Biological Surveys of Three MPAs and their Reference Sites in Pohnpei 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 have 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 ecological 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 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.

In an effort to ascertain the overall capacity of monitoring protected natural resources in Micronesia, PICRC set out to get a perspective on sites and how the protected areas in the region are being monitored and whether the data collected was being stored and utilized. Additionally, the team aimed to ensure that all the jurisdictions were applying the 'minimum standard' methods for conducting ecological surveys in the region based on the methods agreed upon during the 2nd MC Measures Workshop in February 2010. With these goals in mind, the team set out to the various islands of Micronesia to calibrate techniques and assist in filling any training gaps needed by each jurisdiction. Outlined in the following trip reports are results of the survey activities and lessons learned, which can be used in the future to help resource agencies and communities design and implement their monitoring activities.

METHODS

Study Sites

Survey was conducted between February 10 and 18 in the Pohnpei State of FSM (Fig.1).

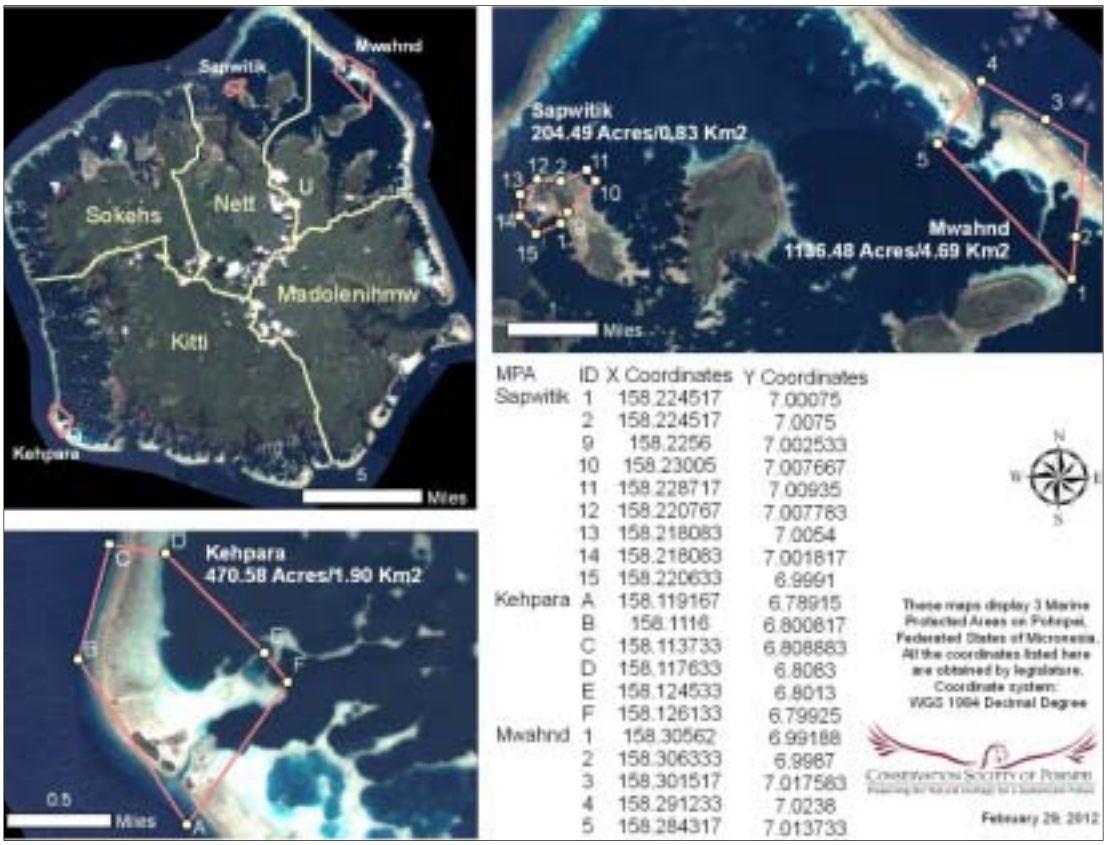

Fig. 1. Image of Pohnpei. Image taken from Conservation Society of Pohnpei.

Three MPAs (Sapwitik, Mwahnd, and Kehpara) and similar reference sites were surveyed for this work. Sapwitik is a fringing reef of Lenger island located in the northwest side of the lagoon with a size of 204.49 acres. In 2001, it was established as a MPA and closed to all form of fishing activities. Mwahnd is a MPA on the barrier reef on the northeast side of Pohnpei with a size of 1,136.48 acres. It was closed in 2001 to all form of fishing and extractive activities. Kehpara MPA has the size of 470.58 acres, and is located on the southwest side of Pohnpei on the barrier reef, and includes both the lagoon and outer reef. It was officially added into the Marine Sanctuary and Wildlife Refuge act in 1999, and closed to all form of fishing activities. For each MPA, we selected a reference site that had similar characteristics but was open to fishing without any form of restrictions.

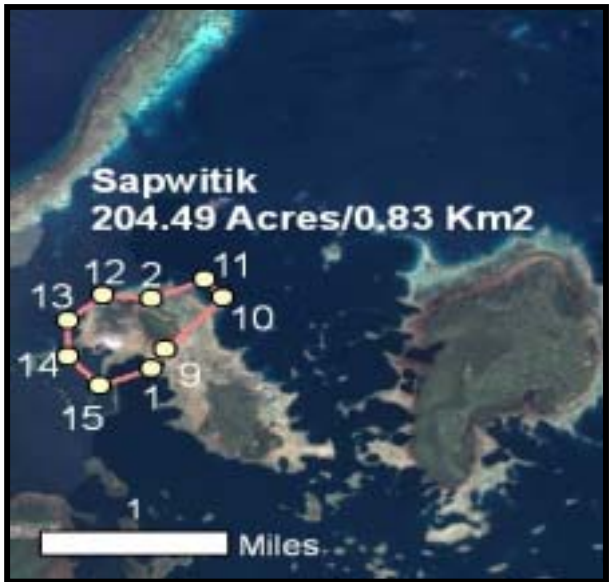

Fig. 2. Image showing location and boundary of Sapwitik MPA. Image taken from Conservation Society of Pohnpei.

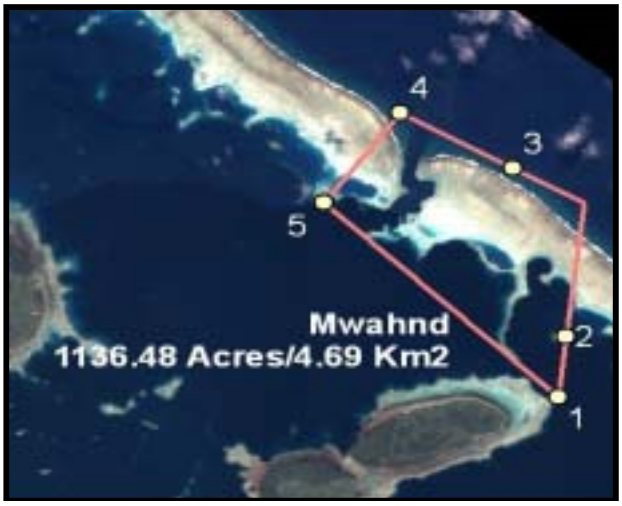

Fig. 3. Image showing location and boundary of Mwahnd MPA. Image taken from Conservation Society of Pohnpei.

Fig. 4. Image showing location and boundary of Kehpara MPA. Image taken from Conservation Society of Pohnpei.

Benthic and Fish Surveys

Within the MPAs of Sapwitik and Mwahnd and their reference sites, 3 stations were established in a fringing and barrier reef, respectively. For Kehpara MPA, which includes areas inside the lagoon on the outer reef, two stations were established inside the lagoon and two stations were established on the outer reefs. References for both the lagoon site and the outer reef site were also established. In each station, 5 50 x 5 m belt transects were surveyed for fish size and density. Commercially targeted macro-invertebrates were also surveyed along the five transects, at the depth of 10 m 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 photographs were analysed using CPCe from 5 random points in each quadrats.

RESULTS

Benthic Assemblages

Mean coral cover at Sapwitik MPA was 32% compared with the reference site, which had a coral cover of 27% (Fig.5a). At Mwahnd MPA, coral cover was 31% inside the MPA and 24% outside of the MPA in the reference site (Fig.5b). Coral cover at the lagoon side at Kehpara MPA was 28%, which was significantly lower than the reference site that had a coral cover of 42%. (Fig.5c). On the exposed side of Kehpara, coral cover in the MPA was 24% while the reference was 13%. Coral coverage was not significantly different in the MPA and reference site; but was significantly lower on the lagoon side at Kehpara MPA.

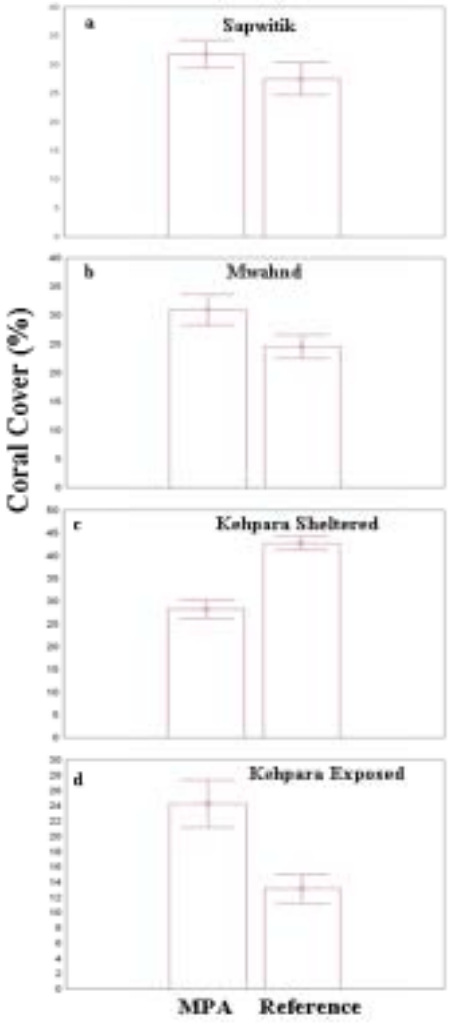

Fig. 5. Coral cover at reference and MPA site at (a) Sapwitik, (b) Mwahnd, (c) Kehpara Sheltered and (d) Kehpara Exposed. Error bars indicate standard errors.

Coral Richness at Sapwitik MPA and its reference sites was 6.7 and 7.1 genera per stations, respectively (Fig.6a). Similarly at Mwahnd, there was no significant difference in coral richness between the MPA (7.9) and reference site (9.2) (Fig. 6b). The richness at Kehpara MPA in the lagoon side was similar inside and outside the MPA (Fig. 6c). At the exposed side of Kehpara, richness was higher in the reference site (6.4 genera per station) compared with the MPA, which had a mean richness of 4.6 (Fig. 6d)

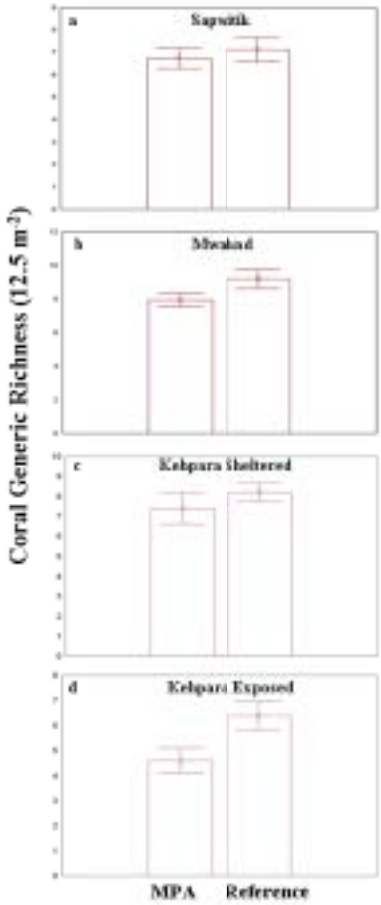

Fig. 6. Coral generic richness in MPA and reference site at (a) Sapwitik, (b) Mwahnd, (c) Kehpara Sheltered and (d) Kehpara Exposed. Error bars indicate standard errors.

Recruit density at Sapwitik was slightly higher than its reference site, but it was not significantly different (Fig. 7a). At Mwahnd, recruit density was 30.9 recruits per stations inside the MPA compared with the reference site, which had a significantly lower recruit density of 12.7 recruits per station (Fig. 7b). At Kehpara, recruit density at the sheltered side of the MPA did not differ significantly with its reference site. The exposed part of Kehpara had similar results, with the MPAs and the reference sites having similar densities of coral recruits at 35.9 and 30.9 recruits per stations, respectively (Fig. 7c and 7d).

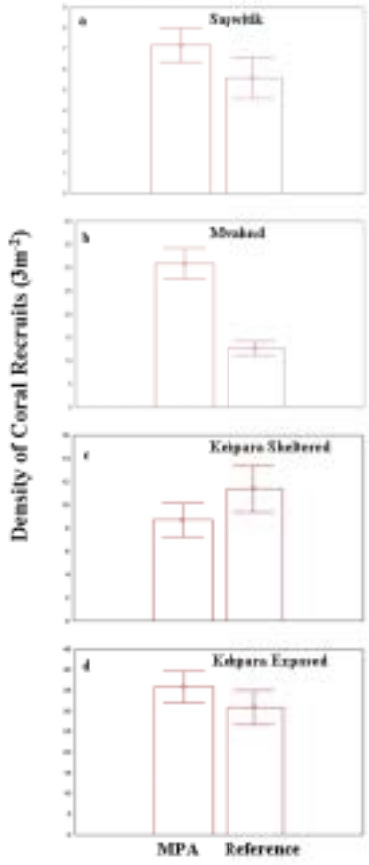

Fig. 7. Density of coral recruits in MPA and reference site at (a) Sapwitik, (b) Mwahnd, (c) Kehpara Sheltered, and (d) Kehpara Exposed. Error bars indicate standard errors.

Invertebrate densities were low at all the MPAs and their reference sites, with only the exposed side of Kehpara having invertebrates' density higher than one. The rest of the sites had average densities lower than one (Fig. 8).

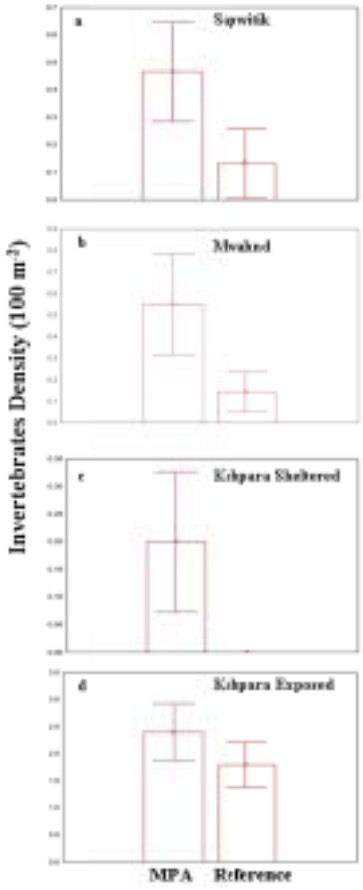

Fig. 8. Density of Invertebrates in MPA and reference site at (a) Sapwitik, (b) Mwahnd, (c) Kehpara Sheltered and (d) Kehpara Exposed. Error bars indicate standard errors.

Fish Assemblages

Fish density at Sapwitik MPA was higher but not significantly different from its reference site (Fig. 9a). In contrast, biomass of fish in Sapwitik MPA was three times more than the biomass in the reference site (Fig. 10a). In terms of fish species richness, there was no significant difference between the MPA and reference site at Sapwitik.

Mwahnd MPA and its reference site had similar fish densities at 9.1 and 9.7 fish per stations, respectively (Fig. 9a). While fish densities were similar, biomass was very different with a much higher biomass of fish found in Mwand MPA than in the control site (Fig. 10a). Fish generic richness was not significantly different between Mwand MPA and it reference site (Fig. 11a).

At Kehpara, fish densities in the MPA and reference site were not significantly different, both for the lagoon site and the outer reef site Fig. 11a). But fish densities was eight times higher in the outer reef side than the lagoon side, regardless of whether the site was protected or not. Biomass of fish in Kehpera MPAs and reference sites followed the same pattern as those of fish densities-

there are no significant differences between MPA and reference sites but there is significant difference between exposed and sheltered sites, regardless of MPA status (Fig. 10 c.d). For generic richness, there was also no significant difference between MPA and reference site, but again, richness was higher on the outer reefs than in the lagoon reefs (Fig. 12 c.d).

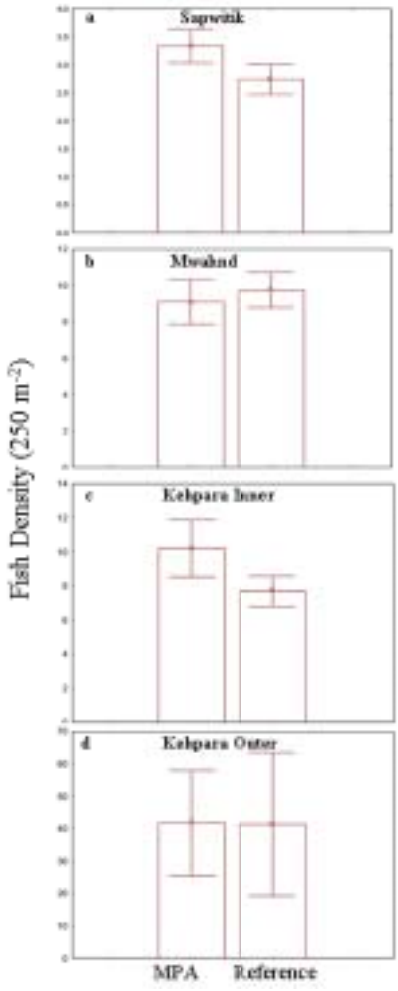

Fig. 9. Fish density in MPA and reference site at (a) Sapwitik, (b) Mwahnd, (c) Kehpara Inner and (d) Kehpara Outer. Error bars indicate standard errors.

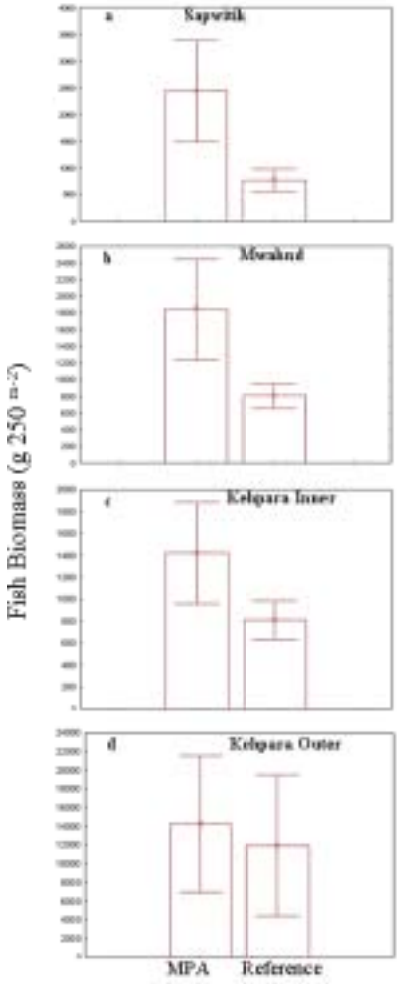

Fig. 10. Fish biomass in MPA and reference site at (a) Sapwitik, (b) Mwahnd, (c) Kehpara Inner and (d) Kehpara Outer. Error bars indicate standard errors.

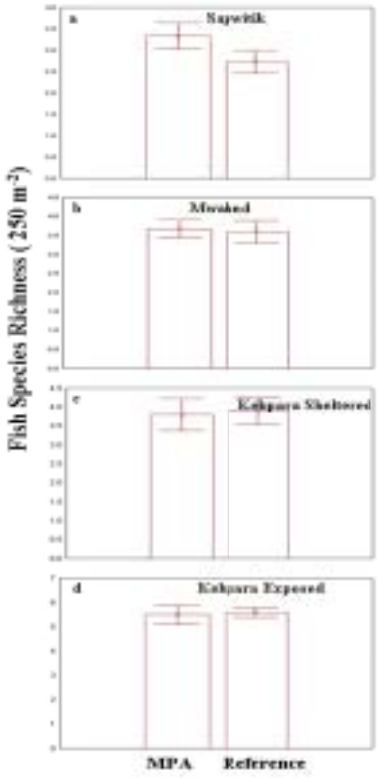

Fig. 11. Richness of fish species in MPA and reference site at (a) Sapwitik, (b) Mwahnd and (c) Kehpara. Error bars indicate standard errors.

DISCUSSION:

Coral cover in the MPAs and reference sites surveyed in Pohnpei, were mostly high with coral coverage higher than 25%. Coral cover did not seem to be related to protection status (Fig. 5). Generic richness was low for all sites, with no site having mean richness higher than 10.

In terms of fish densities, there were no significant difference between MPAs and reference sites, but for both Sapwitik and Mwahnd, there were significant differences in biomass, with MPAs having higher biomass than the reference site. This is encouraging and seems to indicate that while the number of fish is not much different, the size of the fish in the MPAs are much bigger than the fish in the reference sites.

The results of the surveys presented in this report are snapshots in time. Monitoring is needed to evaluate trends over time and determine how the MPAs are working. It is important for monitoring over time to have consistent methods. Therefore, we recommend that a targeted fish species list be created so that different people will count the same fish. We also recommend that people who do surveys be trained so that data between different observers can be compared.

The sizes of the MPAs as well as the reef areas covered by the MPAs in Pohnpei are small relative to the whole reef area of Pohnpei. Consideration will need to be made for areas outside of the MPAs and for fish species that are large and highly mobile, such as bumphead parrotfish or Napoleon wrasse, that need different management strategies.

Finally, while efforts on MPAs should continue, consideration should also be given to watershed and water quality issues. The reefs of the main island of Pohnpei are all located in only a few kilometres from the main volcanic island, therefore making them vulnerable to sedimentation and other pollutants from land. Effective conservation of Pohnpei marine resources needs to address watershed and water quality issues because if they are not addressed, they will affect the habitats negatively. So to have effective MPAs, part of the efforts need to focus on issues outside of the MPAs.

Aknowledgements:
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