

## Science lecture #7: Coral Reefs and Shore Marine Life Specific to Hawaii

The coast of O'ahu is surrounded by fringing reefs (*papaioa*) protecting white sand beaches, bays and other inlets, or rocky shores and headlands. **Coral reefs** (*kohola*) are made up of calcium carbonate (also known as "limestone") deposited by coral polyps, algae, and other organisms. They may also be considered as giant ecosystems, containing enormous amounts of plant and animal species. The species are so diverse and numerous that no other ecosystem on earth can compare to the variety and count found within a coral reef ecosystem.

Many inhabitants of the coral reef, especially invertebrates, conceal themselves during the day either in the sand, under stones, or in crevices. That's because most of the species are nocturnal, or active at night, and feed on each other or on the nutrients floating around nearby. Kohola provides protection as well as being a hunting ground for its many inhabitants; the rigid and sometimes finger-like projections provide immediate "cover" and protection for small species of fish and crustaceans.

**Unique to Hawaii:** *Kohola* in Hawai'i are unique when compared to reefs in other tropical areas: Because Hawai'i is isolated in the middle of the Pacific Ocean, there are fewer species in our waters than those found in similar tropical areas. For example, there are only 40 known reef-building corals in Hawai'i; compare that to the Pacific island of Palau which has over 300 species. A second reason is that Hawai'i is still geologically young when compared to the numerous island communities found in the far western Pacific. Hawai'i's reefs are still small and relatively close to shore. With the exception of Kane'ohe Bay and the south shoreline of Moloka'i, there are no seriously-developed barrier reefs like those seen in the far western regions of the Pacific.

With regard to marine life, those found around the Hawaiian Islands are descendants of organisms that have been able to successfully relocate over thousands of miles of ocean. Although Hawai'i is much closer to the North American continent than any other large land area, only a few shallow-water organisms are common between the two regions. The general trend of most of the marine life found in the central Pacific area has apparently come from the Indian Ocean, spreading out through the Pacific Ocean all the way to Hawai'i. Some of the common shore forms seen in Hawai'i range all the way from Madagascar and the Red Sea, by way of the East Indian current.

The Hawaiian marine species can also be distinguished by *attenuation*, that is, by having fewer species than are found among other island groups in the Pacific. The numbers of shallow water species of corals, mollusks, echinoderms, and fish recorded in Hawaii compared with those found in other island groups within the western Pacific illustrates attenuation:

Genera of corals:	Hawaii = 15	Marshall Islands = 53
Genera of corals (cont.):		Fanning Island = 40
Species of mollusks:	Hawaii = 1000	Ryuku Islands = 2500
Echinoderms:	Hawaii = 90	Philippines = 345
Species of reef fish:	Hawaii = 450	Marshall Islands = 1000

In addition, differences in size and habitat among mollusks, or fin-ray counts among the fish (compared with those of the same species elsewhere in their range) suggest the possibility of an "isolation of gene pools." The tiger cowry (*Cypraea tigris*) from Hawai'i averages 117 mm in length and is found at depths more than 10 meters; elsewhere in the Pacific the average length of a tiger cowry is only 70 mm and the animals are found at shallow depths of a few cm. Among

the fish, “when there is a difference in fin-ray counts, the Hawaiian form usually has more fin rays than its representative further south” (Strasburg, 1955; Gosline and Brock, 1960).

Several groups of well-known Indo-West Pacific organisms have either never reached the Hawaiian Islands, or were here at one time and have since become extinct. The principal reef-associated coral of the central Pacific, *Acropora*, was present in Hawai‘i during the Pleistocene\* era (as evidenced in raised reefs), but is now seldom seen in the Hawaiian Islands; recently though, one small colony was found at depths of 10 meters off the south coast of Kaua‘i. (\*Pleistocene Era = 1.8 million years to 10,000 years ago.) Even the widely-dispersed species of cuttlefish, *Tridacna*, does not live in Hawaiian waters anymore. And, there are no native snappers of the genus *Lutjanus* (blue-striped snapper) or shallow water groupers of the genera *Epinephalus* or *Cephalophis*, fish which are common and important in the Indo-West Pacific waters.

For the Hawaiian people, the ocean and surrounding reefs provided diversity for their meals, supplying fish, crustaceans, seaweed, and other sea animals for their diet. All sea life which could be eaten was consumed, and their primary source of protein came from fish. (The commoners ate fish, while land animals such as pigs, dogs, chickens, and wild birds were kept for Hawai‘i’s chiefs, the *ali‘i*.)

Through Hawaiian tales and chants, we can conclude that native Hawaiians had extensive knowledge of fish and other reef life, for they knew much about many sea animals’ habitats and how they behaved. There are numerous examples within these stories that tell of characters transforming into sea creatures at will, and descriptions within Hawai‘i’s oral history which shows how well Hawai‘i’s people knew the surrounding sea and its inhabitants. One of the most well-known oral compositions of Hawai‘i, The *Kumulipo*, contains numerous references to the ocean and the life within it. This genealogical chant (*oli*) of creation from Hawai‘i’s history has been compared to Greek creation stories such as Hesiod’s *Theogony*, and Hebrew’s *Genesis* of the Bible. No one knows who created the *Kumulipo*, since Hawai‘i’s history was recorded orally and there was no writing at the time.

### Bibliography

1. Beckwith, Martha Warren. *The Kumulipo*, copyright 1972 The University Press of Hawai‘i.
2. Gulko, David. *Hawaiian Coral Reef Ecology*, copyright 1998 by Mutual Publishing.
3. Titcomb, Margaret. *Native Use of Fish in Hawaii*, copyright 1972 The University of Hawai‘i Press.