The Mangrove Debate

By Elena Millard

The florida red mangrove, *Rhizophora mangle*, was introduced to Molokai purposely in 1902 by the American Sugar Company to help solve local erosion problems. By the 1940's, the mangroves had spread extensively along Molokai's coastlines and had also established themselves in abundance by means of ocean currents on the neighboring island of Oahu. Project manager of Molokai's Keawanui Fishpond, Walter Ritte, explains that "The mangroves were brought here to stop the soil from washing out onto the reef due to overgrazing by ranchers. Their roots took hold and did the job. The problem came when they were not managed. They became a pest. They inundated the native fishponds and made them inaccessible, the roots weakened and broke down the stone walls. They also cut off much access to the ocean. It has been 100 years now since the mangroves were brought here and its time we take a closer look."

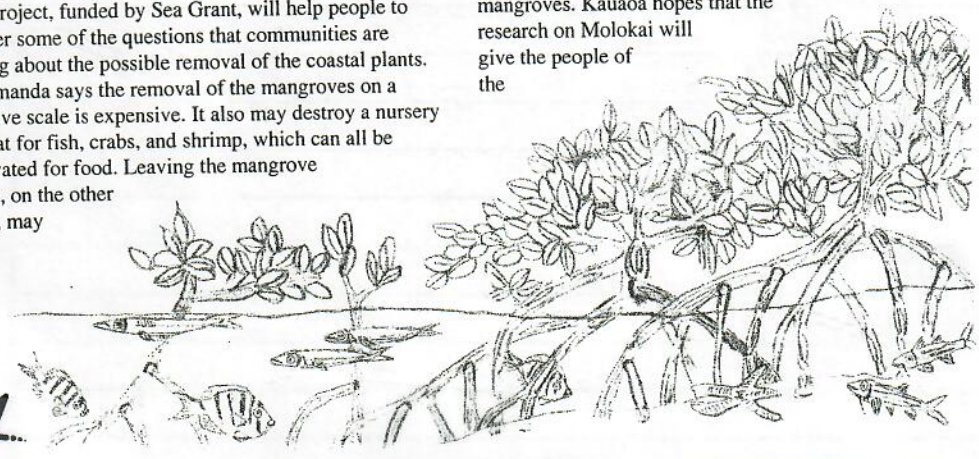
A project under the principal investigation of Dr. Craig Smith and Ph.D candidate Amanda Demopoulos, both of the UH Mānoa Department of Oceanography, aims to assess the impacts that the mangroves are having on coastlines throughout the Pacific. Research is being conducted on Kosrae, Federated States of Micronesia, as well as on Molokai and Oahu, where large areas of mangroves have already been cleared. The researchers hope to identify the proportions of introduced to native organisms that are using the habitat and compare those results to the organisms that inhabit non-mangrove areas. The project, funded by Sea Grant, will help people to answer some of the questions that communities are having about the possible removal of the coastal plants.

Amanda says the removal of the mangroves on a massive scale is expensive. It also may destroy a nursery habitat for fish, crabs, and shrimp, which can all be cultivated for food. Leaving the mangrove alone, on the other hand, may result in a great reduction of native Hawaiian birds such as the Hawaiian stilt, *Himantopus mexicanus*, that require open water spaces for nesting. The tree's destructive effects on the fishponds may put an end to an important piece of Hawaiian culture.

From January 31st to February 3rd, a team of researchers, MOP students, and volunteers conducted the fourth survey of the ichthyofauna and other megafauna that are using the shallow mangrove ecosystem of Molokai's southwest shore. With funding from the USDA Forest Service, Institute of Pacific Islands Forestry and from MOP, MOP student Kauaoa Fraiola, a biology major at UH Mānoa, is assisting with this research on mangroves as his MOP project. In addition to helping with the collection, Fraiola also developed a way to efficiently set up and deploy the large 80 meter collecting net and will be working on identifying the species using taxonomic keys and microscopy.

After the perimeter of a 19 meter by 19 meter square plot was cleared of mangrove roots, the poles and net were set up at low tide. At high tide, the net was deployed and secured, and the animals were collected and preserved during the following low tide. The process was conducted again in a non-mangrove mudflat for comparison. The samples were brought back to the UH Mānoa campus for analysis.

Amanda will be conducting stable isotope testing which will give insight on what these animals are eating and if they are benefiting at all from food supplied by the mangroves. Kauaoa hopes that the research on Molokai will give the people of the



Mangroves: Is clear-cutting a solution?

by Casey Twanow

In the Kahalu'u mangrove stand in Kāne'ohe Bay, the air smells like fresh, salty mud. Prop roots drop down from smooth branches overhead and plunge into the mud like stubby fingers.

Early in the morning you might find University of Hawai'i graduate student Amanda Demopoulos crawling and climbing through the tangle of red mangroves, *Rhizophora mangle,* collecting leaves and mud.

Mangrove trees, which belt two-thirds of tropical shorelines, are not native to Hawai'i. Since the American Sugar Company introduced mangroves here in 1902 to prevent erosion, they have been planted or spread to all of the main Hawaiian Islands.

Today the troublesome trees sprawl across more than 2,000 acres of Hawai'i coastal mudflats, overgrowing the habitat of endangered native shorebirds, the *ae'o* (Hawaiian stilt), *'alae ula* (Hawaiian gallanule), *'alae keo'keo* (Hawaiian coot) and *koloa* (Hawaiian duck). Mangroves also harbor shorebird predators like the night heron and the introduced mongoose, cattle egret, and rat.

On O'ahu, mangrove areas in Nu'upia Ponds and He'eia State Park have been clear-cut by state and federal environmental agencies to restore shorebirds' wetland habitat, and there are plans to clear areas of Pearl Harbor. But mangroves' role in Hawai'i's ecosystem is not fully understood. With Sea Grant funding, Demopoulos studies the Kahalu'u mangroves to determine if native organisms rely on mangrove habitat and to clarify the effects of clear-cutting mangroves on the coastal environment.

UH graduate student Amanda Demopoulos notes leaf litter in a quadrat of mud below a suspended basket. —*E. Quinones photo*

Each month Demopoulos gathers leaves from mesh baskets suspended in the mangrove canopy and leaf litter from a quadrat of mud below each basket. Her observations suggest more leaf matter is produced in and flows out of mangroves in Hawai'i than in areas where they are native, possibly because Hawai'i lacks certain herbivorous crabs, insects and isopods to limit production.

These bountiful mangrove leaves, however, do not seem to support the coastal food web. From chemical analyses of leaf matter and organisms from Kahalu'u,

Demopoulos perches in a tangle of red mangroves to retrieve leaves that have fallen into a mesh basket suspended in the canopy. —*G. Demopoulos photo*

Demopoulos says, "Sandflat and mangrove species seem to depend on algal or bacterial food sources instead."

Even if mangroves are not a main food source, they could be a habitat for native species such as mud-dwelling worms and crustaceans.

To find out if the benthic invertebrates mangroves shelter our mainly native Hawaiian fauna or alien species, Demopoulos is analyzing four years of mud core samples from Kahalu'u.

If she finds a high proportion of alien species in the mud, it is possible that clear-cutting benefits native Hawaiian species by eliminating a "foothold" niche that is easily colonized by invasive alien species.

Some mangrove areas must be cleared to maintain ancient fishponds and modern drainage channels. But in areas where environmental agencies opt to cut mangroves and restore native mudflat habitat, Demopoulos suggests increased monitoring of the effects of mud-dwellers, coastal erosion, and water quality on nearby coral reefs.

The success of replanting native vegetation or leaving the mangrove root systems in place to reduce erosion after clear-cutting also needs to be determined.

Demopoulos recently learned that her Kahalu'u mangroves will be clear-cut and the area will become a regional park. Although it will interfere with her study, Demopoulos sees an important new research opportunity: "I would like to see how this drastic change affects the Hawaiian coastline."

(Casey Twanow is a graduate student at Boston University's Knight Center for Science and Medical Journalism. She participated as a 2002 summer intern with Sea Grant's Science Writers Project.)

Makai.
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