Women's fishing

Nearshore invertebrates decline as coastal development increases around Palau

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Sea cucumbers, sea urchins, crustaceans, molluscs, anemones and many other invertebrate species are popular food in Palau (Fig. 1). They are collected for family consumption and are sold in local markets. They are also exported around the region. Many of these species are used to supplement diets and income, especially in rural areas. They are often collected by women and children from reef flats, seagrass beds and mangrove areas at low tide. For generations, the collection of nearshore invertebrates offered a secure source of protein and an enjoyable pastime to Palauans. However, many people have become concerned that the invertebrates are not as abundant as they once were. People say that many of their favorite invertebrates are now much harder to find than they were in the past.

There is some regulatory control of harvest for some of the more commercially important species. However, the status and extent of collection of most species remain unmonitored and unregulated. It is possible that some of the species are being harvested too heavily in some areas around Palau.

Evidence of the decline in invertebrates is growing: a biological survey conducted this year, discussions of biodiversity-related issues with local community members, and conservation actions that have occurred at the community level all indicate that the invertebrates are showing signs of stress. Many factors are probably contributing to this decline: especially overharvesting, increased coastal development, and climate-related factors. The invertebrates and their habitats around Babeldaob, Palau's largest island, may be in particular danger since the island is undergoing rapid development. Local efforts to protect some of the species include national laws that: 1) restrict the harvest (i.e. trochus can only be harvested if the season is opened by the national government); 2) set size limits (coconut crabs, mangrove crabs and lobsters have minimum sizes); and 3) ban export (export of non-processed crustaceans is banned). Local communities have also set aside places as conservation areas where all harvest or boat traffic is banned for several years in order to protect fish and invertebrate stocks. These efforts should help species recover. However they have met with limited success. Poorly planned or unmanaged development that damages important nearshore habitats may be undermining such efforts at conservation and management of these species.

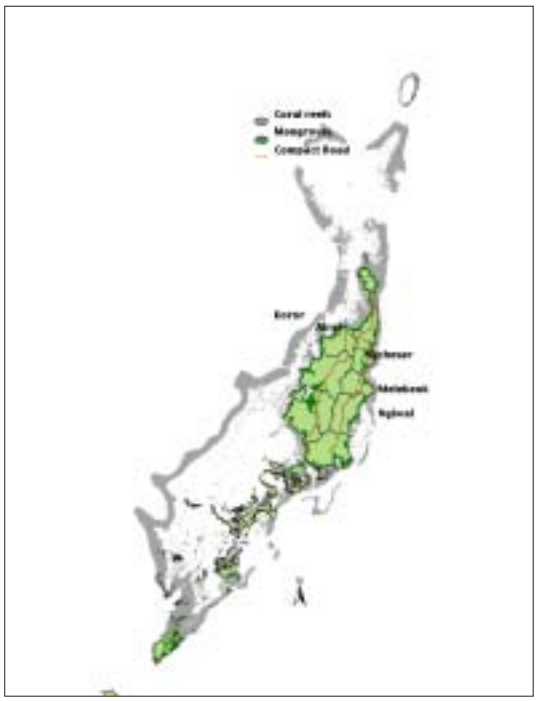

Figure 1. The main Palau islands

Local concerns

In 2002, staff from the Palau Conservation Society conducted interviews in communities throughout Palau to determine the extent of marine and terrestrial resource use and to document local concerns about the future of these resources. These inter-

views were part of Palau's efforts to compile a National Biodiversity Strategy and Action Plan. Declines in fish and invertebrate populations were the most common concerns voiced throughout the country. People from some states were concerned about an overall decline in invertebrates, while others were concerned about particular species. Sea urchins (especially *Tripneustes* sp.), sea cucumbers, land crabs, mangrove crabs, coconut crabs, and mangrove clams were the invertebrates singled out for special concern in many areas.

In Ngchesar state, on the east coast of Babeldaob Island, sea cucumbers were once numerous. Now residents are concerned about declines in the numbers of sea cucumbers, especially *ngimes* (*Stichopus variegatus*). Local women claim that some people collect this sea cucumber in new ways. Previously the women collected the visceral contents by cutting open an animal and throwing the two halves back into the water near where they were collected. They believe that the cut animal will regenerate into two. Now, some women collect the whole animal and they wait until they have finished collecting before they cut them open. By that time, the animals are dead and are unable to regenerate when they are thrown back into the water. The older women of Ngchesar say there are now less sea cucumbers on the reef flats as a result.

Ann Kitalong, who has worked as a biologist in Palau for close to 15 years, conducted a survey of the nearshore invertebrates in Airai state in June 2003. Airai is the southernmost state on Babeldaob Island and is the area where much of the initial development on the island is occurring. She also was concerned about the status of nearshore invertebrates. Recently she worked with two local students to do 49 transects in the prime habitats for giant clams, sea cucumbers, urchins and/or swimming crabs (Figs. 2 and 3). These habitats included mud flats, seagrass beds and fringing reefs. The results are disturbing: the study noted an overall decline in the target species in areas once known as hotspots. The survey team found a few sites that were relatively inaccessible and far away from coastal construction that still had viable sea cucumber or sea urchin populations. Unfortunately, the team found very few live giant clams (*Tridacna* sp.) — although they saw many empty shells — no swimming crabs (two were found outside the study area) and no long-spined urchins (*Diadema setosum*). The team also noted that the seagrass beds in many areas around Airai are looking stressed. Areas that were once healthy meadows of long green seagrasses now look brown, silted, and the blades of the seagrasses are covered with fuzzy algae. Although a full seagrass inventory was not part of Kitalong's study, she noted that there appeared to be less diversity of seagrass, algae and sponges in the areas they surveyed.

While the trochus population seems to be viable as a result of the successful controlled harvest seasons, other species continue to decline despite local efforts at management. For instance, in 1997, a conservation area was set up in Ngiwal on Palau's east coast. One of the goals of the conservation area was to protect the *ibuchel* (sea urchin) from overharvest and to close the area to boat traffic, which is locally believed to have a negative impact on the reef flats. In the five years that the area was closed to fishing, not one urchin was seen during the annual monitoring surveys. Unfortunately it is not known what the current status of urchins is in the area. Residents say they rarely collect urchins in any number anymore.

Figure 2.
Students recording weight of a sea cucumber during an invertebrate survey of Airai state.
Photo: Ann Kitalong

Figure 3.
Sea urchins and cowries measured during the invertebrate survey in Airai.
Photo: Ann Kitalong

Coastal development

Invertebrates are relatively vulnerable to habitat changes — they are sessile and cannot easily find new habitat. Harvesting practices along with increasing threats to the nearshore coastal environment may be combining to endanger the status of many of these invertebrates. All of the areas mentioned in this article (Airai, Melekeok, Ngchesar and Ngiwal) are on Babeldaob Island. Babeldaob is rapidly becoming developed: a 53-mile coastal road is being cut through forests and mangroves in all of Babeldaob's 10 states; the national capital is being relocated from Koror to a hilltop at Melekeok state. Associated with these major projects are nearshore dredging and sand mining; house construction in

sensitive areas within the watersheds; building of smaller access roads; and increased farming along rivers. All of these projects have resulted in sedimentation that has flowed downstream onto reef flats. Landslides that carry sediment onto reefs occur with almost every large rain storm. A study conducted by the Palau International Coral Reef Center, Australian Institute of Marine Science and the University of Guam found that the mud eroded from bare land in Airai is smothering corals and creating a shift in habitat from coral reef to fleshy algae in Airai Bay (Fig. 4).

Figure 4.
Sedimentation smothers the corals in Airai Bay.
Photo: Yimnang Golbuu

The Compact Road is the largest construction project in Micronesia. It is being cut through many sensitive habitats, such as mangroves and forests. Palau's wet climate has created severe difficulties for the contractor building the road. It is currently two years behind schedule, and will not be paved for at least another year.

Other construction activities associated with the road are also contributing to the damage to nearshore areas. Four designated dredge sites around Babeldaob provide fill material for the road. These sites are all located directly offshore. Every other state has at least one dredge area for other uses. Some states also have sand mining operations. Mangroves have been cut and filled for the road as well as for creation of land for buildings such as worker housing. In a non-road related use, mangroves are also used as dumps in many Babeldaob states. They are generally viewed as unimportant, dirty areas that should be reclaimed for more productive uses.

The road will also have future impacts as it increases access to more remote areas. Previously northern Babeldaob was reached only by a three-hour boat ride. Today, even the unpaved road has made it easier to get to the northern part of the island. For instance, Ngiwal state has recently banned the collection of land crabs by non-residents as more and more people are driving to the state to collect the crabs. The residents are afraid that land crabs will be overharvested by people who drive in from elsewhere, collect the crabs, and leave without asking local permission.

Relocation of the national capital will also increase the demand for housing in the states on Babeldaob, especially on the east coast. Impacts of population increases are already being seen in Airai state where the population has almost doubled since 1990, making it one of the fastest growing states in the republic. Forests and mangroves are being cut to make room for housing projects throughout the state. Some people have noticed increasing damage to nearshore habitats from bleach, detergents and other cleaning products that are piped directly out of houses and laundries into streams and mangroves. Local conservationists fear that the environmental damage that is becoming more obvious in Airai will spread northward as the road allows the development to move northward.

Climate impacts

Finally, the climate has also had a devastating impact in the nearshore environment around Palau. The full impacts of the coral bleaching that occurred in 1998 are still being studied. As much as 90 per cent of the *Acropora* sp. corals on many reefs were killed outright by the bleaching event. This has greatly altered the structure of many of the reefs. In addition, giant clams were also bleached and killed. The corals are recovering in many areas, but the reefs are nowhere near as healthy as they were before the bleaching. It is unclear to what extent other environments, such as seagrasses, were affected by the elevated sea surface temperatures that contributed to the coral bleaching.

Conclusion

Nearshore invertebrates are useful indicators of the health of seagrass beds, reef flats and mangroves. Since many are sedentary, they are very susceptible to changes in the local environment, as well as to overharvest. The Airai invertebrate study and observations of people in villages throughout Palau indicate that there is real reason for concern about the status of these once abundant animals. The state governments on Babeldaob are beginning to see the importance of managing land uses in order to protect the nearshore environment. However, to date none of the states has comprehensive land use planning fully in place. Conservation areas and other local efforts to manage and protect nearshore resources from overharvest depend upon such comprehensive land use management programmes. Without control of impacts from pollution, sedimentation, and habitat loss, many positive local conservation efforts will be doomed to failure.