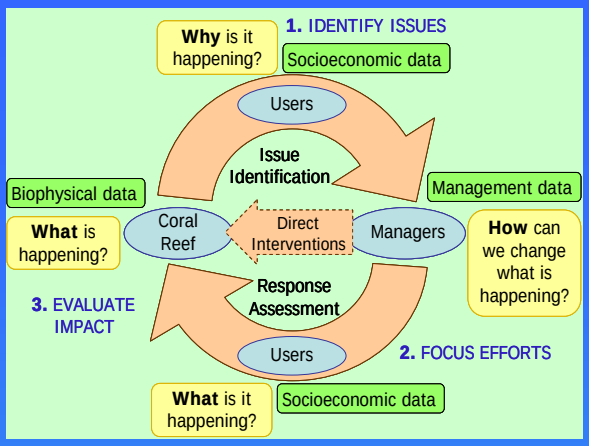

Collaborative Biophysical and Socioeconomic Monitoring Towards Adaptive Management of Priority Coral Reefs in the Philippines and Vietnam

FINAL REPORT

Submitted to U.S. NOAA International Coral Reef Conservation Grant Program

February 1, 2003 to
December 31, 2005

Report Date: March 2006

Marine Environment and Resources Foundation, Inc.

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EXECUTIVE SUMMARY

Monitoring is a vital component of protected area management. It provides crucial information for objectively gauging the performance of protected areas and it is a springboard to stronger natural resource management.

In the Philippines, the Department of Environment and Natural Resources – Protected Areas and Wildlife Bureau (DENR-PAWB) through the National Integrated Protected Areas System (NIPAS) Act of 1992 manages and regulates resource use in 30 protected areas with marine components all over the country. However, despite the implementation of a Biodiversity Monitoring System, few of these sites are regularly monitored due to limited financial resources and personnel, on top of other issues. In addition, the lack of a structured data management and reporting scheme impedes the accessibility of the few collected information to managers and the public.

Recognizing these issues, the DENR and the Marine Environment and Resources Foundation, Inc. (MERF) through funding from the U.S. National Oceanic and Atmospheric Administration jointly implemented activities to achieve the goals of the project "Collaborative biophysical and socioeconomic monitoring towards adaptive management of priority coral reefs in the Philippines and Vietnam" which were:

- ⇨ to improve the marine monitoring component of the Biodiversity Monitoring System mandated for use in all protected areas and make it compatible with widely-used structured methods
- ⇨ to upgrade the skills of selected field personnel on coral reef biophysical and socioeconomic monitoring and at the same time, conduct actual monitoring of selected protected areas
- ⇨ to enhance the monitoring data reporting and management protocols currently in use

From February 2003 to December 2005, we reviewed the Biodiversity Monitoring System and drafted a Supplementary Manual for Coral Reef Monitoring, trained fourteen protected area personnel on basic coral reef biophysical and socioeconomic monitoring methods, monitored Puerto Galera Man and Biosphere Reserve and Palaui Island Protected Landscape and Seascape, and improved the PAWB-Integrated Database on Biodiversity Conservation (IDBC). Among these activities, the enhancement of the PAWB-IDBC is the most significant contribution of the project to NIPAS protected area management.

The key results from these activities were:

- ⇨ DENR regional staff and other trainees benefited from inputs on how to plan and implement biological monitoring of coral reefs and socioeconomic survey of coastal communities. They now have the necessary biophysical and socioeconomic monitoring skills to conduct quality coral reef monitoring. However, limited resources still hinders them from doing so annually.
- ⇨ Given DENR's limited resources, regular marine protected area monitoring should henceforth be focused on the following sites identified by the project: Palaui Island Protected Landscape and Seascape (PLS), Malampaya Sound, Caramoan National Park, Sagay Marine Reserve, Apo Island PLS, Cuatro Islas Protected Seascape, Turtle Islands, Initao-Libertad PLS, Mabini PLS, Bongo Island, and Siargao PLS.
- ⇨ New tables for the PAWB-IDBC have been added to allow objective assessment of protected area performance. Some data at the PAWB central office were also encoded accordingly.

Non-project priority NIPAS Protected Areas can initiate regular gathering, compiling, reporting, and archiving of management indicators first, which requires minimal budget and personnel requirements. Socioeconomic indicators can be monitored every 3 to 5 years in collaboration with locals, LGU, and NGOs. Biophysical monitoring can be tied with existing research projects of academe, LGUs, NGOs, and other groups.

KEY PROJECT INFORMATION

Title:	Collaborative Biophysical and Socioeconomic Monitoring Towards Adaptive Management of Priority Coral Reefs in the Philippines and Vietnam
Proponents:	Andre Jon Uychiaoco, PhD (MERF) Porfirio M. Aliño, PhD (MERF)
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Project Duration:	February 1, 2003 – December 31, 2005
Donor:	U.S. National Oceanic and Atmospheric Administration (NOAA)
Award Number:	NA03NOS4630003

1. Background / Project Overview

Marine protected areas or marine sanctuaries are one of the primary interventions often recommended to reduce pressure on coral reefs and eventually improve reef conditions. In the Philippines alone, there are more than 500 MPAs distributed all over the country with varying sizes and levels of management (Tun et al. 2004). However, only a small proportion of these MPAs are regularly and properly monitored for biophysical indicators and almost none for socioeconomic and governance parameters. Thus, very few MPAs have even a rough measure of their overall effectiveness.

The same scenario is true even for national marine protected areas or those proclaimed under the National Integrated Protected Areas System (NIPAS) Act of 1992. Despite the existence of a mandated Biodiversity Monitoring System for monitoring Protected Areas (PA) under the NIPAS or NIPAS-PA, the marine component of this protocol does not provide sufficient guidance for standardized monitoring and are thus, not compatible with international standards for monitoring coral reefs (e.g., GCRMN and ReefCheck methods). In addition, most of the monitoring data collected in these sites focus on the biophysical aspect of the MPA (i.e., the resources) and nearly no purposively-collected data on socioeconomic indicators exists (i.e., the users). The few existing monitoring data for NIPAS sites have either been lost or are not readily accessible to managers. In addition, park managers oftentimes do not use systematically collected data to determine appropriate management options and actions.

As of December 2005, there were already 101 NIPAS-PA covering a total of 32,200 km^2 of land and water area and roughly 2,200km^2 total buffer zone. Thirty of these PAs (~30%) have marine components. DENR is currently processing the inclusion of 183 other areas into the system. However, very few of these areas have established monitoring plans for objectively evaluating PA management.

Realizing the importance of the NIPAS marine components and the issues facing its conservation and management, the Marine Environment and Resources Foundation, Inc. (MERF) through Drs. Andre Jon Uychiaoco and Porfirio M. Aliño submitted a proposal to the U.S. National Oceanic and Atmospheric Administration last 2002. The main goal was to enhance the monitoring and management capabilities in NIPAS areas through active collaboration with the Department of Environment and Natural Resources and other pertinent national agencies.

NOAA approved the proposal in February 2003 with the following objectives:

(1) Make the reef monitoring systems used by the Philippines' NIPAS sites more compatible with mainstream GCRMN and ReefCheck reef monitoring systems.
(2) Assess, upgrade and validate the skills of NIPAS field personnel and on Vietnamese representative in biophysical and basic socioeconomic reef monitoring.
(3) Organize and test a system for regular dissemination of coral reef monitoring data for back-up, easy access to managers, and regular reporting to national (e.g. PhilReefs) and international (ReefBase) databanks.
(4) Integrate reef monitoring and evaluation into a regular, multi-sectoral/participatory, adaptive management (decision-making) activity.
(5) Collaboratively monitor (biophysical and socioeconomic) Puerto Galera Man and Biosphere Reserve and another high priority NIPAS site.

These five objectives fall under three broader objectives, which are: (1) to enhance the BMS, (2) to train personnel to use the enhanced BMS, and (3) to design and implement a protocol

for data management and for applying monitoring data to guide management decisions (Figure 1).

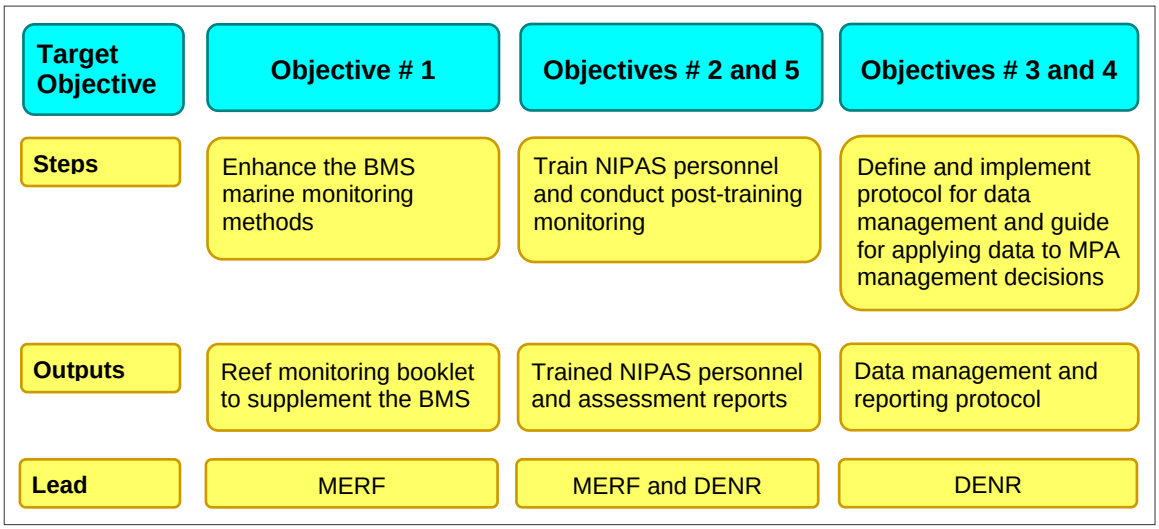

Figure 1. Major project steps, outputs, and lead organization based on the five major objectives.

A Project Advisory Team (PAT) was formed during the earlier stages of the project to guide the directions of the activities. The members of the PAT and their details are summarized in Annex A.

This report covers the major activities done to address each objective, general assessment of the activities, and recommendations for improving monitoring of marine components of NIPAS sites.

2. Summary of Major Project Activities and Accomplishments

Although the program grant period provided by US NOAA to MERF was for 18 months starting from February 1, 2003, all major activities commenced only two years later, after the approval of two successive requests for no-cost project extensions, thus, extending the project's duration to almost 3 years.

Modifications in the original proposal cost the project its first six months while the succeeding 12 months was mainly used to draft and finalize the Memorandum of Agreement between DENR and MERF.

The objectives and activities of the project were straightforward. In the last 12 months, three major field activities, two major Project Advisory Team meetings, and two other workshops were conducted along with other several minor meetings and workshops (Box 1). We also reviewed existing monitoring and data management protocols of DENR-PAWB for marine components of NIPAS sites and evaluated them based on other existing international and national protocols.

The next section recounts the major activities conducted vis-à-vis the three major steps of the project (Figure 1)

Box 1. Summary of Major Project Activities and Accomplishments

1. 1st Project Advisory Team Meeting (April 6, 2004)
   - ⇨ Formed the initial Project Advisory Team composed of heads and representatives of various divisions of DENR-PAWB and from CMMO, WWF-Philippines, WorldFish Center, and MERF sub-contracted trainers
   - ⇨ Discussed refinements to the scope and targets of the project and the project implementation
   - ⇨ Identified criteria for selecting training participants
2. 2nd Project Advisory Team Meeting (February 14, 2005)
   - ⇨ Reviewed the BMS and its implementation
   - ⇨ Identified initial training participants and representative Priority NIPAS sites (one per participant or region)
   - ⇨ Discussed and refined the training program
3. Training and monitoring in Puerto Galera (March 28 to April 7, 2005)
   - ⇨ Formed the DENR's Core Group in Biophysical and Socio-economic Monitoring Team in Marine Protected Areas/Coastal Areas under the DENR (through a DENR Special Order)
   - ⇨ Assessed the monitoring skills and trained 14 participants from 11 regions, PAWB main office, CMMO main office, and Vietnam (Nha Trang Institute of Oceanography)
   - ⇨ Monitored two established sites in Puerto Galera on benthic and fish communities and two barangays on socioeconomic data gathering (i.e., for MPA establishment)
   - ⇨ Reviewed the status of protected areas represented by Puerto Galera participants
   - ⇨ Created initial site-specific monitoring plans for the protected areas represented by each participant

4. Monitoring of Palaui Island Protected Landscape and Seascape (August 18 to 25, 2005)
   - ⇨ Compiled existing data and reports on PIPLS
   - ⇨ Surveyed the benthic and fish community in 4 identified sites around Palaui Island and conducted socioeconomic survey of residents of the island
   - ⇨ Conducted a workshop of stakeholders to identify issues and generate a 6-month activity plan to address these issues
5. Feedback of PIPLS monitoring results to PAMB (November 15-16, 2005)
   - ⇨ Met with DENR Region 2 on updates on the activity plan drafted during the monitoring trip
6. Conducted an internal PAWB workshop for upgrading the PAWB-Integrated Database on Biodiversity Conservation's marine components (IDBC) (October 6 to 7, 2005)
7. Presented a poster in the 8th Philippine Association of Marine Science (PAMS) - National Symposium on Marine Science (October 20 to 22, 2005)
   - ⇨ See Annex B for the poster
8. Drafted the Biodiversity Monitoring System Supplementary Manual on Coral Reef Monitoring (BMS-SMCRM)
9. Conducted a small workshop for encoding existing data from the Priority NIPAS sites into the proposed additional PAWB-IDBC database fields (December 16, 2005)
   - ⇨ Reviewed existing PAWB NIPAS database and compared with international coral reef databanks such as ReefBase
   - ⇨ Reviewed existing data reporting protocol
10. Final Project Advisory Team Meeting (December 26, 2005)
    - ⇨ Presented the results of the project to DENR-PAWB officials including current PAWB Director Virgilio V. Vitug
    - ⇨ Identified post-project commitments and linkages with other upcoming projects
11. Database encoding
    - ⇨ Encoded SRPAO of Palaui, Sagay, Caramoan, Initao-Libertad, Taklong, and Cuatro Islas; permits from Turtle Islands; and, PAMB profiles for Palaui, Paoay Lake, Sagay, and Taklong
12. Submitted biophysical and socioeconomic monitoring data on Puerto Galera and Palaui Island Protected Landscape and Seascape to ReefBase but as of March 22, 2006, they have not yet replied to our letter

2.1. Enhancing the BMS

Review of the DENR-PAWB Biodiversity Monitoring System (BMS)

The NORDECO-DENR Biodiversity Monitoring System (BMS) was critically assessed by the Foundation for the Philippine Environment (FPE) and its Experts Advisory Panel in 2003 and was documented in their final report entitled "Enriching the BMS" (FPE 2003). Recognizing the strengths of the BMS, FPE used this system as the basis for establishing their Biodiversity Monitoring and Evaluation (BIOME) system for the FPE-CBRM project sites. In their review, they used various manuals such as the Coral Reef Monitoring for Management (CRMM, Uychiaoco et al. 2001) and the Socioeconomic Monitoring Guidelines for Coastal Managers in Southeast Asia (SocMon SEA, Bunce and Pomeroy 2003) for improving the methods in the BMS. They recognized the bias of the BMS in monitoring terrestrial ecosystems and suggested the use of the CRMM to improve the monitoring of Marine Protected Areas (MPAs). They also acknowledged the importance of stakeholder participation and monitoring socioeconomic indicators to ensure a sustainable and adaptive management process. However, recommendations from the study focused primarily on terrestrial ecosystems and socioeconomic monitoring components.

We also did a short review of the Biodiversity Monitoring System (BMS) which started with the First Project Advisory Team meeting back in April 2004.

The BMS is DENR's official monitoring system for protected areas under the National Integrated and Protected Areas System (NIPAS) and is implemented through a DENR Administrative Order 2000-13. It was intended to be a minimum starting point for biodiversity monitoring of protected areas in both terrestrial and marine ecosystems given financial and logistical constraints experienced in most NIPAS sites. The simple marine monitoring methods in the BMS are only able to capture a few of the indicators identified as needed for proper management of MPAs by Pomeroy et al. (2004; refer to Annex C). The methods in the BMS are too general to quantitatively detect slight to moderate changes in the resource. However, the authors of the manual also recognize the need for more scientific monitoring methods and actually encourage their use if there is sufficient funding and manpower.

In order to provide greater decision support to managers of Philippine NIPAS sites, the methods in the BMS need to be upgraded to capture important changes in the resource. As such, the MERF proponents and trainers selected biophysical and socio-economic reef monitoring manuals which can build upon the methods prescribed in the BMS. Using the various biophysical, socioeconomic, and governance indicators laid out in Pomeroy and colleagues' MPA management effectiveness guidebook (2004), the BMS and the selected manuals (Annex C) were analyzed as to their ability to measure the indicators (Annex D). The methods in Uychiaoco et al (2001) are able to capture eight of the ten biophysical indicators. In addition, these methods can be easily taught to field personnel using the transect swim method in the BMS since they also involve the use of transects but with a much more structured survey form and an updated list of indicator species/groups. For the socioeconomic indicators, most of them are listed in the SocMon SEA (Bunce and Pomeroy 2003) and can be measured using primarily Key Informant interviews (KI) and Household interviews (HI). Other socioeconomic indicators in Pomeroy et al (2004) can be easily collected using the KI and HI methods, if it cannot be found in secondary sources, or by expanding the context of Focus Group Discussions (FGD) illustrated in the BMS. The MPA Report Guide (CCEF 2004) assesses the status and quality of management of NIPAS sites. It is composed of simple forms which partially capture approximately half of the governance indicators in Pomeroy et al (2004). Use of KIs can increase the ability of the Guide to fully capture the governance indicators. However, questions on enforcement mechanisms and

coverage are severely lacking in the Guide. The governance indicators not captured by the MPA Report Guide are sufficiently incorporated in the draft "Conservation Management Capability Checklist" of WWF Philippines which was presented during the 1st PAT meeting. This checklist provides a more detailed assessment of management efforts and some of the questions from this checklist can be integrated with the MPA Report Guide to create a more practical governance monitoring protocol which would provide a holistic view of the status of MPA management, identify weak points, and determine avenues to improve the management system.

Overall, the biological monitoring manual of Uychiaoco et al (2001), the SocMon SEA (Bunce and Pomeroy 2004), and the MPA Report Guide (CCEF 2004) together with the Conservation Management Capability Checklist (WWF Philippines) can sufficiently measure most of the important indicators in Pomeroy et al (2004) with only a few revisions.

In the context of the training of NIPAS field personnel, it is not feasible though to effectively teach all of the methods in the selected manuals in a span of two weeks. Thus, we grouped the compiled monitoring methods into levels which corresponded to the importance of the indicators they are measuring and the ease of their use (Table 1). Level 1 represents the minimum set of methods which should be taught to NIPAS field personnel. They are relatively easy to do, do not require SCUBA gear, and do not deviate much from the methods in the BMS, yet they still provide a useful overview of the status of the coral reef and its utilization. Discussions with trainers and the PAT are on-going to determine the actual content and schedule of the training. If there is sufficient time, the higher level methods can also be taught.

Table 1. Classification of reef monitoring methods according to levels of importance of indicators measured and ease of use (see Annex C and D for description of methods and the indicators measured by each)

	Level 1	**Level 2**	**Level 3**
Biophysical	Manta Tow / Transect Swim	Snorkel Survey	Point Intercept Transect
	Field Diary / Observation of Human and Natural Disturbances	Fish Visual Census (Families)	Invertebrate Count Fish Visual Census (Species)
	Photo Documentation	Monitoring Fish Catch	
	Focused Group Discussions		
Socio-economic	Focused Group Discussions	Household Interviews / Community Perceptions	
	Secondary Data		
	Key Informant interview		
	Observations		
Governance	Basic Description	Management Rating System	
	General Status	Community Perceptions	

BMS Supplementary Manual on Coral Reef Monitoring

The objective of the BMS was to create a manual that can be used by all NIPAS sites to monitor their resources and users given their limited resources. The authors noted that, if resources are sufficient, further detailed and structured monitoring using standard methods such as line intercept transects and fish visual census can be undertaken. Having a supplementary manual on coral reef monitoring (SMCRM) would provide NIPAS staff with the tools and skills needed to undertake more structured monitoring. Employing monitoring protocols consistent with widely used methods would maximize the application of monitoring data.

Thus, a supplementary manual, the BMS-SMCRM, was drafted which focuses more on the data integration schemes and application to management than on methods, which the main references cited by the manual already tackles comprehensively. As suggested by the participants in the Puerto Galera training in March 2005, the BMS-SMCRM also provides a brief overview and guides for establishing permanent coral reef monitoring sites and creating a monitoring program. The main references used for the SMCRM are the CRMM, SocMon SEA, and the MPA Report Guide for NIPAS sites by CCEF (Table 2).

The SMCRM also divides methods and indicators into levels according to their difficulty and importance. Like the BMS, if resources allow, further detailed data collection can be undertaken.

A key feature of the BMS-SMCRM is the MPA management guide (Annex E) which helps managers link biophysical, socioeconomic, and governance / management indicators.

A CD will also accompany the BMS-SMCRM that will contain electronic copies of the manual itself, the main references cited, and sample MS Excel files for encoding data at the protected area level. Draft copies of the manual accompanied by a manta board, complimentary of the project, were distributed to training participants together with a copy of this report.

The SMCRM has been submitted to DENR-PAWB Director Virgilio V. Vitug and was recommended for institutionalization after further reviews. Copies were also sent to DENR regional offices.

2.2. Training and monitoring in Puerto Galera

Puerto Galera was used as a case study site wherein participants underwent practical work in coastal resource monitoring, focusing on coral reefs, from conducting actual monitoring to encoding, analyzing, and interpreting data, and finally, to reporting pertinent results to local stakeholders and the management body. Table 2 summarizes the methods taught in the training.

The objectives of the training and workshop on coral reef monitoring for management were:

(1) Assess and upgrade the coral reef monitoring skills of selected NIPAS personnel and a representative from the Nha Trang Institute of Oceanography, Vietnam;
(2) Monitor Puerto Galera sites by participants and trainers and provide feedbacks to the pertinent local coastal resources management body;
(3) Gather and compile coral reef monitoring data from selected pilot protected areas per region;
(4) Determine gaps and problems of regional field offices in meeting the requirements for the Biodiversity Monitoring System particularly in marine monitoring;
(5) Create initial site-specific monitoring plans for the protected areas represented by each participant; and,
(6) Select among the NIPAS participants the protected area to be visited and monitored in June/July 2005 by trainers and the participant from the selected protected area.

The training was held in Puerto Galera from March 28 to April 8, 2005. Annex F summarizes the schedule of activities.

Table 2. Methods and references used in the training

Methods	Reference
General reference	
Indicators & MPA management	Pomeroy et al. 2004: "How is your MPA doing?"
Biophysical monitoring	
Manta Tow	Uychiaoco et al. 2001: "Coral Reef Monitoring for Management"
Point Intercept Transect (PIT)	
Fish Visual Census (FVC)	
Socioeconomic monitoring	
Fisheries survey	Uychiaoco et al. 2001
Focus Group Discussions	Bunce and Pomeroy 2003: "Socioeconomic Monitoring Guidelines for Coastal Managers in Southeast Asia"
Household / Key Informant Interviews	
Governance monitoring	
Management Rating System	CCEF 2004: "MPA Report Guide (NIPAS)"
MPA Data Analysis For Management	-- this project (Annex H)

2.2.1. Site description

Puerto Galera is a small peninsula north of Mindoro island, 100 kilometers south of Metro Manila. It is a well-known local and international tourist destination. It was selected as the training site due to its proximity from Metro Manila, the availability of SCUBA equipment, and its considerable history of coral reef monitoring by UP-Marine Science Institute and other organizations. For a detailed description of Puerto Galera, please refer to Campos (2002) and Rañola et al. (2003).

Table 3 provides a brief description of the current biophysical, socioeconomic, and management status of Puerto Galera. Figure 2 shows the location of established coral reef monitoring sites.

Table 3. Information on Puerto Galera coastal resources monitoring and management

Category	Description / Data
Biophysical (Licuanan et al. 2004)	
Location	13°23' to 13°32' N and 120°50' to 121°50' E
Average % coral cover	21% (Escarceo Pt., 1st Plateau, and 3rd Plateau)
Fish species diversity	95spp. (Campos 2002)
Average reef fish biomass	~5kg/500m^2 (Escarceo Pt., 1st & 3rd Plateau, Markoe Bay)
Notable fauna	*Anacropora puertogalerae*; *Xenia puertogalerae*
Socioeconomic (Cola and Hapitan 2004)	
Number of households	4,325 (NSO 2000 data); 56% are in tourism related barangays
Main livelihood	Tourism-related activities(e.g., boats to ferry tourists or resort employment); subsistence and commercial fishing
Average household income	P11,065/mo. (non-fishing); P18,361/mo. (fishing)
Management (Rañola et al. 2003; Campos 2002)	
Management body	No central marine resources management body
Assisting NGOs / academe	UNESCO, WWF, UPMSI, Philippine Tourism Agency
Interventions implemented	Nothing specific to coastal resource management
Main Issues	Conflicts with the LGU, water pollution, uncontrolled foreshore development

* NSO = National Statistics Office

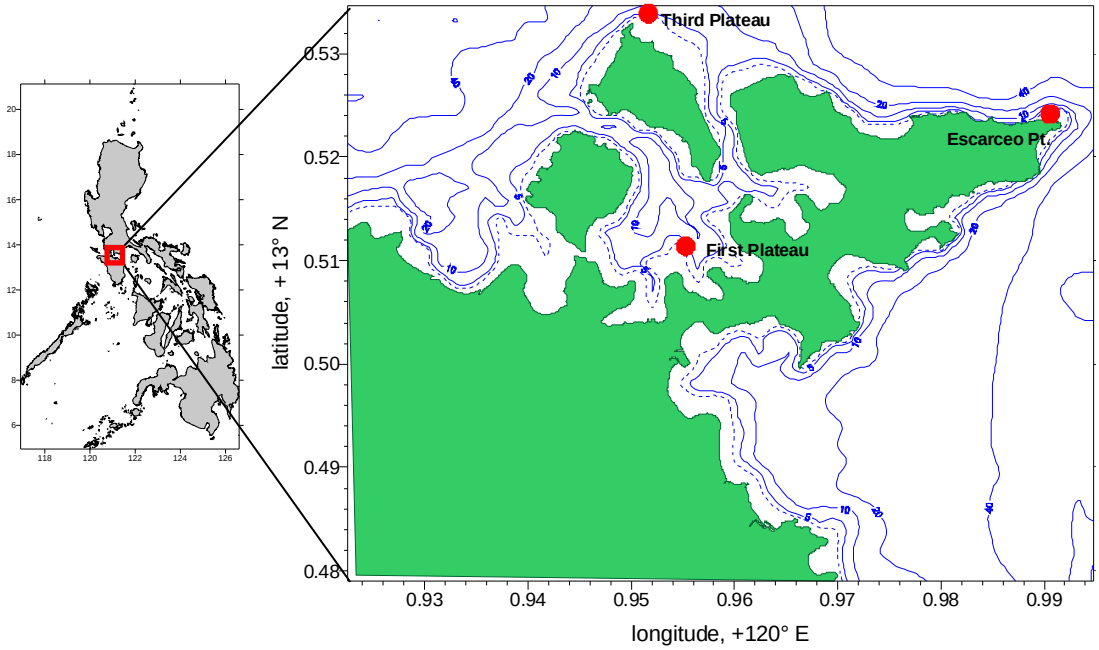

Figure 2. Location map of established monitoring sites in Puerto Galera

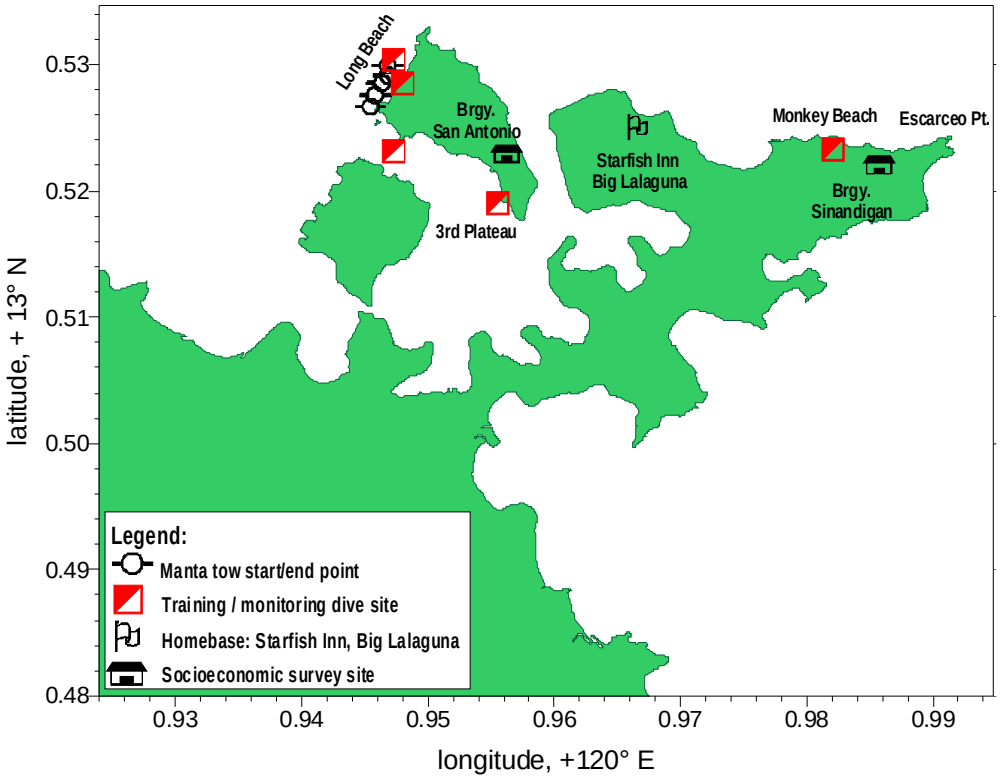

Figure 3. Location of training and monitoring sites for this project. Note that the some dive sites are plotted on "land" due to calibration errors in the GPS used.

2.2.2. Activities

Trainee selection

Preparations for the Puerto Galera training immediately began after the signing of the Memorandum of Agreement (MOA) between the DENR and MERF last July 2004. The criteria for selecting the trainees were:

a. Job responsibility should involve monitoring of coral reefs / coastal resources
b. Preferably a SCUBA diver but at least a good swimmer
c. Should preferably be with a permanent appointment or with a good standing for contract renewal
d. Not over 50 years old
e. Preferably belongs to the top 7 priority regions identified by the Philippine Biodiversity Conservation Priorities Program's (PBCPP, Ong et al., 2002)

The Project Advisory Team met in February 2005 to finalize the list of participants to the training and discuss the training program, among others. The meeting also brought to surface the problems with the BMS and its implementation and, on the brighter side, a pledge of support and cooperation from BFAR representative, Ms. Jessica Muñoz, in conducting coral reef monitoring in NIPAS sites together with BFAR personnel. It was also agreed that each participant should represent and monitor one priority MPA in their region for one or two years before applying the methods to other PAs to test its usefulness and gather greater support from local stakeholders and LGUs.

Through a DENR Special Order signed by former DENR Secretary Michael T. Defensor the selected training participants were officially called to the training and formed DENR's Core Group in Biophysical and Socio-economic Monitoring Team in Marine Protected Areas/Coastal Areas under the DENR. Table 4 shows the list of trainees and the represented protected areas (i.e., "Project Priority NIPAS-PA"). The Project Priority MPAs under NIPAS fall under the "Very High" to "Extremely High" categories of the PBCPP map of priority marine areas (Ong et al., 2002; see Figure 4 on the next page).

Table 4. List of selected trainees and their representative protected area

Name	Region	Protected Area Represented
1. Anson Tagtag	PAWB	-----
2. Francisco Paciencia, Jr.	CMMO	-----
3. Jamelita Taguiam	R-2	Palaui PLS
4. Pedro Velasco	R-4B	Malampaya Sound
5. Jose M. Roco, Jr.	R-5	Caramoan National Park
6. Immaculate Juntarciego	R-6	Sagay Marine Reserve
7. Edmondo P. Arregadas	R-7	Apo Island PLS
8. Arnulfo Viojan	R-8	Cuatro Islas Protected Seascape
9. Almario M. Kaabay, Jr.	R-9	Turtle Islands
10. Edgardo B. Cañete	R-10	Initao-Libertad PLS
11. Alvin Salting	R-11	Mabini PLS
12. Romeo Manzan	ARMM	Bongo Island
13. Milafe T. Salimbangon	CARAGA	Siargao PLS
14. Nguyen An Khang	Vietnam	Hon Mun MPA

* PLS = Protected Landscape and Seascape

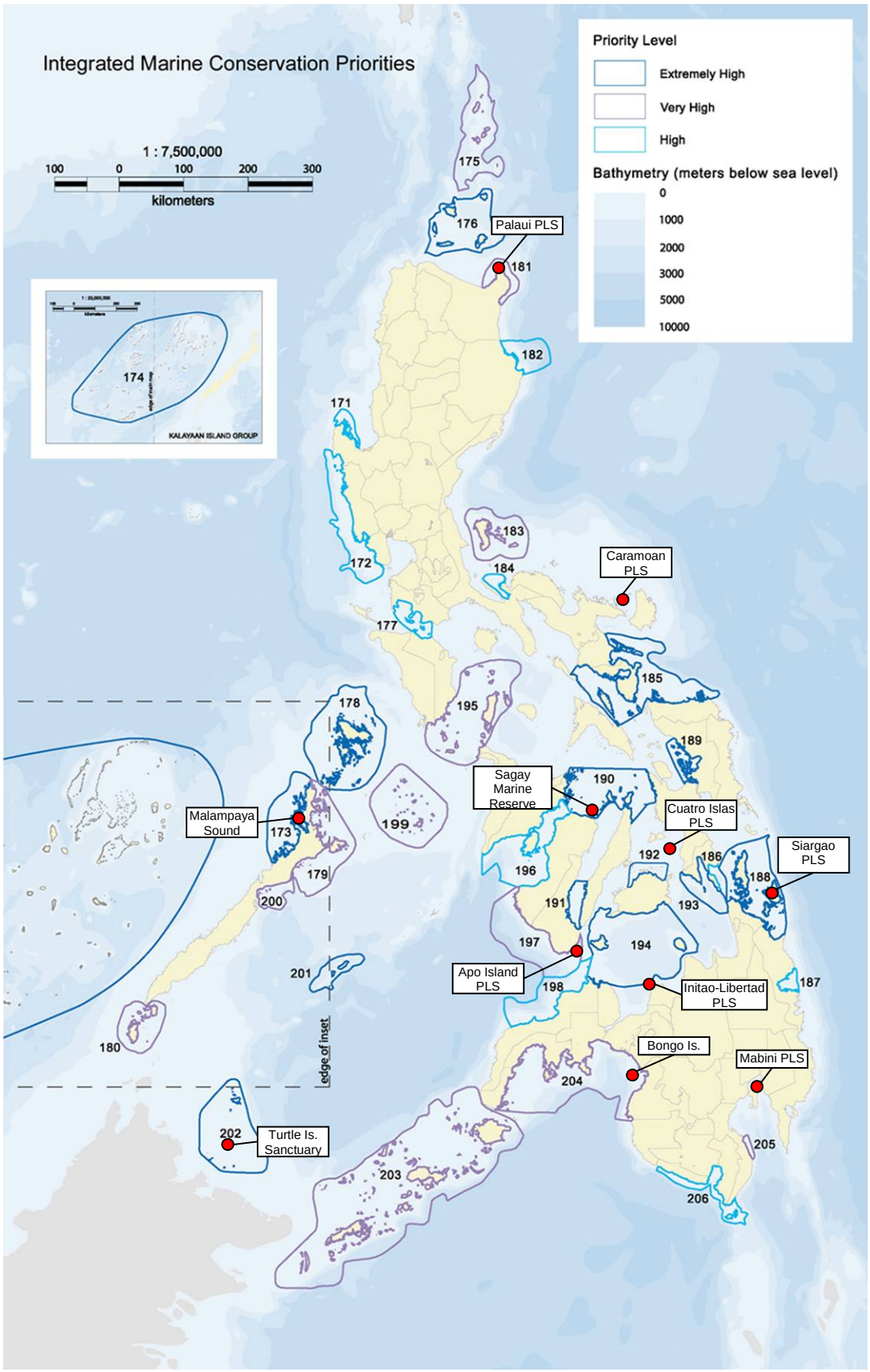

Figure 4. Locations of Philippine protected areas represented by the training participants plotted on PBCPP Integrated Marine Conservation Priorities map (Ong et al. 2002)

Workshop on the status and monitoring of Project Priority PA under NIPAS

The 1st day of the training, March 28, was allotted for a whole day workshop held at the DENR-PAWB Visitors' Center, Quezon City. Top officials from DENR-PAWB and the DENR-Coastal and Marine Management Office (CMMO) as well as representatives from various non-government organizationsNGOs and academe (e.g., World Wide Fund for Nature Philippines, Foundation for the Philippine Environment, De La Salle University) were invited. The participants presented their experiences in monitoring and managing the marine component of the selected NIPAS site or MPA in their region / country. The information shared by each participant for their site included: (1) Top 3 issues and/or management constraints, (2) Top 3 current management interventions, (3) current level of stakeholder participation and compliance, and (4) data availability, feedback, and usage (Annex I). These presentations served two purposes: (1) to determine the participants' skills in monitoring coral reefs (i.e., both biophysical and socioeconomic methods) and (2) to present the issues and constraints in conducting regular monitoring. This was then followed by a brief workshop to determine the expectations of the participants on the training.

Biophysical training & monitoring

The training was divided into two parts: (a) biophysical monitoring (i.e., benthic and fish community surveys) and (b) socioeconomic and governance monitoring (see Annex F for the detailed schedule of activities). Puerto Galera was used as a case study site with the intention of having participants undergo practical work in coastal resource monitoring, focusing on coral reefs, from conducting actual monitoring to encoding, analyzing, and interpreting data, and finally, to reporting pertinent results to local stakeholders and the management body. Thus, the output of the activity was two-fold: (1) to assess and train the participants in standard coral reef monitoring methods (Table 2) and, (2) to monitor selected sites in Puerto Galera (i.e., Escarceo Point and Third Plateau).

Socioeconomic training & monitoring

After the biohysical training, all participants underwent a series of lectures and hands-on training to introduce the concept of socio-economic monitoring. Prior to the start of the socioeconomic training, a meeting was held with the Project Manager of WWF in Puerto Galera, Mr. Johnjoe Cantos, to determine what type of community data can the participants collect which would be most useful to WWF's current efforts in the area. It was agreed that since WWF has been planning to establish small marine sanctuaries in Puerto Galera, it would be very useful for them to have an idea of what the locals think about MPAs and on establishing one or two within the Puerto Galera Man and Biosphere Reserve. Mr. Cantos suggested conducting surveys in Brgy. Sinandigan and Brgy. San Antonio (Figure 3). In order to expose the participants to various survey techniques, the trainer decided to conduct Household Interviews (HI) in Brgy. Sinandigan and Focus Group Discussions (FGD) in Brgy. San Antonio.

Box 2. Socioeconomic Lectures and Workshops

A. Lectures

1. Relevance, objectives and importance of socio-economic monitoring
2. Relevant indicators to use for socio-economic monitoring
3. Data gathering techniques (i.e., Monitoring fish catch, focus group discussions, researching secondary sources, key informant interviews, and household interviews)
4. Data analysis and communication

B. Workshops

The participants were broken up into workshop groups for seven sessions, namely:

1. Workshop 1: List of Relevant Indicators for Each MPA
2. Workshop 2: Identification of Data Sources and Data Gathering Techniques
3. Workshop 3: Development of Survey Instrument for Household Interviews
4. Workshop 4: Preparation of Dummy Tables for Data Analysis
5. Workshop 5: Data Processing and Encoding
6. Workshop 6: Finalization of Tables for Data Analysis
7. Workshop 7: Drafting of Individual Workplans and Integration of Biophysical, Socio-economic and Governance Indicators

2.2.3. Results

A total of 14 participants attended the training with diverse levels of experience in coral reef monitoring. Eleven of which were from various DENR-PAWB or CMMD regional field offices, each representing one priority protected area, two were from the Manila office of PAWB and CMMO, and one is from Vietnam's Nha Trang Institute of Oceanography. One DENR regional participant was not able to attend the biophysical training (i.e., Ms. Immaculate Juntarciego – R6). Table 5 summarizes the outputs of the workshop and the training per objective. The following texts describe in greater detail the general outputs of the training.

During the 1st day workshop, participants were asked to present their expectations from the training. These can be summarized as follows:

- Project / training shall standardize / harmonize monitoring methods (e.g., BMS, Municipal Coastal Database, etc.); trainers shall teach guides to proper site identification
- Methods must be simple and do-able
- Participants will learn more from socioeconomic and political monitoring and coral taxonomy (if possible)
- Trainers will teach appropriate indicators for monitoring
- Trainers will teach how to apply monitoring information to management prioritization / decisions

Table 5. Summary of key results of the workshop and training

Training Objective	Expected Activities / Output	Accomplishment(s) / Remarks
1. **Assess and upgrade the coral reef monitoring skills** of selected NIPAS personnel and a representative from the Nha Trang Institute of Oceanography, Vietnam;	• Activities: Pre-training assessment of the participants' skills re: each monitoring method to be taught; lectures on manta tow, point-intercept transect, fish visual census, focused group discussions, key informant / household interviews, and transcribing, analyzing, interpreting, and integrating monitoring data • Output: assessment / report card for each participant (with recommendations)	• Since 4 participants were non-divers and had no previous experience in coral reef monitoring, the biophysical training had to be adapted to the mix of participant monitoring skill levels • All divers underwent exercises in benthic and fish monitoring; non-divers joined field exercises through snorkeling • Assessment of all participants per training component (i.e., coral / benthic community, fishes, and socioeconomic monitoring) with rating and recommendations
2. **Monitor Puerto Galera sites** by participants and trainers and provide feedbacks to the pertinent local coastal resources management body	• Activity: conduct actual biophysical and socioeconomic monitoring of selected sites in Puerto Galera; present results of the monitoring to local stakeholders and authorities • Output: summarized monitoring data	• 2 reef sites (3rd Plateau and Escarceo Pt.) monitored for benthic and fish communities by both the trainers and the participants • 2 barangays interviewed re: establishment of MPAs in Puerto Galera • Data were encoded by the participants • No feedback to Puerto Galera stakeholders due to time constraint and unavailability of pertinent authorities
3. Gather and compile **coral reef monitoring data** from selected pilot protected areas per region	• Activity: part of the whole-day workshop prior to moving to Puerto Galera for the field training • Output: database of current biophysical, socioeconomic, and governance data from the protected areas represented by the participants	• Only narrative data could be obtained from the presentations of the participants; quantitative data for incorporation into a database were not available during the training

Training Objective	Expected Activities / Output	Accomplishment(s) / Remarks
4. Determine **gaps and problems** of regional field offices in meeting the requirements for the Biodiversity Monitoring System particularly in marine monitoring	• Activity: whole-day workshop where each participant shall briefly narrate his/her experience in monitoring the selected priority protected area in his/her region and the current management issues they are facing • Output: summary of the status of each protected area and their issues	• Common management constraints among participants are: limited budget, personnel, and SCUBA diving equipments; • Lack of LGU support emerged a major issue / constraint for other sites • Aside from the lack of personnel, continuity of efforts is often hindered by problems in transition of knowledge and equipment to succeeding staff
5. Create initial **site-specific monitoring plans** for the protected areas represented by each participant	• Activities: creation of monitoring plans will be done as part of the workshops to be conducted during the socioeconomic part of the training • Output: initial monitoring plans for regional participants with budget estimates; this should be preceded by a brief review of the current state of their monitoring data	• All participants who represented a protected area drafted their own activity plans for their selected site after the training for one year • Budget estimates for conducting biophysical and socio-economic monitoring for 1 year averaged at a total of P140,000 • An average of P30,000 is also estimated by the participants for meetings and training of other staff and the community based on the modules used in this training course • Some sites indicated the need for additional funding for delineating sanctuary boundaries using buoys and for permanently marking monitoring sites or transects with concrete blocks
6. Select among the NIPAS participants the **protected area to be visited and monitored in June/July 2005** by trainers and the participant from the selected protected area	• Activity: participants shall vote among themselves the site which MERF shall assist in establishing regular participatory monitoring • Output: identity of the second site and initial discussions with the participant representing the selected protected area	• Not undertaken due to time constraint • Instead, the 2nd site shall be voted by the Project Advisory Team members among the sites represented in the training based on the data presented by the participants and supplemented with data gathered by the project proponents (i.e., MERF and PAWB)

Biophysical monitoring skills

Although being a certified diver was part of the criteria for selecting participants to the training, four participants, including the Vietnamese, were non-divers. Despite having basic to advance experience in biophysical monitoring of coral reefs, many of the divers had initial problems with their bouyancy which significantly affected their performance in field exercises. Thus, the training program had to be modified on site to fit the diving and monitoring skills of the participants.

Non-divers have almost no experience in coral reef biophysical monitoring but they were quick to learn and excelled in most of the exercises particularly with lifeform identification.

Everyone performed very well in the manta tow exercise. Estimates of cover even by the beginners were very close to the estimates made by the trainer.

Point Intercept Transect (PIT) was lectured to all participants but only the divers were able to practice it in the field with the exception of the Mr. Nguyen An Khang (Vietnam) who had very keen eyes and was able to do the exercises through snorkeling. Those who did the field exercises performed very well, estimating cover close to the instructor's estimates.

A summary of the participants' grades is presented in Table 6. Annex J contains the details of the participants' grades in each training component while the narrative assessments and recommendations by the trainers per participant can be found in Annex K.

Table 6. Summary of grades of the participants for each part of the training

Participant	Office	Benthos	Fish	SocioEcon	Average Score
Anson Tagtag	PAWB	71%	69%	91%	77%
Francisco Paciencia	CMMO	55% *	47% *	N/A **	51% ***
Jamelita Taguiam	R 2	96%	93%	94%	94%
Pedro Velasco	R 4B	53% *	40% *	91%	61% ***
Jose Roco, Jr.	R 5	98%	90%	85%	91%
Immaculate Juntarciego	R 6	10%	N/A	77%	77% ***
Edmondo Arregadas	R 7	98%	86%	82%	89%
Arnulfo Viojan	R 8	99%	98%	77%	91%
Almario Kaabay, Jr.	R 9	79%	94%	91%	88%
Edgardo Canete	R 10	94%	58%	90%	81%
Alvin Salting	R 11	95%	93%	94%	94%
Romy Manzan	ARMM	63% *	44% *	71%	59% ***
Milafe Salimbangon	CARAGA	95%	91%	84%	90%
Nguyen An Khang	Vietnam	70% *	40% *	85%	65% ***

* Relatively low score because the participant is not a certified diver and was not able to fully participate in field exercises

** Served as support staff for the socioeconomic trainer

*** Not valid as measure of overall performance

Fish visual census (FVC) skills and experience of participants ranged from very good to none. Fish identification was a major problem for beginners especially the non-divers. Fish size and abundance estimation skills were generally good. Improvements in skills on fish visual census of individual participants were mainly noted from individual discussions during off-lecture hours. Points and issues raised were mostly on fish identification, and abundance estimation, and the possible sources of error in the technique.

It is highly recommended that the young non-divers (e.g., Nguyen An Khang and Francisco Paciencia, Jr.) take SCUBA diving lessons as soon as possible and they should join monitoring activities near their official stations. The senior non-divers (i.e., Mr. Romy Manzan and Mr. Pete Velasco) hold high positions in their area and generally have minimal exposure to coral reef monitoring. Although they are not expected to conduct monitoring themselves, their attendance to the training is critical in ensuring that the top brass have a comprehensive grasp of the methods and the importance of properly utilizing monitoring data to direct management decisions. Instead of conducting actual benthos and fish surveys in their region, they should echo their training to appropriate junior members of their staff who shall conduct the monitoring. The other participants have both responsibilities (i.e., monitor their protected areas and re-echo their training to their colleagues).

As the point person in the DENR Biodiversity Monitoring System (BMS), Mr. Anson Tagtag needs more field exposure so he can easily relate to the current gaps in implementing the BMS and have the proper experience and knowledge to allow him to appropriately improve the protocol.

Socioeconomic survey skills and secondary data gathering and utilization

Trainees drew a lot of experience during the conduct of both the household interviews and the FGDs. Their insights included the following points:

- Interpersonal skills are very important in conducting data gathering techniques
- There is a different level of accuracy of information generated from FGD and HH interviews, with the latter containing more detail and more accurate information
- Deeper, more detailed information could be generated from HH interviews; consequently, more analysis can be done therefrom
- FGD is a powerful technique in learning about issues; but more skills are needed in conducting FGDs; its very nature calls for proper facilitation on the part of the interviewer
- FGDs can be used to validate responses from household interviews
- Variety in members of FGD makes info gathering difficult; hence, a number of FGDs will have to be conducted (whereby all types of stakeholders are represented, either in one group or as separate groups each) before conclusions can be drawn
- It is difficult to document information from FGDs because of numerous inputs; skills in note taking and facilitation are needed
- Proper introduction of the objectives of the survey, teamwork among the interviewers, and mastery of the survey instrument/ questions are all important
- Documenting for FGD is more direct than for HH interviews; however, generalizations cannot be done for FGDs
- With one or two interviewees dominating in a focus group discussion, there is the tendency to neglect other participants in the group; facilitator should be aware of this
- There is a tendency to mix roles among the interview team members in an FGD; it is difficult for first-time interviewers to stick to the roles assigned to them

All participants did relatively well during the entire training workshop, with some excelling over the others. Half of them got scores above 90%, and only three got scores below 80%. Still, the lower scores could be attributed to lack of experience in managing MPAs, and did not necessarily reflect low inherent capability. The younger trainees did extremely well in grasping concepts and preparing the corresponding workshop outputs, but as expected, the older ones showed more maturity particularly in the conduct of on-site data gathering. Some trainees would need extra help in performing data analysis, but constant practice can definitely improve their skills.

In sum, both data gathering techniques provided valuable lessons for the participants. Each had their own set of pros and cons. The level of accuracy is a factor to consider, as well as the skills and resources required for each type of technique. As for the trainees, as managers of MPAs with limited resources but immediate problems, decisions will have to be made on whether to rely on both types or to choose from the list of techniques which ones would be more appropriate for gathering data for their chosen indicators for monitoring.

Current status of project pilot protected areas

Participants presented the status of their respective protected areas during the 1st day workshop (Annex I) and the last day of the training (Annex L). Table 7 summarizes the results of trainee presentations during the 1st day workshop. It is surprising that only Siargao is the protected area within the group which actively implements the DENR Biodiversity Monitoring System for marine areas. The perennial issues and management concerns of all protected areas (e.g., illegal fishing, lack of personnel and budget, etc.) come up again in the workshop. The most common interventions are information and education campaigns (IEC), users fees, and livelihood programs. It is surprising that

For the last training exercise, participants were only able to provide coarse data summaries due to limited time and availability of data at the training site. Some of the trends, notes, and data were mixed up and placed in the wrong category (e.g., activities such as mangrove cutting placed in biophysical state rather than socioeconomic pressures). General comments and suggestions for improving the data summary forms are given in Box 3.

Table 7. Summary of the top issues, management constraints, and current interventions in the Philippine protected areas represented in the training as presented during the 1st day workshop (only items identified by two or more participants are included; see Annex I for the complete workshop output)

Issues in the PAs	Management Constraints	Current Interventions
• Illegal fishing • Use conflicts (e.g., zoning, proclamation issues, ecotourism development, etc.) • Lack of land tenurial security for locals • Intrusion of commercial fishers	• lack of personnel and budget • conflict with the LGU • Jurisdiction conflicts (e.g., in patrolling); overlapping functions of both internal & external management groups • Lack of skills & management aptitude; new management body; problems in transition • User fees can't be implemented properly (e.g., does not end up to PA management funds)	• Information and education campaigns (IEC) and trainings on monitoring methods to communities • Implementation of user fees mainly for tourism • Alternative livelihood programs • Establishment of POs • Drafting of various management plans (e.g., municipal and barangay-level CRM plans)

Participants' initial monitoring plans

Participants drafted broad initial monitoring plans (Annex M). Generally their plans involve: biophysical and socioeconomic data collection, meetings and trainings, establishment of monitoring sites, delineation and marking of sanctuary boundaries, and procurement of SCUBA gears and other equipments. Total budget estimates for the first year monitoring program ranged from P34,500 (Apo Island) to P620,000 (Turtle Islands, mostly on procurement of SCUBA gears and conducting biophysical monitoring) with a mean value of P248,500. The plans were proposals and, understandably, budget estimates are oftentimes bigger than what each activities cost. Despite having rough drafts, the exercise was successful in exposing participants to vital activities in MPA management – planning and monitoring. By drafting plans, participants were made aware of bigger responsibilities in MPA management and hopefully, they were encouraged to take more active roles in the management of their protected areas by recommending actions to their superiors.

Training assessment by the participants

Before traveling back to Manila, participants were asked to evaluate the training program, the trainers, and the logistics. Overall, participants found the training highly informative and said that they can implement the methods taught in the training to monitor their respective protected areas. They rated "very good" the overall conduct of the training and its usefulness. Some participants suggested including SCUBA diving introduction, identification of other important resources, expanding the program to include other coastal ecosystems such as mangroves and seagrass monitoring, and adding more evaluation mechanisms for management purposes. A few trainees found the training a bit too fast and recommended extending the duration.

Box 3. General comments and suggestions on improving the Protected Area Data Summaries and Monitoring Plans

A. Data Summaries

1. Provide more trends if possible; otherwise provide more quantitative data (e.g., % coral cover, fish species richness, etc.) which can later be converted to trends as other monitoring data sets become available
2. Place community activities (e.g., mangrove cutting, illegal fishing, etc.) in socioeconomic threats and management effectiveness information (e.g., stakeholder participation, activeness of POs and the community, etc.) in the governance responses
3. Properly identify data sources (i.e., name of the project or collecting team and the year of collection) and note statements which refer to personal perceptions rather than actual monitoring trends
4. Supporting explanations can be attached to the form (e.g., proper / complete data source citations, resource use maps (at the back of the form), etc.)
5. When filling up the spaces, try to link the three columns (i.e., resource state shows the resource problems, socioeconomic pressures could partially or wholly explain resource trends, given socioeconomic trends, identify management interventions and gaps to address socioeconomic problems)
6. Refer to the guide (Annex E) for other important trends to note

B. Monitoring Plans

1. Focus on activities for one year first and enumerate monthly activities with budget estimates (i.e., prioritize activities given budget limitations); for areas without baseline data yet, prepare a baseline data gathering plan rather than a monitoring plan
2. Explore collaborative efforts with the LGU, locals, NGOs, and other stakeholders to minimize personnel costs
3. Start with collecting, compiling, and reviewing secondary data first; this can save a protected area lots of money and resources before actually going out to the field and monitoring; most protected area data have been collected by external personnel (e.g., NGOs, academe, other projects, etc.)

Benthic community monitoring of Puerto Galera

Coral cover in Escarceo has gone up to almost 40% from just 15 to 20% in the previous sampling periods. This trend, however, does not demonstrate a positive change, that is, hard coral cover to be increasing as a result of management intervention, e.g., no fishing and anchoring are allowed in the site. This is because the transect line was placed at a slightly different location, some 10 to 15 meters away from the permanent transect. The reason for this is that it was very difficult for us to locate the permanent line because the soft coral *Xenia* completely covered most of the marker blocks. The situation is different for Third Plateau because there the blocks could easily be found. As shown in the graph, coral cover has changed slightly. However, it is difficult to attribute this change to some anthropogenic stresses. In 2004 Licuanan also observed a slight change in the cover between two long period monitoring periods but he pointed out that this could not be easily attributed to anthropogenic factors but perhaps to observer error (his angle when recording the point in the transect or a slight movement of the line transect). Moreover, under normal condition one year interval will not result to significant change in coral cover because corals exhibit slow growth rates.

It is important that the monitoring be done in a fixed location in each of the monitoring sites so that a long-term trend can be established and attributing this to some stresses could be possible. As has been noted here, the manner of laying the transect, i.e., laying it in a slightly different spot would result to significant differences in coral cover. Although good replication in each site may help manage the variability in the data, doing more transects entails additional cost.

Siltation seems to be a problem in the Third and First Plateau. It is important that the local government unit disallows massive land conversion within Puerto Galera Bay and in other embayments in the area. Some forms of land management such as greening of open areas must also be done to reduce soil run –off into the bay. It is important to note that a gyre is present inside Puerto Galera Bay resulting to higher residence time of silt thereby exposing the corals to a protracted period of high turbidity.

Fish community monitoring

A total 133 species of fish distributed among 26 families were recorded from Escarceo Pt. and 3rd Plateau, Puerto Galera (Table 8). Of the total species recorded 14 were indicator species, 88 were major species and 31 were target species. Indicator species are fish that are highly associated with their environment (*i.e.* coral feeding chaetodontids) and their presence or absence in an area may be indicative of the present conditions of the habitat. Species classified under the "major species" are fish with little commercial value in fisheries. However, they play important roles and occupy specialized niches in the marine environment, thus making them important trophic links in the fish communities. Target species are fish with commercial value and are exploited in local fisheries. Species richness ranged from 87 species/500m^2 at 3rd Plateau to 105 species/500m^2 at Escareo Pt. The same composition patterns were observed across stations with major species being the most speciose, followed by target species and then by indicator species.

Table 8. Total species richness and composition of fish (species/500m^2) from two stations in Puerto Galera, March 2005

Stations	Family	Species	Indicator	Major	Target
3rd Plateau	21	87	7	56	24
Escarceo Pt.	24	105	13	69	23
Total (unique)	**26**	**133**	**14**	**88**	**31**

Total fish abundance was estimated at 6,656 individuals for the two sampling stations combined (Table 9). The large majority of this was comprised of major species (6,229 individuals), while indicator species only comprised 238 individuals and target species was only 189 individuals. Mean estimated fish abundance ranged from 2,003 indiviuals/250m^2 (±1,257) at 3rd Plateau to 1,324 individuals/250m2 (±88) at Escareo Pt. Across stations, a similar abundance distributional pattern was evident with major species being the most numerically dominant group, followed by indicator species and finally target species.

Table 9. Mean abundance (individuals/250m^2) and distribution of fish from two stations in Puerto Galera, March 2005

Stations	Mean Abundance	Stdev (±)	Indicator	Major	Target	Total Abundance
3rd Plateau	2,003	1,257	103	3,828	76	4,007
Escarceo Pt.	1,324	88	135	2,401	113	2,649
Total			**238**	**6,229**	**189**	**6,656**

The combined total estimated fish biomass from the two sampling stations was 40.39kg (Table 10 and Annex L). Major fish species contributed the majority of the total estimated biomass with 24.28kg. This was followed by target species with 11kg, and indicator species with 5.11kg. The mean estimated fish biomass between stations was similar, ranging from 10.03 kg/250m^2 (±7.63) at 3rd Plateau to 10.16 kg/250m2 (±0.46) at Escareo Pt. Major species were still dominant over target and indicator species in terms of estimated biomass. However, target species had higher estimated biomass per station as compared to indicator species.

Table 10. Mean biomass (kg/250m^2) and distribution of fish from two stations in Puerto Galera, March 2005

Stations	Mean Biomass	Stdev (±)	Indicator	Major	Target	Total Biomass
3rd Plateau	10.03	7.63	1.43	13.65	4.99	20.07
Escarceo Pt.	10.16	0.46	3.67	10.64	6.01	20.32
Total			**5.11**	**24.28**	**11.00**	**40.39**

It is very important to define the objectives of establishing marine protected areas (MPA's). For example, MPA's may be designed to protect species and genetic diversity, or it may be more geared towards conserving the abundance and biomass of certain groups of fishes (*i.e*. target species). The results of the present study suggest that in terms of fish species richness, and to some extent benthic cover (*i.e*. live coral cover), Escarceo Pt. is a better candidate for protection than 3rd Plateau. Escarceo Pt. recorded a higher species richness of 105 species/500m^2 over 3rd Plateau (Table 8). Furthermore, the diversity and abundance of indicator species (*i.e*. coral-feeding chaetodontids) were also higher at Escarceo Pt. than in 3rd Plateau (Table 8 and Table 9).

3rd Plateau had a higher mean fish abundance and this was mainly due to major species such as *Pseudanthias huchtii*, *Acanthochromis polyacanthus* and *Pomacentrus brachialis* (Table 9; Annex M). The distribution of abundance estimates among the three fish groups/categories within each fish group, show that indicator and target species were more numerous at Escarceo Pt. (Table 9). There was little difference between the two stations in terms of estimated fish biomass (Table 10). However, it has been reported from previous studies, that Escarceo Pt. had the highest biomass among four stations surveyed in Puerto Galera in 2004 (Licuanan *et al*., 2004). In addition, much of the biomass at Escarceo Pt. in the report of Licuanan *et al*. (2004) was contributed by schooling target species such as fusiliers. It is likely that this group of fish was not encountered during the survey simply due to their highly mobile nature.

The data and information generated from the present study are a useful contribution to the database on marine resources monitoring in the area. In addition to the data on the general status of the reef fishes in the area, information on the composition and distribution of abundance and biomass estimates among target, indicator and major species may give additional insights for consideration in the planning and establishment of marine reserves.

Socioeconomic surveys (refer to Annex O for tables)

The household questionnaire developed and used in Puerto Galera is in Annex N while the tables / results are in Annex O. From Tables 1 to 4, it can be gleaned that most of the respondents were still highly dependent on fisheries for livelihood, although a huge percentage recognized recreational activities as major uses of their coastal and marine resources as well. Similarly, perceived threats to their resources consisted of destructive and illegal methods of fishing, rather than coming from tourism. The advantage of this is there seems to be an increasing awareness of the need to wean fishers away from destructive methods, and tourism is not seen as a threat to their current livelihood.

Majority of the respondents seem to have awareness on the concept of a marine sanctuary, with most of them indicating breeding and habitat functions as the main purpose of establishing one (Tables 5 and 6). Moreover, an overwhelming majority of the respondents seem to agree with the idea of establishing one in their area, and as expected, their positive response was directly related to the potential of increasing fish yield (Table 8). Perceived benefits were directly related to increased fish yield and prevention of illegal activities (Table 11), hence primary beneficiaries would be fisherfolk presumably living within the vicinity (Table 12). For those who did not approve of the idea of a sanctuary, there were no concrete reasons given for such responses, indicating that there is a big chance of convincing these people to shift their responses given more information and education. Allowed activities were the least destructive ones, such as snorkeling and research. Surprisingly, less than half approved of even passive methods of fishing such as the use of hook and line (Table 13).

With respect to management of the sanctuary, respondents preferred the use of a permit system over other forms of regulation, although 39% approved of the implementation of a user fee system in the area (Table 15). An overwhelming majority want the Barangay LGU to be the primary management body for the sanctuary (Table 16), indicating their strong preference for community-based management.

Most of the respondents belong to the 31 to 45 age range (Table 17), and a large percentage of those interviewed were male (Table 18). 81% of those interviewed were tagalog in ethnicity (Table 20), and all of the respondents were practicing Roman Catholics (Table 19). Many of them have joined the formal labor sector as laborers or employees, although they still practice fishing as their secondary source of livelihood (Table 21). This is also probably why they were highly supportive of establishing a marine sanctuary, since they were getting incomes from other sources as well, and were not totally dependent on fisheries. Be that as it may, majority still belonged to lower income brackets (Table 23), indicating that the residents will still need to rely on their coastal resources for a portion of their livelihood.

There is a strong potential for the establishment of a marine sanctuary in Barangay Sinandigan to be supported by its local residents. The survey indicates a high awareness among those who responded, albeit the survey itself cannot claim to be random, thus cannot be used to project results for the total population of the barangay. Nevertheless, the survey results can be used as benchmark figures that can provide direction for WWF and the Barangay LGU to design more focused information and education campaigns. What is important is that there is recognition of such conservation tools, and there seems to be awareness on the direct relation of marine sanctuaries and improved fish yield.

WWF can take their IEC campaign a step or two further with the residents, and focus on convincing those that do not support the idea yet through increased information on the benefits of a sanctuary. With respect to tourism, scuba diving is not as acceptable as snorkeling and research, and the management body should take this into consideration. Preferred management strategies should strongly be taken into account, and the concerned government agencies should see how enforcement of laws against illegal and destructive fishing can be improved. Residents seem to support such moves, as long as management of the sanctuary is community-based, whereby they themselves are given the opportunities to decide on how their coastal resources should be managed.

Updates on trainees

Nearly a year after the Puerto Galera training, participants were requested to submit a one-page update report detailing coral reef monitoring and related activities they have done. Excluding Jam Taguiam of DENR Region 2, five out of 11 field participants replied to our request so far (Annex P). These were Alvin Salting, Arnulfo Viojan, Jose Roco, Jr., Edmondo Arregadas, and Edgardo Cañete. Jam Taguiam is the representative of the project pilot site, Palaui Island Protected Landscape and Seascape, which was monitored in August 2005. We are still waiting for others' reply.

Unfortunately, the monitoring of Hon Mun MPA in Vietnam by Nguyen An Khang, which was partly to be supported by this project, did not push through due to problems with the fund transfer. However, we have also asked Khang to report whatever he managed to accomplish despite this setback.

Re-echoing of coral reef monitoring, both to locals in NIPAS and non-NIPAS sites, is the most common post-training activity conducted by the trainees. Some enjoyed further trainings related to coastal resource monitoring. However, since monitoring of the priority protected areas were not included in the annual plans for most of the regions, only Edmondo Arregadas (Apo Island) was actually able to monitor his assigned priority protected area primarily due to his position as chief of the CMMD[1] in their region. DENR should push to incorporate monitoring in regional annual general plan of activities to ensure the sustainability of our efforts. Annex P contains the updates submitted by the trainees.

General assessment of training and monitoring activities

Local regional participants generally hold field monitoring positions (e.g., Environmental Management Specialists) with two holding managerial positions (i.e., Romy Manzan – Director, ARMM PAWD and Edmondo Arregadas – Chief, CMMD Region 7). While the focus of the training was to update the coral reef monitoring methods used by the participants in their protected areas, many participants asked questions pertaining to pre-monitoring steps in MPA management such as establishing monitoring sites and for some, even gathering baseline data. This is because the protected areas represented by the participants were in various stages of MPA management, from establishing baseline resource data (e.g., Caramoan National Park) to interpreting years of monitoring data and utilizing it for appropriate management actions (e.g., Apo Island PLS).

The training-workshop was successful in many ways. Not only was it effective in assessing and updating the coral reef monitoring skills of the participants but, more importantly, it was able to encourage and heighten their enthusiasm.

[1] CMMD = Coastal and Marine Management Division

Participants should be monitored so that they make actual use of the training. Follow-up trainings of the same set of participants will be very helpful. Also, setting-up a communications network between the participants and trainers/MERF for further queries and clarifications may be of value for the continued upgrading of the trainee's skills.

The participants' respective bureaus / divisions should follow-up on their data summaries and activity plans to ensure that they are updating these and implementing or at least, have recommended these to their superiors.

PAWB and the trainees can play a major role in solving the usual problem of budget and manpower constraints. Regional directors of DENR should be convinced to allot more resources into monitoring activities. A stronger advocacy for such can be achieved, by conducting a two-pronged strategy from the field personnel (i.e. the trainees) and the coordinating body at the top (i.e. PAWB) to include monitoring as key result areas in the regular work program of the DENR regional offices. Foreign-assisted projects for MPAs can likewise be convinced to allot more resources into beefing up monitoring activities, particularly in the purchase of equipment and further skills training (e.g. scuba diving or snorkeling lessons) directly and indirectly related to monitoring.

2.3. Monitoring of Palaui Island Protected Landscape and Seascape

The Project Advisory Team selected the Palaui Island Protected Landscape and Seascape (PIPLS), represented by Ms. Jamelita Taguiam of DENR Region 2, to be the project pilot monitoring site. The criteria used for selecting this site were:

a. Its conservation priority level (based on Philippine Biodiversity Conservation Priority-setting Program (PBCPP, Ong et al. 2002))
b. Probability of having favorable weather during the trip
c. Has not received considerable support in monitoring
d. Readiness to provide counterpart time and effort and conduct the monitoring
e. Potential sustainability of monitoring effort

The objectives of this activity were:

(1) to assist Ms. Jamelita Taguiam in establishing regular participatory monitoring in the area (through meetings with pertinent stakeholders and agencies),
(2) to re-evaluate the skills of the PA staff who attended the Puerto Galera training through actual field monitoring and re-echoing of the Puerto Galera training to locals (i.e., training of fishers and other stakeholders in basic coral reef monitoring methods), and
(3) to assist the PA staff in feeding back monitoring information to the PAMB

The first two objectives were concluded in the first visit from October 18 to 25, 2005 while the 3rd objective was met on November 16, 2005 during the PIPLS PAMB meeting (Annex Q).

2.3.1. Site description

Palaui Island ranks as “Very high” in the PBCPP and is a part of the Philippine marine biodiversity corridors. It has not received much support compared to other sites although its regional office is actively working on proposals for management or project grants from conservation NGOs. The Cagayan Economic Zone Authority has plans for developing the area in terms of ecotourism and can take on the lead role of sustaining monitoring efforts while boosting the capacity of the regional DENR office and the LGU. However, community participation is low and although there are several People’s Organizations, most are inactive.

General area description

Palaui Island Protected Landscape and Seascape, which covers a total land and water area of about 3,000 and 2,000 hectares, respectively, is located at 18°32’55.135” North and 122°11’14.460” East (Figure 5) under the jurisdiction of Brgy. San Vicente, Sta. Ana, Cagayan Province.

Legislative background

A portion of Palaui Island has been classified as a Naval Reserve in 1967 under Presidential Proclamation No. 201. In August 16, 1994, under Presidential Proclamation No. 447, Palaui Island became part of the National Integrated Protected Areas System as a protected landscape and seascape. The following year, the Cagayan Special Economic Zone Act of 1995 (Republic Act No. 7922) was enacted thereby placing the entire Sta. Ana municipality, including Palaui Island, under the Cagayan Special Economic Zone. The Cagayan Economic Zone Authority (CEZA) manages the zone.

Previous studies / assessments conducted

Palaui Island became one of the priority sites of the Coastal Environment Program (CEP now coastal and Marine Management Office, CMMO) and a survey of the areas coastal resources was done in 2001.

As a CEP pilot site, six sampling stations were monitored in Palaui Island PLS: two within the informal marine sanctuary / strict protection zone (north of rona island and punta verde), while the rest were at Batayan Point (near Philippine Navy), Tangol Twins (Phil. Navy Post), south of Rona Island and at Siwangag Cove. These sites were not marked and had no coordinates.

Other coastal resource surveys were done by the University of the Philippines’ Marine Science Institute (e.g., in Cape Engaño, Siwangag Cove, and Aguab) through the National Cooperative Drug Discovery Group project (Campos 2002) and the DOST-PCAMRD[2] Pacific Seaboard Research Project I in 2001.

[2] DOST-PCAMRD: Department of Science and Technology – Philippine Council for Aquatic and Marine Research Development

Table 11. Secondary coastal resource data on Palaui Island Protected Landscape and Seascape

Resource	Date(s) of Collection	Data Availability	Collection as part of?	Remarks
Reef Benthos	1996	Summary report only	CEP* survey	% coral cover
	2001	Available	CEP Research	% coral cover
Reef Fishes	2000	Available	Research conducted by CEP	Abundance; relative abundance; biomass; diversity index
Mangrove	1996	Summary report only	CEP Project Site Profile	Dominant and other species present
Seagrass	1996	Summary report only	CEP Project Site Profile	% cover

* DENR-Coastal Environment Program (1993-2002)

Biophysical status

Monitoring of benthic and reef fish communities around Palaui Island was conducted under the Coastal Environment Program in 2001 (CEP 2001) and earlier by the UPMSI-NCDDG project. CEP results show poor to good condition of corals in six sites (Table 12).

Table 12. Results of CEP monitoring in Palaui Island PLS

Site name	Description / Location	% live coral cover *	Fish families	Fish Abundance	Fish Biomass (mt/km^2)
Batayan Point	Reef flat 50m from shoreline Depth = 10ft	28.0%	17	342	142.57
South of Rona Island	Reef flat 10m from shoreline depth = 6ft	28.0%	8	212	8.28
Tangol twins	Reef slope 200m from shoreline depth = 15meters	32.4%	17	798	77.12
North of Rona Island	Informal marine sanctuary 200m from shoreline depth = 20ft	83.0%	15	432	55.47
Siwangag Cove	150m from shoreline depth = 20ft	73.25%	15	957	191.47
Punta Verde	Reef slope	53.45%	13	487	58.54

* live coral cover = hard + soft corals

Unfortunately, stations monitored by CEP had no coordinates but only rough location descriptions. Through the UPMSI-NCDDG project, Cape Engaño, Aguab, and Siwangag were also monitored with coordinates recorded and reflected in Campos 2002. Siwangag is the only common station for both studies but the estimated % coral cover differed greatly. However, comparison of the two data sets is difficult due to lack of a permanent monitoring site or coordinates for the CEP study.

Table 13. UPMSI-NCDDG Project survey site (Campos 2002)

Site	Latitude	Longitude	% hard coral cover
Cape Engaño	18°34.808' N	122°08.022' E	20%
Aguab	18°31.366' N	122°06.966' E	16%
Siwangag	18°32.437' N	122°07.247' E	44%

Socioeconomic status and existing land use

Based on the 1996 Survey and Registration of Protected Area Occupants (SRPAO) conducted by the DENR-PAWB Protected Area Community Management Division (PACManD), Palaui Island is home to 417 residents in 76 households.

Majority of the residents are Ilocanos and belong to the Roman Catholic religion. Elementary level is commonly the highest level of education attained. Roughly 80% of the residents are considered tenured migrants (i.e., reside in the island five years prior to its proclamation as a protected area). However, very few have actual certificate of land titles.

Four land use categories characterize Palaui Island: 1) mangrove forest, 2) agricultural land, 3) grassland, and 4) forest lands. Majority of the island is under forest lands. On the eastern portion of the island, about 24 hectares have been developed into ricelands although yield has been held to a minimum, barely 5 to 23 cavans per hectare. The grassland located in the northern portion of the island, which covers approximately 128 hectares, is leased to Mr. Gregorio Jamoraban under the Forest Lease Grassland Agreement (FLGLA) and will expire on December 21, 2010.

Prior to its proclamation as a protected area, illegal fishing (e.g., blast fishing and use of cyanide) was rampant around the island.

Although blast and cyanide fishing have been significantly reduced, compressor ("hookah") fishing remains rampant as evidenced by the presence of air compressors in almost all fishing boats in the area (Campos 2002).

Management status

Until recently, a voluntary Protected Area Management Board (PAMB) has been overseeing the management and conservation of PIPLS. The official appointment of the PAMB members was signed only last November 2005.

PAMB composed of representatives from:

- ⇨ PASu and PAMB
- ⇨ Sta. Ana LGU
- ⇨ Philippine Navy
- ⇨ CEZA
- ⇨ POs (mostly inactive)

As of December 2005, the protected area's superintendent is Mr. Roman B. Capili who resides in Aparri, Cagayan.

The residents of PIPLS have an unwritten agreement prohibiting fishing in front of their community on the eastern portion of the island (see Figure __). Previous studies such as the CEP have cited this as a strict protection zone. For purposes of this report, we will refer to this area as "sanctuary".

Some of the ordinances / resolutions on coastal resources passed in Sta. Ana Municipality were:

- ⇨ Resolution #59-97: Ordinance prohibiting destructive fishing (Oct. 27, 1997)
- ⇨ Ordinance #10-92: Banning tropical fish gathering within Sta. Ana for commercial purposes
- ⇨ Ordinance #04-99: Comprehensive municipal fisheries ordinance

According to interviews with Municipal Environment and Natural Resource Officer Wevino Alcantara, a coastal resource management plan is already being drafted for Sta. Ana which includes PIPLS.

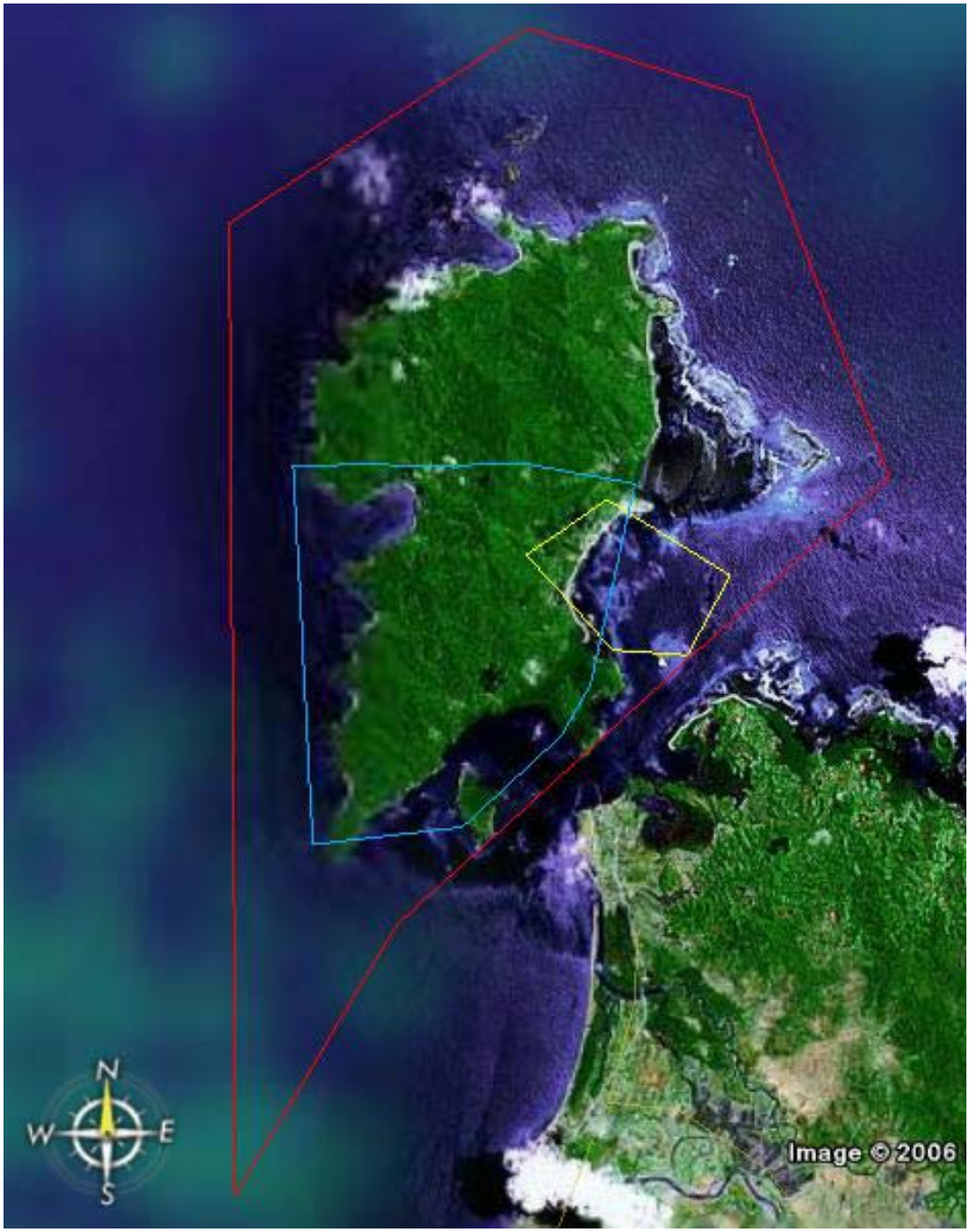

Figure 5. Map of Palaui Island with corresponding boundaries for (a) Protected Landscape and Seascape (red polygon), (b) Naval Reserve (blue polygon), and (c) informal marine sanctuary / strict protection zone (yellow polygon) established by the island residents. (Image from Google Earth®)

2.3.2. Activities

Training / Monitoring

Prior to the field visit, Ms. Jamelita Taguiam of DENR Region 2 sent out invitations to fishers and other residents of Barangay San Vicente, Sta. Ana, Cagayan (including the residents of Palaui Island) for the upcoming training activity. However, despite our efforts to persuade barangay officials and fishers to join the monitoring, none except for the older barangay officials came. According to Barangay Kagawad Jaime F. Palor, Sr. the locals were already tired of attending trainings. He said that people want more than just trainings on monitoring methods and instead what they need are concrete actions to address the issues they are raising. Thus, we shifted our plan towards monitoring Palaui Island PLS resources and socioeconomic status and improving stakeholders' collaboration through a whole-day workshop than on training locals on basic monitoring methods.

Four coral reef sites were surveyed using point intercept transect and fish visual census (Uychiaoco et al., 2001) by the MERF sub-contracted trainers, Ms. Jam Taguiam of DENR Region 2, and Mr. Benito Ritarita of BFAR Region 2 (Figure 6). Two 50 meter transects placed about 10 to 20 meters apart along the reef edge were surveyed for each site. Manta tows were also conducted in Engaño Cove, Siwangag, and the southeastern portion of the island from Batayan Point to the northern boundaries of the community established sanctuary.

Other DENR Region 2 participants conducted basic household socioeconomic surveys for residents of the island under the guidance of the socioeconomic trainer/consultant, Ms. Rina Rosales.

Workshop

A workshop was conducted on August 21 to identify key issues in the management of PIPLS and create a feasible action plan to address these issues. The workshop was attended by representatives of Peoples Organizations, cooperatives, the Sta. Ana Local Government Unit, Barangay Council of San Vicente, fishers, Cagayan Economic Zone Authority, DENR (Central Office and Region 2), and BFAR Region 2. Issues were identified and concrete short-term solutions were committed. Results were then presented to a larger body in August 23 to gather additional support (e.g., from the Philippine Navy and Coast Guard).

Feedback

Results of the monitoring activity were presented in the quarterly meeting of the PIPLS Protected Area Management Board (PAMB) in November 16, 2005. Some of the stakeholders also presented their updates on the drafted plan during the August 21 and 23 workshops. Representatives of peoples' organizations expressed their gratitude to the project due to its role in strengthening coordination among stakeholders towards addressing their concerns.

2.3.3. Results

Benthic community monitoring

Figure 6 and Figure 7 show the mean benthic lifeform cover in the four sampling areas and manta tow paths. Hard coral cover (HC) ranges from poor to good (%) with the transect site located at Rona Island inside the sanctuary having the lowest live coral cover as compared to the other sites. Both Engaño and Siwangag that are located far from the population center, hence relatively inaccessible to most fishers, harbor on the average, 50% live coral cover.

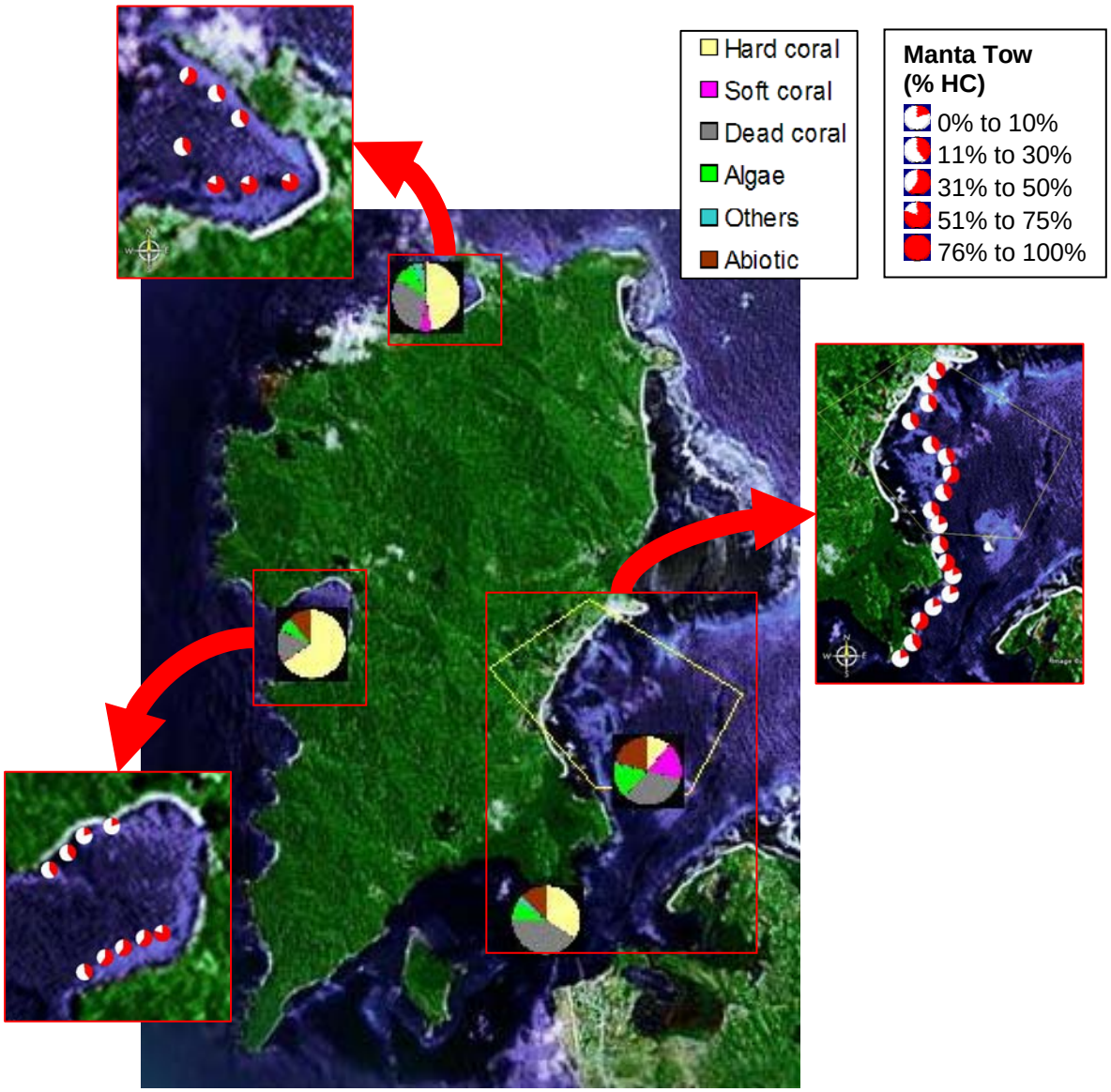

Figure 6. Average benthic community composition of the four study sites in Palaui Island PLS (yellow polygon on the eastern part of the island demarcates the informal marine sanctuary set-up by the community; insets: live hard coral cover from manta tows)

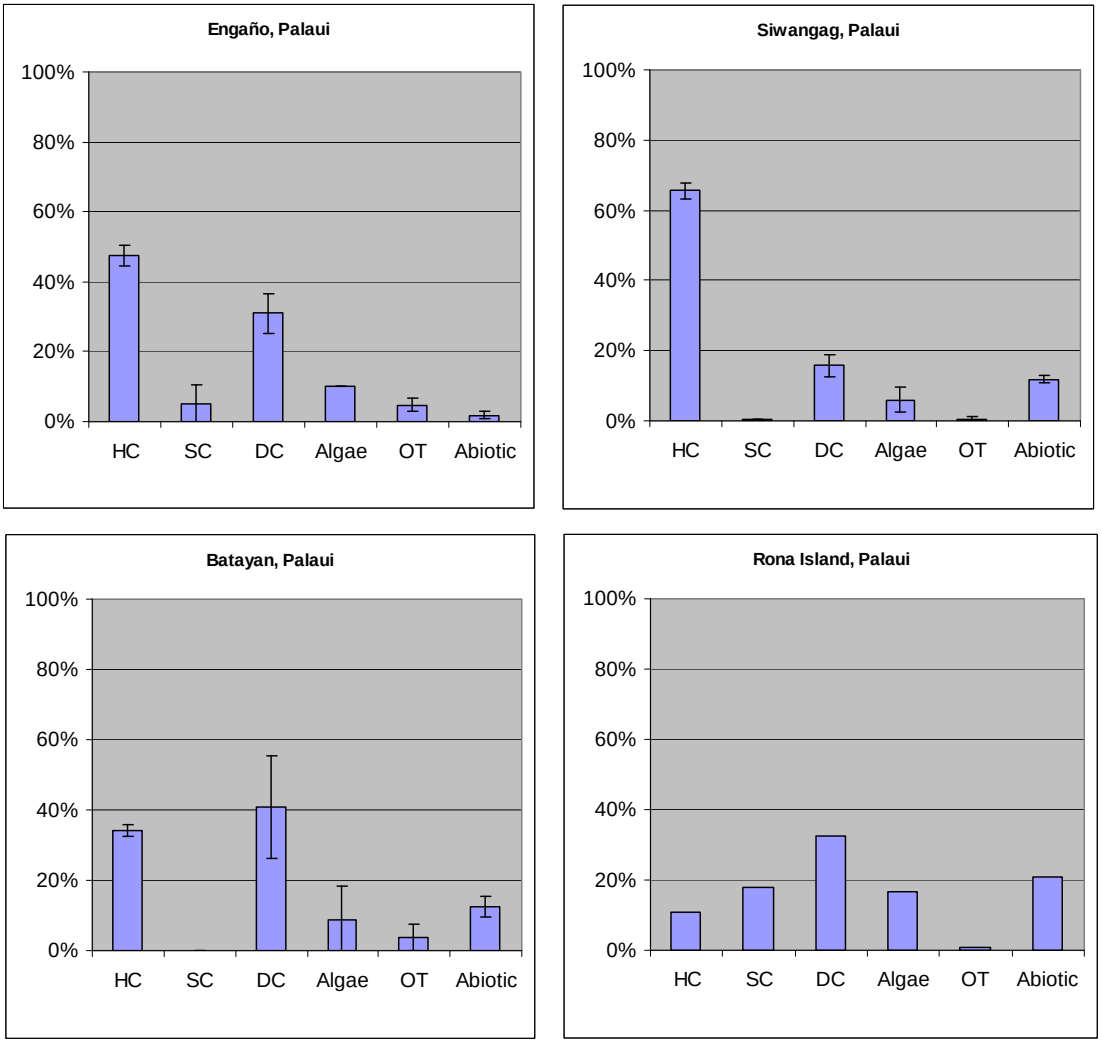

Figure 7. Mean benthic community composition per lifeform in 2005 (±SE; n=2 transects for all sites except Rona Island). HC = hard coral, SC = soft coral, DC = dead coral, OT = others.

Very low visibility because of high concentration of suspended particles was observed in the sanctuary. This is also reflected on the reef bottom where thin layer of silt covered the sandy bottom or dead coral skeleton. Dead corals with algae were also abundant. The gradually declining reef slope is very wide, which is predominantly sandy with coral patches sparsely distributed. Wide beds of seagrasses characterize the area close to the shoreline. Huge mounds of poritids were also present which served as recruit substrates for other corals forming micro-atolls that were partially exposed during low tide.

The result of the manta tow within the sanctuary that commenced from Batayan Point and ended at its northeastern boundary revealed a different picture of the bottom cover than those observed using the point intercept method. However, it is worth emphasizing that the choice of site where the line was to be placed did not benefit from a reconnaissance survey, i.e., manta tow, which is normally done first before transect sites are established. In this case, since we were re-surveying previous sites, manta towing of the southeastern portion of the island was done only during the last day of the survey as an additional exercise.

The manta tow results revealed a diversity of bottom cover condition ranging from poor to excellent conditions (Figure 6). The area from Batayan up to the southwestern boundary of the sanctuary was characterized by the dominance of massive and sub-massive Porites, which

occurred on very shallow depths of about 5 to 10 ft. The strip of reef tends to be located close to the shoreline perhaps due to siltation or presence of recruitment substrate. There were also segments of the tow characterized by rubbles and soft corals (Lobophyton and Sarcophyton spp.)

Inside the sanctuary, high coral cover consisting of newly recruited acroporids, approximately two to three year-old, was observed. These recruits grew on dead coral substrate possibly demonstrating a recovery process. Assuming effective enforcement of the protected areas status and baring natural catastrophe, the site may fully recover, albeit only of coral cover and less in terms of species composition, in 5 to 10 years.

An interesting garden-like underwater landscape characterized by a single species belonging to the Acropora of the Isopora group interspersed with soft corals (Sarcophyton) had been observed at the area near Rona Island. This area is also characterized by strong water current that formed small eddies. This condition might help explain the preponderance of such species in the area. In this kind of condition, the life history and recruitment strategy of this type of acroporid is well adapted. Isoporids are known to be monthly planulators. Corals belonging to this group release well-developed larvae that are ready to colonize a given recruitment space. Planulators do this by brooding their fertilized gametes than releasing them unfertilized in the water column. Because brooded larvae can settle right away, they are well adapted to areas characterized by strong water current because they can settle immediately upon release from the source coral. In contrast, most corals spawn buoyant gametes and fertilization is largely external. Water currents play an important role in the larval dispersal of these corals. Moreover, the asexual reproduction exhibited by the soft corals, i.e., use of vegetative parts, is also an adaptation to strong current where recruitment through sexual reproduction is a less viable option.

Overall, the distribution of corals within the fish sanctuary was very patchy and had been largely confined near the shoreline. Although some patches may be found on the predominantly sandy and gradually sloping reef (the ledge is several kilometers from the shoreline), they are sparsely distributed. The typical horizontal reef zonation characterized by seagrass beds, algal beds then corals does not apply in this site. In most cases seagrasses co-occur with corals especially in shallow areas characterized by sandy substrate.

The dominance of encrusting corals, the presence of spurs and grooves and deep canals at Engano and Siwangag indicates exposure to high-energy waves during the southwest monsoon. Reef growth tends to be confined on the southwest portion only of the cove indicating strong waves action during the southwest monsoon that limits reef development on the windward portion. The distance of these sites from the fishing communities on the mainland may have contributed in the preservation of coral cover since these sites are far from the reach of artisanal fishermen using non-motorized boats. Another indication of low fishing pressure at these sites especially from gleaning was the fact that one of our boatmen were able to gather approximately 2 kilos of assorted types of edible shells at an approximately one hour of snorkeling around the transect area.

Reef fish community monitoring

A total of 193 species distributed among 38 fish families were recorded from 4 sampling stations around Palaui Island (Table 14). Of these, 23 were categorized as indicator species, 106 were major species and 64 were target species (Annex R). The most speciose groups were the wrasses and damselfishes (Labridae and Pomacentridae, n = 38 for each family), and the butterflyfishes (Chaetodontidae, n = 20) (Annex R). Mean species richness ranged from 48 species per 250m^2 at North Rona Island to 85 species per 250m^2 at Siwangag (Figure 8c). Percentage composition of indicator, target and major species show that major fish species were the dominant group in all stations, followed by target species and indicator species (Table 14). Percentage composition of major species ranged from 54.1% to 64.5%, target species from 23.6% to 33.9% and indicator species from 10.1% to 16.3% (Table 14).

Table 14. Total fish species richness (# species/500sqm) and percentage distribution of indicator, major and target species from 4 sampling stations, Palaui Island, Cagayan, August 2005

Station	Family	Species	Indicator	Major	Target
Batayan	30	109	11.9%	54.1%	33.9%
Engaño Cove	27	98	16.3%	55.1%	28.6%
North Rona Is.	19	69	10.1%	62.3%	27.5%
Siwangag	23	110	11.8%	64.5%	23.6%
TOTAL (unique)	**38**	**193**	**11.9%**	**54.9%**	**33.2%**

Table 15. Total abundance (individuals/500sqm) and percentage distribution of indicator, major and target species from 4 sampling stations, Palaui Island, Cagayan, August 2005

Station	Total	Indicator	Major	Target
Batayan	1,014	6.0%	68.0%	25.9%
Engaño Cove	748	15.9%	61.1%	23.0%
North Rona Is.	504	2.2%	85.7%	12.1%
Siwangag	1,232	5.6%	80.2%	14.2%
TOTAL	**3,498**	**7.4%**	**73.4%**	**19.2%**

Table 16. Total estimated fish biomass (kg/500sqm) and percentage distribution of indicator, major and target species from 4 sampling stations, Palaui Island, Cagayan, August 2005

Station	Total	Indicator	Major	Target
Batayan	14.75	7.0%	30.3%	62.7%
Engaño Cove	7.17	14.8%	37.3%	47.9%
North Rona Is.	4.40	6.2%	53.2%	40.6%
Siwangag	11.59	8.9%	55.4%	35.7%
TOTAL	**37.90**	**9.0%**	**42.0%**	**49.1%**

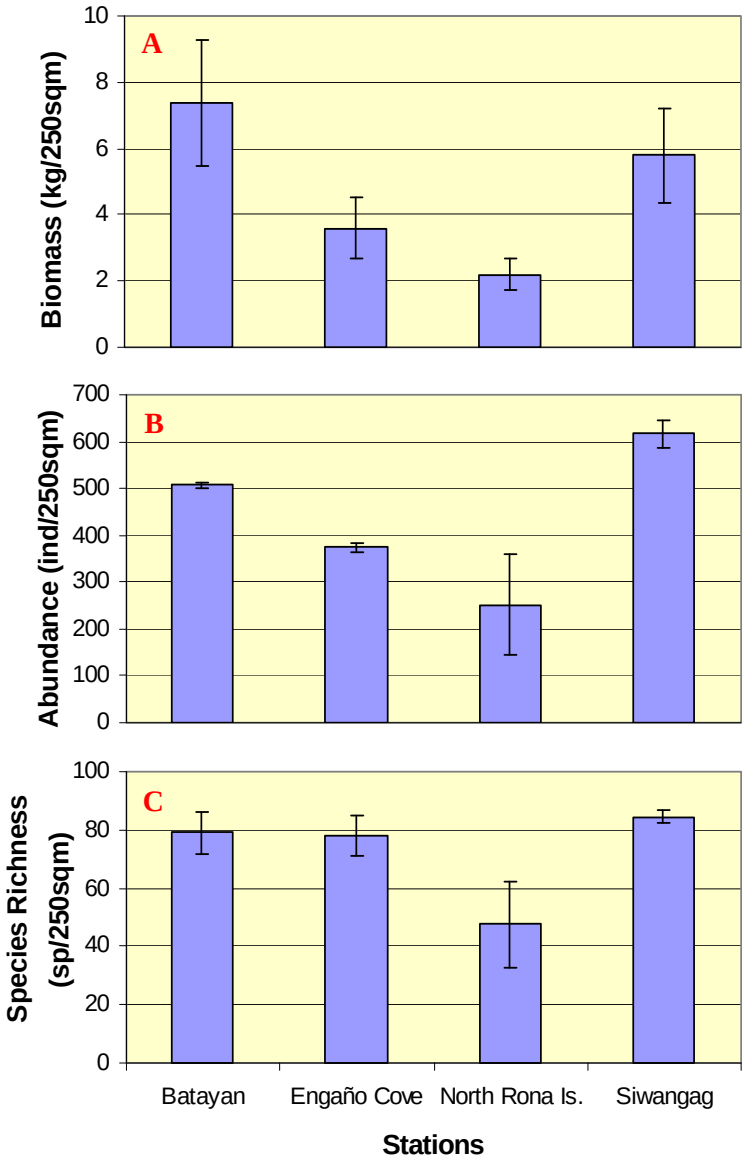

Figure 8. Mean biomass (**A**), abundance (**B**), and species richness (**C**) of reef fish per station around Palaui Island (±SE; n = 2 transects per site)

The total combined estimated fish abundance was 3,498 individuals (Table 17). The numerically dominant groups were the Pomacentridae (n = 1,726 individuals), Labridae (n = 498 individuals), surgeonfishes (Acanthuridae, n = 234 individuals), Chaetodontidae (n = 226 individuals) and the parrotfishes (Scaridae, n = 116 individuals) (Annex R). The highest mean fish abundance was 616 individuals per 250m^2 at Siwangag and the lowest was 252 individuals per 250m^2 at North Rona Island (Figure 2). Individual species with the highest abundances at Siwangag were the damselfishes Pomacentrus philippinus (n = 118), Chromis margaritifer (n = 91), P. lepidogenys (n = 86), Plectroglyphidodon lacrymatus (n = 79), Dascyllus reticulatus (n = 68), and the wrasse Cirrilabrus cyanopleura (n = 66) (Annex R). Percentage distribution of estimated abundance shows that major fish species were numerically dominant over target and indicator species in all four stations (Table 15). Percentage abundance of major species ranged from 61.1% to 85.7%, target species from 12.1% to 25.9% and indicator species from 2.2% to 15.9%.

Table 17. Abundance of reef fishes in four sampling stations around Palaui Island (individuals/500m^2) per size class; fish families selected follow that of Uychiaoco et al., 2001

FISH FAMILY	Engaño Cove		Siwangag			Batayan			Rona		TOTAL
Size class	1	2	1	2	3	1	2	3	1	2	
Angelfish	17	0	44	6	0	11	1	0	6	0	85
Butterflyfish	98	0	47	4	0	56	6	0	12	3	226
Coral breams	0	5	1	10	0	2	3	0	0	0	21
Damselfish	198	0	649	0	0	536	0	0	343	0	1,726
Emperor	0	2	0	0	0	1	0	0	1	0	4
Fairy basslets	0	0	0	0	0	0	0	0	0	0	0
Fusiliers	0	0	0	0	0	0	8	0	0	0	8
Goatfish	4	2	1	0	0	0	8	0	0	0	15
Grouper	0	0	0	0	0	0	0	0	0	0	0
Jacks/Trevallies	0	0	0	0	0	0	0	1	0	0	1
Moorish idol	18	0	12	1	0	13	0	0	6	0	50
Parrotfish	9	16	21	18	1	13	28	0	8	2	116
Rabbitfish	23	0	54	0	0	9	2	0	4	0	92
Rudderfish	0	1	0	0	0	0	0	0	0	0	1
Snapper	0	0	0	0	0	0	39	0	0	0	39
Surgeonfish	96	2	56	4	0	17	37	0	15	7	234
Sweetlips	0	1	0	0	0	0	3	0	1	3	8
Triggerfish	2	6	3	1	0	0	0	0	0	0	12
Wrasse	94	16	219	19	0	92	12	0	30	16	498
OTHERS	125	13	51	6	4	75	38	2	35	12	361
TOTAL COUNTS	684	64	1,158	69	5	825	185	3	461	43	3,497*

Size classes: 1 = 1-10cm; 2 = 11-20cm; 3 = 21-30cm;
Yellow highlighted rows refer to fishery target families
* A 40cm *Aulostomus chinensis* was recorded in Batayan Point which was no longer included in the above categories; hence, the grand total is actually estimated at 3,498 individuals

The total combined standing stock biomass of fish from the four sampling stations was estimated at 37.9 kg (Table 16). Dominant groups included Acanthuridae (5.09kg), Pomacentridae (5.61kg), Labridae (4.78kg), Scaridae (4.58kg) and Chaetodontidae (3.16kg) (Annex R). Mean fish biomass was highest at Batayan with 7.4 kg per 250m^2 and lowest at North Rona Island with only 2.2 kg per 250m^2 (Figure 8a). Dominant species in terms of standing stock biomass at Batayan included *Aulostomus chinensis* (1.58kg), *Ctenochaetus striatus* (1.35kg), *Lutjanus monostigma* (1.34kg), and *Caesio cuning* (1.03kg) (Annex R). Major fish species were only dominant in terms of biomass at North Rona Island and Siwangag, wherein percentage estimated biomass of major species were greater than 50% while percentage target fish only reach 40.6% at North Rona Island (Table 16). On the other hand, target species were dominant at Engaño Cove and Batayan, wherein percentage biomass of target species ranged from 47.9% to 62.7%, respectively, while percentage major species did not exceed 38% (Table 16). Indicator species were the least dominant of the three groups in all four sampling stations and percentage biomass of indicator species ranged from 6.2% to 14.8% at North Rona Island and Engaño Cove, respectively (Table 16).

Size frequency distribution of fish from the four sampling stations showed that the large majority of the fishes in the area were in the 3 – 6 cm size range (Figure 9a). This may be reflective of the preponderance of major fish species, which are mostly small, numerically dominant and visually obvious fishes. An analysis of the size distribution of target species alone showed a dominance of fishes at the 6 – 12 cm size range (Figure 9b). Although this is

a larger size class compared to the previous, it is nevertheless still small for this fish category and may indicate a degree of fishing pressure in the area. Although not quantitative, observations were also made via manta tow on the fish assemblages inside the marine reserve of Palaui Island. It was observed that the target species inside the reserve were much larger than in any of the four sampling stations surveyed. Target fishes observed inside the reserve included surgeofishes, parrotfishes and snappers reaching sizes of up to 25cm, and a school of barracuda estimated to be greater than 90cm in length.

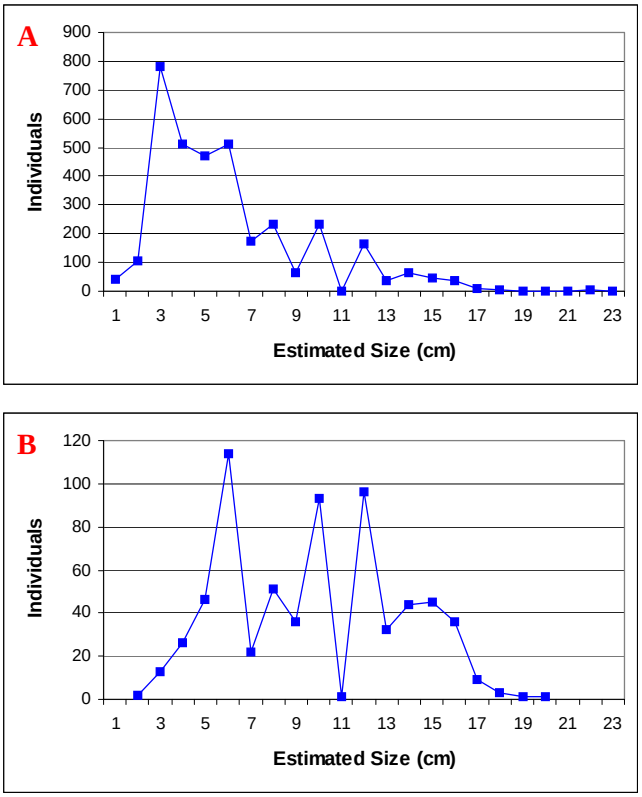

Figure 9. Size distribution of Total (**A**) and Target (**B**) fish from four sampling stations at Palaui Island, Cagayan, August 2005

Estimated fish abundance and biomass in three sampling sites from a survey conducted in 2001 was compared to the results of the present study. Estimated abundance and biomass at Batayan, North Rona Island and Siwangag improved since 2001 (Figure 10a and b). Fish abundance showed the highest increase in Batayan from 342 individuals/500m-2 in 2001 to 1,014 individuals 500m-2 in the present study (Figure 10a). The least improvement was observed in North Rona Island from 432 individuals 500m-2 to 504 individuals 500m-2 since 2001 (Figure 10a). The same patterns were observed in terms of estimated fish biomass. Considerable increases in biomass were recorded at Batayan and Siwangag, while the least biomass increase was recorded in North Rona Island (Figure 10b).

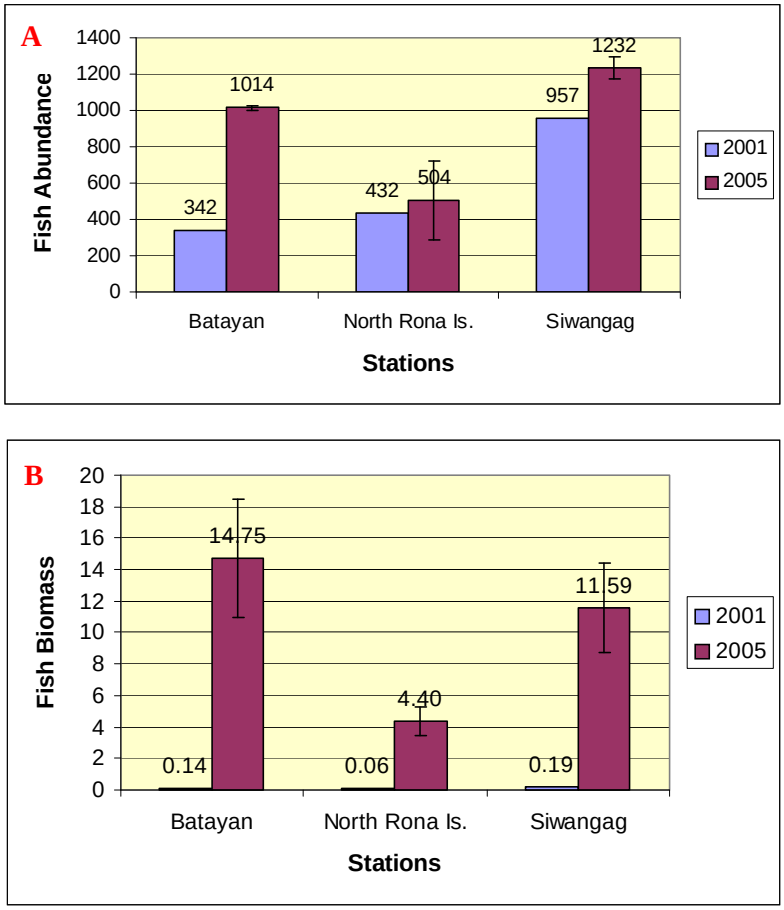

Figure 10. Total (2001 DENR survey) and mean (this study; n=2) fish abundance (**A**, individuals/500m^2) and biomass (**B**, kg/500m^2) from three sampling sites in Palaui Island, Cagayan. Mean values for the present study were extrapolated from 250m^2 survey area.

The results of the study suggest that fishing pressure has adversely affected and may still be affecting the reef fish communities at the four sampling stations (i.e. small size classes and few variety of high-value target species). However, Batayan and Siwangag showed clear dominance over the other two in terms of species richness, estimates abundance and standing stock biomass. It is recommended that special attention be given to the protection of the habitat and reef fish communities at these two stations be enforced in order to allow fish stock to recover at these sites.

Initial observations of fish assemblages inside the marine reserve of Palaui Island suggest that the reserve has been effective in improving the condition of the fish assemblages within its boundaries. Large individuals of target species were observed and this may be the direct result of the effective implementation of resource protection laws. It is highly recommended that the protection of fish stocks within the boundaries of the reserve be sustained and used to showcase the benefits of protective management in information and education campaigns by the local government unit and concerned agencies in the area.

A comparison of data gathered in 2001 and the present study suggest that there have been considerable improvements in the status of the fish assemblages at least in the three stations analyzed. It is probable that protective management has improved since 2001 and that the fish communities are in fact showing signs of recovery. However, it is also possible that the

perceived improvements in fish abundance and biomass at the three stations are effects of sampling effort and placement of transects. Sustained monitoring activities at these sampling stations for the wet and dry seasons are very important to determine whether or not fish stocks are actually recovering. In any case, the results of the study are positive and encouraging, and the strict implementation of protective management measures is again emphasized to ensure the recovery of fish stocks in the area.

Socioeconomic monitoring

Annex T contains the summary figures and tables for the household interviews conducted in PIPLS. The survey questionnaire used is in Annex S. A total of 48 households were surveyed in Palaui Island on August 21 corresponding to almost half of the total number of households in the area, thus forming a significant sample size. Consequently, results can be generalized for the whole population occupying Palaui Island. The objective of the survey was to gather basic socioeconomic and resource use data from the island residents. Although use of coastal resources of PIPLS is neither limited nor largely attributed to the protected area residents, the survey was limited to these households only due to time constraints. Protected area staff should conduct similar surveys on fishers along the mainland who fish within or near the protected area to get a comprehensive picture of the coastal resource use within the vicinity.

Majority of the respondents were Ilocanos (79%) or came from nearby provinces of Northern Luzon. The average level of education was elementary school with 33% reaching high school. The average residency period is 24 years. Mean number of members per household is five and the average monthly household income is Php4,700. Seventy-seven percent of the respondents answered fishing as their primary occupation. Secondary occupations included farming, shell gathering, and “buy and sell”. Less than half of the respondents are members of organizations within their community.

Although ten of the respondents (~21%) own a generator, majority of the respondents still use firewood for cooking (85%). Freshwater is obtained either from communal wells or from the Barangay Water Systems Association (BAWASA). Radio is the most common electronic appliance. Eleven respondents own a cellphone, five residents have karaoke, and one household even has a washing machine.

Eighty percent of the respondents are aware of Palaui Island being a protected area. Many feel that the coastal resources are still in good quality. Eighteen respondents perceived increases in fish catch as positive impacts of the protected area. Although most respondents are aware of the PAMB, they noted that they want to be consulted more often and be involved in decision-making processes.

Threats cited by the respondents included timber poaching, dynamite fishing, and aquarium fishing using cyanide. However, the most serious threat to Palaui Island’s coastal resources is the waning hope and interest of the community on the PAMB and LGU’s loosely coordinated management efforts as characterized by the low response to our invitation for the training/monitoring and from the household surveys. This was also reflected in the responses to the socioeconomic surveys. Strengthening institutional collaboration is crucial to preventing continued decline of the community’s morale.

Workshop

Representatives from the Municipal and Barangay LGUs, POs, DENR R2, BFAR R2, fisherfolks, and the Cagayan Economic Zone Authority (CEZA) attended the workshop held in Barangay San Vicente, Sta. Ana, Cagayan on August 21 and 23, 2005. A general time series workshop was done to identify key issues and events per decade over the past 35 years (Annex U). The issues raised were classified into three broader categories: 1) issues pertaining to land, structures, and population; 2) issues on forest and fishery resources; and 3) issues on strengthening associations. Participants were divided among the three issues such that, as much as possible, all agencies were represented in all groups. From the last visit to PIPLS in November 2005, CEZA had been the most active group in fulfilling their parts in the action plan (Annex V). The LGU and CEZA are beginning to collaborate but there are still some conflicts particularly with the ecotourism plans. The issue of management zoning was also initially discussed in the last PAMB meeting in November wherein PAMB members disputed some of the boundaries of the management zones proposed by the LGU.

2.4. Data management and utilization

2.4.1. Upgrading of the PAWB-Integrated Database for Biodiversity Conservation

Monitoring requires proper data encoding and storage to be useful. A workshop on reviewing and improving the PAWB – Integrated Database on Biodiversity Conservation was held last October 6 to 7, 2005 and a smaller updating and data encoding workshop was held just last December 16, 2005.

The workshop objectives were:

1. Link and harmonize the current DENR-PAWB Integrated Database for Biodiversity Conservation (IDBC) with other existing databases:
    a) ReefBase / PhilReefs
    b) CCEF's MPA Database
    c) Biodiversity Information Sharing System (ARCBC)
    d) Clearinghouse mechanism on biodiversity (PAWB Planning Div)
    e) CMMO's Municipal Coastal Database
2. Identify the data that should be collected from the NIPAS sites
3. Provide inputs for the IDBC to meet the needs of the NIPAS sites
4. Develop a simple yet reliable protocol for the regular reporting and compilation of summarized monitoring data from the NIPAS field offices to the DENR-PAWB central office; and,
5. Identify the data gaps in selected NIPAS priority sites and take initial steps to fill the gaps

The current PAWB-IDBC contains protected area profiles only and yet it still has lots of empty fields. It was designed for protected area profiling and not for archiving and retrieving temporal or monitoring data.

Participants reviewed the purpose of having the IDBC and they identified the ideal characteristics of a NIPAS site which the updated PAWB-IDBC should be able to gauge or rate per site. Box 4 summarizes these ideal characteristics.

Annex W and Table 18 summarizes the new tables developed for the PAWB-IDBC and the status of data encoding for the project's priority NIPAS sites, respectively.

According to the last database workshop, the Biodiversity Management Division of PAWB has data on most of the fields in the tables assigned to them and they are continuously working to encode all available data into the new tables. Most of the data gaps are in the socioeconomic and especially the biophysical attributes. The PAWB-Protected Area Community Management Division collects socioeconomic data from NIPAS sites using the Survey and Registration of Protected Area Occupants (SRPAO) and Community Based Projects (CBP). However, these forms provide mostly demographic and some general resource use data and are often outdated since they are often collected only during the proposal stages of a protected area. Other important indicators identified in the database workshop are currently not collected. In addition, although, most of the sites have SRPAO and/or CBP data they still have to be encoded which would take considerable time and personnel requirements since the data is per household. Data for biophysical attributes are in an even worse shape as there are currently no data stored in DENR-PAWB main office to fill in the fields.

Box 4. Ideal characteristics of a NIPAS site (as identified by participants to the database workshop on October 6-7, 2005)

*The PAWB division(s) stated are the main groups responsible for gathering and compiling the data needed to gauge each characteristic**

Governance attributes (c/o BMD)

1. Active / working PAMB and support groups or volunteers
2. Self-sustaining income for the PA management
3. Sufficient support from DENR and other agencies to the PA
4. Sufficient and trained PA personnel
5. Full compliance with PA and other related ordinances / laws
6. Up to date and approved management and development plans (linked with Socioeconomic attributes through Special Land Use Agreements such as the Protected Area Community Based Resource Management
7. Minimal threats

Socioeconomic attributes (c/o PACManD & NRED)

1. PA occupants have sustainable and sufficient livelihood
2. Stakeholders in PA management are aware of and participate in management and conservation activities
3. Sustainable tourist volume

Biophysical attributes (c/o WRD)

1. Habitats and species are protected (abundance and richness / diversity)

* BMD = Biodiversity Management Division
PACMAND = Protected Area Community Management Division
NRED = Nature Recreation & Extension Division
WRD = Wildlife Resources Division

According to DENR-PAWB staff, they already have data to fill in some of the tables but could not encode it due to the lack of personnel. Thus, the project hired a database encoder for five weeks to address this concern. Encoded data includes:

- ⇨ SRPAO of project identified priority NIPAS-PAs: Palaui, Sagay, Caramoan, Initao-Libertad, Cuatro Islas
- ⇨ PAMB profiles for project identified priority NIPAS-PAs: Palaui, Sagay, and Initiao National Park
- ⇨ SRPAO for non-project priority NIPAS-PAs: Taklong
- ⇨ PAMB profiles for non-project priority NIPAS-PAs: Paoay Lake, Tumauini Watershed Forest reserve, Taklong-Tandog Island PS, Pasonanca NP, Siocon Resource Reserve, Zamboanga City Mangrove Swamps Protected Landscape Seascape, Buug Natural Biotic Area, Murcielagos Island, and Mount Timolan PL
- ⇨ Egg collection permits for Turtle Islands

The bulk of the encoding was done for socioeconomic indicators, particularly the SRPAO forms (4 weeks). There is still a huge bulk of SRPAO and Community Based Projects (CBP) forms stored in the DENR-PAWB Protected Area Community Management Division (PACManD) and in regional offices which needs to be encoded and judging by the rate the initial forms were encoded, it would take a full time encoder at least six months to encode all these forms.

Other sources for the management indicators are in the DENR-PAWB Biodiversity Management Division (BMD) but should be compiled first. Only PAMB profiles were encoded for this project. However, BMD has been encoding other data using their own format prior to and during the project (e.g., PAMB activities). These databases can be easily merged or harmonized.

Unfortunately, current data available from DENR-PAWB Wildlife Resources Division (WRD) cannot adequately fill up the biophysical indicators since they only handle permits and issues related to endangered species, mostly terrestrial flora and fauna. Unlike the PACManD where a standard form is used, collated, and compiled, biophysical information must be extracted from reports written by various sub-contractors with no standard reporting formats. Thus, these appear to be the most resource consuming tables to fill up. Since our database encoder is a computer science graduate with no background in marine biology, we no longer required him to fill up the biophysical tables. From our initial encoding experience, these tables must be filled up on the ground by PAMB personnel or the regional offices and summaries sent to the DENR central office at least annually.

After five weeks of continuous data encoding, we were only able to fill up roughly 20% of the total database for the priority NIPAS-PAs (Table 18). Encoding also slowed down during the last week since data sources had not been collated prior to the actual encoding. A lot of work is needed to complete the tables, even for just the project priority NIPAS-PAs, but once completed it would be an invaluable tool for objectively assessing Protected Area performance which would, in turn, help DENR allocate better its limited resources.

Table 18. Status of data encoding for this project's priority NIPAS-PAs (as of March 22, 2006); continued on next two pages

Protected Area	General Comments	GOVERNANCE ATTRIBUTES				
		Effective / Functional PAMB			Self-sustaining income for PA management	
		PAMB Profile	Activities of the PAMB	Support Group Volunteers	Income	Expenditures
Palaui PLS	Includes results from this project	Filled with 2005 data		Filled using data from this project		
Malampaya Sound		Partially filled (2003 data)				
Caramoan National Park		Filled with 1995 data	Partially filled		Entrance fees (1997 – present)	
Sagay Marine Reserve		Filled with 2004 data				
Apo Island PLS		Partially filled (2003 data)			Partially filled	Partially filled
Cuatro Islas Protected Seascape						
Turtle Islands		Filled with 2005 data	Partially filled (1 entry)	Filled		
Initao-Libertad PLS		Filled with 2003 data				
Mabini PLS						
Bongo Island						
Siargao PLS		Filled (2003)			PA Fund code only	

Table 18. Continued…

Protected Area	GOVERNANCE ATTRIBUTES				SOCIOECONOMIC ATTRIBUTES			
	Sufficient & trained personnel	Compliance on PA related laws	Management / Development Plans	Minimal threats	Sustainable livelihood for PA occupants			
					Demographics	Sources of livelihood	Material style of life	Other PA characteristics
Palaui PLS					Filled using data from this project	Filled using data from this project	Filled using data from this project	Filled using data from this project
Malampaya Sound								
Caramoan National Park	Partially filled		Partially filled (Development plan)	Filled (1 entry)		Filled but very few entries available	Filled but very few entries available	
Sagay Marine Reserve					Filled	Filled except for some quantity estimates		
Apo Island PLS								
Cuatro Islas Protected Seascape					Filled	Filled except for some quantity estimates		
Turtle Islands	Filled (1 entry)		No plan yet	Filled (1 entry)				
Initao-Libertad PLS					1995 data	Filled except for some quantity estimates		
Mabini PLS								
Bongo Island								
Siargao PLS							Annual income only	

Table 18. Continued…

Protected Area	SOCIOECONOMIC ATTRIBUTES				BIOPHYSICAL ATTRIBUTES		
	Awareness & participation of stakeholders		Sustainable tourist impact	Management zoning (Special use agreements)	Habitats & species protection		
	Conservation activities of stakeholders	Participation in PA protection groups			Permits	Habitat	Species
Palaui PLS	Data from this project	Data from this project				Filled using data from this project	Filled using data from this project
Malampaya Sound							
Caramoan National Park							
Sagay Marine Reserve							
Apo Island PLS							
Cuatro Islas Protected Seascape							
Turtle Islands					2000-2002 data		
Initao-Libertad PLS							
Mabini PLS							
Bongo Island							
Siargao PLS	Partially filled	Partially filled		Partially filled			

2.4.2. Streamlining NIPAS data reporting

Figure 11 presents the proposed rough framework for regular NIPAS data reporting and application to management. Ideally, data encoding and processing should be distributed to each level up the DENR-PAWB hierarchy proportionate to each level's available resources. Raw data encoding can be done at the field or regional level and passed on to the PAWB main office which, in turn, will summarize the data for all NIPAS sites to come up with annual regular reports on the status of all NIPAS sites. The PAWB main office should provide copies of the annual national reports to all regions. This maximizes the use of monitoring data. One, it allows protected area managers and staff to assess their sites on a regular basis and two, national reports from the main office can provide field staff with valuable sharing of information and experiences from other NIPAS sites leading to a broader context of adaptive management which involves not just internal site assessments but also applying lessons from other similar sites.

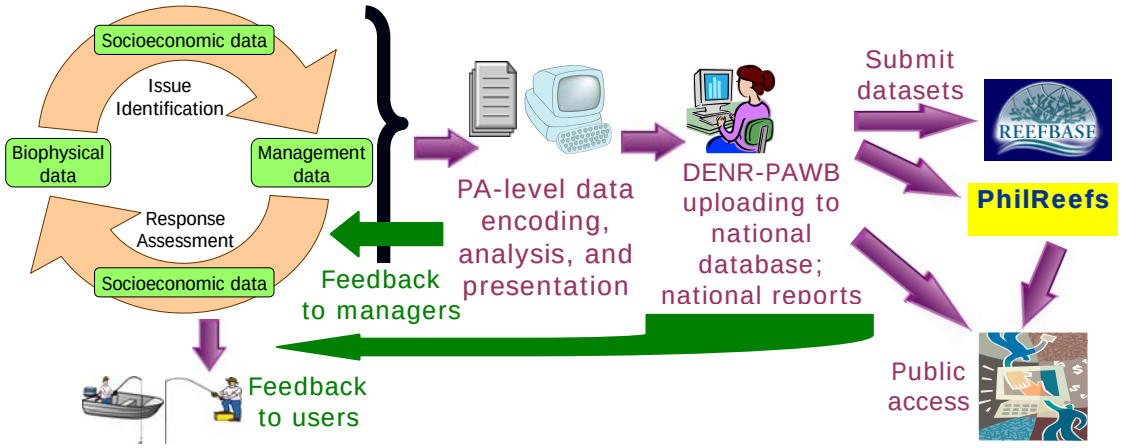

Figure 11. Proposed data reporting framework for NIPAS sites

3. Summary and Recommendations

In summary, some of the main points, gaps, and issues identified over the course of the project were:

1. BMS is an important starting point for NIPAS marine protected area monitoring but protocols should be further structured to allow clear interpretation and application to management
2. Field personnel already have the basic skills necessary to conduct quality coral reef biophysical monitoring but none for socioeconomic monitoring
3. Few protected areas are actually using the BMS and almost none does regular coastal resource monitoring
4. Many sites still need to establish permanent monitoring sites
5. Secondary data are not maximized and data management at the protected area level is lacking
6. Some data are available in print but needs to be encoded
7. Monitoring, even at the broadest context (e.g., using manta tows), still yields useful data; the important thing is to report any and all findings on a regular basis at least to the regional offices!

Although the main goal of the project was to improve the monitoring system of marine protected areas under NIPAS, immersion into the dynamics of NIPAS-PA management both at the protected area level and at the national level reveal the more fundamental need to improve data communication, processing, and storage across the hierarchy. Given the large number of protected areas under DENR jurisdiction and the limited resources that they have, it would be better if DENR focuses on monitoring governance indicators and improving its reporting across the hierarchy. Protected area management staff can easily and regularly generate and report indicators such as issues raised and resolutions passed by the Protected Area Management Board per year, financial status, status of support from other groups, and others without need for additional funding or significant increase in work load. Given also the limited technical skills of protected area staff members, biophysical monitoring of coral reefs can be undertaken in collaboration with the academe or NGOs working in the area. The PAMB may require students or groups interested in research within the area to gather basic biophysical data when applicable (i.e., if the researchers have the necessary skills to gather the required information). The PAMB, through assistance from the respective regional DENR office, may give these applicants a list of important biophysical information they want in return for allowing the applicants to conduct research in the area. Detailed socioeconomic data, on the other hand, can be conducted every three to five years by the protected area staff with assistance from the regional offices, academe, and NGOs.

Other recommendations for DENR-PAWB are:

1. Providing field offices with structured annual report formats for easier reporting
2. Focusing on selected NIPAS sites for marine monitoring to provide greater impact and examples for other sites
3. Re-echoing the training to PASu and other staff especially
4. Gathering and compiling all existing secondary data, reports, and other literature on the coastal resources of the selected NIPAS sites
5. Distributing data management workload among different levels of the PAWB organization
6. Involving recreational divers in monitoring activities

There is much to be desired as far as comprehensive and integrated monitoring of coral reefs among high priority MPAs in the Philippines is concerned. Nevertheless, the interest and the willingness and capacity to learn are present among the NIPAS personnel trained. Skills

upgrading has been provided for on-the-ground personnel and most of the trainees displayed enthusiasm in their work. The next step would be to ensure that this passion is sustained and translated to outputs and improvements in the management of coastal resources.

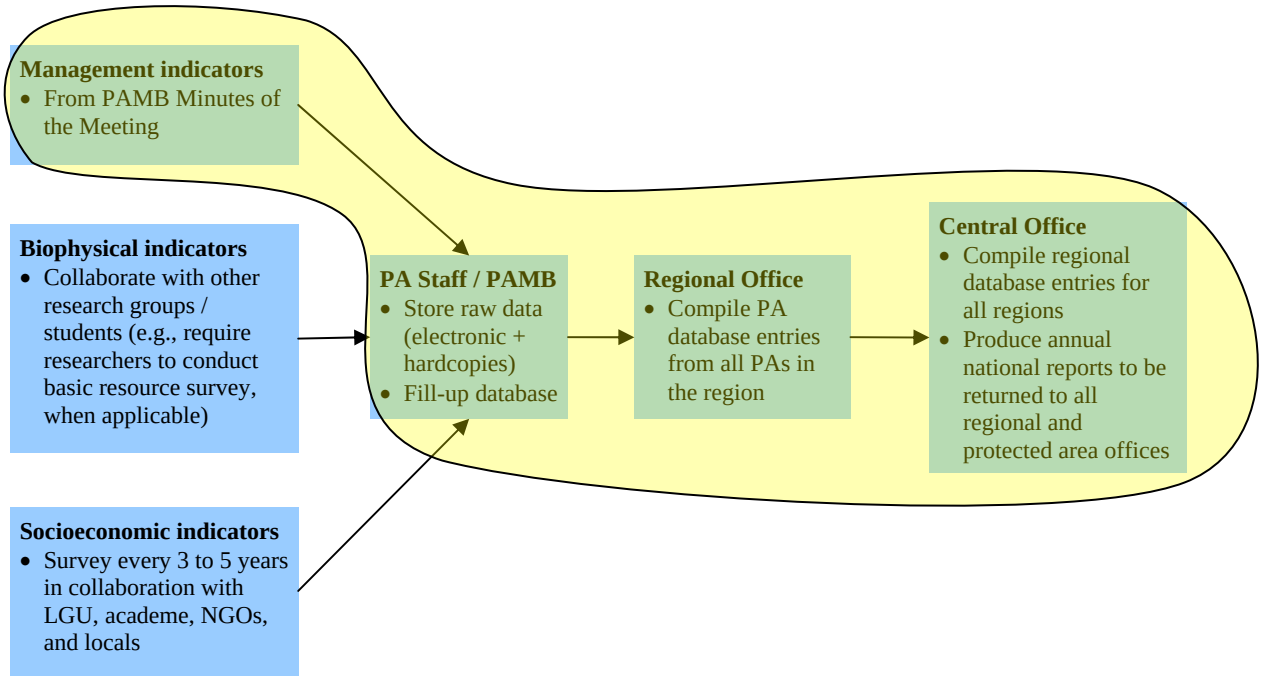

Figure 12. Recommended plan for immediate implementation of appropriate PA monitoring system. DENR-PAWB can start with regularly and properly monitoring and reporting management indicators.

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