Biological Surveys of Nimpal MPA and its Reference Site in Yap State, Federated States of Micronesia

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INTRODUCTION

In recent years, there has been a move by coastal communities around the world to designate areas for conservation or protection. In Micronesia, there has been similar efforts made by the islands to protect their nearshore marine resources from overharvesting. Because most protected areas in Micronesia have been designed to preserve or recover locally important species, managers of these sites want information that can help them to make educated decisions towards achieving specific objectives. Valuable information to assist them can be extracted from data collected through monitoring activities by local resource agencies and communities. At the regional level, data collected in Micronesia can provide a larger picture of the dynamics of ecological communities throughout the islands, as well as assist in the regulation of regionally connected species.

In 2006, the 5 jurisdictions within the Micronesia region launched the Micronesia Challenge, a commitment to "effectively conserve 30% of nearshore marine and 20% of the forest resources across Micronesia by 2020". Today, there are over 150 Marine Protected Areas in the region, from small community-based sites to areas that encompass entire islands and surrounding reefs. Some protected areas were established and are enforced through traditional means, while others have been created through legislation and are policed by trained officers on salary. Although there is a recognized need for accurate information on the state of these areas, there is no complete information on how much monitoring has been conducted to provide managers with useful information. For a number of these areas, little monitoring has been done, due to limited resources and manpower. Periodical surveys to collect useful data require specialized methods and skilled individuals.

Since the declaration of the Micronesia Challenge, there have been efforts to document each of the jurisdiction's progress towards achieving the MC goals. One of such efforts was the formation of an MC Marine Measures Group comprised of individuals, agencies and organizations who are directly implementing monitoring activities. This group was tasked to identify a minimum set of indicators and standardize methods that will consistently be applied across MPAs in Micronesia. During the 2nd MC Measures Workshop, these set of indicators and methods were agreed to by all the jurisdictions.

Palau International Coral Reef Center (PICRC), through the Capacity Enhancement for Coral Reef Monitoring project supported by Japan International Cooperation Agency (JICA), set out to test these methods across MPAs across Micronesia. The selection of the MPA sites was based on ease of access and recommendations from PICRC partners in each of the islands. A total of 14 MPAs were surveyed along with their reference sites. Four of the sites were in Palau, one site in Yap, and 3 sites were selected in each of the islands of Chuuk, Pohnpei, and RMI. Although the team also aimed to identify issues and challenges in consistently applying the methods, this report only covers the survey data collected in Yap.

METHODS

Study Sites

Nimpal MPA, located in Yap State, Federated States of Micronesia, was the site for our surveys (Fig. 1). The surveys were conducted from March 7-10, 2011.

Nimpal MPA was established in 2008 by the communities of Kaday and Okaw. All

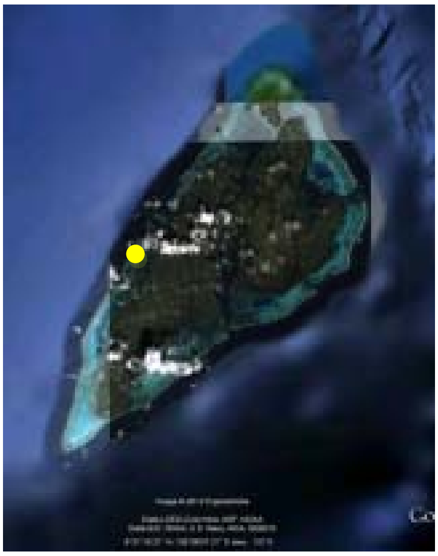

Fig. 1. Image of the main island of Yap, with yellow dot indicating location of Nimpal MPA.

Fig. 2. Image of Nimpal and its reference Gachug stations

forms of fishing are banned inside the MPA, but passage or other non-extractive activities are allowed. Nimpal MPA includes the channel, the outer reef and the reef flats on both side of the channel. The total size of Nimpal MPA is 77 ha.

Three stations were established on the outer reefs of Nimpal and two stations were established in the channel, at opposite sides. At the reference sites in Gachug, stations were established in similar locations, three on the outer reef and two in the channel (Fig. 2).

Benthic and Fish Surveys

In each station, 5 50 x 5 m belt transects were surveyed at the depth of 10m for size and density of commercially targeted fish species. Commercially targeted macro-invertebrates were also surveyed along the five transect, using a reduced belt width of 2 m. Benthic cover and richness was estimated by photographing 50, $0.25m^2$ quadrats on every meter of the transect tape. The photograph were analysed using CPCe from 5 random points in each quadrats. The diameter and genus of all juvenile corals between 0.5 - 5 cm were recorded using visual surveys along 0.3 m either side of the first 10 m of each transect.

RESULTS

Benthic Assemblages

Mean coral cover at the channel in Nimpal MPA was 27.4%, which is significantly lower than the 44.4 % coral cover at the reference site (Fig.3a). At the exposed side of Nimpal MPA, coral cover was 30.5%, while the reference site had coral cover of 25.2% (Fig. 3b). Coral richness as measured by the different number of coral genera was significantly higher in the reference site than Nimpal, at both the channel and exposed reefs (Fig. 4a and 4b).

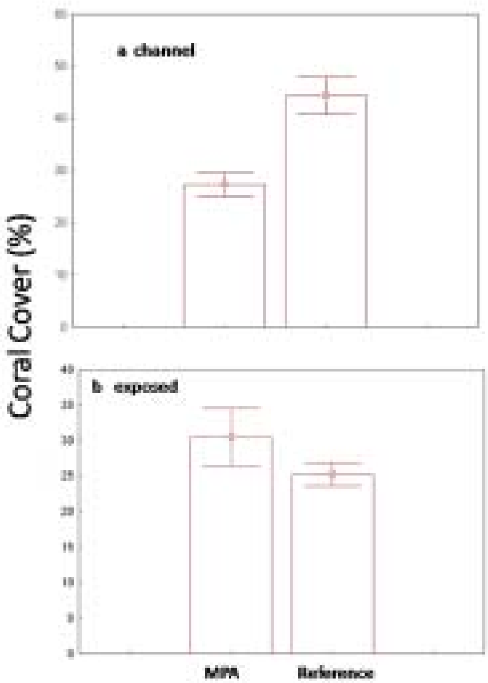

Fig. 3. Coral cover in the MPA and reference site at the a) channel and b) the outer reef.

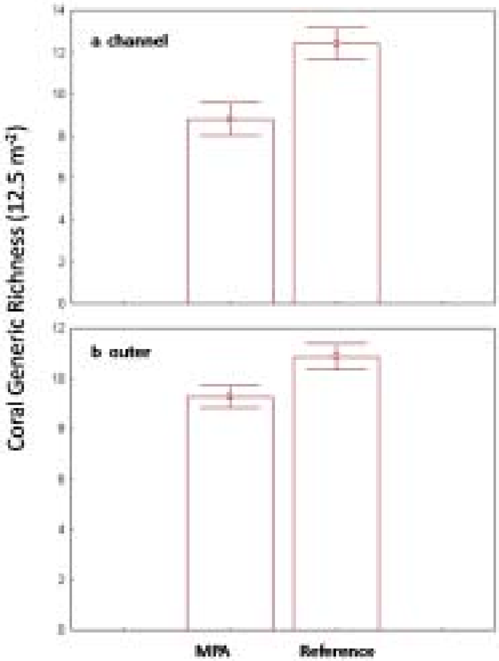

Fig. 4. Coral generic richness at Nimpal and reference site in the a) channel and the b) outer reefs.

The density of coral recruits in Nimpal at the channel was 7.1 recruits $3m^{-2}$, slightly higher than the reference site, which had a density of 4.6. Recruit density at the outer reefs of both Nimpal (24.9) and reference (30.0) were not significantly different, but the outer reefs had much higher recruitment than the channel (Fig. 5).

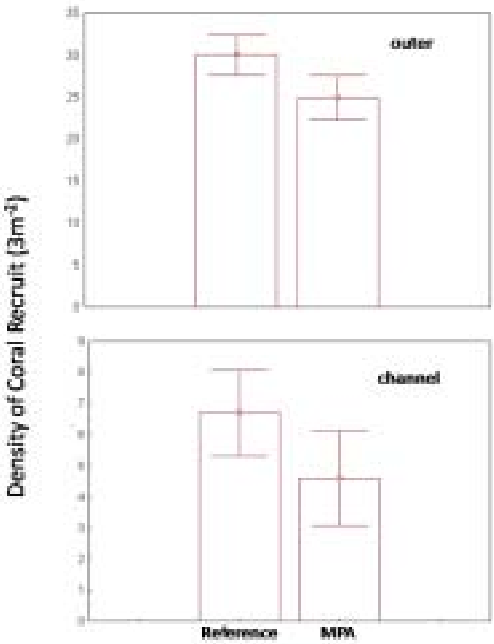

Fig. 51. Density of coral recruits in Nimpal and the reference site at the a) outer reef and b) channel.

Recruit richness followed the same pattern is the recruit density, showing higher richness in the outer reef compared with the channel (Fig. 6). At both the outer reef and the channel, there were no significant different in recruit richness between Nimpal and the reference site (Fig. 6).

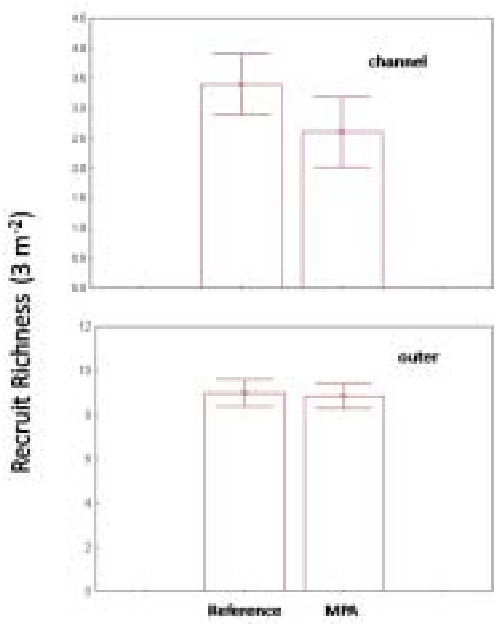

Fig. 62. Recruit richness in Nimpal and reference site in the a)channel and b) outer reef.

The densities of invertebrates at the channel and inner reefs were not significantly different in the MPA compared with the reference site (Figs. 7a, 7b). But at the outer reefs, there were significantly higher number of invertebrates at the reference site compared with the MPA, with densities of 4.2 invertebrates per stations in the reference site while the MPA only had densities of less than one (Fig. 7c).

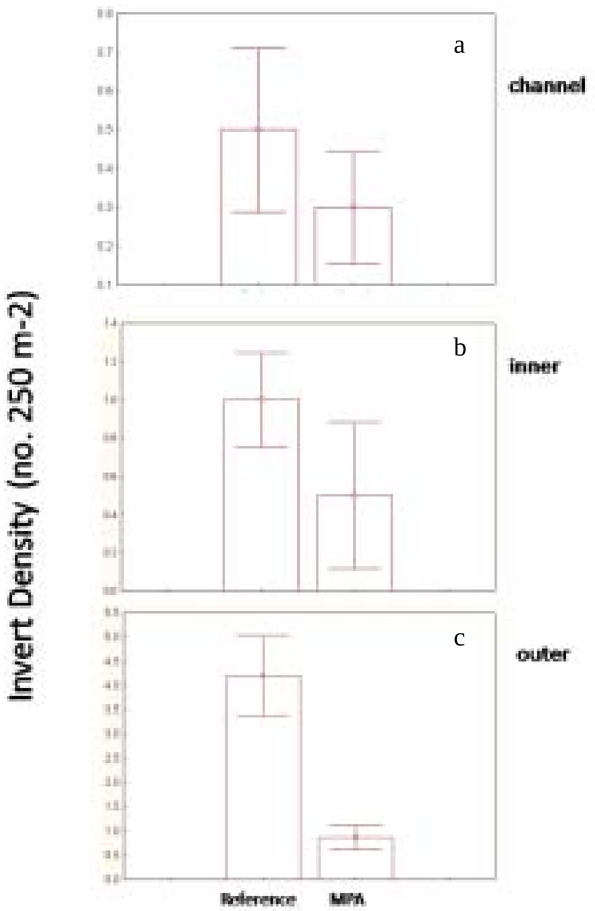

Fig. 7. Macroinvertebrate density in Nimpal and reference site at the a) channel, b) inner, and c) outer reefs.

Fish Assemblages

Fish density at the channels was twice as much in Nimpal MPA compared to its reference site, with densities of 20.2 and 9.3 per 250 m^{-2}, respectively (Fig. 8a). The inner reefs also had higher fish densities in the MPA (23.1) compared with the reference site (16.0) (Fig. 8b). Fish densities at the outer reef was not significantly different in the MPA compared with the reference site (Fig. 8c). Fish densities in the outer reefs were higher than both the channel and the inner reefs (Fig. 8).

Fish species richness was not significantly different between Nimpal MPA and the reference site in the channel (Fig. 9a). At the inner reefs, richness was higher in the MPA, while at the outer reef, the richness in the reference site was higher than the MPA (Fig. 9b and 9c).

Fish biomass was significantly higher in Nimpal MPA compared with the reference site at all habitats. There were also significant differences in biomass among the habitats. (Fig. 10). At the channel, fish biomass in the MPA was almost four times higher than the reference site, with biomass at 9.9 and 2.6 kg 250 m^{-2}, respectively (Fig. 10a). The difference between MPA and reference site was even higher at the inner reefs, with the MPA having over seven time higher biomass than the reference site (Fig. 10b). At the outer reefs, biomass in the MPA was 2 time higher than the reference site.

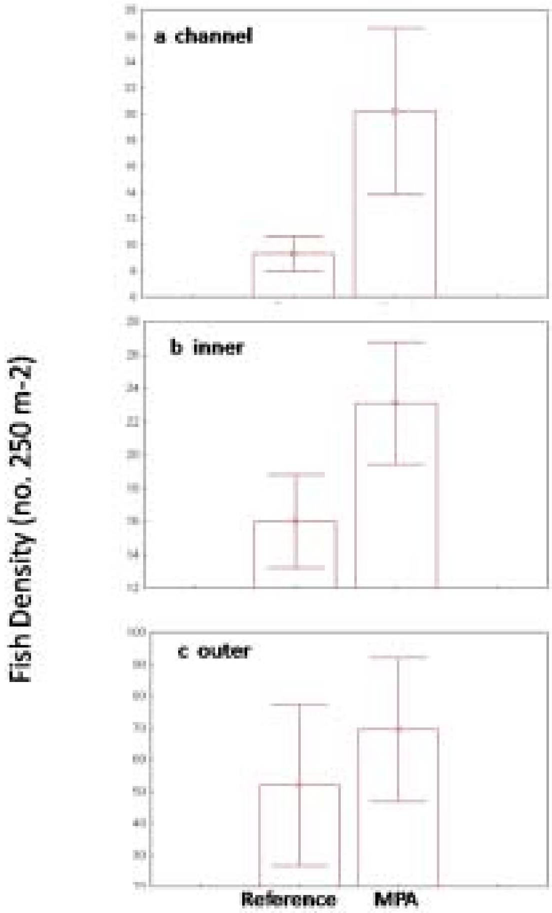

Fig. 8. Fish density at Nimpal MPA and its reference site at the a) channel, b) inner and c) outer reefs.

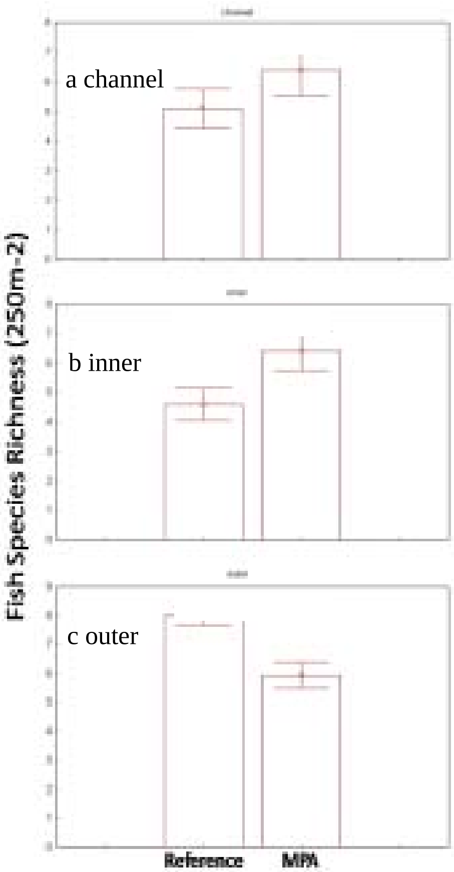

Fig. 3. Fish generic richness in Nimpal MPA and reference site at the a) channel, b) inner and c) outer reefs.

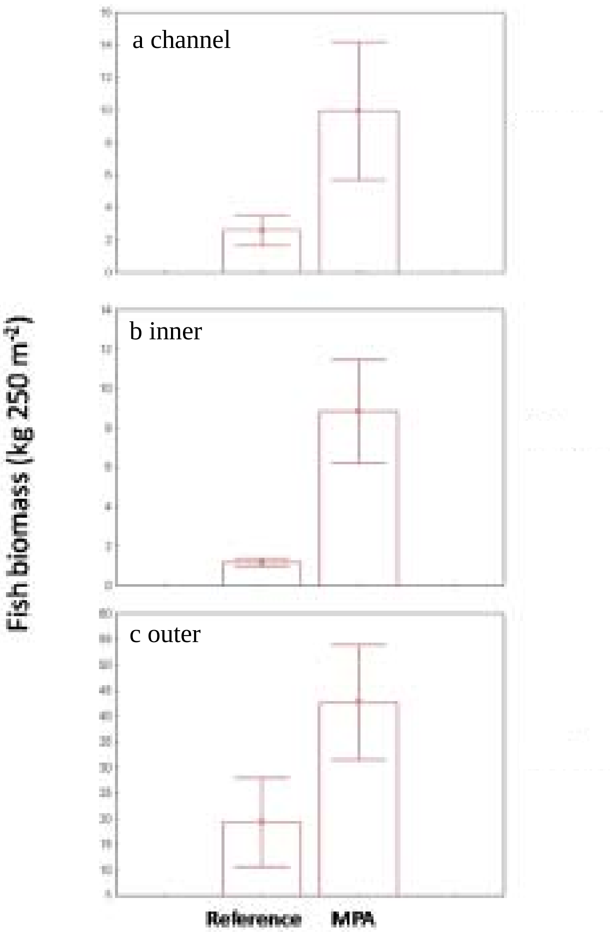

Fig. 4. Fish biomass in Nimpal MPA and reference site at the a) channel, b) inner and c) outer reefs.

DISCUSSION:

While it is evident from the biomass data that Nimpal MPA is very effective in conserving fish resources, it is important to continue to monitoring the MPA to assess trends in resource condition over time. Coral condition did not seem to be related to protection status, and both Nimpal MPA and its reference site have good coral cover. The channel at the reference site has amazing coral cover with huge colonies of the delicate foliose corals.

Since Nimpal has three different habitats, it is important to sample the different habitats because our results show that conditions in the three habitats are very different. While the channel has good coral cover, recruitment is low and therefore if disturbance occur that damage corals in the channel, it will be hard to recover. In contrast, the outer reefs had good coral condition and good recruitment, therefore indicating that it be able to recover better from disturbance than the channel. Not only was coral condition better at the outer reefs, the fish density and biomass was also higher at the outer reefs.

Nimpal Conservation Area lies in close proximity to land and therefore is vulnerable to impact from land activities. Management at Nimpal seem to be very successful in increasing fish resources in the MPA, they must also allocate some resources and efforts to ensure that threat outside of the MPA, such as land activities, are addressed so that the resources in the MPA will continue to be protected, making Nimpal MPA one of the most successful MPA in the Micronesia region.

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