, lack the downy hair of *Hibiscus tiliaceus* and *Thespesia* leaves are more narrow.

Hibiscus tiliaceus grows as a member of several of our local plant communities, not only the mangrove forest. Wherever it grows, it is likely that there is standing water, fresh or brackish, in the area.

Hibiscus tiliaceus is a useful tree. The fibrous bark of the long, erect, branch sprouts is stripped from the wood. It is then soaked in water and dried, to be woven into cordage. It is also used ceremonially, to strain the fluids of sakau (kava) drink. The crushed flowers have a local medicinal use. These are applied topically to skin abscesses.

17. 2. 4. *Hernandia*

Hernandia sonora is in the *Family Hernandiaceae*. Its common names include NONAK and OSCHAL. *Hernandia* is a large coastal tree that grows to 20 or more meters with a "buttressed trunk."

The flowers are white and occur in clusters on short stems. The several bracts at the base of a cluster join to form a fleshy, green or pinkish cup that resembles a Japanese lantern. The black nut inside contains one seed.

Hernandia leaves have a special characteristic. There is a light red or green spot inside the top part of the leaf from which the leaf's veins then radiate. On the underside of this spot is where the leaf's petiole attaches the leaf to the branch. On most plants petioles attach to a leaf's end margin. This special feature makes *Hernandia* leaves easy to identify.

17. 3. BIRD MIGRATIONS AND OUR ONE MUDFLAT HABITAT

17. 3. 1. Introduction

The crowds of tourists stepping off Japan Airlines, Northwest Airlines, and Continental Micronesia flights at the Francisco C. Ada Saipan International Airport are not the only visitors that fly into the CNMI to escape the winter cold. The sunny climate of our Marianas also attracts a variety of migratory ducks, egrets, and shorebirds that spend the winter in Micronesia.

These birds arrive in September, October, and November, departing in April and May. During the summer months, they nest and rear their young in the tundra regions of northern Asia, and in remote areas of northern Japan.

Some shore birds migrate very long distances, and are very accurate in direction finding. After flying thousands of miles over unfamiliar territory, they can return to the exact spot year after year. The sense of taste and smell is not well-developed in most birds, but their sense of sight is extremely accurate.

Shorebirds feed and live near the shoreline and in open fields. Our cleared and well-mowed airport areas are favorite hangouts, as is our one **mudflat** by American Memorial Park.

17. 3. 2. Save Our Mudflat!

A mudflat is an estuarine area of deposited muddy sediments with no trees or grassy vegetation. In ecological terms it is a highly productive ecosystem. Tides regularly flood the mudflats. Rainstorm runoff brings new clays and silt particles which settle out over it.

Our mudflat is an important feeding ground for many international migratory species. It should be protected from commercial “development.” It is clearly a threatened habitat.

Our mudflat is located right near the high traffic commercial port, our developing marinas, and “landfilling” by our infamous Puerto Rico dump. Over the years the mudflat has suffered oil spills, war wreckage, marine and coastal debris, and most probably chemical leachate contamination. Yet our migratory birds come there each year to feed.

17. 3. 3. Our Migratory Bird Types

Three basic types of migratory birds winter here in the CNMI. The first type is called shorebirds. They are small- to medium-sized birds seen on mowed grassy areas (particularly schools, parks and airports), beaches, and tidal flats.

Most common are the Pacific golden plover, tattlers (two species), and the whimbrel. Sandpipers and turnstones are also shorebirds often seen in the CNMI.

In Chamorro, shorebirds are named after the bird’s calls, most species being called DULILI, except the whimbrel—KALALANG. In Carolinian, tattlers (*Heteroscelus* sp.) are called IILIL. The Pacific golden plover (*Pluvialis fulva*) and the whimbrel (*Numenius phaeopus*) are called GHULIING.



Hernandia sonora, Family Hernandiaceae, is a large coastal tree that grows to 20 or more meters with a “buttressed trunk.” The leaves have a white dot inside the top part of the leaf from which the leaf’s veins then radiate. On the underside of this spot is where the leaf’s petiole attaches the leaf to the branch.



A mudflat is an estuarine area of deposited muddy sediments with no trees or grassy vegetation.



Pluvialis sp. are long-legged brown shorebirds common in the Marianas.

The second group of migratory birds are wild ducks (*Anas* spp., NGANGA PALAO, GHEREEL'BWEL) of several species, the most common being the pintail. Wild ducks in the Marianas prefer fresh water marshes, ponds, and lakes.

Certain migratory ducks look very much like the Marianas mallard did. This was the only duck species to have bred regularly in our islands. However, it is now considered extinct by most **ornithologists** (biologists who specialize in the study of birds).

Hérons and egrets comprise the last group of migrants. Several species resemble our resident Pacific reef heron (*Egretta sacra*, CHUCHUKO ATILONG, GHE'RE'SCHO'L). [Note; even though it is not a migratory species, we discuss the reef heron below. It actually is a resident shorebird and it seems to fit better here than in any of the other chapters.]

Our most common migratory egret is the cattle egret (*Bubulcus ibis*, CHUCHUKO A'PAKA, GHE'RE'BWESCH). This is the tall white bird seen stalking about and searching for insects in the grass along airstrips and especially with cattle herds.

17. 3. 4. Migratory Bird Navigation

As mentioned, some migratory birds travel enormous distances. For instance, Pacific golden plovers travel 5,000 kilometers twice a year, to and from the Marianas and the Siberian tundra.

Before their departure, migratory birds feed heavily and put on much fat to provide fuel for their trip. Once prepared for the journey, how do migratory birds find their way?

Birds navigate using one or more techniques. Research has shown that birds instinctively orient their courses by the position of certain stars, by the sun, and even by the earth's magnetic field. Magnetic orientation is accomplished by tiny internal "compasses," microscopic pieces of iron in the birds' heads.

The birds are born already knowing when to migrate, in which direction to go, and how far to fly. Once they arrive in the right general area, the birds then choose which islands, beaches, ponds, or patches of grass to use for their wintering grounds.

None of our migratory shorebirds or egrets visiting the CNMI may be hunted. CNMI law also protects migratory ducks because, due to overhunting in the past, so few of these birds now visit our islands. Another reason for our relatively low duck populations is that there is just so little habitat available for ducks in the CNMI.

Migratory birds are also protected nationally under the US Migratory Bird Treaty Act. This is a federal law that extends protection to our bird visitors.

This law, like many national environmental and resource protection laws, is applicable here in the Commonwealth (See the chapter on federal laws and international treaties, Ch. 38). Penalties for poaching are severe.



The male Pacific golden plover's plumage changes during the breeding season, while the female's remains constant.

17. 4. SOME REPRESENTATIVE SHOREBIRD SPECIES

17. 4. 1. Plovers

Pluvialis sp. are long-legged brown shorebirds common in the Marianas. The most abundant of these, the Pacific golden plover (*Pluvialis fulva*), can often be seen foraging on lawns at Capitol Hill, the Commonwealth Health Center, at airports, and on our mudflat at low tide. In Chamorro it is called DULILI. In Carolinian it is GHULIING. In English it is called the Pacific golden plover.

An astute observer would notice that Pacific golden plovers all but disappear for several weeks each summer. Watch them this spring, and again in the late summer for individuals with black feathering.

Male breeding plumage includes a black belly and a gold-spotted back, from which it gets its English name, “golden”. The facial markings are white and black. Most of the year it has buff-brown feathers, light underparts, a dark eyestripe, and a light eyebrow.

Pacific golden plovers nest in Siberia, on the permafrost of the Arctic tundra, 5,000 kilometers north of the Marianas. Their 3,000-mile journey takes several months, with stopovers along the way in eastern Russia and Japan.

Many shorebirds nest on the tundra, a vast treeless plain of grasses, small shrubs, and ponds. The Arctic tundra encircles the earth between the northern forests and the polar ice cap.

During the brief summer in the northern tundra, there is an incredible number of insects. This is probably one reason that birds journey to nest there. Another attraction is its nearly 24-hour daylight. This allows the birds more time to feed, breed, and nourish chicks.

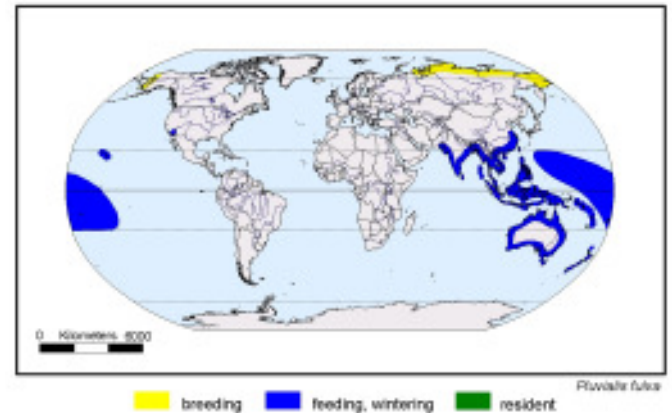
Pacific golden plovers build a nest of dry grass, dead leaves, and moss. Females usually lay four buff to cream-colored eggs, with dark spots. The chicks hatch in about 26 days and follow their parents, feeding on insects, worms, and occasional seeds and berries.

Young plovers are able to fly in just three weeks. The adults are the fastest flyers of the shorebirds. After a few short weeks, Pacific golden plovers make the journey back to the Marianas and other faraway lands where they live until the next summer.

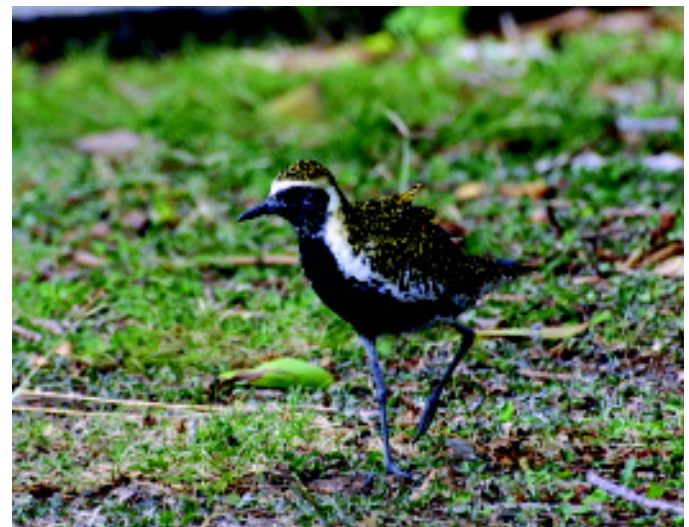
To prepare for the long migration, Pacific golden plovers must gain fat to provide fuel for the flight. Many birds will lose one-fourth to one-half of their body weight during the long migrations over water.

Most long distance migrants fly at night. They fly continuously, stopping to rest and feed when they can, usually around sunrise each day.

Besides plovers, other local long-distance migrants include whimbrels, sandpipers, ducks, snipe, bitterns, crakes, curlews, owls, hawks, falcons, and many seabirds seldom seen on land.



Our Pacific golden plovers travel 5,000 kilometers twice a year, to and from the Marianas and the Siberian Tundra.



To prepare for the long migration, *Pluvialis fulva* must gain fat to provide fuel for the flight.



Numenius phaeopus is a winter visitor which usually confines itself to beaches, generally wading alone along quiet shores.

Some migrants travel more than 15,000 miles during their annual migration. Next time you see a little brown Pacific golden plover, remember this guy is really a world traveler and Arctic adventurer.

17. 4. 2. The Whimbrel

Numenius phaeopus is a winter visitor. In English it is called a whimbrel. In Carolinian it is GHULIING and in Chamorro it is KALALANG. It usually confines itself to beaches, generally wading alone along quiet shores. It is easily disturbed and flies away, up the beach, when approached. Whimbrels are fairly large. Whimbrels are brown with very long, curved bills.

17. 4. 3. Turnstones

Arenaria interpres is like a sandpiper but shorter and fatter. In English it is called a ruddy turnstone. In Chamorro it is DULILI and in Carolinian it is called LIGHISHEWUR. It has distinctive black and white markings and red legs. It, too, is a winter visitor. As its English name implies, it feeds by turning over small stones with its bill. It then gobbles up such insects and worms as might be hiding underneath the stones.



Arenaria interpres is like a sandpiper but shorter and fatter and has distinctive black and white markings and red legs.

17. 4. 4. Sandpipers

Actitis spp. are small gray-brown birds that run up and down the beach. The Chamorro name is DULILI and in English it is called a sandpiper. The Carolinian name is GHULIING. They poke about in the hot sand and in shallow water looking for food. There are at least 3 species that migrate or 'straggle' through the CNMI in wintertime.

17. 4. 5. Reef Herons

Egretta sacra is a large, long-billed, long-legged shorebird. In English it is called a Pacific reef heron. In Carolinian it is GHE'RE'SCHOL and in Chamorro it is CHUCHUKO'. It comes in two colors. Some reef herons are pure white, and other reef herons are dark gray. Both have yellowish legs and bills. The young may be white or mottled.

Reef herons have broad wings, and like all herons and bitterns, tuck their necks into an S-shape when they fly. They can land and take off from water.

These graceful, medium to large herons are occasionally seen at the water's edge along quiet beaches, in shallow lagoon waters, or out on the reef flats of our fringing and barrier reefs. Pacific reef herons are also found among mangroves, and sometimes in freshwater and savanna areas. As already mentioned, it is a resident species and not a migrant one.

Herons are shy of people and will fly away in an arc when approached. They cry out repeatedly, making one ashamed for disturbing them. About a century ago, women's hat fashions created a heavy economic demand for exotic bird plumage, including that of herons. Now they are safe from any commercial hunting threats.

Reef herons are found in many areas of the tropical Pacific. They are expert fishers. They stand aristocratically in shallow water, spearing fish, crabs and other shoreline creatures for food. They usually kill their prey by spearing it, and then hitting it against an



Actitis sp. are small gray-brown birds that run up and down the beach, poking about in the hot sand and in shallow water looking for food.

object and eating it whole.

Reef herons nest year-round in small groups, often on islets close to shore. Some nest in mangrove swamps. They build a nest of twigs and grass in a hidden area on or near the ground.

Females lay two to three eggs per nesting. The young are born almost naked. Both parents have to work extra hard to find fish to feed their growing babies.

Once the young reef herons leave the nest, they watch their parents and practice their fishing technique. They must do this before they can fly away and make a life on their own.



Egretta sacra is a large, long-billed, long-legged shorebird which comes in two colors: pure white, and dark gray. Both have yellowish legs and bills. The young may be white or mottled.



St. Angelo Feit, 1819