

A community based fish/invertebrate monitoring plan for coastal Marine Protected Area with emphasis on MPAs in seagrass habitat

Intended for use in Ngardmau, Ngaremlengui, Airai, and Ngchesar

General Introduction

This monitoring plan is intended for use in the monitoring of Ngelukes Conservation Area, Bkulangriil Conservation Area, Airai Reef Conservation Area, and Ngelukes Conservation Area. The monitoring method can be applied to other conservation areas, however, the monitoring design needs to be modified (where necessary to meet objectives of monitoring).

Since January 2008, the Palau International Coral Reef Center has been working with State designated community/State people to train them on the monitoring of the Marine Protected Areas (MPAs). In this document Marine Protected Area = Conservation Area. The training included estimating the required area to count fish (25 m x 5 m), estimating fish size, counting fish abundance, and counting selected invertebrates. Following the training, the trained people accompanied PICRC research staff during quarterly monitoring for further training and participation in the monitoring activity. It was determined over a course of one year working with these selected people that they are now ready to conduct monitoring on their own.

What is Marine Protected Area?

An area of sea/reef especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means. *IUCN*

Keltukl el basio el mla mechesimer lokiu a lach ma lechub eng bul el diak el kired el mo soiseb er ngii ma lechub a kedemelai a ngerang er a chelsei.

Marine Protected Areas has become a popular management tool in Palau to address declining coastal marine resources. MPAs has been shown to improve abundance of declining fisheries resources in many places throughout the world and in Palau. MPAs has become one of the strategies to address impact of climate change through habitat protection and biodiversity conservation. By conserving critical marine habitats, it can allow for affected resource to recover and through MPAs spillover (when they are more fish inside the close area, they can move outside for fishermen to catch) it may continue to provide fish food for communities without continuing to affect the fisheries stocks.

Why Monitor the MPAs?

In order to determine whether the area that is closed with certain prohibitions is meeting its objectives, i.e. increase fish abundance, monitoring is necessary to detect change (both positive and negative). The information gathered from this monitoring activity can be used by responsible authority to make proper decisions regarding the closed area.

Objectives:

To determine if MPA's have an effect on the abundance of fish and invertebrate abundance.

How will the MPA be monitored?

Monitoring will be conducted inside and outside of a Marine Protected Areas. The outside site (open for fishing) is an area of similar habitat type that is in close proximity to the MPA. For the MPA sites, the outside site is separated from the MPA by a channel (Figure 1).



Figure 1. Map showing general location of Conservation Areas and their reference site for monitoring. Number indicates paired sites.

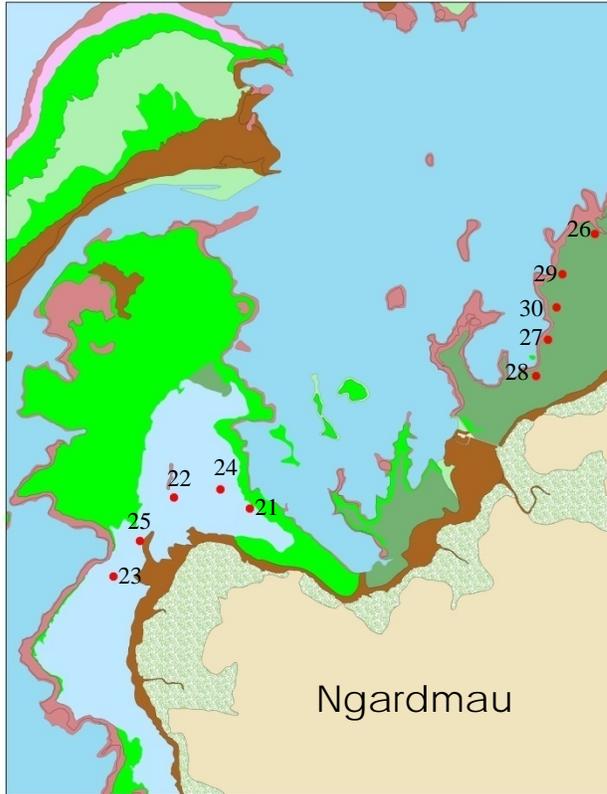


Figure 2. Map showing Ngermasch Conservation Area and the reference monitoring site (Ngeriklerker). Red dots indicate monitoring stations.

Coordinates

21	N07°36.2070' E134°32.6430'
22	N07°36.2610' E134°32.2720'
23	N07°35.8750' E134°31.9760'
24	N07°36.3010' E134°32.4990'
25	N07°36.0490' E134°32.1060'
26	N07°37.5500' E134°34.3300'
27	N07°37.0330' E134°34.1010'
28	N07°36.8560' E134°34.0430'
29	N07°37.3530' E134°34.1710'
30	N07°37.1910' E134°34.1430'

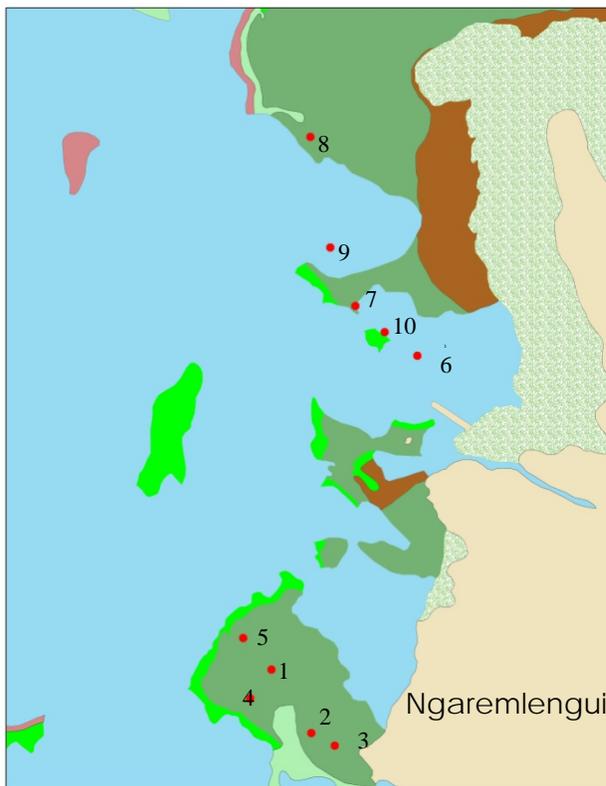


Figure 3. Map showing Bkulangriil Conservation Area and the reference monitoring site (Usas). Red dots indicate monitoring stations.

Coordinates

1	N07°30.9760' E134°29.6340'
2	N07°30.8520' E134°29.7120'
3	N07°30.8280' E134°29.7580'
4	N07°30.9200' E134°29.5930'
5	N07°31.0370' E134°29.5790'
6	N07°31.5880' E134°29.9180'
7	N07°31.6850' E134°29.7970'
8	N07°32.0140' E134°29.7090'
9	N07°31.7990' E134°29.7480'
10	N07°31.6340' E134°29.8540'

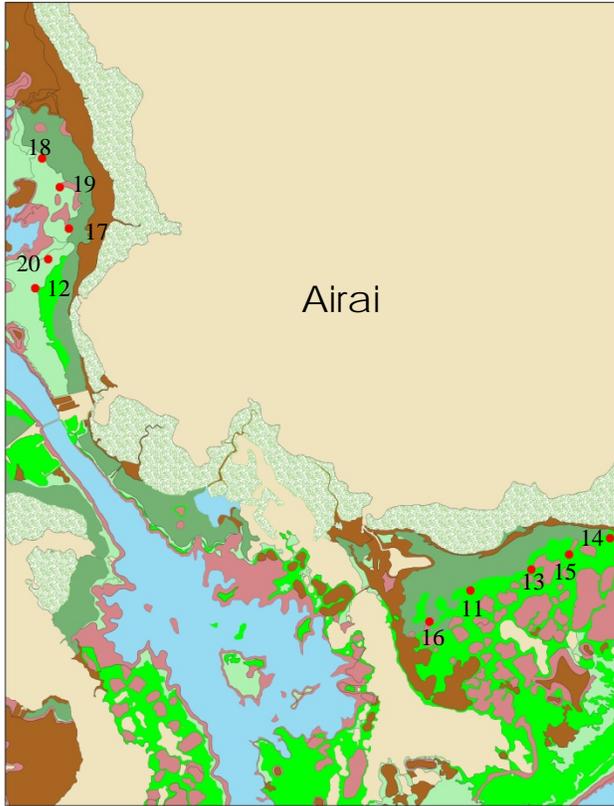


Figure 4. Map showing Airai Reef Conservation Area and the reference monitoring site (Badesbarch). Red dots indicate monitoring stations.

Coordinates

11	N07°20.7860' E134°32.6350'
12	N07°22.4890' E134°30.1740'
13	N07°20.9050' E134°32.9790'
14	N07°21.0820' E134°33.4240'
15	N07°20.9890' E134°33.1920'
16	N07°20.6100' E134°32.4040'
17	N07°22.8250' E134°30.3640'
18	N07°23.2210' E134°30.2120'
19	N07°23.0590' E134°30.3120'
20	N07°22.6520' E134°30.2470'

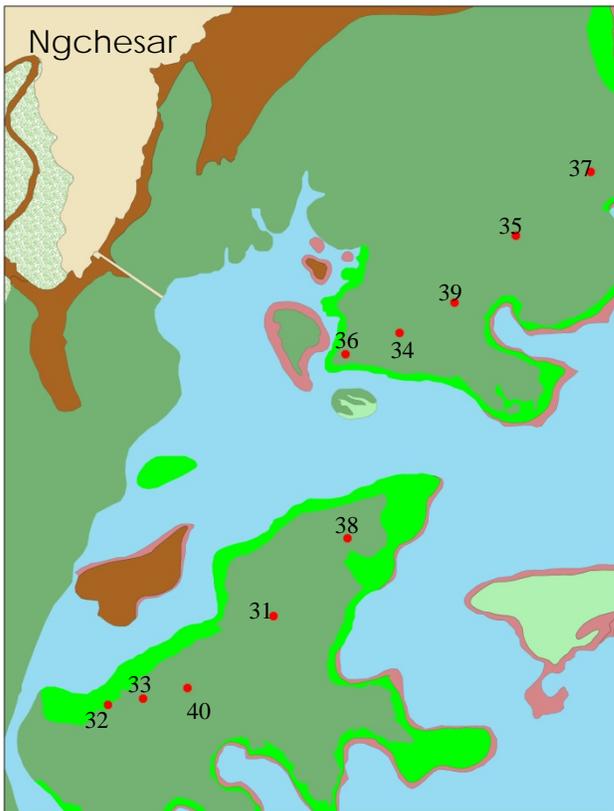


Figure 5. Map showing Ngelukes Conservation Area and the reference monitoring site (Ucher). Red dots indicate monitoring stations.

Coordinates

31	N07°25.3620' E134°36.0520'
32	N07°25.1900' E134°35.7320'
33	N07°25.2020' E134°35.8000'
34	N07°25.9090' E134°36.2950'
35	N07°26.0972' E134°36.5202'
36	N07°25.8680' E134°36.1910'
37	N07°26.2208' E134°36.6646'
38	N07°25.5127' E134°36.1950'
39	N07°25.9677' E134°36.4017'
40	N07°25.2230' E134°35.8860'

Monitoring method

Monitoring personnel

Fish monitoring will be conducted by **at least 2 trained** community members/State employee every quarter (**January, April, July, and October of each year**). PICRC staff will assist field work upon request by the State. PICRC will continue to work with State representative on the implementation of this monitoring plan for a period of one year.

Equipment

All the required equipment to carry out this proposed monitoring plan has been provided to each State, which includes:

- Underwater Digital camera (use for recording unidentified fish or unusual observations during monitoring)
 - Transect tapes (use for marking the monitoring area)
 - GPS (use for locating each monitoring station)
 - Slates
 - Underwater paper
 - Pencils
- } Use for recording data and observations

Locating the monitoring station

Monitoring station were chosen haphazard on a map using ARCGIS and coordinates were extracted (see coordinates for each State). The coordinates should be inputted into a GPS (one has been provided to each State). Locate a station for monitoring by navigating to one of the GPS coordinates (either in MPA or outside reference site).

Fish count

Fish monitoring will be conducted inside the MPA and in an outside (reference) site on a 25 m x 5 m belt transect. There will be three replicate transects for each station. For each site, there will be 5 stations, marked by GPS coordinates.

During the fish monitoring, the fish observer will swim in front of a person laying the transect tapes (this is to avoid disturbing the fish) and counting the fish within the monitoring area. At the end of each 25 m transect, the person will signal to the fish observer to stop (this will mark the end of one

replicate transect). The fish observer will begin counting fish in a new data sheet marked as transect 2. At the end, the tape person will signal and the process begins again, until all three transects are completed for each Station.

Fish monitoring should be conducted during high tide or incoming tide. This is because, the survey area gets exposed during low tide and therefore fish will move to a deeper area during low tide and therefore, there will be no fish to count at low tide.

Invertebrate count

If there are more than 2 people who are able to conduct field surveys, then they can count invertebrates. If there are only 2, then invertebrate count will be done by the same people doing the fish count.

Invertebrate count will be conducted along a 25 x 2 m belt transect. Whenever an invertebrate is spotted along the belt transect, it will be measured (length) and recorded on a data sheet. The data sheet should show: 1. name of species and 2. number and size of each individual species. If an invertebrate falls outside of the 1 m on each side of the transect, do not count it.

Invertebrate monitoring can be done at both high and low tide

Data management

Following field surveys, you should enter all your data into the excel database (provided). One person should enter all data and the another should check if all data were entered correctly. Training on this will be provided by PICRC staff.

All data will be deposited at PICRC, and PICRC will maintain a database of MPA data and will provide summary of data to State. PICRC will continue to work with the State personnel in building their capacity for data management.

Palauan Name	English name	Scientific name
Kelsebuul	Lined Rabbitfish	<i>Siganus lineatus</i>
Meas	Dusky Rabbitfish	<i>Siganus fuscescens</i>
Beduut	Fortktail Rabbitfish	<i>Siganus argenteus</i>
Itotech	Thumbprint Emperor	<i>Lethrinus harak</i>
Udech	Orange stripe Emperor	<i>Lethrinus obsoletus</i>
Mechur	Yellowlip Emperor	<i>Lethrinus xanthurus</i>
Melangmud	Longface Emperor	<i>Lethrinus olivaceus</i>
Deringel	Blackspot Snapper	<i>Lujanus fulviflamma</i>
Reall	Blacktail Snapper	<i>Lujanus fulvus</i>
Ngiaoch	Pacific Longnose Parrotfish	<i>Hiposcarus longiceps</i>
Melemau	Dark-capped Parrotfish	<i>Scarus oviceps</i>
Berdebed	Bumphead Parrotfish	<i>Bulbometapon muricatum</i>
Ngimer	Humphead wrasse	<i>Chellinus unulatus</i>
Budech	Anchor Tuskfish	<i>Choerodon anchorago</i>
Bang	Dash-dot Goatfish	<i>Parupeneus barberinus</i>
Mesekuuk	Yellowfin Surgeonfish	<i>Acanthurus xanthopterus</i>
Besechamel	Bigeye Barenose	<i>Monotaxis grandoculus</i>

Table 1. List of fish species to be monitored inside and outside of MPA.

Figure 2. Pictures of fish to be monitored in and outside of MPA.

MPA Fish/invertebrate Monitoring Data Sheet

State:		Site Name:	
Date/Time:		Observer:	
Lat:		Long:	
Station No.		Transect Number:	
Moon phase:		Tide:	
Check one: _____ Fish(Ngikel) _____ Invertebrate(Cheremrum, Ngimes, Kim)			

Name	Observed Number & size (cm) 1 inch = 2.54 cm

Comments:

Table 2. MPA monitoring data sheet.

