

Coral reef development near cities

Makoto Tsuchiya

More than one million people live on Okinawa Island, mostly in cities, such as Naha, Ginowan, Urasoe, Tomigusuku and Itoman, situated in the southern part of the island. Many tourists utilize these urban areas year-round as their base for further tours to the northern areas and neighboring islands, such as Kerama Island. Current intensive bleaching events have apparently spared the coral reefs around Kerama Island (e.g., in 1998) and relatively healthy reefs are still found there.

Owing to intensive development activities following Okinawa's return to Japan in 1972, extensive coral reef areas around Okinawa Island disappeared and/or suffered various disturbances (e.g., bleaching events, crown-of-thorns starfish outbreaks, and terrestrial soil inflows). However, it is also true that healthy coral reef communities can still be seen in some places; such sites are utilized for activities such as environmental education and diving. These coral reefs may be unique in Japan, or even the world, in that they are so strongly connected to intensive human activities.

A coral reef near Naha Harbor has been protected from disturbance by human activities because of its location, in front of the American military base, which has meant that admission has been restricted for a long time. If intensive bleaching events have not occurred here, intrinsic coral reef communities will probably be found in this area. It is likely that species richness and abundance are greater here than in more disturbed areas and that larger sized reef organisms would be seen.

Rich *Acropora* communities were reportedly developing along the coast of Naha Airport until the 1998 bleaching event. On the breakwaters of Naha Harbor, located adjacent to the airport, it has been observed that many coral colonies are proliferating (Photo. 1). These areas have the potential to foster the healthy growth of coral communities, despite their seemingly unfavorable locations, and thus



Photo. 1. A coral community developing on the breakwater of Naha Harbor, Okinawa (photo by K. Shimoike).

may serve as appropriate sites for research into the conservation and management of coral reefs, with reference to the human activities. Recently, the coexistence of coral communities with the activities of Naha Harbor has been discussed (Ports and Harbors Bureau, Ministry of Land, Infrastructure and Transport 2003).

Since such urban-adjacent reefs are easily accessed from neighboring cities, and relatively rich flora and fauna exist, they are frequently used as sites for environmental education. The Nature Conservation Section of Okinawa Prefecture holds an event for the public to observe marine life on these reefs every year.

Changes in the size of fish catches off Okinawa have also been affected by human activities related to the history of Okinawa. During the 1970s, sea urchins, octopus, and giant clams were caught in relatively large numbers, but the catches have decreased since that time (Fig. 1). Although data before 1973 are unfortunately not available, we can assume, from information on fish catches off Okinawa, that these organisms were not caught in great numbers before that time (Tsuchiya 1999; Tsuchiya in prepara-

tion). It has been speculated that the cause for this change relates to changes in the dietary habits of the Okinawan people. Their food choices have been affected by mainland Japan's habit of eating these organisms. The resulting increase in demand has resulted in fishermen over-catching these particular resources. Similar information has been obtained from many fishermen on Okinawa Island and from the Yaeyama region.

On the other hand, other possible reasons for the sudden decrease in the size of fish catches should also be considered, because catches of other preferred fishes, such as lobsters and parrotfish, have remained relatively stable. The effect of terrestrial

soils derived from land development projects may be one cause. Fishes that can swim freely, and lobsters living mostly at reef edges, may not be directly affected by soil accumulation, while benthic organisms living mainly on reef flats are more susceptible.

As more people inhabit the area, more food resources will be required, and this means that more fishing will occur. Needless to say, resources are limited. Therefore it is necessary to understand the carrying capacity of coral reefs, both with respect to food and recreational resources, in order to avoid their degradation. For the future sustainable use of coral reefs, more precise information and further detailed discussion are required.

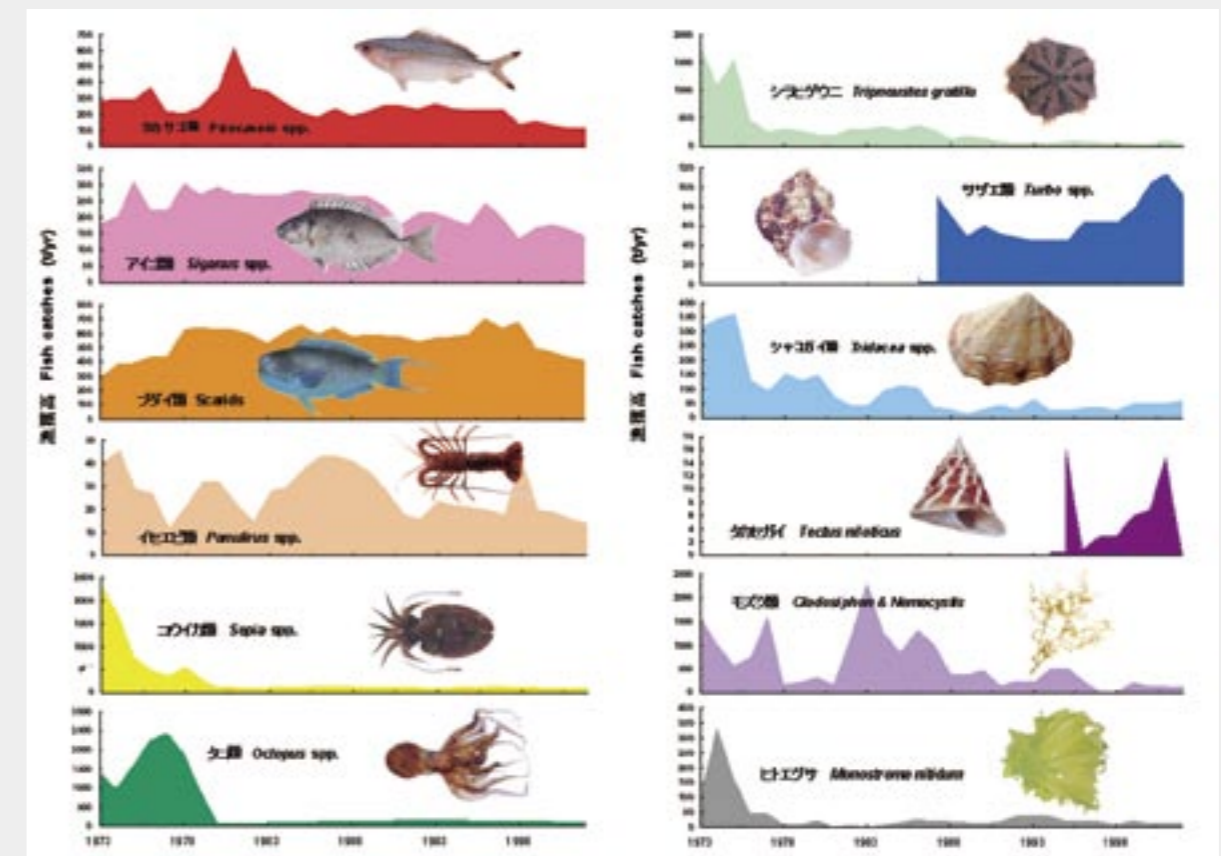


Fig. 1. Changes in fish catches on Okinawan coral reefs (Tsuchiya 1999, modified).