MPA Evaluation and Habitat Characterization for Vulnerability Assessment in Davao, Philippines

Della Grace Bacaltos[1], Hilly Ann Roa-Quiaoit[2] , Fra-and Quimpo[2], Roy Molina[3], Joy Jimenez[1], Buzar Beu Bacaltos[1]

[1]Southern Phil. Agri-business & Marine & Aquatic School of Technology, Malita, Davao del Sur
[2] McKeough Marine Center, Xavier University, Cagayan de Oro City 9000
[3] Barangay Local Government Unit, Sta. Cruz, Davao del Sur
Corresponding author: gbacaltos@yahoo.com

Abstract. Sta. Cruz in Davao del Sur was assessed to attain sound management interventions as well as climate change mitigating and adaptation measures in terms of its exposure to stressors, its sensitivity given the existing seagrass ecosystem in the area, and adaptive capacity with its locally-managed MPA. It is one of the sites of the national program on Resilient Seas under the project Invertebrate Fisheries Population as Response Indicators for Climate Change. Based on the recent monitoring and evaluation conducted by ECOGOV, the marine protected area (MPA) in the study site is still on Level 1 which implies that the management strategy is just being established, with the preliminary requirements (e.g. municipal ordinance, management body, Information, Education, Communication (IEC) budget allocation, etc) being complied. With the gross habitat characterization conducted, the study site was found out to be mostly occupied by seagrass with *Enhalus acoroides* as the dominant species. Mean percent cover did not vary much from among the inside of the marine sanctuary (34 to 52%), within the buffer zone (25-51%), and in the open access (38-48%). Likewise, values for the mean density   show slight variation which range between 71 to 152 shoots/m^2 for the three zones surveyed. The substrate type in the study station is sandy with presence of coral rubbles in some transects. Some invertebrates, such as sea cucumber and sea star, were also observed.

Key Words: Marine Protected Area, Vulnerability Assessment, Climate Change, Seagrass, Coral
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Introduction

The term vulnerability has been defined in many different ways by various scholarly work. But in this project the term vulnerability is used in the context as the degree to which a coastal system (e.g. Bato coastal community) is likely to experience harm due to exposure to a climate-related hazard (Turner II et al. 2003). Vulnerability is now a central concept in a variety of research contexts such as natural hazards and disaster management, ecology, development, secure livelihoods, sustainability, and climate impacts and adaptation. Based on the article of Allison (2007) vulnerability can be a function of potential impact (sensitivity + exposure) and adaptive capacity. There are several preliminary processes that have to be done before determining the vulnerability of a certain coastal community. These include MPA (Marine Protected Area) evaluation, habitat characterization, and obtaining data on socio-economics. Information obtained from these activities are needed for the determination on specific aspects (e.g. coastal habitat, fisheries, socio-economics, coastal integrity) that serve as criteria in determining the degree in which a coastal community is most vulnerable. By then, adaptation and mitigation measures can be formulated.

Adaptation to climate change is necessary and is required in addition to mitigation to avoid unacceptable impacts of climate change (IPCC 2007). Information on the degree of vulnerability should be made available to the Local Government Units before they can plan and allocate funds for their constituents that are "particularly vulnerable" to climate change. This is to meet costs of assessing, planning, and implementing adaptation measures. It is along this context that this project was

implemented with objectives, to wit: 1) to attain sound management interventions as well as climate change mitigation and adaptation measures relative to its exposure to stressors, its sensitivity given the existing ecosystems in the area, and its adaptive capacity; 2) to identify which aspect (e.g. fisheries, habitat, socio-economics) in which coastal community are most vulnerable; and 3) to assist LGU (Local Government Units) in planning, resource allocation, and implementation of adaptation measures for climate change.

Material and Methods
The project site is in Sta. Cruz which is one of the fifteen municipalities of the Province of Davao del Sur in the Philippines. Its present total land area is 27, 960 hectares or 276.90 square kilometers and inhabited with 67,317 people per latest National Statistics Office Census of Population. It consists of eighteen barangays characterized as follows: seven uplands, nine upland-lowland-coastal and two lowland-coastal barangays. The municipality comprises a large area of municipal water on which the fisherfolk largely depend for their sources of income. The recent economic developments in the municipality brought about by the agri-industrialization has contributed to its soaring income classification. The Department of Finance classified Sta. Cruz as second class since 1997 up to the present. In year 2000, it has total income of P55,160,768.98 which constitutes 25.41% local sources and 74.59% national share from internal revenue allotment. Sta. Cruz is still agriculturally productive both in upland and coastal zones but its present physical environmental conditions showed a great need for rehabilitation, conservation, protection and proper management for sustainable development (Source: Sta Cruz MCDP).

As part of the entry protocol and gathering of secondary data, the project team conducted an entry protocol to local chief executives to inform them about the Vulnerability Assessment (VA). This was followed by a visit to the planning office and the Municipal Agriculture Office to request existing reports that serve as secondary data. These were used to complete the rubrics for the VA.

For resource assessment which was completed in 2008, standard methods were used for the assessment of the seagrass beds and for the coral reef. Some data were obtained through the Participatory Coastal Resource Assessment (PCRA) methods. Reef fish assemblages inside and outside the marine protected areas of Brgy. Bato were surveyed using the standard visual census technique (English et al., 1994). A 50- m transect line was established along the reef slope. All fish encountered within 5 m width in every 10 m length was identified and counted. The sizes (fork lengths) of the fish were also estimated to the nearest cm. The point intercept transect was used by the scuba divers to estimate the percentage cover of live hard and soft corals, dead corals, other animals, plants and various reef substrates which may reflect the health of the reef (Uychiaoco et al., 2001). A total of 50 m transect line was used to intercept the benthic life forms inside and outside the marine protected areas of the three selected barangays. Three replicates of transect were laid each for the inside and outside of the sanctuary.

As to MPA evaluation, a focus group discussion (FGD) was conducted wherein a maximum of ten officers or individuals involved in the MPA management participated in the FGD. Some participants were members of the management body such as : 1) MPA Manager or head of the management body/council either as chairman or president; 2) MPA treasurer or chairman of the finance committee whoever is highly involved in the finances of the

MPA; 3) MPA secretary or chairman of the Monitoring & Education (M & E) committee; 4) Bantay-Dagat chairman or chairman of the law enforcement committee; 5) Member of the core group that initiated the MPA, and; 6) LGU and NGO staff who is assisting the MPA management

A focus group discussion was also conducted to present the vulnerability assessment matrix and to validate the data that were listed based on previous resource assessment reports and from the development plans of Sta Cruz. The manner of presenting was through a facilitator who encouraged the fisherfolk (FGD participants) to comment and affirm the data as to their actual observation. The facilitator further explained to the participants the methods and computations to be followed in obtaining the vulnerability scores. Steps in VA are patterned from the Level 1 Model (c/o Dr. Al Licuanan of De La Salle) and Level 3 Model (c/o Dr. Sam Mamauag of UP MSI).

Results
For habitat characterization, Sta. Cruz is mostly occupied by seagrass with *Enhalus acoroides* as the dominant species. Mean percent cover did not vary much inside the marine sanctuary (34 to 52 %), within the buffer zone (25-51%), and in the open access (38-48%). Likewise, values for the mean density show slight variation which range between 71 to 152 shoots/sq.m. for the three zones surveyed. The substrate type in the study station is sandy with presence of coral rubbles in some transects. Other invertebrates such as sea cucumber and sea star were observed during the survey. Based on the fish visual census done, a total of 15 and 17 reef fish families were recorded inside and outside the marine protected areas in Brgy. Bato. Target fish, health indicators and common fish were also found in the area. This was compared with other barangays in Sta. Cruz. The assemblages of reef fish inside and outside the marine protected areas

(MPA) in Brgy. Tuban indicated that species richness is high inside the MPA as compared to the outside MPA. There were also more families of fish inside the MPA as compared to the outside MPA. In Brgy. Bato, there were 20 fish families recorded inside the MPA and 17 families outside. Since the coral reef cover inside is in good condition relative to that outside, this can be attributed to other factors such as enforcement of no-fishing policy inside the MPA. Among the families of fish, Pomacentridae, locally known as *palata* were recorded to be most abundant, while Aulostomidae was the least abundant inside and outside the MPA.

Generally, percent cover of live hard corals were also high in relation to dead coral cover inside and outside the marine protected areas in Brgy. Bato, Sta. Cruz. The live coral cover outside (45%) the MPA in Brgy. Bato was higher than that inside (31.8%). However, it also had higher percentage of dead corals (33.3%). In fact, the mortality index of the coral cover was higher outside (0.4) than inside (0.3) the MPA. This was also a relative improvement from the 20 % live coral cover recorded in the area last 2001 (Pasig Development Area Planning Workshop, 2001).

As to the MPA evaluation using the MPA Management Effectiveness Assessment Tool (MEAT), Sta Cruz, being one of the sites of the project, has a locally-managed MPA. Based on the recent monitoring and evaluation conducted by ECOGOV, the MPA in the study site is still on Level 1 which implies that it is just being established with the preliminary requirements (e.g. municipal ordinance, management body IEC, budget allocation, etc) complied.

While for the Level 1 Vulnerability Assessment (VA) results gathered from the coastal community, including the habitats, Bato, Sta Cruz have sub-scores of 3 for

sensitivity, 3 for exposure, and 2 for lack of adaptive capacity resulting to moderate vulnerability. This scoring is based on the VA rubrics in which values of 1-2, 3-4, and 5 denote low, medium, and high vulnerability, respectively. The sub-score of 3 for sensitivity was obtained from average value of all the sub-score based on the data that correspond to the criteria (e.g. coastal habitat, fish and fisheries, coastal integrity). Since Bato has still relatively intact habitats (e.g. coral reef, seagrass, mangroves) and its Local Government Unit is quite supportive to coastal resource management, the score for lack of adaptive capacity was pegged only at 2. The interplay of the key elements for vulnerability resulted to a moderate status. Consistent with Level 1 VA , the assessment for the Level 3 VA with sub-scores 5 for fisheries, 3 for reef fish/habitat, and 3 for socio-economics resulted to an overall vulnerability of 4 which means moderate in status.

Discussion

The generally good status of resources in the site may be attributed to the presence of Marine Protected Areas which serve as a protection of spawning stock, provides a recruitment source, and maintenance of natural population and areas of undisturbed habitats. The MPA in the site was established under the Habitat and Fisheries Management of the Municipality Coastal Resource Management Monitoring (MCRM) and Evaluation Report Plan of the Sta. Cruz in 2000 – 2010 (MCD, 2005). Brgy. Bato allocated 25 hectares for the establishment of the MPA as indicated in the Fish Sanctuary Management Plan that was adopted by the barangay. Moreover, there was a good status of fish resource as there were more families of fish inside the MPA as compared to the outside and the total mean abundance was higher inside the MPA than that outside, although, the total mean biomass was higher outside than that inside the MPA. These may

be attributed to the good conditions of their live hard corals.

The VA implies that the coastal habitats in Bato are still relatively healthy and that they manifest moderate sensitivity to hazards brought about by climate change. Except for the score of 3 for exposure which was attributed to the problem on sedimentation and storm waves which the locality experience with the advent of climate change. While other stressors (e.g. sea surface temperature, storm surge, sea level rise) are felt in some other regions in the country.

Also as indicated in the VA scores, Barangay Bato is most or highly vulnerable in terms of the fisheries sector. This is due to the low fish catch rate data that was gathered from reports and was affirmed by the fisherfolk who attended the VA-FGD validation.

Both results from Level 1 and Level 3 VA further imply that the Bato coastal community and its Local Government Unit need to be vigilant for the protection of their remaining vital ecosystems. Since these contribute to the adaptive capacity of a system to counteract the stressors brought about by climate change. Moreover, the detailed results of VA can suggest appropriate strategies for resource management as well as climate change mitigating and adaptation measures. As a response to the challenge presented by the Project VA team, the barangay local government unit have planned for the following strategies: 1) intensify the information, education, and communication (IEC) on resource management and climate change; 2) implement conservation efforts; 3) strengthen local legislation; 4) comply infrastructure as well as M & E requirements (e.g. guardhouse, scuba gears) for the MPA; 5) review and improve MPA management plans; 6) empower and capacitate BFARMC (barangay fisheries and aquatic resource

management council); as well as 7) strengthen linkages and collaboration.

Acknowledgement

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