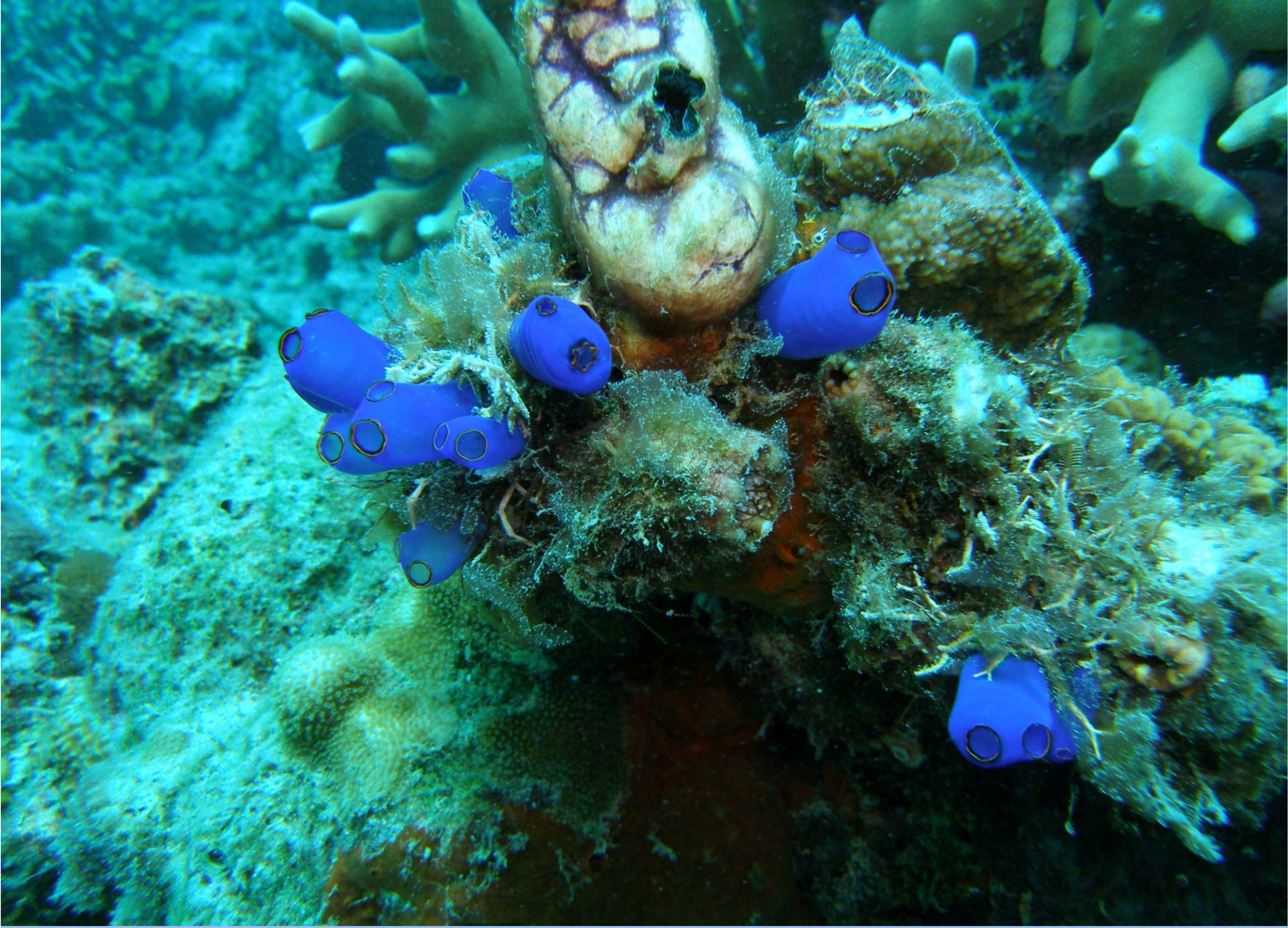

PHILIPPINE ENVIRONMENTAL GOVERNANCE 2 PROJECT (EcoGov 2)

Strengthening MPA Management in Baler Bay

Training on Marine Sanctuary Monitoring and Evaluation (M&E)

USAID
FROM THE AMERICAN PEOPLE

The EcoGov 2 Project is an initiative of the Government of the Philippines, implemented in partnership with the Department of Environment and Natural Resources, Department of the Interior and Local Government, local government units and other stakeholders, funded by the United States Agency for International Development and managed by Development Alternatives, Inc. and its subcontractors:

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PHILIPPINE ENVIRONMENTAL GOVERNANCE 2 PROJECT (EcoGov 2)

Strengthening MPA Management in Baler Bay

Training on Marine Sanctuary Monitoring and Evaluation (M&E)

March 20, 2007

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ACRONYMS

EcoGov	-	The Philippine Environmental Governance Project
FVC	-	Fish Visual Census
GPS	-	Global Positioning System
LGU	-	Local Government Unit
M&E	-	Monitoring and Evaluation
MPA	-	Marine Protected Area
MS	-	Marine Sanctuary
SB	-	Sangguniang Bayan
USAID	-	Development Alternatives, Inc.

Part I. Marine Protected Area Benchmarking, Monitoring and Evaluation

Rationale

Monitoring and evaluation (M&E) of marine protected areas (MPAs) is crucial for management to be sensitive, pro-active and responsive to the changes that are occurring as the MPA is being implemented. Monitoring is the continued observation of any chosen parameter at regular intervals over time. Ideally, monitoring should be done inside the marine sanctuary (MS), or the no-take zone of the MPA, as well as in adjacent areas outside the MS. It is important to conduct benchmarking activities to serve as baseline information before or immediately after the MPA is established and to which succeeding monitoring data will be compared. The data include coral cover, fish abundance and fish biomass.

Main Objective

The monitoring survey was carried out to evaluate the present ecological conditions of the coral reefs of Mapalad-Dibaraybay Marine Sanctuary. The results of this exercise will be compared from the previous monitoring to evaluate management effectiveness as the marine sanctuary is being implemented.

Expected Outcome

Site report will show present reef conditions and the trend of the chosen parameters such reef fish density and biomass, composition of all reef species and percentage cover of the different benthic attributes. Current management status and issues are also discussed.

Field Methodologies

For the reef benthos survey, underwater video transects (Osborne and Oxley, in English et al 1997) were used in determining the percentage cover of the different benthic lifeforms. The transect stations were marked by locating their positions using a Global Positioning System (GPS) instrument. Video transects also allowed for the proper documentation of the sites. For this method, the same transects laid for the fish visual census technique was used. An underwater video was taken while swimming at constant speed, along the transect with the camera lens parallel to the substratum and maintaining a constant distance of about 25 cm above it. The video was recorded at belt of 0.25-m wide. A 50-meter transect line usually takes 8 minutes to record, following the proper speed. The video footages were then downloaded to a computer using the WinDV software (http://windv. mourek.cz). For each transect, a total of 100 still frames were extracted (captured) using the Virtual Dub software (http://www. virtualdub.org) from which 500 points were read for 100 still frames. The frames will serve as the sub samples of the entire transect.

The observer identifies the benthic lifeform using the 28 lifeform categories in English et al. (1997) under 5 points arranged on the screen of the computer monitor (Figure 1)

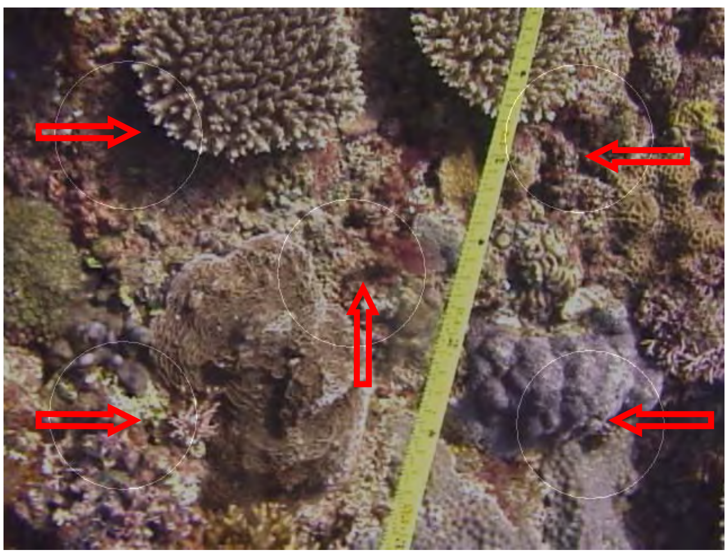


Figure 1. Arrangement of the five sampling points on the picture frame for video transect analysis

Percentage cover was then obtained using the following formula:

$$\text{Percent cover} = \frac{\text{Total number of points for lifeform}}{\text{Total number of points for transect}} \times 100$$

Fish Visual Census (FVC) was used to determine fish abundance and the community structure of the assemblage in the proposed MPA sites. The general procedure involves laying a 50-meter transect line at about 20 feet and at a constant depth contour. The same transect line was also used for the video transect or the snorkel survey for the benthos life form. After the line has been laid, the observers wait for about 5-10 minutes before the actual census begins to allow for the disturbed fish community to return to their normal behavior. Starting at one end of the line, all fishes are identified up to species level, their numbers and sizes estimated within a 5m x 5m imaginary quadrat along the transect line before moving to the next 5m mark. The observer swims slowly and stops briefly at every 5-m along the line until the 50m x 10m belt transect line is completed. The faster moving fishes are counted first before the slower moving fishes. Each transect covers an area of 500 m^2 (50m x 10m width). Fish sizes are estimated to the nearest centimeter. Fish density and biomass are then computed using a database program called Reef sum developed by Uychiaoco (2000). Fish biomass is based from the relationship, $\mathbf{W=aL^b}$, where W is the weight in grams; *a* and *b* are the growth coefficient values taken from published length-weight data; and L is the length of the fish in cm (Kulbicki et al. 1993). A species list is generated for each site.

RESULTS

MAPALAD-DIBARAYBAY, DINALUNGAN AURORA

Site Description and Transect Locations

Monitoring stations were established inside and adjacent to the Mapalad-Dibaraybay Marine Sanctuary. The sanctuary straddles two barangays of Mapalad and Dibaraybay. The sanctuary covers total of 51 hectares of the core zone or the no-take zone. The reef area is basically one big shoal, the shallow part reaching to about 10 feet and is surrounded by sand. The slope going towards the deeper part is gradual (EcoGov 2003). Seven monitoring stations were monitored (Figure 2).

Station 1 - 16°7.189’N, 121°55.187’E (inside MPA); 20 feet; slope - 45°
Station 2 - 16°7.080’N, 121°55.381’E (inside MPA); 25 feet; slope - 0°
Station 3 - 16°7.133’N, 121°55.426’E (inside MPA); 16-18 feet; slope - 5°
Station 4 - 16°7.201’N, 121°55.442’E (inside MPA); 20 feet; slope - 70°
Station 5 - 16°7.343’N, 121°56.369’E (outside MPA); 25 feet; slope - 5°
Station 6 - 16°7.364’N, 121°56.384’E (outside MPA); 20 feet; slope - 5°
Station 7 - 16°7.456’N, 121°56.439’E (outside MPA); 20 feet; slope - 30°

Coral Reef Resources

The reef area in Mapalad-Dibaraybay is mainly dominated by algal assemblages (AA). The average covers of 44.1% and 55.9% for both inside and outside fish sanctuary (Table 1), respectively. Live hard coral cover is generally fair, i.e., within the range of 11-30% (see Gomez et al. 1994) for both inside and outside fish sanctuary (average = 20%). The dominant coral lifeforms are massive, encrusting, submassive and branching coral species while the dominant coral genera are *Porites, Acropora*, and belong to faviids groups. Algal cover is higher outside the MPA at 10.9% (see also Appendix Table 1).

Trend of benthic cover from 2003-2006

Monitoring sites were established in Mapalad-Dibaraybay Marine Sanctuary on August 2003 and monitored on October 2004 and May 2006 consisting of four stations within the sanctuary and three stations outside the sanctuary approximately a kilometer from it (Appendix Table 2). Table 1 shows a comparison between sampling period which further illustrated in Figures 3A, 2B & 2C highlighting the difference in the amount of lifeform composition for both inside and outside the sanctuary.

Within the sanctuary, the present set of data showed a drop in hard coral cover by as much as 8% relative to the base line information. This was coupled with a 4% increase in dead corals overgrown with algae and a 2% increase in cryptic sponges. A considerable increase of up to 20% in the amount of algae was also observed dominated by algal assemblages and coralline algae.

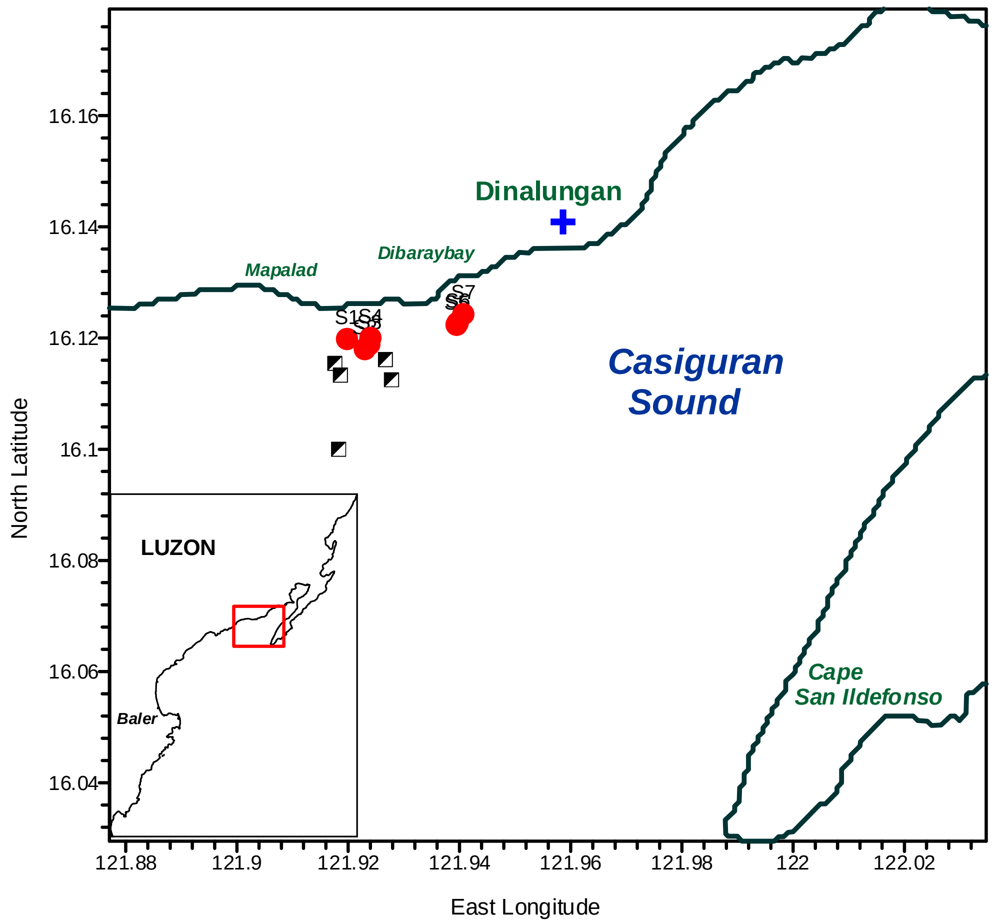


Figure 2. Location of transect sites (red circles) surveyed in Mapalad-Dibaraybay, Dinalungan. The off-shore boundaries of the sanctuary (half-shaded squares) are also presented. Inset map: Aurora Province (EcoGov 2003).

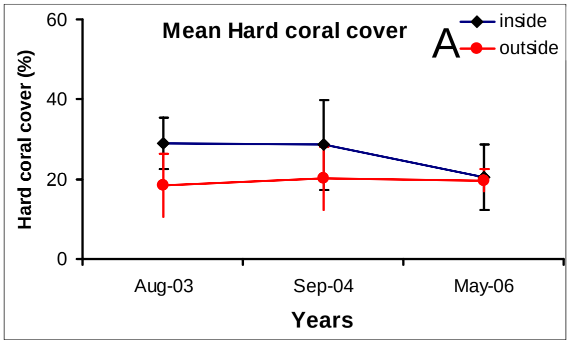
Table 1. Mean percentage cover of benthic lifeform categories in Mapalapad-Dibaraybay Marine Sanctuary.

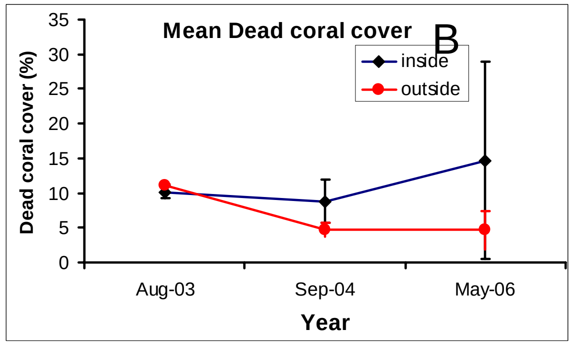
LIFEFORM CATEGORY	CODE	AVERAGE % COVER INSIDE MPA 2003	2004	2006	OUTSIDE MPA 2003	2004	2006
HARD CORAL	HC	28.9	28.6	20.5	18.5	20.1	19.7
SOFT CORAL	SC	0.8	1.0	0.7	1.1	0.8	1.3
DEAD CORAL/ WITH ALGAE	DC/DCA	10.1	8.8	14.7	9.0	3.1	4.7
TOTAL ALGAE	MA	15.9	50.1	44.1	14.1	61.3	54.9
OTHER FAUNA	OT	0.8	0.1	0.2	0.4	0.3	0.8
TOTAL ABIOTIC	AB	41.5	11.3	15.9	56.0	14.3	15.6
SPONGE	SP	1.3	0.1	4.0	0.5	0.1	3.1
UNIDENTIFIED	UNID	0.7	0.1	0.3	0.4	0.1	0.0
TOTAL		**100**	**100**	**100**	**100**	**100**	**100**

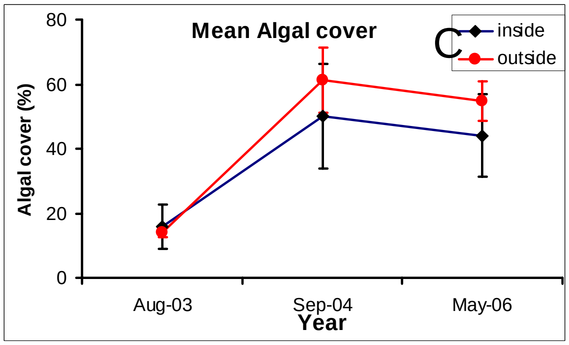
On the other hand, benthic attributes appeared to be no significant change in hard coral cover along the outside sites with even a slight decrease in the percentage occupied by dead corals over grown by algae. Like the inner site however, there is considerable increase (40%) in the amount of algae with algal assemblages and coralline algae making up 40% and 11% of the bottom cover respectively.

The sanctuary appears to be vigilantly monitored by its stakeholders with villagers regardless of meager resources going after fishers who may have strayed with in the sanctuary boundaries. Villagers have also displayed a high degree of interest towards participating the activities (e.g., workshops and trainings) that would strengthen their skills in managing the resources. The reef community however appears to be impacted greatly by sediment inputs emanating from rivers along the Dinalungan coast. Turbid waters are characteristic of the coastal area particularly during the rainy period, which last more than half the year. Heavily affected were the branching and tabulate *Acropora* although healthy stands of these corals continue to thrive in the area. Massive *Porites* heads with some growing up to a meter above the substrate and submassive and encrusting forms of Goniopora and other faviids being more resistant to silt dominate the reef.

Terrestrial run-off also increases the amount of nutrients entering the reef that could favor the growth of algae and the proliferation of sponges. This has resulted in the increased amount of algae [AA] in the area growing over exposed substrate such as rock, rubble and dead corals. The increase of filamentous algae can hinder the re colonization of the substrate by coral larvae.







Figures 3A,B,C. Trends of hard coral, dead coral and algal cover in three monitoring periods (i.e., August 2003, September 2004 and May 2006.

Reef Fish Resources

In the recent reef fish survey, a total of 113 species belonging to 27 families were recorded in the Mapalad-Dibaraybay Marine Sanctuary. Species richness in the "inside no-take" area stations in ranges from 42 to 49 species (Total species=100) while "outside no-take area" of the marine sanctuary ranges from 25 to 38 species (Total species = 63). The most abundant fish groups were the pomacentrids (damselfishes/palata) followed by acanthurids (surgeonfishes/ labahita), labrids (wrasses/mameng) and caesionids (Fusiliers/ dalagangbukid). The average fish density inside was moderate (Hilomen et al, 2002) ranging from 0.4 to 0.6 individuals per m^2 (average=0.5) while in the outside stations was 0.3 individuals per m^2. In terms of fish biomass, the inside stations ranges from 10.5 to 50.3 mt/km^2 (average=30.3) while the outside stations ranges from 5.5 to 7.8 mt/m^2 (average=6.5). (Table 2, Appendix tables 4,5,6,7,8)

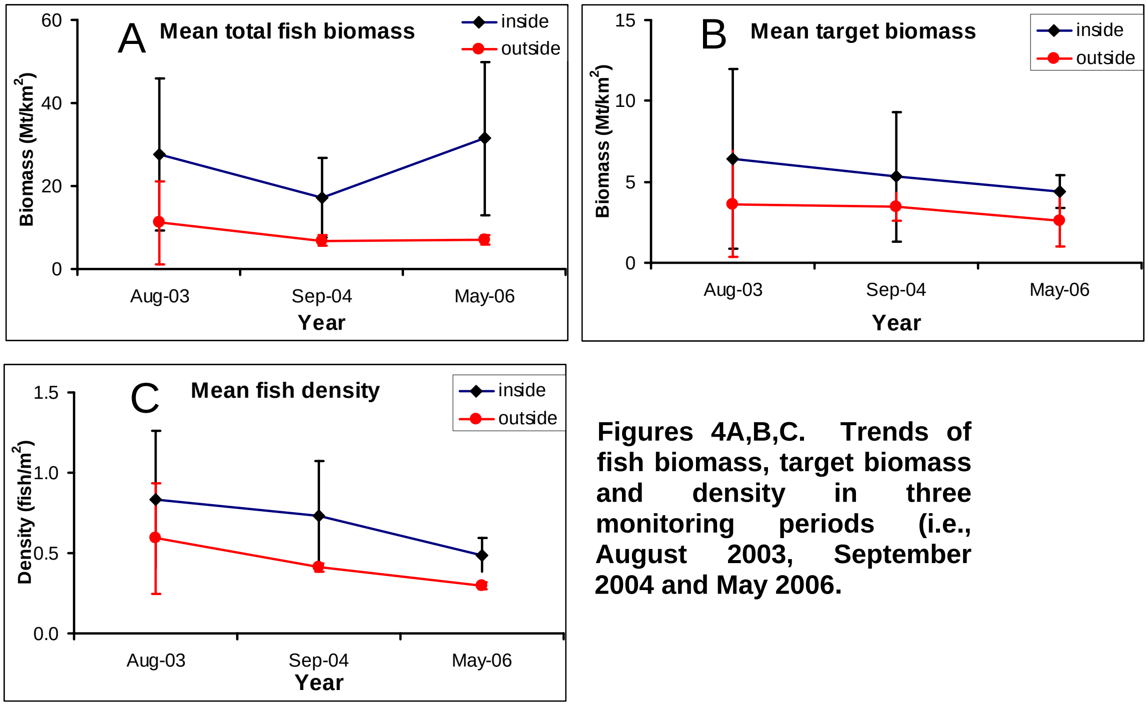
Based on the benchmark figures (for species diversity, abundance and biomass) established in the country, the following describe the initial reef fish profile of Mapalad-Dibaraybay based from the sites survey in the Philippines: 1) species diversity falls under low (<48 species) to moderate (within 48 to 75 species) categories; 2) abundance falls within low (within the range of 202 to 676 individuals 1000/m^2) (Hilomen et al, 2002); and 3) fish biomass estimates on the other hand, falls from medium (between 10.1 to 20.0 mt/km^2) to high (within 20.1 to 50.0 mt/km^2) (Aliño and Dantis 1999, Nañola et al., 2002).

Trend of fish density and biomass from 2003-2006

Total Fish biomass inside the marine sanctuary decreased in September 2004 but showed an increasing trend in the succeeding monitoring (i.e., from September 2004 to May 2006) (Figs. 4A, B & C). Mean target biomass and fish density on the other hand, both inside and outside the fish sanctuary showed a decreasing trend from the baseline data until the succeeding monitoring periods. There are some positive indications of intervention effects in the sanctuary, some a larger target species greater than 40 cm were recorded (e.g., *Plectropomus leopardus* of the family Serranidae/groupers). This species were not observed or recorded during the previous monitoring periods. Moreover, some larger sized grouper species were also observed in shallower part of the sanctuary during the recent survey. This indicates that there is possibly a redistribution of fish possibly towards the no-take area. Shallow water sightings were based on personal anecdotal observations, as these areas were not included in the fish visual transects censuses. Perhaps in the disturbed reefs (i.e., outside sanctuary - fished area), fishes may go deeper or move to the undisturbed reef (e.g., MPA). Alternatively during the monitoring period, some of the larger fish were feeding in the shallow areas of the reef and thus were not recorded during the surveys. This suggests that there initial positive indications that enforcement of the sanctuary have shown some effects. On average, fish biomass and density in the sanctuary is higher compared to the outside sanctuary but only fish density showed significantly different ($p<0.05$).

Table 2. Mean fish density and biomass in Mapalad-Dibaraybay Marine Sanctuary during May 2006 monitoring period.

Site Name	Species (combined)	Family (combined)	Mean Density (individual/ m^2) Total (Combined)	Target	Indicator	Mean Biomass (mt/ km^2) Total (Combined)	Target	Indicator
Inside (n=4)	100	27	**0.5**	0.2	0.02	**30.3**	25.2	1.3
Outside (n=3)	63	20	**0.3**	0.1	0.02	**6.5**	3.6	0.6



Figures 4A,B,C. Trends of fish biomass, target biomass and density in three monitoring periods (i.e., August 2003, September 2004 and May 2006.

DIGISIT-PUNTI-AN, BALER, AURORA

Geographic Location

Baler is the political and economic center of Aurora. It is located some 230 kilometers northwest of Manila via a mountain pass accessible by bus. Baler is host to spectacular geographic formations and is situated on a vast plain at the mouth of Baler Bay, a contiguous segment of the Pacific Ocean.

Site Description and Transect Locations

The proposed sanctuary in Zabali straddles the coastal villages of Digisit and Puntian. It extends from the rocky shoreline to approximately a kilometer offshore beyond the Anao cluster of islands. Coral communities enclosed by the sanctuary exist along a narrow rock fringe extending to less than 300m form shore. Hard and soft coral colonies together with sponges and algae populate the rocky substratum that proceeds gradually from shore to depths of 3 to 5m, that is approximately 200m from shore before dropping abruptly to a gradual sand slope scattered with rock and rubble at 10 to 15m. The rock shelf with relatively rugged relief is an extension of the mountainous headland with sheer cliffs. Its irregular surface with mounds, fissures, crevices and ledges provide a variety of habitat for both fish and invertebrate species. Two monitoring stations with 2 transect locations were established (Figure 5):

Station 1A – 15.75831'N, 121.62287'E (inside MPA); 30 feet; slope – 45
Station 1B – 15.75831'N, 121.62287'E (inside MPA) 30 feet; slope – 45
Station 2A- 15.75861'N, 121.61877'E (outside MPA) 30 feet; slope – 45
Station 2B- 15.75861'N, 121.61877'E (outside MPA) 30 feet; slope – 45

Coral Reef Resources

Hard coral cover however was low with only 19.6 and 12.4% observed from within and outside the sanctuary, respectively (Table 3,Appendix table 3). Live hard coral cover both inside and outside the proposed fish sanctuary are generally in the fair category (i.e. within the range of 11-30% (see Gomez et al. 1994). Encrusting forms were the more common coral types represented by Diploastrea, Mycedium, Porites, Goniastrea and other faviids. Dead coral overgrown with algae accounted for 12.7 and 9.6% of the bottom areal cover, respectively. A relatively high amount of algae dominated by algal assemblages, the calcareous macro-algae, Halimeda and coralline algae were found growing in the area.

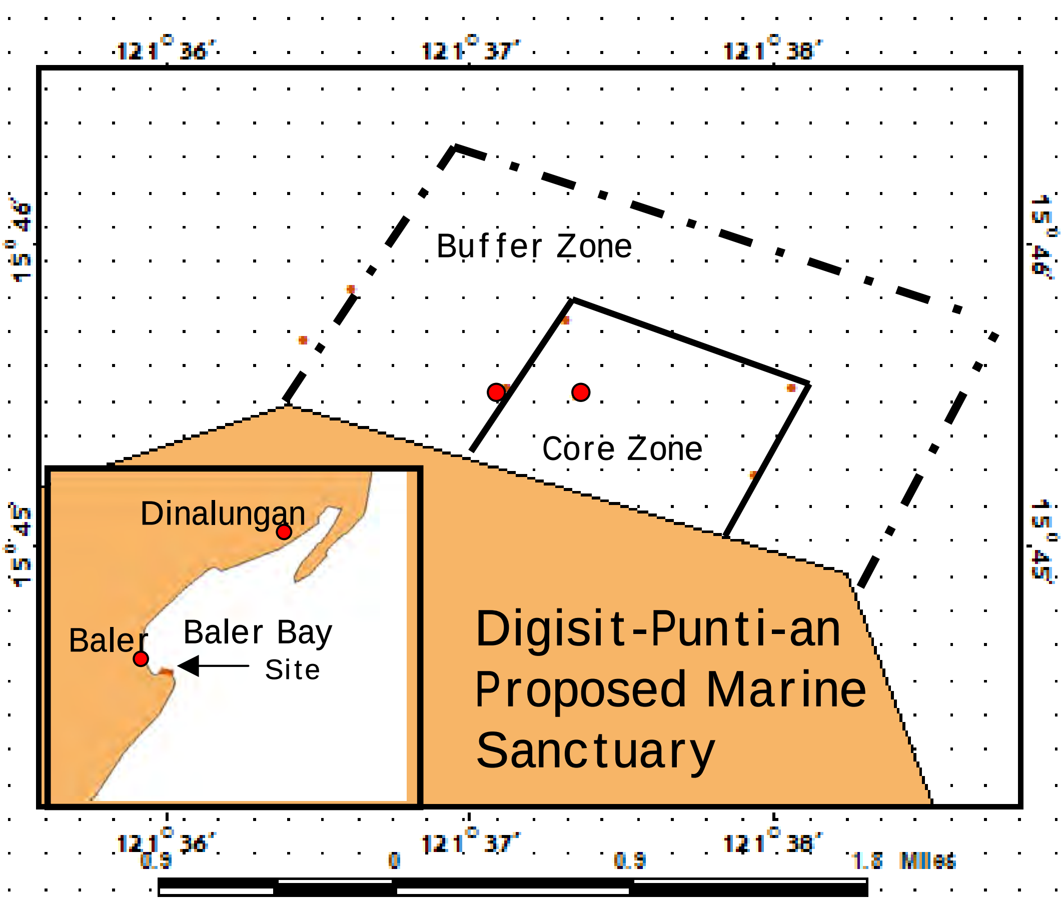


Figure 5. Location of transect sites (red circles) surveyed in Digisit-Punti-an proposed Marine Sanctuary, Baler, Aurora. The buffer boundaries of the sanctuary (half-shaded squares) are also presented. Inset map: Aurora Province.

Table 3. Mean percentage cover of benthic lifeform categories in Digisit-Punti-an proposed Marine Sanctuary.

LIFEFORM CATEGORY	CODE	AVERAGE % COVER	
		INSIDE MPA	OUTSIDE MPA
HARD CORAL	HC	**19.6**	**12.4**
SOFT CORAL	SC	**3.0**	**10.0**
DEAD CORAL/ WITH ALGAE	DC/DCA	**12.7**	**9.6**
TOTAL ALGAE	MA	**49.9**	**54.1**
OTHER FAUNA	OT	**0.4**	**0.8**
TOTAL ABIOTIC	AB	**3.5**	**1.8**
SPONGE	SP	**10.9**	**11.3**
UNIDENTIFIED	UNID	**0.0**	**0.0**
TOTAL		100.0	100.0

Reef Fish Resources

For the baseline survey, a total of 71 species belonging to 25 families were recorded in the Digisit-Punti-an proposed marine sanctuary. Species richness for the proposed inside-sanctuary stations ranges from 37 to 35 species (Total species=56) while those in the proposed outside the fish sanctuary ranges from 29 to 38 species (Total species = 47). The most abundant fish groups were the pomacentrids (damselfishes/palata) followed by acanthurids (surgeonfishes /labahita) and labrids (wrasses/Labayan), respectively. The average fish density inside was moderate ranging from 0.3 to 0.6 individuals per m^2 (average=0.5) while in the outside stations was low range from 0.4 to 0.5 (Average=0.4) individuals per m^2. In terms of fish biomass, the inside stations ranges from 10.1 to 15.9 mt/km^2 (average=13.0) while the outside stations ranges from 4.3 to 8.4 mt/m^2 (average=6.3). (Table 4, Appendix tables 4,5,6,7,8)

Based on the benchmark figures established in the country, the following describe the initial reef fish profile of Digisit-Punti-an proposed marine sanctuary based from the sites surveyed in the Philippines: the species diversity falls under low (<48 species) categories and abundance falls within low (within the range of 202 to 676 individuals per 1000m^2) (Hilomen et al, 2002) while fish biomass estimates falls from medium category (within 10.1 to 20.0 mt/km^2) (Aliño and Dantis 1999, Nañola et al., 2002).

Table 4. Mean fish density and biomass in Digisit-Punti-an proposed Marine Sanctuary during May 2006 benchmarking.

Site Name	Species (combined)	Family (combined)	Mean Density (individual/ m^2)			Mean Biomass (mt/ km^2)		
			Total (Combined)	Target	Indicator	Total (Combined)	Target	Indicator
Inside (n=2)	56	22	**0.46**	0.11	0.03	**13.0**	7.4	2.1
Outside (n=2)	47	24	**0.43**	0.03	0.01	**6.3**	1.5	0.4

Part II. Training on Marine Sanctuary Monitoring and Evaluation (M&E)

Rationale

Three (4) Marine Protected Areas (MPAs) have been established and one additional proposed MPA in Aurora province, with the technical assistance of the Philippine Environmental Governance Project (EcoGov2), i.e., namely Ditangol and Mabudo in Dinalungan, Dibutunan in Dipaculao and the proposed Zabali marine sanctuary in Digisit-Punti-an in Baler. Among these MPAs, the Digisit-Punti-an is not yet officially established. It is still waiting for legitimization by the adoption of MPA plan through the execution of ordinance of the Sangunihan Bayan (SB). All the others however, are already implementing activities and programs in line with the MPA plan and ordinance through its management bodies with the support of the local government and other existing agencies. Aside from the law enforcement, the MPA management body recognizes the need of the M&E program that would assess the level of implementation and gauge the progress of the intervention. This program would provide the regular reporting and feedbacking of the results to the community and the LGUs. This will generate policies, support and funding, which determine the various resources needed to sustain the project. Furthermore, the integration of the M&E as a regular activity would provide information on the extent of benefits that the project provides the society as a whole.

In the training workshop, the MPA management bodies (i.e., monitoring and evaluation committee) were trained using the community-based monitoring and evaluation techniques. They were provided hands-on experience in various tools and strategies including the data processing, analysis and reporting which they could use in the management. Moreover, the training came up with the standardized method for the MPA managers for the future data storage and management. Likewise, the workshop also capacitate the existing support groups such as the inter-LGU coastal resource management committee of the province and the ASCOT which provide technical assistance in the conduct of M&E in the respective MPAs. The involvement of the ILCRMC and ASCOT in the MPA implementation is critical in hastening collaboration and coordination among existing MPAs, which provide a venue for networking and lesson sharing of the MPA managers.

Although capacitating local communities in M&E is important, there is paucity of skilled manpower from the technical support group. The

EcoGov2 Project tries to address this gap by seizing opportunities wherein the skills of local technical groups (i.e. ILCRMC, ASCOT) can be further enhanced in conjunction with meeting the focal project targets such as in the strengthening of MPA management.

OBJECTIVES

The specific objectives of the training are:

1. To build capacities of local management bodies through M&E and initiate linkages of their performance monitoring,
2. To provide the support mechanisms for M&E and performance evaluation procedures by enhancing the skills of potential local service providers or technical teams through standardization exercises,
3. To facilitate common understanding and cooperation among local MPA management bodies towards the establishment of an MPA network system as part of the strengthening and sustainable mechanisms for good environmental governance.

EXPECTED OUTCOME

The result of this training workshop was to strengthen the management of MPAs as seen in the eventual results obtained from the annual M&E and PMP activities that was conducted by the marine sanctuary monitoring teams. Specifically the training workshop produced (a) Process documentation report on the M&E training, (b) Site report for Dinalunagan MPAs and (c) Agreements on M&E and performance evaluation system as part of a guide manual for M&E and PMP of MPA standards system supported by EcoGov2.

PARTICIPANTS DURING THE TRAINING WORKSHOP

The participants of the training workshop were composed of the Marine Sanctuary monitoring team of six (6) members from each MPA area (i.e. Dinalungan, Dipaculao and Baler) from the local communities, four (4) from San Luis, Two (2) from ILCRMC (M&E Committee), Three (3) from ASCOT and four (4) facilitators/trainors.

FIELD METHODOLOGIES

Snorkel Survey

This method is used mainly to determine the percent cover of the benthic lifeforms: (1) hard coral (HC), (2) soft coral (SC), (3) dead coral (DC) and dead coral with algae (DCA), (4) Marine plants including macro-algae (MA), turf algae (TA), coralline algae (CA), (5) Non-living or abiotic components such rock (RCK), rubble (R), sand (S) and silt (SI), (6) Other fauna (OT) such as echinoderms, mollusks over a more specified area. Unlike the manta tow, this method will give a more detailed description of the reef, albeit at a smaller scale. A 50-meter transect was lain at a depth of 20 ft. The observer will then estimate the percent cover of each of the benthic attribute within a 5-m x 5-m imaginary quadrat, starting from 0-m until the whole transect was sampled. The estimates from the ten sampled quadrats over the 50-meter line were then averaged to get the benthic description for that particular site.

Fish Visual Census (FVC)

This method is used to determine fish abundance and assemblage in a specified area of observation. The general procedure involves observations over a 50-meter transect line at about a constant 20 feet depth contour. It is usually done using the same transect lain for the snorkel survey method described above. A 5-10 minutes gap between the line laying and actual census is allowed for the disturbed fish community to return to their normal behavior. Starting at one end of the line, two observers (one on either side of the transect line) will record estimated counts and sizes of fishes in their local names, observing 5-m to his side of the transect and moving forward until the next 5-m mark. Both observers swim slowly forward and briefly stop at every 5-m along the line until the transect line completed. The faster moving fishes were counted first before recording the slower moving fishes were counted. Each transect covers an area of 500 m^2 (50m x 10m width). Initially, the trainees were taught to estimate the size of each fish according to size classes. The size classes are: 0-10 cm (1-4 inches), 11-20 cm (5-8 inches), 21-30 cm (9-12 inches), and more than 30 cm (>12inches). This method is usually taught to fishers and other non-technical persons. The other more scientific way to estimate sizes will require the observer to estimate the size of each fish to the nearest centimeter. This will be particularly useful when calculating for fish biomass. However, the trainees may only be able to do this after future constant field practice.

Standardization of local fish names and sizes was done during the lecture. The local fish names are presented in Appendix table 9). Fish dummies were used to practice size estimation both in land (during the lecture) and underwater (during actual survey).

RESULTS

For the snorkel survey, the trainees tend to over-estimate the hard coral cover compared to the estimate of the experienced trainor, who made observation simultaneously with the trainees. This was probably due to mis-identification of the benthic categories like dead coral with algae (DCA) as live hard coral and some DCA as abiotic or non-living (i.e., Rock) (Table 5). This problem can be resolved with more practice on the part of the trainees during the future monitoring and evaluation period.

The trainees were able to record 16 reef fish families in Digisit-Punti-an proposed fish sanctuary. Mangadlit and Scaridae (Parrotfishes/ Molmol) were the dominant fish families. There were also several moros and Salmonete (Mullidae/goatfish). Meanwhile, the trainees in Dinalungan were able to also record only 13 reef fish families. Among of these, the dominant families they identified include Palata (*Pomacentridae/damselfish*), labahita (*Acanthuridae/* Surgeonfish) and moros. Observations became limited due to poor water visibility and strong current velocity in the area during the survey (near late afternoon).

Table 5. Average % cover of the benthic attributes in Mapalad-Dibaraybay MS and Digisit-Punti-an proposed MS in Baler obtained by the trainees and the trainor using snorkel survey and Video transect survey, respectively.

LIFEFORM	CODE	Mapalad-Dibaraybay		Digisit-Punti-an	
		Trainor	Trainees	Trainor	Trainees
Hard coral	HC	20.1	41.5	16.0	21.6
Soft Coral	SC	1.0	5.5	6.5	18.2
Dead Coral w/ Algae	DC/DCA	9.1	28.1	11.2	28.1
Other fauna	OT	4.0	7.1	11.7	0.1
Plant/ algal assemblages	MA/AA	49.5		52.0	
Abiotic component	AB	15.8	17.4	2.7	**32.0**
TOTAL		**100**	**100**	**100**	**100**

The trainees in Dinalungan and Baler also recorded the abundance and sizes of particular fish families. Tables 6 and 7 show the results of the fish visual census by the trainees using snorkel survey. The records of different observers for the same transect station are presented. In Digisit-Puntian-an trainees identified fish abundance of 120 fish/250m^2 or this can be translated to 0.5 fish/m^2. Whereas trainees in Mapalad-Dibaraybay, observed fish at 150 fish/250m^2 or 0.6 fish /m^2. The result was comparable to the trainors in terms of fish abundance estimates. But it only differs on the number of fish groups identified.

Improvement of trainee's estimation of fish survey was noticed in the participants from Dinalungan since some of them were involved during the training in EcoGov1. Their data recorded in terms of size and count was more reliable compared to some new trainees. This indicates that with more practice the trainees can improve to attain greater accuracy and precision in data gathering and eventually in the processing and evaluation of their data and feedbacking of information.

LABORATORY OR ABOVE WATER EXERCISES

The trainees were able to estimate the percent cover of all 6 benthic lifeforms (Table 8) using picture frames simulated as 5m X 5m quadrat while projected on the screen prior to field applications. Based on the trainor estimates, in terms of hard coral cover (HC) majority of the trainees tend to be underestimates. But when it comes to other benthic lifeforms, most of the trainees committed mistakes by interchanging dead coral with algae (DCA) category to rocks (RCK) as abiotic component while some errors were made on the hard coral to be soft coral or vice versa. Thus, trainees had to know how to estimate percentage covers of lifeform categories but primarily would need or enhance their skills in identifying different benthic lifeforms categories to come up with consistent and comparable estimates of percent bottom cover.

Table 6. Fish abundance data in the proposed MS in Digisit-Punti-an obtained by the trainees using snorkel survey.

Fish Family	Common Name	PARTICIPANTS 1	2	3	4	Total	Average
	Mangadlit	25	9	45	10	89	22
Scaridae	Molmol	30	10	18	30	88	22
Kyphosidae	Ilak	20	8		5	33	8
	Bunod	20			1	21	5
	Moros	20	14		50	84	21
Caesionidae	Solid	5			20	25	6
Lutjanidae	Guret	20			2	22	6
Balistidae	Pakoy	10	13		1	24	6
Mullidae	Salmonete	30			4	34	9
Pomacenridae	Palata		5			5	1
Siganidae	Mataway		7	22		29	7
Holocentridae	Pulahan		6			6	2
Labridae	Mameng		5			5	1
Atherinidae	Guno			2		2	1
Acanthuridae	Labahita			7		7	2
Chaetodontidae	Alibangbang			5		5	1
Total abundance fish/250m2)		**180**	**77**	**99**	**123**	**479**	**120**

Table 7. Fish abundance data in Mapalad-Dibaraybay obtained by trainees using snorkel survey.

Fish Family	Common Name	PARTICIPANTS 1	2	3	4	5	Total	Average
	Moros	29	18				47	9
Scaridae	Molmol	7	11	76	17	18	129	26
Balistidae	Pakoy	1			27		28	6
Pomacentridae	Palata		45	200	20	3	268	54
Serranidae	Lapu-lapu		4	3	1		8	2
Acanthuridae	Labahita			108	15	45	168	34
Chaetodontidae	Alibangbang			20	21		41	8
Siganidae	Balawis				14		14	3
Holocentridae	Siga				15		15	3
Pomacantidae	Maredi				20		20	4
	Parakpakin			2			2	0
	Bagusan			9			9	2
Labridae	Mameng			3			3	1
Total abundance (fish/250m^2)		37	78	421	150	66	752	150

Table 8. Average benthic cover estimation exercises using picture frames simulated as 5m X 5m quadrat.

Benthic Lifeforms	Trainor	Trainees							
	Mel	Rommel	Teddy	Rogelio	Reymar	Gigi	Amado	Bencio	Rodolf
Hard coral	**35.5**	20.5	20.8	16.0	34.6	17.0	24.5	21.0	20.0
Soft coral	**7.5**	21.0	6.3	8.5	6.0	15.5	17.0	19.0	20.0
Dead coral W algae	**14.0**	11.5	10.5	43.0	28.0	33.0	40.5	17.0	23.3
Other Animals	**0.6**	6.0	0.3	1.0	0.5	6.0	18.0	1.0	0.0
Plants	**7.5**	8.0	17.9	6.0	3.0	2.5	0.0	10.0	14.2
Abiotic	**34.9**	33.0	44.2	25.5	27.9	26.0	0.0	32.0	22.5
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

For fish size estimation (i.e., above water exercises), the trainees were able to estimate fish dummies and compared to the actual sizes. The difference is the deviation from the actual size of fish dummies. The negative sign suggests being under-estimated while positive sign suggests being over-estimated and zero is the precise estimation. The deviation of ±1 inches or ±2 cm) from the actual size is good estimates. The results of the laboratory exercise show that 60% in Baler participants shows to be under estimated and 40% tend to be over estimated while in Dinalungan majority them tend to be under-estimated as shown by the negative sign (See Tables 9 & 10). The wide range of variance of estimated between observers can be corrected with more practice especially underwater exercises practicum in the field.

Table 9. Fish size estimation of trainee in Baler on laboratory exercise using fish dummies. The value is the deviation from the actual sizes of the fish dummies.

Dummies No. (cm)	Trainees							
	Teddy	Amado	Florante	Rodolfo	Rogilio	Raymar	Gigi	Bencio
38 (40)	-5	-10	+8	-15	-8	+5	+5	0
32 (20)	0	-3	+10	-10	-2	+5	+5	0
35 (24)	-6	-4	+13	-4	-4	+4	+6	-1
43 (29)	-2	+6	+16	+1	-4	+6	+1	+6
20 (10)	+2	0	+2	-5	-2	+1	0	0
29 (10)	0	-6	-6	-7	-4	0	+2	0
25 (29)	+1	+11	+6	-1	-1	+13	+10	+11
31 (17)	0	-5	+21	-9	-3	+4	+3	+3
17 (17)	+1	-2	-2	-11	-1	+2	+3	0
40 (13)	-2	-3	-10	-9	-3	+2	+2	+2

Table 10. Fish size estimate of participants in Dinalungan on laboratory exercises using fish dummies. The value is the deviation from the actual sizes of the fish dummies.

Dummies No. (Inches)	Trainees							
	Arnel	Mar	Levy	Doming	Jon	Ed	Trainee1	Ferdi
37 (10)	-3	-2	-4	-3	-4	-2	-4	-2
12 (13)	-2	-1	-1	-3	-1	-2-1	-5	-3
29 (4)	+1	-2	-2	-2	-2	0	-1	-2
25 (11.5)	-5.5	-1.5	-3.5	-1.5	-2.5	-0.5	-1.5	-5.5
47 (5.5)	-1.5	-1.5	-1.5	-2	-1.5	+0.5	-3.5	-1.5
21 (9.5)	-3.5	-1.5	-3.5	-2.5	-3.5	-0.5	-2	-3.5
1 (12)	-2	-2	-2	-4	-2	+1	-1	-5
20 (4)	0	-1	-1	-2	-1	+1	-1	-1
2 (5)	-2	-1	-2.5	-3	-1	-0.5	-1	-2
8 (8)	-3	-1	-3	-4	-1	0	-3	-8

FEEDBACK ON FIELD ACTIVITIES

Overall, trainees were able to figure out on their own the inherent strength and weaknesses of the methods introduced. Some of the problems that they encountered during the field practice include the following:

1. Some trainees (e.g., non-fishers) had a hard time identifying reef fish families. This was, however, not a problem for fisher's participants. There should be certainty on the type of fish that is seen in the censuses. If uncertain, try to describe or draw the fish observed instead. This will afford validation as they return to laboratory to look through reference materials and discuss with other team members.

2. They suggest that to be come more familiar and effective estimation of fish sizes and counting fish, follow up training in their respective MPA site will be undertaken.

3. The trainees had difficulty in distinguishing between benthic lifeform categories. They realize that they really need more practice to have more reliable results.

4. Some participants that already trained previous training (e.g., EcoGov1) on M&E (i.e., Dinalungan trainees), which had more reliable and better in fish identification and estimation of benthic lifeforms cover compared to the first timer. This suggests that follow up training in the field surveys is important to enhance local skills.

5. They found it difficult to conduct the field survey in turbid waters like that of the situation in Mapalad-Dibaraybay MPA at some particular times. Survey should be done when water is not turbid. They said that they would try to do the survey in the calmer sea conditions in their sites.

6. More sampling sites or transects should be done during actual monitoring for more quality monitoring results.

7. Participants observed that data summarization is simple and easy to do.

FUTURE PLANS / ACTIONS

DINALUNGAN AND DIPACULAO

To improve monitoring skills in part of the monitoring team, they will have a more regular monitoring practice and to expand the current monitoring team by eliciting more participation by the community through IEC and re-echo of the newly learned methodologies. The acquisition of equipment that would be used for the monitoring will be made before the monitoring activities. A follow-up will be made with the LGUs on the purchase of the patrol boat. They will make a list of request for equipment needed that will be integrated on the budget for 2007. There is an agreement among the members of MPA management team to set the monitoring program bi-annually during the months of August and March. At least four (4) transects will be done inside and outside the MPA. Documentation and reporting of results will be done regularly and will be submitted to the Mayor, MAO and ILCRMC.

DIGISIT-PUNTI-AN, ZABALI, BALER

In Baler, they need to fast track the MPA ordinance. The public hearing will be conducted on June 15, 2006, 8:00 in the morning at the Fish Port to come up with a general agreement with the community on these provisions. The resolution from the fisherfolk federation will be prepared on May 28 through ASCOT seeking LGU prioritization of the activity. Acquisition of equipment for the MPA monitoring will be taken cared of once the ordinance is enacted. ASCOT signified support by allowing the MPA body to use the equipment available in their CRM office. The MPA body agreed to conduct the monitoring bi-annually during February and August and come up with the reports and submitted to the MAO and ILCRMC. Massive IEC will also be made to generate community support while feedbacking the results of the monitoring activities.

Regular practice will be made by the MPA monitoring team on fish identification and benthic cover estimations. The ASCOT will provide assistance for the conduct of the activities on establishing monitoring sites. The MPA managers will share their experiences by networking among MPAs. An incentive system will be developed to encourage active participation and recognition of the MPA managers such as best MPAs. This can be done during the conduct of annual festival of MPAs.

ILCRMC / ASCOT SUPPORT TO MPA IMPLEMENTATION

The monitoring reports will be integrated in the fisheries database that is being developed by ILCRMC and ASCOT for management purposes. Then the ILCRMC and ASCOT can provide assistance technically during the conduct of actual monitoring activities. They will hold annual MPA workshops and site visits to enhance collaboration among MPAs and advocate sharing of experiences. They will also develop an incentive system for recognition and appreciation of best performing and effective MPAs. The ILCRMC will include in its yearly budget the assistance in conduct of MPA monitoring and MPA annual affairs. The group will also do acquisition of equipment, which will likewise be included in the yearly budget.

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APPENDICES

Table 1. Percentage cover of the different benthic lifeform categories in Mapalad-Dibaraybay MS using video transect method. (Observer: Lambert Menez).

		Inside Sanctuary				*Outside Sanctuary*		
LIFEFORM	***Code***	***MPLT1***	***MPLT2***	***MPLT3***	***MPLT4***	***MPLT5***	***MPLT6***	***MPLT7***
Hard coral		13	14.6	30.8	23.4	17.6	18.6	22.8
Acropora		0.4	5	0	0.6	0	0.8	0.4
Acropora branching	*ACB*	0.4	4.6		0.2		0.2	0.4
Acropora tabulate	*ACT*		0.4		0.4		0.6	
non-Acropora		12.6	9.6	30.8	22.8	17.6	17.8	22.4
Coral branching	*CB*	1.8		0.4	1.4	0.8		0.4
Coral encrusting	*CE*	5	3.6	12.6	7.2	6	6.6	5.2
Coral foliose	*CF*	1.6		0.2				4.8
Coral massive	*CM*	4	5	15.6	10.8	10.4	8.2	8.8
Coral submassive	*CS*	0.2	1	2	3.4	0.4	3	3
Coral mushroom	*CMR*							0.2
Dead coral with algae	*DCA*	24.6	29.2	3.4	1.6	2.6	3.6	7.8
Soft Coral	*SC*	0.6	0.6	0.8	0.8	3	0.4	0.4
Sponge	*SP*	1.6	2.8	5.2	6.2	2	2.8	4.4
Zoanthids	*ZO*			0.2			1.2	0.4
Other Living	*OTL*		0.2		0.6	0.2	0.4	0.2
Algae		43.8	27	47.8	57.8	61.2	54.6	49
Algal assemblage	*AA*	26.8	16.4	32.2	35.4	44.2	35.8	39.6
Coralline alggae	*CA*	10.4	9	15.4	20.2	12.2	13.6	7.2
Halimeda	*HA*	6.4	1.6	0.2	2.2	4.8	5.2	2.2
Macro algae	*MA*	0.2						
Abiotic		16.4	25.6	11.8	9.6	13.4	18.4	15
Rubble	*R*	6.6	5.2	2.4	0.6		1.6	0.6
Rock	*RCK*		0.2	5.4	0.8	0.2	0.4	
Sand	*S*	4.8	3.6	3.8	3.4	4.8	8.6	2.2
Silt	*SI*	5	16.6	0.2	4.8	8.4	7.8	12.2

Table 2. Percentage cover of the different benthic lifeform categories in Mapalad-Dibaraybay MS in three monitoring period using video transect method. (Observers: Hazel arceo (2003), Melchor Deocadez (2004) and Lambert Menez (2006)).

LIFEFORM CATEGORY	CODE	AVERAGE % COVER					
		INSIDE MPA			OUTSIDE MPA		
		2003	2004	2006	2003	2004	2006
Hard Corals							
Branching Acropora	ACB	6.33	7.50	1.30	0.07	0.13	0.20
Submassive Acropora	ACS	0.00	0.00	0.00	0.00	0.13	0.00
Table Acropora	ACT	0.53	0.35	0.20	0.00	0.07	0.20
Coral branching	CB	0.00	0.70	0.90	0.17	0.00	0.40
Coral encrusting	CE	3.95	1.10	7.10	1.93	0.73	5.93
Coral foliose	CF	0.00	0.95	0.45	0.00	0.00	1.60
Heliopora (Blue coral)	CHL	0.00	0.05	0.00	0.00	0.00	0.00
Coral massive	CM	13.13	17.15	8.85	11.50	18.54	9.13
Millepora (fire coral)	CME	0.00	0.05	0.00	0.00	0.00	0.00
Mushroom coral	CMR	0.05	0.05	0.00	0.07	0.07	0.07
Coral submassive	CS	4.93	0.70	1.65	4.80	0.40	2.13
TOTAL HARD CORAL		28.92	28.60	20.45	18.54	20.07	19.67
SOFT CORAL	SC	0.83	0.95	0.70	1.07	0.80	1.27
DEAD CORAL/DEAD CORAL WITH ALGAE	DC/DCA	10.13	8.80	14.70	9.00	3.13	4.67
Algal assemblage	AA	4.00	48.25	27.70	2.70	57.52	39.87
Coralline Algae	CA	8.38	0.45	13.75	6.97	0.20	11.00
Halimeda	HA	0.83	1.30	2.60	2.77	3.53	4.07
Macroalgae	MA	0.13	0.10	0.05	0.07	0.00	0.00
Turf algae	TA	2.53		0.00	1.57		0.00
TOTAL ALGAE		15.87	50.10	44.10	14.08	61.25	54.93
OTHER FAUNA	OT	0.78	0.10	0.20	0.43	0.33	0.80
Rubble	R	0.73	4.90	3.70	0.33	1.80	0.73
Rock	RCK	36.38	5.50	1.60	60.37	9.07	0.20
Sand	SC	4.40	0.85	3.90	3.40	3.40	5.20
Silt	SI		0.00	3.90		0.00	9.47
TOTAL ABIOTIC		41.51	11.25	15.85	64.10	14.27	15.60
SPONGE	SP	1.33	0.10	3.95	0.50	0.07	3.07
UNIDENTIFIED	UNID	0.73	0.10	0.25	0.37	0.07	0.00

Table 3. Percentage cover of the different benthic lifeform categories in Digisit Punti-an proposed MS using video transect method. (Observer: Lambert Menez).

		Inside Sanctuary		*Outside Sanctuary*	
LIFEFORM	***Code***	***DGST1***	***DGST2***	***DGST3***	***DGST4***
Hard coral		23.2	16	13.2	11.6
Acropora		3.8	4.2	3.6	0.6
Acropora branching	ACB	2.4	1.4	0.8	
Acropora tabulate	ACT	1.4	2.8	2.8	0.6
non-Acropora		19.4	11.8	9.6	11
Coral branching	CB	1	0.6	0.4	0.6
Coral encrusting	CE	13.8	9.6	7.2	8.6
Coral foliose	CF	0.6		0.2	
Coral massive	CM	0.6			1.6
Coral submassive	CS	3.2	1.6	1.6	
Coral mushroom	CMR	0.2		0.2	0.2
Dead coral with algae	DCA	11.4	14	10.6	8.6
Soft Coral	SC	1.8	4.2	4.8	15.2
Sponge	SP	9.8	12	13.4	9.2
Zoanthids	ZO	0.2	0.6	0.2	1.2
Other Living	OTL			0.2	
Algae		52	47.8	54.4	53.8
Algal assemblage	AA	22.6	19.8	25.4	22.4
Coralline algae	CA	10.2	5.6	7	9.2
Halimeda	HA	17.4	21.6	20.8	20.6
Macro algae	MA	1.8	0.8	1.2	1.6
Abiotic		1.6	5.4	3.2	0.4
Rubble	R	0.4	1	0.2	0.2
Sand	S	1.2	2	2.4	
Silt	SI		2.4	0.6	0.2

Table 4. Abundance of reef fish species (individuals/500m^2) observed in in Mapalad-Dibaraybay and Digisit-Punti-an MS (Observer: Melchor Deocadez)

Fish species	Baler Fish Sanctuary				Mapalad-Dibaraybay Fish Sanctuary						
	Inside		Outside		Inside				Outside		
	T1	T2	T1	T2	T1	T2	T3	T4	T1	T2	T3
Acanthurus blochii			1								
Acanthurus lineatus					3						
Acanthurus nigricans	6	3	3	1	1						
Acanthurus sp.						2					
Amblyglyphidodon curacao								10	11		7
Amblyglyphidodon leucogaster	4	11	1		8			15			2
Amphiprion clarkii											3
Anampses twistii									1		
Arothron nigropunctatus											1
Balistapus undulatus	3		1		3	1	4	1	1	3	2
Bodianus mesothorax	1	3	2		2	1		4	2		2
Caesio cuning					100						
Cantherhines pardalis	1										
Canthigaster compressa								1			
Canthigaster solandri								5			
Centropyge bispinosus					1	3			2		
Centropyge vroliki	2	7		2	7	1	2		4	12	5
Cephalopholis leopardus	1						1		1		
Cephalopholis miniata					1						
Cephalopholis urodeta						1	1				
Cetoscarus bicolor								1			
Chaetodon baronessa	3		1	2							
Chaetodon citrinellus	1									2	
Chaetodon kleinii							1				
Chaetodon mertensii										4	
Chaetodon ornatissimus		1								1	
Chaetodon rafflesii							1				
Chaetodon sp.		1									
Chaetodon speculum			1			2					
Chaetodon trifasciatus		2	1		3	2	1	3			3
Chaetodon vagabundus	2	1	2		2	3	2				
Cheilinus fasciatus								1			
Cheilinus trilobatus						1			3		1
Cheilodipterus macrodon								7			
Cheilodipterus quinquelineat								2			
Chromis atripectoralis				1							
Chromis retrofasciata					8						1
Chromis ternatensis								15			
Chromis weberi						11		10			
Chromis xanthura		3	3		4						
Chrysiptera rex	1		1	1			30			1	
Chrysiptera rollandi						2		1			2
Cirrhilabrus cyanopleura						11					
Cirrhitichthys falco						1	1				
Ctenochaetus binotatus			6	2	1	16	39	5	11	25	4
Ctenochaetus striatus	39	7	5	4	21	24	68	20	21	23	7
Ctenochaetus strigosus					2	1	2	4	2		
Dascyllus reticulatus	1		10	3	3	1					
Dascyllus trimaculatus											1
Diploprion bifasciatum	1					1			1		
Epibulus insidiator				1					1		
Forcipiger longirostris		2			1	1			2		
Gomphosus varius	2	1	2	1		1	1		1		1
Halichoeres hortulanus	2		2	1	1		2	1	2	1	
Halichoeres melanochir	6	5	2	2	2	4	1	1	1		1
Halichoeres melanurus	1							2		4	
Halichoeres prosopeion					1		4		1		2
Hemigymnus fasciatus	1	1				1	2				
Heniochus acuminatus								2	1		
Heniochus monoceros	1	1					2		1		
Heniochus varius		2			2		1	4	1		
Hipposcarus longiceps					1					1	
Labracinus cyclophthalmus	2		3								
Labrichthys unilineatus	2	2	2			1		1	4		2
Labroides dimidiatus	1		2	1	1	2	2	1	1	2	1
Lutjanus biguttatus								7			1
Lutjanus decussatus	1										
Lutjanus ehrenbergii							1				
Lutjanus fulvus							1				

Cont'n Appendix table 4											
Fish species	Baler Fish Sanctuary				Mapalad-Dibaraybay Fish Sanctuary						
	Inside		Outside		Inside				Outside		
	T1	T2	T1	T2	T1	T2	T3	T4	T1	T2	T3
Macolor niger								2			
Macropharyngodon negrosensis		2									
Meiacanthus atrodorsalis						1					
Melichthys vidua							1				
Monotaxis grandoculis	1						1				
Myripristis murdjan		1			5			11	1		1
Naso annulatus			2								
Naso hexacanthus							1				
Naso lituratus	2						13	2			
Neoglyphidodon nigroris	1	11	1		29	1		7	13	1	22
Oxycheilinus unifasciatus		1	1								1
Paracirrhites arcatus	3	2		1				2			
Parupeneus barberinus					1						
Parupeneus multifasciatus		1									
Pempheris oualensis		1						6			1
Plectroglyphidodon lacrymatu	55	30	64	36	13	4	7	25	20	2	32
Plectropomus leopardus					3		1				
Pomacentrus adelus					2		6		2		1
Pomacentrus alexanderae											5
Pomacentrus amboinensis	8	16	13	7	18	14	24	5	5	6	6
Pomacentrus bankanensis							1				
Pomacentrus lepidogenys	68	12	53	72			29	3			3
Pomacentrus philippinus	18	16	43	8	4		1	2	13	7	4
Pomacentrus sp.						4	5	1	14	36	4
Pomacentrus stigma	5	7			11	16			3		1
Pomacentrus vaiuli	6	2		2		2			2	2	2
Ptereleotris evides				25		6			2		
Pterocaesio tile											5
Pygoplites diacanthus	6	2			1		3		1		
Sargocentron caudimaculatum		2			1			2			
Saurida gracilis				1							
Scarus bleekeri	2						2	1			
Scarus bowersi					3	1		1			
Scarus niger							2	4			
Scarus oviceps					1						
Scarus quoyi		2				3	1		2		
Scarus schlegeli							1				
Scarus sordidus	11	9		3	5	7	6	3	5	5	4
Scarus sp.	4			1							
Scarus sp.1				1							
Scolopsis bilineatus			1				1			1	
Scolopsis ciliatus								1			
Scolopsis lineatus							1				
Siganus argenteus					1						
Siganus vulpinus		2			1						
Stethojulis bandanensis			1							1	
Stethojulis strigiventer										1	
Stethojulis trilineata			2								
Sufflamen chrysopterus						1	1				
Thalassoma hardwickii		1	2	3			1			1	
Thalassoma jansenii				2							
Thalassoma lunare			3			28	1		1		
Thalassoma lutescens			3	1		3					
Valenciennea strigata						2					
Zanclus cornutus	5		2	1	1	1	1			2	
Zebrasoma flavescens								1			
Zebrasoma scopas		1		1	3		11	3	2		1
Zebrasoma veliferum							3				
Abundance (indiv/500m2)	280	174	242	187	282	189	295	206	162	144	142
Density (Indiv./m2)	0.6	0.3	0.5	0.4	0.6	0.4	0.6	0.4	0.3	0.3	0.3
Mean Density (Indiv./m2)		0.5		0.4				0.5			0.3
No of species	39	37	34	29	42	41	49	44	38	24	36

Table 5. Reef fish species biomass (g/500m^2) observed in Mapalad-Dibaraybay and Digisit-Punti-an MS (Observer: Melchor Deocadez)

Fish species	Baler Fish Sanctuary				Mapalad-Dibaraybay Fish Sanctuary						
	Inside		Outside		Inside				Outside		
	T1	T2	T1	T2	T1	T2	T3	T4	T1	T2	T3
Acanthurus blochii			157.4								
Acanthurus lineatus					1134.7						
Acanthurus nigricans	288.3	65.7	172.1	31.3	50.9						
Acanthurus pyroferus	20.9		8.0			216.6				157.5	
Acanthurus sp.						79.4					
Amblyglyphidodon curacao								138.6	183.5		116.8
Amblyglyphidodon leucogaster	152.6	423.0	65.1		160.4			382.7			49.3
Amphiprion clarkii											35.4
Anampses twistii									12.8		
Arothron nigropunctatus											5.7
Balistapus undulatus	98.9		77.9		103.6	38.6	72.2	38.6	21.7	82.0	43.4
Bodianus mesothorax	32.9	131.1	130.5		37.7	18.8		70.2	65.9		51.8
Caesio cuning					16951.0						
Cantherhines pardalis	44.7										
Canthigaster compressa								3.0			
Canthigaster solandri								15.2			
Centropyge bispinosus					4.3	18.2			8.6		
Centropyge vroliki	7.1	38.9		12.1	54.4	10.6	21.3		28.1	105.1	43.8
Cephalopholis leopardus	23.7						23.7		13.6		
Cephalopholis miniata					59.8						
Cephalopholis urodeta						74.4	132.7				
Cetoscarus bicolor								88.4			
Chaetodon baronessa	131.1		50.5	101.0							
Chaetodon citrinellus	6.7									44.6	
Chaetodon kleinii							30.1				
Chaetodon mertensii										108.0	
Chaetodon ornatissimus		94.9								30.1	
Chaetodon rafflesii							30.1				
Chaetodon sp.		7.1									
Chaetodon speculum			94.9			32.1					
Chaetodon trifasciatus		60.6	51.4		91.0	102.8	30.3	91.0			133.1
Chaetodon vagabundus	32.1	50.5	126.6		101.0	240.3	113.8				
Cheilinus fasciatus								815.1			
Cheilinus trilobatus						33.8			59.1		19.7
Cheilodipterus macrodon								52.6			
Cheilodipterus quinquelineat								8.6			
Chromis atripectoralis				1.8							
Chromis retrofasciata					1.5						0.2
Chromis ternatensis								135.5			
Chromis weberi						175.6		153.1			
Chromis xanthura		49.2	181.3		171.6						
Chrysiptera rex	0.3		0.6	0.6			18.7			0.6	
Chrysiptera rollandi						2.6		0.6			0.6
Cirrhilabrus cyanopleura						75.0					
Cirrhitichthys falco						16.3	5.6				
Ctenochaetus binotatus			325.2	101.1	31.5	618.3	1666.4	237.9	441.7	806.8	126.1
Ctenochaetus striatus	2318.0	384.6	304.3	140.8	543.4	1077.4	4609.8	1014.8	770.7	828.9	318.9
Ctenochaetus strigosus					28.3	27.6	55.2	150.6	140.7		
Dascyllus reticulatus	2.8		50.9	15.3	25.2	5.1					
Dascyllus trimaculatus											8.4
Diploprion bifasciatum	30.5					30.5			30.5		
Epibulus insidiator				113.0					33.8		
Forcipiger longirostris		101.0			30.1	50.5			60.3		
Gomphosus varius	56.0	51.1	43.5	14.7		39.1	23.7		39.1		39.1
Halichoeres hortulanus	16.1		57.2	47.6	84.6		108.2	84.6	132.2	47.6	
Halichoeres melanochir	134.4	148.7	60.9	36.9	33.1	87.5	9.5	9.5	13.3		23.6
Halichoeres melanurus	9.5							19.1		31.4	
Halichoeres prosopeion					9.5		66.4		23.6		30.2
Hemigymnus fasciatus	89.6	51.1				39.1	317.5				
Heniochus acuminatus								187.6	93.8		
Heniochus monoceros	195.3	140.7					390.6		140.7		
Heniochus varius		208.3			95.9		184.1	656.6	184.1		
Hipposcarus longiceps					271.1					150.7	
Labracinus cyclophthalmus	46.3		116.7								
Labrichthys unilineatus	26.7	12.9	34.1			17.0		9.7	82.6		19.4
Labroides dimidiatus	2.1		4.2	2.1	2.1	4.2	3.4	1.3	1.3	2.8	2.1
Lutjanus biguttatus								659.6			78.3
Lutjanus decussatus	21.7										
Lutjanus ehrenbergii							182.2				
Lutjanus fulvus							156.7				

Cont'n Appendix table 5											
	Baler Fish Sanctuary				Mapalad-Dibaraybay Fish Sanctuary						
Fish species	Inside		Outside		Inside				Outside		
	T1	T2	T1	T2	T1	T2	T3	T4	T1	T2	T3
Macolor niger								533.0			
Macropharyngodon negrosensis		134.5									
Meiacanthus atrodorsalis						1.6					
Melichthys vidua							539.1				
Monotaxis grandoculis	143.9						386.9				
Myripristis murdjan		54.2			169.0			736.1	66.9		54.2
Naso annulatus			364.0								
Naso hexacanthus							462.5				
Naso lituratus	364.0						6117.1	216.9			
Neoglyphidodon nigroris	19.8	401.2	38.1		711.5	24.7		152.9	204.2	19.3	570.4
Oxycheilinus unifasciatus		42.9	19.7								10.1
Paracirrhites arcatus	34.8	33.9		14.4				535.6			
Parupeneus barberinus					51.7						
Parupeneus multifasciatus		98.4									
Pempheris oualensis		57.0						356.6			28.7
Plectroglyphidodon lacrymatu	443.5	255.4	724.1	340.6	102.1	30.4	53.2	238.8	149.5	15.2	439.5
Plectropomus leopardus					1775.7		204.6				
Pomacentrus adelus					10.0		26.0		10.0		5.0
Pomacentrus alexanderae											15.0
Pomacentrus amboinensis	10.6	30.1	25.4	12.2	30.4	18.9	37.1	8.1	8.1	8.8	11.7
Pomacentrus bankanensis							7.6				
Pomacentrus lepidogenys	318.0	78.6	273.8	295.6			116.6	12.1			21.2
Pomacentrus philippinus	26.2	37.2	89.6	16.0	3.4		1.4	0.9	14.3	6.5	4.8
Pomacentrus sp.						16.0	25.0	5.0	90.9	193.6	30.4
Pomacentrus stigma	140.0	246.7			221.7	285.5			54.2		19.3
Pomacentrus vaiuli	11.1	2.9		4.1		1.8			2.9	4.1	2.9
Ptereleotris evides				158.4		38.0			33.0		
Pterocaesio tile											148.9
Pygoplites diacanthus	272.4	53.8			43.1		178.8		59.6		
Sargocentron caudimaculatum		278.4			66.9			278.4			
Saurida gracilis				3.2							
Scarus bleekeri	788.1						877.0	671.9			
Scarus bowersi					1271.1	150.7		205.1			
Scarus niger							965.4	598.3			
Scarus oviceps					205.1						
Scarus quoyi		239.0				645.1	88.4		239.0		
Scarus schlegeli							213.2				
Scarus sordidus	836.3	710.7		236.9	218.0	347.9	658.3	66.3	330.9	236.9	205.7
Scarus sp.	311.0			88.4							
Scarus sp.1				150.7							
Scolopsis bilineatus			91.2				32.8			51.4	
Scolopsis ciliatus								30.4			
Scolopsis lineatus							4.1				
Siganus argenteus					46.3						
Siganus vulpinus		225.4			61.5						
Stethojulis bandanensis			11.1							14.4	
Stethojulis strigiventer										14.4	
Stethojulis trilineata			30.6								
Sufflamen chrysopterus						77.9	77.9				
Thalassoma hardwickii		10.6	29.4	35.9			39.1			23.7	
Thalassoma jansenii				76.9							
Thalassoma lunare			64.0			391.2	9.9		22.4		
Thalassoma lutescens			85.9	8.9		64.7					
Valenciennea strigata						21.0					
Zanclus cornutus	461.2		256.7	25.5	45.5	12.6	45.5			71.0	
Zebrasoma flavescens								47.0			
Zebrasoma scopas		46.2		46.2	62.8		514.8	76.0	50.7		25.3
Zebrasoma veliferum							526.9				
Biomass (g/500m2)	7969.6	5056.8	4217.0	2131.8	25172.3	5259.2	20461.6	9793.8	3918.3	3055.5	2738.8
Biomass (Mt./Km2)	15.9	10.1	8.4	4.3	50.3	10.5	40.9	19.6	7.8	6.1	5.5
Mean Biomass (Mt./Km2)		13.0		6.3				30.3			6.5

Table 6. Abundance of reef fishes families (individuals/500m^2) observed in Mapalad-Dibaraybay and Digisit-Punti-an MS (Observer: Melchor Deocadez)

Fish species	Baler Fish Sanctuary				Mapalad-Dibaraybay Fish Sanctuary						
	Inside		Outside		Inside				Outside		
	T1	T2	T1	T2	T1	T2	T3	T4	T1	T2	T3
Acanthuridae	50	11	18	8	31	45	137	35	36	50	12
Apogonidae								9			
Balistidae	3		1		3	2	6	1	1	3	2
Blenniidae						1					
Caesionidae					100						5
Chaetodontidae	7	10	5	2	8	8	8	9	5	7	3
Cirrhitidae	3	2		1		1	1	2			
Gobiidae						2					
Holocentridae		3			6			13	1		1
LabBodianinae	1	3	2		2	1		4	2		2
LabCheilininae		1	1	1		12		1	4		2
LabCorinae	12	10	17	10	4	37	12	4	7	8	4
LabLabrichthyinae	3	2	4	1	1	3	2	2	5	2	3
Lethrinidae	1						1				
Lutjanidae	1						2	9			1
Microdesmidae				25		6			2		
Monacanthidae	1										
Mullidae		1			1						
Nemipteridae			1				2	1		1	
Pempheridae		1						6			1
Pomacanthidae	8	9		2	9	4	5		7	12	5
Pomacentridae	167	108	189	130	100	55	103	94	83	55	96
Pseudochromidae	2		3								
SEpinephelinae	1				4	1	3		1		
SGrammistinae	1					1			1		
Scaridae	17	11		5	10	11	12	10	7	6	4
Siganidae		2			2						
Synodontidae				1							
Tetraodontidae								6			1
Zanclidae	5		2	1	1	1	1			2	
Abundance (indiv/500m2)	283	174	243	187	282	191	295	206	162	146	142
Density (Indiv./m2)	0.57	0.35	0.49	0.37	0.56	0.38	0.59	0.41	0.32	0.29	0.28
Mean Density (Indiv./m2)		0.46		0.43				0.49			0.3

Table 7. Reef fish family biomass (g/500m^2) observed in Mapalad-Dibaraybay and Digisit-Punti-an MS (Observer: Melchor Deocadez)

Fish species	Baler Fish Sanctuary				Mapalad-Dibaraybay Fish Sanctuary						
	Inside		Outside		Inside				Outside		
	T1	T2	T1	T2	T1	T2	T3	T4	T1	T2	T3
Acanthuridae	2991.2	496.5	1331.1	319.3	1851.6	2019.3	13952.9	1743.2	1403.8	1793.2	470.2
Apogonidae								61.2			
Balistidae	98.9		77.9		103.6	116.5	689.3	38.6	21.7	82.0	43.4
Blenniidae						1.6					
Caesionidae					16951.0						148.9
Chaetodontidae	365.3	663.1	323.4	101.0	318.0	425.6	779.2	935.2	478.9	182.7	133.1
Cirrhitidae	34.8	33.9		14.4		16.3	5.6	535.6			
Gobiidae						21.0					
Holocentridae		332.6			235.9			1014.5	66.9		54.2
LabBodianinae	32.9	131.1	130.5		37.7	18.8		70.2	65.9		51.8
LabCheilininae		42.9	19.7	113.0		108.9		815.1	92.9		29.8
LabCorinae	305.7	396.1	382.5	220.9	127.2	621.4	574.2	113.2	243.4	131.6	92.8
LabLabrichthyinae	28.8	12.9	38.3	2.1	2.1	21.2	3.4	11.0	83.9	2.8	21.4
Lethrinidae	143.9						386.9				
Lutjanidae	21.7						338.8	1192.6			78.3
Microdesmidae				158.4		38.0			33.0		
Monacanthidae	44.7										
Mullidae		98.4			51.7						
Nemipteridae			91.2				36.9	30.4		51.4	
Pempheridae		57.0						356.6			28.7
Pomacanthidae	279.6	92.7		12.1	101.8	28.8	200.1		96.3	105.1	43.8
Pomacentridae	1124.9	1524.4	1449.0	686.1	1437.8	560.5	285.6	1228.3	717.5	248.1	1330.9
Pseudochromidae	46.3		116.7								
SEpinephelinae	23.7				1835.5	74.4	361.0		13.6		
SGrammistinae	30.5					30.5			30.5		
Scaridae	1935.5	949.7		475.9	1965.2	1143.7	2802.2	1629.9	569.9	387.5	205.7
Siganidae		225.4			107.7						
Synodontidae				3.2							
Tetraodontidae								18.3			5.7
Zanclidae	461.2		256.7	25.5	45.5	12.6	45.5			71.0	
Biomass (g/500m2)	7969.6	5056.8	4217.0	2131.8	25172.3	5259.2	20461.6	9793.8	3918.3	3055.5	2738.8
Biomass (Mt./Km2)	15.9	10.1	8.4	4.3	50.3	10.5	40.9	19.6	7.8	6.1	5.5
Mean Biomass (Mt./Km2)		13.0		6.3				30.3			6.5

Table 8. Reef fish indicatorabundance and biomass observed in Mapalad-Dibaraybay and Digisit-Punti-an MS (Observer: Melchor Deocadez)

Fish species	Baler Fish Sanctuary				Mapalad-Dibaraybay Fish Sanctuary						
	Inside		Outside		Inside				Outside		
	T1	T2	T1	T2	T1	T2	T3	T4	T1	T2	T3
Abundance											
Target species	75	30	20	11	155	58	151	66	47	60	25
Coral indicator	14	11	9	3	9	10	9	10	9	9	5
Major families	194	133	214	173	118	123	135	130	106	77	112
Abundance (indiv/500m2)	283	174	243	187	282	191	295	206	162	146	142
Density (Indiv./m2)	0.566	0.348	0.486	0.374	0.564	0.382	0.59	0.412	0.324	0.292	0.284
Mean Density (Indiv./m2)		0.5		0.4				0.5			0.3
Biomass											
Target species	5242.2	2161.4	1500.3	513.3	23082.5	3269.5	17738.7	6341.3	2130.3	2314.1	995.0
Coral indicator	853.2	668.9	614.2	126.5	363.5	455.3	824.7	944.8	561.5	253.7	152.5
Major families	1874.2	2226.5	2102.5	1492.0	1726.3	1534.5	1898.2	2507.7	1226.4	487.7	1591.3
Biomass (g/500m2)	7969.6	5056.8	4217.0	2131.8	25172.3	5259.2	20461.6	9793.8	3918.3	3055.5	2738.8
Biomass (Mt./Km2)	15.9	10.1	8.4	4.3	50.3	10.5	40.9	19.6	7.8	6.1	5.5
Mean Biomass (Mt./Km2)		13.0		6.3				30.3			6.5

Table 9. Local names of reef fish families translated by the participants from Digisit, Baler, Aurora.

FAMILY NAME	ENGLISH NAME	LOCAL NAME
Holocentridae	Soldierfish Squirrelfish	Siga, Aray-aray, pulahan
Aulostomidae / Fistularidae	Trumpetfish / Flutemouth	Torotot
Scorpaenidae	Stonefish/Lionfish	*Lupo, ampo*
Serranidae/ Epinephelinae	Grouper	Lapu, Kigting (E. tauvina) Sibungin (P.leavis)
Anthiinae (Serranidae)	Fairy basslets	Pulata (malalim)
Apogonidae	Cardinalfish	Samong
Carangidae	Jacks	Talakitok, malapundo (C. ignobilis, salmon (E.binilatus)
Lutjanidae	Snapper	Guret, dayangdang, Maya-maya (Lutjanus spp.
Caesionidae	Fusilier	Solid (Pterocaesio spp.), Dalagangbukid (Caesio cuning)
Haemulidae	Sweetlips	Alatan, labian
Nemipteridae	Coral bream	Tungog, saray
Lethrinidae	Emperor	Katambak, bukawin
Mullidae	Goatfish	Salmonete
Belonidae	Needlefish	*Du-al*
Epphipidae	Batfish	Bayang
Chaetodontidae	Butterflyfish	Alibangbang
Zanclidae	Morish idol	Debdiban
Pomacanthidae	Angelfish	Kubalan
Pomacentridae	Damselfish	Palata, kiskisan (abudefduf spp.)
Labridae	Wrasse	Mameng, Liyo-liyo (Labroides spp.)
Scaridae	Parrotfish	Mol-mol, mabuntok (Bolbometapon)
Sphyraenidae	Barracuda	*Tamutsong (small), barakuda (big)*
Pinguipedidae	Sandperch	Basakay
Mugilidae	Mullet	*Anggapang; bulahi (small); banal (big)*
Acanthuridae	Surgeonfish	Maragta (Ctenochaetus) Labahita (Acanthurus), Surahan (Naso)
Siganidae	Rabbitfish	Medyad (S. guttatus), Mataway (S. spinus), Baliwis (S. argenteus)
Balistidae	Triggerfish	Pakoy, Paget
Ostracidae	Cowfish / Boxfish	*Tabakan*
Monacanthidae	Filefish/leatherjacket	*Pakoy*
Synodontidae	Lizard fish	*Dalag*
Tetraodontidae	Pufferfish	*Botete, boriring*

FAMILY NAME	ENGLISH NAME	LOCAL NAME
Plotosidae	Catfish	*Patuna, iito*

Table 10. Detailed Schedule of training and survey Activities

Date/Time	***Topic/Nature of Activity***	***Responsible Person/Group***	***Resource Requirements***
May 15, 2006	***Travel to Baler***	***PMA, 2 MPA M&E STTAs***	***Preparation of:*** ***- dive gears*** ***- compressor*** ***- SCUBA tanks*** ***- Fish dummies and visual aids*** ***- LCD/laptop*** ***- craft paper, white board and markers*** ***- photocopying of reading materials and powerpoint presentations; other reference materials [C. Nav, coral and fish books]*** ***- Blank data forms***
Day 1 – May 16, 2006 (Tuesday)- Baler			
A.M.	***Opening Program*** ***Overall situation of MPAs in Aurora*** ***Lecture:*** • ***MPA strengthening and sustainable management*** • ***M&E on MPA strengthening and sustainable management*** • ***Fish visual census and coral reef fish communities M&E analyses and reef health conditions***	 ***Ped/ ILCRMC*** ***PMA*** ***LM*** ***MD***	• ***Hand-outs*** • ***LCD/laptop*** ***Food and accommodation arrangements for all participants.***
P.M.	***M&E Methods briefing and group assignments*** ***Workshop group standardization and observations*** • ***Travel to Dinalungan (3pm)***	***PMA, LM, MD*** ***PMA***	• ***Hand-outs*** • ***Field guide books*** • ***Fish dummies*** • ***Papers and pens*** • ***Data***

Cont'n Appendix table 10

Day 2 – May 17, 2006 (Follow-up M&E in Dinalungan) Wednesday			
A.M. ***P.M.***	***Field training of Dinalungan M&E team and M&E of Mapalad Reef Area*** ***Gauge standards and observations of the MS activity***	***LM & MD*** ***PMA***	• ***Snorkelling sets*** • ***SCUBA gears and tanks*** • ***UW slates*** • ***UW video camera*** • ***Transect lines*** • ***Fish dummies*** • ***Boats***
Evening	***Data transcription (Mayor's place)***	***PMA, STTAs***	• ***Computers*** • ***Generator in staff house/ training venue***
Day 4 – May 18, 2006 (Follow-up M&E in Dinalungan) - Thursday			
A.M. ***P.M.***	***Continuation of field activity*** • ***Review and finalize the standardized M&E protocols and next steps*** • ***Travel Back to Baler***	***Same as above*** ***Ped Orencio***	***Same as above*** ***Draft M&E and performance monitoring protocol for MPA in EcoGov areas should be presented.***
Day 5 – March 19, 2006 (Field practice in Baler MPA) Friday			
A.M. ***P.M.*** ***(evening)***	• ***Actual field practice and application for participants in Zabali MPA*** • ***Data transcription*** • ***Feedbacking and discussions*** • ***Next steps:*** ***- M&E program for community group*** ***- M&E protocols for LSP group***	***Same as above*** ***Ped*** ***PMA***	• ***Snorkelling sets*** • ***Field guide books*** • ***Fish dummies*** • ***Transect lines*** • ***Papers and pens*** • ***Data forms*** • ***SCUBA gears and tanks*** • ***UW slates*** • ***UW video camera*** • ***Boats***
Day 6 – March 20, 2006 -Saturday			
A.M./P.M.	***Travel back to Manila***		

Table 11. Budget for the Training workshop.

ITEMS	ILCRMC/ ASCOT Cnterpart	Dinalungan Cntrpart	Dipaculao Cntrpart	Baler Cntrpart	San Luis Cntrpart	EcoGov
Meals of participants:						
Accommodation of participants						P25200.00
Venue Rental Baler Dinalungan		Municipal hall				P2000.00 (AMCO)
Sound System and other facilities						
Boat Rental & Gasoline Dinalungan Baler		P2000.00		P1000.00		
Diving Gear rental (P1000 x 4 days x 3sets)						P12,000.00*
Skin Diving Gear Rentals						
Tanks – P150.00 x 10 tanks x 4 days	P6000.00					P2400.00*
Compressor rental						
Field supplies (underwater slates, fish dummies, transect line, manila papers, pentel pens	15 slates 3 pairs masks & snorkels Transect line					P3,000.00*
Supplies and photocopying (training kits, hand-outs, data forms						P1730.00
Gasoline (Boat and Generators)						P2124.00
Van Rental						P6000.00
Local Transport of participants to and from the venue		P1440.00	P1200.00	P240.00	P720.00	
Films and Film Processing						P500.00
Batteries (digital camera, flashlights)						
TOTAL	P6000.00	P3440.00	P1200.00	P1240.00	P720.00	P54954.00

Table 12. Materials used in the training workshop

A. TRAINING

- Handouts
- Reference materials
- LCD and laptop
- Papers and pens
- Fish dummies
- Field guide books

B. BENCHMARKING AND M&E

- SCUBA/snorkel equipment
- SCUBA tanks
- Boat
- Underwater slates
- GPS
- Manta board and rope
- Transect lines/ropes
- Field guide books
- Data forms

References:

- *Aliño et al. 2001. Challenges and opportunities in MPA Management in the Philippines (9th ICRS)*
- *Aliño 2002. Lecture series (Iceland)*
- *Arceo et al. 2001. Orientation on MPAs*
- *Uychiaoco et al. 2001. Coral reef monitoring for management*
- *Philippine Marine Sanctuary Strategy Survey Form and Report Card*
- *White, et al. 2006. Creating and Managing MPAs in the Philippines*

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