

Health of Maskelyne Reef System

Dates: October, 2005



Corals in the MPA Sakao Island

Reef type:

The Maskelyne Island group is situated at the southeast tip of the Malakula Island mainland. The group consists of two bigger islands, Sakao and Uliveo, and a few smaller ones. Each island is surrounded by extensive fringing reefs. The fringing reef of the small Vulai Island extends over 2,6 nautical miles into a barrier reef called the Sughulamp Reef.

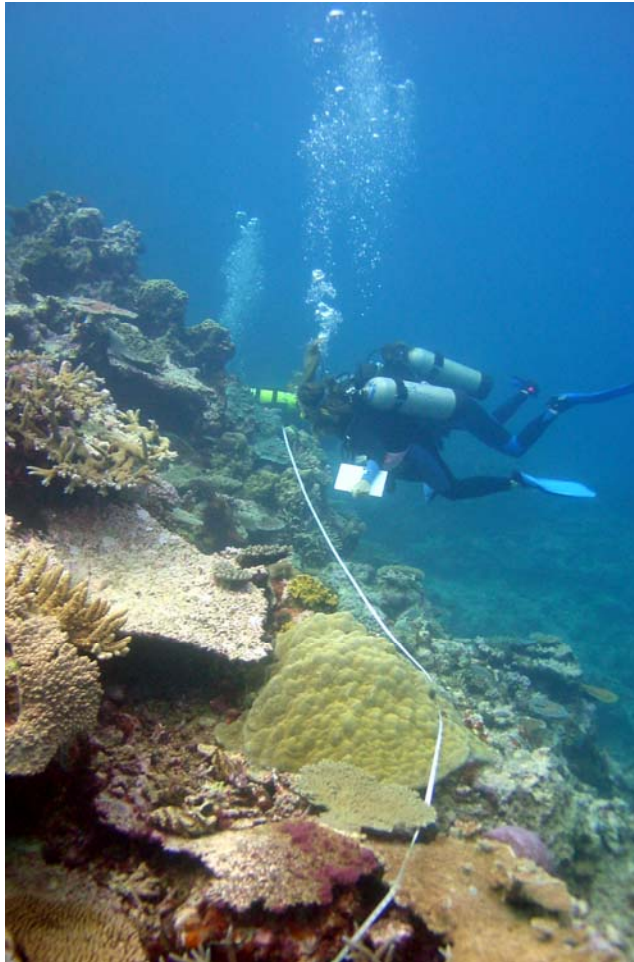
Most fringing reefs inside the island group are exposed to strong currents due to tide changes drawing water through the channels. All fringing reefs inside the island group form gradual slopes, which give space for extensive fields of branching *Acropora*. The outside fringing reefs and the outside of the Sughulamp Barrier Reef display a different coral composition with more encrusting, massive and plate growth forms rather than the thin branching *Acropora* of the inside reefs.

Vitareef data collection and transects were conducted in two zones:

- 1.) the sloping outside of the Sughulamp Barrier Reef and
- 2.) the marine protected area (MPA) of the Sakao Island fringing reef.

Using a handheld global positioning unit (GPS) we spent one day tracking large sections of the reef contours, including the Sughulamp Barrier Reef, the Sakao Island fringing reef, the Uliveo Island fringing reef and the Avokh/Ulendeuv Island fringing reef.

Additionally, we conducted observational dives at the entrance of the Northeast Channel between the Malakula mainland and Sakao Island.



Transect on the Sughulamp Barrier Reef

Average Water Temperature:

The water temperature, measured from the *RV Heraclitus* anchored 1,5 cables off Vanubai Point of Sakao Island, ranged from 25.8°C to 26.8°C during the study period.

Bleaching:

No signs of bleaching were found on the barrier reef nor on the fringing reef. There was also no evidence of previous bleaching events.

Coral Disease:

There were no obvious signs of coral diseases commonly found throughout the Pacific. Only one *Pavona* colony was found displaying a thin black band dividing live tissue and the dead part of the coral, which could possibly be a disease.



Possible disease on a *Pavona* colony

Visibility:

Outside the barrier reef we observed visibility up to 45 meters, and inside the island group at the Sakao Island fringing reef we observed visibility up to 30 meters as measured through Secchi disk readings.

Crown of Thorns Starfish (*Acanthaster planci*):

At the study site outside of the Sughulamp Barrier Reef, we did not encounter any crown of thorns starfish. In the MPA of the Sakao Island fringing reef, however, we noted a significant number. We observed several feeding trails throughout the reef. Crown of thorns had grazed the root tissue of several tall branching *Acropora* and had completely digested many small coral colonies including *Montipora*, *Pavona*, *Favia* and *Fungia* colonies.

During one dive in the Sakao Island MPA we counted 21 crown of thorns starfish.



Crown of thorns starfish



Grazing trail on *Acropora* coral colony



Grazing trail on *Favites* coral colony



Grazing trail on *Pachyseris* coral colony

Geography and Background:

At the southeast corner of Malakula lie the Maskelyne Islands, comprised of numerous coral-fringed islands. Between the islands are channels with strong currents. Many of the islands are lined by mangrove forests. On the northwest corner of Sakao Island is an MPA where all fishing is banned. In addition, around Uliveo Island the villages have set up several protected areas. The majority of the regional population, consisting of approximately three thousand people, resides on the main island, Uliveo, often called Maskelyne, which has three separate villages, Pellonk, Peskarus and Sangalai.

Reef topography:

The Sughulamp Barrier Reef is a long narrow stretch of reef extending from Vulai Island. It forms the southwest barrier of the Maskelyne Island group. At low tide the flat reef top extends above the water surface. In places the outside of the barrier reef consists of gradually sloping coral and rock substrate to a depth of 15 to 25 meters. Continuing deeper, to approximately 60 meters, the slope becomes sand. Elsewhere, small drop-offs of about ten meters continue deeper as gradual slopes. The inside of the barrier reef is dominated by scattered corals over a shallow sandy bottom. Transects and Vitareef data collection were conducted in approximately seven meters of depth on gradual slopes at the northeast tip of the outer barrier reef.

Most of the fringing reefs situated inside of the island group form gradual slopes changing into sandy slopes at ten to 30 meters of depth. Transects and Vitareef data collection were conducted in approximately seven meters of depth on gradual slopes on the fringing reef of west Sakao Island's MPA.



Slope on the Sughulamp Barrier Reef



Slope on the Sakao Fringing Reef MPA



Huge *Echinopora* colony between *Acropora* fields

Coral Observations:

The inside fringing reefs consist mainly of broad *Acropora* fields. Arborescent and bottlebrush *Acropora* densely cover the slopes and alternate with a few rubble fields. Most *Acropora* are large colonies, which have a fragile appearance with their long, thin branches. Most are in good condition. Some of the dead and broken *Acropora* pieces grow together forming a hard bottom substrate instead of loose rubble. Here, on the inside fringing reefs, an array of different small encrusting coral colonies grow increasing the diversity of the fringing reef. However, *Acropora* obviously dominates the reef in abundance.

In places the reef is also covered by widely spreading *Porites* fingers. Around Sakao Island we saw two plate-forming *Echinopora mammiformis* colonies covering large areas. One colony, which occurred partly in one of our transects, spanned about six meters in diameter. The other extended around 30 meters. Both colonies seemed to be in good condition.

In general most corals in the fringing reef appeared in good condition. In some areas on the south side of Sakao Island and on the north side of Uliveo Island all colonies were partially covered from the roots by either filamentous algae or macroalgae. In the MPA of Sakao Island where we collected data and encountered a serious number of crown of thorn starfish, ten percent of all colonies were affected by tissue damage, primarily due to grazing by crown of thorn starfish. These invertebrates have had an obvious impact on the ecology of this reef.

There were also signs of anchor damage in the northern part of the MPA.

The Sughulamp Barrier Reef showed high coral diversity with many *Acropora* plates, encrusting *Montipora* colonies, and different massive growing corals. The coral coverage was slightly lower than on the fringing reef, and encrusting coralline algae often covered spaces on coral rock between live corals. Similar to the fringing reef, most coral colonies observed on the Sughulamp reef seemed in good condition. Corals were not affected by crown of thorn starfish grazing, as on the fringing reef, but instead by other grazing organisms including parrotfish.

Overall the corals around the Maskelyne Islands seemed in good health and lacking signs of disease or scars of former bleaching events.



healthy *Acropora* colony



damaged *Acropora* colonie

Fish Observations:

The fish life in the Maskelyne Islands appears to be diverse and abundant when considering small fish, giving one the impression of swimming in an aquarium. Snapper, fusiliers and parrotfish were also abundant. However, top predators such as sharks, barracudas and larger commercial fish seemed to be absent from the reefs.

On the outside of Sughulamp Reef was a diverse array of typical small reef fish, including damselfish, butterflyfish, angelfish, wrasses, surgeonfish and triggerfish. We observed one dogtooth tuna swimming through our transect area. In addition we found snappers, parrotfish, a few small groupers, a couple of sweetlips and a large school of fusiliers in the area of the transect.

The diversity of reef fish at the MPA of Sakao Island was very similar to the study site at Sughulamp Reef. We found many of the same small reef fish as well as a dogtooth tuna in our transect area. There we also observed snappers, parrotfish, groupers, and sweetlips, but in lower numbers than at the outside barrier reef.

Villagers frequently fish the reefs around the Maskelyne Islands using nets, fishing lines, and spears. According to the local Reef Check team, the Maskelyne committee of chiefs collectively agreed to ban net fishing and night spear fishing from October through March during the breeding season. In addition to this fishing restriction, the Sakao MPA has a no-take policy that is reportedly observed.

Local villagers talked of dense aggregations of tuna existing in the past throughout the channels of the Maskelyne Islands during the months of March, April and May. In addition, some villagers mentioned that they fished for sharks in the area. They explained that they attach a chain to a buoy on one end and to a large hook with a chunk of meat on the other and anchor this setup in one of the passes. When they see the buoy bounce up and down on the water, they come and retrieve the line. They eat the shark meat and sell the fins to passing fishing boats. This would explain the absence of sharks in the region.

During a few observational dives at the entrance of the Northeast Channel we encountered an impressive abundance of big fish such as sweetlips, bumphead parrotfish and snappers. Giant stingrays, eagle rays, a great barracuda, big schools of fusiliers and surgeonfish as well as turtles made this site very special. Due to its greater distance from the villages it is probably not as frequently visited by fishing people as the areas in closer proximity to the villages, including our study sites. This reduced fishing pressure would give the fish stock better chances to reproduce and subsequently to spread to other areas of the Maskelyne reef system.

Invertebrate Observations:

The Sughulamp barrier and Sakao fringing reefs both displayed a fair to good presence of giant clams, including *Tridacna squamosa*, *Tridacna maxima*, *Tridacna crocea* and *Hippopus hippopus*. The only species recorded on our transects was *T. squamosa*, though we observed *T. maxima*, *T. crocea* and *H. hippopus* in other areas of the barrier and fringing reefs. According to local reports the area has a history of overfishing of giant clams, which were more abundant in the past. A local family established the Ringi Te Suh Marine Conservation Centre in 1994 to help restore the local giant clam population by rebuilding stocks of the four previously mentioned species. The Conservation Centre seems to be very well managed, and after eleven years the positive impact of the Centre on the local ecology is already apparent, as villagers have reported baby giant clams becoming well established in surrounding areas.

Bioeroding invertebrates were most prolific on the Sughulamp Barrier Reef with a strong presence of the bioeroding mussel *Lithophaga zittelliana*, Christmas tree worm *Spirobranchus giganteus*, and coral hermit crab *Paguritta gracilipes*. Of these, the bioeroding mussels are the most harmful to coral as the mussels bore into the coral head producing tunnels, which greatly weaken the skeletal structure and, when combined with other boring organisms, can cause the eventual death of the colony. Most *Montipora* colonies observed on the Sughulamp Barrier Reef showed much evidence of bioeroding mussle presence.

The dominant sea urchin species we found on both the fringing and barrier reefs studied were *Echinostrephus spp.* and *Echinometra mathaei*. Both are known to excavate small holes in rock and even live coral for protection. We found evidence of these bioeroding organisms at our study site on the Sughulamp Barrier Reef while none were found on our transects at the Sakao Island fringing reef.

We also found a great wealth of sessile invertebrates, such as sponges, bryozoans and soft corals, throughout the area. Their abundance was particularly high on the barrier reef where *Acropora* dominated less area than on the fringing reef, where the high density of *Acropora* possibly limited the presence of these invertebrates. According to local reports, the green turban snail *Turbo Marmoratus* is now extinct in the area due to overfishing.

The presence of sea cucumbers (beche-de-mer) was highest on the sandy rubble areas of both the fringing and barrier reefs in depths of three to five meters. However, none of the species observed during the entire study were of those considered

commercially valuable. We found no sea cucumbers on either of our barrier reef transects and only on one of the transects on the Sakao Island fringing reef we noted the presence of two species, namely *Bohadschia graeffei* and *Holothuria edulis*, both of low value commercially.

We found a significant abundance of crown of thorns starfish on the fringing reef of Sakao Island, counting 21 individuals in a relatively small area. Although none were seen on the transects, we found evidence of their presence in the characteristic trails of cleaned white coral skeleton on several colonies on the transect. Absent from the transects were the giant triton (*Charonia tritonis*), Harlequin shrimp (*Hymenocera picta*) and the fire worm (*Pherecardia striata*), all invertebrate natural predators of the crown of thorns.

Marine Mammals:

Twice during our voyage to the Maskelyne Islands from Epi Island we observed pods of common bottlenose dolphins riding the bow of our ship. The first of these pods, observed about ten miles off the Maskelynes, consisted of at least eight individuals. The second sighting occurred approximately two miles off the Maskelynes and consisted of at least 14 individuals.

From our anchorage at Vanbuai Point, Sakao Island we saw a group of unidentified dolphins in the distance traveling through the Northeast Channel.

During our explorations around the area on several occasions we encountered dugongs in Gaspard Bay. We observed three to ten animals at a time either feeding alone or in groups of up to five. They usually surfaced for a series of breaths before diving and remaining submerged for about seven minutes.

Turtles:

During our entire study in the Maskelyne Islands we encountered only five hawksbill turtles and three green turtles. These we observed while diving and manta towing around the fringing reefs. Surprisingly, we did not see any turtles on the Sughulamp Barrier Reef.

According to local reports turtles are hunted for a special feast every February. In the past every village caught over one hundred turtles. Now turtles are protected and the number of turtles for each village is restricted to about fifteen, depending on the size of the village.

Threats to the Reef:

The biggest threat to corals in the Maskelyne Islands appears to be the strong presence of crown of thorns starfish in a few areas. Though inhabiting a relatively small area for now, they could easily spread throughout the reef system. Of the known predators of the crown of thorns starfish (napoleon wrasse *Cheilinus undulates*, the moustache triggerfish *Balistoides viridescens*, yellowmargin triggerfish

Pseudobalistes flavimarginatus, giant triton *Charonia tritonis*, Harlequin shrimp *Hymenocera picta*, fire worm *Pherecardia striata*) only one moustache triggerfish and one napoleon wrasse was observed during our study. Apparently on the Maskelyne Island reefs there is a general lack of crown of thorn starfish predators to keep the population in check.

The ideal solution for the overabundance of crown of thorns starfish is the full protection of its predators. Until those species recover in this area the abundance of crown of thorn starfish should be carefully monitored. Before their numbers seriously increase they should be removed from the reef and carefully dried or burned on land, as they have the ability to regenerate body parts, creating multiple new individuals when severed into pieces.

As crown of thorns starfish populations are out of control in many reefs all over Vanuatu, contributing to the degeneration of these reefs, efforts should be made to control this problem now in its early stages in the Maskelyne Islands.

Another concern is the threat of coral bleaching caused by global warming. It appears that the Maskelyne Islands have been lucky so far and have not yet experienced a serious bleaching event as have many other countries in the South Pacific. As a bleaching event could hit the Maskelyne Islands at any time in the near future, carefully protecting these reefs will be essential to increase their chances for recovery should a bleaching event occur. For this reason a reef with the highest coral diversity and coverage available, with access to upwellings of cooler deep-flowing water, should be selected for full protection. Access to cooler water will provide a chance for some of the coral to be protected from overheating and subsequent bleaching. A high coral diversity will ensure a good stock of many different coral species to repopulate areas where corals have died off.

We recommend selecting parts of the Sughulamp Barrier Reef, the entrance to the Northeast Channel or the diverse reef next to the entrance of the small channel into Pelonk village as marine areas for full protection.

For general recommendations on the sustainable management of your coral reefs and fish stock we attach a photocopy of the WWF Marine Biological Survey Report.