NOAA 2011 Final Report:

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B. Amount of Grant: $ 18,648.00
C. Project Title: Coral and Fish Monitoring in the State of Kosrae, Federated States of Micronesia
D. Grantee: Micronesia Conservation Trust, Kosrae Conservation and Safety Organization, PI

Introduction:

Kosrae is a high volcanic island at the eastern end of the Caroline Islands and constitutes the entire land area of the State of Kosrae within the Federated States of Micronesia. The roughly triangular island (approximately 110 km²) is inhabited by approximately 10,000 indigenous islanders concentrated within several villages around the island. Starting in a clockwise direction from 3 o'clock, these are Lelu and neighboring Tofol off the east, Malem off the southeast, Utwa off the south, Walung off the west, Okat off the northwest, and Tafunsak off the north parts of the Island. The island supports three large natural harbors (at Lelu, Utwa and Okat), a smaller harbor at Yela, and several inland waterways through freshwater swamp and mangrove forests that dominate the coastal plains. A broad, near continuous shallow fringing reef offshore completely encircles the island and protects landward areas from large waves and strong currents. Kosrae is situated near the Inter-tropical Convergence Zone that straddles the Pacific near the 5º N latitudinal and experiences heavy rainfall over much of the year. The wet climate supports the island's rainforests and swamps and mobilizes nutrients that support sea-grass and lagoon ecosystems. The island is often in the path of the

eastward moving Equatorial Countercurrent, bringing abundant pelagic fisheries near the island. Aside from near pristine forests and swamps over much of the island, Kosrae also supports well developed sea-grass beds, white sand beaches, low lying barrier islands, and healthy coral reef habitats around much of its circumference. Prevailing trade winds are from the northeast, but there are extensive periods of calm seas during the year.

The growth of commerce in our islands over the years has resulted in the greater threat to our marine resources. The pressure on the fisheries resource is increasing when added to the need to support the subsistence livelihoods of the people of Kosrae. In addition with the growing population, a majority of which is unemployed and thus depends greatly on marine resources, it becomes even more critical that these resources are effectively managed. In order to do this however, Kosrae needs a strong monitoring program to inform the work we do.

The reef area of Kosrae is 22 km² that the monitoring program is very important to understand the reef health. With grant assistance from the National Oceanic & Atmospheric Administration (NOAA), the Micronesian Conservation Trust (MCT) and training from regional partners (PICRC, PMRI) the Kosrae monitoring program was started in 2007 as a collaborative effort between the Kosrae Conservation and Safety Organization, Department of Resources and Economic Affairs and the Kosrae Island Resource Management Authority.

Executive Summary:

In 2011, the Kosrae Conservation and Safety Organization was awarded an amount of $18,648.00 to support Kosrae's coral reef monitoring program. The coral reef monitoring program is a collaborative effort among the Kosrae Conservation and Safety Organization, Department of Resources and Economic Affairs and Kosrae Island Resource Management Authority dedicated to understanding general health, diversity and size class distributions of fish, invertebrates and corals within the Kosrae's reef. Monitoring protocols developed with the help of Dr. Peter Houk from the Pacific Marine Resources Institute have been incorporated to collect data in areas deemed of priority significance throughout the Kosrae's reef. The original intent of the program was to monitor and assess changes in coral covers over time as well as health and population of corals and fish in all five established monitoring sites in Kosrae. Due to lack of staffing and technical expertise in data management and analysis, a more realistic number of 4 priority sites were established. The goal of adding sites as staffing and experience improved in subsequent years. The actual data collection has been completed for 2011, giving us five years- worth data for the four monitoring sites. Discussions and meetings with Kosrae Department of Resources and Economic Affairs, Kosrae Island Resource Management Authority, Pacific Marine Resource Institute, Palau International Coral Reef Center and input from key community members, a list of monitoring sites were identified to be closely monitored. The monitoring of these sites provided an adequate picture of what is happening on specific reefs throughout the Kosrae's reef. Thus, we can make informed decisions based on this information. These sites have been chosen based upon the following criteria:

a) Status as an Area of Biodiversity Significance (ABS site)
b) Whether or not they are a potential MPA/LMMA site
c) Areas with local significance as important fishing grounds
d) Areas of significance as threatened areas (ie reef near development site, overfishing, etc.)
e) Areas of special environmental significance as spawning aggregations or areas with unique habitat characteristics
f) Recommended site for protection based on Rapid Ecological Assessment in 2006

The Kosrae monitoring program also is also associated with regional endeavors such as the Micronesian Challenge and adds local support for implementation of the FSM National Biodiversity Strategic Action Plan (NBSAP). The Micronesian Challenge motivated us to put more emphasis on data management, sharing and analysis at the regional level. A critical step was taken during the 2nd Micronesian Challenge Measures Meeting, wherein methodologies and indicators for measuring the "effective management" of our marine resources, were agreed upon, providing a framework through which data across the region can be compared and analyzed as a whole. As a result, the Micronesian Challenge Database was created to allow local monitoring programs to utilize the MC database to house their data. Once data are inputed into the database, people with more professional experience in data analysis could analyze the data more thoroughly and provide us the answers we seek on the ground. In February of 2012, the Kosrae Conservation and Safety Organization represented the state of

Kosrae participated in a workshop to familiarize ourselves with this process.

Table 1: Site specific information regarding reef type, ABS site and MPA status.

SITE NAME	REEF TYPE	AREA OF BIODIVERSITY SIGNIFICANCE	MPA
Tafunsak Marine Protected Area	Inner Reef Channel	Yes	Yes
Okat South	Inner Reef Channel	Yes	No
UBR	Inner lagoon	Yes	Yes
UBR BZ	Inner lagoon	Yes	No

Table 2: Dates, # of visits & GPS locations per monitoring site.

Site Name	Coordinates		Number of Visits	Visit Dates
	Latitude	Longitude		
Tafunsak Marine Protected Area	05˚21′39.9″ N	162˚ 58′ 05.5″ E	2	01/24/12 and 05/21/12
Okat South	05˚ 21′ 01.8″ N	162˚ 57′ 19.0″ E	2	01/24/12 and 05/21/12
UBR	05˚ 16′ 19.4″ N	162˚ 57′ 35.6″ E	2	01/23/12 and 05/23/12
UBR BZ	05˚ 16′	162˚ 57′	2	01/23/12

	46.3″ N	59.0″ E		and 06/05/12

Methodology:
The Kosrae coral reef monitoring program uses the same methodologies developed at the 2nd Micronesian Challenge Measures Meeting. These monitoring methods were developed for the purpose of standardizing methodologies across the Micronesian region in order to better compare results as a whole. A belt transect of 5, 50m transects is used, to gather fish, invertebrate and benthic data over a 250m stretch of reef at a depth of 10m. The person conducting fish counts does so within an area of 2.5m X 2.5m on both sides of the transect tape. For counting invertebrates, all indicator species are counted also with a 2.5m X 2.5m area for each of the 5, 50m transects. Benthic data uses similar protocols, wherein a photo is taken at every meter along the 50m transect line for each of the 5 transects, giving a total of 250 photos for the 250m stretch of reef. The photos are then input into the Coral Point Count (CPC) software for benthic data analysis.

Monitoring team members consists of four staff members from the Kosrae Conservation and Safety Organization, one staff from Department of Resources and Economic Affairs and one staff from Kosrae Island Resource Management Authority.

Key Findings:

The Kosrae Conservation and Safety Organization monitor four sites. Two of the sites are Marine Protected Area (TMPA,

UBR) and other two are set as reference sites (Okat South, UBR BZ). It has been five years of monitoring the MPA sites where the reference sites were added in 2010. Much of the data is to provide enough baseline data to assist our local team and regional partners and to support MPA community based management. At the beginning of our monitoring, the data collection was conducted on a quarterly basis. This project year, we changed the data collection to monitor the fish and invertebrates twice a year. The data collection for corals is now once a year. This is in line with the regional monitoring as agreed in February 2012 at the marine measures group meeting in Palau.

Figure 1: KCSO established 4 monitoring sites.

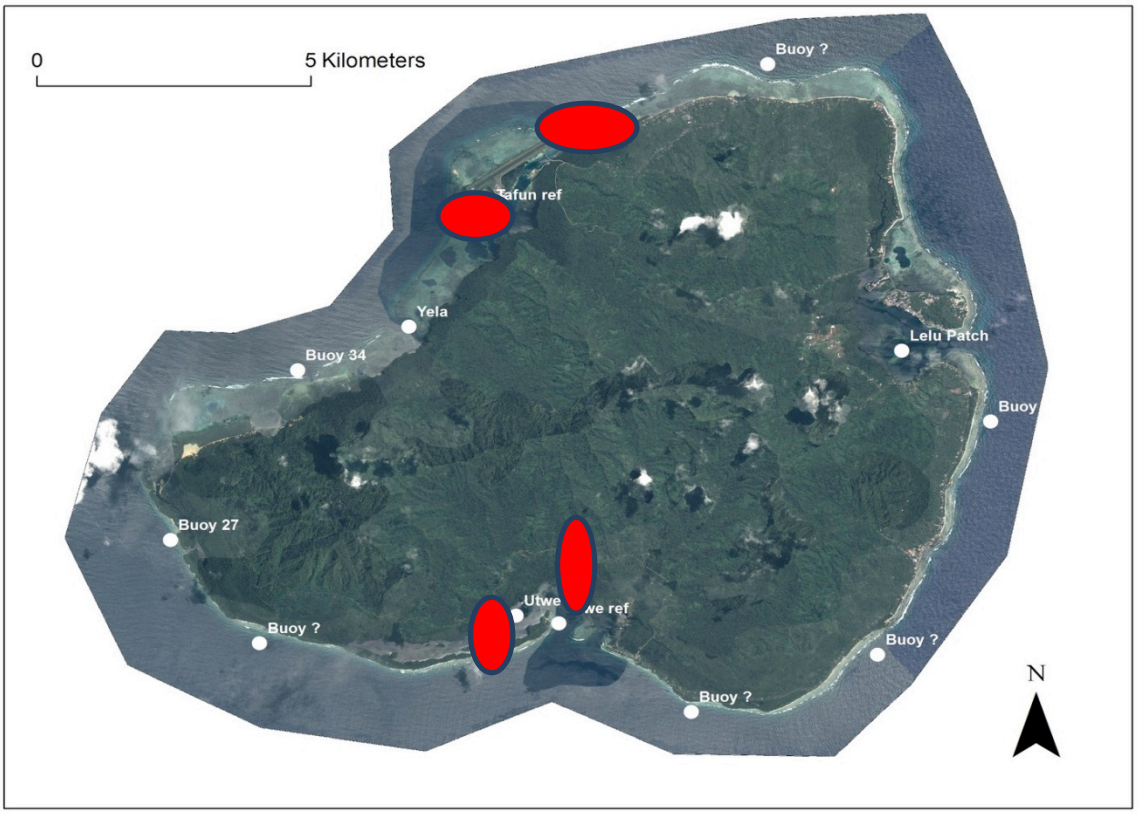
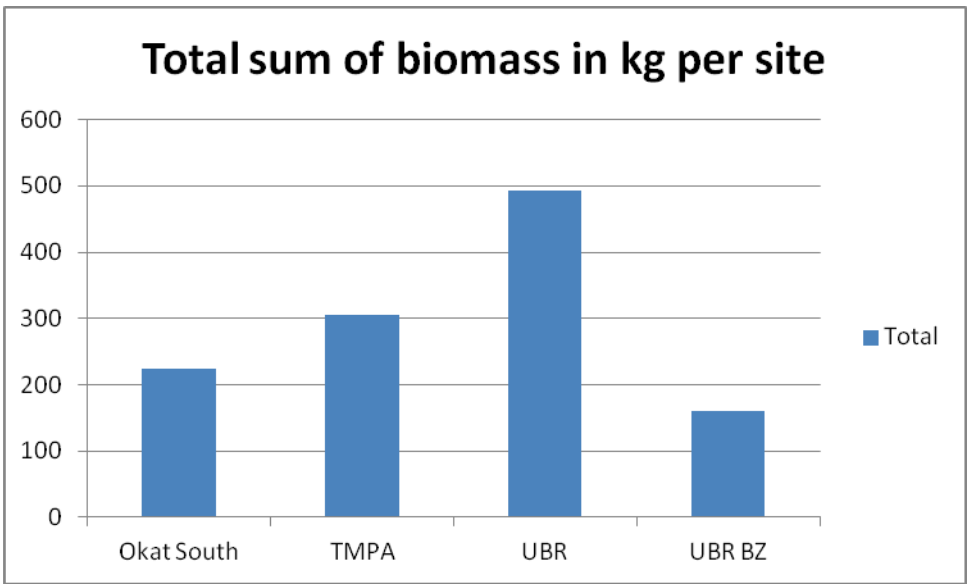
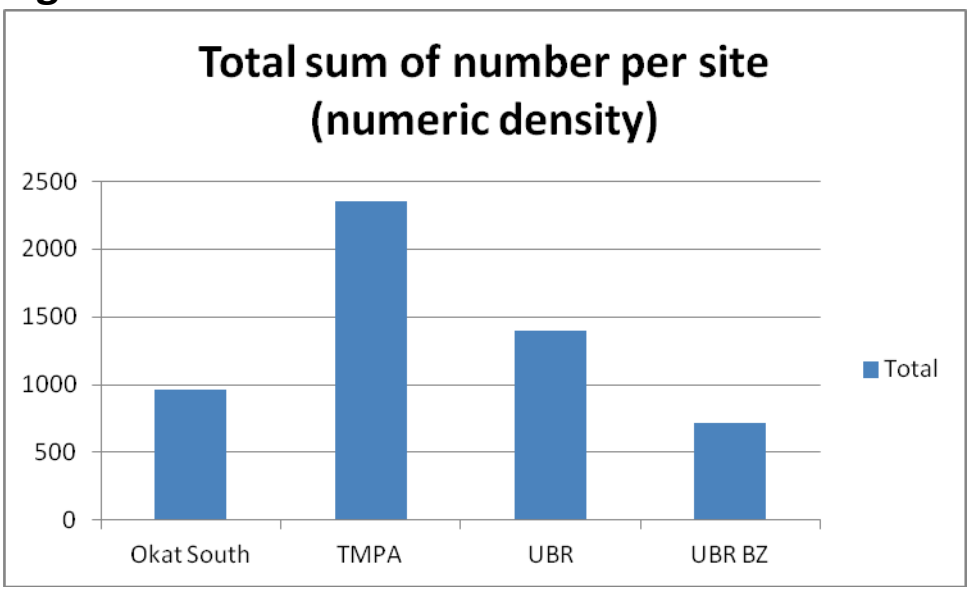


Figure 1: Fish Biomass



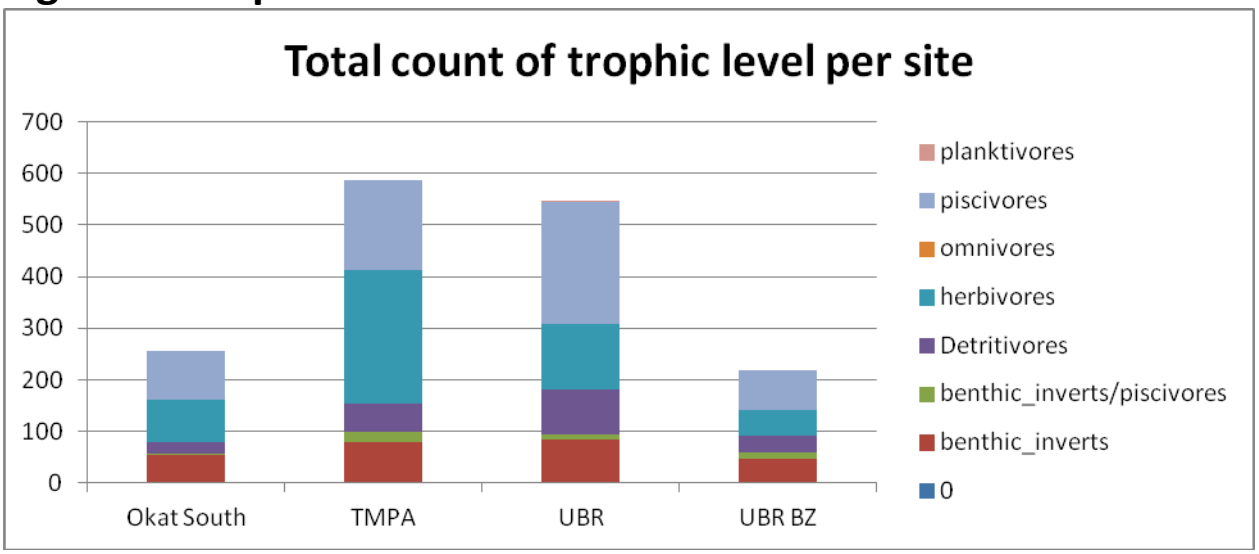
The total biomasses of food-fish recorded during the monitoring of four sites in Kosrae using a single transect 250 m long by 5 X 5 m wide at each site. UBR site appeared to hold the greatest biomass of fish; however, the TMPA site also had relatively high biomass. These two sites are community declared marine protected areas.

Figure 2: Fish Number



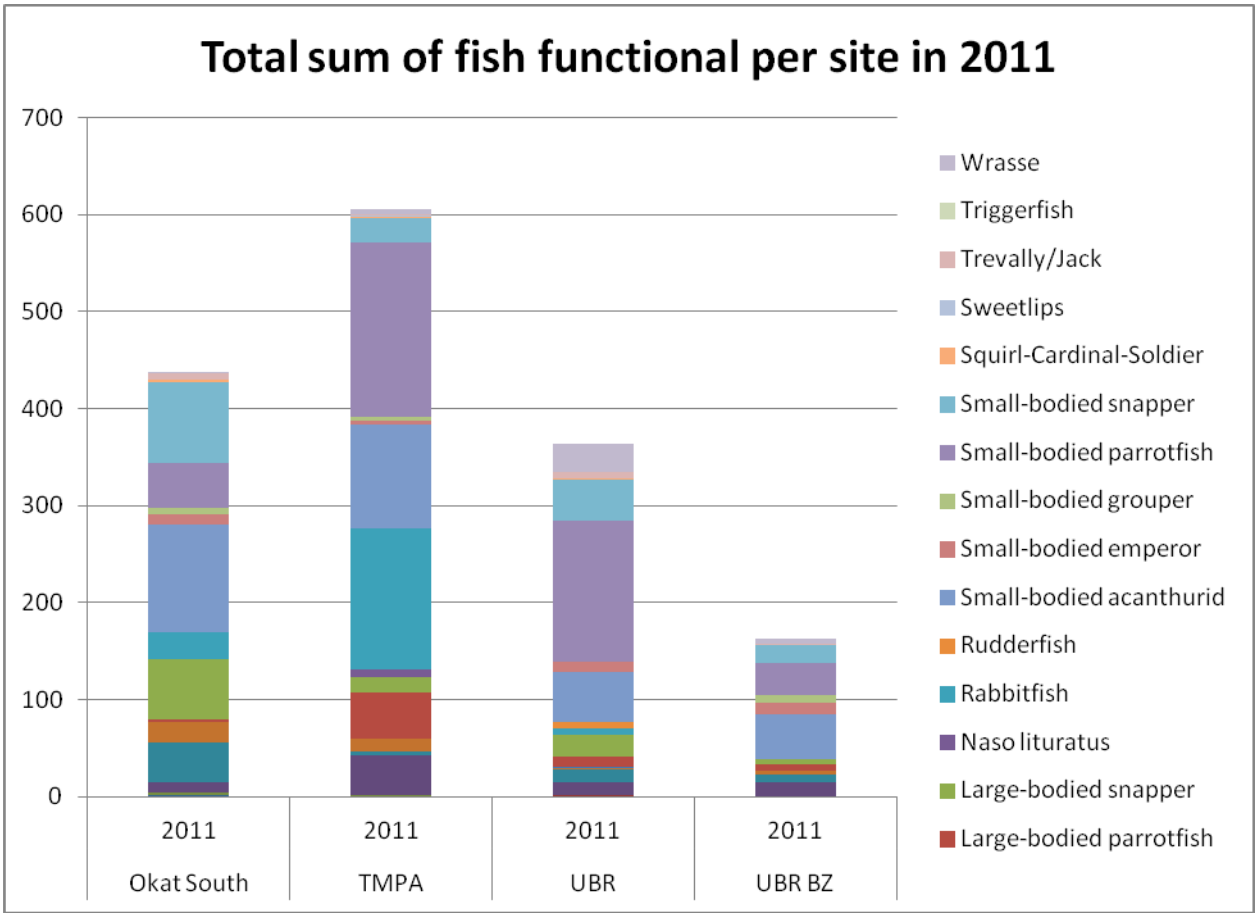
Numeric density of food-fish observed during exploratory monitoirng using a single transect 250 m long by 5 X 5 m wide at each site. It appears that TMPA site holds the greatest density, however in figure 1, it shows that fsih size at UBR site are larger.

Figure 3: Trophic level



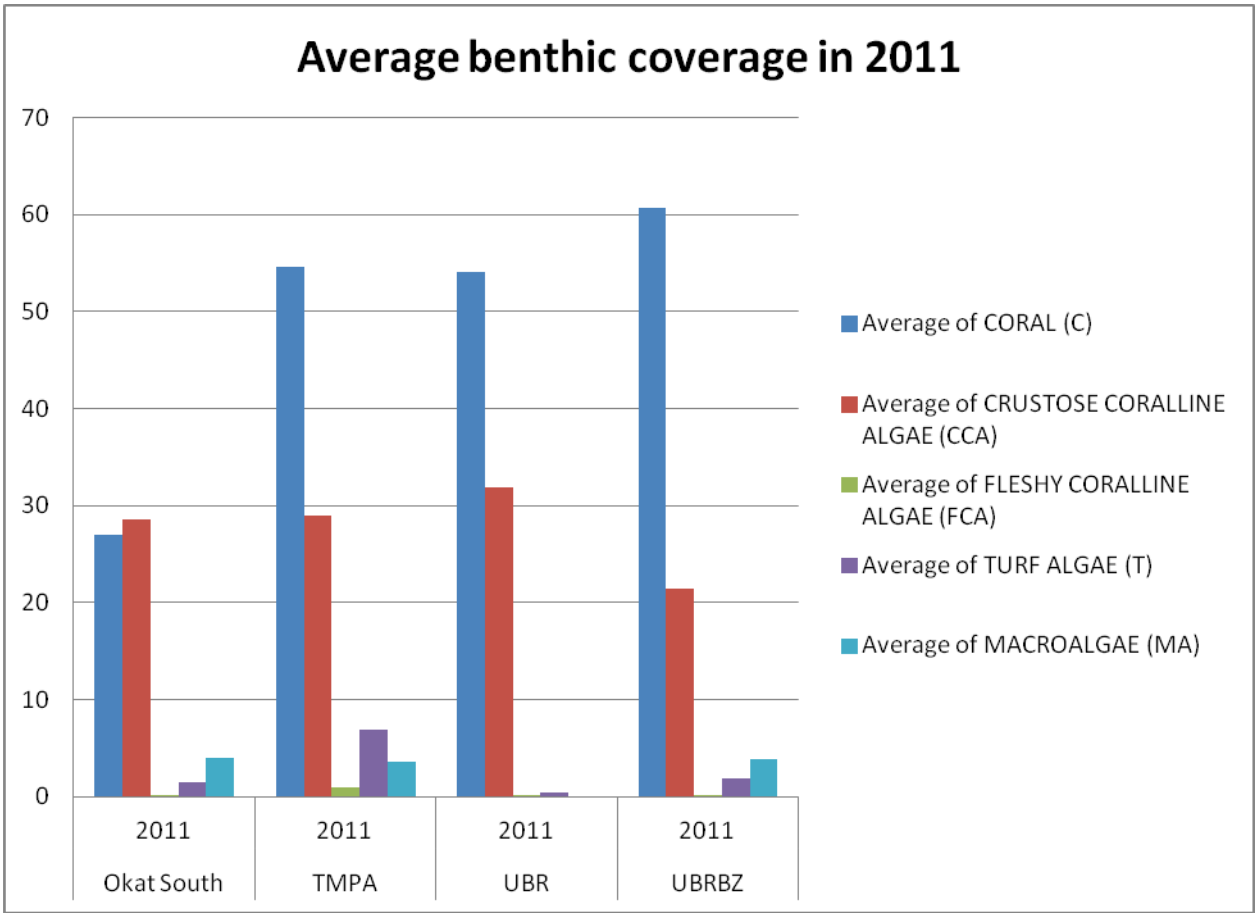
The total count of foodfish observed during monitoirng using a single transect 250 m long by 5 X 5 m wide at each site, grouped by trophic level. The TMPA and UBR site are noted in having abundances of piscivores and herbivores compared to two reference sites.

Figure 4: Function and family



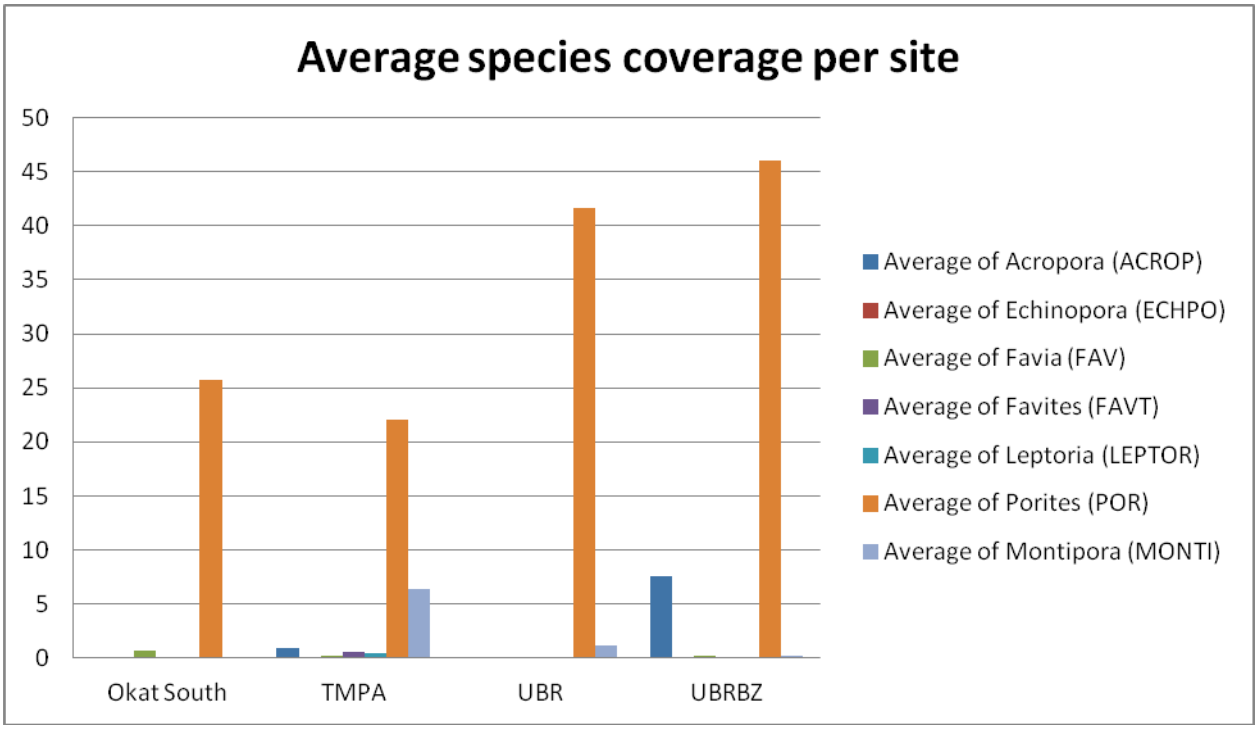
The total sum of foodfish observed during exploratory monitoirng using a single transect 250 m long by 5 X 5m wide at each site, grouped by function and family. This graph enable us to understand characteristics differences exist in the composition of food-fish at four monitoring sites. It appears that the two dominant groups at all sites are small bodied parrot fish and small bodied acanthurids. We also noted that there were more large bodied parrot fish recorded at the TMPA.

Figure 5: Benthic coverage



At every meter along the single transect of 250m long, a photograph is taken to record the benthic community. This graph shows the average of each benthic which indicates that the coral cover is dominant at most sites except the Okat South site.

Figure 6: Coral species coverage



This graph shows the average of species coverage at each site. It appears that the porites is more dominant at each site where favia is the lowest. We also noted that at UBRBZ, the porites itself covers more than 45%.

Conservation & Management:

1. KCSO consent to monitoring methodologies and protocols developed at the 2nd Micronesia Challenge Measures Meeting in February 2012. We strongly believe that we can achieve the goal of effectively managing our marine

resources. Additionally, we work collaboratively with our local and regional partners to support community based MPA management.

2. Results from our monitoring program are also a large part of our awareness activities at schools and communities in Kosrae. Moreover, the result of our monitoring at one of the site, namely UBR supports the official recognition of it to become the first legal marine protected area in Kosrae.

Challenges:

1. Loss of community team member due to lack of funding needed to retain services.
2. Lack of adequately trained staff in database management and data analysis.

Next Steps:

1. Familiarize monitoring team members in use of MC database and begin uploading data to database.
2. Training for members in monitoring protocols and fish/invert/benthic taxonomy.
3. Secure scuba diving supplies and more taxonomic reference materials.
4. Work with MCT, PMRI & PICRC to identify a means of getting more professional assistance in terms of data analysis, so as to get more out of the data collected.