

Son-ok Marine Protected Area Monitoring Results 2011



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1 - Introduction to Coral Cay Conservation

Coral Cay Conservation (CCC) is a not for profit organisation, founded in 1986 by a British scientist. CCC's mission is:

Providing resources to help sustain livelihoods & alleviate poverty through the protection, restoration & management of coral reefs & tropical forests.

In order to achieve this mission, CCC has carried out conservation projects all over the world, including in the Philippines, Belize, Honduras, Malaysia and Fiji. CCC successfully set up Marine Protected Areas and provided scientific data that has been used to manage local marine resources. The project in Danjungan Island in the Philippines between the years 1996-1999 was particularly successful and the reefs around the island received the accolade of Best Managed Reef of the World. Since 1995, CCC has worked with the Philippine Reef and Rainforest Conservation Foundation Inc. (PRRCFI) and local communities to survey and safeguard reef and rainforest areas in the Philippines. To date these have included coastal regions of the Southern Negros Occidental, Anilao, Palawan, Danjungan Island and the forests of North Negros.

At the invitation of the Provincial Government of Southern Leyte, CCC began its survey work in Sogod Bay in September 2002. CCC is conducting a collaborative program to survey the region's coral reefs and provide training and conservation education opportunities for project counterparts. The aim is to develop local capacity and ensure the long-term protection and sustainable use of marine resources throughout Southern Leyte. The project in Southern Leyte has been extended twice, most recently with a move to Napantao in the municipality of San Francisco on Panaon Island in 2008.

The Philippines is renowned for its rich marine environment but with as much as 97% of its reefs at risk, immediate conservation action is needed. Communities living in coastal areas are recognized as the stewards of their marine resources and CCC is working closely with local stakeholder groups to raise awareness and increase understanding of the need for greater conservation efforts in the Philippines.

2 - Marine Protected Areas

MPAs are an important management and conservation tool in protecting existing fish stocks and helping them to recover. In addition to this, they allow coral reefs to grow and protect pristine reefs from harmful human actions. A properly managed MPA can begin to show benefits in just a few years.

Protected within an MPA, fish can grow larger (as they live longer), and a larger fish produces proportionately more offspring than a smaller fish. Eventually, as fish numbers inside the MPA increase, a 'spill over' of fish from within the MPA to outside the MPA allows fishermen to catch more fish in this area and ensures that a healthy fish community remains in the protected area (see Fig. 2.1). One square km of healthy reef can support over 20 tons of fish per year, whereas one square km of damaged or destroyed reef can only produce 3 tons (Bohnsack, 1990).

Community based MPAs have proven to be an effective method of producing sustainable fisheries and maintaining peoples livelihoods. MPAs can provide an income from eco-tourism, with divers paying a small fee to dive within the MPA. As long as the numbers of divers is restricted and diving is done without touching or interacting with the marine environment, the effects of eco-friendly diving have been proven to be minimal.

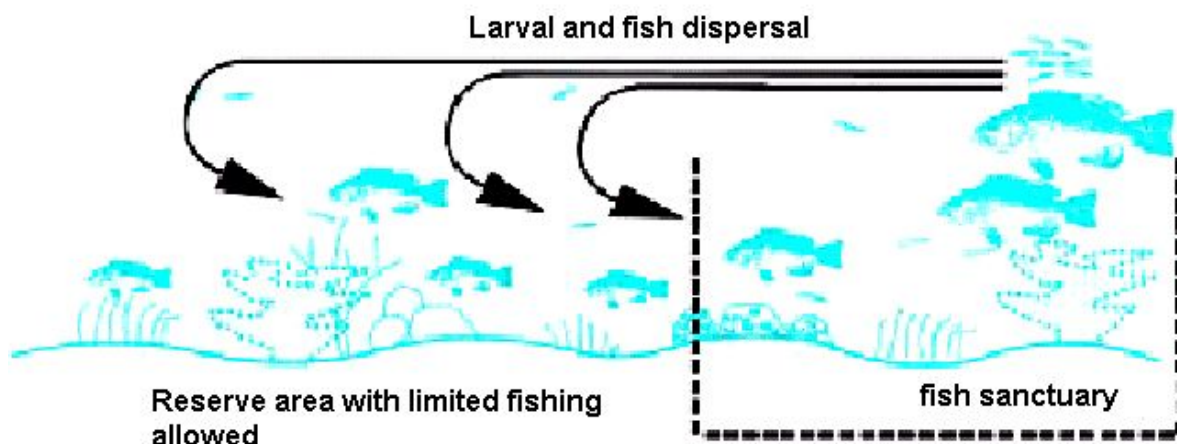


Fig. 2.1. Schematic diagram of MPA functioning. Protected fish in the MPA grow larger and produce more offspring, this leads to 'overspill', increasing fish numbers outside the MPA. In addition, the corals inside the MPA are not disturbed by direct human impacts.

3 – Son-ok MPA

The MPA at Son-ok was established in 1995 and has an area of 8 hectares. At the time that this survey was carried out, the buoys which mark the boundaries of the MPA were not present. A new guardhouse has recently been built and is manned by trained members of the Municipal Fishery Law Enforcement team.

As with other MPAs in the Philippines, the aim of the protected area at Son-ok is to aid the recovery of fish stocks. In addition, a growing tourism industry in the area, offers great potential for income through diving by paying visitors. A population of whale sharks, present seasonally in the ocean around Son-ok, already attracts a number of people every year.

4 - Methods

The designated Marine Protected Area was assessed with 10x 50m full survey transects, in March and April 2011. The surveys were carried out at a depth of 6m due to the topographical nature of the MPA. For comparison, additional 10x 50m survey transects were assessed in an area outside the MPA at a depth of 6m. The survey method closely follows that outlined in the 'Coral Reef Monitoring for Management' book put together by the Marine Science Institute of the University of the Philippines, Diliman; the Guiuan Development Foundation Inc. and the Volunteer Service Overseas (Uychiaoco *et al.*, 2010).

4.1 – Point-intercept transect

For estimating the relative abundance of living and non-living coral on the reef bottom, a benthic point-intercept transect was used by SCUBA divers (figure 4.1 and 4.2). “Benthic” refers to the animal and plant life growing on the seabed. A 50m transect line was laid out along a constant depth 6m. A note was made of the benthic cover every 50cm along the line. The total number of points along the transect line was 100. From these results, the percentage cover of the various substrate types could be calculated. Benthic categories were chosen as follows:

Benthos types			
Hard coral	Sponges	Turf Algae	Rubble
Soft coral	Other animals	Fleshy macroalgae	Rock
Dead coral		Coralline algae	Sand
Dead coral with algae		Seagrass	Silt

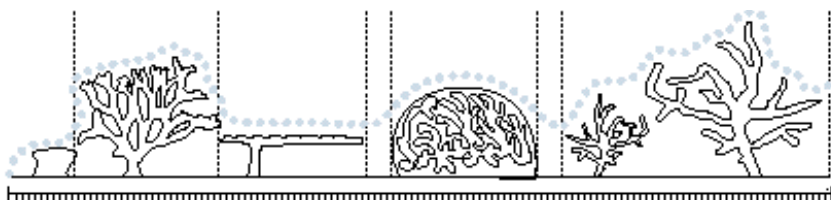


Fig. 4.1. Schematic diagram of a point intercept line laid over different coral lifeforms.



Fig. 4.2. A CCC SCUBA diver laying the transect line during the survey at Son-ok

4.2 – Fish visual census

Fish families were counted and a note was made of their size within a defined area, along the same transect line as used to estimate benthic cover. Two divers swam side by side and counted numbers of target fish 2.5m to either side and 5m above of the 50m transect line (figure 4.2). Swimming speed was controlled and there was a 15-minute waiting period after the line has been laid so as not to

disturb the fish and let them come out of hiding. Fish families that were observed were chosen on the basis that they are (a) good indicator species of reef health or (b) important fish for consumption and hence an indicator of overfishing if their numbers are found to be low, or fishery recovery if their numbers are found to be relatively high. The following families were counted during the surveys:

English name (Scientific name)	Bisaya name
Groupers (Epinephelinae)	Lapu-lapu
Snapper (Lutjanidae)	Maya-maya
Sweetlips (Haemulidae)	Lipti
Emperors (Lethrinidae)	Katambak
Jacks / Trevally	Talakitok
Fusiliers	Dalagang bukid
Coral Breams (spinecheeks) (Nemipteridae)	Silay
Goatfish (Mullidae)	Timbongan
Triggerfish (Balistidae)	Pakol
Butterfly fish (Cheatodontidae)	Alibangbang
Parrotfish (Scaridae)	Mulmul
Surgeonfish (Acanthuridae)	Indangan
Rabbitfish (Siganidae)	Kitong
Rudderfish (Filefish) (Kyphosidae)	Ilak
Moorish Idol (Zanclus cornutus)	Sanggowanding
Angelfish (Pomacanthidae)	Adlo

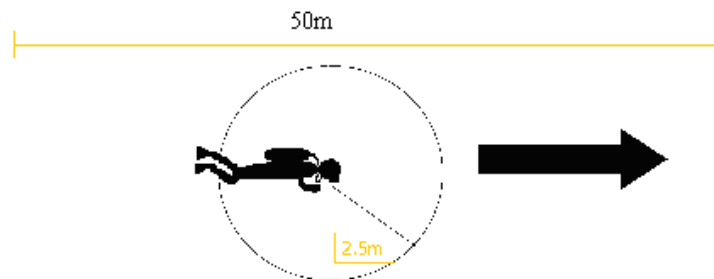


Fig. 4.2. Fish visual survey method used to estimate fish abundance along the 50m line. The diver notes down any target fish seen 2.5m to either side and 5m above.

The size of each fish recorded was also noted as a healthy fish stock will contain individuals of a range of sizes. Additionally, large adults of predatory fish such as lapu-lapu (groupers), maya-maya (snappers) and lipti (sweetlips) will produce proportionally more offspring than smaller individuals and are therefore important in the recovery and maintenance of fish stocks. Size was recorded by class: 1-10cm, 11-20cm, 21-30cm or >30cm.

4.3 – Invertebrate survey

Invertebrate numbers were recorded 2.5m either side of the 50m transect line, a total area of 250m². The species recorded are either commercially important (e.g. giant clams, lobsters, sea cucumbers) or

are good indicators of reef health (e.g. *Diadema* urchins, crown-of-thorns starfish). The species recorded were:

Target invertebrate	Importance
<i>Diadema</i> urchins	Found in high numbers on degraded reefs
Pencil urchins (<i>H. mammilatus</i>)	Commercially important
Crown-of-thorns starfish (<i>Acanthaster planci</i>)	Eat coral, can threaten reefs in high numbers
Giant clam (<i>Tridacna</i>)	Commercially important, now threatened
Triton shell (<i>Charonia tritonis</i>)	Eat crown-of-thorns starfish
Lobster	Commercially important
Sea cucumber (non-synaptid)	Commercially important
Banded coral shrimp (<i>S. hispidus</i>)	Commercially important, eaten by fish
Nudibranch	Indicators of a healthy, diverse reef system
Drupella	Eat coral, can be damaging in high numbers

4.4 – Human impacts and abiotic factors

In addition to the fish, invertebrate and benthic data, another observer made a note of negative impacts on the reef, both natural and human induced. These include:

- SEDIMENTATION Sediment prevents light reaching the corals, restricting their growth and can lead to coral death if severe or prolonged
- BLASTING PATTERNS From illegal dynamite fishing
- ANCHOR DAMAGE From boats mooring inappropriately
- OTHER BREAKAGE Caused by many factors including bad weather or irresponsible diving
- CORAL BLEACHING A reaction to stress, can cause coral death if prolonged
- GHOST FISHING GEAR Fishing equipment abandoned in the area, continues to catch and kill marine animals
- FISH TRAPS Illegal fishing in the MPA
- CORAL DISEASE Caused by many factors, can devastate whole coral communities
- SEAWEED OVERGROWTH Prevents light reaching coral and can lead to death, often caused by low numbers of seaweed-eating fish
- CORAL-EATING SNAILS Can be destructive in high numbers
- CROWN-OF-THORNS STARFISH Outbreaks can destroy entire reefs
- PLASTICS Do not break down quickly, accumulate on reefs and harm corals, fish and other animals

The level of these impacts was graded as 0 – none, 1 – low, 2 – medium or 3 – high.

5 - Results

What follows is a summary of the most important findings from the point intercept transect, belt transect, and general reef health and abiotic (non-living) factors.

5.1 – Benthic cover

Fig. 5.1 shows that the predominant benthic cover both inside and outside the MPA was hard coral (43.9% and 34.4% respectively), while hard coral cover seems higher inside the MPA, the difference is not statistically significant. There were significantly higher amounts of sponges and dead coral with algae inside the MPA (Figure 5.2), while there were significantly higher amounts of sand outside the MPA.

-  Seagrass
-  Turf Algae
-  Silt
-  Macroalgae
-  Other Animals
-  Soft Coral
-  Coralline Algae
-  Dead Coral
-  Sponges
-  Rock
-  Sand
-  Dead Coral with Algae
-  Rubble
-  Hard Coral

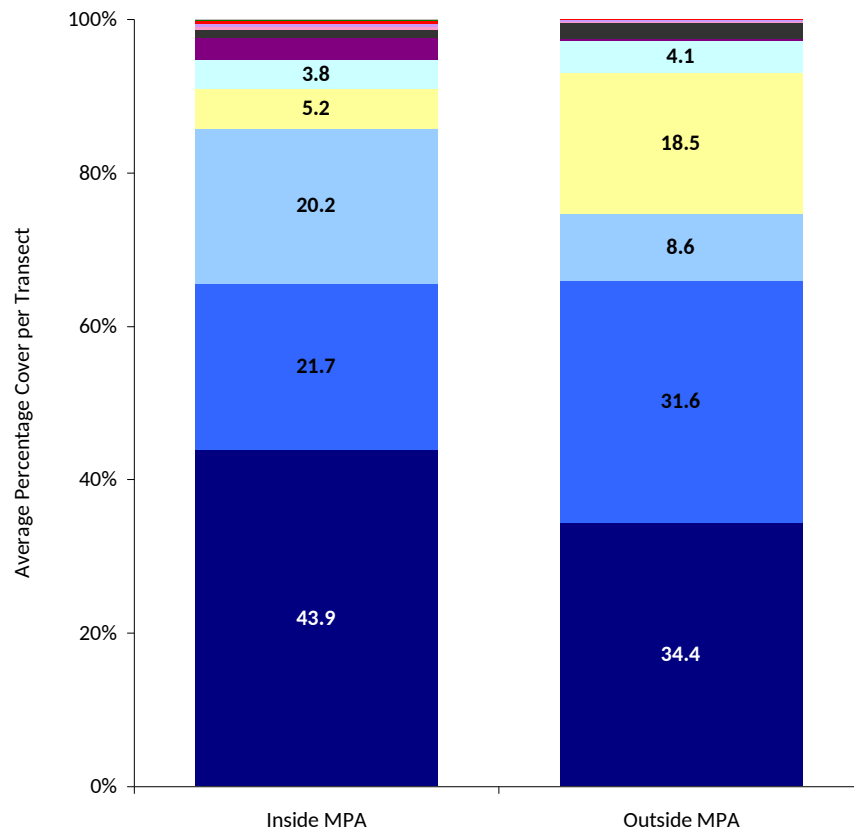


Fig. 5.1. Benthic cover inside and outside the MPA

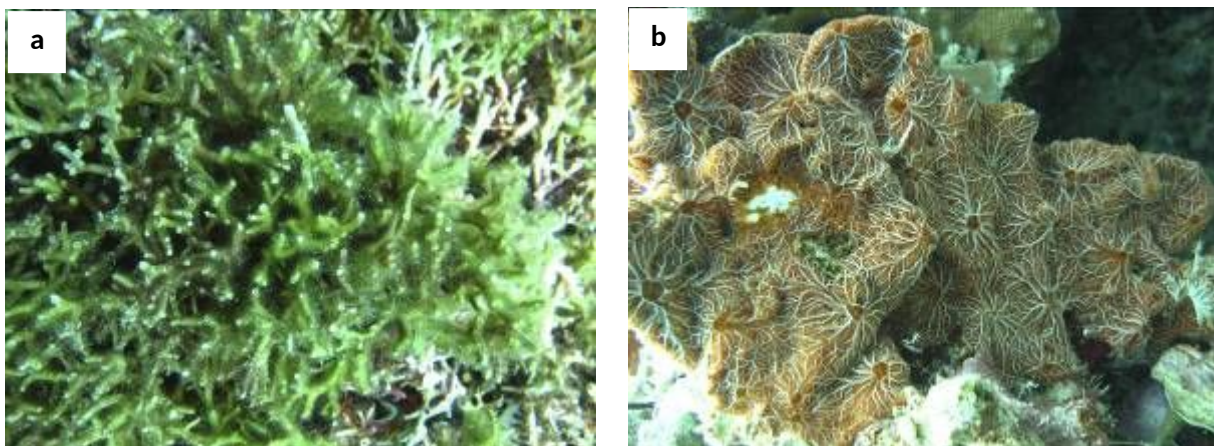


Fig. 5.2. Dead coral with algae (a) and sponges (b) were significantly more abundant inside the MPA

5.2 - Fish abundance

The average number of fish recorded per transect was not significantly different between inside and outside the MPA (81.4 and 70.7 respectively). However, some individual fish families were more common inside the MPA (Figure 5.3). There were significantly higher numbers of maya-maya (snappers), alibangbang (butterflyfish) (Figure 5.4), indangan (surgeonfish) and kitong (rabbitfish) inside the MPA. Outside the MPA there were significantly higher numbers of timbongan (goatfish).

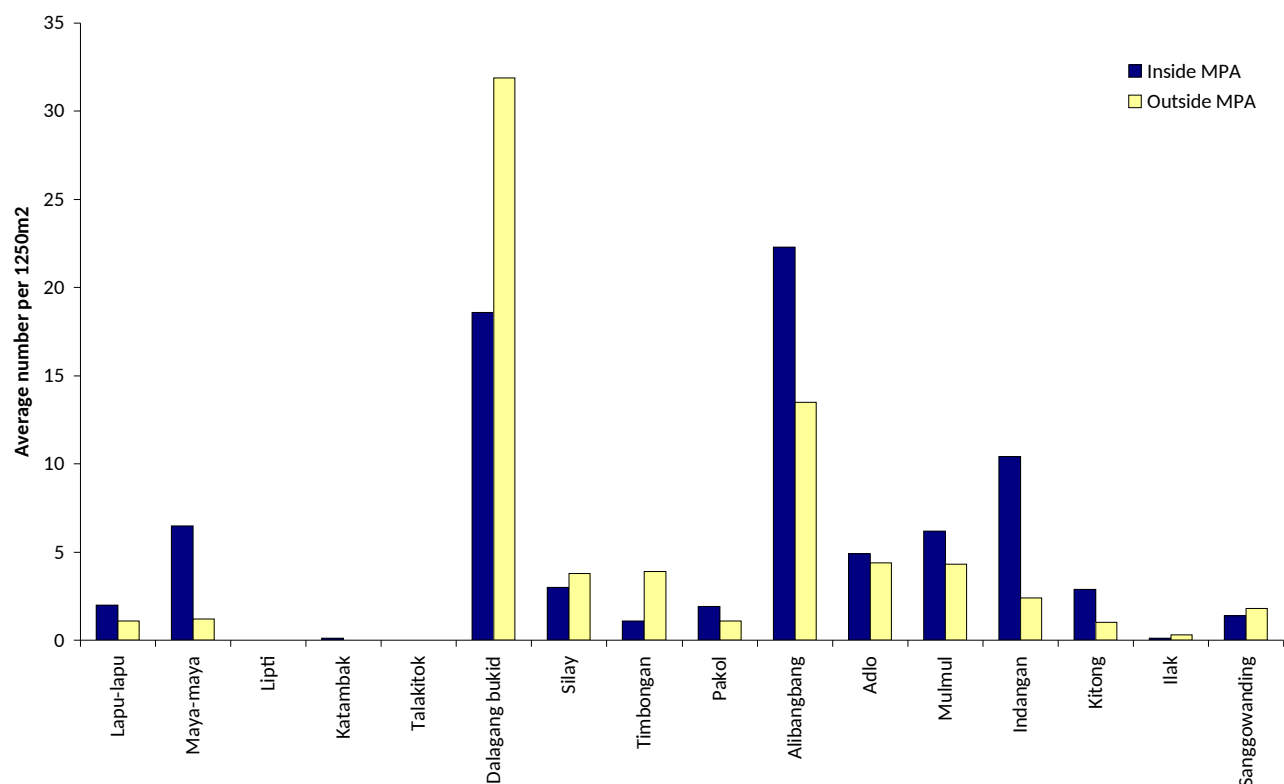


Fig. 5.3. Average number of fish in target families recorded per transect inside (blue) and outside (yellow) the MPA

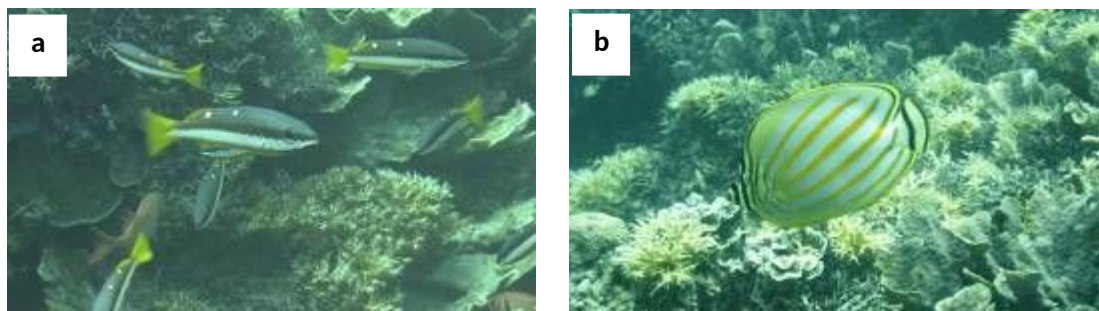


Fig. 5.4. Significantly higher numbers of (a) maya-maya (snappers) and (b) alibangbang (butterflyfish) were recorded inside the MPA.

The majority of fish recorded, both inside and outside the MPA, were in the 1-10cm size class (45.8% and 74.7% of recorded individuals respectively). However, there were more larger fish inside the MPA, with significantly higher numbers of individuals in the 11-20cm and 21-30cm size class inside the MPA (Figure 5.5). No fish were recorded in the >30cm class outside the MPA and only a small number were recorded in this class inside the MPA.

a

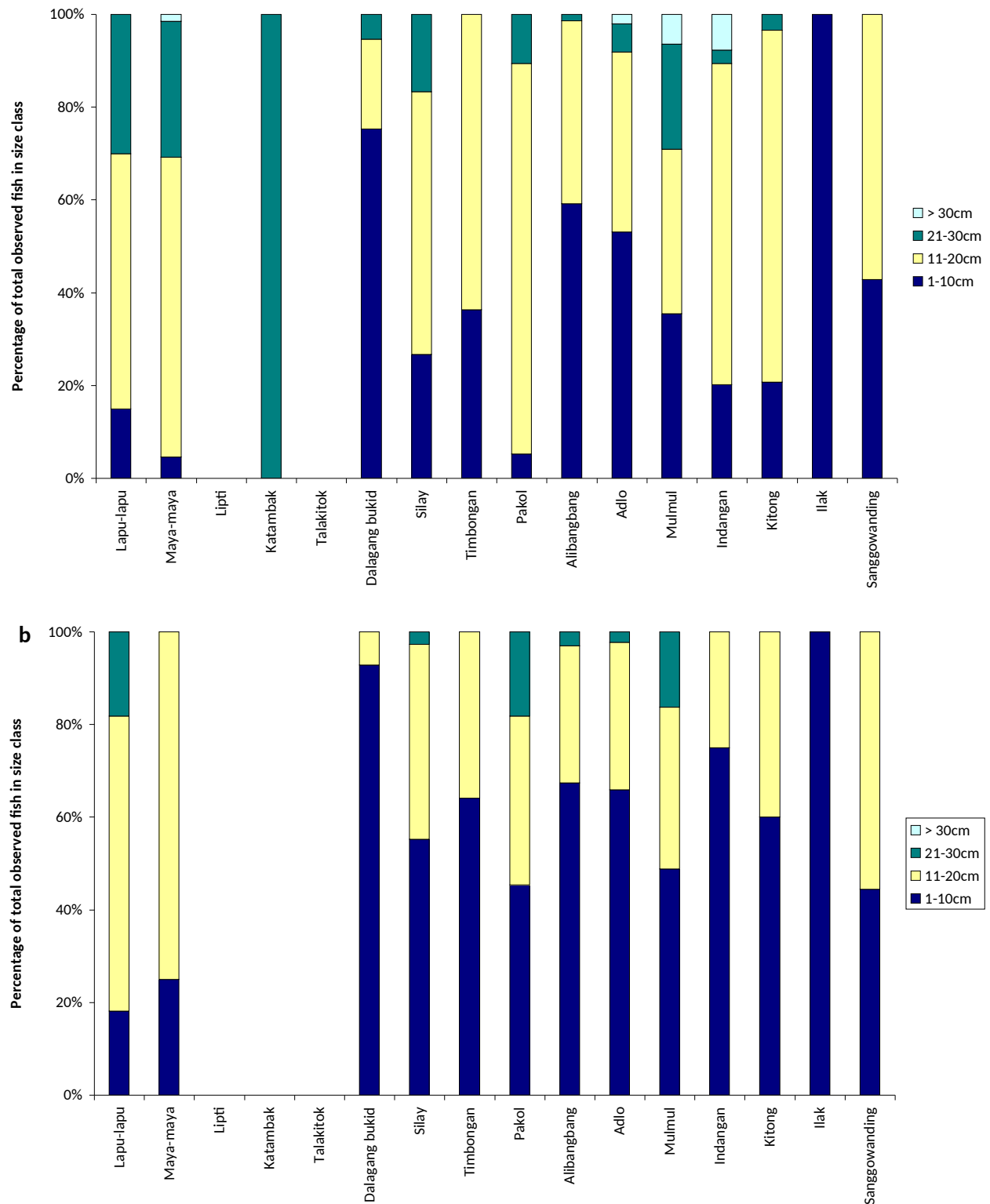


Fig. 5.5. Proportion of fish in target families in each size class **(a)** inside and **(b)** outside the MPA.

5.3 - Invertebrate abundance

Figure 5.6 shows the abundance of invertebrates inside and outside the MPA. There was no significant difference between the numbers of any invertebrate recorded inside and outside the MPA. The most common invertebrate recorded inside the MPA was drupella (coral eating snails, an average of 11.1 per transect), while long spine sea urchins were most common invertebrate outside the MPA (an average of 8.7 per transect). Recorded numbers of other invertebrates were relatively low in both locations.

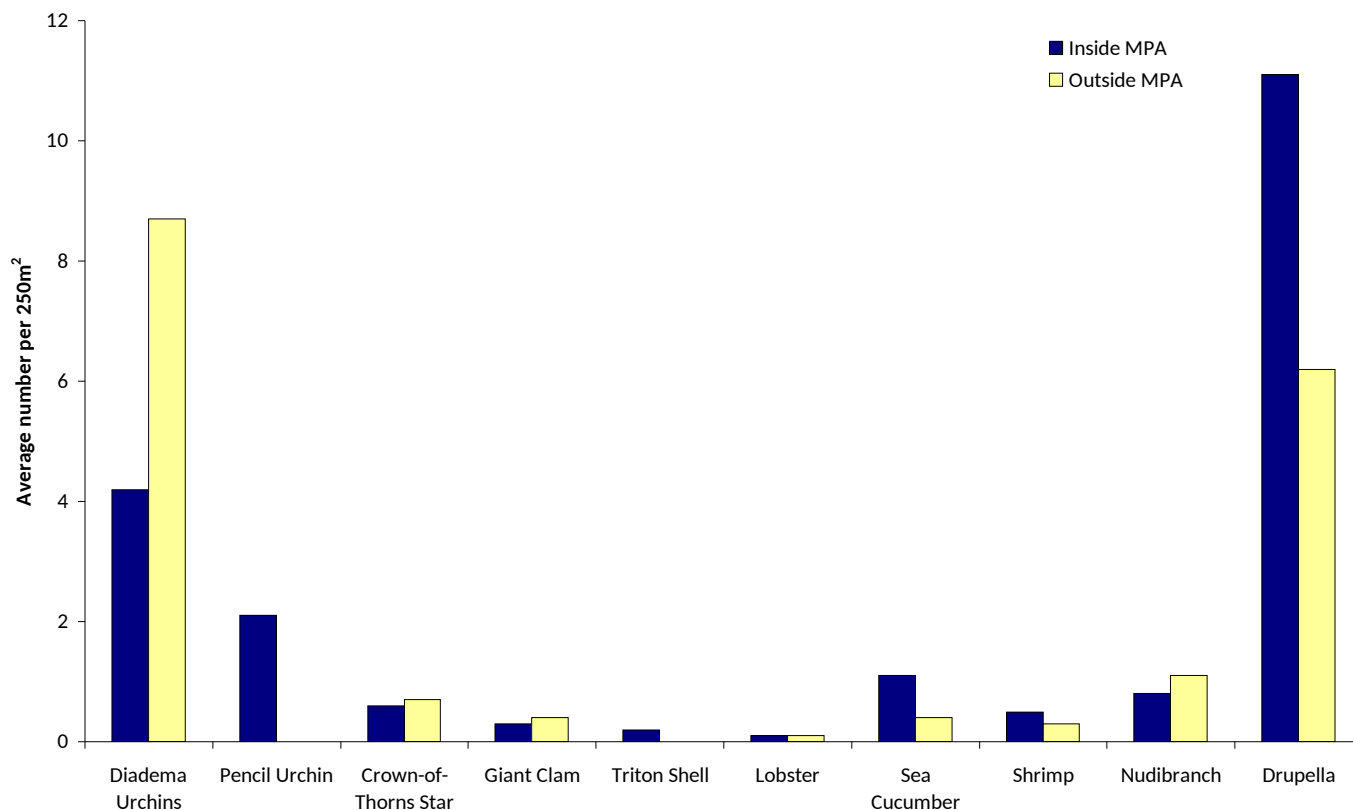


Fig 5.6. Average number of individuals in target invertebrate groups per 250m² inside (blue) and outside (yellow) the MPA.

5.4 – Human impacts and abiotic factors

Anthropogenic and abiotic impacts were low both inside and outside the MPA, with average levels below 2 for all impacts (Figure 5.7). The main impacts inside the MPA were coral breakage and coral eating snails (average impact level of 1.2 and 1 respectively), while outside the MPA the main impacts were coral breakage and coral disease (average impact level of 1.4 and 0.9 respectively). Fish traps were recorded inside the MPA, as was ghost fishing gear (abandoned lines and nets which continue to catch and kill fish and other marine animals, as well as damaging coral).

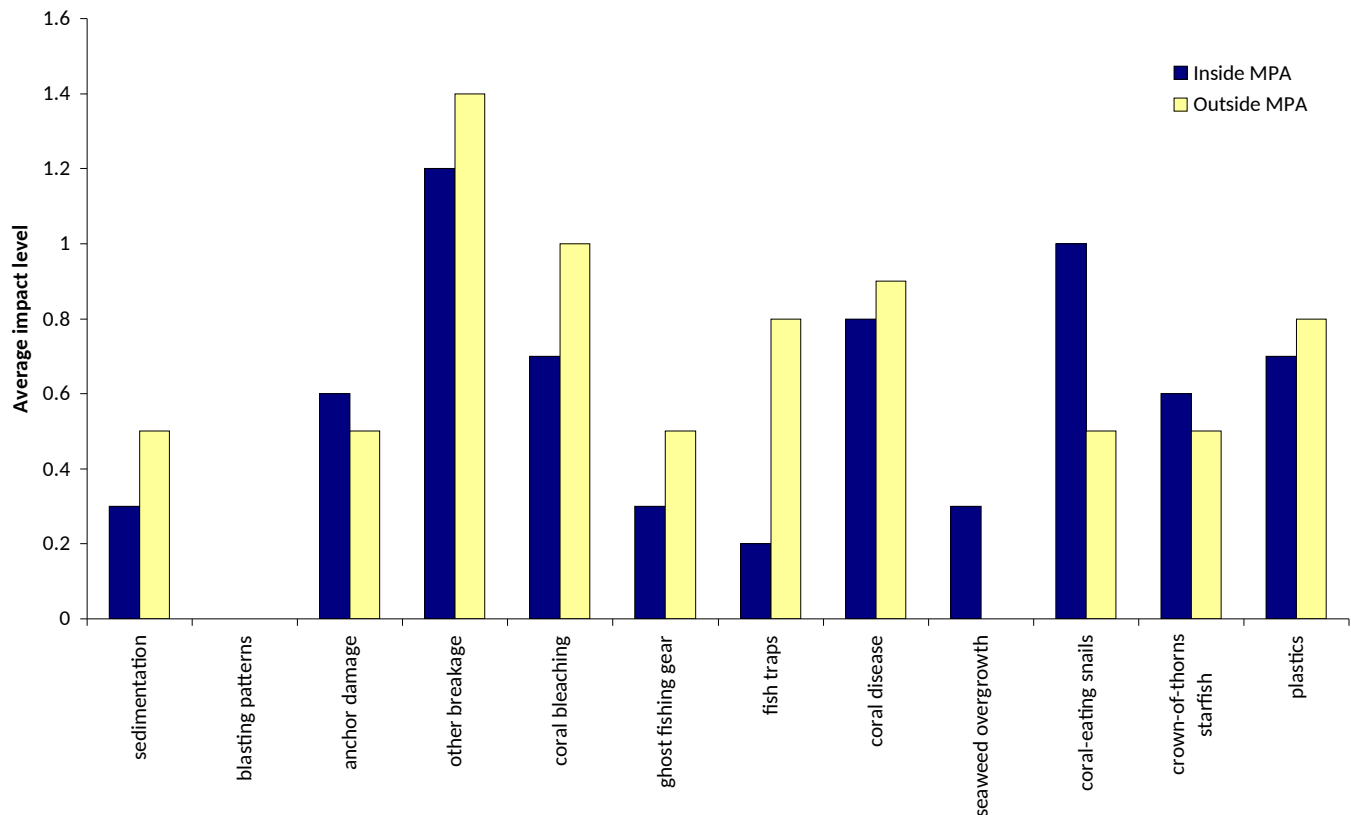


Fig. 5.7. Average level (0 - none, 1 - low, 2 - medium, 3 - high) for negative impacts on the reef inside (blue) and outside (yellow) the MPA.

6 - Conclusion and recommendations

The overall health of the reef in the Son-ok MPA is good, however the high levels of dead coral with algae may be cause for concern. This may be an indication of past or ongoing stress to the coral (although recorded levels of recently killed coral inside the MPA were low, which would imply that the reef is not currently under stress). Since coral requires a hard substrate on which to grow, it is possible that the dead coral will provide a suitable substrate on which new colonies could establish, thus leading to an increase in hard coral cover. The high levels of sand outside the MPA on the other hand, would not provide a suitable habitat for hard coral growth, thus making increases in hard coral cover outside the MPA less likely.

The fact that the overall abundance of fish recorded was not significantly greater inside the MPA than outside may be an indication of ongoing fishing pressure in the MPA, or alternatively could indicate that an overspill effect is occurring. It is not possible to establish which of these scenarios is more likely with the data currently available, ongoing biological and social monitoring is required to determine this. The community structure of the fish inside and outside the MPA is different however. The significantly higher numbers of maya maya (snappers) and alibangbang (butterflyfish) inside the MPA are particularly interesting. Maya maya are an important food fish that are caught by fishermen and the higher numbers inside the MPA indicate that the protection of the MPA is working and the

population is increasing. Alibangbang are not caught for food but they are biologically important and are used as an indicator of a healthy reef system. They feed on coral and therefore are only found in large numbers in areas where there is a healthy reef present. The significantly higher numbers recorded inside the MPA are an encouraging sign that the reef there is in good health. The significantly higher numbers of timbongan (goatfish) recorded outside the MPA can be explained by the higher levels of sand in this area, since timbongan feed on small animals which live in soft, sandy sediments.

While, in terms of percentage of individuals recorded, the most prevalent size class both inside and outside the MPA was 1-10cm, inside the MPA there were significantly higher numbers of individuals in the 11-20cm and 21-30cm classes. This means that the fish inside the MPA are generally larger than those outside. As discussed in section 2, one aim of an MPA is to allow fish to grow larger, as a larger fish can produce more offspring. In this sense, it appears that the MPA at Son-ok is working. However, it is important to note that very few fish were recorded in the >30cm size class, and it is likely that the recovery process is still ongoing.

The range of invertebrates recorded both inside and outside the MPA shows a diverse communities in these areas. Particularly encouraging are the sightings of lobsters and triton shells, both of which are biologically or commercially important but are now extremely rare as they have usually been fished out. The numbers of *Drupella* snails inside the MPA are to be expected given the levels of coral cover and are not a cause for concern. Interestingly, the community structure for invertebrates is very similar inside and outside the MPA and overall numbers recorded are relatively low. Again, it is possible that the recovery process in the MPA is still ongoing or that an overspill effect is occurring, and further research would be required to establish which is more likely to be the case.

The levels of anthropogenic and abiotic impacts were low both inside and outside the MPA, and generally not a cause for concern.

Following here, a brief list of issues that the management is encouraged to consider.

While the size of fish inside the MPA is increasing, it is not possible to determine whether an overspill effect is occurring and it important to realise that even a small number of violators can have a serious impact on the success of an MPA. Strict enforcement of the rules and regulations is essential if the MPA is to reach its full potential. This is best achieved through the use of the guardhouse and the availability of a patrol boat. It is crucial that MPA wardens (bantay dagats/local police/coastguard) watch the area at all times and make sure there are no violations such as illegal fishing and passage inside the MPA. Coupled with this, an effective system for recording and logging any violations should be used. A full time warding system can create costs that the LGU can't afford; it's been shown in many cases that volunteer-based warding can be effective. However, the commitment of the wardens should be regularly assessed.

In order to discourage violators, it is essential to have simple, understandable rules that are extensively explained to the community. Misunderstanding is a source of frustration and may undermine the support of the community. Boundaries of the protected areas, indicated by marker buoys as well as on-land references, need to be clear and explained to the community. Marker buoys, unfortunately, do incur maintenance costs and have the irritating habit of being washed away by wave action. Wherever possible, natural features shall be used as supplementary signs. In our experience, it

is well worth investing an initial considerable budget to install structures that are durable and long-lasting, rather than having to spend a fair amount of money every year to maintain a cheaper but less solid initial set up.

Another important step would be to establish a consistent monitoring scheme in order to determine whether there are any changes in hard coral cover, fish size and abundance, and invertebrate abundance over the years. This will enable managers to determine whether the reef health is improving or declining and adapt their strategy accordingly. Ideally this should be carried out at least annually by trained stakeholders and members of the local community. The results of these surveys should be presented to the community of Sonok and the surrounding barangays to enable the people to see whether the MPA is benefiting them and how. Social surveys are very valuable in order to get a better picture of community awareness, appreciation and opinions about the MPA. The community must remain involved in future decisions and their voice should be heard. Without the support of the community in and around Son-ok, the MPA cannot work.

The local stakeholders should identify partners able to provide support and specific training for the MPA managers. While NGO's can be of great help in the short term, the long term partnership should be with provincial and national agencies such as PENRMO and DENR. The Provincial Environment and Natural Resources Management Office in particular, being the body in charge of the MPA's management in the whole province, should also be notified of major initiatives concerning the MPA and its management. It is our opinion that the long experience with the topic makes this office a strong ally to face the challenges of managing an MPA.

The MPA at Punta was established only 2 years before this survey was carried out but these results show that recovery has already begun, especially of fish stocks. With good a good monitoring and management system in place, the MPA at Punta has the potential to be extremely successful and beneficial to the local community.

7 - Visual Assessment

The following images were taken during the surveys at Son-ok.

7.1 - Outside the MPA



Fig. 7.1. View of the area outside the MPA showing patchy hard coral cover and abandoned fish trap



Fig. 7.2. Abandoned fish trap (top right) with dead tabulate coral. The damage to the coral was likely caused by the fish trap.



Fig 7.3. Crown of thorns starfish. The recorded numbers of these coral-eating animals were low.



Fig. 7.4. Some plastic litter was recorded both inside and outside the MPA, but the overall impact level was low.



Fig. 7.5. Outside the MPA was mostly patch reef interspersed with sand.

7.2 - Inside the MPA



Fig 7.6. Hard coral cover inside the MPA was good.



Fig. 7.7. The reef inside the MPA is in good general health.



Fig. 7.8. Nudibranch (sea slug), one of several species recorded inside the MPA which are interesting to divers.



Fig. 7.9. The invertebrate community inside the MPA is diverse.



Fig. 7.8. Giant clam, a commercially important invertebrate recorded inside the MPA.

8 - References

Bohnsack, J.A. (1990). The potential of marine fishery reserves for reef fish management in the U.S. Southern Atlantic. NOAA Technical Memorandum NMFS-SEFC-261, Miami, USA

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